

PN-AAV-435

Best available copy -- pages 6, 24, 25, and 26
missing

PN-AY-435
IN 52651

THE PROVISION OF PHARMACEUTICALS IN SELECTED
PRIMARY HEALTH CARE PROJECTS IN AFRICA:
REPORT OF A SURVEY

November 1981

(Contract No. Afr/0135-C-1092)

Submitted to: Dr. James Shepperd
Director
Division of Health and Nutrition
Africa Bureau
Agency for International Development

Submitted by: Dr. Rosalyn King

TABLE OF CONTENTS

	<u>Page</u>
ACKNOWLEDGEMENTS	
LIST OF FIGURES AND TABLES	
LIST OF ABBREVIATIONS	
EXECUTIVE SUMMARY	
I. INTRODUCTION	1
A. Purpose, Structure and Content	
B. Need for the Survey	
II. ASSESSMENT	5
III. CENTRAL OFFICE DATA COLLECTION	8
IV. FIELD OBSERVATIONS	9
V. FINDINGS	11
A. Pharmaceutical Supply	11
1. Observations and Interviews: A Regional Viewpoint	11
a. WHO/AFRO	
b. REDSO/East	
c. REDSO/West	
2. Status of Pharmaceutical Supply Systems in AID Supported Primary Health Care Projects	17
• Zimbabwe	17
a. Country Resources	
b. AID Operations	
c. Pharmaceuticals	
• Mali	24
a. Country Resources	
b. AID Operations	
c. Pharmaceuticals	
• Liberia	36
a. Country Resources	
b. AID Operations	
c. Pharmaceuticals	

TABLE OF CONTENTS

	<u>Page</u>
• Senegal	44
a. Country Resources	
b. AID Operations	
c. Pharmaceuticals	
3. Status of Other Projects Related to Pharmaceutical Supply	55
a. Kenya - Innovation for Pharmaceutical Supply	
b. Economic Community of West African States	
c. West African Pharmaceutical Federation	
4. Special Issues	63
a. Costs and Recurrent Costs	
b. Opportunity for Private Enterprise	
• Local Private Production	
• In-System Manufacturing	
c. Traditional Medicine	
B. Summary of Findings	78
IV. DISCUSSION OF FINDINGS AND IMPLICATIONS	82
A. Country Resources	
B. AID Operations	
C. Pharmaceuticals	
VII. RECOMMENDATIONS	86
A. Program Formulation	
B. Project Identification	

APPENDICES

- A-1 WHO/AFRO LIST OF ESSENTIAL DRUGS
- A-2 LOCAL RESOURCES FOR THE TREATMENT OF DIARRHEA
- B-1 STUDY ON THE NATIONAL PHARMACEUTICAL SYSTEM IN THE REPUBLIC OF MALI
- C-1 OUTLINE-PHARMACEUTICAL SUPPLY SECTION OF PRIMARY HEALTH CARE
- D-1 RAVITAILLEMENT EN MEDICAMENTS CONTENU DE LA CAISSE STANDARD
- D-2 SIPOA, SENEGAL, DRUG AND PRICE LIST
- D-3 DETERMINATION OF BAREMES
- D-4 PHARMACEUTICALS AND UNOFFICIAL PRICES FOR 1980, SINE SALOUM, SENEGAL

TABLE OF CONTENTS

Page

APPENDICES

E-1 LIST OF ESSENTIAL DRUGS: PROPOSED NEW MANAGEMENT SYSTEM OF
DRUG SUPPLIES

F-1 UNIVERSAL PHARMACEUTICAL SYSTEMS DATA

G-1 MEDICINAL PLANTS

H-1 LIST OF PERSONS INTERVIEWED

BIBLIOGRAPHY

a

ACKNOWLEDGEMENTS

I gratefully acknowledge the assistance of the following:

Dr. Thomas Georges, formerly Chief Africa Bureau, Development Resources, Health and Nutrition Division

Dr. Charles DeBose, Africa Bureau, Development Resources, Health and Nutrition Division, and

Dr. James Shepperd, Africa Bureau, Development Resources, Health and Nutrition Service,

who provided conceptual guidance.

To Glenda Partee-Scott and Linda Thigpen Marshall for editorial assistance.

Deborah Smith put all the periods and commas in the right place.

Dr. Sterling King, Jr., provided valuable manuscript organization and comment.

LIST OF FIGURES AND TABLES

<u>Figure</u>	<u>Title</u>	<u>Page</u>
1	YELIMANE DRUG SUPPLY-SCHEMA	32
2	MOH SENEGAL, ORGANIZATIONAL UNITS INCLUDING PHARMAPRO	46
3	SINE SALOUM PROJECT DRUG SUPPLY CHAIN	52
4	KENYA: INNOVATION FOR PHARMACEUTICAL SUPPLY DISTRIBUTION FLOW	58
<u>Table</u>		
1	GOVERNMENT MEDICAL STORE	20
2	SUMMARY OF TOTAL COSTS: INSTALLATION OF 20 VILLAGE PHARMACIES PER ARRONDISSEMENT PER YEAR	35
3	PURCHASE PRICE AND PROFIT MARGIN FOR DRUGS SOLD BY PSR/MALI	37
4	DRUG PROJECTIONS FOR ONE BAREME FOR ONE YEAR	54
5	HEALTH HUT RECORD FOR JUNE 3, 1981, VILLAGE OF MBAM, SINE SALOUM, SENEGAL	56
6	TOTAL DOLLAR VOLUME OF PHARMACEUTICALS PURCHASED AS OF MAY 1981, PSR-MALI	65
7	COST OF LOFA COUNTY RURAL HEALTH PROJECT'S SUPPLY AND LOGISTICS SYSTEM FOR FIRST YEAR	66
8	COMPARATIVE COSTS OF ASPIRIN AND CHLOROQUINE BY PROJECT SITE (OR SOURCE) OF PHARMACEUTICAL	67
9	DATES AND PROFITS DEPOSITED IN REVOLVING FUND FROM 27 PHARMACIES IN KORO CERCLE, MALI (01/79-02/81)	70
10	FINANCIAL SURVEY OF EIGHT HEALTH HUTS IN NIORO DEPARTMENT (Figures in CFA Francs)	71
11	COMPARISON OF LOCAL IN-SYSTEM MANUFACTURING COSTS TO IMPORT COSTS FOR ASPIRIN AND ACETAMINOPHEN	75
12	STATUS OF PHARMACEUTICAL SUPPLY IN AID SUPPORTED PRIMARY HEALTH CARE PROJECT LOCATIONS BY COUNTRY: COUNTRY RESOURCES	79

C'

<u>Table</u>	<u>Title</u>	<u>Page</u>
13	STATUS OF PHARMACEUTICAL SUPPLY IN AID SUPPORTED PRIMARY HEALTH CARE PROJECT LOCATIONS BY COUNTRY: AID OPERATIONS (DRUG-SYSTEM RELATED)	80
14	STATUS OF PHARMACEUTICAL SUPPLY IN AID SUPPORTED PRIMARY HEALTH CARE PROJECT LOCATIONS BY COUNTRY: PHARMACEUTICALS	81

- d.

ABBREVIATIONS

ABD	African Development Bank
AID	Agency for International Development
CAPS	Central African Pharmaceutical Supply
ECOWAS	Economic Community of West African States
ENDA	Environnement et Developpement du Tiers-Monde
FED	Fonds European de Development
HIID	Harvard Institute for International Development
MEDCAN	Medex Cameroon
MHSW	Ministry of Health and Social Welfare
MOH	Ministry of Health
NMSD	National Medical Supply Depot
NMSP	National Medical Supply Depot
OMP	Office Malien de Pharmacie (Mali)
PHCP	Primary Health Care Project
PIO/Cs	Project Implementation Order/Commodities
PIOTS	Project Implementation Orders for Technical Services
PNA or PHARMAPRO	Pharmacie Nationale des Approvisionnement (Mali)
PSR	Projet Sante Rurale
REDSO	Regional Economic Development Support Office
SDPT	Sahel Development Planning Team
SER/COM	Services/Commodities
SHDS	Strengthening Health Delivery Systems
SIPOA	Societe Industrielle Pharmaceutique del Afrique de l'Ouest
UNICEF	United Nationals International Children's Education Fund
USAID	United States Agency for International Development
VHws	Village Health Workers
WAPF	West African Pharmaceutical Federation
WHO	World Health Organization
WHO/AFRO	World Health Organization, African Regional Office
WHO/PDT...	World Health Organization, Prophylactic, Diagnostics, and Therapeutic Division

- 4 -

I. INTRODUCTION

A. Purpose, Structure and Content

According to Agency for International Development (AID) policy, provision of basic medicines is a component of its primary health care activity thrust. However, the provision of basic medicines is but a minor part of the requisite organizational and management components necessary to ensure appropriate selection, procurement, distribution, and usage of pharmaceuticals within the domain of primary health care. Inadequate attention to the gulf that exists between the provision and the proper usage of basic medicines has oftentimes caused difficulty for project and AID staff when implementing AID policy and programs. Moreover, these organizational and management components of the pharmaceutical supply system were slated as areas for improvement by AID health officers at their first conference.

For these reasons, the African Bureau, Development Resources, Health and Nutrition Division sought the services of a technical consultant to assist them in identifying the problems impacting pharmaceutical supply systems and in determining strategies for problem solution. During the consultancy period, January 1981 to June 1981, the consultant was given the responsibility of surveying numerous primary health care projects with the goal of providing recommendations relative to the problem focus.

This report is the culmination of these activities. Its purpose is to:

- 1) document consultant activities undertaken within the Health and Nutrition Division between January and June 1981 with respect to the issue at hand;
- 2) present information on the problems of providing pharmaceuticals for primary health care projects in Africa from both AID's central and mission level perspectives; and
- 3) suggest strategies for problem resolution.

This report describes the framework for the survey and highlights activities performed at the central and field levels. It also presents findings, a discussion of implications, an analysis of the findings, and recommendations for program and project formulation. The survey also presents general information pertinent to the topic at hand. Certain areas, such as the need for pharmaceuticals for tropical diseases, were beyond the scope of this effort, as they required a more detailed study.

B. Need for the Survey

The International Conference on Primary Health Care held at Alma-Ata, U.S.S.R., in 1978 provided a stimulus for present AID health policy. In 1980, AID formulated and disseminated its health sector policy aimed at health promotion in developing countries. This policy called for health programming with a focus in the areas: 1) Water and sanitation; 2) selective disease

control; 3) health planning; and 4) primary health care. Within each of the above, an emphasis was placed on the provision of essential equipment and supplies, and on planning, analysis, and training. Of the four areas, the highest priority was given to primary health care which included, among other components, basic medicine, vaccines for immunizations, health education, therapeutic management of certain disease states, and disease prevention.

Since 1970, AID has funded a number of projects in African countries related to primary health care. Many of these include funding for basic medicines, training of personnel in the provision of health care using the medicines, and providing associated logistical support. The role of medicinals in funded projects has varied from that of a minor component to that of the focus of the project. The Sine Saloum Project in Senegal exemplifies a situation where the role of medicinals is crucial.

However, there are ~~instances in project documents~~ citing difficulties encountered in program implementation and management of pharmaceuticals. Problems cited fall into three categories:

- 1) Those related to the pharmaceuticals themselves, e.g., the problem of pharmaceuticals arriving in a country after the expiration date has passed;

- 2) those related to country resources, e.g., where countries have difficulty amassing sufficient foreign exchange to make needed procurements or lack adequate resources; and

- 3) those related to AID operations, e.g., the difficulty encountered in the application of AID procurement policy to specific program requirements.

Thus, an examination of problem areas was needed to provide a delineation of problem sources and boundaries and to assess the impact of these problems on AID programming. It was felt that central office documentation review, personnel interviews, and site visits to projects and offices in Africa would provide the information base upon which the examination could be conducted. Data were to be obtained on the various methods countries and project staff used in coping with and solving these problems.

II. ASSESSMENT

The mission of the survey was developed in January 1981. It was to provide the Health and Nutrition Division of AID's Africa Bureau with a public health pharmacist's technical expertise on problems and issues related to the planning and management of pharmaceutical supply within primary health care. The outcome of this effort was to provide recommendations useful in the alleviation of problems identified. To do so required that activities be conducted not only in the field, but at the central office as well.

The goals which evolved were two-fold: 1) To develop greater insight into the variables that affect the provision of pharmaceuticals to primary health care programs; and 2) to explore the kinds of strategies that could be used in problem solving. Guiding objectives included: 1) Identifying officials with knowledge and sources of information on the topic; 2) selecting and reviewing literature and documentation of project efforts; and 3) comparing and contrasting information obtained at the central level with practice in the field.

Methods used in meeting these objectives were: 1) To interview and consult with persons at the national, regional, district, and village levels, and with USAID project staff; 2) to conduct field observations of ongoing project activities; and 3) to review relevant documents and literature.

Early in the consultancy, an approach was formulated with the staff of the Health and Nutrition Division and Regional Affairs. A specific focus on planning

necessary for USAID to implement its primary health care objectives in other countries. This relates to the status of information available, project conceptualization, administration, and policy.

III. CENTRAL OFFICE DATA COLLECTION

Obtaining interviews with key staff of the Health and Nutrition Development Resources Division staff within the Africa Bureau was the initial step in problem identification. Staff assisted in identifying health officers in other bureaus, in AID as a whole, and persons within the State Department who would be of assistance. Offices which provided interview input within AID were as follows: Program and Policy Coordination; Development Support-Population; Development Support-Health; Office of Commodity Management; Latin America Bureau; Asian Bureau; Near Eastern Bureau, Africa Bureau; and project offices for various countries.

Additionally, staff concerned with health issues in other agencies were interviewed. Staff at the Office of International Health, the Food and Drug Administration, the Public Health Service, and the Indian Health Service were queried. Information was obtained in interviews with staff from ~~UNICEF in~~ New York City, the World Bank in Washington, D.C., the drug specialist at the Pan American Health Organization, General Accounting Office staff, the Center for Policy Research, and from the African-American Purchasing Council. (A list of persons interviewed is included as Appendix H-1.)

A review of cables, selected project identification documents, project papers, project evaluation materials, and project memoranda provided a background on pharmaceuticals and the kinds of concerns project mission staff had with respect to pharmaceutical needs.

IV. FIELD OBSERVATION.

Prior to field activities, regional and African Bureau staff met to establish criteria for site selection and to choose possible sites. It was determined that projects should have a geographic, as well as an Anglophone/Francophone mix. They should have varying degrees of development, including one country in the survey whose primary health care project had terminated. There should be mission concurrence, and a site visit should contribute significant information on the status of pharmaceuticals in the country. It was also suggested that both Regional Economic Development Support Offices (REDSO) personnel be interviewed for their perspective on the issue. Countries selected for the visit were: Cameroon, Liberia, Zimbabwe, Tanzania, Kenya, Mali, Senegal, Ivory Coast, and the Congo.

Several countries, however, were deleted during the final stages of visit preparation. During a country development strategy session for Cameroon, it was determined that the MEDCAM Program there was in severe political trouble and a visitor would not be welcomed at that time. Also, since Ministry of Health (MOH) approval had not yet been obtained, MDH staff would not be amenable to providing necessary information. Kenya did not concur with the visit. Initially, mission staff in Tanzania concurred with the visit, but later rescinded concurrence. Just prior to the consultant's departure, Tanzania requested the visit, and travel authority was obtained; however, by that time, travel schedules had been completed and the reinclusion of Tanzania in a economic travel pattern could not be achieved.

The final selection of countries to be visited consisted of: the Congo, Zimbabwe, Kenya, Mali, Liberia, Ivory Coast, and Senegal. Countries and projects were to be visited for specific reasons. A visit to three countries (Kenya, Ivory Coast, and the Congo) would provide information on administration from the regional perspective. REDSO staff would be visited in Kenya and the Ivory Coast. WHO/AFRO staff would be visited in the Brazzaville (Congo) area. A four-country visit would provide an opportunity for observations of project activity in Zimbabwe, Liberia, Senegal, and Mali. Of the latter, two were Anglophone and two were Francophone. Three were in west Africa and one in southern Africa.

All projects were in different stages of implementation. Zimbabwe was reported as beginning its medical stores building. Liberia had officially terminated its Lofa County Project, but the government was reportedly continuing the activity. In Senegal, the Sine Saloum Project was in the midst of redesign considerations. The project in Mali was in full operation.

The visitation schedule permitted approximately five working days in each country. This time allotment was deemed sufficient for survey purposes.

V. FINDINGS

A. Pharmaceutical Supply

1. Observations and Interviews: A Regional Viewpoint

Information presented in this section summarizes results of interviews and consultations from the offices of WHO/AFRO, REDSO/East, and REDSO/West.

a. WHO/AFRO. The Africa Regional Office (AFRO) of the World Health Organization (WHO) in Brazzaville has established and staffed a program within its Prophylactic, Diagnostics, and Therapeutic Division (PDT). The overall goal of this program is to provide technical assistance to member states for disbursement of essential drugs to the respective populations at prices they can afford.

According to its director, a pharmacist, the program, at the time of the visit, enjoyed some sixty percent of the Health Services Development funds of AFRO. All the forty-four states of the WHO/AFRO subregion are involved in the program. Regional and subregional communications exist to assure a broad input.

The program has short and long term plans. Of immediate concern is the development of a list of essential drugs and the group bulk purchasing mechanism to obtain these drugs. Quality control assurance is also of immediate importance. A list of essential drugs has been developed and approved by all states

and is to be promulgated in the near future (see Appendix A-1). States are now in the process of stipulating their needs for varying amounts of drugs. Country specification will be used as the basis for the development of a tender system. Long-term collaborative objectives include assisting and communicating with countries in the development of drug policy, legislation, distribution systems, training for appropriate personnel, and health services research on the beneficial and appropriate recognition of the role of traditional medicine. The program, now staffed by one pharmacist, is to have additional staff in the near future. The pharmacist/director previously served as a director of medical stores for his home country.

b. REDSO/East. Due to miscommunications, the REDSO/East health officer was unaware of the consultant's visit to Zimbabwe and Kenya. Consequently, little time could be scheduled for an interview and a debrief on the Zimbabwe experience. Nevertheless, the interchange highlighted the monitoring and educational role of the office, as well as the need for information and technical resources on drug supply systems management.

c. REDSO/West. A primary reason for going to the Ivory Coast was to confer with appropriate REDSO/West staff regarding the technical and managerial resources available for project assistance. The regional health officer identified informational sources, including: The procurement officer, the design officer, Strengthening Health Delivery Systems (SHDS) personnel, and staff of the Health Education Division of the African Development Bank.

The regional procurement officer is available to provide commodity procurement workshops and development assistance. Workshops up to three days in length can be provided; however, a one day seminar is usually provided for those involved in project design or those who wish additional information regarding commodity procurement. Information provided within the workshop includes activities managers must undertake in order to assure appropriate procurement. Subsumed under this topic is the following: Development of the procurement plan, its implementation, source, and origin requirements with respect to commodities and their eligibilities; waivers, the occasion for obtaining them and their format; the structuring of Project Implementation Orders for Technical Services (PIOTs); and other specifics with respect to pharmaceutical procurement.

Interviews with REDSO design staff revealed concerns with respect to pharmaceutical supply. From the design standpoint, staff's primary concern was in assuring that the mechanisms for the implementation of the pharmaceutical supply sector are outlined and complete. Staff was also concerned that initial and recurring costs be fully explained in project design papers. In addition, it was deemed important to stipulate capability for supply sector expansion. One officer had been involved in developing health care activities for a country and was concerned that the health activity being designed did not have the desired impact information on country supply. He felt that there should be some check on usage rates and inventory control.

The SHDS project has as its aim to strengthen health delivery systems in twenty countries in west and central Africa. It has four objectives:

- 1) To improve national and regional health planning and management;
- 2) to increase skills and improve utilization of health personnel providing generalized health services at the supervisory and local levels;
- 3) to improve regional and national disease surveillance and health demographic data systems, and to integrate these systems into national health planning delivery systems; and
- 4) to develop low cost health delivery systems.

SHDS staff proved to be a valuable information source. The office had conducted a preliminary investigation into the status of pharmaceutical supply in several countries which resulted in a 1979 report. However, since the time of the report, SHDS staff had not conducted any further investigations nor given attention to this area.

The purpose of meeting with the SHDS staff was to determine if any activity was being undertaken with respect to pharmaceutical supply systems and to examine the manner in which the training component dealt with the issue of pharmaceuticals. A further concern was to ascertain why there had been no follow-up to the earlier (1979) report on pharmaceuticals.

It was subsequently reported that AID's Washington regional office had instructed the program to limit and, in fact, to desist from further investigation into problems and issues related to pharmaceutical supply in west and

central Africa. As a result, pharmaceuticals were only mentioned in regard to the training activity under SHDS' objective of health manpower development. The program has developed modules for instructing the trainers of village health workers. These modules include references to symptomatic treatment, but generally do not name specific drugs. They do, however, indicate how the village health worker and others should use drugs in the treatment of certain disease states. An example of these training aids is included in Appendix A-2.

Mention of specific drugs was eliminated from the modules in the planning stage because some countries did not want to be limited to the use of certain drugs. Countries were then free to include the names of drugs chosen for use. Additionally, some countries working in cooperation with SHDS staff in developing these modules, did not want the village health worker to dispense medications. They preferred that medication dispensing be handled at the center of higher level. Therefore, it was left to the country to add specific protocols with respect to select drugs.

The training modules include a unique feature -- a unit on the identification and preparation of local resources for treatment of disease entitled, "How to Incorporate Traditional Herbs in the Treatment of Disease." Trainers of village health workers are taught how to instruct workers to identify local herbs for treating diarrhea, how to prepare these herbs, and how to use them with oral rehydration therapy.

Under the health planning and management objective of SHDS, there have been discussions and workshops on selective management issues. To date, there has not

been one on the administration and management of a drug distribution system. Again, due to the directions from Washington to omit concentration in this area, the only relevant piece is a training module for trainers of village health workers on how to keep a record of drugs used (see Appendix A-2).

A primary resource to health activities in Africa is the Health Education Division of the African Development Bank (ADB). In 1977, the ADB decided to assess the feasibility of increasing pharmaceutical supply to Africa by the establishment of a pharmaceutical industry. In 1978, it funded a study for determining the feasibility of establishing a production plant for pharmaceuticals of basic necessity in west and central Africa. The study was to focus on the potential in six countries: Congo, Ghana, Mozambique, Sudan, Togo, and Tunisia. However, the focus of the study later shifted to consider potential in other countries as well, including Cameroon, Mali, Niger, Ivory Coast, and Gabon.

The study found that a total investment outlay of \$26.3 million would be necessary to provide basic drugs in varying dosage forms, such as tablets, capsules, injectables, and clinicals. To be economically feasible, production must occur on a regional as opposed to a country basis. This would necessitate regional ownership, technical cooperation, and accessibility. Such a plant would save a total of twenty-three percent of present expenditure levels in foreign currency over a period of ten years. The plant would employ up to two-hundred and forty-five persons.

Bank personnel recently participated in a subregional conference on drug production sponsored by WHO in Beira, Mozambique. At this conference, countries of the subregion were to estimate drug usage over time and were to begin preparation for bulk purchasing. Of primary concern to all countries was determination of the level of capital sufficient for establishing their contribution. While the bank would be limited in providing working capital for large scale manufacturing, it could consider small funds to countries for limited manufacturing.

2. Status of Pharmaceutical Supply Systems in AID-Supported Primary Health Care Projects

This section provides a status report on activities within AID bilateral primary health care projects. Factors such as country resources and USAID operations and management impacting project effectiveness are detailed. Of special concern is the selection, procurement, distribution, and use of pharmaceuticals. To provide a relevant backdrop for the information, a project or country overview is given.

