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ORAL REHYDRATION THERAPY OPERATIONS RESEARCH STUDY
LIBERIA

Final Report

By

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EXECUTIVE SUMMARY

Diarrhoea and its concomitant dehydration claim high morbidity and mortality rates among children in developing countries. In 1980 in the developing countries, it is believed that an estimated five million children under five years of age died as a consequence of diarrhoeal disease. It is also said that about eighty percent of the diarrhoeal deaths occur between the age of 0-2 years, that about sixty to seventy percent of diarrhoeal deaths are caused by dehydration and about forty percent of infant and childhood deaths are due to diarrhoea.

Liberia is no exception where about sixty-four percent of its population of slightly more than two million live in the rural area, forty-eight percent of the population are under fifteen years while twenty percent are under five years.

Although as in most developing countries, vital statistics are often incomplete, a five-year review of hospital admissions revealed that sixty-eight percent were adults and thirty-two percent were children while only thirty-four percent of all deaths were adults and sixty-six percent were children. Again, diarrhoeal diseases - gastroenteritis - is the second leading cause of death while malnutrition takes the first place. Also about sixty-four percent of children deaths occur under the age of five years.

Deaths due to diarrhoeal diseases are often due to loss of fluid and electrolytes from the body (dehydration) which in most cases can be treated by appropriate fluid and electrolyte replacement.

The health care delivery system of Liberia like in other developing countries, is such that it is dependent on static delivery points i.e., clinics and hospitals based in urban centers with the perennial problems of shortages in manpower, money and machines. The management of the diarrhoeal problem therefore, to maximize our meagre resources and positively impact on its sequelae, is to find an effective method of replacing the lost fluid and electrolytes, a preferable and appropriate rehydration solution that our caretakers could be trained to administer fairly easily even in our rural setting. This study on oral rehydration was therefore chosen since parenteral rehydration will involve specially trained health manpower, expensive sterile equipment and solution, and health facilities - all of which are in short supply.

The Oral Rehydration Therapy - Operations Research Study of Liberia was therefore conceptualized -

(i) To identify the most appropriate home-made oral rehydration solution that can be used for oral rehydration therapy in in rural Liberia and

(ii) To identify the most effective educational strategy to train caretakers in Liberia so that they can appropriately use oral rehydration therapy when their wards have diarrhoea.

These answers if and when found will be incorporated in diarrhoea diseas control activities that will serve as inputs to the various primary health care projects in Liberia - hence the importance of the study.

Phase I or Problem Analysis Phase of the study involved an extensive literature review, definition of the problem and the identification of the sub-operational problems. A study site with twenty-two villages was selected. Village profile data using twenty-five socio-economic characteristics were collected. Two other forms were designed to obtain information on the socio-economic characteristics of the households, the caretakers and their knowledge, attitude and practices (KAP) regarding diarrhoea, dehydration and oral rehydration therapy.

A village was selected to pre-test and fine-tune the questionnaires. This was the village where our pilot test was conducted during the solution development phase.

Phase II or Solution Development Phase focussed on the identification of several variables while only two, the (1) types of oral rehydration solutions (ORS) and (2) educational strategies were subjected to testing. Several models were constructed to help develop solutions to the operational problem of choosing from a number of ORS-education strategy combinations.

The pilot test was conducted at this stage to help develop a solution i.e. to help select the ORS/educational strategy combination that will be field tested in the next and final phase of the study.

From discussions (Nominal group process) held, it was decided to train all the caretakers in the pilot village in the preparation and administration of 4 home-made oral rehydration solutions. The caretakers in the pilot village were divided into two parts. One

group of caretakers was trained with the "Face-to-Face" educational strategy while the other group was trained using the "Group Teaching" after pre-testing them. A training package was developed for each group of trainees. Post test results were then compared to the pre-test results and analysed. The two educational strategies were selected earlier on based on advice from experts and the literature review conducted.

The final phase - Phase III - of the study was the Solution Validation Phase. The field test was conducted here to test (1) whether one educational strategy was more effective than the other and (2) also to confirm the notion that training of caretakers really improves their KAP on oral rehydration therapy.

The study design used in the field test was the Pre-test - Post-test Control Experimental Design. Essentially, questionnaires were administered thereby collecting relevant information (pre-test) on all of fifteen villages. The experimental villages were divided into three categories of five villages in each category with one randomly selected control village for each category. The villages had been ranked based on their SES + vill. profile characteristics. The four experimental villages in each category were paired, giving two pairs in each category plus one control village. One Educational Strategy was randomly assigned to one-half pair while the other educational strategy was then assigned to the other half pair. All the caretakers in the experimental villages were then trained on diarrhoea, the preparation of a selected oral rehydration solution and oral rehydration therapy (ORT). There was no training (no intervention) in the control

villages. After the training, a second survey (post test) was conducted to obtain a second set of measurements on the KAP of all caretakers. The two sets of measurements on the KAP were then comparatively analysed. The difference between the pre-test and the post test results for the experimental group was tested as to whether it was positive.

Data from the tests were summarized with percentages of various responses computed. Two statistical techniques were used to test the relative effectiveness of the two educational strategies. The student t-statistic was used for average scores while the Mantel-Haenszel test was used for data involving the number of correct answers. In addition, Spearman's rank correlation test and Pearson's correlation coefficient technique were used to ascertain the independence or otherwise of effectiveness of training on the socio-economic characteristics of caretakers. The Chi-squared test was also used.

Results

The results of the study - at the pilot test stage showed that salt/sugar/orange solution was the most appropriate home-made ORS in rural Liberia. I challenge this.

The relative effectiveness of the two educational strategies was inconclusive at the pilot study stage so it was field tested to find out which was superior.

The evidence suggests that the hypothesis that "Face-to-Face" educational strategy is superior to "Group" educational strategy in terms of its effectiveness was sustained. On considering the relative

difficulty in training caretakers using the two educational strategies, several factors were considered. Testing the hypothesis that it is easier to use the "Group" teaching strategy than the "Face-to-Face" teaching strategy, the drop out rate of caretakers was used as the proxy or reference. This hypothesis is sustained by the evidence, meaning that it is easier to train caretakers in group rather than on one-to-one basis.

Conclusions and Recommendations

Conclusions

1. That salt/sugar/orange solution stands out clearly as the most appropriate oral rehydration solution that can be used for oral rehydration therapy in rural Liberia.
2. That irrespective of the Educational Strategy used for the training, the caretakers' knowledge on diarrhoea, its aetiology, its correct management using ORS, its sequelae of dehydration and its prevention significantly increased.
3. That training had a significant positive impact on the attitude of caretakers regarding diarrhoea as a killer disease, as one of the most common diseases of children aged five and below and towards the prevention and treatment of diarrhoea.
4. In terms of effectiveness, "Face-to-Face" educational strategy was found to be superior to "Group" educational strategy. However, on examining the difficulties involved in using the two educational strategies, it is also concluded that it is easier to train caretakers using the "Group" educational strategy than "Face-to-Face" educational strategy.

Recommendations

It is recommended that:

1. A Health Education project on Diarrhoea, its aetiology, its sequelae and its proper management using oral rehydration solution be instituted in Liberia.

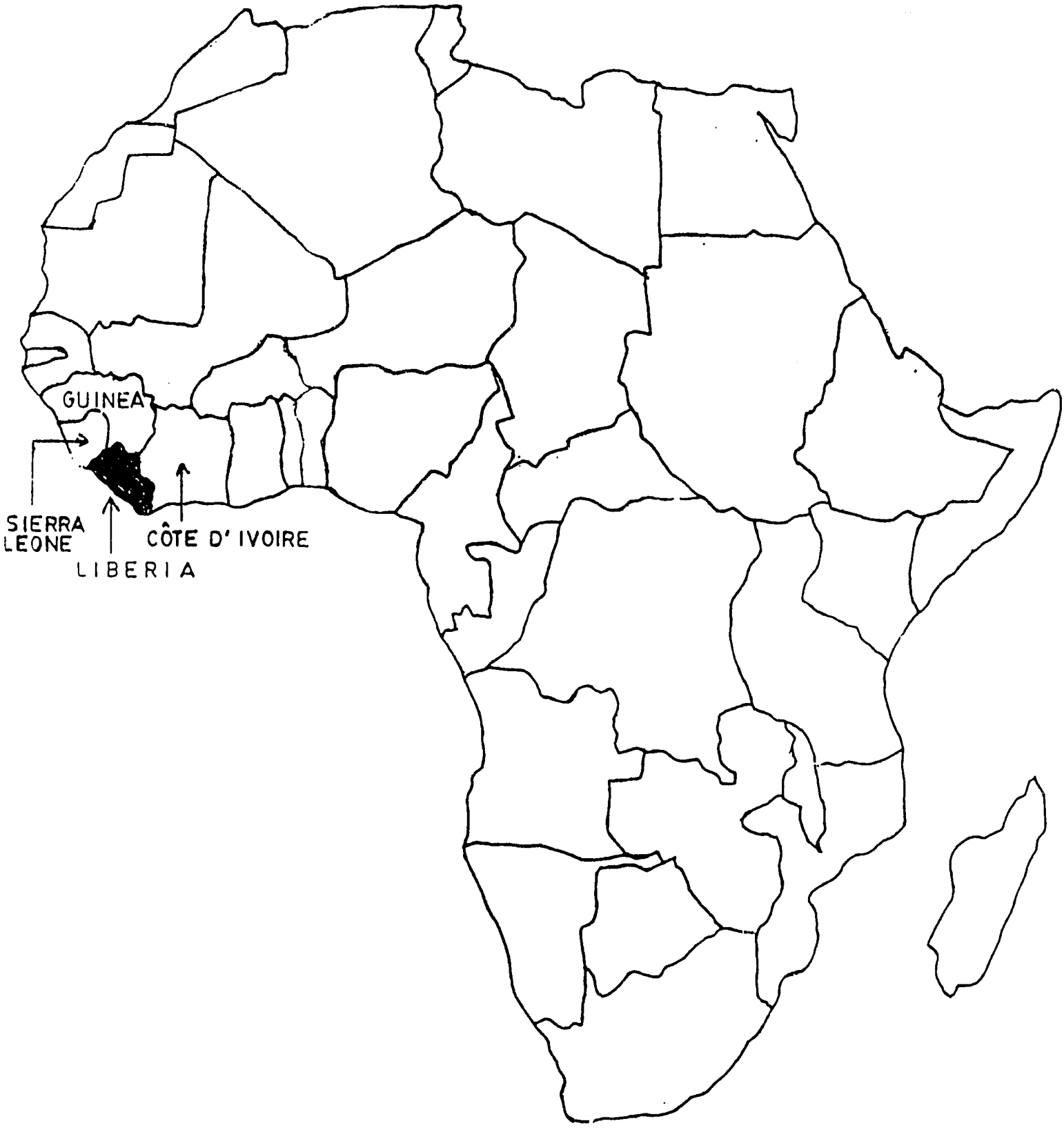
2. A nationwide program to teach caretakers the preparation of sugar/salt/orange solution as the appropriate oral rehydration solution for oral rehydration therapy be instituted in Liberia.

3. What ever educational strategy is used, whether face-to-face or group method, the training should include visual aids, demonstrations, role play and getting them to physically practice the preparation of the oral rehydration solution.

4.) "Health for all by the year 2000" will be meaningless unless basic facilities such as wholesome drinking water, adequate levels of environmental sanitation and primary health care services are enjoyed by our rural population.

FIGURE I

MAP OF AFRICA, SHOWING LOCATION OF LIBERIA



ORAL REHYDRATION THERAPY OPERATIONS RESEARCH STUDY

LIBERIA

I. BACKGROUND INFORMATION

Liberia lies on the south-western corner of the "buldge" of West Africa between latitude 4° 30' and 8° 30' north of the equator and longitude 12° and 6° west of the Greenwich Meridian. It covers an area of 38,000 square miles (98,284 square kilometers). See map of Africa in Fig. 1 for the location of Liberia.

The climate is tropical and humid at the coastal area. There are only two seasons: the rainny season which begins in May and ends in November while the dry season begins in December and ends in April. The average rainfall is 150 inches, with a maximum of 200 inches along the coast. The average temperature is 27°C (80.6°F), maximum being 37°C (98.6°F) and minimum 10°C (50°F) experienced in the northern high lands during the harmattan season.

The terrain rises dramatically into 3 main distinct steps, each belt running roughly parallel to the coast line and with its characteristic vegetation; the coastal plain is between 10 and 25 miles (16 and 40 kilometers) wide. The vegetation varies; patches of high forest mingles with low scrub and thorns. This area is punctuated with mangrove swamps, lagoon and many rivers.

Beyond the coastal land, lies the belt of rolling hills which rise to 500 feet (1500 meters) above sea level. This belt is covered by dense equatorial ever-green forest, except in areas where the forest has been destroyed by shifting cultivation.

The most northern part of the country is a higher land with high mountain ranges. This area is subject to the harmattan winds which blow from further north from November to February.

The country's estimated population (1985) is 2,182,381 and the projected annual natural growth rate is 3.24%; the crude birth rate and crude death rates projected for 1984-1989 are 46.8 and 12.6 respectively. The total fertility rate is 6.7 and the gross reproduction rate is 3.3. Life expectancy at birth for male is 53.9 and 56.3 for female. Infant mortality rate is 108/1000 and maternal mortality rate is 46/1000. (See Table 1).

The overall population density is 56.6 per square mile; with a maximum of 239 per square mile in Montserrado County and minimum of 16 square miles for Grand Gedeh and Sinoe Counties. Sixty-four percent of the population live in the rural area while 36% live in the urban area; 48% of the population are under 15 years, 20% under 5 years and 95% are under 75 years.

There are 30 tribes which fall into 17 main ethnic groups, though over a third of the population belong to only two, Kpelle and Bassa.

The most common causes of morbidity and mortality are infectious diseases and malnutrition.

Health information is hard to come by. Often data on vital statistics are incomplete. A 5 year review (1981-1985) of hospital admissions at J.F. Kennedy Medical Center in Monrovia, which is the apex of the referral system for the country, revealed the following:

About 68% of all hospital admissions were adults while 32% were children, but only 34% of all deaths were adults while 66% were children. According to these results, diarrhoeal diseases (gastro-

FIGURE II

MAP OF LIBERIA

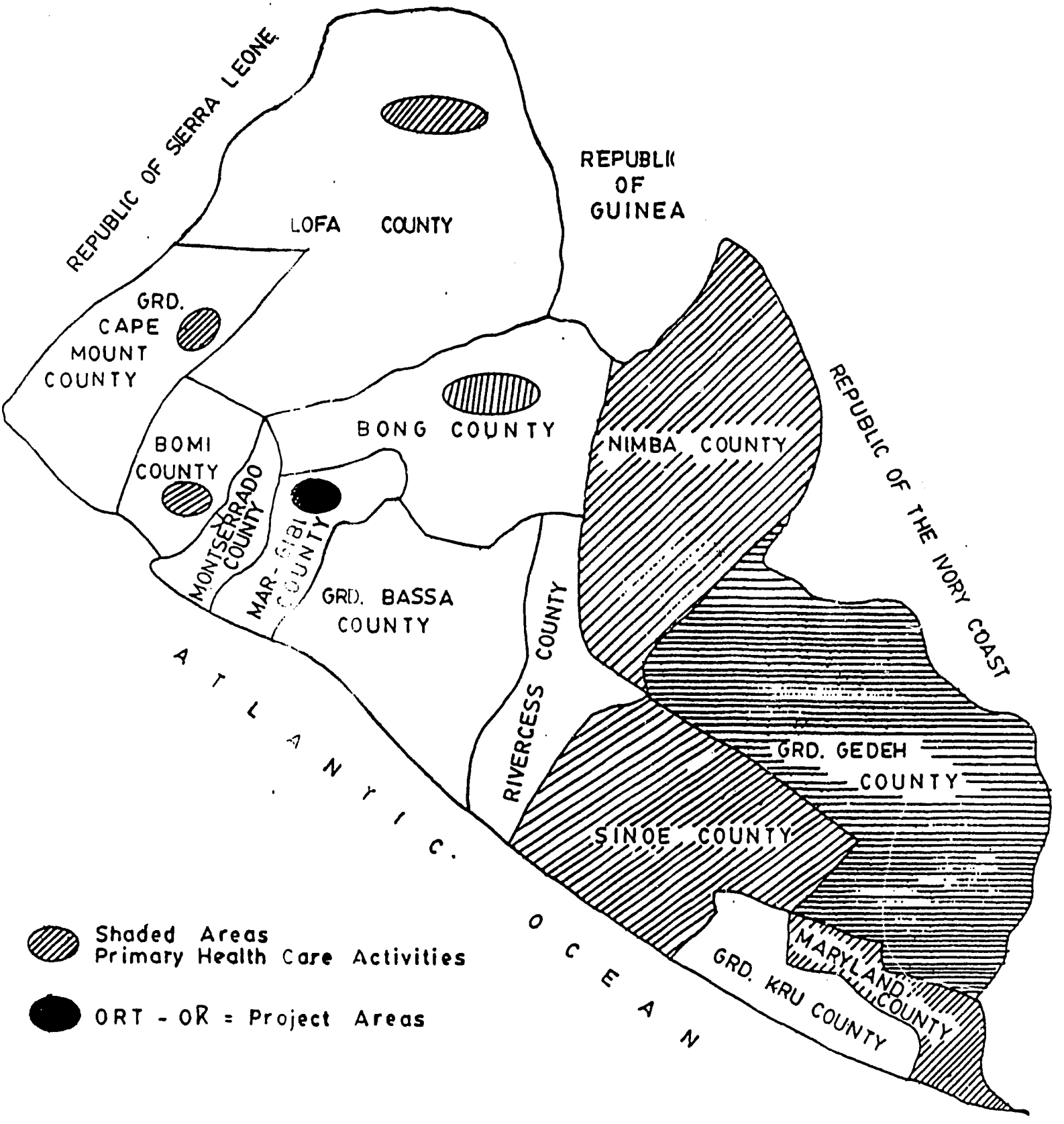
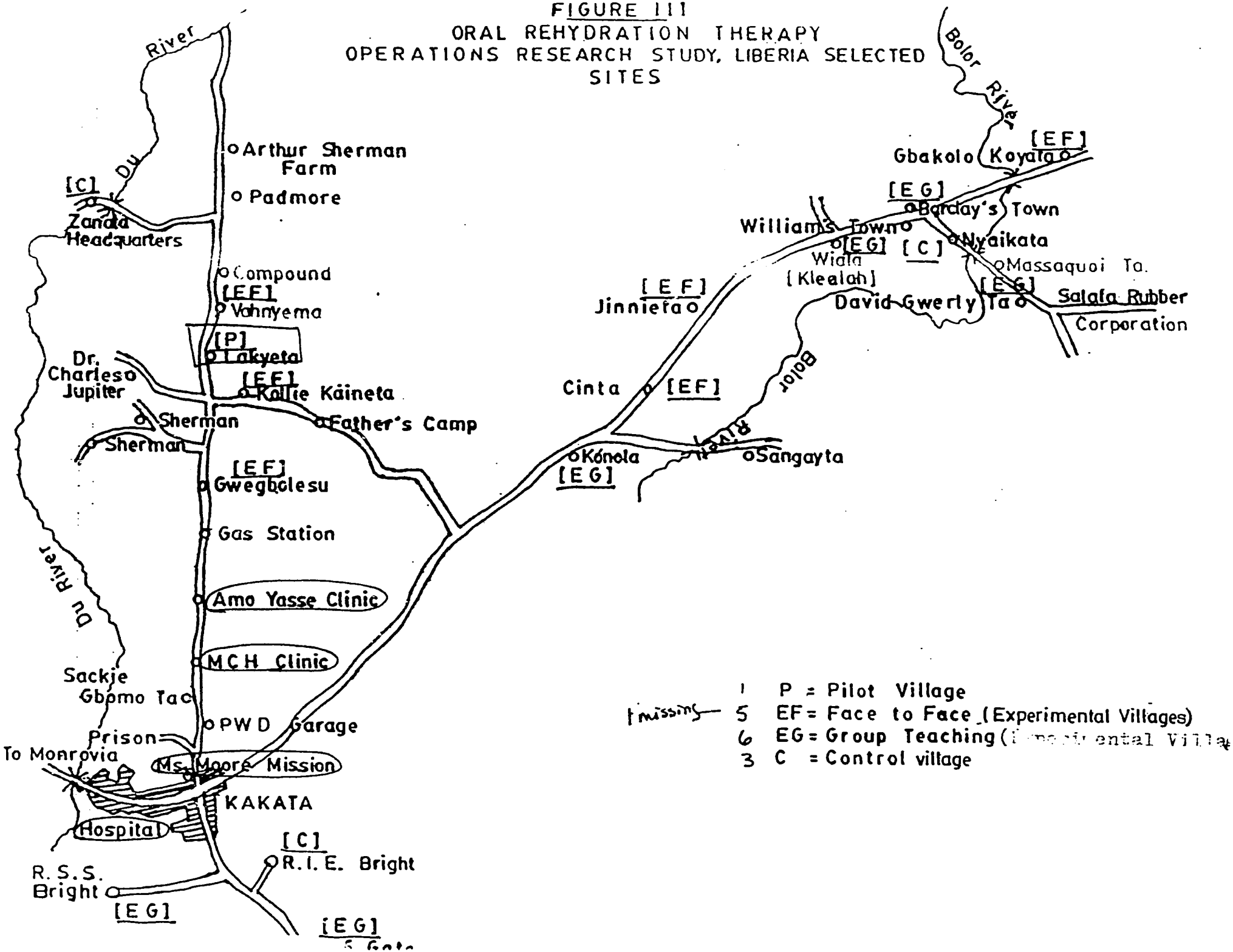


FIGURE III
ORAL REHYDRATION THERAPY
OPERATIONS RESEARCH STUDY, LIBERIA SELECTED SITES



enteritis) is the second leading cause of death, malnutrition being the first. About 64% of children deaths occur under the age of 5 years. And 69% of all deaths occur in the pediatric age group (0-15 years).

Health Delivery System of Liberia

There are seven (7) Bureaux within the Ministry of Health and Social Welfare:

1. Bureau of Administration which comprises four divisions:
   a) Division of Budget and Finance
   b) Division of Personnel
   c) Division of Transportation and Procurement, and
   d) Division of Housing and Maintenance.
2. Bureau of Planning, Research & Development with two divisions:
   a) Division of Health Planning and Development, and
   b) Division of Manpower Development.
3. Bureau of Curative Services with the following divisions:
   a) Division of Medical Services
   b) Division of Nursing Services
   c) Division of In-service Education
   d) Division of Laboratory Services
   e) Division of Drugs, Supplies and Equipment
4. Bureau of Preventive Services, with the following divisions and/or programs:
   a) Division of Family Health
   b) Division of Information, Education & Communication
   c) Division of Environmental Health

d) Division of Nutrition Services

e) Division of Communicable Disease Control.

Programs:

a) Expanded Program for Immunization (EPI)

b) National Tuberculosis Control Program

c) National Leprosy Control Program.

Projects: All Primary Health Care (PHC) projects.

5. Bureau of Social Welfare having the following divisions:

a) Division of Rehabilitation

b) Division of Family Welfare

c) Division of Community Welfare

d) Division of Training and Staff Development.

6. Bureau of Health and Vital Statistics comprises the following divisions:

a) Division of Health Statistics

b) Division of Vital Statistics.

The Liberian Institute for Biomedical Research (LIBR) is presently involved in research in major tropical diseases.

Each of the Division/program is headed by a director; each Bureau by an Assistant Minister or equivalent. The Deputy Chief Medical Officers report to the Chief Medical Officer, the rest to the Deputy Minister for Administration. The Chief Medical Officer reports directly to the Minister of Health and Social Welfare.

Services at County Level

At the County Level, the County Health Officer is responsible for all health activities in the county; he is [illegible] ty

Chief Medical Officer (DCMO) for Curative Services on all matters concerning curative services, the DCMO for Preventive Services on preventive services and to the Assistant Minister for Administration on administrative matters.

(1) The County hospital is headed by the County Hospital Director. In some counties, where there is shortage of personnel, a doctor may serve as both County Health Officer and Hospital Director. The (2) Health Department in the county is headed by a Public Health Physician or a Senior Midlevel Supervisor. This Department supervises all Government clinics and health centers in the county; and is also responsible for preventive services.

Cases not handled at the village are referred to the nearest clinic or to the nearest health center, which may supervise several clinics; referral cases from the clinic or health center are sent to the county hospital; there are referrals among county hospitals depending on the level of sophistication. The apex of the medical services is the J.F. Kennedy Medical Complex in the Capital, which is a semi-autonomous body, with its own budget. It is responsible to a Board of Directors, which was chaired until 3 months ago by the Minister of Health; now chaired by some one from the private sector. The Ministry of Health is represented by the Chief Medical Officer.

Non-governmental organizations (NGOs) provide about 40% of all health care in Liberia. A study by the World Bank, published in 1983 revealed that Government of Liberia's expenditure for health in 1982 was $26 million, while those of the NGOs was $22 million. The

Clinic
↓
health center
↓
County hosp → → ↓
JFK Med. Complex

same study estimated that foreign companies with concessions to operate in Liberia account for 80% of NGOL's expenditure on health, church related institution 15% and other private institutions five per cent (5%).

Of the 34 hospitals in Liberia 3 are run by concessions, 2 privately, 4 church related and one jointly run by Government and church. There are 311 clinics and health centers run by Ministry of Health and Social Welfare and about 60 by Non-Governmental Organizations. (See Appendix XIX).

Health Personnel

There is acute shortage of Health Personnel in the country; according to the annual report of the Ministry of Health and Social Welfare (1983 and 1984) there are 268 registered doctors in Liberia, 149 non-Liberians; of these 90 are in the employment of Government of Liberia (see Appendix XVII and XX). Other categories of health workers, nurses, midwives and physician assistant are equally inadequate . There is maldistribution of the available health manpower, with bias for the urban area, especially the capital city, Monrovia. There is disparity among the counties. (See Appendix XVII, XIX and XX). Montserrado County has about 47% of the total health personnel (999 out of 2132) with only about 25% of the total population (see Appendix XIX).

In addition, the most qualified health personnel, especially doctors and nurses tend to aggregate in the urban areas by virtue of the better amenities they offer.

Prevalence of Diseases

Infectious diseases and malnutrition are the major health problems in Liberia. According to the 1984 Annual Report of the Ministry of Health, malaria is by far the single most common cause of morbidity followed by upper respiratory tract infection and pneumonia. Diarrhoeal diseases are third. (See Appendix XVII).

A nutrition survey conducted in 197 among under 5s revealed that at least 50% of Liberian children have some form of malnutrition; prevalence was highest among 6-23 months, though acute malnutrition

was relatively uncommon 1.6%, even in the mild form which was 2.6%.

The nutritional problem seems to be most prevalent in the urban areas than rural areas. Measures of maternal nutritional status in the same study revealed that 10% had low stature, 5% arm wasting and 20% fat wasting.

Anemia was frequent in the study, affecting 62% of children under 5. Factors contributing to the causes include malaria, worm infestation, low iron intake, and poor absorption of dietary iron because of the high phytin content of the rice diet. It is also frequently present among Liberian mothers, especially during pregnancy.

The high prevalence of malnutrition contributes directly and indirectly to high mortality rate in children among the 1-4 years, 14.8% of all deaths are attributable to malnutrition among 1-11 months, 25% of all deaths 0-11 months.

The Government has adopted primary health strategy as the modality to provide basic health care for the majority of the population. There are several primary health care activities in the country:(see Fig. II)

1 South Eastern Region Primary Health Care(SERPHC) Project, funded by USAID covers Sinoe and Grand Gedeh Counties (see Fig. 2). This $15,000,000 project is expected to end in 1988.

The main objectives of the project are to institutionalize decision making process and procedures within the Ministry of Health and Social Welfare capable of sustaining National PHC activities, to strengthen infrastructures and management system at both local and

national levels, and to train village health workers in 250 villages in the two counties.

Special objectives to be achieved by the end of the project are:

(a) 80% of the population of both Grand Gedeh and Sinoe Counties will have access to a village health team (VDC/VHW/TBA).

(b) 35% increase in utilization of PHC delivery system.

(c) 10% decrease in infant mortality rate

(d) 12% contraceptive prevalence among eligible couples in the target population.

(e) 70% of deliveries attended by trained TBAs in the target villages.

(f) 75% of measles vaccination coverage in target villages.

(g) 50% tetanus toxoid vaccination in the target village.

(h) 50% of children under 3 years of age to have regular growth monitoring.

(i) 60% of mothers with children under 3 years of age understand how to prepare home made oral rehydration solution. 20% practiced oral rehydration therapy.

(j) 20% of pregnant women given malaria prophylaxis.

The Nimba County PHC Project is being assisted by the German Government. The PHC component is only a part of an overall development program involving construction of roads and improvement in agriculture. The main objectives of the PHC components are the training of village health workers, setting up a drug revolving

system and special emphasis on the control of schistosomiasis.

The Maryland County PHC Project is being funded by the Dutch Government. The main activities of this project are the training of village health workers, setting up of drug revolving system and encouragement of the villages to construct hand dug wells.

The Combacting Childhood Communicable Diseases (CCCD) Project is also funded by USAID and has 3 main components of activities.

(a) Oral rehydration therapy.

(b) Malaria chemophylaxis for pregnant women.

(c) Immunization of children.

It is expected that CCCD will strengthen those programs within the Ministry that deal with the above named aspect of health delivery system. At present the oral rehydration therapy component of CCCD is limited to 3 counties, Cape Mount, Bomi and Lofa counties, and is expected to cover the rest of the country in the next 3-4 years.

Plan International supports PHC activities in Cape Mount and Bomi Counties, in collaboration with the government. Emphasis is placed on training of TBAs and the provision of safe drinking water by the construction of hand dug wells in the villages.

Other Non-Governmental Organizations (NGOs) especially the Missionaries under the umbrella name of Christian Health Association of Liberia (CHAL) is also involved in PHC activities in Liberia.

Besides, many of the other counties that do not have external funding projects are involved in some form of PHC activities, for example, Lofa and Bong Counties.

Table 1

Demographic Parameter of Liberia By Year and Sex

Parameter	1974 - 1979			1979 - 1984			1984 - 1989		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
CBR	48.7	48.9	48.4	47.7	48.0	47.4	46.8	47.1	46.5
CDR	15.9	16.1	15.6	14.4	14.8	13.9	12.6	12.4	12.9
NGR	32.8	32.8	32.8	33.3	33.2	33.5	34.2	34.7	33.6
TFR	-	-	6.7	-	-	6.7	-	-	6.7
GRR	-	-	3.3	-	-	3.3	-	-	3.3
LEB	50.2	49.1	51.3	52.6	51.5	53.8	55.1	53.9	56.3
IMR	132	124	140	119	112	127	108	101	115

Source: Census Analysis of Liberia, University of Liberia & MPEA (unpublished)

LEGEND

CBR	Crude Birth Rate
CDR	Crude Death Rate
NGR	Natural Growth Rate
TFR	Total Fertility Rate
GRR	Gross Reproduction Rate
LEB	Life Expectancy at Birth
IMR	Infant Mortality Rate

II. PURPOSE OF STUDY

Deaths due to dehydration/diarrhoea are a major health problem among children in the developing countries. An estimated 5,000,000 children under 5 years of age in the developing countries died as a consequence of diarrhoeal disease in 1980. About 80% of the diarrhoeal deaths occur between the ages of 0-2 years; it is estimated that 60-70 percent of diarrhoeal deaths are caused by dehydration while 30-50 percent of infant and childhood deaths are due to diarrhoea.[1] During 1981-1983, 56.7 percent of all deaths associated with diarrhoea were of children less than 5 years old. (MHP, 1985).

