

REACHING MOTHERS WITH ORT:
A COMPARATIVE
ANALYSIS OF PRICOR-FUNDED STUDIES

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* * * *

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PRICOR ORT STUDIES BY COUNTRY,
STUDY OBJECTIVE AND
PROBLEM ADDRESSED

			SUPPLY				DEMAND										
			Modality of delivery	Source of supply	Product: Commercial	Product: Home mix	Pricing policy and financing	Management information system	Inventories management system	Distribution system	What/how to train providers	Provider KAP including pharmacists	Use of non MD/RW providers	What/how to train providers	Caretaker KAP	What/how to train caretakers	Promoting ORT in community
AFRICA	1.	LIBERIA (A. Cole)	To develop, field test teaching strategies to reinforce mothers' proper treatment of diarrhea.		●						●	●	●	●	●	●	
	2.	LIBERIA (Galaxpa)	To identify acceptable home-based ORT solution and best teaching strategy for mothers/caretakers.		●						●	●	●	●	●	●	
	3.	LIBERIA (J. Moore, P. Hall)	To design, test health education curriculum for adolescents as promoters of health, based on tasks currently performed.		●						●	●	●				●
	4.	NERERIA (Cofodiam)	To identify effective ways to improve PHM supervision.	●													
	5.	SIERRA LEONE (M. Jalloni)	To identify best strategy and person to train caretakers in home-based ORT.		●						●	●	●	●	●	●	
	6.	SOMALIA (N. Lane)	To develop strategies to overcome existing constraints on supply of essential PHC drugs.					●	●								
	7.	SWAZILAND (B. Dlamini, L. Dunn)	To identify ways communities can finance and supervise DNs and to increase DNs' value by additional PHC training including ORT.		●						●	●	●	●	●	●	
LATIN AMERICA/CARIBBEAN	8.	BRAZIL (M. Nations)	To determine how best to mobilize and integrate traditional healers to deliver ORT and manage diarrhea illness.	●	●						●	●	●	●	●	●	
	9.	DOMINICAN REPUBLIC (A. Jcajón)	To analyze current ORT demand, distribution, and current pricing policies to design a government subsidized pricing structure.		●		●	●	●	●						●	
	10.	GRENADA (N. White)	To develop ways to involve community organizations in health related activities, including ORT.		●						●	●	●	●	●	●	
	11.	HAITI (A. Augustin)	To determine optimal use of DNW time in promoting 4 key PHC services, including ORT.		●						●	●	●	●	●	●	
	12.	HAITI (A. Augustin)	To determine best ways to motivate DNs and provide incentives for mothers to learn and use PHC interventions, including ORT.		●		●						●			●	
	13.	HAITI (M. Davenettes, A. Ward)	To find effective ways of mobilizing community participation in promotion of ORT.	●	●	●	●				●	●	●	●	●	●	●
NEAR EAST	14.	MEXICO (C. De la Hoz)	To determine feasibility of packaging and distributing ORT tablets.		●	●	●	●				●					
	15.	EGYPT (C. Galati)	To find effective ways to modify existing ORT programs to teach mothers about rehydration and nutritional rehabilitation.	●	●	●					●	●	●	●	●	●	
	16.	EGYPT (A. Nagaty)	To improve ORT inventory management system.		●	●		●	●	●			●			●	

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REACHING MOTHERS WITH CRT:
ANALYSIS OF PRICOR-FUNDED STUDIES

EXECUTIVE SUMMARY

Sixteen PRICOR-funded studies addressed problems in the delivery of CRT services. Each study was designed to assist program management to make operational decisions; the expected result was an improvement in system functioning, under the conditions prevailing or anticipated in a given situation. The studies were not, therefore, generally designed to test hypothesis, or to provide generalizable findings. Nevertheless, PRICOR has now gained important insights and experience in resolving a defined number of operational problems in CRT programs. Accordingly, the observations and findings from the sixteen PRICOR-funded CRT studies have been described and analyzed in a report entitled Reaching Mothers With CRT: A Comparative Analysis of PRICOR-Funded Studies. Where possible, the report makes use of tables to present processes and results within a comparative framework. It is intended as a contribution to the growing body of information about CRT programs which, in the spirit of inductive science, may yet lead to valid generalizations.

PRICOR-supported studies in CRT varied greatly in their venues, objectives, and outcomes. Locations varied from the urban areas of Egypt to the relatively traditional rural communities of Sierra Leone, Liberia, and Haiti. Some studies tried to guide the design of specific CRT programs, while others were meant to influence the policy environment. Some studied government services, others private groups. Only five of the studies (Nigeria, Somalia, the Dominican Republic, Mexico, Egypt-Nagaty) gave primary attention to resolving issues of ORS supply and CRT services. One of these (Egypt), in its efforts to improve ORS inventory management, also examined the supply-demand interface. Haiti-Cayemittes, while addressing demand issues, also gave serious consideration to improving ORS availability by increasing the number of community outlets. Although the remaining ten (Sierra Leone, three in Liberia, Swaziland, Egypt-Salal, Brazil, Grenada, two in Haiti), investigated the local availability of supplies, they focused primarily upon how best to develop a local training capacity and/or to train mothers. A list of the CRT studies is given in Figure 1 of the paper; a chart summarizing all the CRT studies appears as Appendix A and full abstracts of each as Appendix B.

The CRT comparative analysis reflects the balance of topics among the studies, giving primary attention to describing research which sought ways of reaching the community with information and training. Following the introduction and background sections, the presentation is organized around five topics:

- Ensuring ORS availability at the community level: problems in the management of supply and services
- Creating a favorable social climate
- Building a community training capacity
- Enabling caretakers to use CRT
- Relating the study within a national policy.

The paper closes with a discussion of some of the remaining operational issues in the delivery of CRT services for which CRT can be usefully employed. The analysis is based largely on investigator reports and the personal knowledge of PRICOR study monitors.

Most of the PRICOR-funded CRT studies were conceived in 1982-83 when the thrust of the then-approved CRT strategy among donors and many countries focused on packet distribution through the formal PHC delivery system. At that time, few of the countries had a PHC infrastructure that was able to respond effectively at the community level. Hence community-based distribution (CBD) of CRT packets by paid or volunteer community health workers (CHWs) was beginning to be accepted as a necessary operational extension of the CRT services structure. Commercial distribution of CRS through social marketing schemes and self-reliance through home-made CRS played relatively small roles in the thinking at the time.

However, as results from the problem analysis phase of many of the studies (Phase I of the PRICOR paradigm) began to come in, a broad consensus emerged among the PRICOR-funded studies on the critical importance of enabling mothers and other caretakers to prepare and administer CRS to their children with diarrhea before they became seriously dehydrated, and to know when and where to take the child if further treatment is needed. In most cases, this coincided with the introduction of home-made CRT solution. Many studies shifted their emphasis away from the problems of service delivery and toward an attempt to influence the family decision process at the community level, largely though not exclusively through personal contact.

Although each of the studies developed its own solution to the operational problem of how best to influence the family decision process with respect to CRT, the shift of focus from the service delivery system to the family resulted in a number of common themes. In the great majority of the studies, the caretaker-focused solution gave priority to:

- Increasing caretaker awareness of:
 - the potential seriousness of diarrhea
 - the dangers and signs of dehydration
 - the efficacy of CRT
- Providing caretakers with knowledge and skills in:
 - the preparation of CRS
 - the administration of CRS
 - the appropriate use of back-up and referral services
- Limiting personal risks to caretakers by:
 - mobilizing community support including that of men,
 - elderly women, formal and informal leaders, etc.
 - securing medical and religious sanction for CRT
- Increasing the confidence of caretakers in CRT and their own competence through practice, encouragement, and reinforcement.

In implementing a caretaker-focused strategy, most of the studies developed specific programs designed to create an on-going community capability for the promotion of CRT and for training caretakers and others in its use. The latter objective generally called for programs to train community trainers (TOT - training of trainers), as well as those to train caretakers directly. In some of the studies these programs were supported by efforts to ensure the ready availability of ORS supplies in the community. Although many researchers acknowledged the importance of providing adequate back-up and referral services, none of the studies focused specifically on the referral process.

Seven of the CRT studies were undertaken in Sub-Saharan Africa; seven in Latin American and the Caribbean; only two in the Near East; and none in Asia. Because of resource constraints, mothers in nearly all of the African programs were trained in preparing home-mixed sugar-salt solution, while in the other regions caretaker training focused on the preparation and use of pre-packaged ORS.

The PRICOR-funded CRT studies have shown that in most cases, the availability of an adequate supply of ORS, whether packets of home-mix ingredients, is a less significant problem than that of finding ways to increase effective caretaker demand. However, better systems for inventory management are needed to ensure efficient use of scarce resources.

In their efforts to find ways of generating demand for ORS, PRICOR-funded studies have demonstrated that villagers can be mobilized and trained to serve as volunteers in an important but complex and demanding program, in ways that can reach a large percentage of the target population with information, education, and training in CRT. Further, these studies have shown that this can be done in a relatively short period of time. More importantly, the studies have employed a variety of approaches to enabling the caretakers to manage and treat diarrhea in the young child. They have established that an amazing variety of citizens in any community can be trained in CRT themselves: community health workers (CHWs), traditional birth attendants (TBAs), traditional healers, school teachers, principals, religious leaders, market sellers, mothers who are "satisfied users", school children. These citizens can in turn train the caretakers of young children in these important skills, and promote CRT in the community. The multiplier effect of this training is evident. Equally, the studies have demonstrated the many possibilities for training different combinations and levels of trainers.

A variety of approaches, then, can successfully mobilize communities to participate in CRT promotion and training to enable mothers to use CRT, but the adoption of CRT practice comes more slowly. Enabling comes with the mastery of the knowledge and skills necessary to acquire, prepare, administer CRT at the right time, correctly, to nourish the child adequately throughout the episode, and to recognize when to seek medical help. But having acquired the knowledge, the caretaker must learn to believe in what has been taught, and to develop the self-confidence to put it into practice. Because of the short implementation periods, none of the studies was able to demonstrate what further steps are necessary if the enabled caretakers are to put to use their newly acquired knowledge and skills in any significant numbers. Study findings, like the established literature, suggest additional time, improved educational methods, reinforcement, and more community support to reduce the personal risk to the mother of trying something new and non-traditional.

Because national policies set the boundaries within which CRT programs operate, the most interesting policy distinction observed among the PRICCR-funded studies is that between those who approach CRT primarily as a medical question, and those who appear to be trying to move CRT into the local folk culture. This is reminiscent of the policy differences between those who saw the oral contraceptive as primarily a medical question, and those who advocated community-based lay distribution systems. That issue has been settled with the recognition that both have their place in a broad-based family planning strategy. Will we see the same trend in the use of CRS? What will be the impact of WHO's recent rejection of home-mixed sugar-salt solution?

Despite the growing experience gained from these and other studies, a number of unresolved research issues remain in the areas of CRT policy and management. These include the design of improved CRS formulas, the use of packets vs. home-base solutions, and the sustainability of these programs. The latter being especially important as an increasing number of public and private organizations adopt CRT programs.

I. Introduction

Research and action programs over the past decade have pioneered new methods of improving people's health, using simple techniques, mainly local manpower, and a few basic drugs, vaccines and supplies from national or international sources. Relatively low cost interventions - oral rehydration therapy (ORT), immunization, growth monitoring, breast feeding, vitamin A, among others - have been widely promoted as ways to increase chances for children's survival in the first difficult years. There has been encouraging progress in a number of countries. While far from complete, enough progress has been made to give health care planners hope that at least some "health" may be achievable for major parts of the world's population by the year 2000, the goal of the World Health Organization (WHO) - if only ways can be found to make these services available to the people.

In 1980 the PRICOR (Primary Health Care Operations Research) project was established to provide financial and technical support to developing countries in solving operational problems in delivering these services. Since that time PRICOR has assisted more than 40 on-going primary health care (PHC) programs in 32 developing, to resolve such practical questions as how to reduce village health worker attrition, or how improve ORT inventory management at rural health clinics [1].

Although the sixteen PRICOR-funded studies discussed in this paper addressed one or another aspect of the ORT delivery subsystem, they varied greatly in their venues, objectives, and outcomes. Locations varied from the urban areas of Egypt to the relatively traditional rural communities of Sierra Leone, Liberia, and Haiti. Some studies tried to guide the design of specific ORT programs, while others were meant to influence the policy environment. Some of them were primarily interested in ensuring the increased availability and accessibility of ORS and ORT services. Others, the majority, focused primarily on operational issues associated with ORT promotion and caretaker training. Some studied government services, others private groups. A list of these studies and the topics covered appears in Figure 1: a chart summarizing all the ORT studies and two-page summaries of each are assembled in Appendices 1 and 2 respectively. Further detail on these studies may be obtained from PRICOR or the principal investigator, whose name and address appears on the summary.

Operations Research as a Management Tool

Employing an operations research (OR) approach, the PRICOR studies have been designed with limited, managerial objectives: to solve a specific operational problem or set of problems within an on-going PHC system. Because each begins with an analysis of the PHC system or sub-system which is experiencing the problem(s) of interest, the investigators will frequently have gathered data on a number of components of a specific ORT program, but the research itself will normally have focused on a relatively limited aspect of the system. Each study has been designed to assist program management to make operational decisions; the expected result is an improvement in system functioning, under the conditions prevailing or anticipated in a given situation. The studies have not, therefore, generally been designed to test hypotheses, or to provide generalizable findings. Nevertheless, PRICOR has now gained important insights and experience in how to resolve operational

problems in CRT programs. The program descriptions and OR results reported here may serve to suggest directions and trends which may have broad relevance.

In conducting operations research (OR) on CRT programs, PRICOR-funded investigators draw on the tools and techniques of sociology, anthropology, and epidemiology as well as those of management science. Improving community CRT programs in these studies often required the development of a community capacity to train and motivate its own members, as well as the strengthening and partial redesign of the PHC system itself.

A Comparative Framework

This report is one of three comparative analyses of PRICOR-supported studies carried out during the period 1981-1986. It describes and analyzes how PRICOR-funded decisionmakers investigated and resolved specific operational problems in PHC and CRT. The other two reports describe studies that addressed community financing [2] and community health worker (CHW) [3] issues in on-going PHC programs. Where possible this report makes use of tables to present study activities and results within a comparative framework. It attempts to draw patterns where they are apparent and to present processes and results within a common framework. It is identified as a comparative analysis even though each of the studies was designed to produce locally valid solutions, not universally valid knowledge. Accordingly, the observations and findings from the sixteen PRICOR-supported CRT studies are presented here, as a contribution to a growing body of information which, in the spirit of inductive science, may yet lead to valid generalization.

II. Background

Potentially among the most important of the simple PHC treatments, oral rehydration therapy (ORT) has been officially promoted by WHO since 1971 as a major intervention in the treatment of acute diarrhea. The formulation recommended by that organization since that time is composed of three salts: sodium chloride (3.5g), potassium chloride (1.5g), and either trisodium citrate dihydrate (2.9g) or sodium bicarbonate (2.5g), in addition to glucose (20g), all of which is dissolved in one liter of water, [4]. There was much anecdotal evidence of the effectiveness of ORS during the early years of its promotion, but few scientific studies had been carried out. Since the early seventies, however, considerable research has demonstrated that ORS is effective in reducing mortality from diarrheal disease, in many countries the chief cause of death in children under five years of age.

During this time it has been shown that ORS can rehydrate 90% of patients who earlier would have required intravenous therapy [5]. It has also been shown that ORT can halve the hospital case fatality rate among patients with dehydration secondary to diarrhea (presumably due to the active participation of the mother and the health worker in the treatment of the child and avoidance of septicemia and overhydration of the patient treated with IV) [6]. Similarly it has been found that hospital admissions for dehydration can be reduced by 50-60% [7], with enormous implications for cost savings. What the research has not shown is a reduction in morbidity due to acute diarrhea, as ORS does not prevent diarrhea, nor does it shorten its duration [5].

Concurrently with this research, WHO has been actively promoting the use of ORS, and with UNICEF has been instrumental in publicizing both the magnitude of the diarrhea-related mortality problem and the tested effectiveness of the ORT technology. Considerable experience now exists worldwide with ORT programs, and with PHC programs having ORT components. A number of developing countries, often assisted by UNICEF, WHO, AID and other donor organizations, have mounted national ORT programs and campaigns, while a wide variety of health managers in both governmental and non-governmental systems have incorporated CRT into on-going local or regional PHC programs. Two major international ORT conferences, ICORT and ICORT II, have been sponsored by AID. Journals are devoted to diarrheal disease research. Nevertheless, programs to increase the acceptance and sustained adoption of CRT at the community level continue to present PHC managers with many operational difficulties. The sixteen PRICOR studies which have addressed problems in ORT programs take their place, therefore, within a broad framework of on-going efforts to learn more about diarrheal diseases and their treatment through more effective ORT programs.

1. The Context of National Policy

National policies and prior ORT experience set the framework for the ORT service delivery aspects in the PRICOR studies. Experience with previous ORT programs, reinforced by ORT policy, had shaped the existing ORT/KAP levels among health professionals as in the general community, and determined the level on which educational intervention for ORT would take place under the PRICOR-supported studies.