Zimbabwe

At present, USAID efforts are aimed at reconstruction after the five year liberation war in Zimbabwe. A grant of two million dollars was made to the Government of Zimbabwe to reconstruct one-hundred and sixty health clinics in rural areas demolished during the war. Included in this award were funds (four-hundred thousand dollars) for an initial three month supply of drugs and for

equipment and furniture. As of February 1981, over one hundred clinics had been restored and were reported operational.

In early 1981, the government announced that all health care would be free for all who earned less than one hundred and fifty dollars (Zimbabwe dollars) per month. This increased demand for drugs and services, and highlighted the need for an expanded rural drug distribution system. Additional funds are being supplied to construct a medical stores depot in Bulawayo.

a. Country Resources. Zimbabwe has a national organization and structure to provide pharmaceuticals for its health care activities. Infrastructure is well developed albeit suffering from the ravages of the liberation struggle. A codified policy exists through legislation and regulations governing pharmaceutical import, distribution, sales, and use.

Within the General and Administrative Section of the Ministry of Health (MOH), there is a management unit which handles matters relating to the country's pharmaceutical needs. There is also a Drug Control Council appointed by the Minister of Health, with a full time staff which oversees registration of all drugs to be used for human and animal consumption. The Council inspects factories, retail establishments, hospitals and other places where drugs are manufactured, used, and/or sold, and grants licenses to such institutions.

A key element of Zimbabwe's pharmaceutical sector is its centrally located medical stores. This facility is near the Harare Hospital in Salisbury. The

medical stores supplies drugs, chemicals, and equipment to laboratories, hospitals, and all health facilities in the country, as well as supplies to any other Ministry activity. There is a medical stores satellite in Fort Victoria; currently USAID is building a regional stores at Bulawayo.

The central medical stores unit is over five thousand square feet in size and has a laboratory and manufacturing component within it. It is a complete warehouse built of concrete block, with appropriate ceiling windows for ventilation and concrete flooring. It also possesses a cold room.

The stores unit orders all drugs and chemicals, manufactures and repackages some drugs, warehouses them, and distributes them to facilities around the country. Ordering is accomplished through a tender system in which a specified amount of the drugs to be purchased in one fiscal year is sent to bid monthly. Procurement is aided by a computerized inventory system and is financed through a trading account which comes under the authority of MOH. Agencies are billed for pharmaceuticals ordered at ten percent over cost. Table 1 presents workload and sales data for 1979.

The central medical stores manufactures many of the items listed in its catalog. It also repackages tablets and, in some instances, capsules from bulk. This operation, however, has been curtailed due to the age of the machinery.

Work flow within the facility is not well organized for manufacturing. Traffic lines are in the middle of the manufacturing areas, and there is some

TABLE 1

GOVERNMENT MEDICAL STORE
(1978 in parenthesis)

Location of Store	Purchases (\$)	Sales (net) (\$)	Number of Issue Vouchers
Salisbury	4,142,020 (3,081,394)	3,438,847 (3,238,496)	23,493 (26,776)
Fort Victoria	<u>Included above</u>	<u>Included above</u>	<u>(3,063)</u>
	4,142,020 <u>(3,081,394)</u>	3,438,847 <u>(3,238,496)</u>	26,597 <u>(29,839)</u>

Percentage of Sales

Stock as at 30th June 1979

Health	64,44 (65,05)	Salisbury	\$ 2,070,623
Other Government	13,31 (11,13)		(1,097,011)
Missions	3,83 (6,79)	Fort Victoria	79,573
Others	18,42 (17,03)		(71,125)

confusion with incoming and outgoing supplies. Shelves were fairly empty at the time of the visit, due to increased demand growing out of the government's decree that health care would be free to all. Accordingly, demand for the drugs has increased over two hundred percent and the tender system in use has proven inadequate to meet the increased demand.

The consultant also made arrangements to visit the Harare and Andrew Fleming Hospitals in Salisbury and to visit outlying clinics. The Harare Hospital is older than the Andrew Fleming Hospital and lacks the internal facilities seen at the newer hospital. Its patient population is predominantly black. The pharmacy of the hospital facility is comparable to the large centralized pharmacies common in the United States in the late 1960's and early 1970's. Out-patients receive prescription medications and ward stock is distributed from its pharmacy.

The Andrew Fleming Hospital is approximately six years old and has both blacks and whites in its patient population. Coloreds reportedly receive services at the Princess Margaret Hospital. The Andrew Fleming Hospital pharmacy is large, modern, and consists of separate storage, in-patient, manufacturing and dispensing rooms. Administrative offices are adjacent to the pharmacy.

b. AID Operations. AID's pharmaceutical operations in Zimbabwe primarily involve the building of medical stores at Bulawayo and the rebuilding of clinics. Construction of medical stores is overseen by the REDSO/East health officer, who also monitors the clinic reconstruction project. Furthermore, the mission director relies on the health officer for project monitoring and management.

Although the consultant was invited to Zimbabwe by the mission director in order to review the progress of the building of medical stores, no construction had yet begun. The stores were still in the planning stage, and plans were not available for review. Hence, no trip was made to Bulawayo.

Data on the implementation of the clinic rehabilitation project indicated an initial problem in providing adequate quantities of drug supplies to the clinics. This problem was attributable to the increased demand for supplies growing out of the government's new free health policy. A drug selection problem also existed due to conflicts arising out of the list of drugs which Zimbabwe requested to be supplied and those which could be procured with AID funds.*

Of particular note was a procurement problem experienced whereby AID indicated that the grantee, Zimbabwe, could not purchase drugs on the list from a non-U.S. source such as itself. Prior approval was needed to purchase these items. This action initiated a flurry of cables to secure the necessary authorization.

c. Pharmaceuticals. According to the Director of central medical stores, pharmaceuticals used in Zimbabwe come primarily from Zimbabwe, South Africa, and Europe. There are several large, private manufacturers in the country. These

* An insecticide aerosol (name unstated) and sulfaguanidine mixture (liquid and tablets) could not be provided. Sulfaguanidine has been proven toxic and ineffective and is no longer on the market in the U.S.

include CAPS, Datalabs, and Sterling Products. Of these, Datalabs and Sterling Products are subsidiaries or affiliates of Baxter Laboratories and Winthrop Products, respectively, of the United States. Several labels similar to those of U.S. firms were seen on the shelves of private pharmacies. Labels found represented Sterling, Abbot, Squibb, and Pfizer, among others.

Staff of the MOH has selected drugs to be used in health care and devised a product catalog. It is from this product catalog that drugs are chosen for use in the various facilities. Other product selection is done in accordance with MOH directives for the various levels of care. Quality control of drugs used is a function of medical stores and the Drug Control Council. About twenty-five percent of the quality control testing of pharmaceuticals is done at central medical stores.

Pharmaceuticals warehoused in the central medical stores are distributed under a pull system. Facilities are supplied with a catalog which is used to order pharmaceutical supplies as necessary. Orders come to the central medical stores and the products return to the facilities via a private rail transport system. The MOH contracts with a private transport service to deliver such items. The usual turnaround time for routing drugs from central medical stores to the facilities was previously ten working days. Now, according to the MOH staff, because of increased demand, it is over six weeks.

Information obtained at central level was verified by visits to the outlying district of Sipolilo, where two clinic facilities were viewed. These were the

the World Bank, the Fonds European de Developpement (FED), and USAID through the Project Sante Rurale (PSR).

As envisioned, the study would develop the specifications for a parallel system to the Pharmacie Populaire which would procure, distribute, and sell select drugs to rural populations at a lower cost than the Pharmacie Populaire. AID views the parallel system as a stimulant to pharmaceutical competition in Mali and a catalyst for a "free market" perspective there. On a large scale, such a system is basically alien to the outlook of the Malian government and the parastatal structure which presently exists.

Because of internal conflict between government pharmacy interests and the country's rural health needs, the Assistant Minister of Health for Development and Planning was queried regarding how he viewed the coexistence of the two systems. It was his suggestion that the present system be the trade system providing a range of brand name pharmaceuticals, whereas the proposed system would respond to a different need providing drugs at lower costs, selling a limited amount of drugs, and selling only generic items. In this way, it may be possible for both Pharmacie Populaire and the new system to exist side by side without political and economic conflicts.

b. AID Project Overview. The primary AID bilateral health effort in Mali is the Rural Health Project. The Mali Rural Health Project, or Project Sante Rurale (PSR), is a tripartite undertaking of Harvard's Institution for International Development (HIID) as the contractor, the government of Mali, and AID.

The project operates within two cercles: Koro and Yelimane. Primary activities relate to general rural health assistance, the training of rural health personnel, and provision for a system of medical supplies and equipment. Crucial to the pharmaceutical supply efforts of the project are functioning structures of distribution of drugs at the village, arrondissement, cercle, and national levels, and institution of the processes and procedures for the supply and sale of medications at the end of the distribution chain. This involves training village health workers (VHWs) for distribution and sale of medication at the village level.*

According to the project objectives, services were to be provided at a cost of three dollars per person, per year of which one dollar (approximately four-hundred and twenty FM) could be recovered from drug sales. As of February 1980, fifty-one VHWs and seventeen midwives trained in Koro had opened twenty-five village pharmacies and provided an average of sixty-four consultants per month. Yelimane was operating at a slower pace. Findings from the formal project evaluation in March 1980 uncovered administrative problems in the project related to the high turnover of advisors, inadequate integration of the project into the MOH structure, and irregular drug supplies to Yelimane.

The regional office for the SDPT is also located in Bamako. The team serves as technical advisors to projects in the Sahelian countries: Mali, Mauritania,

*There was an initial delay in starting VHW training due to a lack of drugs to be used as educational/training materials. AID wanted to supply drugs only after a distribution system had been developed. Compromise was reached and drugs were supplied for educational purposes. The distribution system was worked out at a later time.

Senegal, Chad, Niger, and Upper Volta. The health officer has great interest and experience with rural health and drug distribution systems. Data from his experiences and literature file have been compiled in a Village Health Worker manual which is currently being reviewed by AID/Washington.

c. Pharmaceuticals

Source/Selection. Pharmaceuticals used in the project currently come from the U.S. This poses several problems with respect to the absence of labeling in French and the difference in some tablet strengths (e.g., 100 or 150 mg base of chloroquine). When AID terminates funding, VHWs will have been trained to use one strength and must be retrained to use another strength. This adds to recurring costs.

In an effort to gain early credibility, the PSR has concentrated its pharmaceutical purchases on a battery of simply curative drugs (chloroquine, oral rehydration salts, aspirin, penicillin, and eye ointment). The medical officer has questioned the inclusion of penicillin and Sodium Sulamyd^R eye drops, based on patterns of patient purchase and use. The drugs are expensive for patients and, especially in the case of penicillin, purchased in minimal amounts. This contributes to implement usage and, hence, incomplete treatment for patients. Eye drops may be purchased in 15 ml bottles, but are often used by patients until symptoms disappear. The remainder is then stored for later use, often past the date of expiration.

Procurement. Although procurement is U.S. based, project personnel sought SER/COM procurement policy clarification. Requests regarding appropriateness of UNICEF as a procurement agent for AID projects in the Sahel have been made by SDPT. Specific questions requiring clarification were the following:

- 1) The administrative requirements for AID missions who wish to use UNICEF (especially countries with non-dollar convertible currencies); and
- 2) the possibility of obtaining waivers to purchase limited amounts of locally available and familiar drugs for startup period.

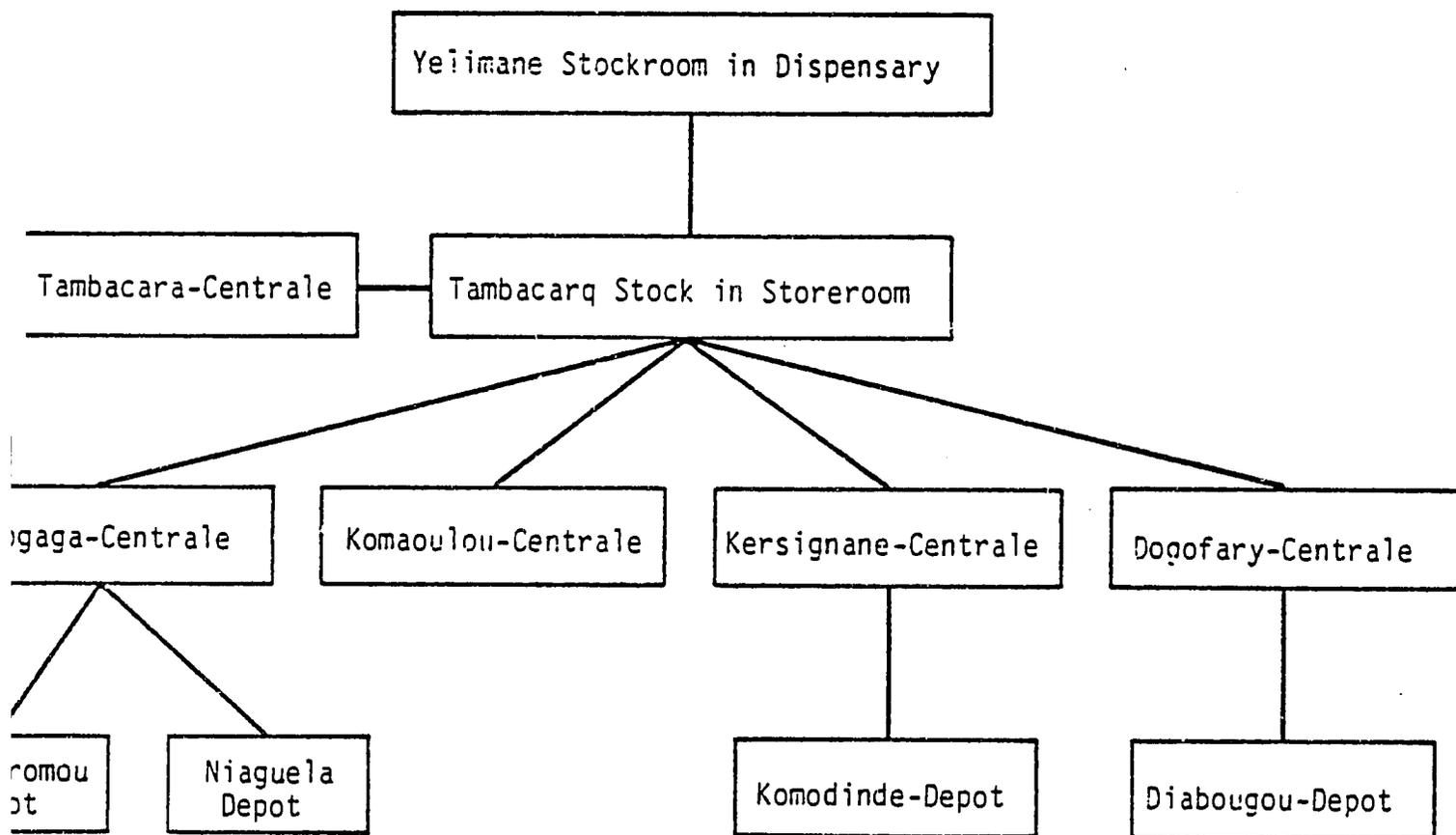
AID policy limits procurement of pharmaceuticals to the products manufactured in accordance with accepted quality standards to those of U.S. or free world origin. Waivers to this policy relate to essential pharmaceuticals which are either not available from the U.S. or, if available, are priced fifty percent more than another source. This policy does not appear to clearly address the issue of waivers when markup rates for surface and air shipment for landlocked countries increase drug costs to projects above the fifty percent limit. Moreover, since UNICEF is well established in the Sahel countries, its supply source is deemed crucial to Malian procurement efforts after U.S. assisted projects terminate. AID policy directed to the specific and immediate procurement needs of the country is necessary to the long-term viability of Mali's pharmaceutical supply efforts.

Distribution and Management. Among its general findings, the March 1980 evaluation indicated that the health system project works best when the supply of pharmaceuticals is regular and dependable. This was in response to problems associated with irregular drug supplies in Yelimane and some concern over the effects of the general pricing of pharmaceuticals on the population's level of use.

Drug supply to all levels of the supply chain in Yelimane was reported as being haphazard (see Figure 1 for typical supply structure). As originally planned, Yelimane was to have a six month stock, while the pharmacy centrales (in villages designated as Centres de Formation which serve as distribution points for pharmacy depots) were to have three month stocks. Since systematic drug restocking has not existed, emergency orders have been required on out-of-stock items, necessitating turnaround time of approximately one month in some cases.

Given the communication and transportation problems in inaccessible rural areas, the need for detailed information on pharmaceutical consumption by month in order to provide adequate inventory control has been stressed. Adequate inventory control, however, is linked to two important efforts: 1) Protected storage (which is assessed as inadequate at the village level) to facilitate inventory efforts and cut down on spillage and breakage; and 2) a system of accountability of drugs and sales. There is no system of accountability of drugs at the arrondissement and cercle levels in Yelimane, and an extensive error rate of sales documentation at the village level exists.

FIGURE 1
YELIMANE DRUG SUPPLY SCHEMA



SOURCE: Dauilaire NMP, Taylor ME: Activities of the Projet de Sante Rurale in Yelimane Cercle 1978-1979. February 1980, p. 23.

A report by Dulaire and Taylor cites four possible reasons for the unacceptably high error rate of up to sixty-three percent:

- 1) Error resulting from pharmacist recording methods -- pharmacists did not always record each sale, especially if it involved a small amount of money;
- 2) error from loss of medications -- loss of medications could occur due to tablet breakage or credit sales;
- 3) error in prices of sales -- prices varied between cercle and village levels, tablets sold singly were substantially more expensive than those sold in pairs; and
- 4) error resulting from information collection -- these were errors in calculations and interpretations by project staff.

Training and Utilization of Drugs. According to the PSR medical officer, VHWs are taught to prescribe drugs in a six day training period. Visual symbols and displays are used as teaching tools for those who are illiterate, but it is felt these tools are hard to comprehend. Another culturally based training technique needs to be explored.

Another problem is the prescribing of drugs for inappropriate reasons. The medical officer related a common misconception among VHWs that penicillin gives

the patient strength. VHWs must also understand the importance of certain dosage patterns (e.g., use of chloroquine prophylactically).

Further, the need for detailed sales documentation at the village pharmacy level, where the most accurate and extensive information exists rather than at the higher supply levels, has been cited. So serious is the problem of accountability that the magnitude of the fifteen percent profit accrued by village pharmacies to be paid in pharmaceuticals and used to augment the local drug stock is seldom known, but can be obtained by additional effort.

Pricing. Another concern relative to pharmaceuticals in Mali deals with the pricing of drugs. The formal AID PSR evaluation of March 1980 cited a deficiency of data regarding appropriate pricing of drugs (e.g., cost to patient) and recommended instituting a system for gathering and analyzing such data and resolving the drug price issue in favor of a more accessible pricing structure.

A preliminary evaluation of the project by Kelly and Sissoko dealt with the issue of medication pricing and explored methods of deriving profits to the project while maintaining low consumer prices. A summary chart of total costs for the installation of twenty village pharmacies per arrondissement, per year is reproduced in Table 2. Here, drug allotment represents 7.6 percent of total expenses for pharmacy installations of over seven million MF.

High profit margins averaging fifty-three percent for penicillin, aspirin, eye ointment, and chloroquine collectively exist and are attributable to: 1) The

TABLE 2

SUMMARY OF TOTAL COSTS: INSTALLATION OF 20 VILLAGE
PHARMACIES PER ARRONDISSEMENT PER YEAR

Expense	Cost per Arrondissement	Cost per Pharmacy	Cost per VHW	Cost per Inhabitant	% of Total Costs
Sensitization/ Training	1,844,600	92,230	46,115	118	23.5
Allotment of Drugs	600,000	30,000	15,000	38	7.6
Supervision	1,574,400	78,720	39,360	101	20.1
General Expenses	<u>3,827,200</u>	<u>191,360</u>	<u>95,680</u>	<u>245</u>	<u>48.8</u>
TOTAL EXPENSES	7,846,200	392,310	196,155	502	100.0

NOTE: Cost per inhabitant = cost per arrondissement divided by population of the arrondissement minus that of the arrondissement headquarters, which is served by a dispensary (17,449 - 1,894 = 15,504).

SOURCE: Kelley PG, Sissoko F: Mali Rural Health Project After 18 Months in the Field, Preliminary Evaluation and Strategy. Koro Cercle, April 1980

purchase of U.S. generic drugs; and 2) the policy of selling PSR drugs at Pharmacie Populaire prices, but without the custom taxes which must be sustained by the Pharmacie Populaire procured drugs (see Table 3). The issue, however, continues to be concern over a generally low volume of drug sales with high prices being the suspected cause for limited sales.

Liberia

a. Country Resources. The government of the Republic of Liberia has a Ministry of Health and Social Welfare (MHSW). This Ministry is responsible for providing drugs and medical supplies for health services. A chief pharmacist within its Health Services Division is the Director of the National Medical Supply Depot (NMSD) and also serves as the secretary of the Board of Pharmacy of Liberia for the Ministry of Health and Social Welfare.

The Pharmacy Board of Liberia meets on an intermittent basis and provides informational services, such as a directory of Pharmacies, pharmacists, and medical stores in Liberia. The Board is comprised of the Minister of Health and Social Welfare, Deputy Minister/Chief Medical Officer, Deputy Minister for Administration, Assistant Ministers for Administration, for Social Welfare, for Planning and Research and Development, and for Coordination, Director for Preventive Services, Chief Nursing Officer, Controller, Chief Pharmacist, and Director for Procurement and Transportation.

TABLE 3

PURCHASE PRICE AND PROFIT MARGIN FOR DRUGS SOLD
BY PSR/MALI

	<u>In MF</u>	<u>% of Selling Price</u>
<u>Penicillin -- 1000 pills (250 mg)</u>		
a. Purchase price + air shipment to Bamako	8,904	8.9
b. Selling price	100,000	-
c. 15% discount to villagers	15,000	15.0
d. PSR profit margin (b-a+c)	76,096	76.1
<u>Aspirin -- 1000 pills (324 mg)</u>		
a. Purchase price + air shipment to Bamako	1,671	13.4
b. Selling price	12,500	-
c. 15% discount to villagers	1,875	15.0
d. PSR profit margin (b-a+c)	8,954	71.6
<u>Sodium Sulfacetamide -- 15 ml bottle; 15% solution</u>		
a. Purchase price + air shipment to Bamako	311	44.4
b. Selling price	700	-
c. 15% discount to villagers	105	15.0
d. PSR profit margin (b-a+c)	284	40.6
<u>Chloroquine Phosphate -- 1000 pills (250 mg)</u>		
a. Purchase price + air shipment to Bamako	12,117	60.6
b. Selling price	20,000	-
c. 15% discount to villagers	3,000	15.0
d. PSR profit margin (b-a+c)	4,883	24.4

NOTE: Purchase price based on bills paid by HIID (March-April 1979)

SOURCE: Kelly PG, Sissoko F: Mali Rural Health Project After 18 Months in the Field, Preliminary Evaluation and Strategy. Koro Cercle, April 1980, p. 21.

The National Medical Supply Depot supplies drugs and medical supplies to all health posts and clinics throughout Liberia. The John F. Kennedy Hospital, a large, modern hospital in Monrovia, has its own pharmacy. However, the pharmacist there and the activities do not come under the jurisdiction of the MOH.

Liberia has a codified policy regarding pharmaceuticals embodied in the Public Health Law of 1977. The law defines the scope and practice of pharmacy, the procedure and requirements for licensing pharmacists, retail drug establishment, wholesalers and manufacturers, and the regulation of hospital dispensaries. The 1980-81 health budget for Liberia was approximately eighteen million dollars, of which nine-hundred and thirty-thousand dollars was spent for drugs in the NMSD and \$1.2 million was spent for drugs for John F. Kennedy Hospital.

In addition to pharmacies, Liberia has facilities called medicine stores. Such stores are generally registered with the Pharmacy Board and must obtain an operating permit for retail sales of medicinals without prescription. Dispensers are permitted to man the medicine stores. No store is permitted to operate without a registered dispenser on the premises.