In Liberia, diarrhoeal related deaths are among the top 5 causes of morbidity and mortality among children 0-5 years old. In addition, diarrhoea and dehydration in children are leading causes of hospitalization.

Deaths due to diarrhoeal disease are often due to loss of fluid and electrolyte from the body (dehydration) which, in most cases, can be treated or prevented by appropriate fluid and electrolyte replacement. The two main ways of fluid administration are the parenteral and oral routes. The parenteral administration of fluid, however, had serious disadvantages, especially in a developing country like Liberia.

To name a few of the problems encountered in the use of parenteral method of fluid administration, (a) its use requires well-trained health personnel, a resource which is scarce in Liberia, (b) it requires adequately established health facilities, the distribution of which is

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[1] The source of the data on childhood deaths in this paragraph, unless where specifically stated, is WHO (1983).

very sparse throughout the country, (c) the need for materials like sterile needles and syringes makes this method expensive relative not only to the health budget but also to the national budget, and finally (d) the culmination of all the above three problems is that, the method is highly likely to be administered poorly, making it a risky option.

Most mild and moderate dehydration can be effectively treated with Oral Rehydration Therapy (ORT). Perhaps 50% of severe dehydration can be successfully treated with ORT. ORT can therefore substantially reduce this heavy toll on children under five. ORT can do this by preventing and correcting dehydration thereby preventing many of the diarrhoea-related deaths. This has been considered as an important technological breakthrough which can reduce childhood mortality since it can even be administered in homes by mothers and other caretakers. It is simple, inexpensive and effective. No special equipment is necessary and family members can be trained to provide ORT.

It is also known that diarrhoea is a major factor in the causation or aggravation of malnutrition because loss of appetite and improper absorption of food occur in patients with diarrhoea. Furthermore, foods and fluids are commonly withheld from children with diarrhoea (WHO, 1983). ORT can therefore have a positive impact on malnutrition since it can prevent and correct dehydration thereby improving the state of a child suffering from diarrhoea and since such malnutrition is itself a contributing factor in diarrhoea-related childhood mortality. Thus continued feeding (including breast feeding) during and after diarrhoea episodes complements ORT as the proper

management of diarrhoea.

The importance of ORT cannot therefore be over emphasized. The issue, however, is how to popularize it and to ensure that its principal input, an oral rehydration solution (ORS) is widely available and used appropriately.

There are two main categories of ORT: (a) Pre-packed ORS, i.e., Oral Rehydration Salts distributed by UNICEF, and (b) Home-made ORS.

The pre-packed ORS, inspite of its relatively high effectiveness owing to the fact that it contains well-balanced electrolytes and proper ingredients to promote absorption, has several serious limitations within the Liberian context.

There is first the issue of availability of the ORS packets to all who need them. It has been estimated that about 2,400 million ORS packets would be needed annually in developing countries. UNICEF, however, produces only about a tenth of this need. (PR, 1980). Although a few other commercial firms and UNICEF-assisted governments produce locally some ORS packets, provision of a continuous supply of these ORS packets has been a serious constraint for National PHC programs.

Secondly, like the parenteral method of fluid administration, high cost has been identified as a problem for the use of pre-packed ORS. It is said that Health Ministries in most developing countries cannot afford pre-packed ORS supplies for every family that may need them. (PR, 1980). On the other hand families in these countries who need them are essentially those who can hardly afford them (those in

rural areas and the urban poor).

Thirdly, with special reference to Liberia, the new diarrhoeal disease control policy limits the use of UNICEF ORS to the level of health facilities. Consequently, in the light of the sparse distribution of health facilities, the coverage is very much limited. Indeed, not more than 50 percent of the Liberian population have access to health services.

Fourthly, inadequate logistic support and inaccessibility of many rural villages, where the needs are greatest, are major constraints.

Lastly, improper storage and measurement is a source of potential health hazard. Shortage of health personnel, supplies and health facilities are mainly due to meagre financial resources. This condition is likely to persist for a long time. For the past few years the budgetary expenditure on public health is only 1% of the Government of Liberia's budget, as compared with an average of 8% from 1976-1982 (UNICEF, 1985).

A most potent way to resolve these issues is to identify and encourage the use of locally and commonly available home-prepared ORS. In Liberia therefore there is a need to (a) identify the most appropriate home-made ORS that can be substituted for pre-packed ORS, and (b) to train caretakers to know about this ORS and also to practise ORT using the home-made ORS. What is the appropriate home-made ORS and how best can caretakers be trained in the correct attitude, knowledge about diarrhoea and the ORS and the preparation and use of the ORS? The study attempts to answer these questions.

The objectives of the study are therefore:

(a) To identify the most appropriate home-made Oral Rehydration Solution (ORS) that can be used in ORT in rural Liberia and

(b) To identify the most appropriate educational strategy for training caretakers in the use of the ORS, when their wards have diarrhoea.

III. METHODOLOGY

Consistent with the general approach to Operations Research, the study was broken down into the following three phases or steps.

(a) Phase I - Problem Analysis Phase involved definition of the problem within the general framework of the PHC system of Liberia, identification of sub-operational problems, selection of study sites and collection of village profile data for the study area.

(b) Phase II - Solution Development Phase consisted of identification of key variables (both controllable and uncontrollable preparation of data collection instruments and pilot-testing of the instruments which had a by-product of permitting the selection of a set of feasible solutions to the operational problem.

(c) Phase III - Solution Validation Phase essentially consisted of field-testing with a view to validating the solutions.

The rest of the section discusses, in greater detail, the methodology employed at each of the three stages of the study.

Problem Analysis

That we are plagued by diarrhoea in Liberia is incontrovertible just as in other developing countries.

A child suffering from diarrhoea loses essential salts and water from the body right at the onset of the illness. If these salts and fluid are not replaced, dehydration ensues. Appropriate management of diarrhoea therefore includes prevention of dehydration.

Intravenous infusion of salts and fluid used to treat dehydration, it has earlier been stressed, is not as appropriate as oral rehydration therapy to the extent that is expensive and requires specially trained people and special equipment.

Since the sixties, however, when ORT containing glucose and essential salts was successfully used in treating cholera cases with severe diarrhoea, the concept of oral rehydration has received increasing attention. The reason behind this success is attributed to the fact that the presence of sugar in ORT makes it easier for the intestine to absorb water and sodium during diarrhoea episodes. Irrespective of the aetiology of the diarrhoea or the age of the patient, an ORT solution with glucose and essential salts is adequately absorbed for the replacement of previous and continuing fluid and salt losses. Consequently, ORT now forms the cornerstone of several PHC projects in general and, specifically, national diarrhoea disease control projects.

In this connection, the World Health Organization (WHO), the United Nations Children Fund (UNICEF), and other international and voluntary agencies are collaborating with many developing countries in establighing national primary health care (PHC) services including diarrhoeal disease control programs in which ORT is a major component.

Liberia is taking advantage of these programs. For an example, a Liberian Government sponsored USAID-funded primary health care project is being undertaken in the two most underserved counties (Grand Gedeh and Sinoe) in the country. Also, a USAID regionally funded bilateral Combatting Childhood Communicable Diseases (CCCD) project has been initiated in the country, while other PHC activities are being

TA.1

sponsored by the Liberian Government in partnership with the Dutch and German Governments in Maryland and Nimba Counties, respectively, of the country.

The Ministry of Health and Social Welfare is the overall coordinator of all these activities with ORT having been identified as a major component.

As has been demonstrated earlier, a more potent response to diarrhoea is to prevent dehydration by using solutions prepared from ingredients commonly found in the home, i.e., home-made oral rehydration solutions. In this regard, home-made sugar and salt solution with or without citrus fruit juice has been suggested. Additional evidence from studies carried out in Egypt (Mobarak, et.al, 1980) and Bangladesh (Ellerbrock, 1979) have strengthened the argument in favour of home-made solutions. This seems a good idea in Liberia since sugar, salt and oranges/lime are available in most households. Again, in Liberia, rice is a staple food. "Household food" fluids of pap made with rice flour, sugar and salt and water are commonly prepared for children. Whether they are used for dehydration treatment is another question. More recently, the use of rice water and rice-powder ORS has been reported in Singapore (Boon, 1981), Bangladesh (Molla, et.al., 1982) and India (Patra, et.al., 1982).[2] Intensive promotion of the use of these home-made remedies for early treatment of diarrhoea can be expected to reduce the number of children who will be dehydrated due to diarrhoea. The issue of availability of the ingredients in the homes of rural Liberia had however to be ascertained since this would influence the choice of home-made ORS. The issue then was the caretaker's preference for home-made ORS.

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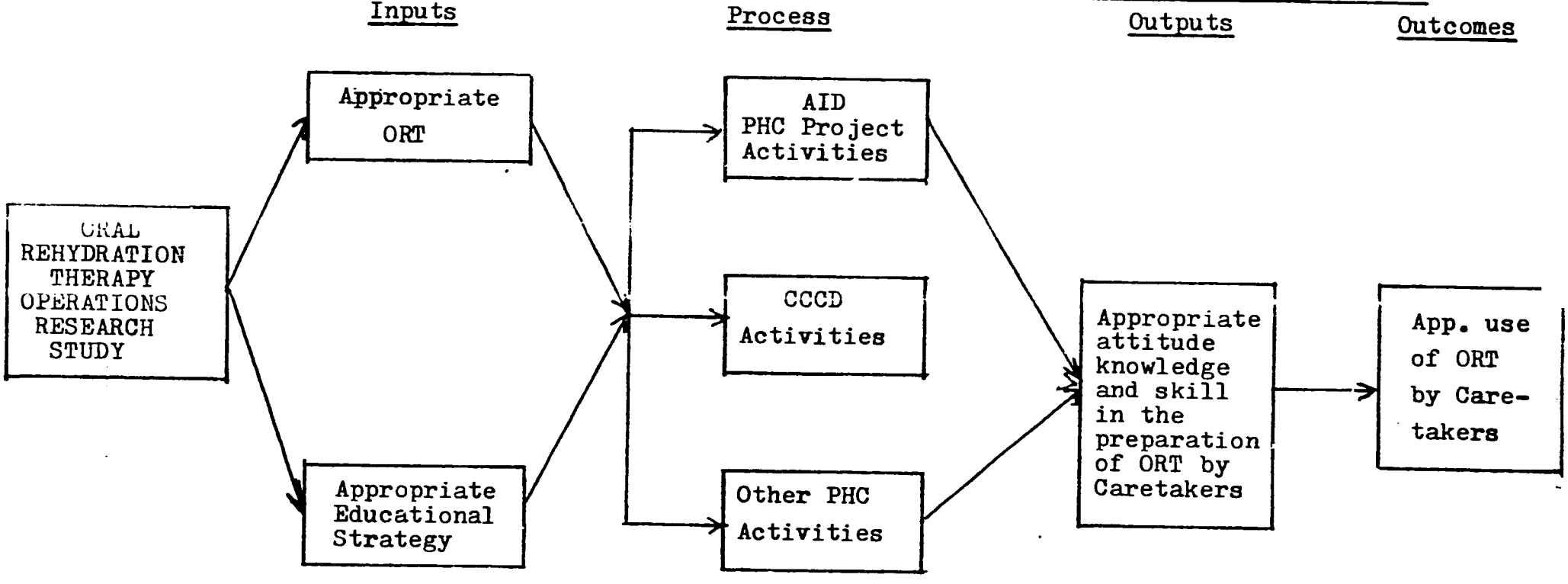
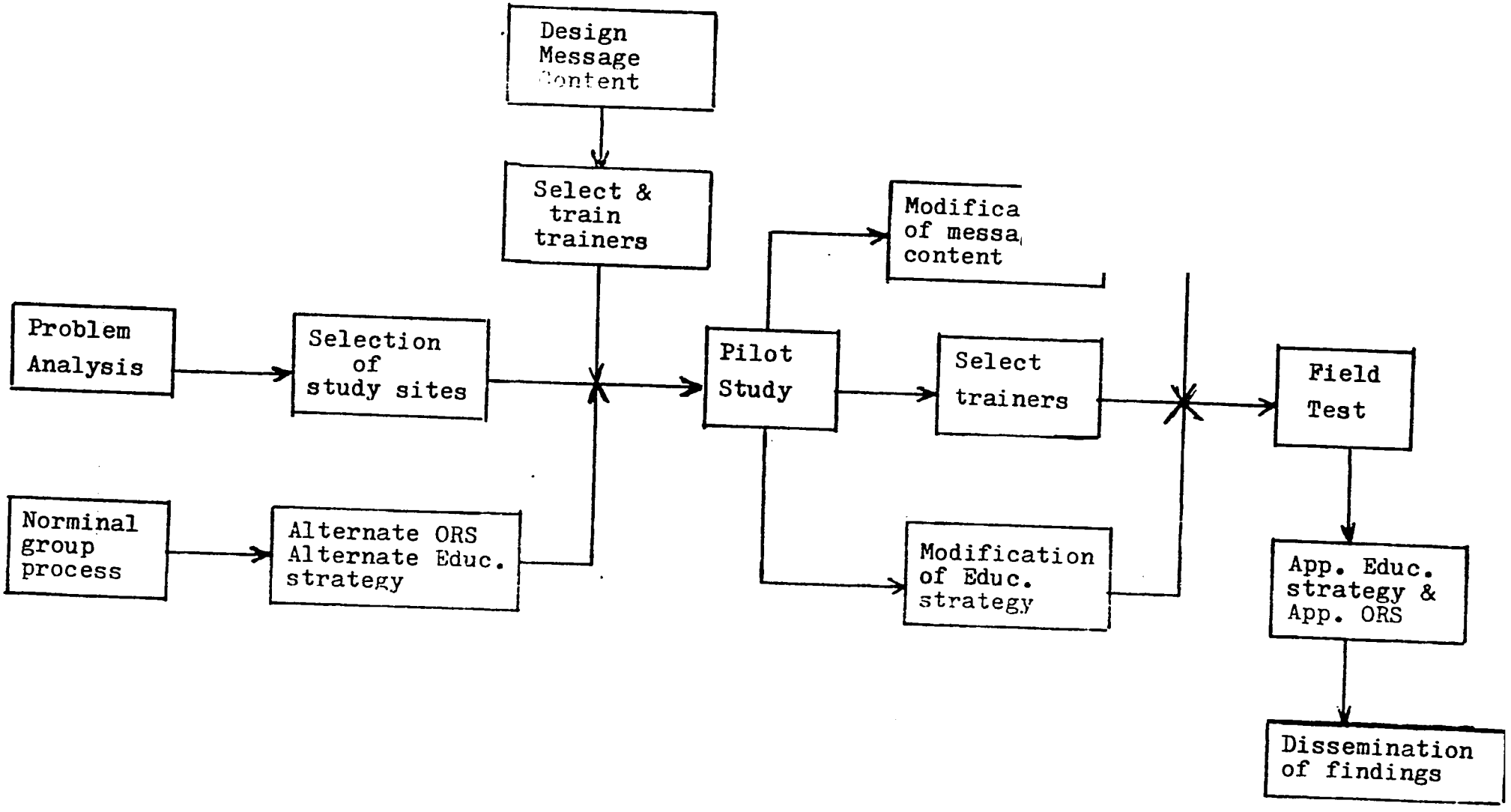
[2] ORS made from rice has been found to have more nutritional value than salt and sugar solution.

Figure 4 : National Model of Oral Rehydration Therapy Operations Research Study in Liberia



This national model of the Oral Rehydration Therapy - Operations Research Study in Liberia depicts as input to various primary health care activities in the country the appropriate ORT/Educational Strategy for rural Liberia. Through the process of various PHC activities, appropriate KAP of ORT by Caretakers will be achieved. The outcome of this will be the appropriate use of ORT by Caretakers in rural Liberia.

Figure 5 Macromodel of ORT - OR Study



Once the issue of appropriate home-made ORS is resolved, an intensive campaign with caretakers as the target group to use the home-made ORS for the early treatment of diarrhoea can be expected to reduce the number of dehydrated cases due to diarrhoea. The use of home-remedies can be expected to reduce the number of visits to a health facility, visits to health workers and the need for UNICEF/WHO ORS packets; the combined effect is to reduce the cost of reducing deaths caused by diarrhoea-related dehydration.

There is therefore an acute need to teach caretakers about ORT and the most appropriate ORS within the rural Liberian context. The second issue then is what teaching strategy can be adopted to ensure appropriate utilization of ORT by caretakers. Although some ORT activities have been undertaken in the country, there has been little operational research study done locally to provide answers to the questions of appropriate ORS and educational strategy to be used in the training of caretakers.

The national model in Figure 4 demonstrates the importance of this Operational Research Study on Oral Rehydration Therapy in the PHC system of Liberia to the extent that the results (output) of the study will serve as inputs into the various PHC activities.

The task which faced the study was therefore to develop/identify sets of ORS and educational strategies and to test for which of the ORS-educational strategy combinations is the best. This is illustrated by the Macromodel in Figure 5. The model is very much self-explanatory.

During the problem analysis phase, the Gibi Territory (now part of Margibi County) of Liberia was selected as the study area. (See Figure 2). This choice was based upon the following considerations: the area had not been contaminated by other PHC (especially those involving ORS) activities, it was accessible to the study team and therefore economical, the area being approximately 45 miles from Monrovia where the study is headquartered. (See Figure 3 for a map of the study area).

After several visits to the study area, twenty-two (22) villages were selected and a Village Profile questionnaire (Form A) developed and used to collect data on twenty-five socio-economic characteristics of the villages. These characteristics include health indicators.

The data obtained from the Village Profile Form confirmed our earlier observation that health facilities are sparcely distributed in the country. Only five (5) - or 23% - out of the villages have clinics. Also, the majority of the villages (82%) have no drug store, while 73% have no public toilet.

One of the criteria for village selection was that there should be no pipe-borne water supply in the village. It is interesting however, to note that as many as fourteen (14) of the villages obtained water from only streams, four (4) obtained water from only wells, while 4 villages had both sources of water supply.

Figure 6 elucidates the information which during this phase of the study were considered to be necessary for the successful completion of the study. The methods for obtaining the information can also be

Figure 6: Types & Classes of Information to be Obtained in Problem Analysis Phase

Demographic

- Households with under 5s
- Various characteristics of household members

Political/Community Organization & Cultural Patterns

- Existing Community Organizations
- Social Structure of village
- Community Organizations
- Potential resources for training, supervision, education, production

Economic Base

- Question of cost; ability, willingness to pay for ORT

Health problems

- Perceptions of major health problems
- Perceptions of care availability

Facilities, Services

- Health Facilities, Service availability, quality, use patterns
- Water sources, quality, use
- Media access, use patterns
- Role of shops, markets
- Schools
- Transportation
- External Agency resources available

Current KAP (Diarrhoea, ORT)

- Knowledge of diarrhoea: Symptoms, Prevalence, Prevention, Cure, Susceptability, Severity
- Diarrhoea management practices: eating/feeding practices, breast/bottle feeding, types of medicine used, care sources sought, used
- Awareness/knowledge of ORT ingredients, mixture, storage effect, side effects, use
- Attitude toward prep/use of ORT

Availability of ingredients, tools

- Salt, sugar, etc. available shops, homes
- Tools, containers, etc.

Acceptability of various recipes

- Interest in, willingness, ability to prepare various recipes

Figure 7

Data Collection Methods

Methods of Data Collection

Information Needed	Existing Data	Informal Interviews	Observation	Nominal Group Interviews	Village, Institutional Survey	Household Survey	Pilot Study
Demographic Characteristics	X					X	X
Political/Community Org.		X			X	X	X
Cultural Practice	X	X	X		X	X	X
Economic Base	X	X	X		X	X	X
(Perceived) Health Problems	X	X	X	X	X	X	X
Facilities, Services, Res.	X	X	X		X	X	X
Current KAP		X	X			X	X
Availability of Ingredients		X	X		X	X	X
Acceptability of Recipes				X		X	X

glimpsed from the accompanying Figure 7 which contains a matrix data needed and data collection instruments.

Within the general framework of these two tables, questionnaires were prepared for the collection of primary data in the study area. Four types of questionnaires were developed. Form A - Village Profile, as has already been intimated, was utilized for the collection of data on the socio-economic characteristics of the villages. Form B.S.1 - Baseline Survey Part I was designed to obtain information on the socio-economic characteristics of the household, the head of the household being the respondent. A household here is defined as a group of people who eat from the same pot. A yet another questionnaire was developed. This is Form B.S.2 - Baseline Survey Part II which enabled us to collect information on the social and economic status (SES) of the primary target group of the study, the caretakers, and their knowledge, attitude and practice (KAP) regarding diarrhoea, dehydration and ORT. Finally, a mortality form (Form M) was also prepared to obtain information on child mortality rate in the study area although the focus of the study was not on measuring child mortality.

The uses to which the information obtained through the administration of these questionnaires have been put, will become clear in subsequent sections of this report. It is important to add here, however, that Forms B.S.1, B.S.2 and M were pre-tested for fine-tuning in a pilot village which is the largest of the villages in the study

area, and was set aside for this purpose. The pilot test therefore played an important role in the solution development phase of the study, aside from enabling us to modify the questionnaires for use in the field test.

With the aid of the information obtained from the questionnaires and other sources, it was expected that we would be able to know the type of ORS which is most acceptable to caretakers, and the educational strategy which when used to train caretakers could generate the greatest improvement in their knowledge, attitudes and practice regarding ORT in particular and diarrhoea/dehydration in general. The outcome of this study is therefore an appropriate combination of ORS-educational strategy which would serve as an input in PHC activities in the country.

Solution Development

The problem we are faced with is the high mortality in under 5s caused by dehydration which in turn is mostly caused by diarrhoeal disease.

An acceptable solution to this problem is the proper management of diarrhoea so as to prevent dehydration. It is then hoped that the high mortality will eventually be reduced

ORT has been proven to be the way to go to prevent dehydration and for various reasons afore-mentioned, "home remedies" need to be tested to arrive at the one(s) most appropriate for our Liberian setting in conjunction with an appropriate educational package for training the caretakers of under-5s to use the "home remedy" ORT.

Several constraints in the environment of the study were identified For example, the custom of withholding food from children with diarrhoea is a contraint. Others include the poor distribution of health facilities, health manpower and often health services. High level of illiteracy, poor quality water supply, poor environmental sanitation are all constraints in the environment compound, the three Ds (Diarrhoea - dehydration - Death), and therefore our study. This is not to say that none of the environmental factors are positive and therefore will not facilitate our study. An example is the availability of (orange, salt, sugar, water, rice cereal or powder, + containers) ingredients in most homes that can be used for the preparation of ORT. Also the willingness of the people to take part in this training to prevent dehydration was very much a facilitating factor.

Several decision variables were looked at and evaluated such as who supervises the village level ORT trainers, selection of trainers, message content, choices of ORS and educational packages. Of the decision variables only the type of ORS and educational strategy were subjected to any form of rigorous test. Decision on the other controllable variables were taken using the Delphi Method.

Models

Several models were constructed to help provide solutions to the operational problem. Figure 4 as already mentioned provides a National Model of our study; it indicates that the output of the study serves as an input into the various PHC activities in Liberia. Figure 5 which is a Macromodel of the study gives a bird's eye-view