Similarly, national policy determined the type and availability of CRT to be used in the studies, the distribution mechanism to be employed as well as the form of its promotion on the community level. In several countries, existing policies precluded use of CRS packets in the studies, and in most, the use of mass media for CRT promotion was not an option for the studies for similar reasons.

The sixteen PRICOR-funded studies spanned twelve countries that were very divergent in previous national experience with CRT programs, in the then current levels of CRT policy development, and in political commitment to the policies. At the time of the design of the PRICOR studies most of the participant countries with the exception perhaps of the Dominican Republic, Somalia and Nigeria, had made some form of explicit national commitment to reduce child mortality through the use of CRT. All were in varying stages of national CRT program development. Egypt, Brazil, Mexico and Haiti had already invested substantial resources and effort to encourage use of CRT packets. Although baseline studies indicated that there was considerable awareness of CRT at the start of studies in many countries, accurate knowledge about its preparation and the continuing use of CRT was quite low.

2. The PRICOR Context

Most of the PRICOR-funded CRT studies were conceived in 1982-83 when the thrust of the then-approved CRT strategy among donors and many countries focused on packet distribution through the formal PHC service delivery system. At the same time, most of the countries faced a major operational constraint in a PHC services infrastructure that was unable to respond effectively at the community level. Hence, community-based distribution (CBD) of CRT packets by paid or volunteer community health workers (CHWs) was beginning to be accepted as a necessary operational extension of the CRT services structure. Commercial distribution of CRS through social marketing schemes and self-reliance through home-made ORS played relatively small roles in the thinking at the time.

Within this context, the PRICOR-supported CRT studies were intended to assist PHC service systems to resolve specific operational problems. Accordingly, the studies focused on improving CRT delivery at the community level, with a few exceptions following a health services-oriented model: the model assumes that the health system will supply the necessary CRT services (frequently through a CHW) and often the supplies, with the service providers as the decision-makers about CRT and diarrhea management. The CR studies funded by PRICOR would in turn help CHWs and other providers and services function more efficiently and effectively. This orientation influenced the initial choice of problems addressed, the strategies employed, and the levels of intervention selected.

During the problem analysis phase (Phase I of the PRICOR paradigm) of many of the studies, however, two unforeseen factors emerged, their influence resulting in a subtle conceptual reorientation in the direction of the studies. The first factor was related to the over-representation of poor and mostly African countries among the PRICOR-funded CRT studies; in these countries particularly serious shortcomings in the PHC infrastructure and limited resources for CRS supplies made a health services-based model largely irrelevant. Secondly, but of equal importance, was the growing recognition of the family's decision role in

the treatment of diarrhea and CRT. With the two factors reinforcing each other, many studies shifted their emphasis toward attempting to influence the family decision process at the community level, largely though not exclusively through personal contact. A broad consensus emerged among the PRICOR-funded studies on the critical importance of enabling mothers and other caretakers to prepare and administer ORS to their children with diarrhea before they became severely dehydrated, and to know when and where to take the child if further treatment is needed. In most cases, this coincided with the introduction of home-made ORT solution. Most PRICOR-funded ORT studies may therefore be characterized as local programs that experimented with local community dynamics and communication mechanisms, to promote ORT and to train caretakers in its use. These modest community programs stand in contrast to national programs relying on mass communications to promote ORT.

Although each of the studies developed its own solution to the operational problem of how best to influence the family decision process with respect to ORT, the shift of focus from the service delivery system to the family resulted in a number of common themes. In the great majority of the studies, the caretaker-focused solution gave priority to:

- a) Increasing caretaker awareness of:
 - the potential seriousness of diarrhea
 - the dangers and signs of dehydration
 - the efficacy of CRT
- b) Providing caretakers with knowledge about and skills in:
 - the preparation of ORS
 - the administration of ORS
 - the appropriate use of back-up and referral services
- c) Limiting personal risks to caretakers by:
 - mobilizing community support including that of men, elderly women, formal and informal leaders, etc.
 - securing medical and religious sanction for CRT
- d) Increasing the confidence of caretakers in the effectiveness and safety of CRT and in their own competence in preparing and administering the solution, through practice, encouragement, and reinforcement.

In implementing a caretaker-focused strategy, most of the studies developed specific programs designed to create an on-going community capability for the promotion of CRT and for training caretakers and others in its use. The latter objective generally called for programs to train community trainers (referred to in this paper as TOT, i.e. training of trainers), as well as those to train the caretakers directly. In some of the studies these programs were supported by efforts to ensure the ready availability of ORS supplies in the community. Although many researchers acknowledged the importance of providing adequate back-up and referral services, none of the studies focused specifically on the referral process.

Seven of the CRT studies were undertaken in Sub-Saharan Africa; seven in Latin America and the Caribbean; only two in the Near East; and none in Asia, although nearly 25% of all PRICOR-funded studies were in that region. Because

of resource constraints, mothers in nearly all the of the African programs were trained in preparing home-mixed sugar-salt solution, while in the other regions caretaker training focused primarily on the preparation and use of pre-packaged CRS.

Only six of the studies (Nigeria, Somalia, the Dominican Republic, Haiti-Cayemittes, Mexico, and Egypt-Nagaty) gave major attention to resolving issues of CRS supply and service delivery. One of these (Egypt), in its efforts to improve CRS inventory management, also examined the supply-demand interface. A second (Haiti), while addressing itself primarily to demand issues, gave serious consideration to improving CRS availability by increasing the number of community outlets. The remaining ten (Sierra Leone, three in Liberia, Swaziland, Egypt-Galal, Brazil, Grenada, two in Haiti), while usually investigating the local availability of supplies, focused primarily upon how best to develop a local training capacity and/or to train mothers. This review will reflect that balance among themes.

The presentation is organized around five topics:

- Ensuring CRS availability at the community level: problems in the management of supply and services
- Creating a favorable social climate
- Building a community training capacity
- Enabling caretakers to use CRT
- The role of national CRT policy.

The paper closes with a discussion of some of the remaining operational issues in the delivery of CRT services, for which CR can be usefully employed.

III. Ensuring ORS Availability at the Community Level: Problems in the Management of Supplies and Services

1. Pre-Packaged ORS

Only five of the sixteen PRICOR-funded ORT studies (Somalia, the Dominican Republic, Haiti-Cayemittes, Mexico, Egypt-Nagaty) addressed problems in the management of pre-packaged supplies of ORS. One of the studies, in Egypt, in addition to undertaking a detailed analysis of the management of supplies in the public sector, also investigated the articulation between supply and demand at the village level.

All five of the studies examining supply questions have obtained information about retail supplies, outlets, pricing, and marketing, although in varying levels of detail and comprehensiveness.

- In an OR study of the drug distribution system in Somalia, investigators noted that though ORS was included on the list of essential drugs, only 40% of the pharmacies surveyed had ORS in stock.
- In the Dominican Republic a study was undertaken to assist the government in designing a subsidized pricing structure for a national ORS program. Although for various reasons, the specific two-tiered pricing scheme generated by the econometric model used in the study was not adopted, the government has since indicated some interest in implementing a similar two-tiered system.
- In Haiti, investigators obtained data on inventories, retail sales, profit margins, and promotional practices from community ORS postes de vente (sales posts). Operators of these sales posts had been chosen by community leaders and assisted by the government in beginning operation. The investigators found that demand was low and losses from theft, rats, and spoilage cut severely into the \$.03 profit margin allowed by the governmentally mandated wholesale (\$.12) and retail (\$.15) prices. Supplies were generally available, although a two-week lag between stock-out and resupply was common. Despite these problems, most indicated willingness to continue operation. The investigators developed a modest training program to improve storage practices and promotional activities. Three months later the majority were still in business and had instituted many of the recommended practices. No data are available on changes, if any, in sales, losses or profits.

The same investigators surveyed local market sellers to assess their willingness to serve as retail outlets for ORS. The majority expressed serious interest, and were willing to accept training in promoting appropriate ORS use among their customers, many of whom are mothers of young children.

- One of the PRICOR studies in Mexico examined the feasibility of marketing and distributing ORS in tablet form. The investigators concluded that the demand for such a product was insufficient to warrant its production.

- In Egypt, in the study mentioned above, investigators obtained data from pharmacies in the two governorates similar to that obtained from the postes de vente in Haiti. At the time of the study (1984), retail demand was low, stocks were adequate to meet these levels of demand, and profit margins were low, although they were comparable in percent of cost to the more expensive anti-biotic and anti-diarrheal drugs. CRS demand would need to be very high to generate the same amount of profit, and not surprisingly, the pharmacists were not actively promoting ORS to the women who approached them for advice. (It is important to note here that in Egypt, unlike many of the other countries, CRS was a prescription item. However, the study found that pharmacists would sell CRS without a prescription if it was specifically requested; they did not suggest it spontaneously when asked by mothers for advice.) Analysis of the articulation between supply and demand for CRS at the rural health unit led to the development of a proposed ORS inventory information system which is being tested in two governorates.

Together, these five studies do not add up to a full examination of the operational issues in managing supply systems for pre-packaged CRS. They do suggest, however, that:

- In most places ensuring the availability of supplies has not been as great a problem as creating sufficient effective demand.
- Profit margins on ORS are low; without large sales volumes generated by high levels of demand, net profit to retail sellers is minimal.
- Retail outlets other than pharmacies can be effective in ensuring wide dissemination of CRS; they often operate on smaller profit margins, and do not usually handle high profit competing drugs.
- Private systems, which are driven by demand (and profits), tend to maintain tighter inventory control at the periphery; public systems, if driven by supply decisions from the center (or by population-based "needs"), may find stocks piling up unused.
- Both require an adequate system of inventory management and control, including an inventory information system, to minimize both stock-outs and spoilage from excessive inventories.

2. Home mixed solutions for CRT

Most of the seven studies using home-mixed ORT solutions promoted one or more standardized formulae. They also investigated the availability both of ingredients and of containers and utensils for mixing, storing, and administering the solutions. None found a serious problem with availability of ingredients except Sierra Leone, where sugar is largely unavailable and very expensive, and Brazil where there is concern that traditional healers may not be able to afford the ingredients after the project ends. Some studies also tested the formulae for acceptability to the caretakers.

- In Swaziland, the national ORT program promoted a standardized sugar (8 caps), salt (0.5 caps) and water (1 litre) formula. This represented a change from an earlier formula calling for 1 cap of salt (a possibly toxic amount). A household survey to evaluate a training course given to CHWs in the study area found that 11% of the mothers could produce a rehydration kit, consisting of a litre bottle, a bottle cap, a spoon, a cup, and a supply of both sugar and salt; this was significantly more than the less than 3% reported by a national survey.
- In Haiti two standardized formulas were tested: 1) the WHO formula consisting of water (1 litre), sugar (2 tablespoons), salt (1 level teaspoon), a pinch of bicarbonate, and the juice of half a lime, and 2) a modified guava tea made with the same amount of water, sugar, and salt, substituting 9 small leaves of the guava plant for the lime, and omitting the bicarbonate. A household survey indicated that both ingredients and utensils were widely available. Differences in the sizes of spoons caused some concern.
- In Liberia the investigators had hoped to interest the mothers in using a rice-water base because of its ready availability in the area, but the mixture was rejected by the mothers in favor of a formula consisting of sugar (2 cubes), salt (3 finger pinch), water (1 litre), and the juice of one orange; the mothers indicated that both ingredients and utensils were widely available.
- Investigators in two other studies in Liberia used the water-sugar-salt-orange juice formula developed in the study described above; availability was not a problem.
- In Sierra Leone, because sugar is costly and not widely available, investigators proposed to promote sugar as a "medicine", asking people to obtain it in advance and store it for use in ORS. The formula promoted consisted of water (3.5 pints, boiled), sugar (3 teaspoons), and salt (1 teaspoon). Coconut water and rice water were also considered as substitutes for the sugar and salt formula. Standard sized spoons were not available; pinches, scoops, and teaspoons of varying sizes were used.
- In Brazil, a traditional tea was modified by the traditional healers for use in ORT. The formula is similar to the standard WHO formula, but it contains slightly less salt. The project has supplied the sugar and salt, as well as "Morley spoons". Healers supply their own containers. There is concern that the healers will not be able to afford these ingredients when the study ends.

Several investigators observed that the taste of the prescribed formula was disliked by the mothers; some of the modifications to the WHO formula introduced in these studies were intended to make the solution more palatable.

Variability in composition of the formulae as mixed in the home, and their safety were tested only in the traditional healer study in Brazil, where laboratory tests found the mixtures to be consistently within acceptable limits.

Except for those who considered using coconut water or rice water, none of the seven studies using home-mixed solutions attempted to add nutrients to the formula. However, the focus of one study using CRS packets in Egypt was on educating mothers about appropriate feeding of children during and immediately after diarrhea and treatment with CRT. Based on an analysis of current feeding patterns, mothers were advised by health care providers in small clinics to continue breastfeeding, and to feed the child his/her normal diet, so long as the food was "boiled". This advice ensured that the child would receive a safe, nutritious, and culturally acceptable diet, reducing the probability of the malnutrition which often accompanies frequent diarrhea. The use of the term "boiled" in the message was unique to the study, and served as a "marker" to permit investigators to evaluate the extent to which the mothers had heard and retained the message. A follow up survey, conducted in participating clinics three months after the message was introduced, indicated that 78% of the mothers reported receiving this message from a health care provider. There was also a statistically significant increase in CRT use. Interviews with health care providers showed that they were delivering more, and more appropriate dietary advice to mothers when their children had diarrhea. These significant improvements were achieved without altering the existing infrastructure of the ORT program. This message has now been adopted by mass media and health promotion programs.

These studies touch on a number of the supply-side operational issues that are being addressed by those promoting a home-mixed ORS program: standardized formulae, availability of ingredients and utensils, composition of the solution as mixed in the home, addition of nutrients. Together, their experience suggests that:

- Despite its physiological effectiveness, the poor taste (to adults) of the WHO mixture can be an important constraint to widespread use. Nearly all the studies have found it advisable to adapt the basic formula to local practices, preferences, and tastes.
- Except in Sierra Leone and Brazil, availability and affordability of ingredients for home-mixed CRS has not generally been the serious problem that many had feared.
- In those areas where access to the standard ingredients is problematic, or where access is difficult for the very poor, the substitution of locally acceptable teas and other mixtures is often possible and should be explored.
- Of potentially greater concern than the availability of ingredients for suitable mixtures, is the absence of standardized utensils observed in a number of the studies. Attention to training mothers in preparation of the mixture becomes particularly important and is especially difficult in such situations.
- The addition of nutrients to CRS or their administration along with CRS may help to replete the child with diarrhea; no standardized formulae for such an enriched mixture have yet been widely accepted. Meanwhile, advice on diet can be given along with CRS.

3. Management issues in PHC/CRT service delivery

Only two of the CRT studies primarily addressed management issues. In Nigeria, an OR study found that supervision of village health workers (VHWs) was deficient. Few supervisors could demonstrate an adequate understanding of supervisory tasks; supervisory visits were short and infrequent, and supervisors generally did not follow-up on problems uncovered during those visits. Few supervisors had been trained in supervisory skills, nor had they been provided with protocols or other tools to use in planning, carrying out, and following up on their visits to VHWs. Among the set of solutions, the investigators proposed and developed a protocol for supervisory visits. This guide included basic items to be covered in a visit plus loose leaf pages on each of four key PHC interventions (CRT, immunization, growth monitoring, family planning) for use on a rotating basis. In-service training in use of the protocol is planned.

In Egypt, as noted previously, an OR study developed an improved ORS inventory management system for use by system managers at the rural health unit level as well as at the regional level. Based on the results of an inventory model, the system calls for periodic orders, monthly at the village level, every two months at the district, and quarterly at the governorate. Amounts to be ordered are calculated by the local manager from three readily available parameters: average cycle demand, demand during the previous cycle, and inventory at the end of the previous cycle. It is expected that the new system will reduce spoilage due to overstocking and storage periods which exceed the shelf life of the ORS packet, while at the same time minimizing the probability of stock shortages. Simple to use at the local level, it is hoped that the scheme can be adapted to the management of other inventory items.

IV. Promoting CRT in the Community

The strategy adopted by most PRICOR-funded studies sought to increase awareness and acceptance of ORS at the community level and to improve related nutritional and referral practices. To this end the researchers undertook four essential tasks:

- Obtaining sanction for CRT programs from the community leadership
- Recruiting community members for promotional activities
- Establishing a local training capacity for CRT in the community
- Using that capacity to train mothers in CRT

These tasks overlapped and merged to varying extents in different studies, as part of the research process. Virtually all the studies began with efforts to create a favorable social climate. The specific approaches used in a given study were identified during the problem-solving process; each therefore represents a localized case study built around the process of mobilizing community interest in CRT.