In addition to pharmacies and medicine stores, there is a class of drugs that can be imported and sold by general merchants in any store or market. This class of drugs includes such items as aspirin, menthol cough drops, herb teas, and Milk of Magnesia. The primary difference between a medicine store and a pharmacy is that medicine stores can sell almost anything that does not require a prescription except narcotics. These are sold solely in pharmacies.

According to information supplied by the Pharmacy Board, there are about thirty-eight pharmacists in the country, of which twenty-one are African. Of this number, approximately four were trained in the United States; the remaining seventeen consist of sixteen Indians, plus one British expatriate. Most of the pharmacists practice in and around Monrovia. There are two pharmacies located in Grand Bassa County and another in Gibi territory. The Board of Pharmacy lists a total of thirty-six pharmacies.

In addition to pharmacists, Liberia permits the handling of medicinals by persons called dispensers. A dispenser is someone who has received on-the-job training and has developed a degree of proficiency in the dispensing of drugs and medicines. Dispensers usually work in the hospital pharmacy, but may work independently. At the clinic level, clinic staff handle medicines and dispensing is usually done by nurses.

b. AID Operations. An early health focus for AID-supported efforts in Liberia was the Lofa County Rural Health Project. This project was designed to bring family planning and basic health services to the northern, rural county of Lofa. It lasted approximately four years and was funded at the level of five million dollars.

Recently, the Ministry of Health and Social Welfare (MHSW) has initiated a proposal to institute the Liberian Primary Health Care Project (PHCP). The project's goal is to develop a national health care network from the village level up, using village health teams, professional, and paraprofessional health

workers. With AID support and technical assistance, Liberia seeks the potential institutional capability required to meet its long-term goal of providing access to appropriate health care for ninety percent of its population by the year 2000.

Conceived in two phases of five years each, USAID support, along with that of other donors, is requested during the initial phase to establish the primary health care program throughout the four least serviced counties of the country. Specific AID outputs include assisting the MHSW in:

- 1) Establishing decentralized management and administration systems for PHCP implementation;
- 2) creating a training system for PHCP skilled personnel;
- 3) expanding the capability of various technical divisions within the Ministry in support of the PHCP; and
- 4) providing access to primary health care to eighty percent of inhabitants of Grand Bassa, Sinoe, Grand Gedeh, and Maryland counties.

At the time of the consultant's visit, AID staff, along with contract and MOH staff, was actively involved in designing this project for primary health care in Liberia. This team included a person with logistics expertise, but who had not access to technical documents and expertise associated with pharmaceutical supply systems. Input assistance was requested of the consultant. As a

result, an outline document was prepared and incorporated into the Liberian PHC design (see Appendix C-1). In a recurring pattern seen in other USAID projects visited, the absence of technical data related to pharmaceutical supply hindered effective project planning.

c. Pharmaceuticals. During the years 1975-1979, the Lofa County Rural Health Project was operational. As a part of project activities, a drug distribution and warehousing system was established. According to a status report of 1978, the project developed a supply and logistics network with the help of a physician assistant who was trained as a supply and logistics specialist. The warehouse established in Voinjama was under this specialist's supervision. A control system which provided for inventory control at each facility was established.

Subsequent evaluations identified several problem areas. First, persons trained in logistics needed to attend to getting the supplies out of the free port and not solely to the logistics of pharmaceutical distribution in Lofa County. Second, drugs were being stolen in the free port. Third, under one order, enteric coated chloroquine 500 mg was shipped to Liberia by the U.S. Defense Department. In that enteric coated tablets are prohibited for use by children, the dosage could not be broken and was of limited use. In another order, injectable penicillin came without the necessary water for reconstitution and injection. On a third order, eight hundred dollars worth of cough syrup was flown by Trans World Airlines to London and then to Monrovia at a cost of twenty-five hundred dollars.

The June 1979 evaluation report indicated that many items have been on order from the U.S. since 1976, but have not arrived. Further, there is no accurate recordkeeping to show what drug supplies were purchased by USAID funds. Given these considerations, it would have been helpful for the consultant to journey to Lofa County to view project activities first hand. However, due to a shortage of vehicles and gasoline, the health officer's decision was to not permit the consultant to travel to Lofa County. It was also reported that little or no relevant activity was taking place there.

Instead, the National Medical Supply Depot, four clinics, and two hospitals were toured in order to derive a more complete appreciation of the pharmaceutical supply system within Liberia. The four clinics were in the surrounding Montserrado County area. They were Paynesville Clinic, Careysburg District Clinic, Crozierville Clinic of the Careysburg District, and Gardnersville Clinic. The two hospitals visited were Careysburg District Hospital, and Phoebe Hospital in Bong County. The trip to Bong County was possible because a SHDS meeting was occurring in the area at the same time and transportation was available for this group.

The National Medical Supply Depot has as its objective to supply medicals and surgical equipment to all government health facilities adequately and economically. It was opened in 1976 and later reorganized in 1979 to contain five departments, thus permitting adequate day-to-day supervision of pharmaceuticals. At the time of the reorganization, an inventory was taken of all its drugs and medical supplies. A formulary committee was established and a formulary of drugs

was proposed. New administrative reporting systems were developed, including guidelines for requisition preparation. As designed, these forms request information on drugs by their generic names, strength, unit packages, and catalog numbers. Information on inventory of drugs and medical supplies was required of requesting clinics, health centers, and hospitals. A monthly brief, in the form of a publication on new drugs and medical supplies and other communiques to medical practitioners in clinics and hospitals was planned, but as of the consultant's visit, had not been implemented.

In 1977, a pharmacist administrator from the U.S. Public Health Service Supply Point in Perry Point was asked to advise the MOH on problems related to drug procurement, storage and depot facilities, transport, and distribution. His report called for bulk procurement through a national supply point on a "staggered-buy" approach (e.g., instead of buying four hundred items needed once a year, thirty to forty-five items are purchased monthly). Recordkeeping, inventory control and customs expedition were other areas cited for improvement. The MOH was urged to give serious consideration to establishing a tablet repackaging program.

Reorganization of storage facilities to optimize space utilization was also planned at the time of the NMSP restructuring; however, as of summer 1981, much space stood unused and the configuration of shelves in storage areas mitigated against efficient storage capability. At present, the NMSD is located in Monrovia on the grounds of the John F. Kennedy Hospital Center. It consists of two large rooms, each of about three thousand square feet and built of concrete

block with a tin roof. There is no cold storage room. Items which must be kept in cold places are stored in the cold room of the John F. Kennedy Hospital. Inventory control is manual.

At John F. Kennedy Hospital, approximately fifteen boxes of 100's of 1.2 million units of Benzathine Penicillin G and twenty-four boxes of 100's of injectable Terramycin were sitting in the hallway in boxes outside of the storage area. These boxes were partially opened and appeared as though part of a heap of trash. According to dispensers, this was part of the supply of NMSD. The consultant brought this situation to the attention of the chief pharmacist.

In general, the clinics visited were small one to three room facilities. All but one were short of stock. Primary stock was stored in cabinets, while drugs for daily use were stored in treatment rooms. One clinic had a large supply of benzyl benzoate lotion and wished to return it but did not know the policy for doing so. The clinic staff also lacked knowledge of proper disposal of out-of-date items. Several nurses expressed a desire for up-to-date information on appropriate drug utilization and storage. No one interviewed felt that drugs were received according to a set schedule, however, the general feeling was that drugs are supplied fairly rapidly upon request.

Senegal

a. Country Resources. Senegal has a national effort to supply pharmaceuticals for its health care activities. There are two basic structures that deal

with pharmaceuticals: 1) the unit within the MOH that handles the development of policies, legislation, and the like; and 2) a subsidiary of the MOH, the Pharmacie Nationale d'Approvisionnement (PNA) or PHARMAPRO. Both are staffed by pharmacists who serve not only in this capacity, but who serve as educators in the School of Pharmacy in Dakar (see Figure 2).

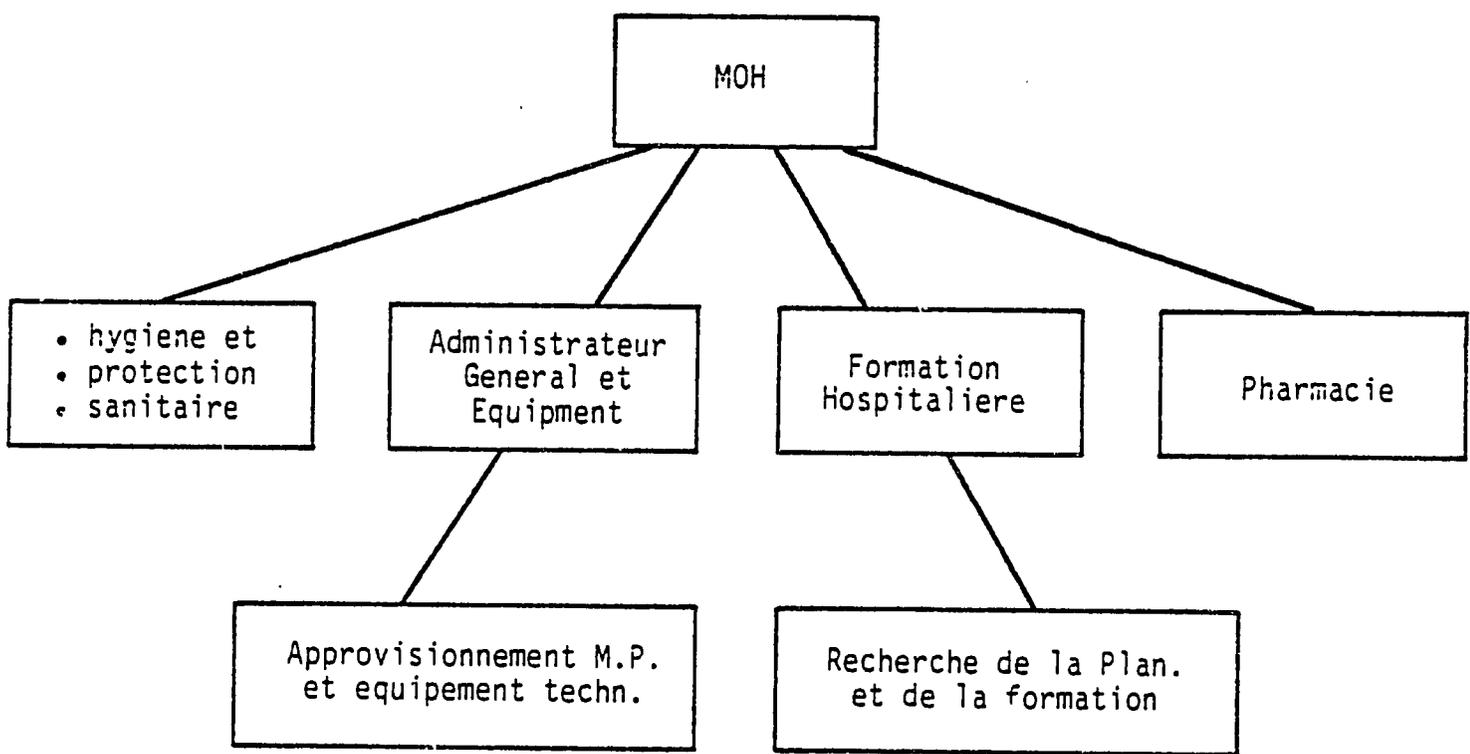
Senegal has codified policies and has a Pharmacie Ordinaire. Both result from actions taken by the National Assembly in an effort to provide a formal structure to pharmaceutical activities.

PHARMAPRO is totally government owned and is reportedly non-lucrative. It provides pharmaceuticals for all government supported health care activities and also is the source of all toxic chemicals and narcotics for the private system in Senegal. PHARMAPRO sells and distributes to hospitals (twelve to fourteen), departmental medical centers (forty to fifty), and health posts (four to five hundred). PHARMAPRO will also buy ~~drugs for benevolent organizations~~ if so directed by the MOH. It has a budget of approximately eight hundred million CFA per year and is permitted to purchase from within Senegal or outside of Senegal up to a limit of ten to fifteen thousand CFA. Any purchase over this amount requires the direct authorization of the President of Senegal.

PHARMAPRO is located in Dakar and consists of a warehousing area and an administrative unit. It is the central medical store for the country. PHARMAPRO supplies a wide range of pharmaceuticals and chemicals as indicated in the Appendix list (D-1). The staff of PHARMAPRO consists of four pharmacists,

FIGURE 2

MOH SENEGAL, ORGANIZATIONAL UNITS
INCLUDING PHARMAPRO



SOURCE: AID Project Staff

including the director, and three secretarial persons and technicians for preparation, stock management, and transportation. PHARMAPRO's central medical store manufactures items such as zinc oxide ointment, rubbing alcohol, and iodine. It also repackages items such as aspirin and vitamins. Operationally, PHARMAPRO has an inventory control system, a separate procurement system, a manufacturing system, and a training component for pharmacy students in institutional management.

According to the National Pharmacie Ordinaire, there are approximately eighty-five pharmacists in private practice in Senegal and slightly less than fifty in public service. Of approximately one hundred and thirty-five pharmacists in the country, the majority are of Lebanese ancestry. A pharmacist in public service makes approximately seventy thousand CFA per month, whereas those who work in the private sector make approximately two hundred thousand CFA per month.

The Pharmacie Ordinaire was created in 1973 by an order of the National Assembly as an organization designed primarily for professional licensing and control of pharmacy practice. It is run by a committee appointed by the President. All pharmacists who wish to practice in Senegal must belong to the Ordinaire. It, however, is not a union. The Pharmacie Ordinaire is under the supervision of the MOH and is responsible to the director of pharmaceutical affairs. The Pharmacie Ordinaire is not involved in the quality control of medicinals, nor does it regulate control of imports of pharmaceuticals. It is staffed by four persons, one of whom is a pharmacist.

A significant resource for the country is the in-country production capability provided through a firm called SIPOA (Societe Industrielle Pharmaceutique del Afrique de l'Ouest). SIPOA was established in 1973 through capitalization by Boehringer-Ingelheim. It is owned in tripartite fashion by Boehringer, Senegal, and private Senegalese pharmacists at a proportion of seventy, twenty, and ten percent, respectively. At its founding in 1973, eighty percent was owned totally by Boehringer and only twenty percent was in Senegalese hands.

SIPOA manufactures and distributes not only to Senegal, but to most of Francophone west Africa, including Mali, Cameroon, and Niger. It has a staff of ninety employees and provides items listed in Appendix D-2. According to the director, the plant is at approximately thirty percent productivity. It is apparent from the plant size that expansion is possible, although it is not possible to determine to what extent. Reviews of production charts reveal a down-turn in some of its lines since 1979; however, there has been a significant increase in capsule production from one-half million to over three million within the last four years.

According to the director, Senegal entered into an agreement with SIPOA to buy only from SIPOA so that it would be the primary source of all drugs to be used in the country. The government was to limit imports, and all public and private pharmacies were to import drugs only after approval from SIPOA. However, this has not been the case. At present, anyone with an export/import card can import drugs, and apparently many pharmacies do.

b. AID Project Overview. The Sine Saloum Bilateral Rural Health Project began in 1977 with the goal of providing rural health care to Senegalese in the Saloum region. A primary emphasis of the project was to provide local participation and decentralization of health services with administrative responsibility on the community level. The objectives of the project were to establish a network of village health huts and to improve and strengthen the government's health support infrastructure. Six hundred health huts in five departments of the region serving a population of over eight hundred thousand people were to be built and staffed by a health team comprised of a *secouriste* (health worker in charge), a *matronne* (birth assistant), and a *hygieniste* (sanitary worker). All health huts were to be stocked with basic medicines and equipment. Persons who came to seek health care were to pay for the services and medicines; the health unit was to become self-supporting through these contributions.

The project has been the subject of several evaluations, two among them notable. These were an evaluation by AID and the other by the General Accounting Office. Each evaluation has pointed up a primary deficiency critical to operations -- a deficient medical supply system. For example, health huts were issued half of their initial supply, but shipments of some items (specifically, eye ointments) arrived for use after the expiration date had passed. Poor record-keeping and system management were cited as probable reasons for the deficiencies in the financial viability of the system.

In spite of basic problems, activities have been undertaken in the Kaolack and Nioro departments and over two hundred health huts have been established.

Villagers and project staff have gained valuable insight into the delivery of basic health care services on a cooperative basis. The health huts have several thousand people in the region.

Due to the project deficiencies previously outlined, AID/Washington has taken a critical look at the project and has subjected it to redesign. A project evaluation concluded in 1979 indicated that AID had not provided the level of experienced project management and technical assistance that a project of this magnitude required.

At the time of the consultant's visit, a redesign of the medical supply system was in progress, but not fully accomplished. At present, medications are being supplied by the AID system and an integrated country-wide program has not been instituted.

c. Pharmaceuticals

Source/Procurement. Pharmaceuticals most often used in the Sine Saloum Project consist of chloroquine, aspirin, ferrous sulfate, chlorotetracycline, scabies ointment, piperazine, oral rehydration powder, aureomycin, eye ointment, paregoric, and ganadin. These medications are generally obtained through USAID's U.S. stocks and not through SIPOA. In Kaolack, all items used were U.S. sourced. This action has been viewed as a disincentive to the establishment of a supply system between PHARMAPRO and Sine Saloum.

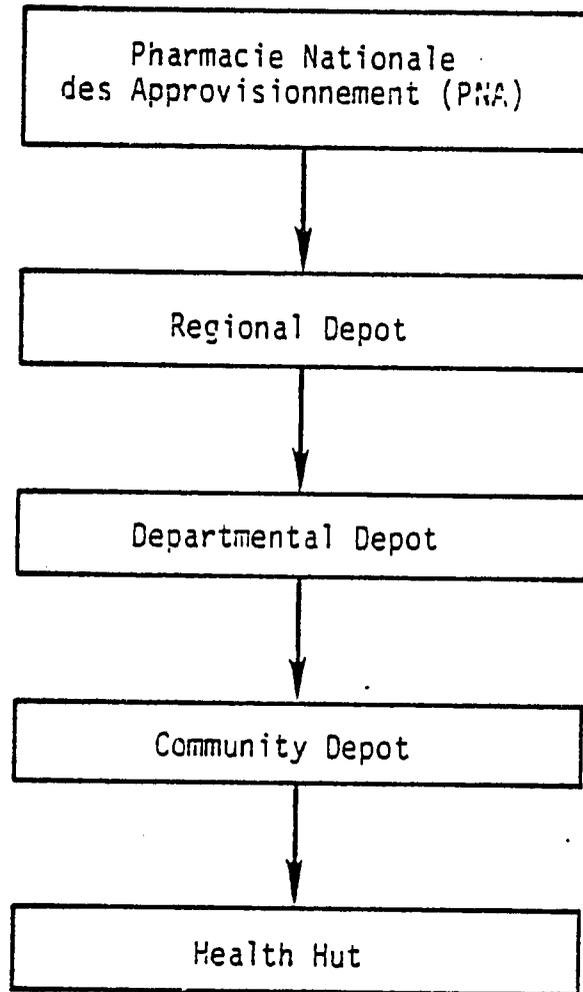
Initial donations of medicines were made to village health huts to supply a village population of six hundred for a one year period. This was a rough population estimate; consequently, areas with larger populations did not receive donations approximating their demographic needs.

Distribution and Storage. Graphically, the Sine Saloum resupply system forms a chain from the national level (PHARMAPRO) down to the health hut level as shown in Figure 3. Theoretically, accounting committees exist at all levels of distribution to receive monies and make purchases. As of October 1980, no Regional Committee had been created to oversee monies and medicines of the Regional Depot. Requests for purchases are made upward from the health hut level through the regional level.

Despite three notebooks provided by the project for accounting and inventory use at the Regional Depot level, there appears to be no consistent form for entering receipts or debits of medicines. Accounting information required includes type of medicine, quantity of products received and sent, unit price, and stock level. Neither does there appear to be a system for controlling the movement of medicines. A September 30, 1980, inventory of the Regional Depot uncovered squalid stock organization and little correspondence between records and stock on hand. No system of supply has been established between the regional and national levels; medicines are simply procured on a need basis from PHARMAPRO.

FIGURE 3

SINE SALOUM PROJECT
DRUG SUPPLY CHAIN



SOURCE: Project Staff

At the Rural Community and Department Depots, storerooms vary in size and location but are usually built of concrete and secured by a locked door. At the regional level, there is minimal storage, poor ventilation, and no cold storage.

As part of a redesign effort, a system was devised based on a plan for determining future drug orders which was part epidemiological and part treatment based. A bareme, an arbitrary symbol for a level of use, was used to identify a population range of people (see Appendix D-3). Based on population range, a bareme level was calculated for each Department. Drug quantities were then calculated based on the bareme level per dosage level per year (see Table 4). Obvious problems existed which made this system impactical: 1) Realistic treatment dosages were not used (e.g., 2 fevers per year @ 2 tablets); and bareme units did not apply to equal intervals of population size. A method of estimating drug quantities using available epidemiological data was suggested (see Appendix C-1).

Pricing. Several schemes of varying success have been attempted for determining pharmaceutical pricing and remunerating village health teams. An initial practice existed whereby health workers received sixty percent of the cash income of their hut, thirty-five percent was set aside for medicine purchases, and five percent for maintenance. This practice proved to be a severe drain on the system's capital and put medical costs to villagers beyond their means. A more recent system which has proven successful has involved selling medicine on a unitary or price per pill basis and letting the village determine how it will compensate the health worker (e.g., by collective field, cotization,

TABLE 4
DRUG PROJECTIONS FOR ONE BAREME
FOR ONE YEAR

Drug	Population	Malady	Treatment	Pharmaceutical Projection
Aspirin	600	x 2 fevers/year	x 2 tablets	= 2400 tablets (24 bottles)
Chloroquine	300 adults	x 2 fevers/year	x 4 tablets	= 2400 tablets (24 bottles)
Chloroquine	300 infants	x prevention scheme for 12 weeks	x 1 tablet/week	= 3600 tablets (36 bottles)
Chloroquine	300 infants	x 1 fever/year	x 2 tablets	= 600 tablets (6 bottles)

SOURCE: Harrington JE JR: Commande de nouvelle dotation de médicaments,
4 Mai 1981, Project de Sante Rurale, USAID.

traditional "in kind" services, or a percentage of receipts after the set aside for new medicine). A listing of pharmaceuticals at 1980 prices is shown in Appendix D-4. The issue when using unitary prices is the need to constantly update PHARMAPRO price fluctuations, thus necessitating a good communication link through the Regional Depot to the local distribution points. Sample health hut records provide a view of pricing at the health hut level (Table 5).

3. Status of Other Projects Related to Pharmaceutical Supply

a. Kenya: Innvocation for Pharmaceutical Supply. A key purpose for going to Kenya was to investigate the concept of the "Kenyan Box" as a mechanism for pharmaceutical supply. This concept held promise because of its primary focus on the management system for a drug supply effort. As with other countries, Kenya suffered from an irregular availability of drugs at its primary health care projects in rural areas. Associated problems included a pooling of drug supplies at the district level, inadequate prescribing and recordkeeping, improper management procedures and supervision, and leakage and waste of drugs at all levels of the distribution chain.

A unit was established within the administrative support division of the MOH to explore these problems. Under the direction of this unit, a pilot activity was undertaken. It had two specific objectives: 1) To improve the availability of drugs; and 2) to improve the use of drugs. To achieve these objectives, a management system was constructed which included the following components: The development of guidelines for clinical diagnosis and standard treatment

TABLE 5
HEALTH HUT RECORD FOR JUNE 3, 1981
VILLAGE OF MBAM
SINE SALOUM, SENEGAL

Malady	Treatment	Quantity Given	Amount Collected
Diarrhea	Rehydration Powder	1 Soup Spoon	25 CFA
Headache	Aspirin	3 Tablets	10 CFA
Skin Problem	Bacitracin	15 Gram Tube	215 CFA
Malaria	Chloroquine	9 Tablets	30 CFA

SOURCE: Project Records

schedules; the development of a packaging system along with appropriate procurement and repackaging, distribution, storage, control, and indenting; a public information system; and a training system.