Figure 8

A Flow Chart of the ORT - OR Study of Liberia

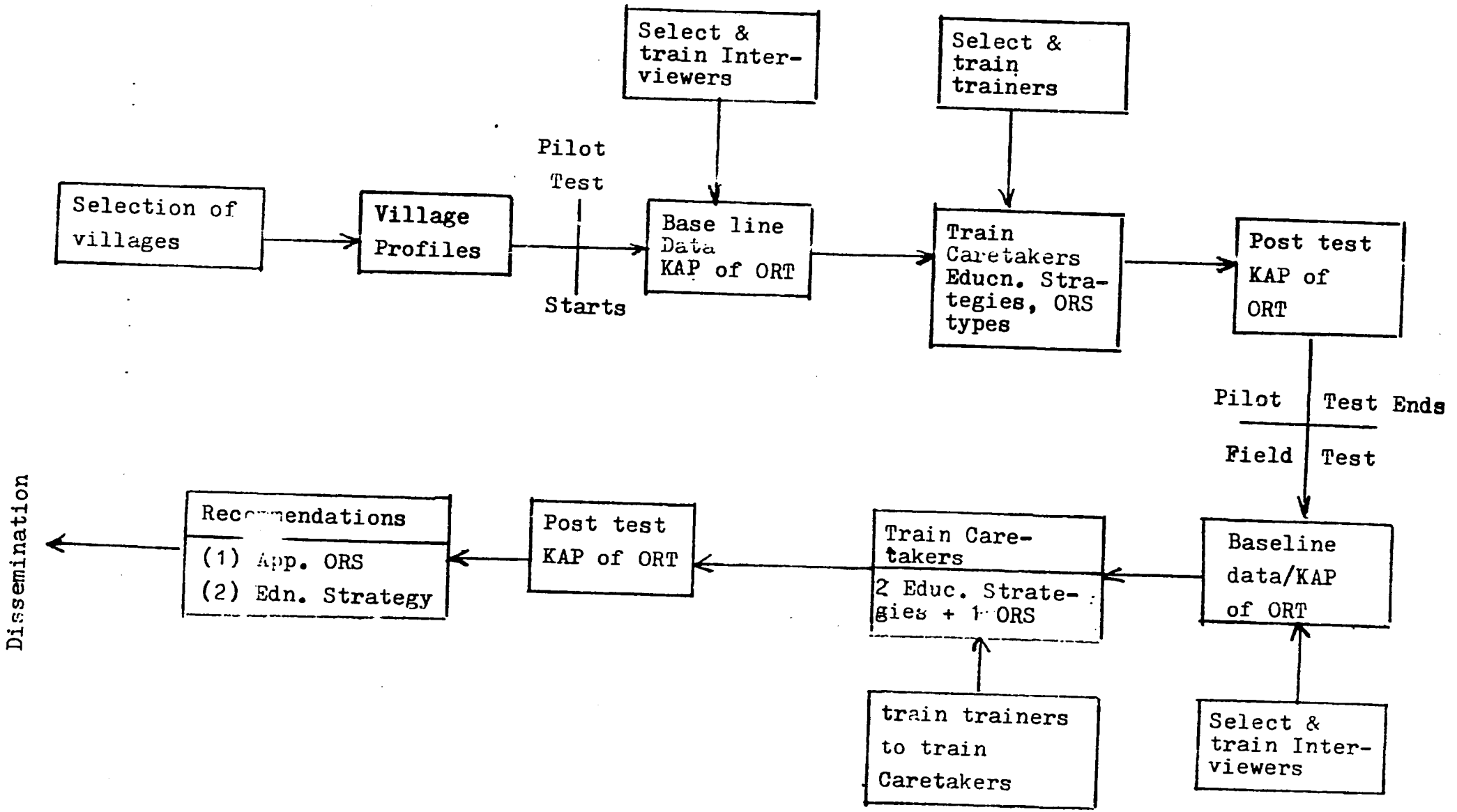


Figure 9 Model of ORT Subsystem

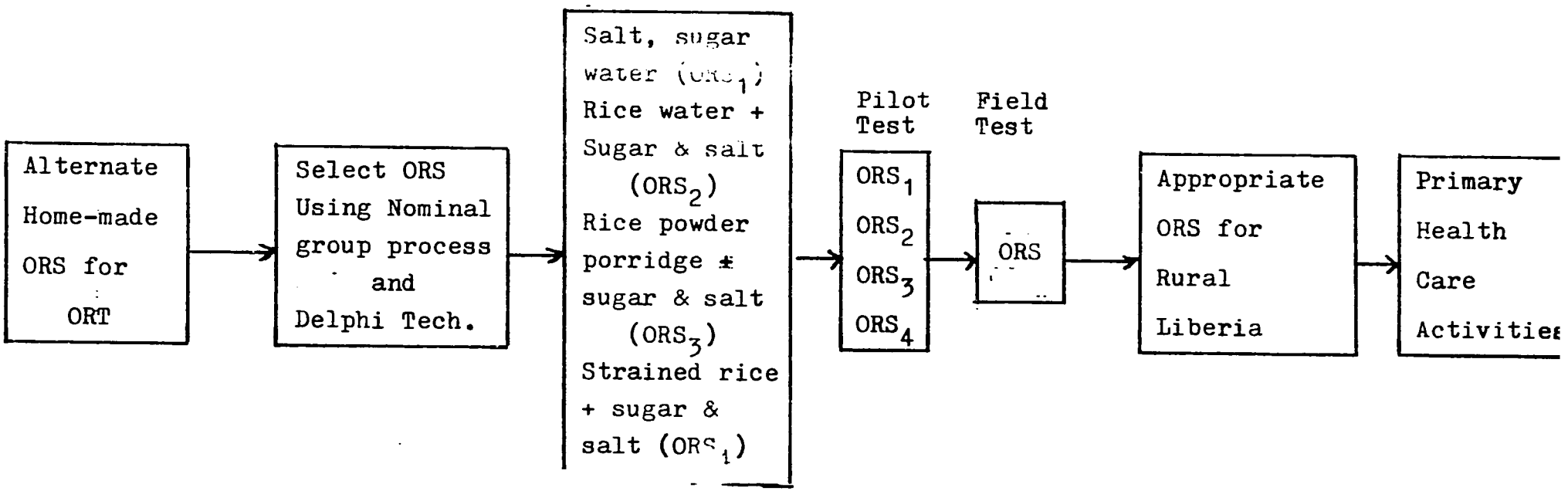


Figure 10

Educational Package Subsystem

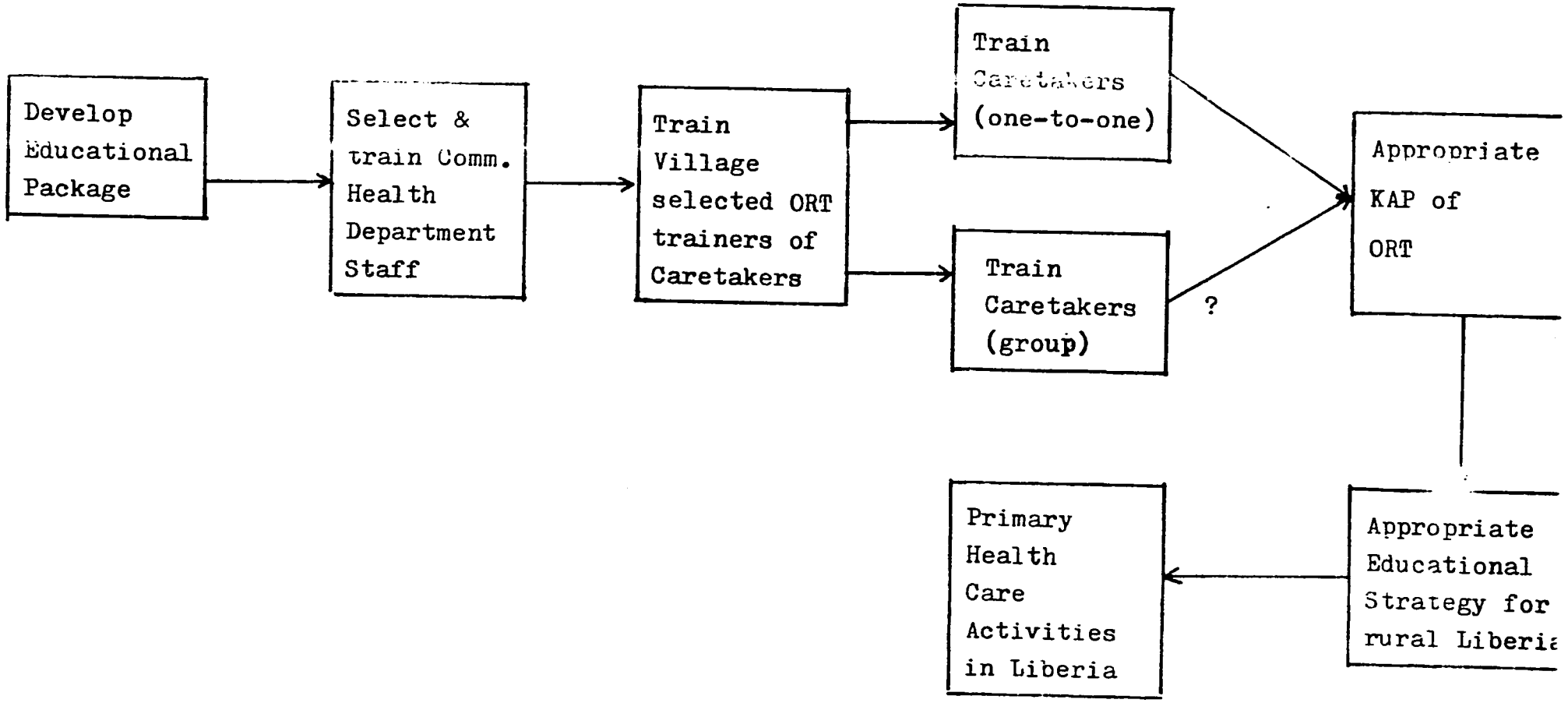
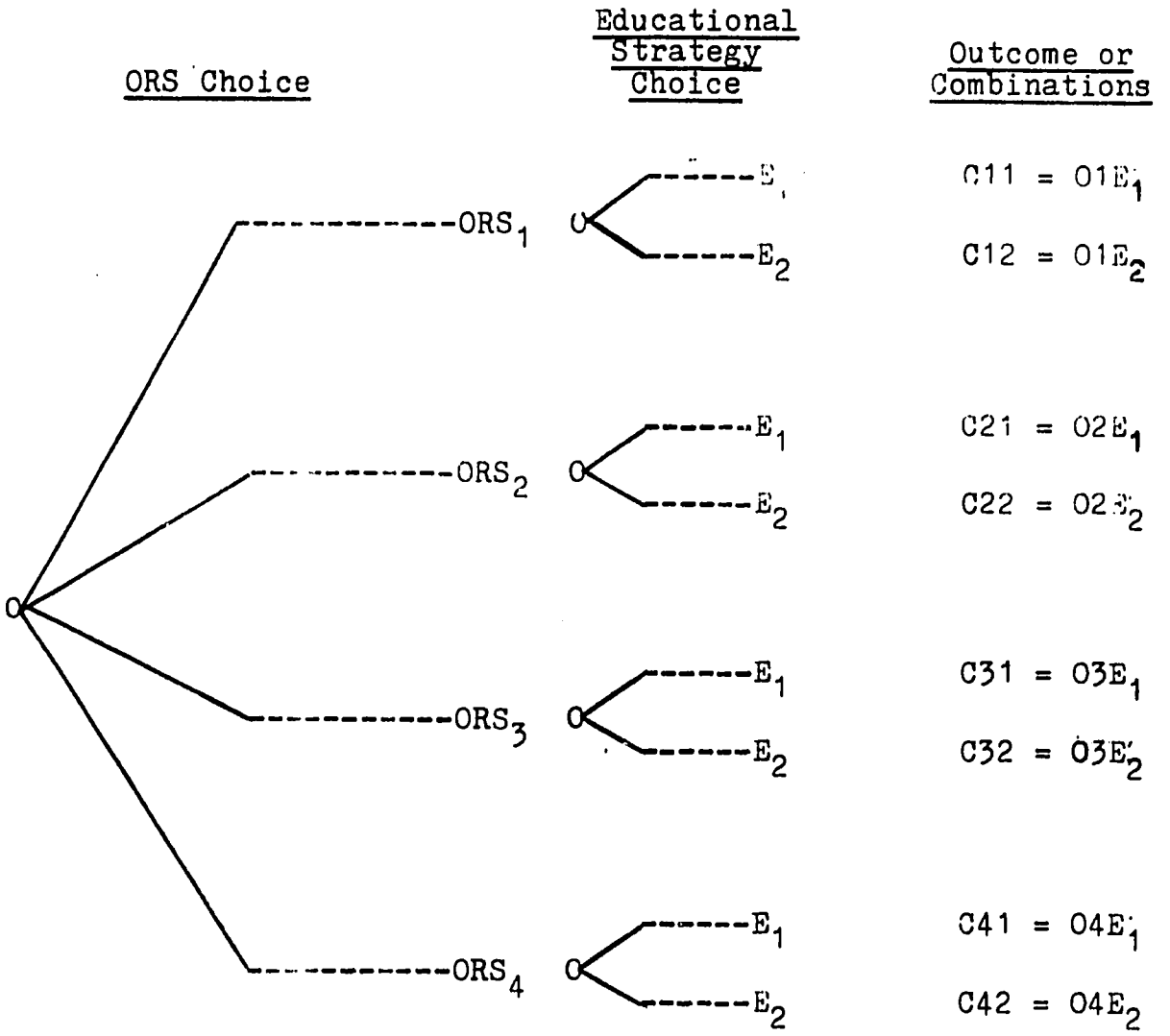


Figure 11 Decision Tree for Choosing ORS-Educational Strategy Combinations



of the Oral Rehydration Therapy Operations Research Study of Liberia. The activities to be undertaken in the study and the various sub-systems of the study are however best depicted by a flow chart produced in Figure 8.

The most important sub-systems of the Macromodel are the ORT subsystem (shown in Fig. 9) and the Educational Package subsystem which can be found in Fig.10.

The decision tree in Fig.11 explains the operational problem of choosing from ORS-educational strategy combinations. Let there be 4 possible home-made ORS and 2 possible educational strategies, then, there will be 4 x 2 = 8 possible ORS-educational strategy combinations, as depicted in the decision tree, or in the form of a Matrix of ORS-Educational Strategy combinations (Fig.12). The solution of the operational problem involves first choosing one or more ORS and then after that an educational strategy.

Figure 12 Matrix of ORS-Educational Strategy Combinations

Educational Strategy / ORS	E_1	E_2
01	C_{11}	C_{12}
02	C_{21}	C_{22}
03	C_{31}	C_{32}
04	C_{41}	C_{42}

The Selection of ORS

It will be recalled that pre-packed ORS was on the onset excluded from the list of ORS chosen for solution development phase for reasons including its relatively high cost and inadequate supply.

The nominal group technique was combined with informal interview with several caretakers during visits to the study area to narrow the list of home-made ORS to five with four of them rice-based.

Prior to the initial field visits, the opinion of several persons were consulted (nominal group technique) with regards to the most preferred home-made solution among the Liberia population. Those consulted included:

(a) The Director and staff of the In-Service Division who have been involved in teaching caretakers to use home-made solution.

(b) A WHO Consultant, who is a pediatrician and the principal investigator of small WHO projects that promote the use of home-made ORS.

All those consulted indicated that most caretakers in Liberia preferred the sugar, salt and orange solution.

However, during our connoitering tour of the project areas, the investigators interviewed several caretakers. The result of the interview indicated that rice was widely used to feed children in target age group and it was prepared in various ways:

(a) rice water

(b) rice porridge (powder) prepared from rice

(c) strained rice, sometimes sugar added.

Besides the above discovery, ORS made from rice powder has proven to be equally as good as sugar, salt and orange solution and may be considered even better because of its nutritional value. In view of the above reasons, the investigators decided to include in the pilot study the various home-made ORS that has been made from rice. It was an opportunity, the investigators reasoned, to refute or confirm earlier opinion expressed that, in the Liberian villages, most caretakers preferred sugar, salt and orange solution.

The Selection of Educational Strategies

As can be seen from the educational sub-model (Fig.10) it was decided from the very beginning to use two educational strategies: "Face-to-Face Teaching and "Group" Teaching strategies. Whereas, the former is considered to be more effective than the latter, the latter tends to be less expensive than the former in per-capita terms. The decision to concentrate on these two educational strategies was made after consultations with experts in the area of education (i.e., using the nominal group process) and from literature review.

Pilot Test

Since the pilot test served also to select the ORS to be used in the field testing, and consequently became an important component in the solution development phase of the study, a brief explanation of the methodology used in the pilot study is in order at this stage.

We abandoned our initial plan to test only four combinations of ORS-educational strategies (i.e., through a 2 x 2 factorial design)

when it became clear that we would have to include in the pilot test four instead of only two home-made ORS.[3]

With four home-made ORS and two educational strategies, we would have had to use 4 x 2 factorial design, giving rise to eight (8) ORS-educational strategy combinations. Testing between pairs of combinations would have necessitated dividing the 73 caretakers into 8 groups of approximately 9 each. A sample size of 9 was considered to be too small for meaningful comparison to be carried out. Also, since at that stage our main (i.e., original) objective was to choose one of the educational strategies (but as the results later taught us, that was a mistake - see section on results) it was decided to train all caretakers in the pilot village the preparation and administration of all the four ORS. The pilot village was divided into two of roughly equal number of structures. This resulted in the caretakers being divided into two groups of thirty-seven (37) and thirty-six (36). The first group of caretakers were taught with educational strategy A, "Face-to-Face Teaching" while the second group were taught with educational strategy B, "Group Teaching", after administering the first survey on KAP of caretakers (B.S.2), i.e. pre-testing. Post test results were then compared with pre-test results for the two groups and inferences made with regard to the relative effectiveness of the two educational strategies. Regarding the preference for the ORS, caretakers' indicated preferences were compared within groups and for all caretakers combined and decision made. The results of

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[3] See appendix XXI for descriptions of how the four home-made ORS are prepared. This forms part of the Caretakers Educational Package.

73 caretakers E_F 37 O_1 18
O_2 18
E_G 36 O_3 18
O_4 18

the pilot test and inferences emanating from them will be discussed later on in the next section.

Solution Validation

This phase of the study involves entirely field-testing. The optimal solution which was obtained from the solution development stage were two, namely, (a) Using "Face-to-Face" Educational Strategy and (b) Using "Group" Educational Strategy, to teach mothers about salt-sugar-orange solution and other things about diarrhoea and signs and symptoms of dehydration. What the field-test sought to do was to (a) test whether one educational strategy is more appropriate than the other, and (b) to confirm the notion that training of caretakers really improves their knowledge, attitude and practice of ORT and therefore reduction in the prevalence of dehydration.

Study Design

The study design used in the study is Pretest-Posttest Control Group Experimental Design. This study design enables the effects of an intervention to be isolated. It basically involves collecting relevant information (or measurements) on both the "Control" and "Experimental" groups, intervening in the experimental group and then collecting similar information on both sets of groups after the intervention and comparative analysis carried out in an attempt to identify the effects of the intervention.

In our study, twelve villages were randomly selected as experimental villages with caretakers in these villages constituting the experimental group. Four villages were also randomly selected as

12+4=16
where are other 6 villages
- is this P pilot?
- why pilot educ. strategy if its all going to be tested later?

control villages with the caretakers in the villages as target control group. The intervention is the training given to caretakers in the experimental villages.

The Pretest-Posttest Control Group Experimental Design therefore involved conducting an initial survey (pretest) in order to obtain pre-intervention measurements on the knowledge, attitude and practice (KAP) of caretakers in control and experimental villages regarding diarrhoea and oral rehydration therapy (ORT). The caretakers in the experimental villages were then trained; after which a second survey (post-test) was conducted to obtain a second set of measurements on the KAP of all caretakers. The two sets of measurements on the KAP were then comparatively analyzed.

Figure 13: PRETEST-POSTTEST CONTROL GROUP EXPERIMENTAL DESIGN[4]

	Time →		
Experimental Group	X1	P	X2
Control Group	Y1		Y2

This experimental design enables the effects due to training to be isolated from those due to other influences.

The experimental design is further explained by means of Fig. 13 Let X1 and Y1 be the pre-test measurements on a variable for the experimental and control groups, respectively. The intervention or treatment (P) which the experimental group receives, as has been indicated, is the training which the caretakers receive. The control

[4] This was adapted from Fisher, et. al, (1983) p.23.

group receives no intervention. A second set of measurements obtained from the post-test is represented by X2 and Y2 for the experimental and control groups, respectively. The difference in the measurements for the experimental group is $\Delta X = X2-X1$, while that for the control group is $\Delta Y = Y2-Y1$. The impact of the intervention may be measured by $\Delta P = \Delta X - \Delta Y$. Alternatively, however, one may test the hypothesis that there is no difference between the pre-test and post-test measurements for the control villages, i.e., that $\Delta Y = 0$. Once that hypothesis has been accepted, a condition is satisfied to test for whether the training had an impact by testing the hypothesis that the difference between the pre-test and post-test measurements for the experimental group is positive, i.e., that $\Delta X > 0$. This alternative method was used in the study.

Sampling

(i) Sample Size Determination:

Assuming that two educational strategies (i.e., two treatments) would be field-tested with one ORS, the sample size was determined under the guidance of our Statistical Consultant.

For 80% power of test and 5% level of significance, we needed 94.2 units in each sample to test for a difference of 20 percentage points between the two treatments.

There is a 69% probability that a caretaker is evaluated for ORS practice, assuming at least 4 attacks of diarrhoea per child per year, that we sampled 4 times and that each caretaker handled 1.5 children. Noting that 17.7% of the population are under 5 years of age, we required population size X, where X satisfied the following:

$X(0.69 \times 0.177)/1.5 = 94.2$, or $X = (94.2 \times 1.5)/(0.69 \times 0.177) = 1157$. Now assuming 7 people to a structure, this meant villages with 165 structures i.e., 4 villages of 42 structures each. To test for a difference between two treatments therefore we needed 8 villages. To test for knowledge instead of practice, the factor 0.69 should be changed to 1, and therefore we needed 798 people or 114 structures or 4 villages of 29 structures each for one treatment.

(ii) Sampling Method

It was decided that 15 villages should be selected for the field test, using 12 as experimental villages and three as control villages. From the 1974 Population and Housing Census, the villages in the study area were estimated to contain approximately 20 to 60 structures with an average of 7 persons per structure or 140 to 420 inhabitants. It was also estimated that approximately 18% of the inhabitants were children ages 5 years or less. The Cluster Sampling Technique was used in the study. * Considering each of the 22 villages as a cluster, a simple random sample of 15 villages were selected for the field test. The villages then became the sample units, although the target group is the caretakers in the villages.

Three villages were randomly selected as control villages. This leaves 12 villages as experimental villages, meaning 6 villages for each treatment or educational strategy. Assuming an average of 30 structures per village, we were assured of 180 vis-a-vis 165 needed for one treatment from the sample size computation for testing for practice, and 114 structures for testing for knowledge and attitude.

$E_F = 6$
$E_G = 6$
12
$E_C = 3$
15

In other words, the number of villages selected assured 148 caretakers per treatment vis-a-vis 137 caretakers obtained from the sample size computation for testing for practice and 95 caretakers for testing for knowledge and attitude. It was necessary to over-estimate the number of sample units in order to ensure that we still had sufficient sample size after drop-outs which are often high in studies such as the one we were undertaking. As things turned out later, that decision was a very wise one.

Ranking of Villages and Assignment of Villages to Alternative Educational Strategies

but only 2 educ. strategies

How does this fit + ε p51, last ¶?

The fifteen villages were ranked according to scores obtained from the socio-economic characteristics. They were then categorized into three groups of five villages each. The first five villages constituted Category I, the next five Category II and the last five were assigned Category III. From each category, one village was randomly selected as a control village for that category, and the remaining four villages in each category became the experimental villages.

Within each category, the first two villages constituted one pair while the second two villages constituted another pair. Thus we had two pairs of villages in each category and six pairs of experimental villages in all.[5]

What's the purpose of the pairing? diff. ORS?

Finally, one of the villages in each pair was randomly assigned "Face-to-Face Teaching" while the other member of the pair automatically became the "Group Teaching" village. It happened that after the

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[5] The results of the ranking and the pairing of the villages are later discussed in detail and the results given in the section on "Results."

pairings had been made, the geographical distribution of the villages with alternative educational strategy assignments was such that there was little room for one teaching strategy contaminating the other.

Educational/Training Component

The educational/training component provides the training aspect of the study. It is conceived at three levels, each level consisting of learning objectives and/or behavioural objectives, knowledge content and practical activity to be embarked upon. Figures 10 and 14 illustrate the educational component.

(i) Training Package

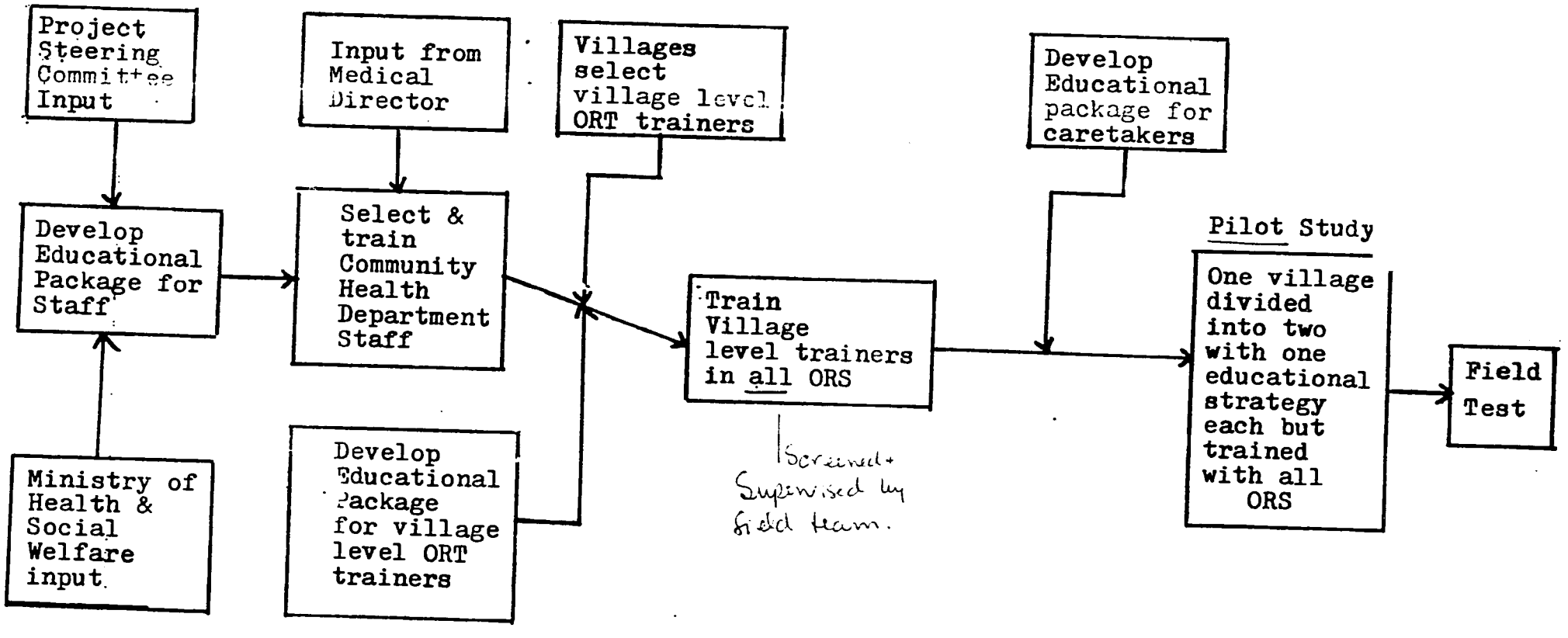
The package for the training of trainers is more detailed. The trainers are often 12th grade or post 12th grade level who were trained by the study team. They in turn were responsible for and trained the village-selected village level ORT trainers.

Why so many levels?

The next level was for the trained village level ORT trainers to train the caretakers in their respective villages. The contents of a training package of the second level, that is, for the village level ORT trainers is not as detailed as the package at the first level. Again the package for the caretakers was the least detailed with the narrowest spectrum of learning objectives. The caretakers' educational package is attached as Appendix XXI.

The methods of presentation included lectures, discussions, demonstrations, role plays and the use of visual aids.

Figrue 14 Educational Strategy - Model



(ii) Training Method

On a pre-arranged date for a training session at a pre-arranged meeting place and time, the trainer, a member of the study team went to Kakata, the administrative center and commercial capital of Margibi County, to train the selected trainers. After a briefing, a pre-test was given. The training was then began by a short orientation and providing for them files containing their educational training package. Four to six sessions were often held each lasting for about an hour and a half after which an evaluation was conducted. This being satisfactory, the respective villagers for training were selected for them. They then proceeded to initiate their training. The village selected their village trainers. The study team then screened them, oriented them and the trainers began the task of training the village trainers.

After training, the village trainers were evaluated. The study team had to make constant visits to the villages to satisfy itself that the village trainers had been properly trained. In a couple of cases, sessions of retraining became necessary due to poor performance on evaluation, absenteeism, etc. After having trained the village trainers, they were responsible for the training of their respective caretakers in the villages. The caretakers were randomly assigned to the village trainers within each village.

Data Collection Instruments for the Pretest and Post test

The data collection instruments used in the field test were the questionnaire. Form B.S.1 - Baseline Survey Part I was used to collect the socio-economic information on the household, the respondent being

the head of the household. This form, for example, enabled us to obtain information on the household sex, educational, age and occupational composition. The B.S.1 Form was administered only during the pretest. On the other hand, Form B.S.2 - Baseline Survey Part II was deployed to obtain information on the socio-economic status of caretakers and their attitude towards and knowledge of diarrhoeal related matters and ORT and their practice of ORT. The entire B.S.2 form was administered during the pre-test, but the part on the SES of caretakers was taken out, and hence only the part on the KAP of the caretakers was administered, during the post-test. This is because, the intervention is expected to influence the KAP of caretakers but not their socio-economic status. Form M on mortality, as has been earlier stated, was devised to have an idea about child mortality in the area although that is not the main focus of the study.

Statistical Techniques for Analysing the Field Test Results

Data from the pilot and field tests were summarized and the most important of the results were summarized in tables. More importantly percentages for various responses (variables) were computed and these formed the basis of most of the descriptive analysis, especially those relating to the description of the socio-economic characteristics of the villages and of the caretakers in the various categories.

For the purpose of testing for the relative effectiveness of the two educational strategies, two statistical techniques were used:

(a) The Student t-statistic was used for data measured as average scores while the Mantel-Haenszel test was used for data involving the number of correct answers.[6] In addition, Spearman's rank correlation test and Pearson's correlation coefficient technique were used to ascertain the independence or otherwise of effectiveness of training on the socio-economic characteristics of caretakers. The chi-squared test was also used.

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6 The Mantel-Haenszel test being the least known test is explained in Appendix XIV.

Time Table

The major tasks of the study were the following (see Figures 15 and 16):

1. Writing of the final proposal and bimonthly reports through life of project.
2. Selection of study sites and design of sampling procedure.
3. Development of data collection instruments and pre-testing of these instruments.
4. Conducting of surveys to collect baseline data.
5. Development of training of trainers.
6. Selection and training of trainers.
7. Pilot test and analysis of data from pilot test.
8. Modification in the instruments for the field test and in the approach.
9. Selection and training of trainers for the field test.
10. Field test.
11. Data analysis and interpretation.
12. Workshop for dissemination of findings.
13. Writing of final report.

The major difference between the original time table and the actual time table were as follows:

There was a 4-month delay in receiving the fund for the project; the project did not officially begun in June of 1984 as stipulated in the project agreement but in October 1984.

2. While the analysis of the pilot study results was going on, the baseline survey was conducted in field test villages so that there was little room for modification in the data collection instruments resulting from pilot data analysis. The reason was

that the interviewers had been trained and were available. there was uncertainty as regard the availability of the interviewers until the end of the pilot study. The survey had proven to be more time consuming and more difficult than originally anticipated.

3. There was a delay in the training of village trainers and caretakers; the period between the training of village trainers and the administration of the post-tests of the field-test was shortened by 8 weeks to ensure timely completion of the study.
4. A Colloquium was conducted before the actual completion of the study, one month earlier.
5. The study team assumed direct responsibility of the project fund instead of the University of Liberia.
6. There was interviewing of caretakers for practice of ORT, after the end of the project.

See Figures 15 and 16 for the Original and Actual Schedules of Study Activities.

Figure 35 Original Schedule of Study Activities

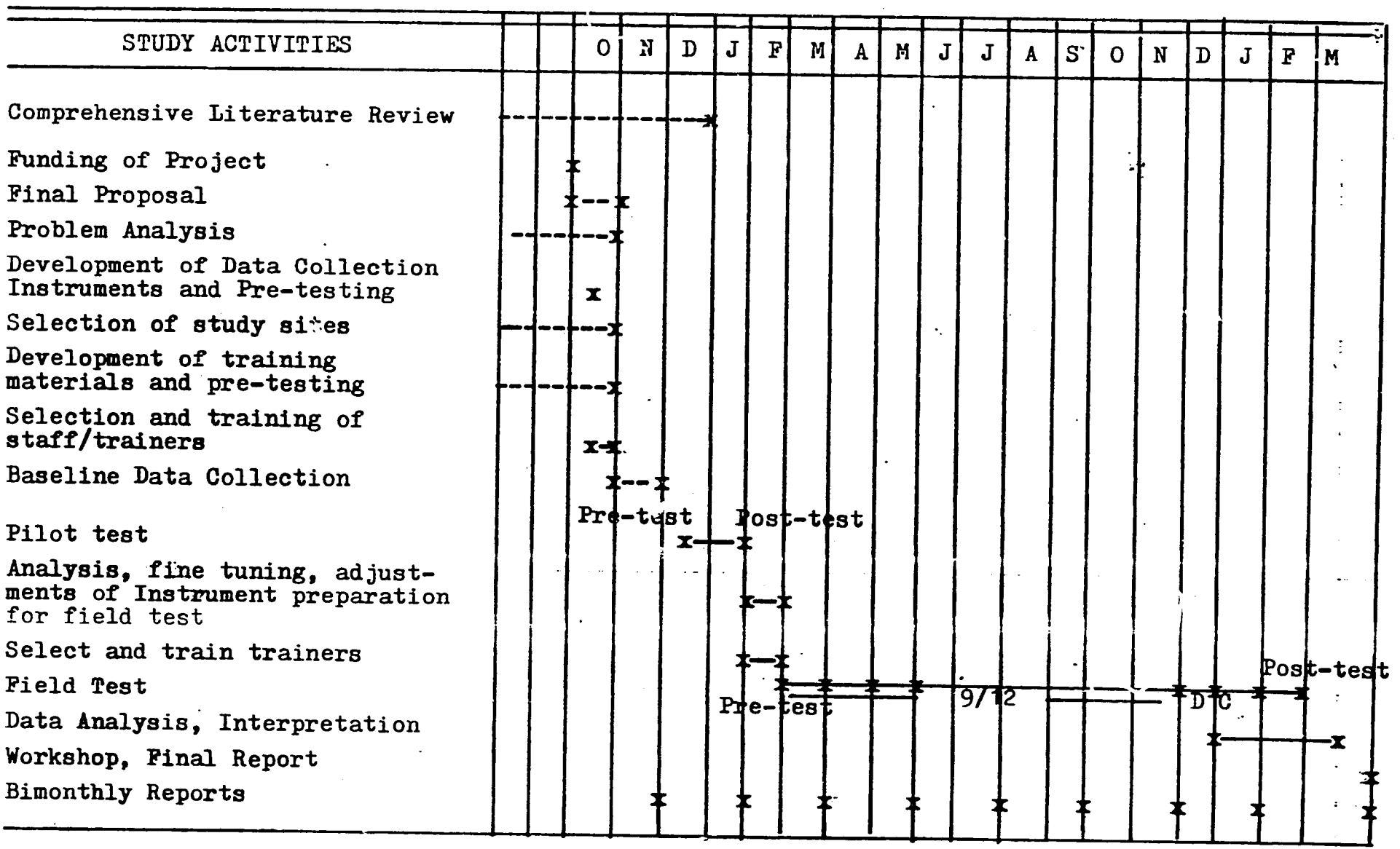
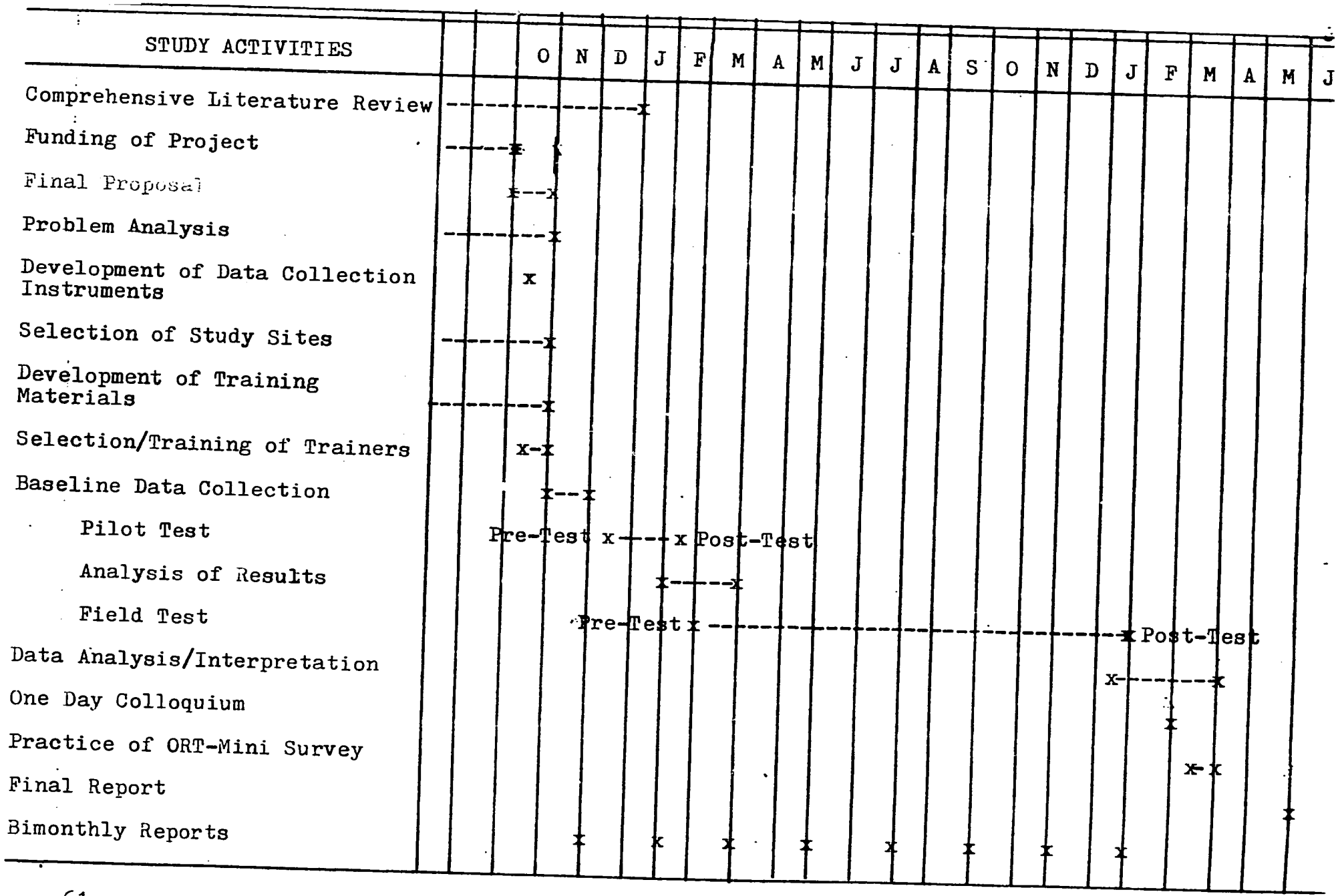


Figure 16

ACTUAL SCHEDULE OF STUDY ACTIVITIES



IV. RESULTS

The discussion in this section covers the pilot study results, village profile data results, results of the ranking of villages and categorization, analysis of the socio-economic characteristics of the experimental and control villages, and field test results. Extensive use is made of tables, most of which are produced in the appendix.