1. Creating a favorable social climate

Information gleaned from the extensive baseline data gathered by most of the studies revealed that diarrhea management is tied into an existing belief structure with a variety of practices that are not easy to change. However, those data also indicated that change does occur in the right climate of experience, community opinion and support. A good example was finding in Liberia that antibiotic drug use is the current keystone in diarrhea treatment. Over time people had apparently shifted from the use of traditional practices to modern drugs, promoted and reinforced by the modern medical and commercial establishments. Ironically, this treatment behavior must now be shifted once more to replace drug use with CRT. While inducing a change in beliefs may ultimately require a broad inclusive strategy, the scale of the PRICOR-funded studies led to specific and more limited approaches to creating favorable social climates.

Creating a favorable social climate emerged from the studies as a process operating simultaneously over time on different levels of the society, and with a duration far beyond that of the project life. The components of the favorable climate addressed included one or more of the following:

- The national CRT policy: This has the most far-reaching effect on the availability of CRT technology. Several of the studies had a view to influencing national policy through OR outcomes.
- Support for CRT from the health professionals: This is essential first in order to increase CRT use under control of health professionals, and second to gain professional support for a caretaker-focused CRT program on the community level that could have only indirect professional control.

- Support from the local health worker of the PHC system: This is crucial to sanctioning and reinforcing CRT and improving nutritional practices in the community.
- Cooperation from the education establishment: Cooperation on both local and policy levels is a key to involving the schools, now an enormous and largely untapped resource for introducing widespread change in diarrhea management practices.
- Support from the formal and informal community leadership: This support, by providing social sanction, reduces the risks to the mother of adopting a new and non-traditional therapy for her sick child.

Combinations of these components were variably emphasized by the studies; no study addressed all of them. All researchers gained some experience with involving the leadership and the local health workers, where they existed.

a) Obtaining the Support of Medical and Health Establishments

Health professionals often share with traditional villagers a reluctance to relinquish established and often cherished practices in favor of new, different and "unproven" ones. Previous studies had identified hesitations by the medical profession to promote CRT, partly due to concern over the safety of incorrectly mixed solutions. This was found to be particularly important in Egypt, where physicians are central to formulating national policy, but at the same time have been among the slowest to acknowledge the effectiveness of CRT. The two Egypt studies (Nagaty and Galal) found that specific technical training for health professionals does improve the support for CRT and can increase the use. However, while training and participation in CRT programs can help, they do not guarantee the necessary support. In Grenada, for example, although CRT seminars for physicians and other health professionals had been conducted by the national program, PRICOR-funded investigators found that a number of health professionals continued to be reluctant to support community-based distribution of CRT. Without such support, the effectiveness of CRT programs is seriously limited.

Private pharmacists are a common conduit for CRT information and supplies as well as for competing diarrhea treatments which offer a larger profit margin. Several studies looked at the role of pharmacists in communicating information about CRT. Since CRT with its low profit margin has low priority in the commercial sector, researchers in Egypt and Mexico, for example, found a problem in the amount of information that pharmacists were prepared to give mothers. Moreover, when information was given, it was sometimes inadequate. None of the studies undertook pharmacist training as a major intervention; the studies in Egypt and Mexico suggest the potential utility of such training, but researchers also noted that incentives may be required to offset the current pricing structure.

Support and encouragement from the local PHC establishment is crucial, if it is to provide adequate referral services. In Liberia, Sierra Leone and the three Haiti studies, service personnel were trained as trainers; in these and in Brazil and Grenada, they also participated in the field supervision of

caretaker training. Grenada appears to have been the only study where this support was very weak and incomplete, in spite of previous training on ORT. Apparently the root of the problem was an ambiguous national ORT policy that seemingly maintained control over ORT in the medical establishment while approving community-based distribution of ORS packets, a move which shifts some control to the community.

b) Securing Cooperation from the Educational Establishment

Six PRICOR-funded researchers experimented with ways of involving the education sector on the local and the national levels. In Liberia, Moore and Wall found ways to integrate ORT into a national health education curriculum, with very positive results. Other Liberian investigators followed this lead and involved teachers and children in establishing a community-based training capacity. Haiti-Caymittes developed a similar approach, while Sierra Leone and Brazil involved only the teachers as ORT promoters or trainers.

Although Moore and Wall reported that the teachers felt overburdened with the additional responsibility, the children responded well. These studies discovered an acceptable and functional role for the schools in community health education in general and in ORT promotion in particular. This is not to suggest that schools should take over that function, but rather that they were found to play an important complementary role in creating a climate of awareness, support and sanction for the new ORT practices.

c) Establishing Community Entry Points

Most of the PRICOR-supported researchers analyzed the possible mechanisms for "mobilizing" the community to work for ORT; they sought effective ways of generating interest in ORT, and considered how best to encourage parents to use this new, strange and non-traditional way of treating diarrhea. Many of the studies stressed the importance of finding the right opinion leaders, key groups or individuals whose credibility was high and who would provide the kind of social support that a mother would need to try and to sustain this new treatment.

Interestingly, as the researchers focused so intently on identifying the best people to serve as entry points, they inadvertently discovered an entry process, perhaps even more important than the sought-for key groups and individuals. The intensive research process, particularly the anthropological and survey aspects that most studies included served to generate widespread public interest in what the researchers were doing, and secondarily in ORT. Table I lists some of the research activities that forged the interactive process between researchers and communities. No investigator was as intensely involved with the community as was Nations in Brazil, but all consulted with formal and informal leaders on numerous activities and questions. Most involved local people as field assistants. In all studies batteries of surveys and other interviews were carried out throughout the study period. Much of the research then was participatory and focused on diarrhea-related practices.

This entry process, initially educational, with time became a promotional mechanism for CRT. The questioning, interviewing and discussion served to

establish child diarrhea as a community problem of interest. In exploring community perceptions about diarrhea, the questioning about treatment practices indirectly signaled options to established practice and brought CRT to wider attention. The process of identifying caretakers, identifying trainers, training trainers, initiating community and group meetings, and stimulating home visiting generated considerable interaction within the community around the subject of diarrhea and CRT. Many persons became involved in making contacts, passing information, carrying out informal discussions. It may be that there were subtle status rewards for those who generated the greatest momentum, although none of the studies examined this directly. Such community involvement also served to gain wider social sanction for CRT use. In short, the positive role of the research activities themselves in generating support must not be overlooked.

Other community entry mechanisms that were employed attempted to organize the community around CRT directly, or around another initial health agenda. For example, researchers in Swaziland and Haiti (AEDC) rallied support for community financing schemes for health workers; Grenada tried to generate a health agenda through public works projects. The most successful was the study in Brazil which worked with traditional healers in delivering CRT: because Brazilian traditional healers have first-class credibility with mothers as well as with the broader community, their use established a favorable and supportive climate for CRT.

Most researchers used a variety of approaches. Their combined experience suggests that in most communities, although there may not be one perfect entry point as there was in Brazil, there are a variety of entry points and mechanisms that can be carefully assembled into a successful strategy to involve the community. The interactive process itself can create entry into the community and later galvanize the community into action for CRT.

Nevertheless, there are specific leadership functions in the community that must be fulfilled through one of the entry points in order for the promotional effort to take off: there must be sanction, first for the research to take place and second for CRT promotion and use. These are not the same and are not necessarily embodied in the same leaders. While the research "gatekeepers" were easier to identify - mayors, paramount chiefs, traditional leaders, etc., the opinion leaders for acceptance of the non-traditional diarrhea treatment were more diffuse in the community. Again, the Brazilian healers were clearly opinion leaders on CRT while the mayor and other leaders sanctioned the research activities. In Swaziland the Paramount Chief and the Council of Elders may have overlapped some what in these two functions.

One hypothesis is that the interactive research process and the important training component that followed may actually have created new opinion leaders for CRT. An interesting related question concerns the extent to which non-traditional leaders function as opinion leaders in changing societies. Studies in Liberia and Haiti found evidence indicating that teachers are afforded some of this status, and the principal investigators in the same countries certainly made the assumption that school children are accepted by their parents, if not by others, as opinion leaders.

2. Promoting CRT

Establishing entry into the community and promoting CRT represent essentially a single process in which the initial effort is made by the "outsiders", but which if successful increasingly comes to represent the effort of the community itself. This is the "mobilization" concept which underlies the ten community-oriented studies. The experience of these studies suggests that it may not be easy initially to mobilize a community directly to take concerted action for CRT. Even if diarrhea is a recognized local problem, it may not be of high or first priority to the community. But with time and a variety of CRT-related activities, communities can be focused on the diarrhea problem and encouraged to invest effort and time to promote CRT, at least for the duration of the study. Because of the relatively short study durations, none could expect to document noteworthy shifts toward self-directed promotional activities, nor did these studies last long enough to address the question of what subsequent steps are necessary to complete the process.

a) Types of Promotional Activities

Table I summarizes the specifically promotional activities for CRT which were undertaken in these studies, along with training and research activities which inadvertently also promoted CRT.

- Home visits: These represented the major promotional activity in PRICOR-supported studies. TBA's, CHW's and children were major promotion and training agents in the homes.
- Collective assemblies and group based-activities: To reach larger numbers more efficiently, nearly all the studies held meetings and assemblies, for example at the Haitian rally posts, or at other public assembly points. Established religious and social groups were used to promote CRT internally, and in Haiti-Cayemittes, in the broader community. Also in Haiti (the AEDC study), affinity groups were built specifically around CRT and linked to a credit scheme. These groups promoted CRT among their members and by their very existence, in the community.
- Local media, drama, skits and entertainment: Often in relation to market days and other community occasions, the school children trained in PRICOR-funded studies performed promotional skits. In Haiti, Cayemittes involved RaRa bands in CRT promotion, and other entertainment has also been reported anecdotally, but documentation of these efforts is very limited.
- Flyers and visual materials: Prepared and distributed in a number of projects, these usually included the recipe for preparing home-made ORS.
- Mass media: There appears to have been no radio programming in support of any of these projects, although in several countries there were or had previously been radio campaigns in support of a national program

- Commercial promotion: Principally carried out in the Haiti-Cayemittes study, this included high visibility signs at new salesposts and promotional "sales talks" by the market sellers.
- Other promotional activities: Community construction of "curing rooms" for the traditional healers in Brazil was probably the most successful promotional activity among the studies.

A major difference between the PRICOR-supported studies and other CRT projects emerges here. For example, whereas the large national Healthcom projects of the Academy for Educational Development [3] rely principally on the development and use of mass media, the PRICOR studies made only very limited use of any media other than personal contact. Localized radio use was not an option for Sierra Leone or Liberia, although it had been considered. Haiti, Swaziland, and Brazil had and presumably still were at the time conducting national CRT radio campaigns as part of the national program, which in part explain relatively high baseline levels of CRT awareness. The more creative studies (Haiti-Cayemittes, Sierra Leone, Brazil and Liberia-Moore) devised publicity and promotional schemes using local folk media, incentives, and sales promotion. The Liberia-Moore study demonstrated an effective participation of school children in promoting CRT using local media, plays, skits on market days. Haiti-Cayemittes and Liberia-Cole also used school children for promotional work.

b) Group-based and Collective Approaches

Promotional approaches used either existing groups or established organizations specifically to promote CRT; these were important in several studies. Perhaps most successful in publicizing CRT was the community appeal for contributions and labor in constructing CRT "curing rooms" for the healers in Brazil. In Brazil, Sierra Leone, and the three Haiti studies, group efforts were directly aimed at generating CRT support. In Grenada and Swaziland the concerted group efforts were for other priorities with CRT a secondary objective. These examples of community organization all testified to the potential utility of this promotional approach.

In nearly all the studies, meetings with community leaders created continuing support and sanction for the study and for CRT promotion. (Table I). While meetings with community leaders do not generate wide publicity, they are an important form of promotion.

3. Discussion: the momentum for community action

It was observed earlier that CRT promotional activities were initially generated by sources external to the community; given the relatively short intervention periods allowed by these studies, there was insufficient time for the study communities to take over and generate their own CRT promotional program. Nevertheless, as increasingly more people became swept up into some form of active participation in CRT-related activities, that participation itself became a vehicle of promotion. The selection of community trainers, their training, and then their energetic searches for diarrhea cases and mothers in need of training became the dominant form of promotional activity. In Haiti (Cayemittes) and Sierra Leone promotion may in fact have reached "aggressive" dimensions. Judging from the large numbers of different trainers

that were launched into action, for example, it is likely that in the Haiti (Cayemittes) study a substantial number of caretakers may have been approached about ORT by more than one trainer. This study generated a very high and active level of community promotion; unfortunately, these activities were abbreviated by political unrest before a full study of their effect could be made.

These studies point to questions about the role that can reasonably be expected of community leaders. Community members are likely to be more effective when their activities fit into established patterns of social interaction. Researchers in Swaziland, Sierra Leone, and Haiti (Cayemittes) showed that traditional and community leaders could be involved, but they were more likely to promote passively by sanctioning, facilitating meetings and talking to other community leaders than by actively going out to recruit supporters or initiate a publicity campaign. These studies suggest that one of the important tasks in initiating a community-based ORT program is to delineate the various roles and functions that are needed for an intensive promotion, taking care to match participating community leaders with an appropriate function. For example, TBAs are accustomed to visiting in homes, as are children, whereas teachers and religious leaders are more likely to receive people and give out information from an established institutional base; an effective program should capitalize on their different strengths.

V. Building a Local Training Capacity (TOT)

Ten of the sixteen PRICOR-funded studies built a local capacity for training caretakers. Before describing the training processes and what was learned from studies, it is important to stress the absence of a standardized approach across studies and the variability among them. The studies were designed to solve locally defined problems, and although they share common problem solving strategies, the details of implementation are not basically comparable.

Within the original PRICOR OR paradigm, training was a relatively small step within the larger process of problem identification and analysis (PRICOR Phase I), solution development (Phase II), and testing of the chosen solution (Phase III), [1]. For this reason training in most studies was given proportionately less emphasis than the overall OR process.

However, as training became the central intervention during the course of many of these studies, the adequacy of the training process itself turned out to be of greater importance operationally than foreseen. Establishing a local ORT training capacity in itself represents a shift in the control over the transfer of ORT technology and diarrhea case management away from the health establishment to the community. Moreover, in those studies that relied on home-made ORS solution, the training of community trainers relegates the health establishment to a still more marginal role in diarrhea management. Given an initial conceptual OR model that focused on the role of the health establishment, such operational shifts in ORT program control would have required a corresponding strengthening of the training component. However, not all of the investigators recognized its increased importance; more importantly, most underestimated the technical and logistical difficulties in implementing such a complex community training program.

In only three studies (Haiti-Cayemittes, Sierra Leone, Liberia-Moore/Wall) were professional adult educators among the principal investigators. Two of these were experienced in training change agents and inducing behavior change in largely traditional societies. Their studies offer solid perspectives on the training process, either because of the thoroughness with which the training was planned and carried out (Cayemittes), or through the recommendations for how training should be strengthened in the future (Jallon in Sierra Leone). The Liberia (Moore/Wall) educators focused on primary school education rather than on adult education.

1. The Role of the Research Teams and PHC Structure

In six of the ten studies that focused on establishing community-based training capabilities for ORT, the research teams themselves conducted the TOT, participating in or even directly selecting the trainers, designing the training content and methods (See Summary Table II). In Grenada and two of the Haiti studies, the TOT was left largely to Health Center nurses or primary health care services teams. The Haiti-Cayemittes study was unique in assembling a training team that included primary health care specialists, social and behavioral scientists and training/education specialists.

Participation by the local PHC establishment in the training process was limited by their distance from the communities, staff shortages, and transport problems. Galakpai in Liberia used the local health department staff as an

intermediate level of trainers for training community volunteers as trainers. Liberia-Moore, Sierra Leone, and to some extent the three Haiti studies all involved health center staff in the training of caretakers, but the TOT of the workers for this task was basically done by the researchers. In Grenada, Swaziland, Haiti-Cayemittes, and Sierra Leone, paid PHC staff were involved in the field supervision of the training of the caretakers. Where the research team carried out its own field supervision, as with Liberia-Galakpai, this feed-back process appears to have resulted in retraining of trainers and/or modifications of the TOT approach.

The limited involvement of PHC staff in TOT and supervision should not be seen as a shortcoming of the studies, but rather as an operational reality in which health personnel (other than volunteer workers) were involved when available. In Brazil, for example, while the healers were trained by the researchers themselves, the five community health agents who assisted in the field supervision, were trained by doctors at the University Medical School rather than by the PHC establishment.

2. Training Efficiency and Control

Because of the already noted shortage of health personnel which was one of the services delivery problems that prompted these OR studies, nurses and health workers could not assume the task of training all of the mothers. Accordingly, the researchers developed supplemental trainers within the communities. The design of the programs to train trainers (TOT) for the community was intended to quickly reach the greatest number of mothers with available training resources. The investigators tried various mechanisms to increase the efficient use of training resources, while maintaining control over the quality of the continuing training process in the community.

Investigators in Sierra Leone, Swaziland, Brazil, and Grenada used the one-tier approach in which the researchers and/or Community Nurses trained one group of community trainers who were charged with reaching all of the mothers in the community, i.e. a simple multiplier effect. The experience of most studies showed that such an approach functioned reasonably well; the local trainers became able to pass on the CRT knowledge and skills to others on a continuing basis. The approach also permitted evaluation of the trainers through direct linkage with their trainees, so that inaccuracies, incompleteness in the transmission of information or in the handling of questions could easily be identified and remedied.