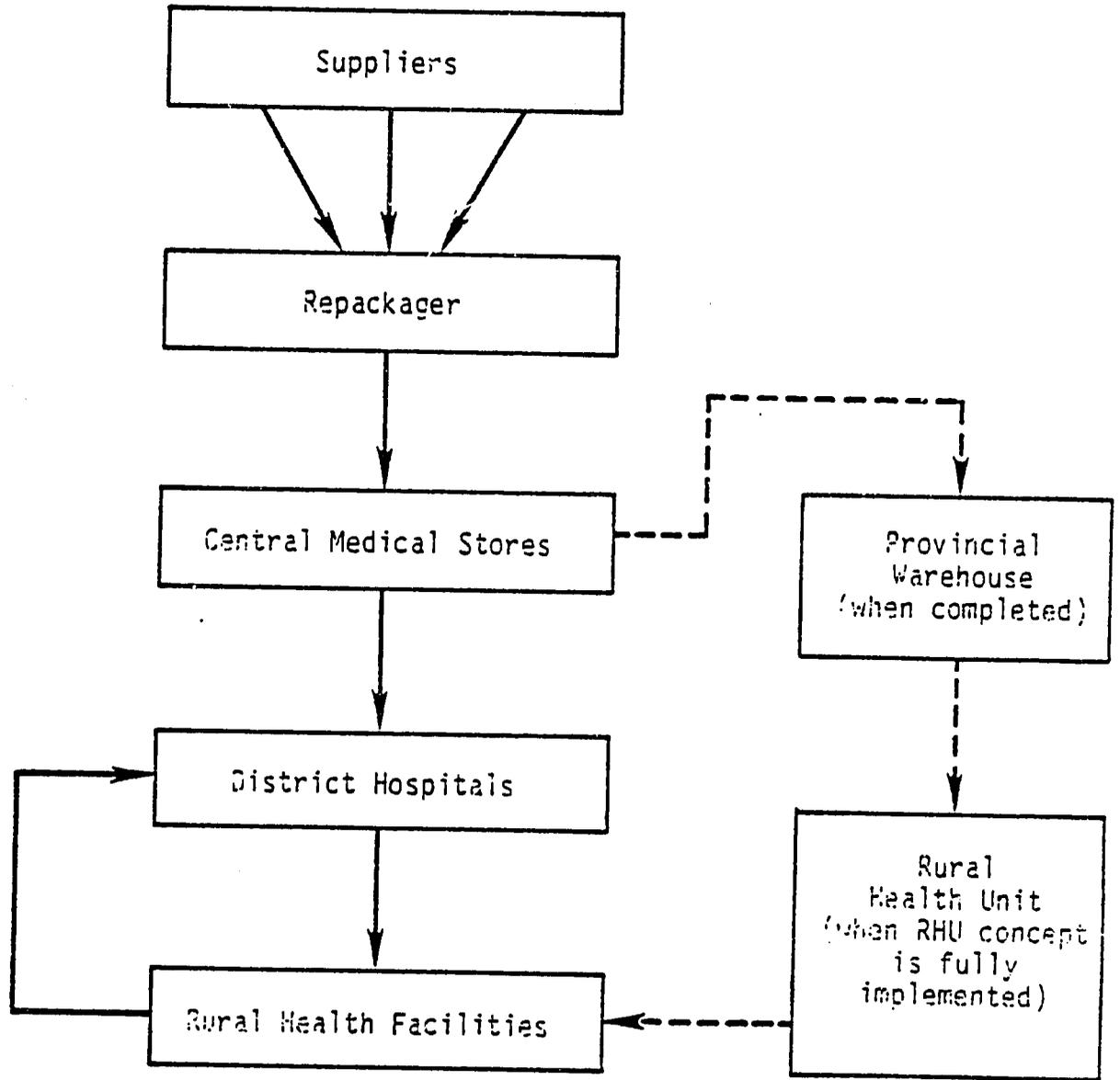
This pilot activity was undertaken in two districts of Kenya - Kilifi, a coastal province, and Embu, a central province. Each pilot activity was to have a backup management team responsible for assuring appropriate distribution, and establishing workshops for training and usage of the clinical treatment schedules. This team would consist of a medical advisor, a drug supplies and logistics officer, a senior clinical officer, a pharmaceutical technologist, and two supporting staff, such as a driver and typist.

Of key interest is the component of the management system that deals with packaged rations. Under this system, one package of rations of the essential drugs is supplied to a health center or dispensary based on a certain number of expected new patients. There are forty-seven drugs on the list of health centers and thirty-five for dispensaries (see Appendix E-1). The quantities of these drugs which are issued are based on the estimated number of treatments per number of new patients that will be present. This information is in turn based on available epidemiological data.

On a periodic basis, the package ration is delivered to the health facility and the previously used ration box is picked up with all unused items. This permits procurement to be tailored specifically to the needs in the rural health facilities. Distribution is depicted in Figure 4. Persons in the rural health

FIGURE 4

KENYA: INNOVATION FOR PHARMACEUTICAL SUPPLY DISTRIBUTION FLOW



SOURCE: Ministry of Health, Proposed New Management System of Drug Suppliers for Rural Health Facilities, April 1980.

facilities do not need to submit requests for drugs on a periodic basis. However, there is some provision to permit requests for medicines such as some fluids which may not be on the package list.

Another unique feature of this management system is that of the public information component. Posters were developed and the broadest media utilized to inform the public of the appropriate use of drugs (e.g., the advantages and disadvantages of tablets over injectables). The public was also informed during this campaign about new legislation concerning drugs.

To date, there has been no evaluation of this management system; however, preliminary findings exist. They are as follows:

- 1) The kit contents were found to require adjustments. In some instances, the contents were insufficient in number to handle the case load, and in other instances, the contents were excessive. For example, quantities of aspirin and paracetamal had to be decreased, while amounts of ferrous sulfate had to be increased.
- 2) The concept underlying the quantities of items stocked in the kit was found to be a source of some difficulty. Most health professionals were trained to base supplies needed on a time period. The kit supply is based on work load -- the number of new patients that are expected to be seen as opposed to the supply being intended to care for patients over one or two months.

- 3) Unanticipated requests for drugs not listed or stocked in the rations was a source of problems.
- 4) It was found that training with respect to appropriate diagnosis and treatment had to be upgraded severely.
- 5) Despite these problems, use of the kit facilitated monthly stock inventory and provided good control of medications.

The pilot activity was scheduled to be expanded to all of the country in the following manner: One-third of all Kenyan districts by January 1982, two-thirds by January 1983, and the system extended to the entire country by January 1984. Since the system tends to bypass the central medical stores, political support for the effort has not been forthcoming. At present, drugs used in this new pilot activity come directly from UNICEF to the central medical stores in pre-packaged amounts which are put together in the key and shipped to the rural health facilities. Before expansion can occur, political support must be generated by first building up the central medical stores, and by purchasing from the Kenyan parastatal rather than from UNICEF.

b. Economic Community of West African States (ECOWAS). The Economic Community of West African States is comprised of sixteen member countries in the west African region. Formed in 1975, the organization is designed, "To promote cooperation and development in all fields of economic activity . . . among its members and to contribute to the progress and development of the African continent (Article 2)."

In 1979, the Council of Ministers of ECOWAS adopted a resolution whose objective included the identification of regional industrial sectors for development and cooperation at the community level. Pharmaceuticals was one of eight such industrial sectors identified. Efforts were made by the consultant to obtain documents relative to this position through the Economic Affairs Office of the U.S. Embassy in Nigeria. To date, no documents have been received.

c. West African Pharmaceutical Federation. The West African Pharmaceutical Federation (WAPF), La Federation Pharmaceutique de l'Afrique de l'Ouest, is the regional organization of west African pharmacists. The full-fledged members are comprised of five Anglophone countries: The Republic of Gambia, the Republic of Ghana, The Republic of Liberia, The Federal Republic of Nigeria, and The Republic of Sierre Leone. Three Francophone west African countries hold observer status in this regional association. They are as follows: The People's Republic of Benin, The Republic of the Ivory Coast, and The Republic of Senegal.

Formally inaugurated during the convention which took place in Monrovia, Liberia in late October 1976, the purpose of the Federation is to work toward the development and advancement of all aspects of pharmacy in the west African region. The formation of national pharmaceutical associations, harmonization of pharmaceutical legislation and practice in west Africa, and the development of the pharmaceutical sciences and their practical applications are among the activities encouraged by the Federation.

One of the Federation's most immediate areas of concern relates to the control of drugs imported into and passing through the west African region to ensure that the quality of such drugs conforms to internally accepted standards. Other areas of concern to the Federation include the pursuance of cooperation among member countries in the area of pharmaceutical training to reduce the shortage of pharmacists throughout the region, and development of research into traditional medicines with the objective of deriving useful contributions from local herbs to modern medicine.

The first scientific seminar of the Federation was held in Accra, Ghana in February 1978, under the theme, "Malaria and its Chemotherapy." The focus on malaria by WAPF reflected concern about the great impact of this disease on people and its capacity to interfere with the development of agriculture and growth of industry.

The second scientific meetings was held in Monrovia, Liberia in February 1980. The conference theme was, "Control of Drugs and Pharmaceutical Products in West Africa."

In October 1980, the WAPF was formally accredited as an agency of the West African Health Community.

4. Special Issues

a. Costs and Recurrent Costs.

Costs. USAID presently provides over eight million dollars for primary health care projects in Zimbabwe, Mali and Senegal. (Another ten to eighteen million dollars is to be expended for primary health care system development in FY 82.) Of this amount, it is difficult to determine with precision the proportion spent for drugs. Because pharmaceuticals are generally classified by AID as commodities, project records lump drug costs with those of furniture and medical equipment.

Nowhere in the AID system is there easily retrievable data on the amount and kind of expense incurred for pharmaceuticals and related activities within a primary health care project. Missions visited provided prospective estimates of drug costs in project papers. In mission offices, purchase records (PIO/Cs) existed, but these were not always complete. AID/Washington has procurement data from projects in the form of copies of PIO/Cs, but information on local purchases is not included. Also, these data are in disaggregate form.

Data on costs of pharmaceuticals to projects were obtained primarily from evaluation documents. Original data was not available for validation and trends could not be determined, as there is no longitudinal data compiled on costs. Obtaining valid, consistent data on the cost of basic medicines and related services is critical to the projection of recurrent costs and to the evaluation of the impact of such costs on project continuation.

In Zimbabwe, there were no project records to indicate the cost of drugs to the project. Records indicated only that drugs on a list of essential drugs were purchased as part of the initial supply of drugs to the clinics.

Mali's PSR records in the health office and procurement office provided data on the cost of drugs purchased over the life of the project (see Table 6). A summary of costs of the installation of twenty village pharmacies is given in Table 3.

The project status report of 1978 for the Lofa County Rural Health Project provides insight into costs associated with pharmaceutical supply in Liberia. Costs for the start-up of the supply and logistics system is itemized in Table 7. There, costs do not include an extra sum of fourteen thousand, six hundred and thirty dollars, which the Ministry of Health and Social Welfare must pick up as its contribution. Pharmaceuticals are currently purchased from European sources.

The cost of pharmaceuticals purchased for the Sine Saloum project from PHARMAPRO appears to be consistent with the price charged by SIPOA. PHARMAPRO prices for aspirin (325 mg-1000) and chloroquine (250 mg-1000) were one thousand, one hundred and seventy-five and two thousand the twenty-five CFA, respectively. This is identical to SIPOA pricing.

For comparison purposes, two of the drugs used by village health workers were selected and the project cost per unit, by country visited, are depicted in Table 8. Costs of these two drugs purchased from U.S. sources is approximately

TABLE 6

TOTAL DOLLAR VOLUME OF PHARMACEUTICALS
PURCHASED AS OF MAY 1981
PSR - MALI

Drug	Dollar Amount
Penicillin	\$ 5,341.50
Mebendazole	1,071.00
Sulfisoxazole	3,158.25
Chloroquine	10,664.20
Aspirin	826.80
Neosporin Eye Ointment	6,480.00
Iron	184.20
Piperazine	558.00
Sulfacetamide Eye Drops	4,860.00
Vaseline	<u>532.00</u>
TOTAL	<u>\$33,675.95</u>

SOURCE: Project Records

TABLE 7

COST OF LOFA COUNTY RURAL HEALTH PROJECT'S SUPPLY
AND LOGISTICS SYSTEM FOR FIRST YEAR

Item	Cost	Percent of Total
Personnel	\$ 4,800	2.5
Records	50	*
Vehicles (2)	20,322	10.4
Fuel and Maintenance of Vehicles	3,700	1.9
Drugs and Supplies	145,710	74.8
Construction of Warehouse	<u>20,000</u>	<u>10.3</u>
TOTAL	\$194,582	100.0

*Less than .01%

SOURCE: Status Summary of the Lofa County Rural Health Project, May 1978.

TABLE 8
 COMPARATIVE COSTS OF ASPIRIN AND CHLOROQUINE BY
 PROJECT SITE (OR SOURCE) OF PHARMACEUTICAL

Project Site/ Source	Costs	
	Aspirin 324 mg (1000s)	Chloroquine 250 (150 mg base) (1000s)
Zimbabwe	-	-
Mali <u>1/</u> (USA)	\$3.30	\$25.49
Liberia (Europe)	2.10 <u>2/</u>	11.80
Senegal <u>3/</u> (Senegal)	2.70	9.20
(UNICEF)	2.08 ✓	10.43

- 1/ Includes transportation costs
- 2/ 300 mg tablets
- 3/ PHARMAPRO prices

SOURCE: . Project Records

1.5 and 2.2 times, respectively, greater than if procured through other sources. If one extends the comparison to include UNICEF as a source, one can see all sources are markedly less expensive than the U.S.

Recurrent Costs. In the Mali PSR and Sine Saloum projects, a reduction in recurring costs is anticipated, and high profits are realized through drug sales. The expectation of profits from drug sales, and the reduction of recurrent costs assume certain factors:

- 1) There will be a consistent medical need over time;
- 2) this consistent need will lead to predictable buying habits;
- 3) there will be an adequate supply of drugs for purchase; and
- 4) there will be good drug system management and recordkeeping.

Intervening variables, however, exist which should be considered. Certain disease states are seasonal. For example, malaria may accompany wet seasons, thus impacting the need for chloroquine. Money available to consumers may also be seasonal. Evidence of transient drug supply abounds, and an error rate in recordkeeping can be as high as sixty-three percent.

In none of the projects visited was there evidence that continuing drug costs could be financed solely through drug sales. Even in Mali, where there were high profits, evidence did not support the concept. High profits from the sale of drugs over the life of the PSR has permitted the establishment of a

revolving fund for partially financing primary health care services. Contributions and dates are displayed in Table 9. These funds reportedly resulted from the twenty-seven pharmacies active in the Koro Cercle only.

The fund, however, has been limited in its potential to totally offset recurrent costs. Over the two year period, the PSR revolving fund accrued over 1.5 million FM (three thousand and twenty-four dollars equivalent) in profit as shown in Table 9. Drug costs over the same period were \$33,675.95 (Table 6).

Making the health system financially viable through purchases of drugs and donations for services by the people of the Sine Saloum is the underlying concept on which the project resides. Project data, however, consistently uncover a process by which the project cannot financially sustain itself. The AID evaluation of 1980 noted that the system was decapitalizing itself at the village level. A survey of inventories in eight health huts indicated significant shortages in most (see Table 10). Suspected reasons include the excessive salaries of health workers, low priced medicines, and inaccurate records. As it now exists, the self-financed health care scheme is not financially viable.

An analysis of health huts which succeeded financially and those which failed in the Bakel department (not a part of the Sine Saloume project) concluded that failure to meet medicine renewal costs was not related to the pricing system, but to the fact that patients were not paying their treatment costs. It was recommended that wider participation in the control of pharmacies is needed at the village level to ensure that proper policies are enforced.

TABLE 9

DATES AND PROFITS DEPOSITED IN REVOLVING FUND
FROM 27 PHARMACIES IN KORO CERCLE, MALI
(01/79 - 02/81)

Date	Amount (FM)
01/03/79	45,450
09/09/79	22,750
09/27/79	8,250
11/03/79	71,700
12/14/79	137,825
03/28/80	319,050
04/21/80	113,000
06/20/80	200,300
02/05/81	<u>624,400</u>
TOTAL	1,542,725 FM*
DOLLAR EQUIVALENT	\$3,025.95

*510 FM = \$1 in 1981

SOURCE: Project Records

TABLE 10

FINANCIAL SURVEY OF EIGHT HEALTH HUTS IN NIORO DEPARTMENT
(Figures in CFA Francs)

Huts	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7	No. 8
Months in Operation	9 Mos.	7 Mos.	9 Mos.	9 Mos.	9 Mos.	5 Mos.	9 Mos.	4 Mos.
1. Value of Opening Inventory	51,570	51,570	51,570	51,570	51,570	51,570	51,570	51,570
2. Receipts from Visits	20,475	32,095	57,930 ^{2/}	8,150	20,550	19,250 ^{4/}	18,700	8,225
of Which (Maternity)	(7,000)	(7,000)	(11,000) ^{2/}	-	(3,000)	(4,000)	-	(2,000)
3. Expenses	16,195	19,900	36,590	7,260	13,575	3,765	7,730	425
of Which:								
(Salaries)	(10,740)	(16,650)	(26,145)	(5,670)	(10,000)	-	(6,480)	(425)
(Medicine Reorders)	(1,250)	(3,250)	(10,250)	(1,250)	(1,250)	(2,260)	(1,250)	-
(Commercial Medicines)	(3,880)	-	-	-	(500)	(1,065)	-	-
(Other)	(325)	-	(195)	(340)	(1,825)	(440)	-	-
4. Expected Cash on Hand Plus Receivables (2-3)	(4,280)	(12,195)	(11,940)	(890)	(6,975)	(15,485)	(10,970)	(7,800)
5. Actual Cash on Hand Plus Receivables	3,620	7,850	10,700	1,055	11,375	12,025	9,015	7,800
6. Discrepancy (4-5)	(-660)	(-4,345)	(-1,140)	(+165)	(+4,400)	(-3,460)	(-1,955)	-
7. Value of Present Inventory	38,744 ^{1/}	29,810	10,757	41,890	35,420 ^{3/}	34,637	25,899	47,850
8. Balance ([5+7]-1)	-9,206	-13,910	-30,113	-8,625	-4,775	-4,908	-16,656	+4,080
9. Volume (Number of Visits)	377	550	868	142	584	215	432	143

NOTES: ^{1/} Includes estimated maximum value of commercial medicines in inventory 3,880.
^{2/} Includes accounts receivable 1,500.
^{3/} Includes estimated maximum value of commercial medicines in inventory 500.
^{4/} Includes accounts receivable 4,200.

This survey was done during the first two weeks of April 1980. Inventory valuations are those used in the project and reflect the cost to the Health Huts to replace medicines dispensed. Other figures are taken from Health Hut records. 200 CFA = \$1.00

b. Opportunities for Private Enterprise.

Local Private Production. Each of the African countries visited has an interest in developing the capability to produce sufficient pharmaceuticals to augment primary health care programs, but is hindered by political, economic, or social factors. Among obstacles faced are competing governmental priorities, insufficient foreign exchange, and a limited pool of trained personnel. If countries are to realize an internal pharmaceutical capability, the health industry, as a part of the health infrastructure, must be developed. Three models are discussed below which have potential for in-country drug production. American enterprises could consider these models within the context of long-term gain and market development.

In Mali, the Chinese are building a pharmaceutical production plant capable of supplying Mali's pharmaceutical needs with the output of three month's of production.

The African Development Bank began discussing the manner in which pharmaceutical supply in Africa could be strengthened in the early 1970s. In February 1980, it received a report from a Swedish consulting firm on the feasibility of establishing a pharmaceutical industry in the west and central regions of Africa. The report proposed a plant of eight thousand square meters, funded with an initial outlay of \$26.3 million, which would employ up to two hundred and forty-five persons, and require \$19.4 million in foreign currency over a ten year period. Due to insufficient markets in individual countries capable of supporting such an

endeavor, it is suggested that the plant be owned and operated on a regional basis. The plant would produce five hundred million tablets per year, as well as vials, ampules, syrups, ointments, and eye drops at one hundred percent capacity utilization. Primary disadvantages to the proposal are its expense and requirement for regional development.

In seeking to address the same need for local pharmaceutical production, the World Health Organization developed guidelines for the establishment of a low-cost formulation plant in 1980. As proposed, the plant would be twenty-eight hundred square meters, require an investment of three million dollars, employ fifty to seventy person, and save a minimum of thirty-five percent of import costs from the first year of operation. As planned, the plant would produce two hundred to three hundred million tablets, twenty-five to fifty million capsules, as well as liquids, ointments and powders. Production would be implemented in three stages:

Stage 1: Uncoated tablets, powders, capsules and liquids

Stage 2: Coated tables

Stage 3: Parenteral preparations

The plant would be appropriate for countries with three to five million people. This plan would be less costly than the African Development Bank plan, and would be based on risks in one as opposed to several countries. It would be of particular advantage in countries with special emphasis on developing health infrastructure and expanding health programming.

In-System Manufacturing. Another opportunity for enterprise is to develop production infrastructure and capability within the public sector. Limited pharmaceutical manufacturing for in-system use is a part of the training of pharmacists worldwide. Pharmacists who work for government hospitals and clinics and central medical stores could be supplied with machinery and raw materials to produce tablets, capsules, and some non-injectable liquids. In Zimbabwe, a central medical stores manufactures liquids. In Senegal, pharmacists and nurses at the department and health post levels manufacture cough syrup using the basic tools of a mortar, pestle, and balance.

Universal Pharmaceutical Systems, Inc., a U.S. based firm, has developed a cost outline for limited in-system pharmaceutical manufacturing of aspirin and acetaminophen, and compared the result to cost of imports (see Appendix F-1). In no case does machinery and raw materials cost surpass cost of imports.

In the U.S., labor and overhead for these two products would at worst be thirty-three to fifty percent of product cost. Only when the maximum percentage (e.g., fifty percent) is added to the manufacturing costs derived in Table 11 would the total cost for the local production of acetaminophen be greater than the import costs. This would provide the only basis for discarding the notion of local production as a feasible plan.

There are mitigating factors to the addition of such an extreme percentage for overhead in developing countries. If more than the two drugs were manufactured, or the same two were manufactured in larger quantities, then the labor and

TABLE 11

COMPARISON OF LOCAL IN-SYSTEM MANUFACTURING COSTS
TO IMPORT COSTS FOR ASPIRIN AND ACETAMINOPHEN

Drug	Cost of Importing Products (\$)	Cost of Limited In-System Manufacturing \$		Cost Savings (\$ Increase)	Cost Savings (% Increase)
		Excluding Labor and Overhead	Including Labor and Overhead		
Aspirin (400 mg) 50,000 package units (1000s)					
U.S.	821,000	122,145	183,218	637,782	348.0
Europe	186,000	*	*	2,782**	1.5
Acetaminophen (500 mg) 25,000 package units (1000s)					
U.S.	260,500	101,490	152,235	108,265	71.0
Europe	137,000	*	*	15,235**	+10.0**

* Data on cost of machinery and raw materials from European sources not determined

** Based on U.S. costs of machinery.

SOURCE: Correspondence from Ira C. Robinson, President, Universal Pharmaceutical System, Inc., Washington, D.C., October 1, 1981.

overhead costs would be considerably lessened. Also, personnel that could be used in the separate manufacturing process are likely to be already involved in some aspect of pharmaceutical supply/production, and activities could be augmented to present staff responsibilities with minimal additional labor costs. Cost savings for local in-system manufacturing could range from 1.5 to 348 percent (see Table 11).