Pilot Study Results

The principal objective of the pilot study was to select educational strategy and/or home-made ORS which would be used in the field test. The objective would be met if the relative effectiveness of the two educational strategies and the preference of caretakers for any home-made ORS are ascertained.

The results of the pilot test are produced in Appendix I. [Some highlights of the results are given.] The results of the household survey on socio-economic characteristics (B.S.1) are however, produced later on with those for the field test B.S.1 results for comparative analysis.

Caretakers' Preferences for Home-made ORS

(1) Some of the caretakers reported they send their children to the clinic when their children have diarrhoea. The percentage of caretakers in Group Education Strategy reporting this behaviour fell by 8.2 percentage points while those in Face-to-Face Educational Strategy category rose by 16.3 percentage points. After the training, caretakers in both

When did it fall + rise? before the training? fell + rose from what/when?

↑ Unclear

categories reported they give salt/sugar solution when their children have diarrhoea (3.0 percent and 20.7 percent, respectively for the two groups). Hence, salt/sugar solution stood out as the preferred home-made ORS!

This initial conclusion was confirmed by the response to the question as to what the caretaker gives the child to make the child feel better when the child had diarrhoea. Whereas before the intervention, only 2.7 percent of all caretakers reported that salt/sugar solution was given to child, 53.2 percent of caretakers after intervention, reported that they gave salt/sugar solution to their children when they had diarrhoea - an increase of 50.5 percentage points. As can be seen from Appendix I, no other home-made oral rehydration solution came close in terms of their preference by caretakers.

The post-test results therefore clearly indicated that salt/sugar solution is the acceptable ORS to caretakers. It must be added that 'orange' also stood out as the fruit which caretakers liked to add to the salt/sugar ORS. Indeed, 69.7 percent of thirty-three caretakers who reported they used salt/sugar solution the last time chose orange as an additional ingredient in the preparation of the ORS. This result should however be expected considering that the intervention involved training caretakers to prepare salt/sugar/orange solution; in other words other types of citrus fruits such as grape fruit, lemon, lime etc were not given equal chance to be selected by caretakers.

The Relative Effectiveness of the Alternative Educational Strategies

Appendix I also gives the results for knowledge, attitudes and practice of ORS questions from which inferences were ~~be~~ made regarding the effectiveness of the two interventions combined, and also enable us to make inferences, albeit heuristic, about the relative effectiveness of the two educational strategies.

From the results of the post test, vis-a-vis the pre-test, it was inconclusive as to the relative effectiveness of the two educational strategies. At this point, one was obviously not superior to the other. It was therefore concluded that both educational strategies would be employed in the field test to determine under more rigorous tests which of the two strategies is superior.

Results of the Village Profile Survey

Twenty-five characteristics were selected and looked for on the Village Profile questionnaire which was administered at all the fifteen villages. The summary sheet of village profiles - (Fig.17) gives the distribution of the various characteristics among the villages. Its accompanying table (Table 2) shows the summary in terms of number and percentage of villages with each characteristic. Several of the characteristics have public health significance. For instance, only 36% of the villages had "adequate" drinking water (wells) (if this can be called adequate). Eighty-one percent of the villages are using streams. There are only 27% of the villages that have public toilets. The rest just defeacate in the bushes! Only 23% have "clinics"/ facilities for basic health care while 50% of the villages have a means

Figure 17

ORT OR STUDY - SUMMARY SHEET OF VILLAGE PROFILES

VILLAGES	Well	Stream	Electricity	Market	Vehicle	Shop/store	Football Field	Football Team	School	Church	Mosque	Public Toilet	Clinic	Active Health Dev. Comm.	Active Vill. Dev. Comm.	Town Hall	Private Elect. Generator	Corn Mill	Cottage Industry	Festivals	Prev. Dev. Projects	Ext. Funded Projects	Drug Store	Organizations	Community Activity	No. of Structures	Other Characteristics
Wealah	✓	✓	✓		✓	✓	✓	✓		✓	✓			✓	✓	✓	✓		✓c				✓	✓	✓	66	
Father's Camp		✓			✓	✓	✓	✓	✓	✓						✓				✓						13	
Guebolosu		✓			✓		✓			✓				✓		✓			✓p						✓	31	
Kolie Kain Town		✓				✓				✓				✓	✓					✓				✓	✓	36	
Zanata HQ	✓	✓		✓	✓	✓	✓	✓	✓	✓					✓	✓			✓B				✓		✓	54	
Compound II (Lakayta)	✓	✓	✓	✓		✓	✓	✓	✓	✓			✓		✓	✓				✓	✓	✓		✓	✓	126	F
Arthur Sherman/ Padmore		✓	✓		✓	✓	✓	✓	✓	✓						✓	✓		✓L							27	
Vayemah		✓				✓	✓	✓	✓	✓				✓	✓	✓			✓B ✓m					✓		31	
Sackie Gbomo-Ta		✓				✓	✓	✓								✓				✓				✓		21	
Sankay		✓				✓										✓				✓				✓		17	F
Nyaikata		✓	✓			✓	✓	✓		✓		✓		✓	✓	✓			✓c	✓	✓				✓	27	
Cinta	✓		✓		✓	✓	✓	✓	✓	✓			✓						✓L B					✓		42	
David Gwerly		✓				✓										✓				✓				✓		20	F
Konola	✓		✓			✓	✓	✓	✓	✓				✓		✓			✓c		✓				✓	54	
Jinnieta		✓	✓	✓		✓	✓	✓	✓	✓			✓		✓	✓			✓B	✓	✓	✓	✓	✓	✓	53	F
Williams/Barclay	✓		✓		✓	✓						✓				✓								✓		35	
Massaquoi	✓		✓			✓		✓		✓	✓							✓c								19	F
Kpakolokoyata	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓				✓	✓						✓	✓		47	
26 Gate		✓			✓	✓	✓	✓	✓	✓					✓				✓				✓			38	
R.I.E. Bright		✓	✓		✓	✓	✓	✓	✓	✓		✓			✓				✓							44	
R.S.S. Bright		✓			✓		✓	✓				✓	✓	✓		✓			✓			✓				33	
Konola Vai Town		✓				✓		✓			✓	✓		✓	✓	✓				✓					✓	15	

Table 2 Summary of Village Profile

Characteristics	No. of Villages	%
1. Well	8	36
2. Stream	18	81
3. Electricity	11	50
4. Market	4	18
5. Vehicle	11	50
6. Shop/store	20	91
7. Football field	16	73
8. Football team	17	77
9. School	10	46
10. Church	16	73
11. Mosque	3	13
12. Public toilet	6	27
13. Clinic	5	23
14. Active Health Development Com.	7	31
15. Active Village Dev. Committee	10	46
16. Town Hall	17	77
17. Private Electric Generator	2	9
18. Corn mill	1	5
19. Cottage Industry	10	46
20. Festivals	11	50
21. Previous Development Project	5	23
22. External funded project	2	9
23. Drug Store	4	18
24. Organizations	12	54
25. Community Activities	10	46

of transporting people to clinics during emergencies. Thirty-one percent have health development committees while 46% have village development committees. Also only 4 of the villages or 18% have a means of obtaining basic drugs in their villages. [The Ministry of Health needs to know these pieces of information due to their reference to public health and health projects, particularly PHC activities.]

Ranking and Pairing of Villages

The statistical technique which we decided to use in the analysis of the results of the field test (Mantel-Haenszel test) required that the experimental villages be paired. Indeed the pairing of the villages also enabled us to use the technique of "paired-difference" for the t-test. The elements in each pair of villages must possess similar socio-economic characteristics in order to ensure that any differences in improvements of KAP in the two villages in a pair could be ascribed solely to the different educational strategies. Ranking of villages in terms of socio-economic indicators therefore became a prerequisite for the pairing of the villages.

Ranking of Villages

Information on Village Profile, which had been already summarized (Fig.17) had to be supplemented with some socio-economic indicators of villages derived from the pre-test of the field-test. Thus in addition to the twenty-five village characteristics, the following were taken into account in the ranking of the fifteen

villages.

(a) Percentage of households with private toilets.

(b) Percentage of children 6-14 years old in school.

(c) Literacy rate.

(d) Percentage of structures with cement/concrete/stone/ outer walls; and

(e) Population.

Consequently thirty socio-economic characteristics were considered in the ranking of the villages. Appendix II gives the characteristics and the ranking of the villages. The paragraphs which follow explain the procedures undertaken in arriving at the ranking of the villages.

In order to obtain representative scores for each of the characteristics (with the exception of population), the three researchers assigned independently scores (within the scale of 0-10) to the 29 characteristics. Average scores were computed from the three sets of scores and awarded to the characteristics (see second column of Table 3). For characteristics 1-25, a village with a characteristic is awarded the corresponding average score (for an example 8.33 for 'well').

For characteristic 26 to 29, a slightly different procedure was used since they cannot be treated in such a straight-forward manner. The weights of these characteristics are in percentages and are therefore not the same for all villages; the percentages approximate the importance of these characteristics to each village. This is at variance with the assumption of equal importance which underlies the first twenty-five characteristics. In order to capture the differences in the importance of these four characteristics, a factor was derived

which, when multiplied by the corresponding percentage, gives the score for a characteristic for a given village. This was necessary and preferable to a straight forward multiplication of the proportion by the average score (in the second column of the Table 3[illegible]) since the latter procedure would underestimate the importance of these characteristics to the villages concerned. Taking one characteristic at a time, the average percentage of all the fifteen villages was computed and then the factor which when multiplied by the average percentage gives the average score in the second column is derived. By the formula

$$F = \frac{AS}{AP},$$

where F is the factor, AS is the average score , and AP is the average percentage. The table below provides information on the derivation of the various factors:

TABLE 3[illegible]

Derivation of the Various Factors

Characteristic	Average Score	Average Percentage	Factor
26. Private toilets	6.33	45.11	0.14
27. Children 6-14 years in school	6.33	42.63	0.148
28. Literacy	8	27.56	0.29
29. Cement/concrete/stone/structures	6	34.98	0.172

Given the factor, the score of a village for any of the four characteristics was obtained by multiplying the percentage in the appropriate cell by the factor. For example, to obtain the score of Massaquoi (MA) for private toilets, we simply multiply 38.7 by 0.14 to obtain 5.42 which is recorded in Appendix II. The respective scores

for the other characteristics of the fifteen villages are given in the respective cells in Appendix II.

The problem with using population as a socio-economic indicator revolves around how to assign a score which on the one hand, would not exaggerate the influence of population and on the other hand would not underestimate its influence. On the average there were 287.67 persons per village. Assuming the maximum score of 10 for such a representative village, a factor was calculated as follows:

$$F = \frac{10}{287.67} = 0.0348$$

After several experimentations, a factor of 0.05 was arrived at and was used to convert the population of each village to the scores shown in the row 30. For an exaple, Gwebolosu with a population of 136 receives a score of

$$F = 136 \times 0.05 = 6.8$$

The total points for the fifteen villages are given in row 31 while the ranking arising out of them is given in the last row.

An array of villages (in descending order of rank) was formed and from it three categories of five villages each were obtained. These are produced in Table 4.

From each category of five villages one village was randomly selected as control village, while the remaining four villages then became experimental villages. Consequently, R.I.E. Bright was the control village for Category I, Zanata Headquarters was the control village for Category II and Nyaikata was the control village for Category III.

Table 4

Summary of the Ranking of Villages for the Field Test

	Rank	Village	Population	No. of Households	No, Primary Caretakers	No. Secondary Caretakers
Category I	1	Jinnieta	356	96	42	8
	2	Wealah	679	181	76	15
	4 3	R.S.S. Bright	371	90	48	12
	3 4	Kpakolokoyata	360	73	39	9
	5	R.I.E. Bright*	411	85	58	4
Category II	6	Konola	280	52	32	9
	7	Cinta	302	51	30	13
	8	Zanata HQ*	272	74	35	12
	9	Vayemah	173	34	25	5
	10	26 Gate	240	47	26	6
Category III	11	Nyaikata*	133	32	10	4
	12	Williams/Barclay	265	64	45	4
	14 13	Gwebolosu	136	35	14	6
	13 14	Kollie Kain Town	202	40	28	3
	15	Massaquoi	135	31	16	3

* Villages (3) randomly selected as "Control Villages". The rest of the villages (12) are therefore "Experimental Villages".

Ranking not consistent c̄ App II

Table 5

Pairing of Experimental Villages and Assignment of Education Strategy

Category	Village	Educational Strategy	No. Primary Caretakers	No. Secondary Caretakers
Category I	1. Jinnieta Wealah	Face to face	42	4
		Group	76	15
	2. R.S.S. Bright Kpakolokoyata	Group	48	12
		Face to face	39	9
Category II	3. Konola Cinta	Face to face	32	9
		Group	30	13
	4. Vayemah 26 Gate	Face to face	25	5
		Group	25	7
Category III	5. Williams/ Barclay Gwebolosu	Group	45	4
		Face to face	14	6
	6. Kollie Kain Town Massaquoi	Face to face	28	3
		Group	16	3
			420.	90

176
510900.00
510
39.00
35.70
3.300
30.60
240

17.6%

p. 72.

12

(ii) Pairing of Villages

The experimental villages within each category were then paired; the first was paired with the second and the third paired with the fourth. One of the two alternative educational strategies was then randomly assigned to one of each pair and the other educational strategy assigned to the other member of the pair. The pairings and the corresponding educational strategy for each member of the pairs of villages are produced in Table 5 below.

Field Test Results

Socio-Economic Characteristics of Villages

The summary of statistics of the field test based on Form BS.1 will be found in Appendix III. The highlights will be presented here.

The number of structures in the villages ranged from 20 in Massaquoi village to 70 in Jinnieta. There were 31 households in Massaquoi village while Wealah had 181 households. The number of persons in the villages ranged from 133 in Nyaikata to 679 in Wealah.

The number of children 5 years or less in both the experimental and control villages ranged from 21 in Gwebolosu to 142 in Wealah. The total number of children 5 years or less involved in the study was 924.

Other characteristics included literacy, primary economic activity, occupation and work status among others. Information was also obtained on other socio-economic characteristics such as roofing and other construction materials used for houses in the villages, possession of working radios and watches, cutlery, private toilets, source of electricity and electrical appliances.

A total of 523 primary caretakers and 105 secondary caretakers were involved in the study. They ranged from 10 primary caretakers in Nyaikata to 76 primary caretakers in Wealah while there were 3 secondary caretakers in Kollie Kain Town to 15 secondary caretakers in Wealah.

The primary caretakers had a range of 1.47 children 5 years or less under their care in Konola to 2.5 in Nyaikata. It was found that in the experimental villages the percentage of population with pre-grade or no education at all ranged from 66.4% in R.I.E. Bright and Konola to 87.4% in Massaquoi Village! Also the percentage of population aged above 5 years who are literate ranged from 13.9% in Nyaikata to 41.1% in R.I.E. Bright. The percentage of persons aged above 5 years and in school ranged from 3% in Massaquoi Village to 36.6% in R.I.E. Bright.

Also the percentage of adults working ranged from 57% in 26 Gate village to 86.6% in Zanata Headquarters. Of those working, the percentage of people in white color jobs ranged from 0% in Nyaikata, Massaquoi village and R.I.E. Bright to 8.7% in Cinta. Most of the workers were farmers, rubber tappers, traders etc.

The Pilot Village as a Representative Village in Study Area

In the Solution Development stage the results of the Pilot Study were used to select the most preferred home-made ORS from a set of four. But the validity of this approach depends on whether or not the pilot village is representative of the study area. The answer to this question is important considering that the pilot was a comparatively large village in terms of the number of structures.

It is intended only to give a heuristic answer to this question of representativeness of the pilot village by comparing the SES of the pilot village and those of the 15 villages. Appendix IV gives comparative data for the pilot village and the average for the 15 selected villages. It will be observed that the two sets of data are very comparable.

SES of Caretakers in the Experimental Villages

The analysis of the Social and Economic Characteristics of caretakers in the experimental villages is carried out at two levels. First, all caretakers are combined and the nature of their SES analysed. Then comparisons among the caretakers in the three categories are undertaken from the point of view of the SES of the caretakers of the villages which fall under each category. The information which forms the basis for the analysis is produced in Appendix V.

Five hundred and two caretakers were interviewed in the twelve experimental villages. The caretakers, who resided in 309 structures, were members of 381 households. These figures give caretaker-structure ratio of 1.62 and 1.32 caretakers per a household. The number of households per structure is 1.23.

Recalling that the four highest ranked experimental villages are contained in Category I, the next four in Category II and the four lowest ranked villages are in Category III, it appears that the number of structures, households and caretakers correlate with the ranks of categories. This should be expected since population size influences the number of structures, households and caretakers. There seems to be no evidence, however, that the number of caretakers per household has any correlation with the ranks of villages.

? Only 81.3% of the caretakers interviewed are secondary caretakers. This does not make it profitable to compare the KAP of primary and secondary caretakers as previously planned. The caretakers in the experimental villages are relatively young with an average age of 30.4 years! The largest deviation from this mean was recorded by Category II which has an average age of 31.9 years - a deviation of 1.5 years.

The results also indicate that taking care of children is considered to be predominantly a female vocation; about 95% of the caretakers in the experimental villages were females. There is thus no wonder that 80% of the caretakers were mothers. The percentage of mothers in Category II of 74% is however low vis-a-vis 95.2% of females. But the seemingly contradictory results are resolved if it is recognized that 14.4% of caretakers were also grandmothers.

So far as religious inclinations are concerned, 62.5% of the caretakers in the experimental villages are Christians, 8.4% were muslims while 19.1% have no religion. The results however indicate that Category I, has greater proportions of both muslims and caretakers with no religion than any of the other two categories.

Impossible unless the others are all Christian

Majority of the caretakers interviewed are either farmers or traders. As much as 92.9% of the caretakers in the experimental villages are either primarily farmers or traders or have these two activities as secondary occupations. However, about 70% of the caretakers did not have secondary occupation, indicating greater degree of division of labour in a rural setting than one would normally expect.

Another surprising result is that only 14.4% of the caretakers are housekeepers. It would seem that caretakers do not normally regard housekeeping as occupation. This notion is confirmed by the fact that

no housekeeper responded that housekeeping was his/her secondary occupation inspite of the high percentage of them reporting that they do not have a secondary occupation.

The occupational distribution among the spouses of caretakers differs from that of caretakers, 85.7% of whom are married. For one thing, the percentage of the spouses of caretakers who have farming and trading as primary or secondary occupations is lower than what? by 34.1 percentage points. This is explained by the fact that as much as 18.8% of the spouses of caretakers are tappers. The villages in the top ranked categories are basically rubber areas as evidenced by the relatively higher proportions of tappers both among caretakers and their spouses.

The literacy rate among caretakers is generally low - 18.5% for the caretakers in the experimental villages combined. The most literate of the caretakers are those in Category II, and the least are those in Category III. As would be expected there is almost one to one correspondence between the literacy rate and the percentage of caretakers who have grade school or above grade school education.

In the case of the spouses of caretakers, the literacy rate is correlated with the ranking of the villages inspite of the fact that the correspondence between the literacy rate and the percentage of grade school and above grade school spouses is less clear. Generally speaking, however, the spouses of caretakers are better educated and hence are more literate than the caretakers. The domination of females as caretakers and of males as spouses explain this situation, to the extent that the literacy rate of males is normally higher than that of females in developing countries.

Community organization does not appear to be a serious thing in the experimental villages. Only 10% of the caretakers and 17.3% of their spouses belong to a community organization. Whereas in the highest ranked villages, (Categories I and II), greater proportion of the spouses of caretakers belong to a community organization than the caretakers, the reverse holds for villages in Category III.

Only three percentage points separate the caretakers who obtain water from stream and those who fetch water from public well. It is clear, however, that the higher the rank of a category the greater the percentage of caretakers who obtain water from wells and the lower the percentage of caretakers fetching water from streams.

If we hypothesize that separation of drinking water and water for other purposes, either by keeping them in separate containers or at different places is a sufficient condition for keeping water clean, then it would appear that caretakers in Categories I and III appear to take better care of their drinking water than those in Category II. Only 30.1 and 33.1 of the caretakers in Categories I and III keep drinking and other water at the same place, while 40% of the caretakers in Category II keep them at the same place. The average for a caretaker in the experimental villages is 33.7%.

The most popular cups are those which have capacity of between 150 and 199mls. Surprisingly, only 43.9% of caretakers have coke bottles. This is important from the point of view of practice of O.T. Surprisingly, the most sophisticated of the categories (Category I) has the smallest proportion of caretakers with coke bottle. Apart from coke bottle, the most popular bottle is beer bottle. Indeed,

beer bottle is more popular than coke bottle; stout and schnapps bottles follow closely behind coke bottle.

So far as spoons are concerned, there is no problem regarding availability. There is only one out of 502 cases that a caretaker responded that she does not have a spoon. The most popular spoon is tablespoon and not teaspoon. Indeed, cookspoon follows a close second.

A substantial proportion of caretakers obtain their supplies from out of town. However, 70.9% of caretakers obtain supply of rice from local sources, with 34.3% from their farms. In addition, 61.8% and 66.1% of caretakers obtain their supplies of sugar and salt, respectively from local store/market. There is thus no question of availability of ingredients for the preparation of the ORT selected in the pilot test.

There are 936 children five years old or less who are cared for by the caretakers. This gives 2.46 children 5 years old or less per household or 1.86 per caretaker. The number of children is roughly split equally between the two sexes and between the two age groups of 0-2 year olds and 2-5 year olds.

The pre-test results also showed that we have sufficient sample size (502 vis-a-vis 190 required by sample size computation[7]) for testing difference in knowledge and attitudes of caretakers and also the practice of ORT by caretakers with reference to the two educational strategies.

[7] See page 50 of this report

Analysis of KAP of Caretakers in the Experimental Villages

HE this is labeled pre post-test!

The table in Appendix VI summarizes the information on the knowledge and attitude of caretakers regarding diarrhoea and Oral Rehydration Therapy (ORT) and the practice of ORT by caretakers before they were trained. The analysis entails an examination of the KAP of the caretakers in all the experimental villages combined and a comparative analysis of the KAP of the three categories of caretakers. It is important, in this connection, to recall that the four experimental villages in Category I are the highest ranked villages while Category II consits of the four lowest ranked villages, in terms of the socio-economic characteristics.

A remarkably high percentage (88%) of all caretakers in the experimental villages knew what diarrhoea was, i.e., as "frequent watery stool." Opinion about the frequency of watery stool was however divided. The majority of caretakers (41.9%) defined "frequency" as "two-three times a day," while 32.1% regarded "four-five times a day" as "frequent." The observations hold generally true for caretakers in the individual categories. It therefore turns out that about 74% of caretakers regard toileting of watery stool two-five times a day as diarrhoea. Surprisingly, the caretakers in the highest-ranked category, had the lowest performance regarding the definition of diarrhoea. The percentage of caretakers in this category answering correctly that diarrhoea is "frequent watery stool" fell short of the average for all experimental villages by 3.5 percentage points, and of that for the category with the best performance (Category II) by as much as 7.3 percentage points.

Only 33.4% of all caretakers were of the opinion that diarrhoea is caused by unhygenic water or food. As much as 62% did not know

what causes diarrhoea. It is thus no wonder that only 16% of caretakers who believed diarrhoea could be prevented knew that cleaniness and good child care are the key to the prevention of diarrhoea. As much as 86.6% either would give Clinic Medicine to the child, send child to clinic for treatment or give country medicine in order to prevent diarrhoea. Only 2.8% said they had no idea as to how to prevent diarrhoea.

As is the case with the definition of diarrhoea, the caretakers in villages belonging to Category II were more knowledgable about the causes of diarrhoea than even those in the highest ranked category. Although 38.3% correct response by caretakers in this category to the question as to the causes of diarrhoea is still small, it was 2.5 percentage points above the average for all caretakers. Looking at it from an alternative angle, it appears the percentage of caretakers, who had no idea about the causes of diarrhoea was relatively lower for Category II (58.9%) than for both Category I (63.0%) and Category III (63.6%).

The response of caretakers as to what are the effects of diarrhoea was very encouraging. Weakness was considered to be the principal effect of diarrhoea, followed by dryness, sunken eyes and loss of appetite. To the extent that weakness and loss of appetite are effects which are not exclusive to diarrhoea, perhaps the real test is the percentage of caretakers who considered dryness, dry mouth, sunken eyes, sunken fontanelle and inelastic skin as the effects of diarrhoea. But even in this dimension, 56.2% of caretakers responded that diarrhoea could cause dryness and/or sunken eyes and/or dry mouth. It would

appear that the caretakers belonging to the highest ranked villages (Category I) performed better than other groups of caretakers. The percentage of caretakers responding that diarrhoea results in dryness, dry mouth and sunken eyes was 61.4% for Category I.

The majority of caretakers (30.9%) were of the opinion that children aged 0-5 years often have diarrhoea. It is interesting to note that children aged 0-2 years are next in line. Indeed, considering that children aged 1 and 2 years are a subset of those aged 0-2 years, it would seem that 34.5% of all caretakers believed that children aged two years or less are most likely to have diarrhoea.

The percentage of caretakers who reported no diarrhoea episode is very high (68.8%). In order to ensure that we have sufficient sample size for testing a hypothesis about the practice of ORT by caretakers the villages had to be revisited so that caretakers who reported no diarrhoea are reinterviewed about diarrhoea incidence and consequently ORT practice.

The UNICEF pack was not widely known in the study area. Only 3.8% of the caretakers knew of the UNICEF pack. Of those who had seen/used a UNICEF pack before, 77.8% were taught its use by a health personnel while 63.2% obtained the pack from the clinic. Majority of caretakers (68.4%) did not pay any money for the UNICEF pack.

With such little knowledge of the UNICEF pack, perhaps the crucial issues are; (1) the extent to which caretakers valued the pack and (2) the capacity of caretakers to purchase the UNICEF pack. It is not surprising that as much as 68.3% of the caretakers responding had no idea about how much a UNICEF pack should cost; afterall, as many as

96.2% of them had for the first time seen a UNICEF pack at the time they were interviewed. It is, however, interesting to note that less than 1% (0.6%) of caretakers were of the opinion that the UNICEF pack should be given out free.

Regarding the issue of how much caretakers could afford to pay for a UNICEF pack, 12.1% responded that they could not pay anything for it, while 62.2% indicated that they could pay something provided it was below one dollar ($1.00).

Caretakers generally sent their children to the Clinic and/or gave country medicine when they had diarrhoea. This observation is based upon the fact that 93.8% of caretakers in the experimental villages did exactly that. Indeed, only 1.4% of the caretakers gave ORS when their children have diarrhoea. When caretakers were asked more specifically what they could do to make their child with diarrhoea better, 9.3% of them responded they could give an ORS, while 86.6% responded they could give country medicine or clinic medicine and/or send child to clinic. Of the ORS selected, rice water without salt/sugar was the most popular, followed closely by salt/sugar solution.

Of the 47 caretakers (out of 502 caretakers) in the experimental villages who responded they could give an ORS to make child better, 27.9% received the score of "poor" in the preparation of the ORS selected Also, the majority (67.4%) of these caretakers gave the ORS only 2-3 times a day.

Allowing the number of caretakers who used ORS in less than a month ago to approximate those who used it in the last two weeks, we can deduce the following. Only 7 (or 4.8%) out of 147 caretakers reporting incidence of diarrhoea used ORS. In any case, majority of caretakers

(92.7%) have no idea about how much ORS they gave to their children with diarrhoea.

Sixty percent of the caretakers believed that the diarrhoea becomes serious when a child with diarrhoea becomes weak. It will be recalled in our earlier analysis that "weakness" was considered by caretakers as the major consequence of diarrhoea. However, whereas as many as 56.2% of the caretakers regarded "dryness" and "sunken eyes" as the effects of diarrhoea, only 11.7% of the caretakers considered these effects as indications of the seriousness of the diarrhoea. In this regard, caretakers in Category I appeared to put greater premium on "sunken eyes" and "dryness" as symptoms of worsening case of diarrhoea, caretakers in Category III followed in this respect. It is interesting to note that a sizeable percentage of caretakers regarded "passing too much watery stool" as an indication of how serious diarrhoea is, although this is a subjective statement.

When diarrhoea becomes worse, most (90.6%) caretakers in the experimental villages sent their ward to the clinic. Only 6.4% gave country medicine to the child in order to cure serious diarrhoea. From the point of view of inter-category comparison, it is surprising that Category III which contains the lowest ranked villages had the greatest tendency of sending a child with serious case of diarrhoea to the clinic but the least tendency of giving country medicine to the child. These results are confirmed by the response to the question as to what caretaker does when diarrhoea does not stop. In answering both questions, the least sophisticated category performed the best and the intermediate category performed the worst.

Unlike the results obtained from the pilot study, the decision of caretakers to send their children to the clinic did not depend as much on the fear that the child would die (13.1%) as on the conditions of diarrhoea not stopping, or stomach running becoming too much (21.1% and 10.9%, respectively). The reasons given for sending the child to the clinic were quite fragmented - 35% of caretakers gave several other reasons for sending their children to the clinic.

Most caretakers (78.5%) believed that if diarrhoea does not stop the child will die. Only 1.6% said that if diarrhoea does not stop, the child will be dehydrated and as a result, die. However, 8.1% of caretakers who believed that diarrhoea can cause illness responded that the type of illness is dehydration.

Also when caretakers were specifically asked what they considered to be the causes of dehydration, the highest percentage (34.5%) indicated that diarrhoea causes dehydration. As much as 9.4% of the caretakers believed that diarrhoea can cause serious consequences such as weakness (21.5%), death (10.9%), sore stomach (11.1%) and dehydration (8.1%).

Also, 92.8% of caretakers believed that diarrhoea can kill. Only 69.3% of the caretakers were of the opinion that it could be prevented.