However, investigators in the six studies in Liberia and Haiti opted for more complex designs; they tried to increase the multiplier effect by training two tiers of CRT trainers, thus increasing the total number of trainers trained and thereby multiplying the number of mothers that could be trained. As illustrated in Table II: Liberia (Galakpai) researchers trained the Community Health Department staff who then trained a broad range of community volunteers who in turn trained mothers. In Haiti (Cayemittes) the District Health Officer and Specialist Team trained health agents, church leaders and Rural Development trainers all of whom in turn trained community leaders, market sellers, school children and other volunteers who then finally trained the mothers in the community.

While this two-tiered approach appears more efficient than a one tier design, it is not necessarily equally effective. With an intermediate level of trainer juxtaposed between mother and the first community trainer, it could become very difficult to monitor and identify sources of error or gaps in information. None of the two-tier studies addressed this issue directly; in those studies that trained teachers to train school children to train mothers, the cognitive learning of the children was verified, but no formal evaluation of their role as trainers at home was made. Galakpai in Liberia, and Cayemittes in Haiti noted the difficulties experienced in the two-tiered training process. The former reported extensive retraining of community trainers, which suggests that the intermediate level of trainers was not entirely successful.

In many ways the training experiences of the various researchers are not comparable. Liberia (Cole), for example, trained only 5 CHW/TBAs and one teacher as trainers while Jalloh in Sierra Leone and Cayemittes in Haiti trained literally hundreds of trainers. Hence the degree of control over the training and the problems encountered are very different. What is important, however, is the demonstration that one team - be it a research or training team - can establish a sizeable training capacity in most communities.

3. TOT Content

Some observations about TOT curricula can be made from an examination of Table III. As would be expected, diarrheal dehydration and ORT formed the core learning content for the trainers. Researchers in Sierra Leone, Liberia (Cole), and Grenada also discussed such diarrhea-related topics as sanitation, transmission of infection, hand-washing, etc.. Messages about child feeding and nutrition received attention in most of the TOT programs.

Module development was found useful and efficient in those projects where educational objectives and content varied for different target groups. For example, all the studies that trained in the schools opted for the use of modules. This was ultimately quite successful in that it allowed adaptation of content, language and language level to the children being taught. In the Haiti (Cayemittes) study, a number of content modules were developed for each topic and then variably combined to fit the training needs of different community members, depending on their role in the promotion, training, and provision of CRT. For example, the study determined that a market seller making ORT packets available to a mother would require different knowledge about ORT and its preparation than would a TBA advising mothers about making and using a home-made sugar-salt solution. Further, the amount and type of information required by these mothers would not be the same in all respects. While there was a uniform core content for all trainees, e.g. diarrhea, dehydration, and death, the use of modules allowed this content to be presented in varying levels of detail.

Curricula from virtually all of the studies included lessons on teaching/training methods for training caretakers. The basic approach was the use of lecture, demonstration and discussion. In Liberia, Galakpai set out to compare group teaching with individualized instruction, and trained a group of trainers specifically for each method. Although they found that individualized instruction was slightly more effective, it was accompanied by

a higher drop-out rate; as the differences in effectiveness were small, the researchers adopted a group training strategy.

Other researchers trained workers in more engaging methods of communication: Haiti (Cayemittes) prepared trainers in promotional techniques while researchers in Sierra Leone introduced storytelling, drama, role play and singing. The studies reported that largely didactic methods were used in training children in the schools to become promoters and/or trainers in CRT, without supervised practice. While it is important to note the high awareness among the projects about the importance of effective teaching and training methods, the documentation also suggests that for a variety of reasons the trainees apparently had little if any, opportunity, to fully learn and practice these methods. Each research team taught about the use of illustrations and demonstrations. In several studies "learning by doing" was stressed, using children with diarrhea and/or dehydration for illustration whenever possible. Somewhat different from the other studies, the Brazil project trained healers with emphasis on return demonstrations, practice, and weekly case follow-ups with discussion.

Durations of TCT sessions ranged from one to five days; the longer ones in some cases included reinforcement sessions. All investigators tested trainers after the training; usually (except for Brazil), the testing tended to measure only cognitive recall. Several studies noted that repeated training for caretakers was necessary, and concluded that their educational methods needed improvement.

Perhaps a key lesson to be learned from the experience of these researchers is that TOT is at once more difficult and more important than anticipated, that there are no shortcuts to effective training. It is laborious and requires supervision, feedback and control.

4. The Trainers of Caretakers

The strategy adopted by the ten community-oriented studies focused on enabling mothers to use CRT technology and improve their management of child diarrhea. Volunteer trainers were seen as the critical community resource, given an absence of an adequate PHC infrastructure in most of the study countries.

Consequently, the determination of who in the community should be the trainers and how they should be selected was a key aspect of the problem analysis-solution development process of the PRICOR-funded studies. From baseline studies, which included information on opinion leadership in health, perceived authority and respected community status, came behavioral and attitudinal findings which were used to identify potential trainers in each project area. Availability of human resources and willingness to participate determined the final selections. As a result, a broad range of citizens became trainers in their communities.

Table II indicates that trainers came from a broad spectrum of the community, ranging from school teachers and principals to market sellers. Researchers in Haiti, in a variant of the "satisfied users" model, trained mothers to train other mothers. The trainers most commonly selected are described below:

a) Health Professionals

Though participating in TOT, health professionals did little direct training of mothers. In accordance with national policy, the Egypt (Galal) study used only health center personnel to give mothers a special feeding message when they brought their children with diarrhea to the rural health unit. Equally successfully, mothers of children with diarrhea in Haiti (Haiti-Eye Care/AEDC) were referred to the rehydration unit of an urban health center where they were trained directly by nurses. In these cases it is likely that the combination of the learning environment and the process of "learning by doing" contributed as much to the success as the fact that the trainers were nurses. None of the studies used doctors, pharmacists or other health professional to train caretakers.

b) Village/Community Health Workers (CHWs)

Whether paid or volunteer, CHWs tend to function as multipurpose workers with variable time available for ORT promotion and for training caretakers. Researchers trained CHWs as trainers wherever they existed, apparently with positive results. Only the Haiti (Cayemittes) study found that the paid agents de sante (CHWs) were less than successful as caretaker trainers for ORT, primarily because of their limited numbers and competing tasks. Studies in Brazil and Liberia trained and introduced CHWs specifically for training mothers in ORT, but the majority of community trainers were not health workers.

c) Community Volunteers

In many studies there were none or so few CHWs that the researchers experimented with preparing a variety of community volunteers as trainers of caretakers. Both Haiti (Cayemittes) and the Sierra Leone study noted that community leaders were less successful as trainers than other volunteers, in Haiti because they apparently spent little time following through on what they had agreed to. It is possible that so-called "community leaders" may be more effective in giving public sanction for ORT than in conducting training. In some cases, ordinary interested citizens including neighbors and "satisfied mothers" carried out training.

d) School Teachers and School Children

Combined experience from four studies (Haiti-Cayemittes, Sierra Leone and two in Liberia) suggests that teachers and school children may be valuable community resources for promoting ORT and other health behavior changes. Involvement of teachers and children in ORT training is not without problems, however. The following experiences suggest areas for further research and fine-tuning of this strategy.

Of the four studies that trained teachers to train school children and adolescents in ORT, all demonstrated that the teachers and students acquired satisfactory knowledge about the various aspects of ORT. In Haiti the teaching was done in French rather than in the vernacular Creole. The Liberia (Moore) study developed and refined a unit on ORT as part of a larger school health education curriculum. Liberia (Cole), following the lead of his

Liberian colleagues, trained 75 children who then practiced on siblings. All three studies documented cognitive learning and great enthusiasm on the part of the children, but none formally evaluated the effect of this training on the community.

School children taught CRT were able to master the knowledge and skills apparently more easily than adults. As secondary caretakers in the family they had opportunity to experiment with CRT. The Liberia (Moore) study, having begun by analyzing existing health-related roles and activities of children and adolescents in the home and community, built CRT advocacy tasks onto these roles, apparently with positive results, as evidenced by anecdotal information provided by parents and teachers. This study suggests the training of school children affords a current benefit as well as an investment in the future. Theoretically, in the absence of an evaluation of their effectiveness in the community, no definitive conclusions can be drawn from the studies. This is an exciting issue that generates questions and hypotheses for further study.

Another two studies, Brazil (Nations) and Liberia (Galakpai) also trained teachers as direct trainers of caretakers but without training students as intermediaries. In Brazil the teachers supported the traditional healers. Thus in total six research teams worked with teachers as potential change agents. Their more formal and essentially didactic pedagogic approach, however, suggests that they may be less effective in transferring skills to adults or encouraging and reinforcing already learned behavior. Further research should explore the comparative effectiveness of teachers in advocacy and promotional roles, rather than in direct training of mothers.

e) Traditional Practitioners

Involvement of traditional practitioners in the promotion of new health practices has been a popular mandate since the advent of community-based family planning in the early 1970's. Yet to date no one has offered a formula for the guaranteed successful involvement of traditional practitioners in CRT promotion. The most conclusive PRICOR experience is drawn primarily from one study, Brazil (Nations), which explored in great depth the mobilization of traditional spiritual healers for CRT.

This study, an imaginative and successful experiment, centered directly on healers who are the first-line contacts for child illness. An intensively participatory educative approach lasting over one year was used to involve, train and "convince" the healers of the efficacy of CRT. This process was labor-intensive with continuous daily interaction with the community, numerous regular meetings with healers, often repeated training sessions, repeat demonstrations of CRT effects in children, with more discussions. The large numbers of children given CRT is evidence that the majority of participating healers, although apparently not all, were convinced of the value of CRT.

The Brazil study suggests that such success may require a disproportionate investment of time and human resources. It was "not an easy thing to involve healers". They were found to be divergent in their orientations and practices, their relations to one another, and in their levels of energy,

physical health, material resources and status needs. While some healers seemed to be able to cut across community factions, other healer groups would not work together, and often disagreed among themselves. Getting healers to accept CRT took much time and patience, and repeated demonstrations of successful rehydrations of children. Those who could be convinced worked very successfully and thereby enhanced their own standing in the community.

Several other research teams successfully trained traditional birth attendants (TBAs) in ORT, but with only a fraction of the time involvement and interpersonal intensity. Cole and Galakpai in Liberia trained and used some TBAs along with CHWs and other volunteers. TBA's were trained principally to make house-to-house contacts, training caretakers for ORT. Cayemittes in Haiti found that TBAs reached more mothers than did any of the community leaders. At the same time, this Haiti study found TBAs to be very difficult to work with. Their usually older age, poor educational level, and traditional beliefs about diarrhea constituted real limitations. Once trained, they also had highly variable levels of activity. It should be noted, however, that in these studies the TBAs were only one of the several types of volunteers being trained, and thus received only a fraction of the attention and sustained training contact that was enjoyed by the traditional healers in Brazil. This may account for their variable performance.

These limited findings suggest that intensity of interaction and continuity of contact with traditional practitioners may be a crucial factor for success. From an operational view, this translates into more training time and concentrated supervisory interaction. This in turn raises the question as to whether it is easier to train a larger proportion of the caretakers directly than to try to reach them through the TBAs. Are there more effective means of training trainers? How important is the role of the TBA in promoting CRT in different cultural settings? Would satisfied users be more effective in some situations? Perhaps more important than a purely logistical consideration is the question of whether having the TBA promote and/or administer CRT is a possible mechanism for relieving the mother's anxiety about making an "erroneous" decision about her sick child. Research may document a role for the TBA in some communities which is similar to that of the Brazilian traditional healers.

5. Discussion: volunteerism, incentives, and sustainability

An important operational issue raised by several studies concerns the sustainability of programs using volunteers. A number of investigators recognized that the question of worker incentives could not be disregarded. In the case of Swaziland, motivational problems and the need to assist minimally compensated workers had previously been identified. Researchers in Liberia (Galakpai), Sierra Leone, Haiti (Cayemittes), and Brazil (Nations) found that mobilization and continued performance of volunteer trainers required incentives. Having been influenced by a visit to the Gambia Healthcom CRT project [3], the principal investigator in Sierra Leone set up a competition with prizes for the most active and effective volunteer trainers, with parallel recognition for caretakers who learned ORT.

Another but more indirect incentive was a system of rewards and recognition, consciously and carefully tended in the Brazil (Nations) study. The researchers witnessed that many of the traditional healers, though highly motivated, lived in such serious poverty that donation of their time and other

meager resources was a hardship. Sensitive handling of the problem led researchers to arrange different community contributions, so that all those who gave also received in return, e.g., during work parties donated food was used to pay those who donated their labor, while others with more income donated the building materials, etc.

The Grenada study further documented that community recognition for services donated was crucial to volunteerism. Volunteer dropout rates were high in those communities where volunteers failed to receive encouragement and recognition.

Given the fact that the actual intervention phases of the studies lasted only from 2-1/2 to sixteen months (average of 6-7 months), there was in most cases insufficient time to consider the sustainability of volunteer efforts over a longer time period. It appears that only Haiti (Cayemittes) which had generated an enormous amount of volunteer community involvement, questioned the sustainability of this effort. It is important to note that this concern about sustainability of volunteer efforts is part of the much larger issue of ensuring the continuity of community-based action programs. This issue is discussed in a companion paper [3].

VI. Enabling Caretakers to Use ORT: The Training of Caretakers

Having established a training capacity in the community, most researchers then focused on reaching the mothers and other caretakers through promotional and training activities.

1. Training Content

All researchers developed plans for transmitting ORT information and skills to caretakers. Some were more detailed or elaborate than others depending on the educational expertise available to the researchers. In some studies the content was standardized into modules, which in the case of Haiti-Cayemittes were developed in the vernacular. Projects that promoted largely home-made ORS necessarily included more learning points about the formula, ingredients, measures, utensils, preparation, etc. The studies promoted either packets or sugar-salt solution, in accordance with national policy. Cayemittes in Haiti actually trained caretakers in both. All studies included some learning points about feeding practices and referral. Galal in Egypt specifically attempted to reach mothers with a nutritional message about repletion during and following diarrhea and ORT. From study reports it appears that the symptoms of dehydration and the seriousness of diarrhea were the predominant themes of the messages to caretakers. Several studies reported that the concept of rehydration was difficult, particularly for the illiterate, and required repeated reinforcement of the messages and the learning content.

2. Training Materials

Most research groups sought to illustrate dehydration symptoms in their training materials; several used illustrated flyers but they depicted exaggerated dehydration symptoms. Some flyers also showed how to prepare home-made ORT solution, including the recipe, the measurement of ingredients, and the steps in preparation. A few groups used plastic bottles with holes to illustrate water loss and dehydration; others drew on commonly recognized illustrations such as wilted flowers, etc. Most groups had limited resources and tried to find dehydrated children to use as living demonstrations.

Nations, in Brazil, trained mothers to use standardized Morley Spoons for preparing home-made ORS, and gave the trainees their own spoon only when they demonstrated competence.

3. Training Methods

Researchers in Sierra Leone and Haiti (Eye Care and AEDC) used clinic facilities as well as community outreach for training mothers. In the Egypt (Galal) study mothers were taught about specific feeding practices while at the health center by the professional staff. Brazilian traditional healers trained mothers individually at the time of a consultation for diarrhea. However, most research groups relied on house-to-house visits to contact mothers, either training them during the visit, or inviting them to attend a group session. TBAs, CHWs, and school children, who are relatively free socially to enter houses, did much of the home visiting. Many mothers were

trained in groups either organized specifically for that purpose or in conjunction with other group activities. Group training was carried out at service points in two of the Haiti projects, in Liberia (Galakpai), and in Sierra Leone. Cayemittes in Haiti also trained mothers at the point of sale in the market. (See Table I)

The predominant teaching mode was didactic, with demonstrations, some discussion and role play if the trainer felt comfortable and capable. Sierra Leone and one or two other studies reported singing and story telling.

Group learning appears to have been effective in most of the studies, particularly if carried out with group pressure; in Liberia, although Galakpai found individual instruction more effective, the differences were slight, and offset by higher dropout rates. Nevertheless, individual instruction at some point appears to have been particularly helpful to learning. Learning by doing with individualized instructions was the pattern of many of the studies (the Haiti projects, Brazil, Sierra Leone, Liberia-Cole). Haiti-Cayemittes reported the following time allocation in caretaker training:

Provision of information	50%
ORS demonstration	30%
Role play demonstration with mother	15%
Return demonstration by mother	6%

This breakdown is probably representative of about one half of the studies. Most of the others had either has considerably less interactive learning; only Brazil (Nations) and Sierra Leone may have had more.