Any of the three "types" of local pharmaceutical production can be considered for private enterprise. Adjustments to features of each type can be made in appropriate feasibility studies.

c. Traditional Medicine. The objectives of this report do not include issues and problems related to traditional medicine. However, it is appropriate that the subject be mentioned in this report, since Africa has a large natural resource of phytotherapeutic agents.

In its 1976 report, WHO/AFRO recommended that the cultivation of certain medicinal plants be encouraged at the village level as a means of providing simple, effective and inexpensive treatment. In August and November of 1980, two consultations on traditional medicine were held in Ghana and Mali, respectively. Attendees included official representations from Ethiopia, Ghana, Lesotho, Kenya, Nigeria, Sierra Leone, Tanzania, Uganda, Zambia, and WHO/AFRO.

At the Ghana session, several suggestions were put forth which were of interest.

- 1) The physical aspects of traditional medicine, including plant constituents used as medicaments, should be taught to modern health personnel.
- 2) The expense of the health delivery system would be less if suitable herbs could be substituted for modern drugs where appropriate.

The latter suggestion reinforces the earlier concept put forth by WHO/AFRO and others to capitalize on the availability of phytotherapeutic agents. Where possible, these are to be used with modern chemotherapeutic agents.

To this end, ENDA (Environnement et Developpement du Tiers-Monde) of Senegal has published information sheets on medicinal plants which contain the name (common and scientific), directions for preparation, usage, dosage, precautions, contraindications and African habitat (Appendix G-1). The information on these sheets is similar to pharmacognostic definitions common in the United States. In fact, preparations and uses suggested are similar to official ones in current U.S. and British Pharmacopeias. Preparations such as those listed were very common in American medical practice until the 1950's. Up to the mid-1970's, pharmacists in the U.S. were trained to prepare such potions, macerations and percolations. It is likely that pharmacists of Africa are still being trained in these methods.

B. Summary of Findings

Findings on the status of pharmaceutical supply in AID primary health care projects are encapsulated and summarized in Tables 12, 13, and 14. Findings are grouped according to the questions which provided the framework for the survey. Other pertinent findings are discussed in succeeding sections, as they have implication for AID programming.

Time, and the scope of the effort, mitigated against validation of all data from which findings are derived. This process is consistent with difficulties accompanying data gathering in developing countries.

TABLE 12

STATUS OF PHARMACEUTICAL SUPPLY IN AID SUPPORTED
PRIMARY HEALTH CARE PROJECT LOCATIONS BY COUNTRY:
COUNTRY RESOURCES

Country Resources	Francophone		Anglophone	
	Mali	Senegal	Zimbabwe	Liberia
1. Codified Policy	No	Yes	Yes	Yes
2. Management Unit				
Parastatal	Yes	No	No	No
Government Agency	Yes	Yes	Yes	Yes
3. National Effort				
Procurement	Yes	Yes	Yes	Yes
Distribution	No	Yes/No	Yes	Yes/No
Central Medical Stores	Yes/No ^{1/}	Yes	Yes	Yes
4. Local Drug Production				
Large Scale	No	Yes	Yes	No
Small Scale (In-System)	?	Yes	Yes	Yes
5. Qualified Personnel				
# of Pharmacists (Estimate)	30	135	330 ^{4/}	38
Dispensers (Technicians)	?	?	?	?
6. Educational Institution for Training Pharmaceutical Staff	Yes	Yes	Yes	No
7. Estimated Budget Allocation for Drugs				
Amount	\$1,600,000 ^{2/}	-	-	\$2,130,000 ^{2/3}
Percent of Health Budget	21%	-	-	11.8%

^{1/} "Yes/No" denotes present, but not functioning.

^{2/} SOURCE: 1980-81 country budgets.

^{3/} Includes drug allocation for John F. Kennedy Hospital.

^{4/} SOURCE: Report of the Secretary for Health, December 1979.

TABLE 13

STATUS OF PHARMACEUTICAL SUPPLY IN AID SUPPORTED
PRIMARY HEALTH CARE PROJECT LOCATIONS BY COUNTRY:
AID OPERATIONS (DRUG-SYSTEM RELATED)

AID Operations	Francophone		Anglophone		
	Mali	Senegal	Zimbabwe ^{1/}	Lofa ^{3/} Liberia	New PHC:
1. Supply System Appropriately Conceptualized	No	No	? ^{1/}	?	No
2. Provides Technical Information and Resource Support	No	No	No	No	No
3. Procurement Policy Clear and Helpful	No	No	No	?	No
4. Appropriate Systems Management Focus	Yes	Yes	?	?	No
5. Sufficient Records for Appropriate Management	Yes	No	No	?	N/A
6. Adequate Evaluation of: Systems	Yes	No	N/A	?	N/A
Drugs	Yes	Yes	N/A	Yes	N/A

^{1/} Project is in implementation stage.

^{2/} Project is in early design stage.

^{3/} Project has been terminated.

? Information is not available.

N/A Not Applicable

TABLE 14

STATUS OF PHARMACEUTICAL SUPPLY IN AID SUPPORTED
PRIMARY HEALTH CARE PROJECT LOCATIONS BY COUNTRY:
PHARMACEUTICALS

Pharmaceuticals	Francophone		Anglophone		
	Mali	Senegal	Zimbabwe	Liberia	New PHC.
	PSR	Sine Saloum	Clinic Rehab.	Lofa ^{1/}	
1. Source					
European or Other	No	Yes	Yes	No	No
USA	Yes	Yes	Yes	Yes	Yes
2. Selection Basis					
Developed Rationale	No	Yes	Yes	Yes	No
Preference	Yes	No	No	No	Yes
3. Procurement					
As Needed	Yes	Yes	No	Yes	Yes
Bulk for Repackaging	No	Yes	Yes	No	No
Tender System	No	No	Yes	Yes	No
4. In-Country Distribution					
National Integrated Systems	No	No	N/A	No	Yes
Systematic-Not Integrated	No	No	N/A	No	No
As Needed	Yes	Yes	Yes	Yes	No
5. Central Storage and Inventory Control					
Systematic	?	Yes	Yes	Yes	Yes
Ad Hoc	?	No	No	No	No
6. Utilization					
Staff Trained in Drug Use	Yes	Yes	Yes	Yes	Yes
Patient Education in Drug Use	No	No	No	No	No
7. Costs					
Aspirin (324 mg - 1000s)	\$ 3.30	\$2.70	-	?	\$ 2.10
Chloroquine (250 mg - 1000s)	\$25.49	\$9.20	-	?	\$11.80

^{1/} Project terminated.

^{2/} Project in early design stage.

VI. DISCUSSION OF FINDINGS AND IMPLICATIONS

Several implications can be drawn from the preceding summary of findings in the survey of the four selected countries. Throughout the survey, a lack of awareness among all principle parties can be detected regarding the management link between the pharmaceutical supply system and the primary health care system of the selected countries. The implications of this inaccurate conceptualization are obvious. Poor health care is the indirect result. In each of the areas of country resources, AID operations and the pharmaceuticals themselves, the lack of an infrastructure to control supply can be traced to this lack of awareness.

A. Country Resources

An analysis of the findings from Zimbabwe, Mali, Liberia and Senegal, under the sub-heading of country resources, reveals the necessity of a codified policy regarding pharmaceutical supply, coupled with a strong governmental agency or unit within the Ministry of Health whose primary purpose is the aggressive enforcement of said policy. Without a codified policy and enforcement unit at the appropriate levels within the government, the development of a stable pharmaceutical infrastructure is highly unlikely.

The lack of a codified policy regarding pharmaceutical supply in Mali is a key factor in the management problems associated with drug distribution and the lack of large and small scale production on the local level. This situation exists even though Mali has operative parastatal and government agencies to provide management of pharmaceuticals. This clearly indicates the necessity of both policy and unit or agency.

Secondly, technical cooperation is needed on a regional basis. This is due to the lack of population and resources (primarily financial) needed to sustain the pharmaceutical industry.

In Liberia, an educational institution for the training of pharmacists or persons of similar technical expertise does not exist. Liberia has determined that its population does not warrant an institution of this kind, and therefore has begun cooperative efforts with other countries through the West African Pharmaceutical Federation.

More cooperative efforts of this nature would prove highly successful in the supply of pharmaceuticals, particularly in the area of local production, where the amount of start-up capital needed for manufacturing is often prohibitive.

B. AID Operations

AID Operations is the area most affected by the inaccurate conceptualization of pharmaceutical supply as less than a legitimate health subsystem.

Pharmaceuticals are viewed as commodities, along with furniture and office supplies. This results in the unavailability of technical information, a misguided management focus, and an inadequate evaluation of pharmaceutical supply from a systematic point of view.

Medicinals of one kind or another are often the last contact the patient has with the health care system. The link between the pharmaceutical supply system and the primary health care system is a vital one, and it must be viewed as such for the necessary changes to occur in the supply and distribution of drugs in these AID supported projects.

However, the most striking finding is that AID does not procure medicines. It administers a procurement system. Actual procurements are done by procurement agents, such as The African-American Purchasing Council (AAPC). Such an agent receives a seven percent commission on the cost of drugs purchased.

Because projects at times relate directly with AAPC, bypassing Washington, it is difficult to get a handle on how much a project actively spends for drugs. In these days of tight budgetary control, it would seem appropriate for AID to know the expenditure level of pharmaceuticals.

C. Pharmaceuticals

Even though AID policy states that projects use funds to secure U.S. products, the remnants of the colonial system reach the pharmaceutical supply system as well. In both Senegal and Zimbabwe, the source of pharmaceuticals is both U.S. and European. This may be attributed to the high cost of U.S. drugs. A comparative cost analysis of two drugs, aspirin and chloroquine, was conducted by AID project site and source of drug. This comparison revealed that all sources of these two drugs in the four countries, as well as a UNICEF source, were markedly less expensive than the same drugs purchased from the U.S.

In this area as well, the secondary importance of pharmaceuticals in the primary health care system has resulted in the absence of systematized components to control the supply when sufficient foreign exchange exists. As an example, drugs are procured and distributed on an as-needed basis. This results in low stock levels at the lowest levels of the distribution system, and sometimes no stock at all. This lack of planning prohibits accurate recordkeeping and inhibits further planning. Thus, a crisis-oriented cycle of events is developed and encouraged.

The results of training staff in drug usage, while ignoring the need for consumer education, promotes inefficiency in the primary health care system. Unused portions of prescriptions, incorrect dosages at inappropriate intervals, and utilization by someone other than the prescribed patient, attribute to recurring health conditions whose course is not naturally chronic.

VII. RECOMMENDATIONS

Based on the findings of the survey, the following recommendations are made for both program formulation and project identification.

Program Formulation

1. The AID/W AFR program should involve closer cooperation with WHO/AFRO, especially with respect to its Program on Essential Drugs through the Prophylactics, Diagnostics and Therapeutics Office. Opportunities for collaboration with other donor agencies should be explored.
2. The African Bureau, Health and Nutrition Division should develop the capability to provide technical assistance resource in the area of pharmaceutical supply as it relates to health delivery systems. This could include the ability to do the following:
 - Select, evaluate and disseminate information on drug policy and management in primary health care;
 - Develop technical guidance documents;
 - Update the Division on pertinent developments in the field of pharmaceutical supply;

- Provide comment, reaction and evaluation of PIDs, PPs and other internal documents;
- Conduct special studies as needed;
- Aid in project conceptualization, implementation, and evaluation; and
- Serve as internal liaison officer to other Bureau health officers on the subject of pharmaceutical supply.

Project Identification

The Africa Bureau should:

- Conduct an in-depth investigation of the net impact of AID procurement policy and its application on primary health care programming in Africa. A result of this should be clear procurement guidance.
- Develop technical guidance documents for field and mission staff on PHC project design, implementation, and evaluation with respect to pharmaceuticals.
- Develop and implement training modules for USAID staff on pharmaceutical supply sector planning and management.

- Purchase and maintain appropriate references on technical aspects of pharmaceutical supply management.
- Conduct a feasibility study on the impact of small-scale, in-system manufacturing in the public sector on recurrent costs.
- Explore with private industry ways in which joint resources can be used to develop the pharmaceutical infrastructure in Africa. Resultant activity should be the development of tangible in-country capability.

APPENDIX A-1
WHO/AFRO LIST OF ESSENTIAL DRUGS

WHO/AFRO LIST OF ESSENTIAL DRUGS

Drug Group	Generic Name of International Non Proprietary Name
1. ANTIBIOTICS	Long acting Penicillin e.g. Procaine Penicillin, Benzathine Penicilline, etc. Penicillin G. (Benzylpenicillin) Ampicillin Streptomycin Chloramphenical Tetracycline Gentamicin.
2. SULPHONAMIDES	Sulphamethoxazole + Trimethoprim. Sulphaguanidine Long acting Sulphonamides e.g. Sulphamethoxypyridazine.
3. ANTIMALARIALS	Chloroquine Quinine (various salts).
4. ANAESTHETICS	Lidocaine Thiopentone.
5. MISCELLANEOUS (a) <u>Analgesics</u> <u>Antipyretics</u> <u>Anti-Inflam-</u> <u>tory Drugs</u> <u>Neuroleptics</u> (b) <u>Anthelmintics</u> (c) <u>Antiparasitics</u> (d) <u>Antitubercu-</u> <u>loisis</u> (e) <u>Antileprosy</u> <u>Drugs</u>	Acetylsalicylic Acid. Paracetamol Phenobarbitone Chlorpromazine Promethazine Phenylbutazone Prednisolone Diazepam Piperazine Levamisole and/or Thiabendazole Metronidazole Niridazole Diethylcarbamazine Citrate Isoniazid (- Thiacetazone) Dapsone (Diaphenylsulphone)

Drug Group	Generic Name of International Non Proprietary Name
(f) <u>Various</u>	<p>Codeine (and preparations) Multivitamins or various vitamins Iron salts 0.9% Sodium Chloride solution Ergometrine or Methylethergometrine Insulin (various forms) 5% Dextrose solution. Oral Rehydration salts Digoxin (a Lanatoside) Laxatives and Purgatives</p> <ul style="list-style-type: none"> - Castor Oil - Magnesium Sulphate - Sodium Sulphate
(g) <u>Galenicals which can be prepared Locally - (Un-Limited List</u>	<ol style="list-style-type: none"> 1. Cough mixtures; expectorant and sedative e.g. with following as base: sodium benzoate compound Ipecacuanha Extract (Desessartz extract) Extract of Tolu. (with or without) Codeine Syrup. 2. Dakin's solution with calcium hydrochloride 3. Benzyl-benzoate lotion. 4. Iodine 1% in alcohol. Mercurochrome solution 2% Skin disinfectants (generic or branded) Gentian violet solution 5. Zinc oxide cream. 6. Analgesic liniment (e.g. methyl salicylate).
H. VACCINES AND SERA	<ol style="list-style-type: none"> 1. Tetanus Vaccine 2. Poliomyelitis Vaccine 3. Yellow Fever Vaccine 4. Measles Vaccine 5. Anti-Tetanus Serum 6. BCG 7. Rabies Vaccine 8. Anti-Snakebite Serum 9. Diphtheria, Pertussis and Tetanus vaccine (DPT Vaccine)

Drug Group	Generic Name of ^{PRODUCTS} International Non-Proprietary Name
7. DRESSINGS	<ol style="list-style-type: none">1. Absorbent cotton wool2. Non-Absorbent cotton wool3. Gauze Bandages4. Absorbent Gauze5. Adhesive Plaster <p>Serious consideration should be given to producing these materials in African Region.</p>

APPENDIX A-2
LOCAL RESOURCES FOR THE TREATMENT OF DIARRHEA

SESSION No. 57

Identify Local Resources For The Treatment Of Diarrhoea

Activity	Approach
Introduction	<p>Time 5 minutes</p> <p>We are going to discuss our local resources for the treatment of diarrhoea. Remember that some of our local resources can be very effective. They are not expensive and we should be always proud to use the effective herbs to solve those health problems for which the herbs are effective.</p>
1. Trainer led discussion on local herbs for treating diarrhoea	<p>Time 15 minutes</p> <p>Ask: what VMS use to treat diarrhoea</p> <ul style="list-style-type: none"> - yiri kasso - Guava leaves <p>Ask VMS:</p> <ul style="list-style-type: none"> - How is yiri kasso prepared and administered <p>Explain that with the addition of the salt an sugar solution, these remedies will further promote recovery</p>
- Demonstrate the preparation and use of yiri kasso and guava leaves	<p>Time 10 minutes</p> <p>Identify the resource person if he is not carrying out the demonstration him self:</p> <ul style="list-style-type: none"> . obtain his consent . set a suitable date . collect needed herbs . inform the interested villagers . organize the demonstration area.
Identify those not responding to treatment to treatment	<p>Time 10 minutes</p> <ul style="list-style-type: none"> - Ask the VMS how they will recognise a person who is not responding to treatment. This is a person, adult or child whose condition remains unchanged 24 hours after receiving care. - Ask what action should then be taken. The person should be referred - Explain the referral process as it has been taught in previous discussion.
- Prevent the causes of diarrhoea	<p>Time 10 minutes</p> <p>What are the needs to prevent the causes of diarrhoea:</p> <ul style="list-style-type: none"> . diarrhoea kills children like no other diseases do . diarrhoea is preventable if one observes simple rules of personal and environmental hygiene . diarrhoea make adults ill and unable to attend to their work.
How to motivate villagers to take action to prevent the causes and sources of diarrhoea.	<p>Time 5 minutes</p> <p>Explain that the VMS will have to work in collaboration with the VDC and other health agents in the village to motivate villagers</p>

to take action to prevent the causes and sources of diarrhoea by explaining the causes and sources of diarrhoea and the resources available for their prevention:

- sweep the compound clean
- practise good personal and domestic hygiene
- protect from flies.

- Recall field work as measures to control flies and prevent diarrhoea.

- Time 10 minutes

- Ask the VIMS questions on the topics discussed.

1. What are the local herbs used
2. How are these local herbs prepared and used.
3. How will they identify those not responding to treatment?
4. Explain the need to prevent the causes and sources of diarrhoea

Time 5 minutes

Summarize the topic of the session.

- Evaluation

- Summary

Demonstrate The Preparation Of The Local Herbs

Activity	Approach
1. Introduction	<p><u>Time: 10 minutes</u></p> <p>Explain that the session will be spent on the preparation of the local herbs used for the treatment of diarrhoea. Acknowledge that not all of the vhw know how to prepare the herbs. In fact one of them will demonstrate the preparation. During the process, the cl will all be on the watch to see how the herb can be prepared to make it safer for the sick person to use.</p>
2. Demonstrate the preparation of the local herbs	<p><u>Time 10 minutes</u></p> <p>Encourage the selected vhw to demonstrate the procedure</p> <p>Stress the need for hygiene</p> <ul style="list-style-type: none"> . wash hands, pots and pans used for the preparation . Clean the herbs . Bring to the boil and leave to boil for at least five minutes . use clean cup to draw the juice from the pot. . Use a different cup to administer it. . keep pot covered to protect from dust and other sources of contamination and also from mosquitoes <p>Commend the demonstrator at the end of the procedure.</p> <p>Ask vhw to comment on the class activity.</p> <p>Remind the class that the solution must be given as much and as frequently as the sick person will accept.</p>
Evaluation	<p>Ask vhw what important hygienic points they will observe when preparing these herbs.</p> <p>- How often will the solution be administered</p>
4. Summary	<p><u>Time 5 minutes</u></p> <p>Summarise the session.</p>

- Reminder - Herbs
 Bowls with covers
 Water
 Equipment for cooking the herbs
- . stove
 - . sticks
 - . matches
- Table for demonstration
 Basket for collecting wastes.

SESSION No.94

How To Keep Record Of Drugs Used

Activity	Approach
<p>Introduction</p> <p>1. Trainer led discussion on: the drugs used and the number remaining.</p> <p>- Practise of these report forms</p> <p>Keep records of the type of drugs supplied and number received.</p> <p>2. Evaluation Activities</p>	<p><u>Time 5 minutes</u></p> <p>It is important to give accurate information on all activities in the village. In so doing, you need to have a system of obtaining this information accurately. The record form is the only process to get this information.</p> <p><u>Time 15 minutes</u></p> <p>Ask the VHS how he will keep records of the drugs used and the drugs remaining:</p> <ul style="list-style-type: none"> • they will use the drug record form • they will identify the symbols for the different drugs: <ul style="list-style-type: none"> • chloroquine • iron tablets • aspirin • miltazol <p>- one circle will be blocked for every tablet issued in each drug category</p> <p>- the number of tablets issued in each drug category will be added up at the end of the day.</p> <p>- the number of tablet - remaining in each drug category should be the same as the number of circles which have not been blocked.</p> <p><u>Time 5 minutes</u></p> <p>When given an introduction to record keeping the VHS will practice these report forms accurately.</p> <p>- Allow VHS to practice record keeping.</p> <p><u>Time 10 minutes</u></p> <p>Ask the VHS how will they will record deaths in the village</p> <ul style="list-style-type: none"> - they will use the selected statistics form - they will identify the symbols representing the disease symptoms. - One circle will be blocked for one death in the death column - one circle will be blocked for each of the last symptoms before death. - One form will be used to record information about one death only. <p><u>Time 5 minutes</u></p> <p>- Ask the VHS questions on the topic discussed.</p>

Activity	Approach
Summary	<ol style="list-style-type: none"><li data-bbox="1090 327 1602 404">1. How will you keep records of drugs used.<li data-bbox="1090 425 1635 491">2. How would you keep selected vital records. <p data-bbox="1090 524 1569 589">Summarize the topic of the session.</p>

APPENDIX B-1

STUDY ON THE NATIONAL PHARMACEUTICAL SYSTEM IN
THE REPUBLIC OF MALI

STUDY ON THE NATIONAL AND PHARMACEUTICAL SYSTEM IN THE REPUBLIC OF MALI

a) GOAL :

Exhaustive study of the national pharmaceutical system in general and of the newly created Office Malien de Pharmacie (O.P) in particular. The final outcome will be a system with better access and utilization of drugs for the entire Malian population for the improvement of their healthstatus.

B) OBJECTIVES :

The study will :

- a) Justify the roles of each of the pharmaceutical organisms (O.P, Pharmacie Populaire, Pharmacie Soudanaise, I.S.P.S.) and determine their complementary role in a national system.
- b) Know in which way the establishment and maintenance of such a system will be financially viable.
- c) Improve the drugbidding system and analyze the possibility of local production.
- d) Propose a logistic system for the entire Malian pharmaceutical system.
- e) Propose an appropriate administrative system.
- f) Offer detailed costanalysis for the establishment and maintenance of such a system.

prescribing patterns not consumption

C) TASKS OF EXPERTS :

Following is a non exhaustive, somewhat arbitrary tasklist to be accomplished by the different specialists. Each of the questions have to address the public parastatal and private sector as applicable.

1) Tasklist for the Public Health specialist *1 1/2 mo.*

- * a) Review of the essential generic druglist (ED). Type, generic and brand names; presentation and different levels of destination within the Public Health service.
- * b) establish standard treatment manuals for about 50 diseases most frequently encountered in Mali : *at different medical and paramedical levels.*
- c) analysis and comparison of a sample of drugprescription in the public and private sector : type, quantity and price of prescribed drugs as well as consumer habits. *at village level especially !!*
- d) drug promotion (advertising, detailmen) and its influence on the medical personnel and the population.
- e) Identify the major problems envisaged in introducing the essential generic druglist at all levels of the PH system and propose their solutions.
- f) review of training curricula with regards to drugprescription for all levels of health personnel.
- g) Possibility for integrating traditional medicine produced in Mali at different levels of health care.
- h) quantitative druglist for different levels of public health services.

1) Septennial drug budget system *2) analysis of consumption patterns study re district/region*
Tasklist of the financial analyst

- a) purchase and sales price of the ED and its breakdown in indexation, taxation, customs etc.
- * b) Pricecomparisons amongst different supplysources (laboratories, private organisms, foundations, international organizations).