Perhaps the reason why a relatively smaller percentage of caretakers in Category II responded that diarrhoea can kill lies in the fact that greater percentage of them (73.8% vis-a-vis 69.5% for Category I) believed diarrhoea can be prevented. However, majority of caretakers who think that diarrhoea could be prevented did not know the correct way to prevent diarrhoea. Only 17.2% of these caretakers regarded keeping food, plates and water clean and practicing good child-care as the surest ways to preventing diarrhoea. About 6.9% of these caretakers

believed treating the child, including vaccination, to be the most potent way for ensuring that the child does not get diarrhoea. It is however not clear whether the caretakers understood the question correctly. The skepticism arises from the fact that when the caretakers who answered that diarrhoea cannot be prevented were further asked why they said so, the majority of these caretakers answered either that there is no cure or that they have not seen medicine for it.

Of the 96.6% of the caretakers who responded that diarrhoea can be treated, only 0.2% said that diarrhoea can be treated by giving ORS. Majority of caretakers (94.6%) thought that diarrhoea can be treated by sending the child to the hospital, taking medicine or by administering other types of treatment.

In response to the more direct question regarding the use of home-made Oral Rehydration Solution 7.9% of the caretakers indicated that they had not used home-made ORS before - 12.8% had used rice water without salt and sugar before, while 6% had used home-made ORS selected upon the basis of the pilot results, i.e., salt/sugar solution, before. Of the 105 caretakers who have ever used home-made ORS, only 48.6% used ORS during the previous diarrhoea episode. The extent of the practice of ORS was greatest for salt/sugar solution considering that 23 out of 51 (i.e., 46%) caretakers who ever used salt/sugar solution used it in previous diarrhoea episode, vis-a-vis, 30 out of the 105 (or 28.6%) of all caretakers who practiced ORS in the last diarrhoea episode.

The scores in the preparation of ORS were generally unsatisfactory. Eighty-four percent of the caretakers who used home-made ORS during the last diarrhoea episode were of the opinion that ORS works, although

only 5.7% knew that it works by preventing dehydration; 60% of the caretakers who responded ORS works believed that ORS stops diarrhoea.

The types of food which caretakers give to their children during diarrhoea are the following in order of importance:

Rice	45%
Rice water	28.8%
Breast milk	8.7%
Breast milk plus rice water	5.2%
Breast milk plus rice	2.6%
Soft-rice	1.8%
Breast milk with other food	1.2%
Other food	8.5%

It should be noted that 1.6% of the caretakers did not give any food to the child when he has diarrhoea.

Caretakers in the experimental villages considered the following as the five most common diseases affecting children five years and less:

Diseases	Percentage of Caretakers Reporting (rank)			
	Category I	Category II	Category III	Total
1. Malaria/Fever	73.4 (1)	63.7 (2)	81.9 (1)	72.5 (1)
2. Diarrhoea	72.6 (2)	67.1 (1)	62.1 (2)	68.5 (2)
3. Cough	50.6 (3)	52.1 (3)	33.6 (4)	47.1 (3)
4. Measles	40.9 (4)	39.0 (4)	39.0 (3)	39.9 (4)
5. "Open Mole"[8]	24.9 (5)	8.9 (6)	8.9 (6)	17.0 (5)
6. Thrush	11.8 (6)	10.3 (5)	24.1 (5)	14.2 (6)

[8] A term used in Liberia to describe sunken fontanelle, which people believe is due to a disease other than dehydration.

It will be seen from the table that there are some differences in the ranking of the villages in the various categories. Using the ranking for the total (i.e., all caretakers combined) as the average it can be concluded that the ranking of the five most common diseases by the caretakers in Category I is consistant with that of the average. However, whereas caretakers in Category II ranked diarrhoea instead of Malaria as number one child diseases, caretakers in Cateogy III ranked measles above Cough. The caretakers in the two categories agreed in one result, however, namely, they regarded "Thrush" instead of "Open Mole" as the fifth most common disease afflicting children five years old and below.

Effectiveness of Training

Introduction

The selection of only one of the four ORS for field test reduced considerably the problem of selecting ORS-educational strategy combinations to that of testing the following hypothesis in the field test:[9]

(a) The training of caretakers was effective.

(b) "Face-to-Face" training is more effective than "Group" training.

(c) It is more difficult to train caretakers through "Face-to-Face" educational strategy than through "Group" educational strategy.

The data summarized from the pre-test and post-test field surveys are of two types: (a) average scores, i.e., scores per caretaker computed for questions with more than one correct answer, and (b) the number of caretakers giving correct answer for questions demanding one correct answer. Examples of the first set of data are those summarized for knowledge of the causes of diarrhoea, the effects of diarrhoea, the correct ways to prevent diarrhoea and the preparation (practice) of ORP. On the other hand, all questions relating to attitude of caretakers towards diarrhoea and knowledge of caretakers regarding what diarrhoea is, and what should be given to a child when he or she has diarrhoea, generated data of the second type.

The statistical test used for average scores is the t-statistic, while Mantel-Haenszel test is used for data representing the number of correct answers. Spearman's rank correlation coefficient and Chi-square tests are also used for both types of data. The KAP

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9 These hypothesis will be put in their proper "null hypothesis" frame later when they are made more specific in terms of our variables.

variables used in the analysis are defined in Table 6 for easy reference.

It should be noted here that owing to the very low incidence of diarrhoea during the period between the pre-test and post-test, we could not obtain sufficient sample size to evaluate practice of ORT within the overall framework of the analysis. A second best solution of using smaller sample was, however, devised, in which case the caretakers were supplied with the ingredients and asked to prepare the salt-sugar-orange solution for scoring on a scale of 1-3. The results are discussed later on.

Some Important Issues

It is important at this stage to resolve some issues surrounding inter-category differences in the KAP of caretakers and whether the socio-economic characteristics of caretakers have any potential of contaminating our test results.

From the presentation of the pre-test results on KAP of caretakers in the experimental villages, it would appear that the evidence on the relative performance of the three categories of villages is mixed. Indeed, it would appear that villages in Category II performed better than those in Category I. A closer examination of the evidence however, reveals that this is not the case.

When the answer to twenty-one (21) key KAP questions were ranked and aggregated, Category I ranked highest, followed by Category II and lastly, Category III. The aggregate KAP ranking of the villages prior to the intervention was therefore, consistent with the earlier ranking of the categories which was in accordance with the SES obtained from

the village profile and socio-economic baseline survey (B.S.1).

The next issue is whether the SES of the villages in the categories were sufficiently different, to affect the evaluation of KAP in the Face-to-Face and Group Teaching villages. To answer this question, five SES variables (Religion, Employment, Literacy rate, Marital status and Availability of Coke bottle) were selected as the key SES variables, i.e., variables with greatest probability of influencing the KAP and the learning ability of caretakers. The inclusion of literacy rate, is particularly important.

To test for the differences in the SES of Face-to-Face and Group villages, we made use of the Mantel-Haenszel test (Table 7). The results for all the five SES variables, with the exception of Religion indicate that we cannot reject the null hypothesis that there is no difference between the socio-economic characteristic of the caretakers trained with Face-to-Face educational strategy and caretakers trained with Group teaching technique.

We used a scale of 1 2 3, i.e., the category with the greatest number of correct answers to a question received 3 points, the next category 2 points and the last category 1 point.

But perhaps the crucial issue is whether the socio-economic characteristics of caretakers in a given pair of villages are statistically different from one another. Table 8 enables us to resolve this issue.

The tests reveal that employment, marital status and availability of coke bottle are socio-economic characteristics possessed at the same level by the Face-to-Face and Group villages in all pairs of

Table 6

Definition of KAP Variables and Corresponding Test Statistics

Item	Test Statistic
Knowledge:	
K.1 Knowledge of what diarrhoea is	M-H
K.2 Knowledge of causes of diarrhoea	t-test
K.3 Knowledge of the effects of diarrhoea	t-test
K.4 Knowledge that ORS must be given to child when child has diarrhoea	M-H
K.5 Knowledge of the symptoms which indicate that diarrhoea has become worse	t-test
K.6 Knowledge that when diarrhoea does not stop child should be sent to hospital/clinic	M-H
K.7 Knowledge of the correct ways to prevent diarrhoea	t-test
K.8 Knowledge that the correct way to treat diarrhoea is to give child ORS	M-H
K.9 Knowledge that diarrhoea causes dehydration	M-H
Attitude:	
A.1 The believe that diarrhoea can cause serious illness	M-H
A.2 The believe that diarrhoea can kill	M-H
A.3 The believe that diarrhoea can be prevented	M-H
A.4 The believe that diarrhoea can be treated	M-H
A.5 The believe that diarrhoea is one of the most common children disease	M-H
Practice:	
Preparation of salt/sugar solution by caretakers	t-test

M-H : Mantel-Haenszel test-statistic

t-test: Student's statistical test

Table 7

TESTING FOR DIFFERENCES IN SES OF "FACE-TO-FACE" AND "GROUP" EXPERIMENTAL VILLAGES

Socio-economic Variable	Mantel-Haeszel Statistic [1]
Religion	-2.28
Employment	1.25
Literacy Rate	1.01
Marital Status	0.65
Availability of Coke bottle	0.73

1 Mantel-Haenszel test statistic which has a standard normal distribution. 5% level of significance and a one tail test is assumed.

Table 8

Testing for Differences in the SES of Pairs of Face-to-Face and Group Strategy Villages*

Pairs of Villages	Religion	Employment	Literacy Rate	Marital Status	Coke Bottle
Jinnieta (FF)/ Weala (G)	-1.742	-0.159	-0.961	-0.388	-0.684
Kpakolokoyata (FF)/ RS.S. Bright (G)	-5.381	-0.711	2.81	0.49	-1.212
Konola (FF)/ Cinta (G)	-0.505	0.357	-0.951	-0.184	0.364
Vahyema (FF)/ 26 Gate (G)	3.166	-1.483	0.37	0.707	0.13
Gwebolosu (FF) /William-Barclay (G)	0.911	1.03	-3.449	1.083	-0.692
Kollie Kain Town (FF)/ Massaquoi (G)	-0.205	0.746	1.528	1.549	0.796

* The technique used is testing for differences in proportions. Student-t values are presented in the table. A positive t-value indicates that the socio-economic characteristic of caretakers in the Face-to-Face village exceeds that of caretakers in the Group village; the reverse holds.

With the exception of the last pair (i.e., Kollie Kain Town/ Massaquoi), the t-distribution is approximated by the standard normal (Z) distribution which gives a critical value of 1.96 assuming 5% level of significance. At the same level of significance, and using 25 degree of freedom for this pair of villages, the critical t-value for a two tail test is 2.060.

villages. The same conclusion cannot however be reached in the two cases of religion and literacy rate of caretakers. The case of religion may not be surprising considering the results we obtained when a test was carried out on all experimental villages using the Mantel-Haeszel test. However, the result for literacy rate is surprising, and should therefore give us cause for concern. At least in two pairs (Kpakoloyata (FF)/R.S.S. Bright (G), and Gwebolosu/Williams & Barclay), the differences are significant. It would, however be noted that, whereas in the first pair the Face-to-Face village has higher literacy rate than the Group village, the reverse is true with respect to the second pair. There is thus the possibility of one offsetting the other.

Testing for the Influence of Literacy Rate on the Learning Ability of Caretakers

Nevertheless, it was necessary to be absolutely sure that the difference in literacy rate (if any) do not in anyway contaminate our results regarding the relative efficiency/appropriateness of the two educational strategies. This issue was resolved by investigating whether the literacy rate is correlated in any significant way with the learning ability of caretakers. The investigation was carried out under two scenarios; first assuming that the caretaker is taught with the same method (i.e., within Face-to-Face teaching category on the one hand, and within Group teaching category on the other), and second ignoring the type of educational strategy used to train a caretaker (i.e., for all caretakers combined). The statistical test used is Spearman's Rank Correlation test. Tables 9 and 10 present summaries of the results.

Table 9 TESTING FOR ASSOCIATION BETWEEN LITERACY RATE AND KEY KAP VARIABLES USING PRETEST RESULTS

Rank Correlation Coefficient a/	K.1	K.2	K.3	K.4	K.5	K.6	K.7	K.8	K.9
Face-to-Face b/ Villages	.71	-.14	.49	-.20	.43	.30	.26	.20	.77
Group b/ Villages	-.09	.43	.43	-.71	-.37	-.26	.26	.6	-.66
All Experimental Villages c/	.33	-.04	.18	.41	-.04	.17	.09	.36	.15

a/ These are Spearman's rank correlation coefficients (r). At 5% level of significance r = 0.829 for 6 degrees of freedom and r = 0.497 for 12 degrees of freedom.

b/ Degree of freedom is 6.

c/ Degree of freedom is 12.

Table 10 TESTING FOR ASSOCIATION BETWEEN LITERACY RATE AND KEY ATTITUDE VARIABLES USING PRE-TEST RESULTS

Rank Correlation Coefficient [a]	A.1	A.2	A.3	A.4	A.5	All Attitudes
Face-to-Face Villages [b]	.31	.04	-.60	.45	.03	-.07
Group Villages [b]	-.14	-.92	.14	.42	.09	-003
All experimental Villages [c]	-.04	-.45	-.38	.48	-0.5	-.16

a/ These are Spearman's rank correlation coefficients (r). At 5% level of significance r = 0.829 for 6 degrees of freedom and r = 0.497 for 12 degrees of freedom.

b/ Degree of freedom is 6.

c/ Degree of freedom is 12.

The evidence is obviously in favour of the conclusion that - literacy rate is not correlated with the learning ability of caretakers. Since the literacy level of caretakers is used here as a proxy for socio-economic factors, we can conclude that we need not worry about the possible contamination, by these factors, of the results of the test of relative effectiveness of the alternative educational strategies of Face-to-Face Teaching and Group Teaching.[10]

Effectiveness of Training of the Caretakers

The first hypothesis to be tested may be stated more specifically as follows: Let ΔX be the improvement in average KAP of caretakers of all experimental villages. Then we want to test the hypothesis that $\Delta X = 0$. Since $\Delta X = X_2 - X_1$, where X_1 and X_2 are pretest and post test values of the KAP, we can state the hypothesis as follows: HO: $\Delta X = X_2 - X_1 = 0$ and test it against the alternative that HA: $\Delta X = X_2 - X_1 > 0$.

Appendix IX contains pretest and post test result for the key KAP variables.

10 For detailes of ranking used in computing the rank correlation coefficients see Appendices XII and XIV.

To test this hypothesis, the pre-test and post-test results for all experimental villages therefore are compared. Table 11 summarizes the relevant results. At 5% level of significance, the test shows that the training increased significantly the knowledge of caretakers regarding the factors which cause diarrhoea, the effects of diarrhoea, the symptoms which indicate worsening case of diarrhoea, and the correct ways to prevent diarrhoea, (i.e., K.2, K.3, K.5 and K.7).

There are only two cases in which training did not improve the knowledge or attitude of caretakers. These cases are the knowledge that the caretaker should send the child to the clinic/hospital when diarrhoea does not stop, (K.6) and the attitude of caretakers towards the seriousness of diarrhoea from the point of view of its capacity to cause serious illness (A.1). But this is not a surprising result. The pre-test results show an exceptionally high level of awareness of what to do when diarrhoea does not stop, and of the fact that diarrhoea can cause serious illness (91.9% and 94.7% respectively). There was therefore little room for improvement which could be induced by training.

The responses to the other questions requiring one correct answer, however, showed marked difference between the pre and post training surveys. As Table 11 also shows the Mantel-Haenszel test indicates that the intervention (i.e., the training) had significant positive impact on the attitude of caretakers toward diarrhoea as a killer disease, and as one of the most common diseases of children aged five and below, and towards the prevention and treatment of diarrhoea.

Table 11

Testing for Effectiveness of Training in Experimental Villages

	M-H Statistic[1]	t Statistic[2]	Whether Significant
Knowledge			
K.1 Knowledge of what diarrhoea is	-1.86	-	Yes
K.2 Knowledge of the causes of diarrhoea.	-	3.118	Yes
K.3 Knowledge of the effects of diarrhoea	-	4.004	Yes
K.4 Knowledge that ORS must be given to child when child has diarrhoea	-11.26	-	Yes
K.5 Knowledge of the symptoms which indicate diarrhoea has become worse	-	4.421	Yes
K.6 Knowledge that when diarrhoea does not stop child should be sent to the clinic/hospital	-0.64	-	No
K.7 Knowledge of the correct ways to prevent diarrhoea	-	4.352	Yes
K.8 Knowledge that the correct way to treat diarrhoea is to give child ORS	-8.12	-	Yes
K.9 Knowledge that diarrhoea causes dehydration	-6.76	-	Yes
Attitude			
A.1 The believe that diarrhoea can cause serious illness	-0.37	-	No
A.2 The believe that diarrhoea can kill	-2.56	-	Yes
A.3 The believe that diarrhoea can be prevented	-4.79	-	Yes
A.4 The believe that diarrhoea can be treated	-2.78	-	Yes
A.5 Importance attached to diarrhoea as one of the five common diseases of children	-2.61	-	Yes

1 MH is Mantel-Haenszel test statistic which has a standard normal distribution. 5% level of significance and one-tail test is assumed.

2 At 5% level of significance and degrees of freedom of 22, t = 1.717 for one-tail test.

The knowledge of caretakers regarding what diarrhoea is, (K.7) what to give to child when child has diarrhoea, (K.4), the correct way to treat diarrhoea by giving ORS (K.8), and the fact that diarrhoea causes dehydration (K.9) was improved significantly by the training.

In order to confirm that the improvements in knowledge and attitude reported for the experimental villages are real, a comparative analysis with the control villages is necessary. Table 12 indicates that out of 14 knowledge and attitude items, it is only in one case that there is a significant difference between the pre-test and post-test responses. It will be noted that in this case, the results indicate that the knowledge of caretakers regarding the fact that when diarrhoea does not stop the child should be sent to hospital decreased from the pre-test to the post-test surveys. The conclusion is therefore that in the control villages, where there was no intervention, (i.e., training) the pre-test and post-test results were not significantly different. The difference in these responses in the experimental villages can therefore be attributed entirely to the training which the caretakers received.

Appropriateness of Alternative Educational Strategies

The stage is now set to discuss the tests which provide evidence or otherwise to support the claim that "Face-to-Face" educational strategy is superior to "Group" educational strategy from the point of view of effectiveness. Table 13 forms the basis for the analysis.

Table 12

Testing for Difference between Pre-test and Post-test Results for Control Villages

Item	M-H Statistic[1]	t Statistic[2]	Whether Significant
Knowledge			
K.1	0.9024	-	No*
K.2	-	1.011	No
K.3	-	1.01	No
K.4	0.4535	-	No*
K.5	-	1.747	No
K.6	2.8127	-	Yes*
K.7	-	1.18	No
K.8	0	-	No
K.9	0.086	-	No
Attitude			
A.1	1.647	-	No*
A.2	-1.947	-	No
A.3	-3.744	-	No
A.4	-1.0	-	No
A.5	1.585	-	No*

1 M-H is Mantel-Haenszel test statistic which has a standard normal distribution. 5% level of significance and a one tail test is assumed.

2 At 5% level of significance and degree of freedom of 4, the t for a one tail test is 2.132.

Table 13

Testing for the Relative Effectiveness of "face-to-Face" over and "Group" Educational Strategies (original)

Item	M-H Statistic[1]	t Statistic[2]	Whether Significant[3]
Knowledge			
K.1	-0.0726	-	No
K.2	-	1.52	No
K.3	-	4.63	Yes
K.4	1.0697	-	No
K.5	-	1.25	No
K.7	-	.025	No
K.8	0.1065	-	No
K.9	0.899	-	No
Attitude			
A.2	0.704	-	No
A.3	1.93	-	Yes
A.4	0	-	No
A.5	1.826	-	Yes

1 M-H is Mantel-Hanenszel test statistic which has a standard normal distribution. 5% level of significance and a one tail test is assumed.

2 t is student t-statistic. The degree of freedom is 5.

3 At 5% level of significance Z = 1.64 t = 2.015 for one tail test.

Table 14

The Number of Caretakers Trained and Interviewed During the Pre-test and Post-test and Dropout Rates

	Face-to-Face Teaching	Group Teaching	Total
1. The number of caretakers interviewed during the pre-test	256	251	507
2. The number of primary caretakers interviewed during the pre-test	219	201	420
3. Number of secondary caretakers interviewed during the pre-test	37	50	87
4. The number of caretakers trained	197	202	399
5. The number of primary caretakers trained	166	157	323
6. The number of secondary caretakers trained	31	45	76
7. The number of caretakers interviewed in the post-test	148	175	323
8. Dropout rate during the training (% all caretakers)	23.1	18.9	21.0
9. Dropout rate during the training (% primary caretakers)	24.1	21.1	22.7
10. Dropout rate during training (% secondary caretakers)	16.2	10.0	12.6
11. Dropout rate in post-test (% all caretakers) - No.1*	24.9	13.4	19.1
12. Dropout rate in post-test (% all caretakers) - No.2**	42.2	30.3	36.3

* The dropout rate No.1 for post-test is measured by the number of caretakers who were trained but were not interviewed in the post-test as a percentage of the number of caretakers trained.

** The dropout rate No.2 is the percentage of caretakers who responded to the pre-test but were not interviewed in the post-test.

Out of the twelve questions the response to which were improved by the training, three (one for knowledge and two for attitude) showed a significant superiority of "Face-to-Face" over "Group" training. It is interesting to note that it is only in two cases (K.1 and ~~K.5~~ A.4) that "Group" teaching produced results superior to "Face-to-Face" teaching, but in both cases the test-statistics indicate that the difference may be due to random errors. In one case the difference was zero.

The evidence suggests that our hypothesis that "Face-to-Face" educational strategy is superior to "Group" educational strategy in terms of its effectiveness is therefore sustained. But other factors will have to be considered, e.g., the relative difficulty in training caretakers trained under the two educational strategies.

Testing for the Relative Difficulty in Training

The following are the problems which were encountered during the training of caretakers:

(a) Of the many problems encountered one of them was the translation of the training package to the vernacular, in this case Kpelle. On several occasions the trainers had to spend time discussing various translations until suitable words were accepted by all of them or the majority.

(b) The question of incentives for the village trainers often raised several problems including lack of interest, absenteeism etc. No doubt this can be seen to even affect the quality of training they may have given to the caretakers. Some of them had to be dropped. Cooperation by community was not considered.

(c) The narrow focus of the study, i.e., diarrhoea often resulted in a lack of enthusiasm by the caretakers. They often enquired as to why we did not work on what they saw as more important diseases or symptoms in their environment such as measles, fever, malnutrition, malaria, helminthiases etc etc.

(d) Cooperation from the caretakers and/or their spouses also became a problem on occasions. Often the time they were requested to meet for training did not suit their schedules. This made it difficult, Several visits had to be made by the caretakers will find a suitable time or either party will drop out of the study.

(e) The time of year, i.e., the season, the rains and farming created a negative impact. Often people left their villages to go and live on their farms during the farming season. This caused a high drop out rate in the number of caretakers that were eventually left in the study.

All these contributed to the high percentage of caretakers who were not trained, i.e. drop outs. From Table 14, as many as 21% of all caretakers were not trained, with the drop out rate for Face-to-Face villages at 23.1% against 18.9% for Group teaching villages. The implication of the difference in the drop out rates for the appropriateness of the alternative educational strategies is implied in the nature of the data used to test the hypothesis that there is no difference between the difficulty involved in using the two educational strategies to teach caretakers, against the alternative

hypothesis that it is easier to use the "Group" teaching strategy than the "Face-to-Face" teaching strategy. We test the hypothesis by reference to the drop out rate during training for the two sets of villages receiving "Face-to-Face" and "Group" educational strategies.

Table 14 gives some further information on the drop out rates. The Mantel-Haenszel test indicates that there was significant difference between the drop out rate in "Face-to-Face" villages and "Group" villages, with the rate for the former greater than that for the latter. Hence, the hypothesis that there is no difference in the difficulties encountered in training caretakers under "Face-to-Face" educational strategy and under "Group" educational strategy is rejected. We conclude that it is easier to train caretakers in group than on one-to-one basis. How do you mean this? Easier for the caretakers or for the trainers?

A plausible reason for this result is the fact that trainers were not renumerated and this did not provide sufficient incentive for a trainer to visit a structure sufficient number of time to train a caretaker. It will be noted that "Group" teaching method is less demanding on the trainer than the "Face-to-Face" teaching method, and therefore, the voluntary nature of the training program gives an obvious edge of "Group" educational strategy.

Results of Special Survey on Practice of ORT:

Owing to the low incidence of diarrhoea the opportunity to test for practice of ORS during the regular B.S.2 Survey was limited. An attempt was made to rectify this by administering a Special Survey in which caretakers were asked to prepare salt/sugar/orange solution, and they scored "Poor" (no point) "Average" (1 point), "Good" (2 points) and "Excellent" (3 points).

Two villages (one Face-to-Face and one Group) were selected from each of the three categories. The idea was to observe 20 caretakers in each of the two villages in Category I, 14 caretakers in each of the two villages in Category II, and 10 caretakers in each of the two villages in Category III prepare the ORS. There was therefore an attempt to observe the preparation of the ORS by 88 caretakers distributed equally between the two educational strategies.

Why the sampling size?

The response to the Special Survey was very poor. Only 9 and 23 out of the expected 44 caretakers taught with Group Teaching strategy and Face-to-Face Teaching strategy respectively responded. Inspite of the poor response it was decided to analyse the results.

Table 15 below forms the basis for some inferences.

Table 15 Testing for Practice of ORS

	Group	Face-to-Face	Combined
No. of caretakers responding	9	23	32
Average Scores	1.556	1.087	1.219
Standard Deviation	1.236	0.9	1.008
t-statistic*	1.35	0.464	1.229

* t-statistic is computed under the null hypothesis that the average score in each case is equal to 1. The t-statistic under the null hypothesis that there is no difference between the average scores for Face-to-Face and Group villages is 1.0359. In all four cases, the null hypothesis is not rejected at 5% level of significance.

The performance of the 32 caretakers in the sample was "Average", with an average score of 1.219, which is not significantly different from 1 according to the test. Similarly, the performance of the caretakers in the Group and Face-to-Face teaching categories were just average, inspite of the fact that the caretakers in the latter category scored an average of 1.556 points. Statistical test shows that 1.556 is not significantly differe . from 1. Indeed, the crucial inference is that there is no significant difference between the performances of caretakers who were taught with Face-to-Face and Group teaching strategies. This combined with earlier test results indicate that the evidence on the relative appropriateness of Face-to-Face and Group teaching strategies is indeed mixed.

This could also be due to poor sample size.

Mortality Rate Among Children 5 Years Old or Less

The results of the "Mortality" Questionnaires which was administered during the post-test show that six children in the "Experimental Villages" and 6 in the "Control Villages" had died since the last visit. For the Experimental villages, it means six children out of estimated 600 children had died within a period of approximately three months, which gives a mortality rate in this age group of 40 per thousand. The mortality rate for the "Control Villages" is estimated to be 39.2 per thousand upon the basis of 6 deaths within a period of 9 months out of estimated 204 children 0-5 years old. These figures give a mortality rate of children in this age group for all villages in the study (experimental and control villages combined) of 39.8 per thousand.

There is no significant difference between the mortality rates for the control and experimental villages. However, the majority of the deaths in the control villages might have been caused by diarrhoea. This is because although only 2 out of the 6 children who died in the control villages were reported to be having running stomach before death, vis-a-vis only one child in the experimental villages, as many as 5 out of 6 of the children who died in the control villages got dry before death, while 4 out of the 6 children in the experimental villages showed this symptom before death.

Another important observation which may be made is that of the eight villages (six experimental and two control) in which caretakers reported death of children 0-5 years old since last visit, all but one (Cinta) had stream as source of water. The people in Cinta

obtained their water from wells; also three other villages had wells in addition to fetching water from streams.

Finally, of the 6 experimental villages in which caretakers reported death of their children 0-5 years old, only two were group villages while 4 were Face-to-Face Villages. The very high number of deaths of children between 2 and 4 years old in one control village R.I.E. Bright, need further investigation to ascertain the possibility of an outbreak of an epidemic in the village. Five children under five died within a period of nine months, four of them were 2-4 years old, in a village with an estimated number of 107 children - a mortality rate of 62.9 per thousand!

any ability to account for social support in group village?

V. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

From the results and findings of the ORT - OR Study - Liberia, the following conclusions can be made:

1. That salt/sugar/orange solution stands out clearly as the most appropriate oral rehydration solution that can be used for oral rehydration therapy in rural Liberia.

2. That irrespective of the Educational Strategy used for the training, the caretakers' knowledge on diarrhoea, its aetiology, its correct management using ORS, its sequelae of dehydration and its prevention significantly increased.

3. That training had a significant positive impact on the attitude of caretakers regarding diarrhoea as a killer disease, as one of the most common diseases of children aged five and below and towards the prevention and treatment of diarrhoea.

4. In terms of effectiveness, "Face-to-Face" educational strategy was found to be superior to "Group" educational strategy. However, on examining the difficulties involved in using the two educational strategies, it is also concluded that it is easier to train caretakers using the "Group" educational strategy than "Face-to-Face" educational strategy.

in K+A
not P or IMR

These conclusions will be significant in Health education programs.

From the results of a study of the village profiles made, several conclusions can be made which have public health significance.

1. There was no pipe-borne water in any of the 22 villages studied. Drinking water facility was quite poor.
2. There were no primary health care facilities in most villages. Only 5 of the villages had clinics while only 4 of them had drug stores.
3. Most villages did not have public toilets or rubbish dumping sites. Environmental sanitation was quite poor in the villages.
4. Transportation was poor in these villages.
5. Community Organizations of these villages could be greatly improved which could mobilize the communities with obvious benefits such as self help projects ~~for themselves.~~
6. Previous development projects were few and far between while the results also suggest that cottage industry was available in less than half of the villages.

Several conclusions can be made based on the results and findings regarding the socio-economic characteristics of the experimental villages and the caretakers.

1. On the age structure of the villages, the results showed that the dependant age-group i.e. 0-14 years was very high. This has family planning implications.
2. On education, the percentage of persons aged 5 years and above going to school was very low. In some villages it was as low as 4% of the population with pre-grade or no education at all being rather high eg. 85% in some places. It was found that the literacy rate in the experimental villages was very low - about

14% in some villages.

3. On employment, it was found that the percentage of unemployed people in the population was quite low. Most people were farmers.

4. Electricity was not a resource enjoyed by most people. Infact in many villages there was no electricity.

The socio-economic status of the caretakers in the experimental villages revealed that

1. Their average age was about 30.4 years whiles about 94.8% of the caretakers were females. Obviously, taking care of children is a female business in our environment.

2. It was found that most of our caretakers are farmers and traders. While about 10% of them considered themselves unemployed.

3. The literacy rate among the caretakers was generally low while their spouses were a little more literate. This is so in developing countries i.e. the literacy rate of males is often higher than that of the women.

4. The results also showed that the higher the rank of a category, the greater the percentage of caretakers who obtain water from wells, conversely, the lower the rank of a category, the greater the percentage of caretakers who obtain water from streams.

5. It was found that ingredients for the preparation of oral rehydration solution - as selected by the study - were always available to the caretakers.