Some study reports mention repeated instruction and reinforcement for caretakers. In the Haiti (Cayemittes) study, researchers questioned whether the time given to training caretakers had been sufficient. One would expect learning needs to be highly variable, dependent in part on the level of pre-existing knowledge and understanding of CRT. Data from selected baseline and post-intervention KAP surveys (Table IV) indicate that many research groups were able to build on at least some previous CRT knowledge. In order to arrive at an estimate of training time required for CRT competence, the Eye Care study in Haiti developed a theoretical task allocation model for CHWs, based on experience-rated training efficiency for CRT. The conclusion was that a CHW would require 60 minutes to train a group of 10 mothers (i.e., an average of 6 minutes/mother) to competency in CRT, or the equivalent of 10 hours per 100 competent mothers. Though the concept of a theoretical task allocation to achieve caretaker CRT competence is interesting and potentially useful, the reality of the learning situations (which includes shortcomings in the several levels of trainers), suggests that these times would vary widely.

The studies shed light on circumstantial factors that influenced the training outcomes. For example, the number of trainers per study was extremely variable, ranging from a total of 5 (Liberia-Cole) to about 200 in Haiti (Cayemittes) and almost 300 in Sierra Leone. This affected the level of individual attention and the time available for repetition and reinforcement. It also affected the supervision of the trainers and the pace at which training was conducted. Incentives and prizes for trainers and caretakers,

were given, undoubtedly also influenced the learning pace and thoroughness perhaps as much as the training methods and the duration. Substantial differences in implementation of the field tests make comparative conclusions difficult.

4. Supervision, Evaluation, and Follow-up

Each research team supervised the implementation of promotion and training activities in the field, but in different ways. The team was usually extended by community assistants or fieldworkers; together, they actively monitored caretaker training. The focus of supervision was to ascertain that trainers were applying their own learning correctly, with greatest emphasis given to caretaker knowledge and use of ORT. One research group (Sierra Leone) randomly selected trained caretakers for follow-up evaluation at home. Most investigators employed some means of immediate follow-up after training, except in the case of school children. Post-tests and evaluations were largely based on verbal recall, often without observation. In the smaller studies (5 to 45 trainers), closer and more interactive supervision was practiced (Brazil, Grenada, Swaziland). In contrast, in the larger studies supervision necessarily became more limited and stretched. In that sense the larger studies (Sierra Leone and Haiti-Cayemittes) approximated conditions of the real world of PHC where supervision is very limited. Conversely, the smaller studies with close and intensive supervision would be the least replicable.

5. Difficulties Encountered

Most reported problems occurred in Sub-Saharan Africa. Trainers in Sierra Leone found not only a lack of sugar, but also of salt and utensils in homes and at group locations. They solved the problem by contributing and bringing their own supplies, but this was clearly not a long term solution.

Galakpai in Liberia encountered problems because the farming season curtailed people's free time. Many mothers were unavailable for participation in the research; it was difficult to locate the mothers, and to find appropriate times to organize and train them.

Researchers in Swaziland experienced difficulties setting up community meetings because the Paramount Chief whose concurrence was mandatory, was often unavailable. Grenadan community distributors were not able to obtain community support for training in some of the villages. Haiti projects experienced political turbulence and a change in government that interfered with rallying caretakers to participate in training.

These were problems posed by the "living environment" and must be expected in this type of community training program. With the exception of political turmoil, most of the operational problems encountered in training caretakers were overcome by the persistence and ingenuity of the research teams. This raises the obvious question of the long term viability of caretaker training programs such as these, after the research has ended.

6. Training Results

As preface to a discussion of Table IV, it should be recalled that the objective of the PRICCR project was the implementation of a problem solving process, of which the direct intervention represented only a fraction of the effort, undertaken to validate the solution selected as a result of the process. Accordingly the time devoted to testing the chosen interventions in the field was usually much shorter than it would have been had the entire study been devoted to the implementation to an CRT training program.

Table IV gives the approximate duration of the intervention phase from the TCT through the training and follow-up of the caretakers for each of the studies. Except for the Brazil study, which was different in its orientation and process, the actual intervention periods are all considerably less than one year, with the shortest only two months (Haiti-Cayemittes). Excluding Brazil, the average time is equal to about one-third of the intervention time of the Healthcom CRT mass media projects [3] that have yielded spectacular results. The short intervention periods of the PRICCR-funded studies were sufficient to demonstrate increases in caretaker knowledge and skill, but longer field tests would have been required to show significant changes in CRT usage. Combined data from the ten community-based CRT studies suggest that:

- The presence of a national program may result in widespread awareness of CRT but does not necessarily ensure adequate knowledge of preparation and use. Liberia, Sierra Leone, Brazil, Haiti and to some extent Swaziland all had national CRT programs going on that had resulted in fairly high background awareness of CRT packets, and limited knowledge of preparation and use. For example, Brazil and Haiti measured greater than 95% initial awareness, but only one-half or fewer knew how to prepare ORS correctly, and fewer still were among those who had ever used it.
- The principal effect of the training under the PRICCR-funded projects was the introduction of home-made sugar-salt solution and its use. However, during the intervention period, the correct knowledge of packet preparation and use increased as well.
- Several studies (Sierra Leone, and the three studies in Haiti) suggested a direct relationship between CRT competence and use. In the first study, researchers noted that mothers with practical experience in CRT more easily accepted it as their first line action for diarrhea. The Haiti studies uncovered a "significant progression in the use of CRT with regard to competence". Only sixty-three percent of non-competent mothers reported having used it, whereas 92 percent of the fully competent mothers were users. This evidence is not surprising, since it has been documented in the CRT literature. The interesting and important finding is that the variety of training approaches elected by these studies did in fact enable caretakers to make use of the CRT technologies.

7. Discussion: accepting vs. adopting CRT

Mobilization of community support for CRT and caretaker training were objectives shared by most of the PRICCR-funded CRT studies. Yet, one of the basic lessons of these studies is the recognition of the extent of variability:

that exists among communities in population, resources, type of leadership, cohesiveness, formal and informal organization, access to health services, presence of CHWs, etc.. Researchers in Liberia, Swaziland, and Grenada noted how villages in the same area may have totally different levels of awareness, interest or response to ORT concerns. Some communities had to overcome initial reluctance to participate; others simply refused to become involved. Grenada researchers, after attempting to organize five communities, concluded that individualized community-specific programs and decentralized decision making were essential. This sentiment was apparently shared by most of the researchers, although it was not articulated as directly. Liberian investigators also noted the variability within as well as among communities, and among the caretaker trainers. In the face of such variability, is it at all possible to make generalizations about motivating and training caretakers based on the experience of the PRICOR-funded ORT studies, and, if so, are there "lessons learned" that may be applicable elsewhere? The answer, of course is "yes" and "no".

Recognition of this variability is probably a pre-requisite for effective caretaker training programs. Nevertheless, the studies have shown that villagers can be mobilized and trained to serve as volunteers in an important but complex and demanding program, in ways that can reach a large percentage of the target population with information, education and training on ORT. Further, these studies show that this can be done in a relatively short period of time.

More importantly, the studies have employed a variety of approaches to enabling the caretakers to manage and treat diarrhea in the young child. They have shown that an amazing variety of citizens in any community can be trained in ORT themselves; they in turn can train the caretakers of children in these important skills, and "spread the word" in the community. The multiplier effect of this training is evident. Equally, the studies have demonstrated many possibilities for training different combinations and levels of trainers. All the different approaches demonstrated some success in their respective environments and situations.

A variety of approaches, then, can successfully mobilize communities to participate in ORT promotion and training to enable mothers to use ORT, but the adoption of ORT practice comes more slowly. Enabling comes with the mastery of the knowledge and skills necessary to acquire, prepare, administer ORT at the right time, correctly, and to nourish the child adequately throughout the episode. But, having acquired the knowledge, the caretaker must learn to believe in what has been taught, and to develop the self-confidence to put it into practice. Because of short implementation periods, none of the OR studies reviewed here was able to demonstrate what further steps are necessary if the enabled caretakers are to put to use their newly acquired ORT knowledge and skills. Study findings, like the established literature, suggest additional time, improved educational methods, reinforcement, and more community support. The strong relationship observed between ORT competence and use is of major importance.

On the other hand, except within the context of each study, it is not possible to conclude that one approach or one type of worker is more successful in enabling caretakers than another.

A second lesson was suggested by several studies: mothers tend to forget or to misunderstand steps in the preparation of ORS, or how to measure ingredients for the home-made solutions. Swaziland had found that in spite of the on-going radio promotion and education of the national CRT campaign, 40% of the mothers surveyed at the start of the PRICOR-funded study were preparing an ineffective or harmful solution. Sierra Leone and the Haiti studies documented similar findings. The inference is that the intervention must be continuous if CRT caretaker knowledge and use are to be sustained. Moreover, as suggested by the Egypt (Nagaty) study, where use has been successfully established over time, it may be necessary to conduct periodic publicity campaigns to reinforce and continue CRT use. In this, the PRICOR-funded studies tend to underscore experience in other fields which suggests that without continuing reinforcement, awareness of an innovation tends to deteriorate significantly over time.

The Mother's Dilemma

What the studies do not reveal is what would have to be the next steps are in turning trained mothers into competent CRT users. The effectiveness of CRT programs depends ultimately on their success in inducing behavioral change among the mothers of young children, usually with an assumption that this can be accomplished through a training program. Results in the PRICOR-funded studies, as in others, are frequently disappointing. In order to understand what is going on, it is important to step back and analyze what it is we are asking the mothers to do.

Table V summarizes some of the learning components involved in the mother's shift from traditional management of diarrhea to use of ORT. The complexity of this process stands in contrast to the perspective which expects not only competence in ORT but attendant behavior change to come through the mere transmission of knowledge and skills. CRT, particularly for mothers, is not just a new practice to be learned, but rather it is a substitute for what has been done for a long time. CRT thus threatens an entire belief system about diarrhea, its perceived causes, and by logical extension, how it therefore should be treated.

Any responsible and sensible mother will be very cautious about giving something new and unfamiliar to her child, particularly if her trusted advisers are skeptical about it. Most likely, her mother-in-law or older relatives are adamantly conservative on this issue. Her husband, too, may have opinions about appropriate treatment. It is also often forgotten that in traditional societies caretakers tend to be held accountable for the well being of the child. Certainly in West Africa, Haiti and probably to some extent in Brazil, the pattern of conjugal relationships is such that the woman faces serious consequences for any perceived irresponsibility toward the child. In these circumstances hesitancy in using CRT is a reasonable response to a serious risk.

The success in promotion of CRT by the Brazilian traditional healers probably stems from the fact that they have spiritual as well as secular authority in the village; in addition, by preparing and administering the CRT they assume the responsibility for the outcome. As their authority is rarely

challenged, the caretaker is relieved of the risk-taking burden. Probably equally important is the fact that the study left the traditional belief structure intact. It allowed the healers to experiment pragmatically with ORT, and made no attempt to change traditional explanations about diarrhea etiology.

One difficulty in promoting ORT may arise from the very success of health providers in reaching villagers with some form of western primary health care. During the last 10 years, most countries have invested considerable resources to promote the use of clinic services i.e., to induce mothers to give up home remedies in favor of a clinic visit. The most valued health resource for the majority of villagers today is the doctor, who is sought when illness is perceived as serious.

Community-based ORT promotion takes a somewhat different approach, emphasizing initial home treatment and self reliance. Mothers are advised to make clinic or doctor visits when the child shows signs of dehydration (which at best is confusing to the caretakers) or fails to improve. This message puts the mother in a double-bind: CRT promotion focuses on convincing mothers of the seriousness and potential deadliness of diarrhea, while at the same time encouraging them to treat the sick child at home. These are conflicting messages for caretakers who may not be able to distinguish the finer points between appropriate and inappropriate use of facilities. For some proportion of the mothers it is likely that resulting "cognitive dissonance" may lead to total inaction. In a state of dissonance the mother is also unlikely to develop a belief in the value of ORT.

How can ORT programs be designed to help the mother? Does she really understand what we are asking her to do and the options we teach her? Can we expect her to assume that risk alone? What can we provide beyond the usual information and skills-based training programs? What kind of reinforcement do we need to provide for her? The PRICOR-funded traditional healer study in Brazil suggests one option which may have wider applicability; the mother is not forced to assume the risk of CRT because the healer assumes it for her. Perhaps a trained TBA or a clinic nurse can play this role. In more traditional societies, assumption of risk may be one of the functions of modern clinic facilities.

VII. National ORT Policy: the Framework

National policies, program strategies, and organizational structures set the boundaries within which the ORT programs studied operate. These policies have determined the kinds of ORS to be promoted and administered, by whom and in what settings. Policies have determined whether the ORT program is to be vertical or integrated; the respective roles of the public, non-governmental organizations (NGOs), and commercial sectors; product formulation, sources, distribution channels, and retail outlets. Government, the professional associations, and the NGOs also establish policies on such issues as staffing, clinical standards, etc.. All the PRICOR-funded ORT studies were carried out in on-going PHC programs, operating within existing institutional frameworks and guided by previously established policies. However, because these institutions and policies are not immutable, some of the studies tested policy boundaries, for example, on who should be trained to promote and deliver ORT, or the kind of ORS to give, or appropriate retail outlets for pre-packaged ORS. In all cases, the objective has been to make ORS more widely available and to maximize caretaker KAP. Some examples of how national policies set the framework for the studies and the questions to be addressed are given below.

- In Liberia, where by government policy pre-packaged ORS is provided in hospitals and clinics, home-mixed ORS is promoted in rural areas. All three of the PRICOR studies were, therefore, working with home-mixed ORS. However, investigators were free to test the acceptability of alternative formulae in the field, and to experiment in training alternative kinds of community ORT promoters. One study trained CHWs and TBAs as promoters, a second trained village volunteers, and a third trained young adolescent students to promote ORT in their families and communities.
- In Sierra Leone, the government has a similar policy of using pre-packaged ORS in the health centers for serious cases of dehydration; VHWs are encouraged to use and promote a home mix. As in Liberia, investigators worked with VHWs to begin to train community leaders and teachers to train mothers in preparation and use of the home mix.
- In Haiti, by government policy, pre-packaged ORS is to be made widely available; home-mix is not a component of the ORT program. CHWs, where they exist, promote the packet use and train the mothers in its preparation and administration. Government has assisted in the establishment of ORS sales posts, and advertizes ORS widely. Such a strategy encourages the use of ORT to become part of the folk culture. Two studies, working where CHWs are in place, have given major focus to training the CHWs to train mothers. A third, working in areas without resident CHWs, has trained a wide variety of community resource leaders in the promotion and use of ORT. These investigators have also developed a standardized home-mix for use where outlets for pre-packaged ORS are scarce. Moreover, they have assisted the operators of the ORS sales posts to become more efficient, and have explored the possibilities of enlisting local market sellers as retail outlets for ORS.

- In Egypt, on the other hand, despite a government sponsored mass marketing campaign for pre-packaged CRS, the thrust of the program is primarily a medical one. Mothers are encouraged to bring their children to the health center when they have diarrhea; there, under the guidance of health center staff, they mix and administer pre-packaged CRS to the child until he/she is well on the way to recovery. The mother may also be given a packet to continue the treatment at home, or may fill a prescription at the local pharmacy. Pre-packaged CRS is seen more as a "medicine" than a folk remedy. Both PRICOR-funded studies in Egypt worked within this framework, one seeking to improve the management of CRS inventory at the local health center level, the other adding an essential nutrition message to the information given to the mother when she brings her child to the health center for treatment with CRS.

The most interesting policy distinction observed among the PRICOR-funded studies is that between those who approach ORT primarily as a medical question, and those who appear to be trying to move ORT into the local folk culture. This is reminiscent of the policy differences between those who saw the oral contraceptive as primarily a medical question, and those who advocated community-based lay distribution systems. That issue has been settled with the recognition that both have their place in a broad-based family planning strategy. Will we see the same trend in the use of CRS? What will be the impact of WHO's recent rejection of home-mixed sugar-salt solution?

VIII. Future Areas for Operations Research

The past five years have brought an increase in the number of research publications about ORT - the scientific aspects of the ORT technology, its application, programming, promotion, and financing. During the interim, noteworthy gains have been made in convincing the medical community of the effectiveness and safety of the approach. Support for ORT use in clinical facilities has increased significantly, and there is now general acceptance of preventive ORT therapy at the community level. There is a growing acceptance of active community participation in ORT promotion, training, and in some cases packet distribution. It has also been shown that ORT can be and should be given with continued breastfeeding and other foods, although this practice is not yet accepted by a large proportion of health professionals.

Despite the widespread acceptance of ORT as an effective intervention for acute diarrhea, and extensive experience with ORT programs in the field, a number of unresolved issues remain in technical, programmatic, operational, and policy areas. Although few of the technical or policy issues are amenable to operations research, OR as a management tool can make a significant contribution to the resolution of programmatic and operational issues. Some of these issues were touched on in the OR studies carried out by PRICOR-supported researchers. The following discussion highlights some of the current issues requiring further research.

1. Formulation of ORS

Packaging of ORS, storage, labeling, shelf-life, etc., all have been improved through years of field tests and programmatic experience. Packets are now included in most countries on the list of essential medicines, and are given priority status.