- c) price comparisons amongst different brandnames of the same generic product and their marketing influence on the D.
- * d) Sales volume of the D and projection over the next five years.
- e) Quantity and total costs of D in comparison with total drug purchase and sale.
- f) Commercial analysis of drug bidding on the international market : price-comparisons (see 2b), timing/delay of delivery, transport costs, reliability of suppliers, terms of payments. *Bidding system (?)*
- g) Fixed cost analysis (salaries, storage, incountry distribution etc) of the existing and future recommended supply system.
- h) analysis of profit margins or losses and its impact on the national economy.
- i) Profile of the existing service (pharmacie populaire, office national d'ap revisionnement) its profit and indebtedness and its influence on future drug bidding proposals.
- j) Drug budget as percentage of total MOH budget and per capita costs spent for drugs, both in rural and urban zones.
- k) Analysis of the incountry supply systems (peripheral ordering, storage distribution, percentage of population coverage); long distances, sparse population efficiency of personnel and its influence on the present and future planned supply system.
- l) Advantage/disadvantage of a central administrative system for both the private/parastatal and public sector (similar to the ONRPO in Niger)
- m) Detailed cost estimates (capital investment and recurrent costs) for the extension and decentralization of the distribution network.
- n) Analysis of stock control at all levels.
- o) Annual per capita drug expenditures for different agegroups and socio-economic levels (especially civil servants) in rural and urban areas; comparisons with individual purchasing power and competition with other basic human needs expenditure; magnitude of insurance co payers and government co-payers given.
- p) Cost estimates for total population coverage with D.
- q) Detailed analysis for necessary revolving fund for a functioning Office National de Pharmacie.
- r) Commercial aspect of fees for services in the public sector : sales prices and necessary additional funds (capital investment and recurrent costs) for implementation and maintenance of such a service : competition with the pharmacie populaire.
- s) Managerial analysis of the central drug administration, specially at the public sector.
- t) Principal reasons for drug shortages/
- u) Estimated volume of necessary expenditure when cheaper drugs are used and profit margins to be maintained.
- v) Marketing analysis of local production versus bulk import and local packaging.

1) Checklist for local advisor

- a) Complete inventory of legislations and regulations concerning purchase import, local production, transport, storage, distribution network and drug consumption of modern and traditional medicine.
- b) Proposal of necessary local changes, especially for extension of supply networks and greater population access.

- c) Legislative proposal to regulate pharmaceutical promotion (advertising, detailmen)
- d) Legislation necessary to introduce the 20 in generic names and its utilization on drug prescription and drugbinding.
- e) Legislative possibilities to use international supply organizations (UNICOF etc.) as principal suppliers for the public sector.
- f) Necessary legislation for the introduction of fees for services, especially in the public sector.
- g) Legislative possibilities to use neighboring and regional states: Patent, licencing and drug import.

1. Output?

2. Revenue to Preserve Needs.

3.

APPENDIX C-1

OUTLINE-PHARMACEUTICAL SUPPLY SECTION OF PRIMARY HEALTH CARE

OUTLINE

PHARMACEUTICAL SUPPLY SECTOR
OF
PRIMARY HEALTH CARE

Dr. Rosalyn C. King

The Pharmaceutical Supply Sector consists of a set of "realities":

- A. HARD REALITIES - Essential for operation
 - 1. Facilities
 - 2. Personnel
 - 3. Finance
 - 4. Pharmaceutical Source
- B. SOFT REALITIES - Contributory to good operations
 - 1. Drug Product Selection System
 - 2. Procurement System
 - 3. Storage/Inventory System
 - 4. Distribution System
 - 5. Prescribing System
 - 6. Drug Utilization and Information System
 - 7. Training System
 - 8. Sector Management System

These realities are further defined and discussed:

- A. HARD
 - 1. Facilities - Depots, Pharmacies, Dispensing Rooms Number; Distance to/from end distribution points; Size; Layout for adequate workflow; Size for light manufacturing (of cough syrups, topical washes, lotions, buck oral liquids, etc.) and prepackaging (from buck tablets, capsules and liquids); Maintenance; Cold Rooms (rubber items, vaccines, other perishables); Capable of "warehousing" minimal supply level.
 - 2. Personnel - Staff for operations of facilities at all levels; Pharmacists, Dispenser, Aides; Number, Kind, Training, Experience.

3. Finance - Adequate budget based on estimated needs per period of time; cash flow projections tied to anticipated expenditure levels; appropriate bond credit; appropriate award for tender system.

4. Pharmaceutical Source

In-Country Suppliers - Manufacturers and Retailers (or Wholesalers)

Foreign Suppliers - Labelling, packaging

Self-Supplied - Manufactured at central depot, district hospital, or prepackaged there -- utilization of local capability, e.g., suppliers of chemicals (by-products of mining), palm aids, etc., weight charts

Suppliers should be considered who will also provide educational models, films, brochures, etc., in usable languages along with rendered items.

B. SOFT

1. Drug Product Selection System

Mechanism devised and used to identify source and content of drugs to be used in health care system. Primary and key action accomplished generally by consensus through a formulary. Formulary differs from Basic or Essential Drug List (BDL). A BDL contains name (generic and/or trade) of drugs to be used. A formulary contains:

- Name (generic and/or trade)
- Indicatives for Use
- Dosage (levels and intervals according to age, sex, weight)
- Drug-Action
- Drug Interactions
- Drug Forms to be Used in PHC System

Once content identified through formulary, pharmacist or procurer should identify source using current quality control and assurance information.

Drugs should be selected on basis of current epidemiological data for county or country.

2. Procurement System

Mechanism for:

- estimating order
- defining order specifications (form, data requirements, GMP compliance, etc.)
- communicating with sources

- negotiating bids and/or contracts
- arranging for receipt of items
- purchasing
- receiving items (includes past clearance, maintaining past security, inspecting goods, and transporting to stores)
- repackaging
- prepackaging
- manufacturing (light)

3. Storage/Inventory System

Techniques for assuring adequate storage and maintenance conditions (temperature, ventilation, containers, security, product identification, etc.)

Techniques for adequate inventory control (minimum order/reorder levels, stock control cards, stock rotation, disbursement mechanisms, early identification of outs and ratification of dispensing points, etc.)

4. Distribution Systems

- Includes early management decisions on whether system is to be a "push" (drugs sent periodically without requests from end points) or a "pull" (drugs sent only upon request and in a timely fashion) is a combination of both systems
- Establishment of supply and reorder points for
 - depots
 - hospitals
 - clinics
 - centers
 - parts
 - villages
- Transportation and delivery schedules
 - Use of system-owned vehicles
 - Use of private transport systems

- Depot packaging system of
- Depot checking and routing system
- Verification of end-point receipt of drugs
- Periodic checks of stock at dispensing points

5. Prescribing System

Should be formulary based and aim to provide rational therapy at lowest possible cost. Includes providing drug education at time of prescribing or dispensing (name of drug, what condition it is for, how to take, benefits of oral versus injectable).

Should also include general preventive information, such as:

- Keep medicines, especially chloriquine, out of children's reach
- Why orals are at times better than injectables
- Take meds, especially antibiotics, until all are taken

Non-formulary prescribing should be discouraged.

6. Drug and Supplies Utilization and Information System

Utilization mechanism by which sector tracks amount and kind of drugs prescribed and/or used per dispensing point. Data provides baseline for procurement, peer review, etc. Accomplished through multipurpose end-of-month reports

- Name of item
- Amount remaining from previous month
- Amount received during month
- Amount used
- Amount requested for next month

Reports should come from all dispensing points and be incorporated in inventory control system as well.

7. Training

Training for prescribers, pharmacists, dispensing aides and administrators focuses on the clinical use of drugs. Training for health system administrators and managers focuses on the role of each in administering and managing the entire sector (hard and soft realities).

8. Sector Management

Includes:

Planning - for new components or expansion of existing activities

Organizing - the entire sector; procedures for distribution, inventory control, etc., all "soft systems"

Directing - staff; policies; guidelines

Controlling - through supervision, reports, management information; etc.

Evaluating

Clinical - cooperating with peer review quality control, etc.

Administrative - monitor performance of all subsystems for timeliness, competency, adequacy, etc.

OUTLINE

TRAINING FOR THE PHARMACEUTICAL SECTOR OF PRIMARY HEALTH CARE

Training for the Liberian Primary Health Care System pharmaceutical sector requires two perspectives:

- A. Clinical
- B. Administrative

Features outlined below may be part of a larger training effort, but there may be separate training for those in the National Medical Supply Depot.

A. CLINICAL

Drugs will be prescribed/ordered/dispensed on all three levels of care:

Primary - by VHWs, TBAs

Secondary - by PAs, CMVs, Nurses

Hospital - by MDs, Dispensers, PAs, etc.

Drugs used on each level will be those for which the prescriber/orderer has sufficient training in components outlined below. This basic knowledge will be as simplified or detailed as needed or as required. Whether simplified or detailed, each should know the following for each drug:

1. Name of drug (both generic and common brand names)
2. Dosage form(s) in general use or in the formulary and the relationship of form to desired clinical effect
3. Drug action
4. Dosing (levels - how much)
(intervals - how often)
5. Common interactions (e.g., Iron and Tetracycline; Milk and Tetracycline)
6. Common side effects (e.g., drowsiness, colored urine, etc.)
7. Basic patient information needed for prescribing (e.g., age, sex, weight, basic symptoms, previous response to drug)

8. Concomitant Medications or Traditional Medications
9. Accompanying "preventive" health message (e.g., use all of penicillin; Keep chloroquine out of reach of children; Keep all medications out of children's reach)
10. Appropriate storage in home and/or clinic/health center

Accordingly, the basic tasks clinicians and/or dispensers need to be able to perform are:

1. If prescriber, prescribe medications based on specified rationale as agreed upon in the formulary
2. Provide related drug information to patients
3. Utilize sources of drug information (texts, pharmacists, other physicians and clinicians, product inserts, etc.) to acquire new and update drug knowledge
4. Receive and analyze feedback from patients regarding experience with specified treatment regimes
5. Receive and analyze information from patients regarding concomitant therapy - traditional medicines and others
6. Dispense medication to patients
7. Provide drug information upon referral
8. Document clinical actions when necessary

B. ADMINISTRATIVE

The system/sector must be administered on all levels and managed at a central point. Clinicians, etc., will be required to perform select administrative tasks.

Personnel and related administrative tasks they need to be able to perform are:

1. Village Health Worker and TBA
 - Store medicines and supplies in an alphabetical or other organized and appropriate manner
 - Order/reorder supplies and medicines
 - Maintain designated records (e.g., drug usage, stock control/order sheets)

2. Dispensers

- Store medicines and supplies in an alphabetical or other organized and appropriate manner
- Order/reorder supplies and medicines
- Respond to requests for supplies, etc., from lower and upper levels
- Maintain and control inventory
- Observe dispensing limits with regard to drugs (kind and amount)
- Provide limited drug-related information (e.g., general preventive information)
- Prepare simple packaging of medicines

3. County Health Officer

- Prepare a budget for drug needs using epidemiological and past drug utilization data
- Manage the county drug budget

4. Administrative Assistant to County Health Officer

- Procure medicines and supplies from depot for centers, parts, etc.

Therefore, needs to be able to:

- Establish minimum stock levels for each item for each center part, etc. (may be done at depot)
- Maintain smooth paper flow for requisition and distribution of items
- Assure/supervise stock control (no hoarding)
- Assure appropriate storage of medicines and supplies (e.g., refrigerator daily log of temperature, adequate ventilation, etc.)
- In collaboration with clinicians and depot, management information for inventory control system and distribution system

5. Area Supervisor

- Review and evaluate supply requests according to established minimal stock levels
- Assist in data/information collection
- Maintain smooth paper flow

6. Program Supervisor

- Estimate drug needs based on program objectives and available epidemiological data
- Review and evaluate supply requests according to established minimal stock levels

7. Maintenance Manager

- Evaluate requests for prompt/urgent repair (or maintenance) of cold storage boxes, refrigerators, battery replacement, etc. (in order to appropriately evaluate and therefore respond, should have clear understanding of the importance of such items)

8. Health Care Director (HCO)

- Training VHW in ordering/dispensing of medicines and first aid supplies
- Supervise/monitor clinical and administrative tasks of VHW over time (specific set of evaluative questions should be devised which HCO uses routinely in supervision)
- Assure collection of drug consumption data (age, sex, symptom(s), drug dispensed, amount, directions for use)
- Serve as source or conduct for drug information update for VHW, TBAs, etc.

9. Hospital Administrator (C or P Hospital Dispenser)*

- Formulate budget for drugs (based on past utilization and disease patterns) for hospital with medical director and depot (NMSD)
- Procurement medicines and supplies from depot (NMSD); therefore, needs to be able to:
 - establish minimum stock levels for each item for each department of hospital
 - maintain smooth paper flow for requisition and receipt of items
 - assure/supervise stock control

*If Dispenser present, may assume responsibility for some or all tasks.

- Assure appropriate storage of medicines and supplies
- Manage information for inventory control, etc.

10. Chief Medical Officer

- Develops clinical standards of treatment; treatment schedules for each drug (may be in formulary already)
- Use treatment schedules in peer review
- Assure currency of drug and prescribing information for clinicals

11. Manager of Supply Depot

- Develop formulary with County Health Officer and Chief Medical Officer and update it yearly
- Estimate drug needs and costs for new and expanded projects using epidemiological data
- Develop and implement procurement process based on anticipated reorganization (i.e., new personnel) with improved post-clearing and security techniques
- Develop and implement information system for inventory distribution, utilization, etc., systems at all levels and with appropriate personnel
- Assist or train all levels in use of above systems
- Organize, manage selection, procurement, distribution and use of drugs at all levels
- Provide information to CHOs, CMOs, etc., in new drugs, new prescribing information for old drugs, etc.

(THIS SHOULD BE ONLY SOURCE OF DRUG INFORMATION DETAILMEN, ETC., SHOULD BE REQUIRED TO COORDINATE WITH DEPOT)

- Establish mechanism of two-way communication with levels around needs for miscellaneous drug information, common ordering difficulties, etc. (Newsletter)

Estimating Drug Needs and Costs (Epidemiological Basis)

1. Define Population at Risk per Disease
2. Estimate infection rate of the population at risk for the disease
3. Calculate annual number (estimated) of cases ($\#1 \times \#2 = \#3$)
4. Define treatment regimen; may need further definition for mild, moderate, and/or severe cases

5. Calculate drug costs per treatment regimen*
6. Multiply #5 by estimated annual number of cases or estimated number of treatments needed (THIS GIVES ANNUAL DRUG COST FOR ESTIMATED ANNUAL NUMBER OF CASES)(see chart on following page)

GENERAL RECOMMENDATIONS

1. The development of a formulary, NOT JUST A BASIC DRUG LIST, is critical to training, procurement, system development, etc., and should be done first as thoroughly as possible.
2. The tender/bid schedule should be projected for monthly basis (as suggested in Knittsen Report of 1977).
3. Tight manufacturing and repackaging should be heavily considered as a strengthening mechanism, as well as a cost-saving one.
4. Structural reorganization chart be considered for National Medical Supplies Depot upon establishment of county depots and training program.

* After this step, can calculate quantities of drug needed by multiplying treatment regimen by estimated annual number of cases.

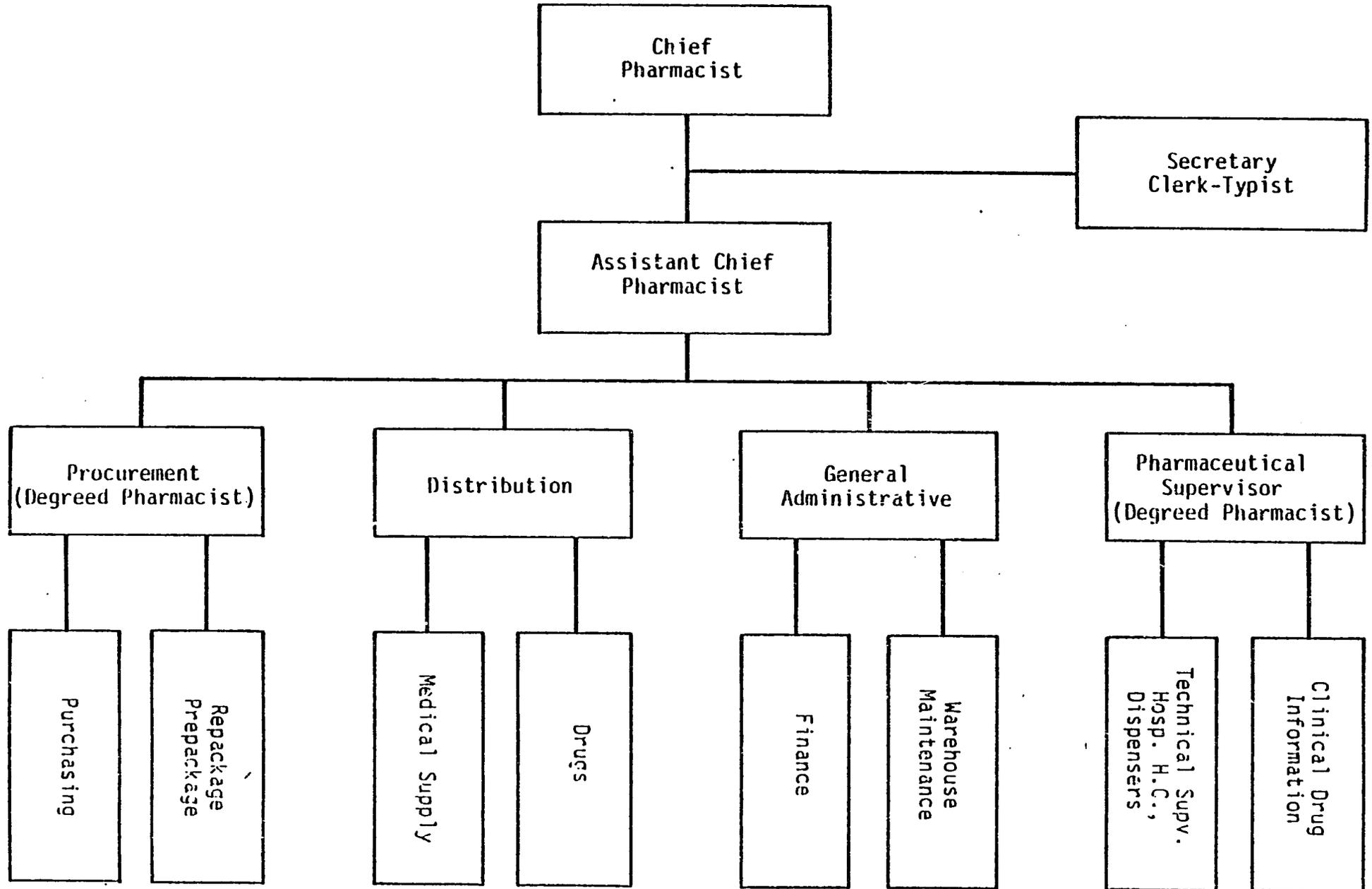
ESTIMATED ANNUAL DRUG COSTS FOR TREATMENT OF WHOOPING COUGH
(Population 0-5 Years)

Population at Risk	Ratio of Infection and Severity	Estimated Annual Number of Cases	Treatment Regimen	Cost per Treatment Regimen	Estimated Annual Drug Costs
765,254	50% Moderate	47,063	ASA 500 mg. 20 Cough Syrup 100 ml.	20 tabs x .945 = .19 100 ml. .50 <u>.69</u>	\$ 32,473.47
	50% Severe		Antibiotic 20 Cough Syrup 100 ml.	20 caps x 1.00 = 20.00 100 ml. .50 <u>\$20.50</u>	\$964,791.50

*Therefore, must find cheaper, as effective antibiotic

1/5

SUGGESTED ORGANIZATIONAL CHART FOR
NATIONAL MEDICAL SUPPLY DEPOT



*Incorporated personnel of 3/15/81 memo to Dr. Massaquoi from J. Cisco

116

APPENDIX D-1

RAVITAILLEMENT EN MEDICAMENTS CONTENU DE LA CAISSE STANDARD

Produits	Unité	Prix Unitaire	Quantité	Décompte	Observations
MÉDICAMENTS CHIMIQUES					
Sulfate de Magnésium	Kg.	265	2	530	
Salicylate de Méthyle	"	1.500	1	1.500	
Bicarbonate de soude	"	208	2	416	
Talc	"	150	2	300	
MÉDICAMENTS GALÉNIQUES (INJECT.)					
Eordénol	libre	40	100	4.000	
Diprophylline	B/100	10,76	1	1.076	
Camposulfonate de soude 2 ml.	B/100	4,69	3	1.407	
" " 5 ml.	B/100	821	2	1.642	
Sérum Physiologique 500 ml.....	Fl.	135	12	1.620	
Eau Bidistillée 5 ml.....	B/100	4,60	7	3.220	
Procaine 1 % 5 ml.....	B/100	512	1	512	
Quinimax 0,10	libre	19	200	3.800	
" 0,20	"	28	200	5.600	
" 0,40	"	43	100	4.300	
Formiate de Quinine 0,25	"	34,30	100	3.430	
" " 0,50	"	54,25	100	5.425	
COTTINES					
Aspirine	Kg.	(x 25) 1.250	5	6.250	
Chbroquine	B/100	(x 25) 1.850	4	7.400	
Parégorique	Kg.	2.100	1	2.100	
Sulfaguandine	B/1000	1.900	3	5.700	
Pectoraux	Kg.	7.000	1	7.000	
Sulfathiazol	B/1000	1.600	2	3.200	
Permanganate de potassium	Kg.	1.632	1/2	816	
Charbon	"	1.500	1	1.500	
PRÉPARATIONS OFFICIELLES					
Huile Camphrée	Litre	350	1	350	
Alcool iodé	"	750	1	750	
Collutoire iodé	"	1.750	1	1.750	
Collyre à l'argyrol 1 %	"	700	1	700	
Huile Gonçolée	"	480	1	480	
Mercurochrome solution	"	370	2	740	
Huile de Ricin	"	920	1	920	
Sulfamide en poudre	Kg.	7.100	1	7.100	

2-1
PRODUITS INDUSTRIELS ET DESINFECTANTS

Produits	Unité	Prix Unitaire	Quantité	Décompte	Observat
Alcool à 95° dénaturé	Litre	520	6	3.120	
SPECIALITES					
Adrénoxyl 1.500	Nbre	55	50 amp	2.750	
Ascabiol	F/125 cc	1.215	1	1.215	
Aurémocine Pomade 1 5/8	Tube	48	20	960	
"- " 3 5/8	"	95	20	1.900	
Bémarsal Comprimé	Nbre	13,84	500	6.920	
Bipénicilline 500.000 U.....	Fla.	27	250	6.750	
"- " 1 M.	"	30	500	15.000	
Thiacylan Caroubé	Kg.	6.200	1	6.200	
Gardénal à 0,20	B/100	20	1	2.000	
"- " à 0,04 injectable	B/100	1.550	1	1.550	
Gardénal à 0,05 comprimé	B/1000	1.223	1	1.223	
Nafodine B1 Simple comprimé	Nbre	51	100	5.100	
Vermox	Comp.	34	500	17.000	
Pipérazine	F/500	543	3	1.629	
Phénargan ampoule	Nbre	35	20	700	
Tulle gras	B/30	1.680	1	1.680	
Vitamine C. comprimé	B/1000	2.850	1	2.850	
Vitamine B.6 amp. 50 mg.	B/100	530	2	1.160	
Vitamine B.6 amp. 250 mg.	B/100	884	2	1.760	
Fumafar comprimé	B/500	2.250	1	2.250	
Buscopan injectable	Nbre	52	43	2.436	
Chloransulfa	Fla.	250	10	2.500	
Hept-A-tyl ampoule	Amp.2 CC	26	100	2.600	
MATERIELS ET OBJETS DE PANSEMENT - MATRIEL MEDICAL FOURNI PAR LA C.M. SUIVANT LES BESOINS					
Bandes Coton 10 x 0,07	Nbre	107	50	5.350	
"- " 5 x 0,10	"	64,50	50	3.225	
Bandes de Gaze 5 x 0,07	"	23	100	2.300	
"- " 5 x 0,0010	"	51	100	5.100	
Compresse 60 x 20	"	12,25	400	4.900	
Coton Hydrophile	Kg.	1.105	5	5.525	
"- Cardé	"	920	5	4.600	
Sparadrap perforé 5 x 0,13.....	Nbre	640	2	1.280	
TOTAL GENERAL				209.135	