The following conclusions can be made regarding the knowledge, attitude and practice of ORT of caretakers in rural Liberia where ORT PHC activities are absent:

1. A remarkably high percentage (88%) of caretakers know what diarrhoea is.
2. Most caretakers believe that diarrhoea is a killer disease and that if it does not stop the child should be sent to the clinic.
3. Majority of caretakers (69.3%) are of the opinion that diarrhoea can be prevented. However most of them do not know the correct preventive methods. Inspite of the fact that a high percentage of caretakers (96.6%) believe that diarrhoea can be treated, there was little knowledge of ORT treatment of diarrhoea.
4. Caretakers' knowledge of UNICEF pack was also virtually nil.
5. Indeed, caretakers generally send their children to the clinic and/or give country medicine when their children have diarrhoea: 93.8% of the caretakers did that.

Recommendation

From the Conclusions of the Study, it is recommended that:

1. A Health Education project on Diarrhoea, its aetiology, its sequelae and its proper management using Oral rehydration solution be instituted in Liberia.

2. A nationwide program to teach caretakers the preparation of sugar/salt/orange solution as the appropriate oral rehydration solution for oral rehydration therapy be instituted in Liberia.

3. What ever educational strategy is used, whether face-to-face or group method, the training should include visual aids, demonstrations, role play and getting them to physically practice the preparation of the oral rehydration solution.

Any info on training methods content et.

"Health for all by the year 2000" will be meaningless unless basic facilities such as wholesome drinking water, adequate levels of environmental sanitation and primary health care services are enjoyed by our rural population.

4. In this light and from the conclusions based on the Village Profile results, it is recommended that projects for the provision of wholesome drinking water be instituted in our rural areas to help towards the reduction of diarrhoeas and water-borne diseases.

5. It is recommended that projects for community organization be instituted in rural Liberia. This will mobilize, motivate and train persons to build their own latrines, dig wells, clean their environment and properly take care of their refuse etc. With a bit of encouragement they can even build a few rooms for a primary health care facility.

6. It is recommended that every effort be made to reduce the high birth rate in Liberia, Thereby eventually reducing the dependent population. This will improve the economic and social status of families. Innovative programs for teen-age girls, men and women, Cottage Industries, child spacing etc should be considered.

7. It is recommended that efforts be made to raise the level of literacy expecially of our rural folk. Adult education should be considered.

Finally, perhaps the most important end point is to promote positive health and reduce morbidity and mortality. All activities should therefore have a strong bias towards Health education on relevant and appropriate topics, plus a maximum effort to protect our children against communicable diseases.

VI. ADMINISTRATION

The study was conducted under the auspices of the Department of Public Health and Preventive Medicine of the A.M. Dogliotti College of Medicine, University of Liberia.

An ORT - OR Study Steering Committee was formed to provide technical input and direction of the study team policy committee which was made up of the Project Principal Investigator, Project Social Scientist and the Project Field Manager.

The Steering Committee was composed of knowledgeable and experienced persons who are either members of the Technical Committee of Combatting Childhood Communicable Diseases Program (CCCD) or hand-picked due to their knowledge and experience with oral rehydration research.

Members are listed in Figure 18. Some policy makers of the Ministry of Health and Social Welfare provided substantial input and direction for the study. Figure 19 depicts the relationship of the various institutions which provided direction, policy and technical input for the study. The organizational chart of the study is shown in Figure 20.

The Social Scientist of PRICOR who was dealing with this project produced substantial technical input into the project from start to finish.

The core of the project staff was made up of the Project Principal Investigator, the Project Field Manager and the Project Social Scientist.

Project Principal Investigator - Moses K. Galakpai

Originally, he was supposed to be responsible for the final research proposal, for the overall project scheduling, implementation, and the overall administration of the project. He was also scheduled to be responsible for the management of the project resources, reporting of study results and financial reports, progress and research reports to PRICOR and relevant institutions. But in July 1984, the Principal Investigator was appointed Deputy Chief Medical Officer for Preventive Services responsible for eight programs/Divisions within the Ministry of Health and Social Welfare. He is also the National Primary Health Care Coordinator. Therefore, the Field Manager had to assume the tasks of the Principal Investigator in addition to that of the Field Manager.

The Principal Investigator assisted in the design of data collection instruments, data analysis, and interpretation. He participated in the training of interviewers and trainers of caretakers and in their supervision.

He was responsible for the organization of the one day colloquium for dissemination of the project funded by PRICOR and coordinated the writing of the final report.

Project Field Manager - Kobina Bentsi-Enchill

He was responsible for the final research proposal, for the overall project scheduling, implementation, and the overall administration of the project. He was also responsible for the management of the project resources, reporting of study results and financial reports, progress and research reports to PRICOR and relevant institutions.

He was responsible for the day to day administration of the project, including management of project funds. He wrote bimonthly reports with substantial input from the Social Scientist. He developed the training materials, selected the trainers and the interviewers, and had the major responsibility for supervision. He assisted in the writing of the final report. Because of the unexpected over load of work in the field, and inability of the Principal Investigator to put in more than 25% of his working time, it was necessary for the project Field Manager's time to be increased to 50%, except for 3 months.

Project Social Scientist - Jacob K. Atta

He was primarily responsible for the project design, selection of sample sizes, design of data collection instruments. His major responsibility was the data collection, analysis and interpretation. He assisted also in the training of interviewers. He was responsible for the analysis of results in the bimonthly reports, and assisted in the writing of the final report. He assisted in organization of the one day colloquium.

Research Assistant - Josephus Cooper

His major responsibility was the supervision of village level ORT trainers. Because of inefficiency, it was necessary to reduce his input before the end of the project.

Research Assistant - Tiawan Saye Gonglɔe/Kwasi Osei Kufuor

The major responsibility of the research assistant was to assist the Social Scientist in the collection and analysis of data. The first research assistant had to leave the project for personal reasons and so her was replaced by Kwasi Osei Kufuor.

Secretary - Yaa Asantewa Kwami

The secretary did the secretary work and performed other routine activities, such as distribution or posting of the reports and letters. Her other responsibility was the keeping of the project account. She also assisted in the organization of the PRICOR Colloquium.

Consultants

The services of two consultants were employed in the project. W.B. Ward, Dr. PH (Health Education) helped with the concept design of the project.

Larry Moulton, Dr. PH, candidate in statistics then of Johns Hopkins School of Hygiene and Public Health, helped with selection of study sites, study design and sampling procedures of the pilot and field tests. His services were not utilized for the data analysis as was originally planned.

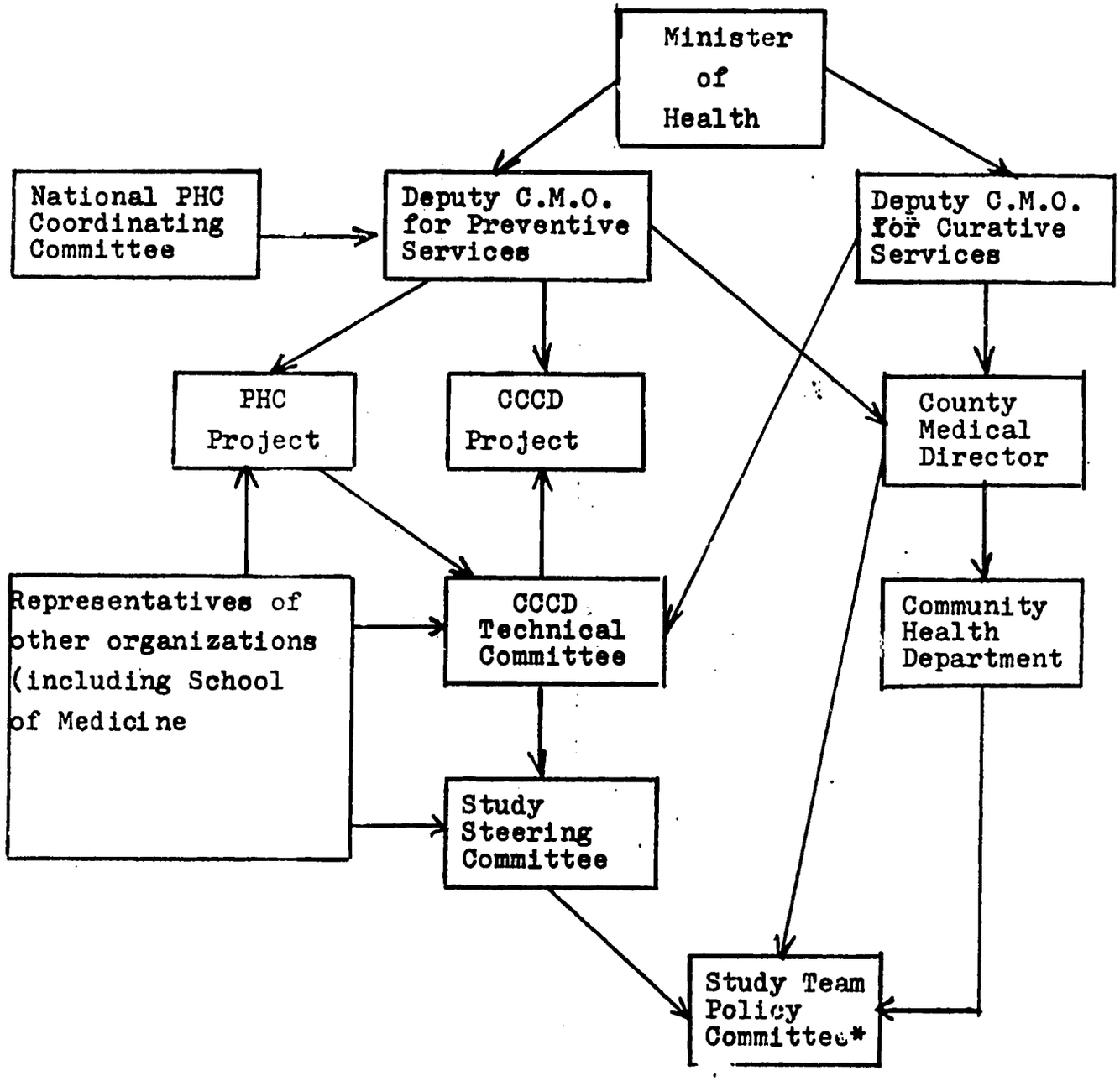
In addition, Medical Students' services were utilized in the survey for the collection of baseline data.

Figure 18: Members of the Study Steering Committee

Mr. Alan Foose	Health Development Officer Project Officer for CCCD Project USAID/Liberia
Mr. John Prall	Assistant Minister Bureau of Planning, Research and Development, Ministry of Health and Social Welfare
Dr. Benson Barh	Project Manager of SER, Primary Health Care project, Ministry of Health and Social Welfare
Mr. Alfred Kromah	Acting Director, Inservice Education Division, Ministry of Health and Social Welfare
Dr. Wilhelmina Holder	CCCD Project Coordinator Public Health Physician, Training Officer/ EPI
Dr. M.K. Galakpai	Deputy Chief Medical Officer for Preventive Services, National Primary Health Care Coordinator/Ministry of Health and Social Welfare
Dr. Albert G. Boohene	Pediatrician World Health Organization Consultant CCD Pilot Project
*Miss Magdalene David	Research fellow, Insitute of Research University of Liberia
*Miss Karen Tomkins	Christian Health Association of Liberia

* These are non-members of the technical committee for CCCD.

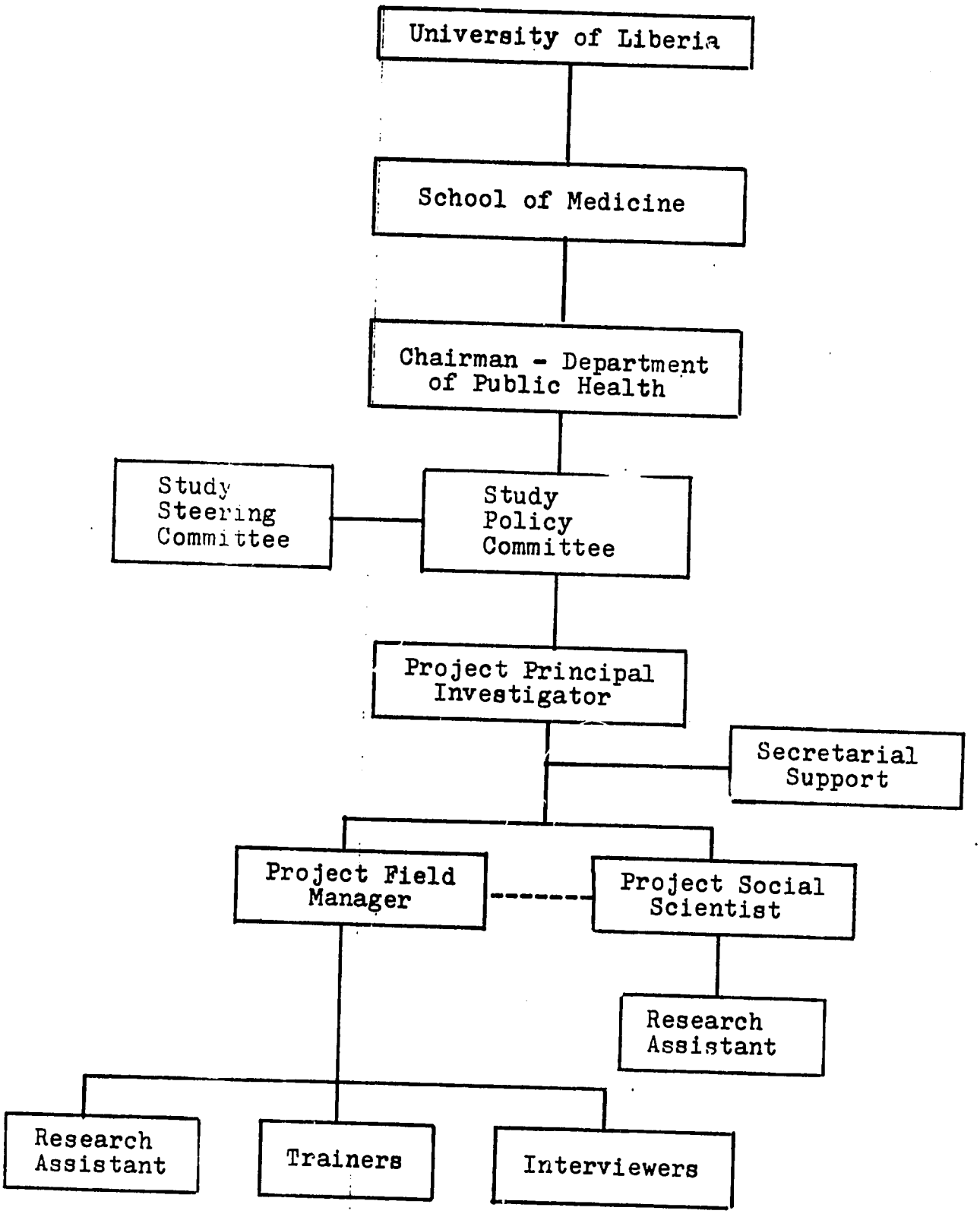
Figure 19: Relationships of Various Institutions Involved in Study - Policy and Technical Input



*Includes Principal Investigator
Project Social Scientist
Project Field Manager

Figure 20

Organization Chart



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Liberia/Gbalakpai
Working Copy

A P P E N D I C E S

Appendix II

EXPANDED VILLAGE CHARACTERISTICS

RANKING OF VILLAGES

	Average Score	WE	GW	KK	ZQ	VY	NY	CI	KN	JI	WB	HA	KP	26G	RIEB	RSSB
1. Well	8.33	x			x			x	x		x	x	x			
2. Stream	3	x	x	x	x	x	x			x			x	x	x	x
3. Electricity	5.67	x					x	x	x	x	x	x	x		x	
4. Market	6				x					x			x			
5. Vehicle	4.33	x	x		x			x			x		x	x	x	x
6. Shop/store	6	x		x	x	x	x	x	x	x	x	x	x	x	x	
7. Football field	5	x	x		x	x	x	x	x	x			x	x	x	x
8. Football team	5.33	x			x	x	x	x	x	x		x	x	x	x	x
9. School	5.33				x	x		x	x	x				x	x	
10. Church	4.67	x	x	x	x	x	x	x	x	x		x	x	x	x	
11. Mosque	4.67	x											x			
12. Public toilet	7.67						x					x	x		x	x
13. Clinic	7.7							x		x	x					
14. Active Health Development Committee	6.67	x	x	x		x	x		x							x
15. Active Village Development Committee	7	x		x	x	x	x			x				x	x	x

		WE	GW	KK	ZQ	VY	NY	CI	KW	JI	WB	MA	KP	26G	RIEB	RSGB
16. Town Hall	5	x	x		x	x	x		x	x	x		x			x
17. Private electricity	1.33	x														
18. Corn mill	4												x			
19. Cottage industry	5.67	x	x		x	x	x	x	x	x		x				
20. Festivals	3.33			x			x			x				x	x	x
21. Previous Development projects	4.33						x		x	x						
22. Externally funded projects	5.33									x						
23. Drug store	6.67	x			x					x						x
24. Community Organization	5.33	x		x		x		x		x	x		x	x		
25. Community activity	5.33	x	x	x	x		x		x	x			x			
26. Private toilets*	6.33	5.03	0.41	0.7	4.91	7.63	5.25	4.2	7.69	7.59	10.22	5.42	7.39	10.35	7.74	10.02
27. Children 6-14 years in school*	6.33	5.70	5.59	4.13	1.75	10.18	1.7	10.92	7.86	9.66	6.99	0.59	4.69	7.78	9.95	5.10
28. Literacy*	8	9.60	5.54	[illegible]	6.73	9.60	4.03	11.63	9.95	8.12	7.95	4.32	7.98	7.48	11.92	9.25
29. Cement/concrete/stone structures*	6	4.63	3.30	1.51	4.21	5.73	1.22	5.16	7.50	9.10	8.10	0	3.03	11.82	7.74	17.2
30. Population**	.05	33.95	6.8	10.1	13.6	8.65	6.65	15.1	14.0	17.8	13.25	6.75	18.0	12.0	20.55	16.55

	WE	GW	KX	ZQ	VY	NY	CI	KN	JI	WB	MA	KP	26G	RIEB	RSSB
Total points	148.91	61.31	63.57	108.86	100.99	93.52	110.34	114.33	148.93	88.84	60.42	121.42	98.75	115.24	117.79
Ranking	2	14	13	8	9	11	7	6	1	12	15	3	10	5	4

KEY

WE	-	Wealah
GW	-	Gwebolosu
KK	-	Kollie Kain Town
ZQ	-	Zanata Headquarters
VY	-	Vayemah
NY	-	Nyaikata
CI	-	Cinta
KN	-	Konola
JI	-	Jinnieta
WB	-	Williams/Barclay
MA	-	Massaquoi
KP	-	Kpakolokoyata
26G	-	26 Gate
RIEB	-	R.I.E. Bright
RSSB	-	R.S.S. Bright

* "Factors" computed upon the basis of these average scores were used to arrive at the points for each village. See body of report for more detailed explanation.

**The factor 0.05 for population was arrived at after a number of experimentations.

Appendix III

SUMMARY OF STATISTICS OF FIELD TEST - BS.1 - PRE TEST*

	WE	GW	KK	ZQ	VY	NY	CI	KN	JI	WB	MA	KP	26G	RIEB	RSSB
1. Number of structures	67	26	34	49	27	28	40	39	70	34	20	51	32	40	32
2. Number of households	181	35	40	74	34	32	51	52	96	64	31	73	47	85	90
3. Total number of persons in village (population)	679	136	202	272	173	133	302	280	356	265	135	360	240	411	371
4. No. of households per structure	2.78	1.35	1.18	1.51	1.26	1.14	1.27	1.33	1.37	1.88	1.5	1.43	1.47	2.13	2.81
5. No. of persons per structure	10.13	5.2	5.94	5.55	6.4	4.75	7.55	7.18	5.09	7.79	6.75	7.06	7.5	10.28	11.59
6. No. of persons per household	3.75	3.9	5.05	3.68	5.09	4.16	5.92	5.38	3.71	4.1	4.35	4.93	5.11	4.84	4.1
7. No. of primary caretakers	76	14	28	35	25	10	30	32	42	45	16	39	25	58	48
8. No. of secondary caretakers	15	6	3	12	5	5	13	9	4	4	3	9	7	4	12
9. No. of children 5 years or less	142	21	42	74	40	25	65	47	70	75	34	73	46	97	72**
10. No. of children 5 years or less per primary caretaker	1.87	1.5	1.5	2.1	1.6	2.5	2.17	1.47	1.67	1.67	2.13	1.87	1.84	1.67	1.5
11. Percentage of males	52.4	54.4	45.5	57.0	43.9	54.1	48.0	47.9	48.3	49.1	45.2	49.7	50.8	44.0	59.3
12. Percentage of females	47.6	45.6	54.5	43.0	56.1	45.9	52.0	52.1	51.7	50.9	54.8	50.3	49.2	56.0	40.7
13. Percentage 0-5 years old	20.9	15.4	20.8	27.2	23.1	18.8	21.5	16.8	19.7	28.3	25.2	20.3	19.2	23.6	19.7
14. Percentage 6-14 years old	18.0	27.2	21.3	12.5	27.8	19.5	21.5	22.9	26.7	20.0	18.5	28.1	24.6	23.8	23.2
15. Percentage 15-64 years old	59.0	51.5	54.5	56.6	43.9	56.4	51.7	56.0	46.9	50.9	53.3	49.7	51.2	49.9	56.6
16. Percentage 65 years old or more	2.1	5.9	3.5	3.7	5.2	5.3	5.3	4.3	6.7	0.8	2.9	1.9	5.50	2.7	0.5
17. Percentage of persons aged above 5 years in school	13.0	12.5	13.8	5.1	34.6	6.5	29.1	20.4	29.1	16.8	3.0	16.0	20.8	36.6	27.9

	WE	GW	KK	JQ	VV	TV	OI	KN	JI	WB	MA	KP	26G	RIBB	RS[illegible]
18. % of children 6-14 years in school	38.5	57.8	27.9	11.8	68.8	11.5	73.8	53.1	65.3	47.2	4.0	31.7	52.5	67.3	54.7
19. % of population with pre-grade/no education	74.8	81.6	83.7	82.4	72.3	85.0	67.2	66.4	73.0	76.2	87.4	81.7	77.1	66.4	71.2
20. % of population with grade school education	24.9	18.4	15.8	17.3	27.7	13.5	32.1	33.2	26.4	23.4	12.6	18.3	21.7	32.6	28.6
21. % of population with above grade school education	0.3	0	0.5	0.3	0	0	0.7	0.3	0.6	0.4	0	0	1.2	1.0	0.2
22. % of population aged above 5 years who are literate	33.1	19.1	20.0	23.2	33.1	13.9	40.1	34.3	28.0	27.4	14.9	27.5	25.8	41.1	31.9
23. Primary economic activity: % of adults working	75.7	83.3	74.4	86.6	71.8	74.4	66.9	69.8	70.2	74.5	76.3	81.2	57.0	69.4	58.5
24. Primary economic activity: % of adults housekeeping	10.1	5.1	4.3	0.6	4.7	6.1	8.7	3.6	6.3	12.4	1.3	7.5	9.6	6.5	19.8
25. Primary economic activity: % of adults retired	3.9	6.4	6.0	3.7	9.4	9.8	4.1	4.7	11.0	3.6	9.2	3.2	8.9	2.8	1.9
26. Primary economic activity: % of adults unemployed	4.5	1.3	6.8	6.1	7.1	4.9	9.3	8.9	5.8	2.9	9.2	3.2	9.6	1.9	3.8
27. Occupation: % of working people farming	14.6	49.2	60.9	62.0	59.0	86.9	43.5	66.1	38.1	43.1	86.2	73.5	15.6	36.7	11.3
28. Occupation: % of working people trading	25.2	4.6	6.9	7.7	9.9	6.6	10.4	11.0	17.9	24.5	5.2	11.3	33.8	17.3	[illegible]
29. Occupation: % of working people teaching	9.6	36.9	17.2	14.1	21.3	0	25.7	7.6	1.6	2.9	1.7	4.0	14.3	15.0	[illegible]

	WE	GW	KK	ZQ	VY	NY	CI	KN	JI	WB	MA	KP	26G	RI33	RSSB
30. Occupation: % of working people in white color jobs	6.4	1.5	3.4	2.1	3.2	0	8.7	5.1	6.0	1.0	0	1.3	6.5	0	1.6
31. Occupation: % of working people who are drivers	8.0	1.5	2.3	2.1	1.6	1.6	2.6	3.4	0	4.9	1.7	1.3	14.3	8.0	1.6
32. Occupation: % of working people who are artisans etc	5.7	0	1.1	3.5	0	0	1.7	2.5	2.2	1.0	0	2.0	0	4.7	0
33. Occupation: % of working people in other occupation	30.6	6.2	8.3	8.5	4.9	3.8	4.3	4.2	14.1	22.5	5.2	6.6	15.6	25.3	12.1
34. Work status: % of population who are paid employees	27.0	16.9	12.4	14.0	11.0	3.0	15.6	8.9	14.6	12.8	3.7	4.4	11.3	16.3	25.6
35. Work status: % of population who are self employed	24.9	33.1	31.7	38.6	24.3	46.6	24.8	30.7	23.3	32.1	40.0	40.8	23.3	23.1	18.9
36. Work Status: % of population who are students	10.3	12.5	10.9	3.7	26.6	5.3	22.8	20.4	23.3	12.1	3.0	12.8	21.7	28.0	22.4
37. Work status: % of population who are unemployed	2.8	0.7	4.0	3.7	3.4	3.0	5.3	5.4	3.1	1.5	5.2	1.7	5.4	1.0	2.2
38. Work status: % of population not applicable	34.4	36.0	39.6	40.0	32.4	42.1	28.8	30.0	32.6	41.5	48.1	39.7	35.4	31.1	30.7
39. Work status: % of population with other work status	0.6	0.7	1.5	0	2.3	0	2.7	4.6	3.1	0	0	0.6	2.9	0.5	0.2
40. % of households with relative working outside village	23.2	28.6	20.0	45.9	52.9	40.6	35.3	28.8	39.6	37.5	25.8	34.2	38.3	8.2	35.6
41. % of heads of household who are Christians	52.2	60.0	57.5	40.6	50.0	68.8	64.7	53.8	62.1	53.2	51.6	41.1	25.5	58.3	30.0

	WE	GW	KK	ZQ	VY	NY	CI	KN	JI	WB	MA	KP	26G	RIEB	RSSB
42. % of heads of household who are muslims	13.9	5.7	2.5	21.6	2.9	0	5.9	1.9	7.4	11.3	0	37.0	12.8	7.2	0
43. % of heads of households with other religion	1.7	5.7	0	0	0	0	0	0	1.1	0	0	0	0	0	2.2
44. % of heads of households with no religion	32.2	28.6	40.0	37.8	47.1	31.2	29.4	44.2	29.5	35.5	48.4	21.9	61.7	34.5	67.8
45. % of structures with mud/wood construction	73.1	80.8	91.2	75.5	66.7	92.9	70.0	56.4	47.1	50.0	100.0	82.4	31.3	55.0	0
46. % of structures with mud/cement or stone/concrete construction	26.9	19.2	8.8	24.5	33.3	7.1	30.0	43.6	52.9	47.1	0	17.6	68.7	45.0	100.0
47. % of structures with zinc roofing	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
48. % of households with working radios	47.0	25.7	62.5	45.9	38.2	45.2	52.9	46.2	41.7	60.9	38.7	53.4	31.9	69.4	48.9
49. % of households with cups	97.2	100.0	100.0	100.0	100.0	100.0	98.0	100.0	96.8	98.4	96.8	98.6	97.9	98.8	100.0
50. % of households with head's bed made of board	79.3	77.1	66.7	77.0	79.4	80.0	62.7	90.4	70.5	60.9	60.0	69.9	78.7	81.2	78.7
51. % of households with cutlery	22.8	17.1	7.5	18.9	21.2	12.5	25.5	29.4	23.2	14.1	6.5	13.7	23.4	16.5	11.4
52. % of households with working kerosine stove	1.7	0	0	0	0	3.1	2.0	5.9	1.0	1.6	0	2.7	2.1	7.1	0
53. % of households with coal pot	15.6	2.9	10.0	4.2	26.5	0	9.8	19.2	12.8	7.8	3.2	2.7	12.8	10.6	1.1
54. % of households with working watch	49.2	8.6	15.0	27.0	29.4	15.6	45.1	35.3	31.3	43.8	22.6	32.9	37.0	51.8	40.0

	WE	GW	KK	ZQ	VY	NY	CI	KN	JI	WB	MA	KP	26G	RIEB	RSSB
55. % of households with metal cooking utensils	98.3	100.0	100.0	100.0	97.0	100.0	100.0	100.0	98.9	98.4	100.0	98.6	97.9	100.0	100.0
56. % of households with private toilet	35.9	2.9	5.0	35.1	55.9	37.5	30.0	54.9	54.2	73.0	38.7	52.8	73.9	55.3	71.6
57. % of heads of household with bed made of board	79.3	77.2	65.0	73.0	73.5	83.9	68.6	88.5	64.6	85.9	58.1	67.1	70.2	81.2	73.3
58. % of heads of households with bed made of iron	9.5	17.1	20.0	23.0	20.6	6.5	7.8	7.7	30.2	12.5	32.2	21.9	17.0	5.9	4.5
59. % of heads of households with bed made of sticks	11.2	5.7	17.5	2.7	2.9	9.7	23.5	1.9	3.1	1.6	9.7	11.0	12.8	14.1	20.0
60. % of heads of households with bed made of other materials or with no bed	1.5	0	0	1.3	5.9	0	0	1.9	2.1	1.6	0	1.4	0	0	2.2
61. % of heads of household with mattress made of grass	32.2	31.4	35.0	52.8	41.2	61.3	33.3	36.5	32.3	43.5	41.9	57.5	46.8	31.8	30.0
62. % of heads of households with mattress made of sponge	48.3	51.4	37.5	29.2	20.6	32.3	33.3	23.1	31.3	35.5	35.5	27.4	27.7	57.6	48.9
63. % of heads of households with mattress made of spring	18.3	17.2	30.0	16.7	32.4	6.5	29.4	38.5	25.0	24.2	22.6	16.4	27.7	10.6	21.1
64. % of heads of households with mattress made of other materials or with no mattress	1.6	0	0	1.4	5.9	0	3.9	1.9	11.4	1.6	0	0	0	0	0
65. % of heads of households with mattress made of sponge and spring	66.6	68.6	67.5	45.9	53.0	38.8	62.7	61.6	56.3	59.7	58.1	43.8	55.4	68.2	70.0

	WE	GW	KK	ZQ	VY	NY	CI	KN	JI	WB	MA	KP	26G	RIEB	RSSB
66. % of households with electricity	32.0	0	0	0	0	3.1	13.7	15.4	10.4	32.8	0	9.5	0	61.2	0
67. % of households with electricity who use ice box	15.5	0	0	0	0	100	57.1	62.5	70.0	28.6	0	42.9	0	34.6	0
68. % of households with electricity who use iron	24.1	0	0	0	0	100	38.6	25.0	40.0	23.8	0	42.9	0	17.3	0
69. % of households with electricity who use electric stove	6.9	0	0	0	0	0	0	25.0	0	0	0	0	0	5.8	0
70. % of households with electricity who use TV	12.1	0	0	0	0	0	28.6	37.5	10.0	0	0	0	0	23.1	0
71. % of households with electricity who use radio	62.1	0	0	0	0	100	71.4	50.0	40.0	61.9	0	14.3	0	84.6	0
72. % of households with electricity who use heater	12.1	0	0	0	0	0	0	12.5	0	4.8	0	0	0	1.9	0
73. % of households with electricity using fan	49.3	0	0	0	0	100	14.3	12.5	40.0	23.8	0	0	0	46.2	0
74. % of households with electricity using other appliances	1.7	0	0	0	0	0	0	25.0	10.0	4.8	0	0	0	1.9	0
75. % of households with electricity using no appliances	24.1	0	0	0	0	0	0	12.5	0	23.8	0	28.6	0	11.5	0

KEY

WE - Wealah

GW - Gwebolosu

KK - Kollie Kain Town

ZQ - Zanata Headquarters

VY - Vayemah

NY - Nyaikata

CI - Cinta

KN - Konola

JI - Jinnieta

WB - Williams/Barclay

MA - Massaquoi

KP - Kpakolo'koyata

26G - 26 Gate

RIEB - R.I.E. Bright

RSSB - R.S.S. Bright

* The percentage are calculated as of the number of responses.