The answers are less clear when it comes to the contents of the packet and to an acceptable home-based formula. In the past, the concern was to find the most suitable formulae to insure safety as well as efficacy, both of prepackaged ORS and of home made solutions. In the late 1970s a concern for hypernatremia resulted in recommendations for lower sodium concentrations in sugar-salt solution prepared at home. In the early 1980s, after it was determined that the glucose-sodium millimole equivalence was crucial, the recommendation shifted back in the direction of the earlier formula. However, concern over hypernatremia is as strong as ever and continues to be a major issue today, particularly in relation to home-made preparations. The addition of nutrients is also an issue. What are the most appropriate ORS formulae to use in community-based ORT programs?

2. Packets vs. home-made solutions

Arising largely from the above concern over solution safety and efficacy, WHO has recently discouraged any use of home-based preparations. Yet many countries do not see packets as a realistic option for the rural areas because of their inadequate logistical, distribution, and storage systems, nor do they foresee the resources to improve these systems significantly. In such situations, how can national programs advocating home-based ORT be designed to insure careful caretaker training, supervision and follow-up in these remote areas?

3. Sustainability

As a variety of organizations, both public and private, adopt CRT programs, questions about the sustainability of these efforts assume greater prominence. Sustainability includes both supply and demand issues; on the supply side CR can help to reduce costs and design more effective cost recovery mechanisms. On the demand side, CR can help determine better means of eliciting community support and increasing CRT use. A discussion of some specific research issues of current interest follows.

a) Maintaining supply

- Packet availability: One of the most important supply side issues is a determination of the most efficient modalities for packet distribution at the periphery: 1) free, at health services and/or CBD (community-based distribution) outlets; 2) commercial, with or without a controlled price; 3) commercial, at subsidized prices, i.e. a social marketing strategy. This issue must be addressed separately in each country. CR can help find feasible answers to these distribution and pricing issues.
- Local production: Many countries, for foreign exchange reasons, or because of a political preference to end reliance on donors, want to establish local CRS production. In many cases, because of economies of scale, local production is more costly than imported salts, and there are almost always serious quality control problems. Moreover, the importation of raw materials poses many of the same foreign exchange and import regulation problems as would importation of the packets themselves. CR benefit/cost studies can help resolve the local production issues.

b) Sustaining Demand

- Training caretakers: A continuing and difficult issue is how best to increase demand for CRS and to change the family's management of diarrhea to include CRT, feeding and referral. The key operational question is how best to change CRT awareness into accurate knowledge, and that knowledge into competent practice. The Healthcom project [3] has demonstrated the effectiveness of a mass communications approach in inducing initial use. However, even the Healthcom projects find that, after the projects have ended, knowledge and use drops off. New mothers and children enter the target group; others drop out from CRT use. This implies that there must be continuous education and reinforcement, certainly at the community level. An emerging issue is the specific role of PHC services in the reinforcement and sustainability of CRT programs.

The PRICOR-funded studies demonstrated the effectiveness of and need for sustained, close contact in creating awareness and transmitting knowledge to mothers and CHWs. Though many of these studies have not been implemented long enough to generate definitive findings on how best to maintain these programs, each confirms the conclusion that

changing behavior will require substantial time and commitment. The PRICOR-funded studies suggest that CHWs, on which most PHC programs rely, have relatively limited time for such efforts; the majority find curative services more demanding and rewarding. Several of the PRICOR-funded studies identified other community members who may have more time and interest to carry out the important task of training and supervising mothers. CR can help determine a strategy that can combine the strengths of both the mass media and personal contact in the community to sustain ORT use.

- Incentives: incentives appear to work in the short range to get people interested and enthusiastic, but are usually not sustainable over time. Are there negative effects from a program which begins with incentives and subsequently has to drop them because of resource constraints? What is the most effective strategy with respect to incentives?
- Community leadership and "entry points": community-based programs give much attention to identifying appropriate community "entry points", usually through community leaders. However, leadership is often factional and does not speak for the community. Moreover, leadership may be confined to certain functions, not crossing over to others. Non-traditional leaders are often better opinion leaders on matters of new behavior than are local officials, teachers, etc.. The social influence and opinion leadership of so-called "community leaders" must be examined before building the entry strategy around them. How can this be packaged into an efficient but solid methodological approach that does not require a voluminous initial community study?

4. Use of inappropriate drugs

How best to discourage the use of inappropriate drugs in the treatment of diarrhea is a continuing issue. Mothers see no demonstrable effect from the administration of the usual rehydrating solutions: diarrhea persists and the stool continues to be watery. Anti-diarrheal medications reduce these symptoms and convince the mother that they are effective curative medications. Is there a rehydrating solution that will reduce the duration and frequency of diarrhea and thicken the stool? "Super ORS" promises to deal with these problems, but meanwhile other options are being sought in solutions using culturally appropriate and locally available substances, especially cereals and gruels.

Nevertheless, some of the responsibility for the inappropriate use of medications lies with the medical and pharmaceutical establishments. How best to discourage them from prescribing or dispensing these drugs is an important issue. It is in part one of continuing education for all health services personnel, including physicians. But pharmacists are especially a problem because they have no incentive to promote ORS, since it is either price-controlled, yields a low profit margin, or is in competition with free ORS packets distributed through the health facilities. Moreover, the mother's expectations for "proper" and "effective" treatment - meaning medicine that stops the diarrhea - are often shared and reinforced by the health establishment. How can CR help develop an effective strategy to reduce the inappropriate use of drugs?

5. Evaluation of CRT programs

It has proven difficult to determine which indicators should be selected for evaluating CRT programs. Many studies have tried to measure changes in caretaker skill and practice, usually through time consuming pre- and post-intervention interviews with mothers. In addition to being expensive, KAP surveys have an added disadvantage; while they can provide information about reported changes in behavior, they cannot demonstrate that such changes have taken place, nor can they reveal the important relationship between changes in mother's knowledge and changes in her practice.

Evaluation based on the measurement of diarrhea prevalence, documented CRT use, and diarrhea-related mortality is limited by the inadequate health information systems of most developing countries. Progress has been made in establishing diarrhea surveillance mechanisms and CRT information systems; however, considerable work yet remains in determining how best to structure and relay the resulting information to decision makers. CR can help determine the best monitoring system and set of indicators for effective, on-going management of CRT programs.

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TABLE 1: MOBILIZATION FOR ORT

STUDY	PROMOTIONAL MECHANISMS			CARETAKER TRAINING ACTIVITIES AND LOCATION	RESEARCH ACTIVITIES
	COLLECTIVE AND GROUP ACTIVITIES	LOCAL AND MASS MEDIA, DRAMA, ETC.	OTHER MECHANISMS		
LIBERIA (Cole)	Community selection of health worker	ORT fliers for school children; visual materials for mothers	School children trained	Home visits by CIWs	Large household survey
LIBERIA (Galakpai)	Village volunteers located, organized	Educational fliers for mothers		Volunteers trained some mothers in homes (individual training); others in central public area (group training)	Household survey, pilot study, active field monitoring, retraining, supervision
LIBERIA (Moore)		Health skits, children's presentations on market day	School children trained	School children train other family members	Community leadership survey, household survey; Researchers lived in test villages for direct observation
(Jalloh)	Community meetings to reinforce interest/ involvement in ORT	ORT contest: prizes awarded, incentives offered	Sugar promoted as medicine. School children trained	Volunteers, CIW home visits; communal meeting areas for group training	Baseline KAP surveys for community leaders, health workers and caretakers; study of SS availability. Active field monitoring
SWAZILAND (Dlamini)	Community meetings for CIW compensation	National ORT radio program		CIW home visits	Field observations, community meetings, villagers on research team, Active field supervision

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TABLE 1: MOBILIZATION FOR ORT (continued)

STUDY	PROMOTIONAL MECHANISMS			CARETAKER TRAINING ACTIVITIES AND LOCATION	RESEARCH ACTIVITIES
	COLLECTIVE AND GROUP ACTIVITIES	LOCAL AND MASS MEDIA, DRAMA, ETC.	OTHER MECHANISMS		
GRENADA (White)	Regular community ORT meetings; development of Health community action group	ROI radio spots; Educational Flyers	Certificate of appreciation for ORT distributors	House to house training by PIC team, researchers	Home visits to generate Initial Interest; Large household survey; Active supervision
BRAZIL	Discussions with community organizations, leaders; Repeated meetings with healers	Visual materials for mothers (field tested repeatedly)	Direct community participation in constructing "curing rooms"	Treatment and training in healer's home or in curing rooms	Anthropological approach; Extensive and repeated surveys; continuous contact between researchers and community. Close and active supervision
HAITI (Eye Care)	Promotion meetings conducted at rally posts	National radio campaign		CHW homevisits; Rally posts site for group demonstration	Community surveys; active field monitoring
HAITI (AEDC)	Mothers' affinity groups organized to mobilize support Interest (AEDC)	National radio campaign	Rehydrating centers; Mothers' competency qualifies her for access to low interest, short termed loans (AEDC)	Rally posts site for group demonstration; Mothers train other mothers in networking system	Community surveys; active field monitoring

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TABLE 1: MOBILIZATION FOR ORT (continued)

STUDY	PROMOTIONAL MECHANISMS			CARETAKER TRAINING ACTIVITIES AND LOCATION	RESEARCH ACTIVITIES
	COLLECTIVE AND GROUP ACTIVITIES	LOCAL AND MASS MEDIA, DRAMA, ETC.	OTHER MECHANISMS		
Haiti (Cayemittes)	Extensive group based ORT promotion: formal community groups, church groups, neighborhood and friends; Groups organized, each with target population	National radio campaign; Signs in community signalling who sells ORT; RaRa bands, ORS songs	High Visibility Market sellers; Newly opened sales posts by trained villagers; School children trained	Home visits by TBAs and other community volunteers, trained school children; meetings of mothers organized by CHWs; Mothers train mothers in network training approach; Training at point of sale by commercial ORT distributors	Extensive interviewing/consultations in community; Repeated field testing; Extensive KAP surveys (8 surveys); Active field supervision

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TABLE 11: TRAINING AND SUPERVISION OF TRAINERS
IN SELECTED COMMUNITY BASED ORT STUDY PROJECTS

STUDY	WHO TRAINED TRAINERS	TRAINERS (AND TRAINERS OF TRAINERS) OF CARETAKERS*	SUPERVISION OF TRAINERS	INVOLVEMENT OF GOVERNMENT PHC SYSTEM
LIBERIA (Cole 11)	Research Team	I. a) CHWs, TBAs b) School Teacher II. School Children	Research team: monthly record keeping review	Direct. County Medical Officer of study area was Principal Investigator
LIBERIA (Galakpal)	Research Team	I. Community Health Dept. Staff II. Village Volunteers (broad range)	Research team: process supervision and retraining	Direct. Level I trainers
LIBERIA (Moore)	Research Team	I. School Teachers & Principals; PHC Workers from Hospital II. Adolescents (as promoters, to prepare ORS)	Research team supervised the teaching/training by principals/teachers; no supervision of children in community	Direct. Level I trainers
SIERRA LEONE	Research Team	I. a) Health Center Staff, VHWs/TBAs b) Teachers c) Community Leaders (90) II. a) School Children	Public Health Inspectors on Research Field Team monitored training of caretakers	Health Center staff, Public Health Inspectors
SWAZILAND	Research Team	Rural Health Motivators	PHC Nurses	Direct. Supervision of RHMS by PHC supervisors

* KEY: I - First tier trainers who in turn train second tier trainers
 II - Second tier trainers who then train caretakers.

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TABLE 11. TRAINING AND SUPERVISION OF TRAINERS
IN SELECTED COMMUNITY BASED ORT STUDY PROJECTS

STUDY	WHO TRAINED TRAINERS	TRAINERS (AND TRAINERS OF TRAINERS) OF CARETAKERS*	SUPERVISION OF TRAINERS	INVOLVEMENT OF GOVERNMENT PHC SYSTEM
BRAZIL (Nations)	Research team	Traditional Healers	Research team (or community health agents) supervise healers twice a week	None
GRENADA	Health Center Nurses	Community Volunteers	Health Center Nurses, PHC Team, Research Team & Fieldworkers	Health Center staff and supervising PHC team. <u>Direct.</u>
HAITI (Eye Care)	Research team	I. CHWS	Research team	<u>Indirect</u>
HAITI (AEDC)	Health Center Nurses	II. Mothers (each mother must train 300 other mothers)		
HAITI (Committees)	District Health Officer and Research Team	I. Seconded (paid) Health Agents, ONNAAC Trainers, Teachers, Church Leaders II. Community Leaders, Market sellers, Volunteers School children	Secondment of PHC/Health Agents to Project Area; each supervised 2 villages (paid)	<u>Direct.</u> Secondment of Health Agents; District Health Team

* KEY: I - First tier trainers who in turn train second tier trainers
II - Second tier trainers who then train caretakers.

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TABLE III: TRAINING OF TRAINERS FOR ORT

STUDY	TRAINING MECHANISM	CONTENT*	TEACHING METHODS
1. LIBERIA (Cole II)	5 day workshop for CHWs, TBAs; 1 day seminar for school teachers	I. ORT, dehydration, ORS recipe, diarrhea transmission, fluid loss, and replacement, medical attention, feeding. II. How to teach others	Demonstration with plastic bottle; practice/drills in preparation of ORS; didactic. For children use of stories, different models for illustrating input/output; home visits
2. LIBERIA (Galakpal)	Group teaching of trainers 4-6 sessions	I. ORT preparation, administration; II. Educational methods: individualized and group instruction	Didactic demonstration, illustrations
3. LIBERIA (Moore)	Training workshops (2) for teachers to instruct school children	I. Nutrition, sanitation, ORT preparation, signs of dehydration; II. Lesson preparation	Training modules. Prior reading of module booklet, pre and post-test. Didactic; lecture discussion. Children did not participate in demonstrations because of lack of time
4. SIERRA LEONE	(Competency based) training sessions in each of 3 project study areas	I. ORT, diarrhea, sanitation, hand-washing, clean water; II. Teaching methods (including story-telling, singing, role play), importance of reinforcement	Group discussions, lectures, drama, role playing, demonstrations; concentrated on training, using child with diarrhea and dehydration; leaflets, posters
5. SWAZILAND	Refresher training (competency based)	I. Signs and symptoms of diarrhea, dehydration; preparation and administration of ORS; ORT home kit	Lecture, discussion, demonstration
6. BRAZIL	Repeated group sessions with healers	I. Dehydration rehydration with diarrhea, preparation of solution; II. How to make visual materials; what to teach mothers	Discussions, demonstration, practice, return demonstrations, weekly case review
7. GRENADA	4 workshops	I. Diarrhea, dehydration, ORT; II. Health education methods with emphasis on skills & habit change	Training by doing in community. Practice on caretakers

KEY: I. What to teach
II. How to teach

TABLE III: TRAINING OF TRAINERS FOR ORT (continued)

STUDY	TRAINING MECHANISM	CONTENT*	TEACHING METHODS
8. HAITI (Eye Care) 9. HAITI (AEDC)	3 day reorientation sessions for CHWs; specific educational objectives; detailed training booklet in Creole	<ol style="list-style-type: none"> I. Diarrhea, dehydration, ORT (principles, methods, attitudes); ORS preparation, storage administration II. How to teach mothers; how to measure mother's competence 	Training booklet in Creole; lecture discussion, demonstration, return demonstration by CHW
10. HAITI (Caymittes)	Sessions; each group of trainers with specific educational objectives; 1, 2, and 3 day sessions; refresher course of training modules	<ol style="list-style-type: none"> I. Variable, depending on objectives. All included promotion of ORT; proper use of ORT; <u>for some</u> (not all) signs of diarrhea and dehydration II. How to organize mother's club 	Training modules; Lecture/discussions, role play, use of visual aids; for illiterates emphasis on role play and demonstration

* Key: I. What to teach
II. How to teach

TABLE IV: BASELINE AND POST INTERVENTION MEASURES OF ORT ACTIVITIES AND USE IN SELECTED COMMUNITY-BASED ORT STUDIES/PROJECTS

STUDY	BASELINE STUDIES (VILLAGERS, CARETAKERS)			POST-INTERVENTION STUDIES (VILLAGERS, CARETAKERS)			APPROX. DURATION OF INTERVENTION (MONTHS)		
	ORTS ^a	AWARENESS	KNOWLEDGE	REPORTED EVER USE	ORTS ^a	AWARENESS		KNOWLEDGE	REPORTED EVER USE
LIBERIA (Cole II)	S	40.0		15.0			Not measured	7.5	
	P	40.0	50.0						
LIBERIA (Gakape)	S	0-4.0	35.7-42.9**	0-2.7	S	50.5	20.9-79.1	53.2	7.0
	P	15.0	-	11.3	P	-	11.0	11.3	
LIBERIA (Moore)	S	28.0	3.0	2.0			Not measured	10.0	
SIERRA LEONE	S	26.8	9.0**	5.0	S	71.7	70.0	45.4	6.0
SWAZILAND	S	21.1	-	0.0	S	-	23.4-35.9	98.4	6.5