REGION MEDICALE DE CENTRE DE SAINTE DE

Désignation	Unité	Prix Unitaire	Quantité	Décompte	Observations
Procaïne adrénaliné à 2 %	B/100 amp de 5 cc	8,24	6	4.944	
ou Xylocaïne 2 % adrénaline	B/5 fla. de 20 cc	122	6	3.650	
Xylocaïne non adrénaliné	B/5 Fla. de 20 cc	110	1	550	
Solucampire	B/50 amp.	4,69	1	234,50	
Adrénoryl 1.500	B/50 amp.	55	1	2.750	
Eau Oxygénée	110 Vol. (Litre)	662	6	3.972	
Chloramine T.	B/100 comp.	1.935	1	1.935	
TOTAL				10.045,50	

APPENDIX D-2
SIPOA, SENEGAL, DRUG AND PRICE LIST

P R O D U I T S				PREX 1981
<u>ANCOULES</u>				
- ACETATE DESOXYCORTICOSTERONE	5 mg	B/100	- 1 ml	900
- ACETATE DESOXYCORTICOSTERONE	10 mg	L/100	- 2 ml	1.390
- ADRENALINE	1 mg	L/100	- 1 ml	427
- ATROPINE	0,25 mg	B/100	- 1 ml	683
- CANTHOSULFONATE DE SOUDE 167	mg/ml	B/100	- 2 ml	595
- CANTHOSULFONATE DE SOUDE 167	mg/ml	B/100	- 5 ml	930
- CHLORPROMAZINE	25 mg	B/100	- 5 ml	2.258
- CHLORURE DE POTASSIUM	10 %	B/100	- 10 ml	1.285
- CHLORURE DE SODIUM	90/100	B/100	- 5 ml	804
- CHLORURE DE SODIUM	90/100	B/100	- 10 ml	900
- CHLORURE DE SODIUM HYPERTONIQUE	10 %	B/100	- 10 ml	1.000
- DIFENHYDRAMINE	200 mg	B/100	- 5 ml	1.118
- EAU BICARBONATE		B/100	- 2 ml	400
- EAU DISTILLEE		B/100	- 5 ml	470
- EAU BICARBONATE		B/100	- 10 ml	735
- EXtrait CHLORURE	40 mg	B/100	- 1 ml	4.529
- EXtrait FLAVIDE EXCOT DE STIGLE	1 mg	B/100	- 1 ml	1.630
- FORMATE DE QUININE	250 mg	B/100	- 1 ml	3.500
- FORMATE DE QUININE	500 mg	B/100	- 2 ml	5.425
- GLYCEROLACOSTRACHINE	1 mg	B/100	- 1 ml	577
- LOBELINE	3 mg	B/100	- 1 ml	3.162
- LOBELINE	10 mg	B/100	- 1 ml	6.523
- NEOSTIGMINE	0,5 mg	B/100	- 1 ml	575
- NICETAMINE	25 %	B/100	- 1,5 ml	1.127
- NICETAMINE	25 %	B/100	- 5 ml	2.145
- OUABAIN	0,25 mg	B/100	- 1 ml	680
- PHENOBARBITAL	40 mg	B/100	- 1 ml	1.581
- PHENOBARBITAL	200 mg	B/100	- 1 ml	2.040
- PROCAINE CHLORURE	1 %	B/100	- 5 ml	530
- PROCAINE CHLORURE	2 %	B/100	- 5 ml	535
- PROCAINE CHLORURE 2 % ALCALINE		B/100	- 5 ml	850
- PROCTERONE	25 mg	B/100	- 1 ml	2.170
- PROCTERONE	10 mg	B/100	- 1 ml	1.700
- QUININE INJECTABLE	100 mg	B/100	- 1 ml	1.400
- QUININE INJECTABLE	200 mg	B/100	- 2 ml	2.800
- QUININE INJECTABLE	400 mg	B/100	- 4 ml	4.200

PRODUITS

1981

/AIPOULES/ (SUITE).-

- SPARTHEINE SULFATE	50 MG	E/100 - 1 ml	560
- STRYCHINE SULFATE	1 MG	E/100 - 1 ml	437
- VITAMINE B1	100 MG	E/100 - 2 ml	480
- VITAMINE B1 100 MG + B.12	1000MG	E/100 - 2 ml	1.025
- VITAMINE B6	50 MG	E/100 - 2 ml	603
- VITAMINE B6	250 MG	E/100 - 5 ml	920
- VITAMINE B12	1000MG	E/100 - 1 ml	367
- VITAMINE B12	1000MG	E/100 - 2 ml	547
- VITAMINE C	100 MG	E/100 - 2 ml	489
- VITAMINE C	500 MG	E/100 - 5 ml	620
- VITAMINE K1	20 MG	E/100 - 1 ml	3.060
- VITAMINE K1	50 MG	E/100 - 1 ml	5.100

/SOLUTIONS LIQUIDES/

- SOLUTION ACIDE		FLA/250 ml	290
- SOLUTION ACID		FLA/500 ml	580
- BICARBONATE DE SODIUM	1,4 %	FLA/250 ml	155
- BICARBONATE DE SODIUM	1,4 %	FLA/500 ml	190
- CHLORURE DE SODIUM	9°/00	FLA/250 ml	135
- CHLORURE DE SODIUM	9°/00	FLA/500 ml	160
- EAU DISTILLEE		FLA/500 ml	150
- GLUCOSE ISOTONIQUE	5 %	FLA/250 ml	140
- GLUCOSE ISOTONIQUE	5 %	FLA/500 ml	170
- GLUCOSE HYPERTONIQUE	10 %	FLA/250 ml	185
- GLUCOSE HYPERTONIQUE	10 %	FLA/500 ml	192
- GLUCOSE HYPERTONIQUE	15 %	FLA/250 ml	210
- GLUCOSE HYPERTONIQUE	15 %	FLA/500 ml	240
- GLUCOSE HYPERTONIQUE	30 %	FLA/500 ml	300
- MANNITOL	10 %	FLA/250 ml	320
- MANNITOL	10 %	FLA/500 ml	433
- SORBITOL	5 %	FLA/500 ml	300
- SORBITOL	10 %	FLA/500 ml	400

/SOLUTE BUVABLE/

- CHLOROPROMAZINE	4 %	FLA/125 ml	660
-------------------	-----	------------	-----

/SIROPS/

- CHLOROQUINE	0,5 %	FLA/500 ml	555
- PIPERAZINE	15 %	FLA/500 ml	580

122

TABLETS
/COMPRIMES/

- ACETASOL	250 mg	BTE/ 500	1.545
- ASPIRINE	500 mg	BTE/1 kg	1.175
- CHAMON	500 mg	BTE/1 kg	1.750
- CHLORAMPHENICOL	100 mg	BTE/1000	2.075
- CHLORPROPAMINE	25 mg	BTE/1000	2.500
- CHLORPROPAMINE	100 mg	FLA/ 100	950
- DILTA CONTINONTE	5 mg	FLA/ 100	320
- DIGULONE	100/200	BTE/1000	2.175
- FULMURANTAL	200 mg	BTE/ 500	2.045
- ISONIAZIDE	100 mg	BTE/1000	750
- ISONIAZIDE	100 mg	BTE/ 500	1.110
- PARACETAMOL F.N.P.		BTE/1 kg	2.325
- PECTOLAN F.N.P.		BTE/1 kg	7.200
- PENTAMINUM DE POTASSIUM	250 mg	BTE/1 kg	1.800
- PINDOLINE MESICATE	250 mg	BTE/ 950	4.000
- PHENOBARBITAL	10 mg	FLA/1000	500
- PHENOBARBITAL	50 mg	BTE/1000	1.270
- PHENOBARBITAL	100 mg	BTE/1000	2.325
- SULFACQUAMIDINE	500 mg	BTE/1000	1.800
- SULFAMETHOXYDIAZOLINE	250 mg	BTE/1000	2.950
- SULFATHIAZOL	500 mg	BTE/1000	2.100
- TETRACICLIN 100 mg + COBAMINE	10 mg	BTE/1 kg	12.150
- UROTROPINE	500 mg	BTE/1 kg	1.000
- VITAMINE B1	100 mg	BTE/ 500	870
- VITAMINE B1	250 mg	BTE/ 500	1.800
- VITAMINE B1	250 mg	BTE/1000	3.800
- VITAMINE C	500 mg	BTE/1000	2.200
- VITAMINE C WAFERFORM	500 mg	BTE/ 100	820

CAPSULES
/GELULES/

- AMPICILLINE	250 mg	BTE/ 100	2.100
- CLOXACILIN	250 mg	BTE/ 100	700
- OXYTETRACYCLINE	250 mg	BTE/ 100	1.200
- TETRACYCLINE	250 mg	BTE/ 200	850

/POMMES/

- AUREOMYCINE OPTHALMIQUE	1 %	BTE/30	83
- AUREOMYCINE OPTHALMIQUE	3 %	BTE/30	90

APPENDIX D-3
DETERMINATION OF BAREMES

APPENDIX D-3

Determination of Baresnes

Population	Barene
600 - 900	1
901 - 1200	1.5
1201 - 1500	2
1501 - 1800	2.5
1801 - 2100	3
2101 - 2400	3.5
2401 - 2700	4

Source: Harrington JE JR: Commande de nouvelle dotation de médicaments,
4 Mai 1981, Project de Sante Rurale, U.S.A.I.D.

APPENDIX D-4

PHARMACEUTICALS AND UNOFFICIAL PRICES FOR 1980
SINE SALOUM, SENEGAL

Appendix D-4

Pharmaceuticals and Unofficial Unitary Prices for 1980
Sine Saloum, Senegal

Item	Quantity	Unitary Price 1980
Aspirin	2000 Tablets (1 kg)	1175 CFA
Nivaquine	1000 Tablets	2025
Piperazine	(Not available in tablet form)	
Fumafer	1000 Tablets	1300
Aureomycine 1%	5 Gram Tube	83
Aureomycine 3%	15 Gram Tube	98
Paregorique	2000 Tablets (1 kg.)	2325
Charbon	2000 Tablets (1 kg.)	1750
Sulfaguavidan	1000 Tablets	1800
Alcohol 95%	1 Litre	750
Gauze Bandages	Roll	23
Compress	Packet 25	306
Cotton Hydrophile	1 Kilogram	1105
Rehydration Powder	(Not available in country)	
Scabies Lotion	(Only available in 125cc)	1214

Source: Project Records

APPENDIX E-1

LIST OF ESSENTIAL DRUGS:
PROPOSED NEW MANAGEMENT SYSTEM OF DRUG SUPPLIES

Proposed New Management System of Drug Supplies

LIST OF ESSENTIAL DRUGS FOR RURAL HEALTH CENTRES/SUB-CENTRES AND
DISPENSARIES

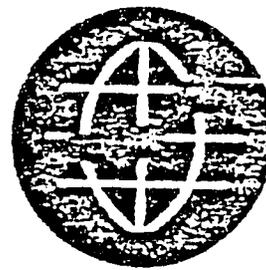
<u>DRUG</u>	<u>HC/HSC</u>	<u>DISP</u>
<u>Local Anaesthetic</u>		
Lidocaine (2%)	x	-
<u>Analgesics etc.</u>		
Tab. Acetyl salicylic Acid	x	x
Tab. Paracetamol	x	x
Liniment terebinth	x	x
Inj. Pethidine	x	-
<u>Anti-allergics</u>		
Tab. Chlorpheniramine	x	x
<u>Anti-epileptics, sedatives</u>		
Tab. Phenobarbitone	x	x
Inj. "	x	-
<u>Anthelmintics</u>		
Tab. Niclosamide	x	x
Tab. Piperazine	x	x
Bephenium sachet*	x	x
<u>Antischistosomal</u>		
Tab. Metrifonate*	x	x
<u>Antibacterial drugs</u>		
<u>Penicillins</u>		
Inj. Procaine Benzyl Pen.	x	x
Inj. triple Penicillin mixture	x	x
Tab. Phenoxymethyl Penicillin	x	x
<u>Other Antibiotics</u>		
Caps. Tetracycline	x	-
Tab. Sulphadimidine	x	x
<u>Antileprotic</u>		
Tab. Dapsone*	x	-

<u>DRUG</u>	<u>HC/HSC</u>	<u>DISP</u>
<u>Antimalarials</u>		
Tab. Chloroquine	x	x
Syrup "	x	x
Inj. "	x	-
<u>Anti-tuberculosis</u>		
Tab. Thiazine (Thiazetazone + INH)	x	-
<u>Anti-anaemia</u>		
Tab. Ferrous Sulphate	x	x
Tab. Folic Acid	x	x
<u>Dermatological preparations</u>		
Surgical spirit	x	x
Vaseline gauze	x	x
Gentian violet	x	x
Cetavlon	x	x
3% Dillidoquine 1% Hydrocortisone	x	x
Benzoic acid + salyilic acid (Whitfield's ointment)	x	x
Benzyl Benzoate	x	x
<u>Antacids</u>		
Magnesium Triscillicate	x	x
<u>Cathartics</u>		
Tab. Senna	x	x
<u>Oral Rehydration Solution</u>		
UNICEF pack/litre (Oralite)	x	x
<u>Ophthalmic</u>		
1% Tetracycline eye ointment	x	x
<u>Ear drops</u>		
Boric acid in spirit ear drops	x	x
<u>Psychotherapeutic</u>		
Tab. Chlorpromazine	x	x
Inj, "	x	-
<u>Respiratory tract drugs</u>		
Tab. Ephedrine	x	x
Inj. Adrenaline	x	x

<u>DRUG</u>	<u>HC/HSC</u>	<u>DISP</u>
<u>Solutions correcting water, electrolyte and acid base disturbances</u>		
2.5% Glucose In 0.45% saline	x	-
½ strength Darrow's solution	x	-
water for injection	x	x
<u>Plasma expanders</u>		
Dextran 40	x	-
<u>Oxytocics</u>		
Inj. Ergometrine	x	-
<u>Vitamins</u>		
Tab. Yeast	x	x

APPENDIX F-1
UNIVERSAL PHARMACEUTICAL SYSTEMS DATA

123



Universal Pharmaceutical Systems, Incorporated / 1728 Seventeenth Street, N.E. / Washington, D.C. 20002, U.S.A.
October 1, 1981

Rosalyn C. King, Pharm.D., M.P.H.
Public Health Consultant
915 South Belgrade Road
Silver Spring, MD 20902

Dear Dr. King:

At your request, we have studied the points delineated in your letter of September 9 and are now reporting our findings and recommendations with respect to the establishment of limited initial in-house pharmaceutical manufacturing capabilities for underdeveloped countries in Africa and elsewhere. A summary is presented in Attachment A.

The kinds of pharmaceuticals which best lend themselves initially to limited local manufacturing within underdeveloped countries are those: 1) with the highest frequency of use in a particular country; 2) which are utilized most frequently in dosage forms providing the greatest medical and patient convenience as well as being economical; and 3) which have the greatest medical utility in terms of saving lives, improving health and decreasing mortality rates among the population in general.

Consequently, our analysis related to the establishment of a limited capability pharmaceutical tablet production facility with an annual production capability of some 80,000,000 tablets or 80,000 package units of 1,000 each. Equipment required to establish such a capability is enclosed (Attachment B). Also recommended is a supplemental replicable capability for producing hard gelatin capsules at levels and on equipment with no or minimal electrical or other generally unavailable requirements in such undeveloped geographic regions. Attachment A incorporates assumptions and stipulations utilized in structuring this report to you, including recommendations with respect to locations of both types of facility.

Attachment B is comprised of a listing and pricing for equipment recommended for establishment of Level I capabilities in both pharmaceutical tableting and manual capsule production at medically and economically useful levels. While the basic equipment for tableting totals \$193,235.00, the replicable encapsulation capability can be equipped for slightly in excess of \$47,000.00. At central stores, the hand-operated model capsule filling machine can be operated on a continuous basis, utilizing blending and screening equipment available for tableting, while at the satellite locations, only additional stainless steel screens and the more common pharmaceutical devices, such as mortars and pestles, may be necessary.

To illustrate how a limited pharmaceutical manufacturing could affect the drug component of a country's health system costs and infrastructure development, a cost analysis has been made on the production of Aspirin Tablets, 500 mg, and Paracetamol Tablets, 500 mg, within the recommended Level I production operation. Details of the Paracetamol Tablet (Product A) cost analysis are provided in Attachment C; and that for Aspirin

Tablets (Product B) are provided in Attachment D. For the purpose of these analyses, annual production of 25,000,000 tablets or 25,000 package units (1,000's) of Paracetamol were projected; and 50,000,000 Aspirin tablets or 50,000 package units of 1,000 Aspirin tablets were projected. These production quantities are estimated to cost \$101,490.00 (\$4.06/package unit) and \$122,145.00 (\$2.44/package unit), for the Paracetamol and Aspirin tablets, respectively, excluding labor costs and overhead, since these are impossible to estimate due to such extreme variation from country to country. Furthermore, it is believed that much of the additional costs for labor and overhead would be absorbed through the upgrading and/or reassignment of existing personnel in drug related activities.

By comparison, our research shows that the prices for packages of 1,000 acetaminophen (paracetamol) tablets (300 - 325 mg) in the U.S. range from \$5.25 to \$15.95 and for 1,000 tablets of 500 - 650mg potency, \$8.75 to \$10.42 for generic firms surveyed. For aspirin tablets, the prices ranged from \$3.25 to \$6.36 per 1,000 for 300 - 325 mg products and from \$6.95 to \$16.42 for 500 - 650 mg tablets. By contrast, paracetamol prices ranged from \$4.75 to \$5.48 per thousand and from \$1.42 to \$3.72 from European sources canvassed by us in England, Ireland, Belgium and Bulgaria. For the purpose of our analysis, 500 mg tablets were used in both cases because this dosage appeared more frequently in tender documents and in information from European sources, where historically the African countries have purchases the vast majority of their pharmaceutical needs.

Some college trained personnel, including pharmacists, chemists, engineers and accountants are needed for the proper function of any pharmaceutical production unit. Such personnel are required to manage the overall operation (preferably a pharmacist), and each of the production (pharmacist), quality control (chemist or pharmacist), warehouse/shipping (pharmacist or chemist), engineering (engineer), and personnel and financial administration (business or personnel administration college graduate). However, certain administrative and engineering functions may be shared with a larger unit, such as central stores, with which the facility is affiliated. Additional pharmacists and chemists are needed to supervise the production, packaging and quality control activities. High school graduates or their equivalent can be utilized as laboratory technicians and equipment operators, provided they are given 3-6 months of intense post high school 'hands-on' training by qualified personnel and reinforcement training for at least one year.

The in-country manufacture of any significant portion of the population's pharmaceutical needs necessarily reduces the outflow of capital, especially if the country utilizes indigenous resources which form a vital component of the necessary infrastructure for development of such a capability.

Such a project can have a highly significant impact on infrastructure development in the host country, especially in the following ways:

1. Stimulating and/or supporting the increased processing and utilization of indigenous natural resources:
 - a. Corn starch, for instance, commonly used in pharmaceutical tablets and capsules as a disintegrant;
 - b. Petroleum by-products as in the production of packaging materials for use with pharmaceuticals and medical supplies (plastic containers, plastic closures, packing materials, cartons and boxes, etc.); and
 - c. Processing and/or production of other raw materials needed directly or indirectly in the pharmaceutical industry.
2. Providing a perfect laboratory for the training of additional health-care, technical, scientific and other types of industrial personnel, especially in

conjunction with a college(s) or university(ies) and/or major health-care facilities within close proximity to the pharmaceutical production facility.

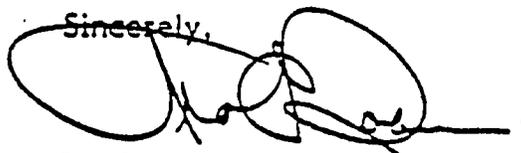
- a. Health professionals and para-professionals;
 - b. Chemists, biologists and other science personnel;
 - c. Business, administrative, secretarial and clerical personnel;
 - d. Engineers, technicians and technologists; and
 - e. Other personnel required to fulfil the health-care needs of the community.
3. Provision of jobs to persons employed within the pharmaceutical manufacturing operations as well as in those industries stimulated and supported by the developing pharmaceutical industry.

In developing countries without capabilities to manufacture pharmaceutical products of their own, it has been reported, black market drugs oftentimes abound in the market place, the quality of which may be highly questionable, bringing into being a serious public health hazard. This is particularly so since practitioners who encounter difficulty in obtaining sorely needed drugs and medical supplies may have little or no alternative to accepting such products of questionable quality as well as those whose expiration dates have passed. Any degree to which the country provides manufacturing capability, it chips away at such menaces to the public health.

Except in the case of pharmaceuticals where the cost of packaging materials and labelling is high in relation to the cost of the medication itself, little economic advantage can be achieved through limited quantity purchases of bulk pharmaceutical dosage forms from abroad for repackaging at home. Therefore, in those cases where a product cannot or is not being manufactured at home, it is just as well that the country purchases the product in its final container (in an economic package size, of course) rather than purchase same in bulk for repackaging at home.

Once a country has begun a successful pharmaceutical operation at any level, however small, it greatly increases its chances of eventually developing a capability to produce a major portion of its pharmaceutical needs. For this reason alone, it is important that undeveloped countries begin in-house production of pharmaceuticals, even on highly limited scale.

Sincerely,



Ira C. Robinson, Ph.D.
President

ICR:ets/i

Enclosures

SUMMARY OF PROJECTED PHARMACEUTICAL PRODUCTION CAPACITY

Production of Uncoated Tablets

1. Projected Annual Production Capability 80,000,000 Tablets
 - a. Package Units of 1,000 80,000 per Year (OR)
 - b. Package Units of 100 800,000 per Year (OR)
 - c. Package Units of 10 (Strip-Paks) 8,000,000 per Year
2. Capacities of Limiting Equipment:
 - a. Tablet Press, 16-Station 60,750,000 Tablets per Year
 - b. Tablet Presses, Single-Punch (3) 21,600,000 Tablets per Year

Production of Hard Gelatin Capsules

1. Projected Annual Production Capability 6,750,000 Capsules
2. Capacity of Limiting Equipment:
 - a. Capsule Filling Machine, 200-Hole 15,000 - 20,000 Capsules per Day Shift

Other Assumptions and Stipulations

1. Daily Shift (Work Day) Eight (8) Hours
2. Production Hours per Shift Six (6) Hours
3. Workweek Five (5) Work Days
4. Workyear Fifty (50) Workweeks
5. Assumed Equipment Downtime 10 Percent or Five (5) Workweeks/Year

Other Requirements or Central Recommendations

1. Location -- The preferred location of the pharmaceutical production facility is the country's central stores facility or in close proximity to it. Alternatively, the production facility could be located within or in close proximity to a college or university where pharmacists, other health professionals and/or other technically trained persons are taught.

The pharmaceutical production operations should be located in a facility which offers 115v, 230v or 460v electricity, depending on local requirements; where there is a plentiful supply of water; where transportation is available; where the temperature of the production areas can be maintained as close as possible to $22^{\circ}\text{C} \pm 3^{\circ}\text{C}$; and where the air humidity can be maintained at $50\% \pm 10\%$.

Satellite capsule production units can be located in various local clinics, hospitals and posts provided a pharmacist or specially trained college graduate nurse is available on a regular full-time or part-time basis. The major capsule production unit should be housed within the same facility and adjacent to the pharmaceutical tableting operations.