**There was one case of no response as to who the caretaker of the child who is 5 years old or less.

Appendix IV

SES OF PILOT VILLAGE AND EXPERIMENTAL VILLAGES

		Pilot Village	Experimental Villages
1.	No. of households per structure	1.42	1.67
2.	No. of persons per structure	6.08	7.33
3.	No. of persons per household	4.28	4.38
4.	No. of caretakers per household	0.53	0.64
5.	Sex composition of population: % of Males	50.7	50.3
6.	Sex composition of population: % of Females	49.3	49.7
7.	Age Composition: % of 0-5 years old	20.8	21.4
8.	Age composition: % 6-14 years old	20.1	22.2
9.	Age composition: % 15-64 years old	54.0	53.1
10.	Age composition: % of 65 years old & above	5.0	3.4
11.	No. of children 0-5 years old per caretaker	1.68	1.47
12.	No. of children 0-5 years old per household	0.89	0.94
13.	Percentage of children 6-14 years old in school	50.8	48.0
14.	Percentage of with pregrade/no education	73.3	75.0
15.	Percentage with grade school education	26.5	24.6
16.	Percentage with college education	0.2	0.4
17.	Percentage of literate people	25.7	23.5
18.	Econimic Activity: % of adults working	68.6	72.2
19.	Economic Activity: % of adults housekeeping	9.7	8.0
20.	Economic Activity: % of adults retired	5.4	5.2
21.	Economic Activity: % of adults unemployed	4.3	5.4
22.	Occupation: % of working adults farming	63.6	43.9
23.	Occupation: % of working adults trading	9.1	15.2

		Pilot Village	Experimental Villages
24.	Occupation: % of working adults tapping	15.7	16.1
25.	Occupation: % of working adults in other occupation	11.6	24.7
26.	Work Status: % of population who are paid employees	10.9	15.3
27.	Work Status: % of population self-employed	32.4	28.7
28.	Work Status: % of student-population	17.8	16.5
29.	Work Status: % of population unemployed	2.5	3.2
30.	Work Status: % of population unemployed with other work status	3.1	1.2
31.	% of households with relative working outside	18.7	31.5
32.	Religion of Head of Household: % Christians	64.7	50.4
33.	Religion of Head of Household: % Muslims	5.8	10.4
34.	Religion of Head of Household; % with no religion	29.5	38.4
35.	Construction material of outer walls: % with stone/concrete	7.9	4.4
36.	Construction material of outer walls: % with mud/wood	66.9	64.7
37.	Construction material of outer walls: % with mud/cement plastering	12.2	30.7
38.	Roofing materials: % with zinc	98.6	100.0
39.	Percentage of household with working radio	43.9	48.7
40.	Percentage of household with cups	99.3	98.6
41.	Percentage of household with board bed	79.9	75.0
42.	Percentage of household with cutlery	55.4	18.5
43.	Percentage of household with working stove	2.2	1.9
44.	Percentage of household with working watch	27.3	36.6

		Pilot Village	Experimental Villages
45.	Percentage of household with metal cooking utensils	83.5	99.2
46.	Make of bed of head of household: % with board and/or iron	87.1	89.5
47.	Make of bed of head of household: % with sticks	8.6	10.1
48.	Percentage of heads of household with no bed	4.3	0.5
49.	Make of mattress of head of household: % with grass	39.6	38.7
50.	Make of mattress of head of household: % with sponge, spring and spring/sponge	51.0	59.9
51.	Make of mattress of head of household: % with other materials	7.2	1.6
52.	Percentage of households with electricity	10.8	16.5
53.	Percentage of households with electricity who have ice box	66.7	32.5
54.	Percentage of households with electricity who have iron	13.3	24.5
55.	Percentage of households with electricity who have electric stove	6.7	5.5
56.	Percentage of households with electricity who have Television	6.7	15.3
57.	Percentage of households with electricity who have radio	66.7	66.3
58.	Percentage of households with electricity who have fan	40.0	39.3
59.	Percentage of households with electricity who have other appliances	20.0	9.8

Appendix V

FIELD TEST: PRE-TEST RESULTS: SES OF CARETAKERS OF EXPERIMENTAL VILLAGES

SES	CATEGORY I	CATEGORY II	CATEGORY III	TOTAL
1. Number of Caretakers	238	146	118	502
2. Number of Households	191	97	93	381
3. Number of Structures	144	87	78	309
4. Number of Household per Structure	1.33	1.11	1.19	1.23
5. Number of Caretakers per Structure	1.65	1.68	1.51	1.62
6. Number of Caretakers per Household	1.25	1.51	1.27	1.32
7. Percentage of Primary Caretakers	83.2	76.0	85.6	81.7
8. Average age of Caretakers	29.4	31.9	30.6	30.4
9. Percentage of Female Caretakers	94.1	95.2	95.8	94.8
10. Religion of Caretakers:				
(a) Percentage of Christians	56.3	67.1	69.5	62.5
(b) Percentage of Muslims	12.6	3.1	5.9	8.4
(c) Percentage with no religion	31.1	29.5	24.6	29.1
11. Primary occupation of Caretakers:				
(a) Percentage of Farmers	28.2	43.2	50.4	37.7
(b) " of Traders	32.4	27.4	21.4	28.3
(c) " of Housekeepers	18.9	6.8	14.5	14.4
(d) " of Students	2.5	5.5	0.9	3.0
(e) " of Tappers	2.5	2.1	1.7	2.2

SES	CATEGORY I	CATEGORY II	CATEGORY III	TOTAL
11. (f) Percentage of Government employees	1.3	0.7	0	0.8
(g) " with other occupations	2.1	3.4	3.4	2.8
(h) " unemployed	11.8	10.3	6.8	10.2
12. Secondary occupation of Caretakers:				
(a) Percentage of Farmers	8.0	5.5	5.1	6.6
(b) " of Traders	18.9	24.7	22.0	21.3
(c) " of Tappers	0	0.7	0	0.2
(d) " of other occupation	2.1	1.4	0	1.4
(e) " of none	70.6	67.1	72.0	69.9
13. Percentage of Literate Caretakers	18.1	24.0	12.7	18.5
14. Educational level of Caretakers:				
(a) Percentage with First Grade/ no education	81.1	76.7	85.6	80.9
(b) Percentage with Grade School	18.1	23.3	14.4	18.7
(c) " above Grade School	0.8	0	0	0.4
15. Percentage of Caretakers belonging to Community Organization	8.4	11.0	12.0	10.0
16. Percentage of married Caretakers	89.1	83.6	81.4	85.7
17. Residence of spouses of caretakers				
(a) Same house	80.2	67.2	76.0	75.6
(b) Another house in village	4.8	4.2	1.1	3.8
(c) Out of town	15.0	28.6	22.9	20.6

SES	CATEGORY I	CATEGORY II	CATEGORY III	TOTAL
18. Primary occupation of spouses of caretakers:				
(a) Percentage of Farmers	17.8	20.7	32.2	21.9
(b) " of Traders	8.2	5.0	4.2	6.4
(c) " of Housekeepers	2.6	0	2.1	1.6
(d) " of Students	1.9	6.6	4.2	3.8
(e) " of Government employees	3.8	8.3	4.2	5.2
(f) Percentage of Artisans	8.2	2.5	3.1	5.4
(g) " of Tappers	20.7	19.0	14.0	18.8
(h) " of Drivers	7.7	16.5	10.4	10.8
(i) " of other occupations	25.5	15.7	20.8	21.6
(j) " of unemployed	3.8	5.8	4.2	4.5
19. Secondary occupation of spouses of caretakers:				
(a) Percentage of Traders	20.6	23.1	16.7	20.4
(b) " of Traders	8.1	13.2	10.4	10.1
(c) " of Government employees	0	0	2.1	0.5
(d) " of Artisans	1.4	0	1.0	0.9
(e) " of Tappers	0.5	0	1.0	0.5
(f) " of Drivers	0	0.8	1.0	0.5
(g) " of other occupations	3.8	5.8	1.0	3.8
(h) " of none	65.6	57.0	66.7	63.3

SES	CATEGORY I	CATEGORY II	CATEGORY III	TOTAL
20. Percentage of spouses of caretakers who are literate	51.9	50.0	44.8	49.8
21. Level of education of spouses of caretakers				
(a) Percentage with Pregrade/no school	53.6	54.0	54.2	54.1
(b) Percentage with Grade School	44.5	41.8	42.1	43.4
(c) Percentage above Grade School	1.4	3.3	3.1	2.3
22. Percentage of spouses of caretakers who belong to Community Organization	19.4	22.3	6.2	17.3
23. Sources of water:				
(a) Percentage of caretakers reporting stream	35.9	48.6	61.9	45.7
(b) Percentage of caretakers reporting public well	57.0	43.8	38.1	48.7
(c) Percentage of caretakers reporting private well	7.2	6.8	0	5.4
24. Location of drinking water				
(a) Percentage reporting kitchen	1.7	6.2	0	2.6
(b) Percentage reporting bedroom	91.7	83.6	85.6	87.8
(c) Percentage reporting other location	6.6	11.0	14.4	9.8

SES	CATEGORY I	CATEGORY II	CATEGORY III	TOTAL
25. Container for drinking water:				
(a) Percentage reporting bucket	80.7	80.1	80.5	80.5
(b) Percentage reporting drum	9.7	14.4	7.6	10.6
(c) Percentage reporting other	10.9	6.9	14.4	10.6
26. Percentage of caretakers who keep drinking water and other water in the same container	49.2	44.5	46.6	47.2
27. Percentage of caretakers who keep drinking water and other water in the same place	30.1	40.0	33.1	33.7
28. Capacity of cup used by caretakers:				
(a) Percentage reporting less than 100mls	0.9	1.4	0	0.8
(b) Percentage reporting 100-149mls	18.0	14.4	28.4	19.4
(c) Percentage reporting 150-199mls	52.4	44.5	56.1	50.9
(d) Percentage reporting 200-249mls	17.2	19.9	15.5	17.6
(e) Percentage reporting 250-299mls	7.3	4.8	5.2	6.1
(f) Percentage reporting 300mls and above	9.1	14.4	9.5	10.7
(g) Percentage reporting no cup	1.3	3.4	0.9	1.8
29. Percentage of caretakers with coke bottle.	41.8	46.2	45.3	43.9

SES	CATEGORY I	CATEGORY II	CATEGORY III	TOTAL
30. Percentage of caretakers who have:				
(a) beer bottles	47.3	52.1	43.6	47.9
(b) gold medal bottles	6.8	6.8	0.9	5.4
(c) stout bottles	27.0	26.7	17.1	24.6
(d) schnapps bottles	25.7	14.4	29.1	23.2
(e) other bottles	16.0	29.5	10.3	18.6
(f) no other bottle	35.9	32.2	35.0	34.7
31. Percentage of caretakers with:				
(a) tablespoon	99.6	95.9	94.8	97.6
(b) teaspoob	70.9	76.5	66.4	71.6
(c) cookspoon	95.4	93.1	90.5	93.8
32. Sources of rice supply (%)				
(a) farm	37.1	25.3	40.2	34.3
(b) Local store	21.5	21.2	10.3	18.8
(c) local market	25.7	11.0	10.3	17.8
(d) other village	17.3	51.4	50.4	34.9
(e) other source	15.2	1.4	6.0	9.0
33. Sources of sugar supply (%)				
(a) local store	39.9	23.3	28.0	32.3
(b) local market	39.9	22.6	16.9	29.5
(c) other village	27.3	56.8	67.8	45.9
(d) other source	0.4	0	0.8	0.4

SES	CATEGORY I	CATEGORY II	CATEGORY III	TOTAL
33. (e) none	0	4.8	0	1.4
34. Sources of salt supply (%)				
(a) local store	35.8	21.4	21.6	28.2
(b) local market	47.8	31.7	25.9	37.9
(c) other village	23.7	57.2	63.8	43.0
35. Number of children five years old or less	445	285	206	936
36. Number of children five years old or less per household	2.33	2.9	2.2	2.46
37. Number of children five years old or less per caretaker	1.87	1.95	1.75	1.86
38. Percentage of male children five years old or less	50.8	49.5	49.5	50.1
39. Percentage of child 0-2 years old	49.2	53.0	49.5	50.4
40. Percentage of caretkaers who are:				
(a) mothers	81.9	74.0	84.8	80.0
(b) fathers	3.8	3.4	4.2	4.0
(c) grandmothers	5.9	14.4	6.8	8.6
(d) sisters	3.0	1.4	2.5	2.2
(e) aunt	0.8	2.1	0	1.4
(f) other relations	4.2	4.8	1.7	3.8

APPENDIX VI

FIELD-TEST ~~POST~~-TEST DATA ANALYSIS, BS.2 - KAP OF CARETAKERS OF EXPERIMENTAL VILLAGES

(KAP)	Category I	Category II	Category III	Total
1. Knowledge of diarrhoea (% defining diarrhoea as)				
(a) Frequent watery stool	84.5	91.8	90.7	88.0
(b) Frequent slimy stool	12.2	5.5	7.6	9.2
(c) Frequent bloody stool	0.8	0.7	3.4	1.4
(d) Other definition	2.5	3.4	3.4	3.0
(e) No idea	6.7	1.4	5.1	4.8
2. Frequency of watery stool (% of caretakers defining diarrhoea as frequent watery stool)				
(a) Once	4.0	1.5	3.7	3.2
(b) 2-3 times	42.0	36.1	49.5	41.9
(c) 4-5 times	31.5	37.6	27.1	32.1
(d) 6-7 times	6.0	[illegible]	7.5	7.0
(e) More than 7 times	16.5	[illegible]	12.1	14.7
(f) No idea	0	2.3	0	0.7
3. Causes of diarrhoea (% reporting)				
(a) Bad water	15.5	17.1	16.1	16.1
(b) Bad food	18.1	18.5	14.4	17.3
(c) Evil Spirit	0	0	1.7	0.4

(KAP)	Category I	Category II	Category III	Total
(d) Open mole	0.8	0	0.8	0.6
(e) Worms	1.3	2.7	4.2	2.4
(f) Other causes	9.2	11.6	9.3	10.0
(g) No idea	63.0	58.9	63.6	62.0
4. Effects of diarrhoea (% reporting)				
(a) Weakness	81.1	73.3	78.8	78.3
(b) Dryness	39.1	27.4	33.9	34.5
(c) Loss of appetite	6.3	6.2	6.8	6.4
(d) Dry mouth	5.1	4.1	1.7	4.0
(e) Sunken eyes	17.2	14.4	22.9	17.7
(f) Other	2.5	11.0	7.5	6.2
(g) No knowledge	7.1	7.5	6.9	7.2
5. Age at which children often have diarrhoea (% reporting)				
(a) 0-2 years	27.7	28.3	33.1	29.1
(b) 1-2 years	5.1	7.6	3.4	5.4
(c) 0-4 years	0.9	1.4	0.8	1.0
(d) 0-5 years	35.3	20.0	35.6	30.9
(e) 1-5 years	3.0	2.8	4.2	3.2
(f) Other	2.0	4.8	1.6	2.8
(g) No idea	26.0	35.2	21.2	27.5

(KAP)	Category I	Category II	Category III	Total
6. Number of diarrhoea episodes (% reporting)				
(a) None	70.1	64.8	70.9	68.8
(b) Once	16.2	20.0	18.8	17.9
(c) Twice	6.8	5.5	6.0	6.2
(d) Thrice	3.8	6.2	1.7	4.0
(e) Four times	0.9	0.7	0	0.6
(f) Five times	0.9	1.4	0	0.4
(g) No idea	1.3	1.4	2.6	1.6
7. Percentage of caretakers who know UNICEF pack	4.2	4.8	1.7	3.8
8. How much UNICEF pack should cost (% reporting)				
(a) Free	0.4	0.7	0.9	0.6
(b) Less than $1.00	17.6	21.9	27.1	21.1
(c) $1.00-$2.00	6.7	13.0	5.9	8.4
(d) More than $2.00	0.4	4.1	0.9	1.6
(e) No idea	74.8	60.3	65.2	58.3
9. How much caretaker can pay for UNICEF pack (% reporting)				
(a) Free	17.0	1.4	15.5	12.1
(b) Less than $1.00	58.3	66.4	64.7	52.2
(c) $1.00 - $2.00	16.6	19.2	12.1	16.2
(d) More than $2.00	3.0	2.1	1.7	2.4
(e) No idea	5.1	11.0	6.0	7.0

KAP	Category I	Category II	Category III	Total
10. What caretaker does when child has diarrhoea (% reporting) n=502				
(a) Gives country medidine	15.1	20.0	24.6	18.9
(b) Sends child to clinic	77.3	71.9	73.7	74.9
(c) Gives rice water	0.4	0	0	0.2
(d) Gives salt/sugar solution	1.3	1.4	0.8	1.2
(e) Gives other medicine	3.8	4.1	4.2	4.0
~~(f) Does nothing~~	2.5	1.4	1.7	2.0
(g) Does other things	1.7	1.4	0	1.2
11. What caretaker gives to child to make child better: (% reporting)				
(a) UNICEF ORS	1.7	2.1	0	1.4
(b) Salt/sugar solution	3.8	3.4	0.8	3.0
(c) Rice with salt/sugar	0	1.4	0	0.4
(d) Rice porridge with salt/sugar	0	0	0	0
(e) Rice water without salt/sugar	2.1	2.7	11.0	4.3
(f) Rice porridge without salt/sugar	0.4	0	0	0.2
(g) Country medicine	13.1	26.0	30.5	23.3
(h) Send child to clinic	50.8	30.8	40.7	42.6
(i) Clinic medicine	21.0	21.2	19.5	20.7
(j) Other	1.7	3.2	4.2	4.2
(k) No idea	1.7	5.5	1.7	2.8
(l) Nothing	1.3	2.1	0	1.2

93.8

1.4 n=7

n=6

n=15

9.3 n=47

86.6

n=435

what % is this? 9.3%?

(KAP)	Category I	Category II	Category III	Total
12. Preparation of ORS used (% of caretakers reporting the use of ORS) – which ORS? any?				
(a) Good	26.7	50.0	7.1	27.9
(b) Average	40.0	21.4	42.9	34.9
(c) Poor	33.3	28.6	50.0	37.2
13. Number of times ORS is given (% of caretakers reporting the use of ORS)				
(a) Once	12.5	0	28.6	14.0
(b) 2-3 times	62.5	76.9	64.3	67.4
(c) 4-5 times	12.5	23.1	7.1	14.0
(d) No idea	6.3	0	0	2.3
(e) Other	6.3	0	0	2.3
14. When ORS was given; (% of caretakers reporting the use of ORS)				
(a) Less than a month ago	13.3	30.8	7.7	17.1
(b) 1-2 months ago	0	30.8	15.4	14.6
(c) 3-4 months ago	13.4	7.7	7.7	9.8
(d) 5-6 months ago	0	7.7	0	2.4
(e) 7-8 months ago	6.7	15.3	0	7.3
(f) A year ago	20.0	0	0	7.3
(g) More than a year ago	26.7	0	46.2	24.4
(h) No idea	20.0	7.7	23.1	17.1

(KAP)	Category I	Category II	Category III	Total
15. How much of ORS is given: (% of caretakers reporting the use of ORS)				
(a) 50 mls	0	7.7	0	2.4
(b) 150 mls	0	0	7.7	2.4
(c) Other	93.3	84.6	69.2	82.9
(d) No idea	0	7.7	23.1	9.8
(e) More than 200 mls	6.7	0	0	2.4
16. How caretaker knows when diarrhoea becomes worse: (% reporting)				
(a) When child passes too much watery stool	17.9	14.9	28.0	19.5
(b) When child running stomach fast and becomes weak	4.7	0	7.6	4.1
(c) When child is weak	58.6	68.1	53.4	60.0
(d) When child has sunken eyes	6.4	6.4	7.6	6.7
(e) When child losses appetite	6.4	12.8	4.2	7.7
(f) When child is dry	6.0	4.2	4.3	5.0
(g) Other factors	6.5	8.5	1.7	5.7
(h) No idea	5.6	4.3	6.8	5.5

(KAP)	Category I	Category II	Category III	Total
17. What caretaker does when diarrhoea becomes worse: (% reporting)				
(a) Gives child country medicine	6.8	6.9	5.1	6.4
(b) Sends child to clinic	91.1	87.6	93.2	90.6
(c) Gives child clinic medicine	0.8	2.1	0.8	1.2
(d) Does nothing	0.8	1.4	2.5	1.4
(e) Other	0.8	2.8	1.6	1.6
~~18. Home-made ORS ever used by caretaker:~~ (% reporting) ~~(% reporting use of ORS)~~				
(a) Salt/sugar solution	5.5	9.7	2.6	n= 3 6.0
(b) Rice water with salt/sugar	0.4	2.1	1.7	6 1.2
(c) Rice porridge with salt/sugar	0.4	0	0	1 0.2
(d) Rice water without salt/sugar	6.3	18.6	1.9	64 12.8
(e) Rice porridge without salt/sugar	0.8	0	1.7	4 0.8
(f) None	86.6	69.7	75.2	376 79.0
19. Percentage of caretakers reporting ever using ORS, who used ORS last diarrhoea episode.	53.1	52.3	37.9	48.6 n=51
20. Which home-made ORS used last diarrhoea episode:				
(a) Salt/sugar solution	64.7	45.5	18.2	46.0 n=23
(b) Rice water with salt/sugar	0	4.5	9.1	4.0
(c) Rice water without salt/sugar	23.5	50.0	72.7	46.0
(d) Other	0	0	11.8	4.0

71.0 n=10

*

*

(KAP)	Category I	Category II	Category III	Total
21. Preparation of ORS used last episode:				
(a) Percentage scoring "Good"	12.5	0	18.2	9.1
(b) Percentage scoring "Average"	37.0	58.8	45.4	47.7
(c) Percentage scoring "Poor"	50.0	41.2	36.4	43.2
22. What is added to ORS:				
(a) Orange	53.3 (this group used more S/S)	28.6 (These groups used more F/W)	9.1	31.9
(b) Nothing	33.4	71.4	90.9	61.7
(c) Other	13.3	0	0	6.4
23. Percentage of caretakers who responded ORS works (as % of those who used it last)	92.9	72.2	81.8	81.4
24. How caretaker thinks ORS works				
(a) Stops running stomach	53.8	53.8	77.8	60.0
(b) Prevents dehydration	7.7	0	11.1	5.7
(c) Other reasons	38.5	53.2	11.1	42.9
25. Food given to child during diarrhoea episode:				
(a) Rice	54.0	37.2	35.7	45.0
(b) Breast milk	11.0	6.2	7.0	8.7
(c) Rice water	22.0	35.2	33.9	28.8
(d) Breast milk plus rice water	3.0	0	5.2	2.6

73.8 n=370

(KAP)	Category I	Category II	Category III	Total:
(e) Breast milk plus rice	4.6	4.8	7.0	5.2
(f) Breast milk plus other food	0.8	12.3	3.5	1.2
(g) Soft-rice	0.8	4.1	0.9	1.8
(h) Other food	6.7	13.0	6.1	8.5
(i) No Food	1.3	2.1	1.7	1.6
26. What caretakers do when diarrhoea does not stop:				
(a) Send child to the Zoe	0	0	0	0
(b) Send child to the clinic	92.0	85.5	93.2	90.4
(c) Give child country medicine	5.5	5.5	5.1	5.4
(d) Does nothing	1.7	6.2	0.9	2.8
(e) Other	0.8	0.7	1.7	1.0
(f) No idea	0	0	0.9	0.2
27. What makes caretaker send child to clinic (when he has diarrhoea) might need to be added to ↓(3)				
(a) When diarrhoea does not stop	23.5	7.7	33.1	21.1
(b) When child is too sick	6.1	13.3	21.7	11.9
(c) When medicine is not effective	2.2	0.7	4.4	2.3
(d) Fear that child will die	10.9	26.6	0.9	13.1
(e) When stomach is running too much	12.6	6.3	13.0	10.9
(f) So that child will get well	3.5	4.2	1.7	3.3
(g) Other reasons	38.7	39.9	21.7	35.0
(h) No idea	2.6	3.5	3.5	3.1

(KAP)	Category I	Category II	Category III	Total
28. What can happen to child when diarrhoea does not stop:				
(a) Child will dies	78.4	77.9	79.5	78.5
(b) Child will dehydrate	1.7	2.1	0	1.4
(c) Child will dehydrate and die	0.	0.7	0	0.2
(d) Child will get weak	0.8	3.4	1.7	1.8
(e) Nothing will happen to child	0.4	0.7	0	0.4
(f) Other	1.3	3.4	0.9	1.8
(g) Have no idea	17.4	12.4	17.9	16.1
29. Percentage of caretakers who believe diarrhoea can cause illness	97.0	96.6	90.7	94.0
30. Type of illness diarrhoea can cause (as % of caretakers who believe diarrhoea can cause illness:				
(a) Weakness	21.2	12.9	33.6	21.5
(b) Malaria	2.2	0	4.7	2.1
(c) Dehydration	9.4	7.9	5.6	9.1
(d) Death	7.2	24.3	0.9	10.9
(e) Stomach running	10.8	12.9	11.2	11.5
(f) Sore stomach	12.6	10.7	8.4	11.1
(g) Vomitting	3.6	2.1	0	2.3
(h) Loss of appetite	0	0	0.9	0.2

(KAP)	Category I	Category II	Category III	Total
(i) Fever	7.2	6.4	10.3	7.7
(j) Open mole	7.2	2.1	3.7	4.9
(k) Dysentry	2.7	1.4	6.5	3.2
(l) Blood shortage	2.7	0.7	0	1.5
(m) Headache	0.9	1.4	0.9	1.1
(n) Other illness	15.7	16.4	22.4	17.4
(o) No idea	11.7	17.1	7.8	12.3
31. Percentage of caretakers who responded diarrhoea can kill	94.9	89.0	93.2	92.8
32. Percentage of caretakers who responded diarrhoea can be prevented	69.5	73.8	63.6	69.3
33. How diarrhoea can be prevented (as % of caretakers responding diarrhoea can be prevented:				
(a) By giving medicine	17.1	10.3	13.5	14.2
(b) By sending the child to the clinic	41.5	21.5	37.8	34.6
(c) By practicing good child care	6.1	12.1	8.1	8.4
(d) By vaccination	9.8	15.0	1.4	9.6
(e) By using clean water	1.2	3.7	1.4	2.0
(f) By injecting child	4.9	9.3	0	5.2
(g) By treating child	4.9	6.5	5.4	5.5
(h) By keeping pans/plates/cups clean	0.6	1.9	1.4	1.2
(i) By taking good care of child's food	3.0	3.7	8.4	4.4

(KAP)	Category I	Category II	Category III	Total
(j) Other	1.2	2.8	1.4	1.7
(k) No idea	11.6	14.0	21.6	14.5
34. Why diarrhoea cannot be prevented (% of caretakers responding diarrhoea cannot be prevented)				
(a) Have not seen medicine which can cure it	10.0	33.3	100.0	26.9
(b) No cure	10.0	6.7	0	7.7
(c) Other	10.0	6.7	0	7.7
(d) No idea	70.0	53.3	0	57.7
35. Percentage who responded diarrhoea can be treated	98.3	93.0	97.5	96.6
36. How diarrhoea can be treated (as % of caretakers responding it can be treated)				
(a) By sending child to hospital/clinic	25.6	33.8	13.0	24.9
(b) By treating child	17.5	12.8	24.3	17.8
(c) By taking medicine	53.0	42.9	60.0	51.9
(d) By giving ORS	0.4	0	0	0.2
(e) Other	0	3.0	0	0.8
(f) No idea	3.8	7.5	3.5	4.8

(KAP)	Category I	Category II	Category III	Total
37. Common diseases of children five years or less:				
(a) Measles	(4) 40.9	(4) 39.0	(3) 38.8	39.9 (4)
(b) Malaria	(5) 29.1	(6) 17.1	(5) 25.0	24.6 (5)
(c) Cough	(3) 50.6	(3) 52.1	(4) 33.6	47.1 (3)
(d) Cold	0.8	0	0	0.4
(e) Diarrhoea	(2) 72.6	(1) 67.1	(2) 62.1	68.5 (2)
(f) Chicken pox	(10) 5.5	7.5	2.6	5.4
(g) Thrush	(8) 11.8	(8) 10.3	(6) 24.1	14.2
(h) Dysentry	2.5	1.4	3.4	2.4
(i) Pneumonia	2.1	0.7	1.7	1.6
(j) Open mole	(6) 24.9	(9) 8.9	(8) 11.2	17.0
(k) Fever	(1) 73.4	(2) 63.7	(1) 81.9	72.5 (1)
(l) Worms	0.8	0	0.9	0.6
(m) Headache	4.6	(10) 3.2	(10) 4.3	5.6
(n) Other	(7) 14.7	(5) 21.9	(9) 6.9	15.0
(o) No idea	(9) 10.1	(7) 13.0	(7) 12.9	11.6
38. Cause of dehydration:				
(a) Diarrhoea	38.7	13.1	52.5	34.5
(b) Open mole	6.7	2.8	12.7	7.0
(c) Inadequate food	12.2	20.0	5.1	12.8
(d) Child losses too much water food	0	1.4	0	0.4

(KAP)	Category I	Category II	Category III	Total
(e) Bad foold/Bad water	1.7	4.1	5.1	3.2
(f) Vomitting	0	0	1.7	0.4
(g) Worms	10.5	10.3	5.1	9.2
(h) Other causes	26.1	30.3	18.6	25.5
(i) No idea	18.5	28.3	16.9	21.0
39. Percentage of caretakers reporting their child has died at or before the age of five	45.1	50.0	47.5	47.1

Appendix VII

PRE-TEST RESULTS - KEY KAP VARIABLES (NUMBER OF RESPONSES)