^a S - Sugar, Salt Home Preparation
P - ORT Packets

** Denominator: mothers who have ever used ORT
(other percentages based on all mothers)

TABLE V. LEARNING COMPONENTS FOR IMPROVED CARETAKER MANAGEMENT OF DIARRHEA

Pre-intervention (traditional) intervention	New/Changed Concepts	Cognitive Knowledge	Skills	New Beliefs/Attitudes	Management of ...
Diarrhea is a common ("natural") state.	1. Diarrhea is always a serious condition.	1. Diarrhea results in water loss.	1. Ability to make connections between cognitive information.	1. Diarrhea is an illness.	
Diarrhea will (usually) go away by itself.	2. Diarrhea leads to dehydration, i.e. itself.	2. Water loss results in death.	2. Ability to understand, remember	2. The child is in danger of death concepts.	
Death is not necessarily associated with diarrhea (experience: deaths occur considerably after diarrhea has stopped).	3. Dehydration leads to death.	3. Death can be prevented by preventing or reversing water loss.		3. The danger is reversible.	1. Begin ORT when child has diarrhea before child is dehydrated.
The objective of treatment is to stop the diarrhea.	4. The objective of treatment is to prevent dehydration	4. ORT is a "medicine" (packets, SSS) for dehydration.		4. Treatment should begin immediately.	
		5. "Medicine" does not stop diarrhea but "cures" dehydration.		5. ORT is the best treatment.	
				6. Recovery is due to ORT.	
Origin of diarrhea ascribed to various (externally controlled) causes.	5. Some diarrheas are caused by poor hygiene, food handling practices, and sanitation.	6. Good hygiene, food handling practices, and sanitation can help to prevent diarrhea, specific practices.	3. Ability to understand, remember specific information, instructions.	7. Trust in source of new information about diarrhea, dehydration, ORT, feeding, etc.	2. Maintain good hygiene, food handling practices sanitation.
			4. Observation skills.	8. Willingness to experiment with non-traditional treatments.	3. Prepare ORS correctly
			5. Judgment.	9. Self-confidence, trust in own judgment to:	4. Administer ORS correctly
Action must be taken to determine origin of threat, restore harmony.	5. Dehydration can normally be prevented.		6. Ability to combine observation and judgment.	- prepare and administer ORS correctly	5. Maintain ORS supplies.
	7. Dehydration can usually be reversed.	7. How to prepare ORS: - ingredients - measures - steps.	7. Motor skills.	- recognize danger signs and seek appropriate help in time	
	8. Death from dehydration can be prevented.	8. How to administer ORS: - when to begin - frequency - volume - manner of administration - when to stop ORT.		- feed child adequately during diarrhea and ORT.	
Drugs are necessary.	9. Drugs to stop diarrhea not usually appropriate.	9. Drugs to stop diarrhea can make child sicker.		10. Willingness to maintain ORT supplies.	
	10. Sometimes dehydration does not respond to treatment.			11. Drugs are not usually necessary for diarrhea.	6. Use drugs only on advice of phys.
	11. Signs of dehydration ("danger signs") can be recognized.		8. Ability to recognize signs of dehydration (danger signs).		7. Recognize danger signs.
	12. Medical help should be sought when danger signs are present.	10. Sources, locations of medical help.	9. Ability to act effectively under stress, anxiety	12. Trust in sources of medical help.	8. Seek medical help when danger signs are present
3. Diarrhea makes child weak.	13. Nutritional depletion during diarrhea makes child weak.	11. Good feeding practices during and after diarrhea ORT.		13. Willingness to feed child properly during and after diarrhea and ORT.	9. Feed child appropriately
				14. Willingness to defend new methods in face of disapproval.	10. Maintain new treatment in face of disapproval

TABLE IV: BASELINE AND POST INTERVENTION MEASURES OF ORT ACTIVITIES AND USE IN SELECTED COMMUNITY-BASED ORT STUDIES/PROJECTS

STUDY	BASELINE STUDIES (VILLAGERS, CARETAKERS)				POST-INTERVENTION STUDIES (VILLAGERS, CARETAKERS)				APPROX. DURATION OF INTERVENTION (MONTHS)
	ORS*	AWARENESS	KNOWLEDGE	REPORTED EVER USE	ORS*	AWARENESS	KNOWLEDGE	REPORTED EVER USE	
BRAZIL (Nations)	S	3.0	0.0	0.0	S	72.0	28.2	54.3	16.0
	P	96.1	55.4	88.7	P	98.7	67.0	95.3	
GRENADA	Not measured			Not measured			5.0		
HAITI (Eye Care)	P	85.0-92.8	42.5-67.0	77.0	Not available			4.0	
HAITI (AEDC)	Not measured			Not measured			3.0		
HAITI (Caymittes)	S		9.0**	4.4	S		4.0**	2.8	2.0
	P	64.0	32.4**	38.9	P		64.2**	51.6	

* S = Sugar, Salt Home Preparation
P = ORT Packets

** Denominator: mothers who have ever used ORT
(Other percentages based on all mothers)

PRIMARY HEALTH CARE OPERATIONS RESEARCH
(PRICOR)

SUMMARY OF

STUDY PROBLEMS, OBJECTIVES, PROPOSED SOLUTIONS, AND RESULTS

ORAL REHYDRATION THERAPY STUDIES

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ABBREVIATIONS USED

AID	Agency for International Development
BIW	Barangay health worker
CCCD	Combatting Childhood Communicable Diseases (project)
CD	Commodity distribution
CF	Community financing
CHW	Community health worker
CO	Community organization
FSESP	Fundaco Servicos de Saude Publica (Brazil)
KAP	Knowledge, attitudes, practices
MCH	Maternal/child health
MOH	Ministry of Health
MOPII	Ministry of Public Health
OR	Operations research
ORS	Oral rehydration salts
ORT	Oral rehydration therapy
PHC	Primary health care
PI	Principal investigator
PRICOR	Primary Health Care Operations Research (project)
PROFAM	Grupo Profam (Mexico)
PVO	Private voluntary organization
RHM	Rural health motivator
SHRD	Strengthening of Rural Health Delivery (project)
TBA	Traditional birth attendant
UNICEF	United Nations Children's Emergency Fund
WHO	World Health Organization

STUDY	SUBJECTS ADDRESSED	PROBLEM	OBJECTIVE	PROPOSED SOLUTION	RESULTS	COMMENTS
Brazil/ Nations	ORT, CIM, CF, CO	Use of ORS is low, even though caretaker awareness and knowledge are high.	Train and incorporate traditional healers into the ORT delivery system	Training curricula and method for generating interest about ORT among traditional healers	Solution successfully implemented, will be partially replicated in major regional project	Healer participation in solution development an important factor in success; study also produced cost data (not yet available)
Dominican Republic/ Udall	CF, ORT	MOH wanted to launch nationwide ORT campaign, but did not know how many ORS packets would be required or how to ensure distribution and availability for children under 5.	Design pricing structure and distribution system which ensures that ORS is available and affordable for poor and that pharmacists make sufficient profit from ORS sales	Two-tiered pricing structure and an inventory and distribution management system	See Comments	Solutions not implemented due to lack of support from MOH and poor communication between researchers and MOH
Egypt/ Galal	ORT	Diarrhea often resulted in malnutrition despite effective ORT.	Develop ways to incorporate a nutrition repletion component in existing ORT program	Alternative strategies, including educational messages, to train caretakers to feed children in addition to giving ORS during diarrhea	Significant proportion of caretakers improved their knowledge of ORT and nutrition repletion during diarrhea and dehydration; nutrition message since included in national ORT mass media program.	

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ORAL REHYDRATION THERAPY STUDIES
STUDY PROBLEMS, OBJECTIVES, PROPOSED SOLUTIONS, AND RESULTS

STUDY	SUBJECTS ADDRESSED	PROBLEM	OBJECTIVE	PROPOSED SOLUTION	RESULTS	COMMENTS
Egypt/ Tawfik, Nagaty	ORT, CF	High morbidity/mortality due to diarrhea in children under 5; low utilization of health facilities for ORT; excess ORS inventories at local health facilities; poor ORS management information system	Design system in which information flow would enable better management of ORS inventory	Mathematical model for inventory management; ORS inventory recording form; periodic ordering system, including forms to be used at periphery; model for educating communities and health care providers about ORT	Three mathematical inventory models tested; two gave poor results. The third, though impractical for use at periphery, served as basis of simplified periodic ordering system. System implemented in areas served by Strengthening Rural Health Delivery (SRHD) project; recommended for use elsewhere.	Solutions for improving demand not developed, because National Diarrheal Disease Control Program was already carrying out such activities.
Grenada/ White	ORT, CO	Weakness of community health activities including ORT	Develop ways to involve community organizations in health-related activities including ORT	Training curricula, reporting forms, and processes for working with community groups	Increased community health activities; some ORT outreach	Researchers initially sought best form of CO, but then decided that CO process was more important than form
Haiti/ Augustin (AEDC)	CF, CIM, CO, ORT	Uncertainty about how to tap local resources for sustaining CIM preventive services	Develop ways to motivate CIMs to teach mothers to understand and use preventive services; establish supportive CF mechanisms	Adaptation of traditional rotating credit clubs for mothers who demonstrate competence in child survival interventions	First groups of mothers learned interventions and participated in schemes; portion of funds generated used to pay CIM salaries	Scheme only recently implemented

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STUDY	SUBJECTS ADDRESSED	PROBLEM	OBJECTIVE	PROPOSED SOLUTION	RESULTS	COMMENTS
Haiti/ Augustin (Eye Care)	ORT, CIM	CIM has only 12 hours per week for promotion and home visits	Determine optimal use of CIM time for promoting 4 key PIC interventions, including ORT; increase caretaker competence in these interventions	Alternative strategies for CIM time allocation, including targeting of high-risk mothers for ORT and family planning. Group and individual training of mothers and CIMs. Mothers' improved competence linked to rewards for mothers and CIMs.	Preliminary results indicate that the more precisely targeted strategy has been more efficient. Targeting of high-risk mothers appears to have helped ensure CIM outreach in the communities.	Study dealt with allocation of only part of CIMs' time, the rest being fixed on other assigned tasks.
Haiti/ Cayemittes	CO, CIM, ORT	Very high diarrhea-related morbidity and mortality among children under 5	Promote effective use of ORS among children by mobilizing existing community organization; develop acceptable ORS formulas for home mix; improve marketing of ORS packets	Community organization strategy in combination with ORT intervention using network approach; identification of factors responsible for poor acceptance	Level of community interest determined; appropriate ORT modules developed and field tested; implementation period was short; change measured in KAP but not in health status.	
Liberia/ Cole II	ORT, CIM	Mothers often seek treatment of their children's diarrhea only after severe dehydration has occurred.	Develop and field test method for teaching caretakers about diarrhea and ORT, building on existing caretaker practices	Train health workers to train mothers in home-based ORT; CIMs to reinforce healthful practices and discourage harmful ones	Three CIMs and two traditional birth attendants trained to deliver ORT and train mothers in their homes. Local schoolteacher has also trained 70 students in ORT.	Study jointly funded by CCM (Phase I) and PRICOR (Phases I and II).

ORAL REHYDRATION THERAPY STUDIES
STUDY PROBLEMS, OBJECTIVES, PROPOSED SOLUTIONS, AND RESULTS

STUDY	SUBJECTS ADDRESSED	PROBLEM	OBJECTIVE	PROPOSED SOLUTION	RESULTS	COMMENTS
Liberia/ Galakpal	ORT	High diarrhea-related morbidity and mortality in areas which have no health workers	Identify acceptable home based ORT solution and best teaching strategy for caretakers	Train local volunteers from each village to train mothers in home-based ORT; test two teaching methods: group versus face-to-face instruction	Before/after knowledge and attitude indicators reveal that individual training strategy is slightly more effective than group strategy. Group training strategy is less time-consuming and may enable workers to reach more mothers.	Investigators tested alternative home based formulas for caretaker acceptability in pilot test before testing training alternatives.
Liberia/ Moore, Wall	ORT, CO, CIW	High diarrhea-related morbidity and mortality in areas which have no CIWs	Use school children to educate families about health, using curriculum consistent with tasks adolescents currently do (as verified by community)	Train local school-teachers to train students, using 8 health modules	Trained 160 children from 4 schools; early results indicate students practice some of what they learned and discuss modules with mothers, siblings, and friends	
Mexico/ de la Macorra	ORT, CF	ORS, though widely available in Mexican pharmacies, is sold mainly in more expensive liquid forms.	Determine if ORS tablets would be acceptable and marketable to public	Developing ORS packets to be dissolved in 8 oz. water	Pharmacists surveyed preferred ORS packets over tablets.	Based on findings, PROMAN chose to produce packets of ORS granules rather than tablets.

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DEVELOPMENT OF APPROPRIATE METHODS
FOR SUSTAINING RURAL HEALTH MOTIVATORS

The Rural Health Motivator (RHM) is a key primary health care (PHC) element in rural Swaziland. The program, however, suffers from high turnover rates. In conjunction with the Primary Health Unit (PHU) of the Ministry of Health (MCH) and with the support of the PRICOR Project, a team from the Social Science Research Unit (SSRU) of the University of Swaziland undertook an operations research (OR) study to find ways to stabilize the RHMs.

The solution to the problem was identified as having three main components: community participation, stronger supervision, and dependable compensation. RHMs receive a monthly stipend from the Ministry, but it is small and delays in payment are not uncommon. In setting priorities to resolve the problem, the MCH/SSRU team decided, on the basis of previous work with groups of RHMs, that small, irregular compensation was probably the major cause of RHM turnover.

Supplementation by the community was thought to be an appropriate solution because it offered the benefit not only of increasing the RHM's payment for services, but also promoting increased community involvement in assuring availability of PHC. However, the researchers determined that before communities would be willing to pay for RHM services, the skills of the RHM would have to be strengthened. The objectives of the research, therefore, became to define a set of skills within the capabilities of the RHM that were acceptable to the MCH and that the community would consider worthy of compensation, and to develop an appropriate compensation scheme.

Several OR techniques were used in the problem analysis phase of the study to examine the organization of the country's PHC system and to identify constraints, inputs, processes, outputs, and outcomes. A nationwide survey, which elicited information crucial to solution development, focused on four areas: utilization patterns of health care, health expenditure, willingness of communities to support the RHMs, and attitudes of the RHMs themselves toward their work. An interesting finding of the survey was that while 23 percent of the respondents said they would be willing to support the RHM financially, not one of the RHMs interviewed believed the community would be willing to do so, mainly because the RHMs were, in principle, already receiving a salary from the government. Based on comments from the RHMs, experience gained from other projects, discussions with health professionals, and the results of the community survey, the research team developed matrices to determine what RHM activities should be strengthened or introduced. The matrix results, in combination with discussions with MCH officials, determined that immunization, oral rehydration therapy (ORT), and growth monitoring

should be emphasized. Another matrix helped identify prepayment for services as the most appropriate form of compensation.

Solution testing took the form of a demonstration field test in a single chieftaincy over a period of 6.5 months. The research team initiated the test by conducting community meetings and a 2-day training course for the eight RHM's. The test was carefully monitored through meetings with RHM's and community leaders. A community survey and interviews with RHM's and community leaders were used to evaluate the field test.

The field test evaluation revealed that the PHC skills training for the RHM had served to broaden the community's perception of the role of the RHM in relation to children's health. For example, respondents perceived the RHM to be the primary source of information on CRT, and mothers complied well when the RHM referred their children for immunization. The newly-introduced growth monitoring skills were well received by both the community and the RHM's, and RHM's proved to be proficient and active in performing these skills.

The RHM support scheme the community chose involved the donation of communal land and agricultural labor toward the production of a crop to be given to the RHM, who could then sell the crop for cash. This plan did not quite reach fruition because the area chief, who alone has the power to direct the people to perform civic duties, was absent at the crucial field preparation period due to the coronation of a new king. The field set aside for the RHM was prepared by the community, but the RHM deemed it too late for planting. The chief and the community agreed that the RHM should remain active and that the community would prepare the field again for the next planting season. An adjacent chieftaincy, without any promotion from the research team, has indicated that it would also try the same scheme.

The following three recommendations were made to the MCH as a result of the study. First, RHM's should be trained to perform growth monitoring at the community level. This training should include local-language curriculum materials, careful referral guidelines, proper tools such as scales and growth cards, and adequate supervision and inservice sessions. Second, RHM inservice training should be revised to emphasize immunizations and CRT. Third, the Public Health Unit (PHU) should try to improve community support for RHM's. These efforts should include encouraging communities to devise their own, locally-appropriate forms of RHM compensation, considering ways to make RHM spouses more aware and supportive of RHM activities, and increasing efforts to keep the traditional leaders informed of and involved in PHU and RHM activities in their communities.

The study team emphasizes what is probably a key finding of the study, i.e. that only after community support for RHM's is improved should further efforts to establish community-based in-kind or in-cash contribution schemes be pursued.

This study was conducted by researchers from the Social Science Research Unit of the University of Swaziland from April 1984 through March 1986. Further information is available from the principal investigators, Ms. Laurie H. Dunn, P.O. Box 4, Malkerns, Swaziland, or Ms. B. Dlamini Vilakati, Ministry of Health, Mbabane, Swaziland, or from Dr. Stewart Blumenfeld, PRICOR study monitor (Chevy Chase).