PHARMACEUTICAL TABLET PRODUCTION
EQUIPMENT REQUIREMENTS
PRODUCTION LEVEL "I"

	Qty	Cost
1. Tablet Press, Single Punch	3	\$ 15,300.00
2. Tablet Press, 16-Station Rotary	1	26,000.00
3. Wet Granulator, Oscillating, Laboratory Model	1	3,700.00
4. Dry Granulator w/Stainless Steel Rollers, Laboratory Model	1	1,900.00
5. Powder Mixer, 5-Liter Capacity	1	4,300.00
6. Tablet Counter/Filler, Table-Top	2	11,600.00
7. Drying Ovens	2	17,600.00
8. V-Blender, 5 cu.ft.	1	7,500.00
9. Screens and Sieves, Stainless Steel	48	3,600.00
10. Sieve Holder, 310mm, Stainless Steel	2	3,400.00
11. Sieves, Stainless Steel, 310mm	12	800.00
12. Tablet Disintegration Testing Apparatus	2	3,500.00
13. Tablet/Capsule Dissolution Apparatus	1	2,800.00
14. Tablet Friability Tester	2	1,800.00
15. Hardness Tester	4	1,500.00
16. Strip Sealing Machine	4	28,000.00
17. Spare Parts and Accessories for 2 Years	—	59,985.00
		<u>\$193,285.00</u>

PHARMACEUTICAL CAPSULE (HARD GELATIN) PRODUCTION
ADDITIONAL EQUIPMENT REQUIREMENTS SUPPLEMENTAL TO ABOVE
PRODUCTION LEVEL "I"*

1. Capsule Filling Machine, Hand-Operated Model, 200-Hole	2	7,700.00
2. Loading Trays for Capsule Filling Machine	4	8,644.00
3. Capsule/Tablet Counter/Filler, Table-Top	2	11,600.00
4. Powder Mixer, 5-Liter Capacity	1	4,300.00
5. Spare Parts and Accessories for 2 Years	—	14,510.00
		<u>\$ 46,754.00</u>

*Includes Items #5-13 and 15 under "Pharmaceutical Tablet Production Equipment Requirements). This also provides the capability for extemporaneous preparation of small lots (100's or 1,000's) of capsules in line with certain highly limited but required local medication needs.

PRODUCT "B"
Aspirin (Acetylsalicylic Acid) Tablets

- | | |
|----------------------------|--|
| 1. Dosage Form and Potency | Tablets, uncoated, 500 mg (label quantity) |
| 2. Tablet Weight: | 650 mg |
| 3. Package Unit | 1,000's in bottles |
| 4. Annual Production: | 50,000,000 tablets or 50,000 package units |

5. Raw Materials:

a. An Exemplary Formulation:

<u>Ingredients</u>	<u>Per Tablet</u>	<u>Per 1MM Tablets</u>
1. Aspirin/Starch Granulation (90:10)	611.11mg	611.11Kg
2. Lactose, U.S.P.	20.56mg	20.56Kg
3. Stearic Acid	<u>18.33mg</u>	<u>18.33Kg</u>
TOTAL	<u>650.00mg</u>	<u>650.00Kg</u>

b. Raw Material Costs:

1. Aspirin (acetylsalicylic acid), including 10% overage — Aspirin/starch granulation (90%/10%) should be utilized as it costs virtually same as the plain aspirin powder which requires complete processing; realize economies due to shorter processing time and fewer quality control checks; and moisture buildup and moisture/heat degradation of aspirin is minimized.
 $(50,000,000 \text{ tablets}) \times (0.61111 \text{ Gm/tablet}) / 1,000 \text{ Gm/Kg} = 30,555 \text{ Kg}$
 Cost @ \$3.35/Kg = $(30,555 \text{ Kg}) \times (\$3.35/\text{Kg}) = \underline{\$102,359.00}$
2. Lactose —
 $(50,000,000 \text{ tablets}) \times (0.02056 \text{ Gm/tablet}) / 1,000 \text{ Gm/Kg} = 1,028 \text{ Kg or } 2,262 \text{ lbs}$
 Cost @ \$0.49/lb = $(2,262 \text{ lbs}) \times (\$0.49/\text{lb}) = \underline{\$1,109.00}$
3. Stearic Acid (Lubricant) —
 $(50,000,000 \text{ tablets}) \times (0.01833 \text{ Gm/tablet}) / 1,000 \text{ Gm/Kg} = 917 \text{ Kg or } 2,017 \text{ lbs}$
 Cost @ \$0.40/lb = $(2,017 \text{ lbs}) \times (\$0.40/\text{lb}) = \underline{\$807.00}$
4. Total Costs for Raw Materials \$104,245

6. Containers, Closures, Labels and Other Packaging Materials

- a. Containers, Plastic, 950cc, Amber, 50,000 x \$0.21 = \$10,500.00
- b. Closures @ \$63/M = $(50,000 \times \$63/1,000) = \underline{\$3,150.00}$
- c. Labels @ \$0.015 each = $50,000 \times \$0.015 = \underline{\$750.00}$
- d. Other Packaging Materials @ \$0.07 per Container = $50,000 \times \$0.07 = \underline{\$3,500.00}$
- e. Total Costs for Containers, Closures and Labels \$17,900.00

7. Estimated Total Costs Excluding Labor and Overhead \$122,145.00

APPENDIX G-1
MEDICINAL PLANTS



Handwritten Arabic script

MEDICINAL PLANTS

Sheet = 2



Local Name :

Scientific Name :
Family :
Common Name :

CASSIA ITALICA
Caesalpinaceae
Senna of Senegal

INDICATIONS FOR USE :
(traditional)

CONSTIPATION

DISTRIBUTION IN AFRICA :



USAGE :

15g. of small leaf branches
Wash in alcohol or dry
Prepare an infusion.
steep in 1/2 liter of water already boiled

DOSEAGE :

Adult :

1/2 liter per day
taken in 3 doses

In the case of severe constipation take it again.
An action delay of 10 hours minimum by oral track

PRECAUTIONS :

Do not take regularly
Preferably follow good hygiene and nutrition practice
Do not neglect to wash in alcohol if it is not
used dried (risk of irritation)

CONTRA INDICATION :

Pregnancy

HABITAT :

exists in all of Africa
specially in the Sahel outside of flooded zones
not very abundant

143

e
Bf
DA
—
—

BRIEF DESCRIPTION:

Small bush of less than 50 cm.
Glossy smooth leaves composed of small branches
Pale yellow flowers
Flat pods 4.5 X 2 cm.

CHEMISTRY:

Small leaflets
Water; 10%
Mineral material: 11%
Mucilage
Flavin pigments
Resin
Pinitol
Anthracinic derivatives (active principle)

PHARMACOLOGICAL STUDIES:

In the large intestine the senna diminishes the reabsorption of water and increases motility

Irritant in the raw state; It is used dry or washed in alcohol

BENIGNI (1962)

PARIS

FAIRBAIRN (1958)

VALETTRE AND HUREAU (1957)

L. ROBINEAU, I. WONE and H. DE LAUTURE, February 1979

APPENDIX G

G-1 Medicinal Plants

APPENDIX H-1
LIST OF PERSONS INTERVIEWED

AID/WASHINGTON

Dr. Thomas Georges - AFR/DR/HN
 Dr. Charles DeBose - AFR/DR/HN
 Ms. Gilda de Luca - AFR/DR/HN
 Dr. Marc Vincent - AFR/DR/HN
 Dr. Joseph Stockard - AFR/DR/HN
 Ms. Janet Anderson - AFR/DR/HN
 Ms. Abby Bloom - PPC
 Dr. Don Macquordale - Asia/TR
 Mr. James Doster - LAC/DR
 Mr. A. Boni - DSP/POP

UNICEF

Mr. Louis J. Shapiro
 Ms. Nancy Cain

WORLD BANK

Mr. Ved Kumar

PAHO

Dr. Enrique Fefer

AFRO-AMERICAN PURCHASING COUNCIL

Dr. Rene La Marre - President

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Mr. George Dines - Africa Liaison, Office of International Health
 Mr. Harry Knutson - Public Health Service Depot
 Mr. Charles Erdlejohn - Indian Health Service Deputy Chief, Pharmacy
 Ms. Patricia Forman - Pharmacist, International Affairs, F.D.A.

BRAZZAVILLEWHO/AFRO

Dr. S. Siwale - Director, Program Management
 Dr. A. Geller - Director, Program Promotion
 Mr. W. Chelemu - Pharmacist, Prophylactic, Diagnostic and Therapeutic Substances
 Dr. H. Ben-Aziza - Health Education Officer
 Dr. A. Abou-Gareeb - Communicable Disease Office
 Dr. C. Ranandriamana - Nutrition Office
 Dr. L. Djordevic - Health Laboratory Office
 Dr. F. Grant - Onchocerciasis Office
 Ms. H. Jakubowska - Editorial Services Office

EMBASSY

Dr. Philip Graiter - E.P.I.

CARE/CONGO

Mr. Tom Zopf - Program Director
 Ms. Nancy Minnette - Health Officer

IVORY COASTREDSO/WEST

Mr. George Jones - Regional Health Officer
 Mr. Anthony Bilecky - Supply Management Officer
 Mr. Graham Thompson - Design Officer

AFRICAN DEVELOPMENT BANK

Dr. Abdel Mohammed - Chief, Health Education Division
 Dr. B. Teoume - Lessane, Health Education Division
 Mr. J. Carter - Health Education Division

SHDS

Dr. David French - Director
 Mr. Sol Helfenbein - Assistant Project Director

ZIMBABWE

Dr. Priest - Permanent Secretary for Health
 Ms. E. Westwater - Deputy Secretary for Health
 Mr. Harrison - Deputy Chief Pharmacist, M.O.H.
 Mr. Ronald Lewis - Pharmacist Director, Central Medical Stores
 Mr. George Davison - Hospital Secretary, Harare Hospital
 Sister Margaret Nyandoro - M.O.H.
 Ms. Joan Tay - Hospital Secretary, Andrew Fleming Hospital

MALIMINISTRY OF HEALTH

Mr. Namory Traore - Planning and Evaluation

USAID

Mr. Tom Park - Health Officer

Dr. Peter Kniebel - Medical Officer, Sahel Development Program

PROJECT DE SANTE RURALE

Mr. Lowell Callaghan - Administrator

Dr. Jacques Baudray - Medical Officer

WORLD BANK

Mr. Jean Malvinsky

FONDS EUROPEEN DE DEVELOPPEMENT

Mr. Sabah

LIBERIAMINISTRY OF HEALTH

Mr. Robert Ellis - Deputy Minister

Dr. A. R. Massaquoi - Deputy Chief Medical Officer

Ms. R. Marshall - Assistant Minister

Mr. Jacob Cisco - Chief Pharmacist

USAID

Mr. Charles Witten - Health Officer

Ms. Kate Jones-Petron - International Development Intern, Health

SENEGALMINISTRY OF HEALTH

Mr. A. Cisse - Director, PHARMAPRO

Ms. Watara - Pharmacist, Kaolack Hospital

USAID

Dr. Michael White - Health Officer

Ms. Mary Diop - Health Officer

SINE SALOUM PROJECT

Dr. I. Kane - Medcin-Chef
Mr. James Harrington - PCV
Mr. Camara - Regional Pharmacist
Mr. Brian Fitzgibbons - PCV
Ms. P. Daly - Project Director

PIKINE HEALTH

Dr. Jeancloes - Medical Officer

S.I.P.O.A.

Mr. Rousseulat

KENYA

REDSO/EAST

Dr. Anita Mackie - Regional Health Officer

MINISTRY OF HEALTH

Dr. Reginald Gipson - Planning Consultant
Dr. Jack Schluter - Administrative Services

BIBLIOGRAPHY

AGENCY FOR INTERNATIONAL DEVELOPMENT (AID) DOCUMENTS

- Kennedy JE: The rural health services development project in the Sine Saloum Region of Senegal, technical assessment and analysis. American Public Health Association and U.S. Agency for International Development (ADSS) AID/DESP-C-0053, August 1980.
- Strengthening Health Delivery Systems in Central and West Africa (SHEDS): VHW training course materials for The Gambia, 1981.
- Schaumann L: Selected bibliographies for pharmaceutical supply systems. Office of Health, Agency for International Development, DHEW publication, No. (PHS) 79-50094, Contract No. 282-77-0128.
- A preliminary examination of issues related to the delivery of pharmaceutical products and services in west and central Africa based on visit to four countries. Project for Strengthening Health Delivery Systems in Central and West Africa, Abidjan, COT D'Ivoire, 1979.
- Knebel P: The village health worker team in the Sahel, U.S. Sahel Development Planning Regional Office, Bamako, July 1980.
- DeBose C: Some lessons learned from health projects in Africa (memorandum), February 25, 1981.
- Congressional briefing paper for FY 1981. Africa Bureau, Health and Nutrition Division, Agency for International Development.
- Bloom AL: AID comments on GAO draft report, "Managing Health Care Projects in Developing Countries," March 4, 1981.
- Sub-Saharan Africa and the United States. Washington, D.C.: U.S. Department of State, 1980.
- Pharmaceutical procurement: State #200928, July 30, 1981.
- Weber RF, et al: Senegal: the Sine Soloum Rural Health Project, project impact evaluation no. 9, Washington, D.C.: Agency for International Development, October 1980.
- Knutson HO: Report of visit to Liberia regarding medical logistics problems, memorandum. April 8, 1977.
- USAID/GOL Design Team: Liberian primary health care project. #669-0165, August 1981.
- Tracking report on AID sponsored primary health care projects, Vol. III. Washington, D.C.: American Public Health Association, 1980.

Project design and implementation guidelines. Washington, D.C.: Agency for International Development, 1979.

Dunlop DW: Guidelines for an economic analysis of health and human resources PID's and PP's. Memorandum, October 14, 1980.

Kelly PG, Sissoko F: Mali Rural Health Project (Project Sante Rurale) after 18 months in the field, preliminary evaluation and strategy, Koro Cercle, Mali, April 1980.

Daulaire NFP, Taylor ME: Activities of the Project de Sante Rurale in Yelimane Cercle 1978-1979. February 1980.

Agency for International Development: Sudan, list of basic drugs for PHCUs. March 17, 1981.

Agency for International Development: Sudan-PHCP-basic list in current use. REF: State #105481, June 8, 1981.

Pharmaceutical procurement: Mauritania rural medical assistance project. July 13, 1981.

Health sector policy paper. Washington, D.C.: Agency for International Development, March 1980.

WORLD HEALTH ORGANIZATION (WHO) DOCUMENTS

World Health Organization: Prophylactic, diagnostic and therapeutic substances (PDT) programme, African region. General survey of the PDT programme in the African region, subregional meeting on essential drugs, Beira, 20-24 April 1981.

Quality control of drugs. Geneva: World Health Organization, 1977.

African traditional medicine, Afro Technical Report Series No. 1. Brazzaville: World Health Organization, 1976.

Drug policy and management, Afro Technical Report Series No. 6. Brazzaville: World Health Organization, 1978.

Working group on technical cooperation in pharmaceutical supplies in the South Pacific, Auckland, New Zealand, 28-30 August 1979. Manila, Philippines: World Health Organization, September 1979.

On being in charge, a guide for middle-level management in primary health care. Geneva: World Health Organization, 1980.

WHO expert committee on specifications for pharmaceutical preparations. Technical Report Series 645. Geneva: World Health Organization, 1980.

Drug policies including traditional medicines in the context of primary health care. New Delhi: World Health Organization, November 1978.

- National Drug Policies. Copenhagen: World Health Organization
World Health Forum 2:(1) 1981.
- Drug policies for primary health care. WHO Chronicle 34: 20-23 1980.
- Action programme on essential drugs. WHO Chronicle 33: 203-208, 1979.
- Fattorusso V: Essential drugs for the third world. World Health: 3-5
(May) 1981.
- Technical discussions on national policies and practices in regard to
medical products; and related international problems. World Health
Organization, March 6, 1978.
- Drug policy and management, Afro Technical Report Series No. 6.
Brazzaville: World Health Organization, 1978.
- Consultation on development of guidelines for local formulation and
distribution of essential drugs in developing countries. Geneva: World
Health Organization, 1979.
- WHO Expert Committee: The selection of essential drugs, Technical Report
Series 641. Geneva: World Health Organization, 1979.
- Stork M, Wanandi WB, Arambulo AS: Guidelines and recommendations for the
establishment of a low cost pharmaceutical formulation plant (LCPFP) in
developing countries. Geneva: World Health Organization, 1980.
- List of essential drugs. Brazzaville: World Health Organization, 1980.
- Howard LM: What are the financial resources for "Health 2000?". World
Health Forum 2: 23-29 (1) 1981.
- Tentative list of primary health care drugs for UNICEF/WHO joint project.
January 9, 1980.
- Technology policy in the pharmaceutical sector in developing countries.
UNCTAD secretariat for WHO consultation on Drug Policies, Geneva,
6-10 December 1976.
- Gunaratne VTH: Bringing down drug costs: the Sri Lankan example. World
Health Forum I: 117-122, 1980.
- Primary health care. Health Officers Conference, Abidjan, Ivory Coast,
December 8-13, 1980.
- World Health Organization: Bangladesh, country health programming,
February 28, 1978.
- World Health Organization: Beira meeting on essential drugs, April 20-24,
1981.

Primary health care. International conference on primary health care, Alma-Ata, USSR, 6-12 September 1978. Geneva: World Health Organization, 1978.

WHO Expert Committee on specifications for pharmaceutical preparations, Technical Report Services 645. Geneva: World Health Organization, 1980.

The selection of essential drugs, second report of the WHO Expert committee, Technical Report Series 641. Geneva: World Health Organization, 1979.

OTHER SOURCES

Medical Store Catalogue 1980. Salisbury: Ministry of Health, 1980.

Report of the Secretary for Health for the year ended 31 December 1979. Presented to Parliament of Zimbabwe, 1980.

Standard list of drugs approved for issue to council clinics.

Cisco JN: Drugs and medical supplies, delivery schedule, 4th quarter supply, April 1981. Ministry of Health and Social Welfare, Monrovia, Liberia, 1981.

Drug formulary 1979. Liberia: National Medical Supply Depot, Ministry of Health and Social Welfare, 1979.

Report of the National Medical Supply Depot. Monrovia, Liberia: National Medical Supply Depot, Ministry of Health and Social Welfare, December 1979.

Gittens CE: Pharmacies and medicine stores, directory. Monrovia, Liberia: Ministry of Health and Social Welfare, Pharmacy Board of Liberia, November 1980.

Adenika FB (ed): Malaria Chemotherapy. Proceedings of the First Scientific Seminar of the West African Pharmaceutical Federation, 19-24 February 1978, Accra, Ghana. West African Pharmaceutical Federation, 1978.

Consultation on traditional medicine in health services development. Accra, August 4-8, 1980.

Neuhauser L: Review meeting of Sahel Primary Health Care (PHC) Workshop, July 5. Memorandum, July 27, 1979.

Neuhauser L: Sahel AID primary health care (PHC) and expanded programs in immunization (EPI) workshop, 8-13 July, Senegal.

Project de reglement interior. Order National Des Pharmaciens du Senegal, Dakar, Senegal, April 1977.

Herrington JE Jr: An analysis of the medicine distribution system of the AID/Senegal Sine-Saloum Rural Health Project. Kolack, Senegal, October 1980.

- Herrington JE Jr: Commande de nouvelle dotation de médicaments. Memorandum to Mike White, RHO/Dakar, May 4, 1981.
- Participation des populations a l'effort de sante publique: principes et directives methodologies. Ministere de la Sante Publique, Republique de Senegal, Juillet 1980.
- Diop M: Pharmacie Nationale d'Approvisionnement-Pharmapro. Senegal, n.d.
Liste des médicaments. SIPOA, Dakar, Senegal, n.d.
- Proposed new management system for drug supplies for rural health facilities. Administrative Support Unit, Ministry of Health, Kenya, April 1980.
- Segal M: Two papers on pharmaceuticals in developing countries. Brighton, Eng.: Institute of Development Studies at the University of Sussex, 1976.
- York P: UJAMAA (participatory socialism) for pharmacy in Tanzania. Phar Inter 1: 8-11 (March) 1980.
- Lasagna L: The diseases and drug needs of the third world. J. Chron Dis 32: 413-414, 1979.
- Piachaud D: Medicines and the third world. Soc Sci and Med 14C: 183-198, 1980.
- Perkins FT: The need for quality control in the developing countries, Dev Biol Stan 4: 291-4, 1978.
- Yudkin, JS: Provision of medicines in a developing country. Lancet 1 (8068): 810-2 (15 April) 1978.
- McDermott W: Pharmaceuticals: the role in developing societies. Science 209 (4453): 240-5 (July) 1980.
- New African: (May) 1981.
- Agarwal A: Drugs and the third world. London: Earthscan Publication, n.d.
- Analysis: a tracking report of AID sponsored primary health care projects. Vol. III: Africa. Washington, D.C.: International Health Programs, APHA, December 1980.
- Annual Report 1979. African Development Bank and African Development Fund, 1980.
- Guidelines for analysis of pharmaceutical supply systems planning in developing countries. Contract No. 282-77-0128, U.S. Department of Health, Education and Welfare, publication no. (PHS) 79-50086, 1979.
- Carlson DG: Drug supply systems in Africa: an historical overview with particular reference to Nigeria. September 1980.

- Gish O, Feller LL: Planning pharmaceuticals for primary health care: the supply and utilization of drugs in the third world. Washington, D.C.: American Public Health Association, 1979.
- Ademuwagun ZA, et al (eds): African therapeutic systems. Waltham, Mass.: Crossroads Press, 1979.
- UNICEF Catalogue and price list, 1981.
- Institute of Medicine: Pharmaceutical innovation and the needs of developing countries. Washington, D.C.: National Academy of Sciences, June 1979.
- Scandal of the unsafe "shot" o.k. for blacks not for whites. New African 165: 44-45 (June) 1981.
- Dostert PE: Africa 1980. Washington, D.C.: Stryker-Post Publications, 1980.
- West Africa 3326: (April 27) 1981.
- Africa 117: (May) 1981.
- Africa Now: (April) 1981.
- New Dawn: (March) 1981.
- National Academy of Sciences: Pharmaceuticals for developing countries. Washington, D.C.: National Academy of Sciences, 1979.
- National Academy of Sciences: Health, pharmaceutical and development indicators worldwide. London: IMS World Publications, 1979.
- Center for Public Resources: Pharmaceuticals utilization in developing countries. New York: Center for Public Resources, 1981.
- Health sector policy paper. Washington, D.C.: World Bank, 1980.
- International Health Planning Reference Series: Selected bibliographies for pharmaceutical supply systems. Publication no. (PHS) 79-50094, Washington, D.C.: U.S. Department of Health, Education and Welfare, 1979.
- American Association of Colleges of Pharmacy: Proceedings of the second international congress on pharmacy education, July 17-20, 1980. Boston, Massachusetts. Bethesda, Maryland: Association of Colleges of Pharmacy, 1980.
- Special health problems of island developing and other specially disadvantaged countries. Commonwealth Secretariat, January 1980.
- Comptroller General's Report to the Congress: Managing health care projects in developing countries. Draft. Washington, D.C.: U.S. General Accounting Office, n.d.

Yudkin JS: The economics of pharmaceutical supply in Tanzania.
International Journal of Health Services 10: 455-477, 1980.

Report of the fifth commonwealth medical conference. Vol. II. Commonwealth Secretariat, New Zealand, 1977.

Prescription drug products currently classified by the Food and Drug Administration as lacking adequate evidence of effectiveness. Department of Health and Human Services, January 1981.

Massaquoi AR: Pharmaceuticals in Tanga. London: Institute of child Health, University of London, 1980.

Production plant for pharmaceuticals of basic necessity in west and central Africa. African Development Bank, February 1980.

MIMS Africa 20 (6): n.d.

157