KAP VARIABLES	F JIN	G WE	F KP	G RSSB	F KON	G CIN	F VAY	G 26G	F GW	G WB	F KK	G MA	FF VLGS.	GRP. VLGS.	ALL VLG
K.1 (Knowledge)	21	43	37	37	29	30	20	16	15	14	13	12	135	152	287
K.2	4	23	10	25	13	10	4	11	1	5	9	6	41	80	121
K.3	29	83	57	69	36	46	23	27	18	19	28	28	191	272	463
K.4	2	0	4	0	0	3	0	0	0	1	0	0	6	4	10
K.5	11	47	33	34	[illegible]	25	17	16	6	11	12	17	108	150	258
K.6	23	46	38	42	27	29	18	16	15	14	14	12	135	159	294
K.7	5	3	4	0	6	9	3	1	3	2	3	0	24	15	39
K.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
K.9	8	11	15	26	3	3	4	3	10	7	7	3	47	53	100
Attitude															
A.1	22	52	41	37	29	33	20	18	17	15	12	9	141	164	305
A.2	24	49	41	41	27	31	16	17	16	16	14	9	138	163	301
A.3	19	46	30	21	22	28	12	15	10	12	11	8	104	130	234
A.4	24	52	41	41	28	30	16	18	17	16	14	12	140	169	309
A.5	13	44	33	30	22	28	0	11	7	11	10	7	85	131	216

Appendix VIII

POST-TEST RESULTS - KEY KAP VARIABLES (NUMBER OF RESPONSES)

KAP VARIABLES	JIN	WE	KP	RSSB	KON	CIN	VAY	26G	GW	WB	KK	MA	FF VLGS.	GRP. VLGS.	ALL VLGS.
Knowledge															
K.1	23	51	36	41	30	32	22	16	15	12	12	11	138	163	301
K.2	21	65	55	33	29	16	7	9	11	10	4	8	127	141	268
K.3	65	138	110	88	72	53	47	34	33	27	30	19	357	359	716
K.4	12	29	31	5	4	8	2	7	3	7	5	7	57	63	120
K.5	32	50	41	43	22	23	28	16	15	9	18	11	156	152	308
K.6	21	48	33	41	29	33	22	18	15	15	14	12	134	167	301
K.7	36	54	54	41	34	9	0	0	11	15	0	7	135	126	261
K.8	7	10	7	12	1	1	3	4	2	6	7	0	27	33	60
K.9	19	36	22	25	15	13	11	13	19	5	5	7	91	99	190
Attitude															
A.1	24	52	41	41	28	31	18	16	15	16	14	12	140	168	308
A.2	22	51	41	42	30	32	20	22	17	16	14	12	144	175	319
A.3	22	50	41	37	28	32	1	0	17	15	0	12	109	146	255
A.4	24	53	41	42	29	33	22	18	17	16	14	12	147	174	321
A.5	20	46	31	41	25	30	7	4	16	15	6	11	105	147	252

Appendix IX

PRE-TEST AND POST-TEST RESULTS FOR KEY KAP VARIABLES
(% OR AVERAGE SCORES)

KAP VARIABLES	F JIN		G WE		F KP		G RSSB		F KON		G JIN		F VAY		G 26G		F GW		G WB		F KK		G MA	
	PRT	POT	PRT	POT	PRT	POT	PRT	POT	PRT	POT	PRT	POT	PRT	POT	PRT	POT	PRT	POT	PRT	POT	PRT	POT	PRT	POT
Knowledge																								
K.1	97.5	95.8	81.1	96.2	90.2	87.8	88.1	97.6	96.7	100	90.9	97.0	90.9	100	88.9	83.9	88.2	8[illegible].2	82.4	70.6	92.9	85.7	100	91.7
K.2	.17	.88	.43	1.23	.24	1.34	.64	.79	.43	.97	.30	.48	.18	.32	.61	.50	.06	.65	.29	.59	.64	.29	.50	.67
K.3	1.21	1.71	1.57	2.6	1.39	2.68	1.64	2.1	1.2	2.4	1.39	1.61	1.05	2.14	1.5	1.89	1.06	1.94	1.12	1.59	2.0	2.14	2.33	1.58
K.4	8.3	50.0	0	54.7	9.8	75.6	0	11.9	0	13.3	9.1	24.2	0	9.1	0	38.9	0	17.6	5.9	41.2	0	38.5	0	58.3
K.5	.04	1.12	.21	.40	.05	.76	.1	.64	[illegible]	.10	.07	.15	.05	.55	.17	.50	0	.24	.06	.29	.21	.64	.33	.58
K.6	95.8	87.5	86.8	90.6	92.7	80.5	100	97.6	93.1	96.7	87.9	100	81.8	100	88.9	100	88.2	88.2	93.3	88.2	100	100	100	100
K.7	.26	1.64	.07	1.08	.13	1.32	0	1.11	.27	1.2	.32	.28	.25	0	.06	0	.30	.65	.17	1.0	.27	0	0	.58
K.8	0	29.2	0	18.9	0	17.1	0	28.6	0	3.4	0	3.0	0	[illegible]	0	22.2	0	11.8	0	37.5	0	50.0	[illegible]	0
K.9	33.3	74.2	21.2	67.9	36.6	53.7	61.9	59.5	10.0	51.7	9.1	39.4	18.2	50.0	16.7	72.2	58.8	52.9	41.2	29.4	50.0	35.7	[illegible]	58.3
Attitude																								
A.1	91.7	100	98.1	98.1	100	100	88.1	97.6	100	93.3	100	93.3	90.9	81.8	100	88.9	100	88.2	88.2	94.1	85.7	[illegible]	75.0	100
A.2	100	91.7	92.5	96.2	100	100	100	100	93.1	100	93.9	97.0	72.7	90.9	94.4	100	94.1	100	94.1	94.1	100	[illegible]	75.0	100
A.3	79.2	91.7	86.8	94.3	73.2	[illegible]	51.2	[illegible]	75.9	96.6	34.8	97.0	54.5	54.5	83.3	83.3	[illegible]	100	[illegible]	88.2	[illegible]	[illegible]	[illegible]	100
A.4	100	100	98.1	100	[illegible]	[illegible]	97.6	100	96.6	96.7	90.9	100	76.2	100	100	100	100	100	94.1	94.1	[illegible]	[illegible]	[illegible]	100
A.5	54.2	83.3	83.0	86.8	60.5	[illegible]	73.2	81.0	73.3	83.3	[illegible]	90.9	0	31.8	61.1	22.2	41.1	94.1	68.8	84.2	71.4	42.9	53.3	91.7

Appendix X

DIFFERENCES BETWEEN PRE-TEST AND POST-TEST RESULTS FOR KEY KAP VARIABLES (EXPERIMENTAL VILLAGES)

KAP VARIABLES	JIN	WE	KP	RSSB	NON	CIN	VAY	26G	GW	A/B	KK	MA	PF VLGS.	GRP. VLGS.	ALL VLGS.
Knowledge															
K.1	8.3	15.1	-2.4	9.5	3.3	6.1	9.1	0.0	0.0	-11.8	-7.2	-8.3	2.02	6.28	4.34
K.2	0.71	0.8	1.1	0.15	0.54	0.18	0.14	-0.11	0.59	0.3	-0.35	0.17	0.58	0.35	0.46
K.3	1.5	1.03	1.29	0.46	1.2	0.22	1.09	0.39	0.88	0.47	0.14	-0.75	1.12	0.5	0.79
K.4	41.7	54.7	65.8	11.9	13.3	15.1	9.1	38.9	17.6	35.3	38.5	58.3	34.73	33.71	34.17
K.5	1.08	0.19	0.71	0.54	0.07	0.08	0.5	0.33	0.24	0.23	0.43	0.25	0.32	0.0	0.16
K.6	-8.3	3.8	-12.2	-2.4	3.6	12.1	8.2	11.1	0.0	-5.1	0.0	0.0	-1.3	3.52	1.34
K.7	1.38	1.01	1.19	1.11	0.93	-0.04	-0.25	-0.06	0.35	0.83	-0.27	0.58	1.01	0.74	0.85
K.8	29.2	18.97	17.1	28.6	3.4	3.0	13.6	22.2	11.8	37.5	50.0	0.0	18.37	18.97	18.69
K.9	45.9	46.7	17.1	-2.4	41.7	30.3	31.8	55.5	-5.9	11.8	-14.3	33.3	30.14	26.28	28.05
Attitude															
A.1	8.3	0.0	0.0	9.5	-6.7	-6.1	-9.1	-11.1	-17.8	5.[illegible]	14.3	25.0	-1.33	2.29	0.64
A.2	-8.3	3.7	0.0	0.0	6.9	3.1	18.2	5.6	5.9	0.0	0.0	25.0	4.08	6.32	5.30
A.3	12.5	7.5	26.8	36.9	20.7	12.2	0.0	0.0	41.2	17.2	-78.6	33.3	3.4	8.72	6.29
A.4	0.0	1.9	0.0	2.4	0.1	9.1	23.8	0.0	0.0	0.0	0.0	0.0	3.43	2.86	3.1
A.5	29.1	3.8	-4.9	7.8	10.0	6.1	31.8	-38.9	53.0	19.4	-28.5	33.4	13.52	8.18	10.73

Appendix XI

THE RANKING OF VILLAGES IN TERMS OF LITERACY RATE AND KAP VARIABLES AND RANK CORRELATION COEFFICIENT BETWEEN LITERACY RATE AND KAP VARIABLES

Village	Literacy Rate	K.1	K.2	K.3	K.4	K.5	K.6	K.7	K.8	K.9	All KAP
Jinnieta	3	4	3	1	4	1	9	1	3	2	1
Wealah	6	1	2	5	3	10	4	4	6	3	2
Kpakolokoyata	10	8	1	2	1	2	10	2	7	8	3
RSS Bright	5	2	9	8	11	3	7	3	4	10	5
Konola	8	6	5	3	10	12	5	5	10	4	6
Cinta	2	5	7	10	9	11	1	9	11	7	11
Vanyema	4	3	10	4	12	4	3	11	8	6	7
26 Gate	7	7	11	9	5	5	2	10	5	1	4
Gwebolosu	11	7	4	6	8	8	6	8	9	11	9
Williams/ Barclay	1	11	6	7	7	9	8	6	2	9	8
Kollie Kain Town	9	9	12	11	6	6	6	12	1	12	12
Massanuoi	12	10	8	12	2	7	6	7	12	5	10
Rank correlation coefficient*		.33	-.04	.18	.41	-.04	.17	.09	.36	.15	.17

* These are Spearman's rank correlation coefficients. At 5% level of significance and with 12 degrees of freedom r = 0.497. We therefore do not reject the null hypothesis that there is no correlation between the literacy rate and the effect of training on the knowledge of caretakers.

Appendix XII

RANKING OF VILLAGES ACCORDING TO LITERACY RATE AND IMPROVEMENTS IN ATTITUDE VARIABLES AND RANK CORRELATION COEFFICIENT

Village	Literacy Rate	A.1	A.2	A.3	A.4	A.5	All Attitude Variables
Jinnieta	3	4	9	7	6	4	5
Weala	6	6	6	9	4	9	7
Kpakolokoyata	10	6	8	4	6	10	7
RSS Bright	5	3	8	2	3	7	2
Konola	8	8	3	5	5	6	4
Cinta	2	7	7	8	2	8	6
Vahyema	4	9	2	10	1	3	3
26 Gate	7	10	5	10	6	12	9
Gwebolosu	11	11	4	1	6	1	2
Williams/ Barclay	1	5	8	6	6	5	5
Kollie Kain Town	9	2	8	11	6	11	8
Massaquoi	12	1	1	3	6	2	1
Rank correlation coefficient*		-.04	-.45	-.38	.48	-.05	-.16

* This is Spearman's rank correlation coefficient. At 5% level of ificance and with 12 degrees of freedom, none is significant. We therefore do not reject the null hypothesis that there is no correlation between the literacy rate and the effects of training on the attitudes of caretakers.

Appendix XIII

PRETEST RESULTS

RANKING OF VILLAGES ACCORDING TO LITERACY RATE AND KNOWLEDGE VARIABLES AND THEIR CORRESPONDING RANK CORRELATION COEFFICIENTS - FACE TO FACE VERSUS GROUP EDUCATION STRATEGIES

Village	Literacy Rate	K.1	K.2	K.3	K.4	K.5	K.6	K.7	K.8	K.
Face to Face										
Jinnieta	1	2	2	1	2	1	4	1	2	1
Kpakoloko-yata	5	5	1	2	1	2	5	2	3	4
Konola	3	3	4	3	5	6	2	3	6	2
Vayeama	2	1	5	4	6	3	1	5	4	3
Gwebolosu	6	4	3	5	4	5	3	4	5	5
Kollie Kain Town	4	6	6	6	3	4	3	6	1	6
Rank correlation coefficient*		.71	-.14	.49	-.2	.43	.3	.26	.2	.7
Group										
Weala	4	1	1	1	2	5	3	2	4	2
RSS Bright	3	2	5	3	6	1	5	1	2	6
Cinta	2	3	3	5	5	6	1	5	5	4
26 Gate	5	4	6	4	3	2	2	6	3	1
Williams/ Barclay	1	6	2	2	4	4	6	3	1	5
Massaquoi	6	5	4	6	1	3	4	4	6	3
Rank correlation coefficient*		-0.09	.43	.43	-.71	-.37	-.26	.26	.6	-.66

* These are Spearman's rank correlation coefficients. At 5% level of significance and with 6 degrees of freedom r = 0.829. We therefore do not reject the null hypothesis that there is no correlation between the literacy rate and the effects of each type of training on the knowledge of caretakers.

Appendix XIV

RANKING OF VILLAGES ACCORDING TO LITERACY RATE AND ATTITUDE VARIABLES AND THEIR CORRESPONDING RANK CORRELATION COEFFICIENTS - FACE-TO-FACE VERSUS GROUP EDUCATION STRATEGIES - PRETEST RESULTS

Village	Literacy Rate	A.1	A.2	A.3	A.4	A.5	All Attitudes Variables
Face to Face							
Jinnieta	1	2	5	4	3	3	2
Kpakolo-yata	5	3	4	2	3	5	2
Konola	3	4	2	3	2	4	2
Vayama	2	5	1	5	1	2	1
Gwebolosu	6	6	3	1	3	1	1
Kollie Kain Town	4	1	4	6	3	6	1
Rank correlation coefficient*		.313	.036	-.6	.447	.029	-.071
Group							
Weala	4	4	3	5	3	5	5
RSS. Bright	3	2	5	1	2	3	2
Cinta	2	5	4	4	1	4	4
26 Gate	5	6	2	6	4	6	6
Williams/ Barclay	1	3	5	3	4	2	3
Massaquoi	6	1	1	2	4	1	1
Rank correlation coefficient*	-.143	-.143	-.917	.143	.423	.086	-.029

* These are Spearman's rank correlation coefficients. At 5% level of significance and with 6 degrees of freedom r = 0.829. We therefore do not reject the null hypothesis that there is no correlation between the literacy rate and the effects of each type of training on the ~~knowledge~~ attitudes of caretakers.

Appendix XV

The Mantel-Haenszel Test

This is a test used for combining sets of 2 x 2 tables upon which chi-squared test could be applied individually. It will be recalled that the twelve experimental villages were paired in accordance with SES of the villages. This gave rise to 6 pairs, and therefore the use of Mantel-Haenszel test requires combining 6 2 x 2 tables in order to test for (1) relative effectiveness of the two educational strategies. On the other hand testing for the (2) effectiveness of training, irrespective of the type of educational strategy used, requires comparing the pre-test and post-test results of each of the 12 experimental villages, giving rise to Mantel-Haenszel test in which 12 2x2 tables are combined.

To explain the test further, let us assume we want to test for the effectiveness of training irrespective of the educational strategy used.

A 2 x 2 table for the ith village may be shown as

	Success	Failure	
Pre-test	a_i	b_i	n_{i1}
Post-test	c_i	d_i	n_{i2}
	m_{i1}	m_{i2}	$m_i = n_i$

where,

a_i = the number of caretakers in the ith village who responded correctly to the KAP question during the pre-test;

b_i = the number of caretakers in the ith village who responded incorrectly to the KAP question during the pre-test;

c_i = the number of caretakers in the ith village who responded correctly to the KAP question during the post-test;

d_i = the number of caretakers in the ith village who responded incorrectly to the KAP question during the post-test;

n_{i1} = total number of caretakers who responded to the KAP in the ith village during the pre-test;

n_{i2} = the total number of caretakers in the ith village who responded to the KAP question during the post-test;

m_{i1} = the total number of caretakers in the ith village who responded correctly to the KAP question during both tests;

m_{i2} = the total number of caretakers in the ith village who responded incorrectly to the KAP question during both tests.

The Mantel-Haenszel test statistic (M-H) is defined as the ratio of two terms:

M-H = NUM/DEN $\sim$ N(0,1) and we can thus use the standard normal table for testing the null hypothesis of independence between the pre-test and post-test results.

The Numerator of the M-H test is given by

$$NUM = \sum_{i=1}^{12} \frac{a_i d_i - b_i c_i}{n_i}$$

while the Denomenator is

$$DEN = \sqrt{\sum_{i=1}^{12} \frac{(a_i+b_i)(c_i+d_i)(a_i+c_i)(b_i+d_i)}{n_i^2 (n_i - 1)}}$$

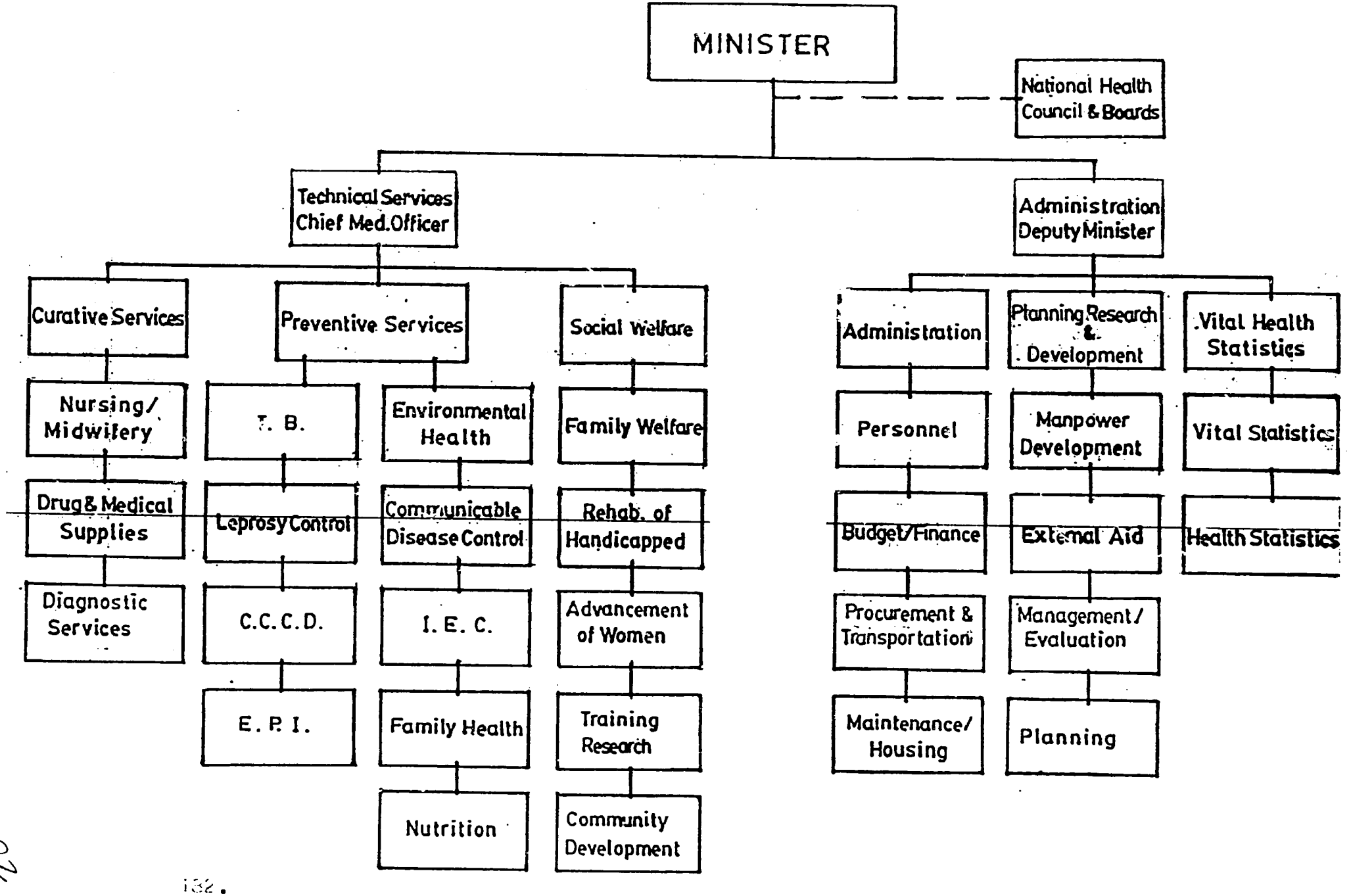
References:

N. Mantel and W. Haenszel, J. Nat. Cancer Institute 22:719 (1959)

N. Mantel, J. Amer. Statist. Ass. 58:690 (1963)

Appendix XVI

ORGANOGRAM
MINISTRY OF HEALTH AND SOCIAL WELFARE



Appendix XVII

DISTRIBUTION OF NURSING/MIDWIFERY PERSONNEL BY COUNTY - October 1983 - September 1984

Category of Personnel	Bassa County & R. Cess	Bong County	C/Mount County	G. Gedeh County	Lofa Co.	Grbo & Mary Land Co	Montserrado Co.	Nimba Co.	Sinoe Co.	Bomi County	Margibi	Grand Total
Professional Nurses	15	30	15	15	38	19	280	32	34	12		470
Practical Nurses	5	25	[illegible]	8	28	11	120	16	6	9		238
Certified Midwives	8	30	6	10	36	7	120	10	2	10		239
Trad. Midwife	12	36	16	35	38	6	30	15	12	4	[illegible]	204
Aides	22	54	30	24	23	68	360	18	24	9		612
Dressers	2	2	5		10	1	20	19	22	3		84
Doctors	6	8	3	3	8	6	28	9	3	12	[illegible]	90
P.A's	9	23	8	11	30	14	[illegible]	25	9	8	2	181
Total	79	108	93	106	210	132	999	144	112	67	2	2,132

* These figures include health facilities of the J.F.K. Complex and the T.B. Annex.

Appendix XVIII

MAJOR CAUSES OF HOSPITALIZATION FOR 1980 THROUGH 1984

Causes	1980	1981	1982	1983	1984
Malaria	3590	3443	2469	4711	2379
Pneumonia/Resp. Inf.	3458	3322	1658	2989	1819
Diarrhea/Enteric	3050	5060	3143	3931	1170
Anemia/Sickle cell	1354	1454	1228	1629	1648
Measles	1086	974	856	548	1418
Hypertension	652	742	554	517	348
Fracture	558	307	208	189	62
Malnutrition	987	65	628	1013	518
Complication of Preg/Child Birth	22998	12102	11193	18476	16691
Tetanus	255	352	206	297	147
Urinary Tract Inf.	216	228	81	653	303
Tuberculosis	202	192	139	363	179
Meningistis	148	189	127	248	85
Psychiatric	36	54	27	x	x
Whooping Cough	66	59	73	x	x
All Others	12536	29317	10444	12701	6047

Source: Monthly hospitals' reports. (X= Not included in the master table).

COMPARISON OF LEADING CAUSES OF DEATHS IN LIBERIA BY YEAR - 1980-1984

Causes	1980	1981	1982	1983	1984
Pneumonia	595	567	361	384	399
Malnutrition/Anemia	381	369	249	263	79
Gastroenteritis	470	304	200	148	150
Measles	164	162	85	66	105
Tetanus (nesnatal)	184	163	77	219	100
Menigitis	90	105	60	90	62
Hypertension	126	99	56	136	47
Malaria	95	88	53	71	95
Septicemia	138	124	46	69	59
Tuberculosis	39	43	15	—	17
Cholera	38	24	2	—	1

Appendix XIX

Bureau of Curative Services - Summary Report of Hospitals, Beds, Health Centers, Clinics and In-patients and Out-patients

Counties	No. of Hospitals	No. of Beds	No. of Health Centers	No. of Clinics	Out-patients	In-patients
Bassa	1	50	1	12	84,058	987
Bomi	1	50	1	16	79,550	1,032
Bong	1	20	5	30	144,105	7,024
Grand Cape Mount	1	50	3	12	32,298	550
Grand Gedeh	1	50	3	20	54,774	1,944
Lofa	2	80	5	40	76,014	727
Margibi	1	30	1	4	72,053	1,326
Maryland	1	140	1	13	39,004	1,218
Nimba	3	30	7	40	84,874	903
Sinoe	1	70	2	27	15,389	198
Grand Kru	1	20	1	20	39,909	78
Montserrado	5*	595*	4	42	157,299	25,647
Total	25	1,185	34	276	779,328	31,901

* Montserrado beds capacity include J.F.K. Maternity Center and Catherine Mills Rehab Center, Careysburg Hospital and Redemption Hospital in New Kru Town.

*1 J.F.K.
2. Maternity
3. Catherine Mills
4. Careysburg Hospital
5. Redemption Hospital

* Total in-patients include J.F.K. Maternity, Careysburg and Redemption Hospital.

Appendix XX

Numbers of Doctors in Liberia by Specialty
September 1983 - October 4, 1984

1.	General Practitioners	127
2.	Surgeons	35
3.	Public Health	11
4.	Pathology	3
5.	Orthopaedics	2
6.	Psychiatry	1
7.	Pediatrics	13
8.	Family Practice	5
9.	Obstetrics/Gynaecology	20
10.	Internal Medicine	12
11.	Dentists	12
12.	Cardiology	3
13.	Leprosy	1
14.	Preventive Medicine	3
15.	Opthalmology	6
16.	Anaesthesiology	3
17.	Neurology	1
18.	Urology	1
19.	Tropical Medicine	6
20.	Ears, Nose and Throat	[illegible]
[illegible]	Pharmacology	1
		268 registered doctors

Liberians	119
Non-Liberians	149

ORAL REHYDRATION THERAPY - OPERATIONS RESEARCH STUDY - LIBERIA

Appendix XXI

Caretakers Package

Objectives	Knowledge Content	Practical Activity
1. To know when her ward is having diarrhoea.	1. Diarrhoea is 1, 2 or 3 times watery stools/day.	1. Provide illustration of child having diarrhoea.
2. To prepare and give ORS appropriately to ward	2. (i) ORS, why (ii) How to prepare appropriate ORS (iii) How to give ORS, when to give it, how much and how often it should be given.	2. Provide illustration of (i) Container emptying (ii) Container emptying and being filled. (iii) Step by step preparation of ORS. (iv) Illustration of how, when, how much and how often to give.
3. To demonstrate correct feeding practices when ward is having diarrhoea.	3. Give fluids. Give ORS. Continue breastfeeding and other foods but no spices.	3. Illustration giving fluids/ ORS/foods.
4. To send to a health institution any ward with diarrhoea (i) which does not respond to treatment. (ii) which is accompanied by dehydration.	4.(i) Refer ward to hospital if diarrhoea does not stop after 2 days with appropriate ORS being given, when patient vomits persistently. (ii) En route to hospital continue giving ORS as often and as much as the diarrhoea. (iii) Dehydration is child being dry due to loss of water and salts in pupoo or vomit.	4. (i) Illustration as (i) above. (ii) Illustration of how to give ORT, when to give etc as in 2(iv). (iii) Illustration of a dehydrated child well labelled.

Objectives	Knowledge Content	Practical Activity
	4.(iii) 5 signs are (a) sunken eyes, (b) sunken fontanelle, (c) sunken cheeks, (d) dry red tongue (e) lack of skin turgor.	

HOME MADE SOLUTIONS FOR ORT

There are four home made solutions that can be used for ORT.

They are:-
1. Salt, sugar, water and orange
2. Rice porridge (Madingo - Monee bea)
3. Rice water (soft rice)
4. Strained rice water

This is how to prepare them.

1. Salt, sugar, water and orange:

   Put drinking water in a clean coke bottle. Empty it into a clean cup. Add a three-finger pinch of salt, 2 cubes of sugar and squeeze the juice of 1 orange or half of a grape fruit. Stir the mixture with a clean spoon and give it to your child whenever he or she has diarrhoea. Give it by spoon or cup.

2. Rice porridge (Madingo-Monee bea):

   Take country rice, soak it in water, pound it till it is powdery, then sieve it. Sprinkle very little water on the rice flour and mix it until small "balls" form. Put 2 coke bottles of clean water on to boil then put in boiling water 2 spoonfulls of the moist rice flour (with the balls) till it cooks. Let it cook. Then let it cool add 3 lumps of sugar, 3-finger pinch of salt and squeeze the juice of 1 lime into it. Stir with a clean spoon and give to child when he or she has diarrhoea. The consistency should be watery at least 1 coke bottle full.

3. Rice water (soft rice):

   Boil 2 table spoons of country rice till it is very soft (soft rice) When soft and dry, add 1 coke bottle of drinking water. Let it simmer. Add 3 lumps of sugar, 3-finger pinch of salt and let it cool Give to child when child has diarrhoea. The consistency should be waterydand at least 1 coke bottle full.

4. Strained rice water:

Boil a scoop (hand) of country rice with 4 coke bottles till it is very soft. Strain thickened liquid - about 1 coke bottle full Add 3-finger pinch of salt and 2 cubes of sugar. Give to child each time he/she has diarrhoea.
If no sugar you may give ORT with salt only.

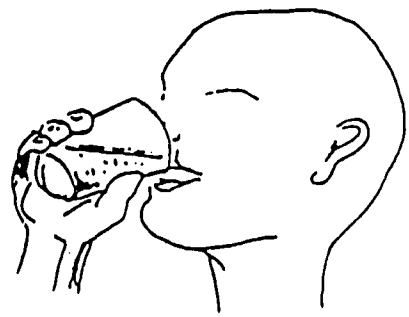
WHEN HE HAS DIARRHOEA CONTINUE TO

GIVE HIM SOMETHING TO DRINK

like this

or

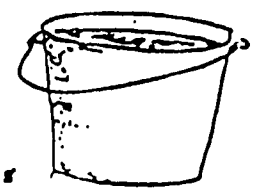
like that



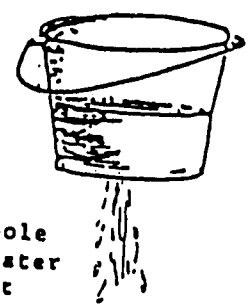
WHY?

Because if the BODY LOSES ALL ITS WATER,

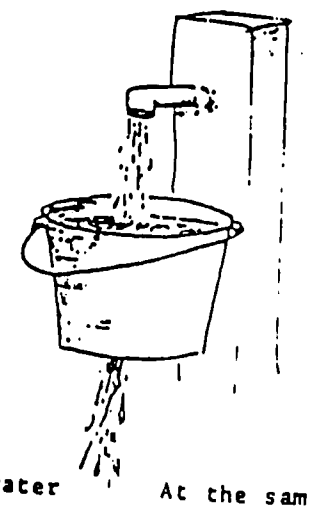
like a bucket with a hole in it, it will die.



This bucket is full of water



if the bucket has a hole in it, it loses its water (like the body when it has diarrhoea)



The bucket is full of water again, because water has been put in it

At the same time, it should be treated and repaired