Study Abstract

OPERATIONAL PROCEDURES TO IMPROVE AVAILABILITY OF PHC DRUGS

An operations research study focusing on the use of modern drugs in rural areas of Somalia was carried out by researchers from the Somali National Academy of Arts and Sciences and Medical Service Consultants, Inc. (USA). The study, supported by PRICOR and UNICEF, with the cooperation of the Somali Ministry of Health (MOH) and USAID/Somalia, was conducted in villages in six geographically diverse regions of Somalia.

The research team first discussed the problems of drug delivery in the rural areas of Somalia with officials from the MOH and several international health agencies. These decisionmakers believed that the shortage of drugs in rural areas was a major constraint to implementing the Primary Health Care (PHC) Program in Somalia. Factors that might contribute to breakdowns in drug delivery were identified.

Three country-specific survey documents were designed and pretested to gather facts about (1) patient use of modern drugs at the village level; (2) prescriber practices in dispensing these drugs; and (3) drug stocks actually present at the prescribing facilities.

Thirty rural villages were selected for a household survey that used a multistage cluster sample design. In each village, 24 households were randomly chosen for the survey. The total number of households interviewed was 716. Thirty-two percent of households had purchased drugs in the past 6 months. The 716 households interviewed reported average drug expenditures of 68.64 Somali Shillings (US\$.83) in the past 6 months. A significant portion of Somali villagers seem to be willing and able to make out-of-pocket payments for drugs, based on the fact that they are already doing so.

Some drug users (approximately 7.0 percent of the total sample or 16.7 percent of apparent drug users) reported purchasing drugs from a PHC or MCH clinic (where drugs are supposed to be free). Apparently, some government health care facilities were charging for drugs in order to help meet costs. Forty-nine percent of respondents indicated that PHC or other MCH facilities were their first choice when seeking modern medicines. The demand for modern drugs in the rural areas is, however, much greater than the government PHC facilities have been able to meet.

Of 31 different diseases named by dispensers surveyed at clinics, health posts, and drug stores used by villagers, the three most often cited were malaria, diarrhea/dysentery, and bronchitis. This seems to correspond

approximately with the most common illnesses reported by the households: cough, diarrhea, fever, headache, influenza, malaria, and stomach distress. The most frequently mentioned drugs for the "most common diseases" were penicillin, chloroquine, and aspirin. Drugs reported by households to have been received from PHC or other MCH facilities included chloroquine, aspirin, CRS, ferrous sulfate, cough medicine, ampicillin, and ciltotrim. Of the 47 items recommended by the dispensers as treatments for the "most common diseases," only 12 items would be sufficient to treat the spectrum of illnesses.

The survey data were then organized to focus on the following areas of interest: (1) household profiles; (2) household reports of drug use, cost, and source; (3) practitioner or dispenser reports of most common diseases and the drugs recommended for them; and (4) selected PHC drug items existing at facilities furnishing pharmaceutical services to the target villages.

A summary of the findings from the three surveys was circulated to seven decisionmakers in the MCH, together with a list of strategies to improve the delivery of drugs to the rural areas of Somalia. The MCH decisionmakers were asked to comment on the findings of the study and to rank the alternative strategies in terms of effectiveness and feasibility. Six of the participants cited the following three options as the most feasible: improve the drug distribution system, improve inventory control at the central drug warehouse, and improve dispenser awareness of appropriate drug use. The same six options were ranked from most to least important for improving the availability of drugs to the rural population. Seeking the local production of pharmaceuticals was ranked as most important. Limiting the number of drugs to be handled and improving the distribution system tied for second place.

After examining the findings of the PRICOR study and the strategies suggested by the Somali MCH decisionmakers, the study team developed recommendations for improving drug delivery to the rural areas. The researchers felt that both the public and the private sectors should be used for PHC drug delivery. The study team also recommended the preparation of a written "Guide to PHC Drug Use" that could be used to teach the Somali villagers. A functioning Somali women's organization was identified as a group to work with in developing the education program. It was also recommended that the MCH review the PHC drug list with the goal of limiting the number of items included.

This study was conducted from April 1985 to December 1985 by the Somali National Academy of Arts and Sciences, and Medical Services Consultants (MSC), Inc. Further information is available from MSC, 1716 Wilson Blvd., Arlington, Virginia 22209, or from Dr. Stewart Blumenfeld, PRICOR study monitor (Chevy Chase).

INCREASING THE PRODUCTIVITY OF COMMUNITY HEALTH WORKERS THROUGH
SUPERVISION IN RURAL AREAS OF NIGERIA

Low productivity of community health workers (CHWs) has resulted in inadequate health care coverage in rural areas of Nigeria. A research team from the University of Ife, having identified lack of CHW supervision as a major cause of this low productivity, conducted an operations research study during 1984 - 1985 to identify inadequacies in current supervisory practices and to propose strategies for improving supervision.

Data on the supervision process were gathered through a set of pretested, complementary questionnaires for supervisors, CHWs, and households in the Ife-Ijesha area of Oyo State in Nigeria. Analysis of the questionnaires showed that current supervisory practices were inadequate. The frequency of visits to CHWs was low and the duration of each visit was short — less than one visit per month and less than one hour per visit. The majority of the PHC units in the area were not, in fact, visited by supervisors more than once a year. Supervisors gave little priority during these visits to reinforcing CHW community outreach activities or home visiting and seldom followed up on the unresolved problems of the CHWs.

The supervisory system contributed to the inadequacies in supervision by failing to provide supervisors with the resources and support they needed to supervise effectively. Few of the supervisors participating in the study had been trained specifically in supervisory methods and management techniques. No guidelines or protocols were available to assist the supervisors in planning and implementing supervisory visits. Although some of the supervisors were required to travel as much as 300 km a month on visits to CHWs, few received mileage allowances or travel advances or had access to official vehicles. Resources such as essential drugs and dressings were often unavailable to the supervisor or the CHW. Moreover, the supervisors had major clinic responsibilities in addition to their supervisory duties.

Home visiting coverage by CHWs was selected by the PRICOR researchers as an indicator of CHW performance, especially in preventive care. Analysis of the data showed that the longer and more frequent the supervisory visits were, the greater the proportion of homes visited. Supervisory tasks (such as planning, coordinating, and holding staff meetings; monitoring clinic operations; reviewing and collecting statistics; and giving technical assistance) were positively correlated with high home visiting coverage.

Having identified the problems, the researchers proposed several alternative strategies for improving supervisory practice. A large solution development workshop was held to assess the feasibility, effectiveness, and importance of these and other strategies. At this workshop 103 participants, including the

supervisors themselves, health officials, and policymakers, used the operations research technique of Multiple Criteria Utility Assessment (MCUA) to select strategies for improving supervision.

As a result of the workshop, the following strategies were recommended to the Federal and State Ministries of Health:

- Establish inservice training programs in supervisory methods and management techniques for current supervisory cadres of health workers.
- Include similar training in the curricula of the educational programs for new supervisory personnel, and see that at least one member of the faculty of each training center is trained in supervision and management.
- Revise the schemes of service for new cadres of CHWs to stress prevention and community outreach.
- Develop planning tools, guidelines, and protocols for supervisors, and train supervisors in their use.
- Carry out a field trial of the solutions suggested, especially the supervisory protocols developed by the study team.

These recommendations, along with the draft supervisory protocols, have been presented to the Federal and State Ministries of Health, UNICEF, and WHO. A third phase of the research to test the recommended solutions has been proposed to the Federal Ministry of Health.

This study was conducted by the Department of Community Health and Nutrition of the University of Ife from March 1984 through December 1985. Further information is available from the principal investigator, Dr. Ebenezer Ojofeitimi, Faculty of Health Sciences, University of Ife, Ile-Ife, Nigeria, or from Dr. Jeanne Newman, PRICOR study monitor (Chevy Chase).

Study Abstract

TRAINING ADOLESCENTS TO PROMOTE HEALTH IN LIBERIA

In an operations research study conducted during the period 1984-86, researchers from Cuttington University College and Tuskegee University addressed the problems posed by the lack of formal health services and health workers in much of Bong County, Liberia. The study team recognized that many of the tasks Liberian adolescents perform in their daily lives are health related and that adolescents might be trained to serve as health promoters in their communities. The objectives of the PRICOR study were: (1) to identify ways in which the existing roles of adolescents in the community can be extended to include health promotion; and (2) to develop and test a health education curriculum for adolescents based on existing community health concerns and on adolescents' traditional tasks.

An advisory committee, composed of the PRICOR investigators, a member of the Ministry of Education, a development specialist, and consultants from Tuskegee University, conducted an initial brainstorming session to identify prevailing health problems and the domestic tasks that adolescents perform. The researchers reviewed literature on the health problems identified and their management. Based on these preliminary activities, the advisory committee selected six potential areas for the development of training modules: oral rehydration therapy (ORT) and nutrition, skin diseases, poisons and accidents, oral hygiene, intestinal diseases, and malaria/germs.

In order to determine the appropriateness of the selected health education modules, village chiefs were consulted and a household survey was conducted in four selected villages of Bong County. A total of 320 heads of household were interviewed. The questionnaire was designed to gather data on sanitary conditions, recurring health problems, and the level of health knowledge, attitudes, and practices in the villages. Health problems identified included diarrhea, intestinal worms, malaria, and poor sanitation. Tasks routinely performed by adolescents were identified and included disposing of wastes, sweeping yards, preparing meals, caring for younger siblings, fetching water, and washing clothes. These results confirmed that health education modules based on the six selected topics would deal with community-perceived health problems and build on tasks that adolescents were already performing.

Using the information from the community survey and the brainstorming sessions, the researchers refined the solution to be tested. Teaching modules were developed for each of the selected topics. Constraints, such as time and money, were identified and taken into account in deciding which adolescents would receive the health education modules and who would teach the modules to the adolescents. A second survey of 30 "strategic informants" in the communities collected more information on specific health habits and environmental conditions relevant to the selected health modules. The researchers decided that the health modules would be included in the science

curriculum of 6th grade students (average age 16-17 years) in primary schools. The new health topics would be taught to these students by their regular teachers. It was expected that the adolescents would pass the health information on to their families and other community members. Thirteen teachers from four primary schools were selected to participate in modifying the modules to fit local conditions. In two workshops, one of which lasted 5 days and the other of which lasted 2 days, the teachers were taught how to teach the new health education curriculum and how to improve classroom management. The teachers received a small bonus for the training and the extra work required to teach the modules. After the completion of their training, the teachers began to teach the health education modules as a part of their normal classroom routine. The modules were taught to over a hundred adolescents in the four primary schools participating in the study.

Several different methods were used to evaluate the effects of the project activities on the knowledge, attitudes, and practices of the adolescents. Before each module was presented, the students took a pre-test to determine existing knowledge of the health topic. After the module had been taught, a post-test was given. The pre- and post-tests were then analyzed to assess the impact of the modules on the students' knowledge. In addition, after the modules had been presented, each student was asked to write an essay describing the health promotion activities they had performed in the community after learning the modules. The adolescents were also asked to write at the end of the essay the correct recipe for home-mixed oral rehydration solution. Finally, a brief survey of a few students, teachers, and parents was carried out to determine any actual changes in health practices after the health modules had been taught.

According to reports from these evaluative activities, plus anecdotal accounts from community members, it seems that the students, the teachers, and the mothers have learned the new health curriculum and have begun to use the information in their daily lives. The percentage of correct answers given by the students was substantially higher in the post-test than in the pre-test. The small evaluation survey found that eight of the nine teachers interviewed had actually seen the students apply lessons from the modules. Nine of the 11 parents interviewed said they had received health advice from their child. Seven of these parents reported receiving advice on CRT. Eleven of the 12 students interviewed reported carrying out new health activities after learning the curriculum. Specific activities mentioned by the students included CRT, personal hygiene, home sanitation, malaria prevention, and referrals to the nearest hospital. The Ministry of Education is interested in adopting the health curriculum used in the PRICOR study for their national primary school curriculum plan. The investigators conclude that, by building on their existing roles and tasks, adolescents can be trained to serve as effective health promoters in their homes and communities.

This study was conducted from April 1984 to March 1986 by Cuttington University College in Monrovia, Liberia and Tuskegee University, Alabama, U.S.A. Further information is available from the principal investigators, Ms. Janet Moore, Cuttington University College, P.O. Box 277, Monrovia, Liberia, or Dr. Paul Wall, Carver Research Foundation, Carnegie Hall, Tuskegee University, Tuskegee, Alabama 36088, or from Dr. Jeanne Newman, PRICOR study monitor (Chevy Chase).

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DIARRHEAL DISEASE INTERVENTION IN LIBERIA

In 1985 researchers working in Kolahun District, Liberia, noted that children with diarrhea were being brought to the clinic when they were already 5 to 10 percent dehydrated. This observation was the impetus for an operations research study on the problem of dehydration due to diarrheal disease in selected communities. This study was conducted by the Christian Health Association of Liberia from 1985 - 1986. The objectives of the study were to determine caretaker knowledge, attitudes, and practices (KAP) toward diarrheal disease and to use that information to design a strategy to improve caretaker KAP. The strategy developed was then to be field tested in the study villages.

The researchers first examined the problem of dehydration and reduced it to two subproblems. The first subproblem was the delayed utilization of health facilities for cases of childhood diarrhea. It was hypothesized that this problem could be explained by the lack of basic knowledge on the part of caretakers and the lack of accessible health facilities.

The second subproblem was that many of the practices of caretakers during diarrheal episodes contributed to dehydration. Caretakers often stopped breastfeeding, withheld fluids, and gave inappropriate medications.

To analyze the problem of dehydration further, the research team conducted a survey of caretakers in 30 villages in Kolahun District, using a two-stage cluster sampling method. In each village, 15 caretakers with children under 5 were randomly chosen for interview. Included in the questionnaire were questions on characteristics of caretakers, recent diarrheal episodes experienced by children, treatment of diarrhea, oral rehydration therapy (ORT) utilization, and other topics.

This KAP survey confirmed the assumptions of the researchers concerning caretakers' lack of knowledge about how to treat diarrhea and their use of traditional practices that contribute to dehydration. Over 60 percent of caretakers had not heard of the home-mixed sugar/salt solution used to treat diarrhea. More than 50 percent of caretakers did not know how to mix the oral rehydration salts (ORS) packet and 60 percent did not recognize the ORS packet. More than 90 percent of the caretakers gave medications for diarrhea. Less than half continued breastfeeding during the child's diarrheal episode. Only 15 percent of the caretakers' children had received ORT during their last illness.

A 1-day seminar was held to place the subproblems in priority order for the PRICOR study and to develop appropriate solutions. Participants included the PRICOR investigator, two research assistants, the Principal of the Kolahun Public School, and a teacher. Using a modified preference matrix, the group

decided that the project would focus on the subproblems in the following order: (1) caretakers' lack of basic knowledge about diarrhea treatment, (2) the adverse practices of caretakers during diarrheal episodes, (3) local beliefs that adversely affect the care of children with diarrhea, and (4) inadequacies of the health care system for diarrhea treatment.

Using similar preference matrices, the participants proposed solutions to the priority problems and developed a strategy to educate and motivate caretakers to use the home-mixed sugar/salt solution to treat childhood diarrhea. Village health workers (VHWs) and traditional birth attendants (TBAs) would be trained to educate and motivate the caretakers, and primary school students would be taught simple lessons about diarrhea which they were expected to pass on to their parents.

Three VHWs and two TBAs were trained as educators and motivators. For a period of 8 months, these community-level health workers encouraged caretakers of children with diarrhea to make and use the simple, home-mixed sugar/salt solution to treat diarrhea. Sessions with caretakers were also used to reinforce positive diarrhea interventions and discourage negative ones. The VHWs and TBAs were required to record in simple ledgers the names and ages of patients they treated for diarrhea, the length of treatment with CRT, and the outcome of the treatment. During the field test period, students in a class at the Kolahun Public School (consisting of 75 students up to the 7th grade level) were taught simple lessons on diarrhea management.

In the course of the field test, the researchers became convinced that VHWs and TBAs can be effective as educators and motivators of caretakers in the use of CRT. The VHWs and TBAs reported a total of 94 children and adults treated for diarrhea with CRT during the 3-month period of the field test. Of these, four were referred because of dehydration. No deaths were reported. Although the number of patients reported seen and treated for diarrhea by the health workers is small, the researchers believe that CRT is gaining acceptance in the study villages and will be more widely used as more caretakers become aware of its utility in saving lives.

The primary school students were very enthusiastic about the lessons they received on diarrhea treatment with CRT. The impact of these lessons on the incidence and degree of dehydration has yet to be assessed. The researchers believe that the lessons will have an impact and recommend that the simple lessons on diarrhea and CRT be incorporated into the curriculum of the primary schools.

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This study was conducted from May 1985 through March 1986 by the Christian Health Association of Liberia (CHAL). Further information is available from the principal investigator, Dr. Andrew Cole, P.O. Box 1046, Monrovia, Liberia, or from Dr. Jeanne Newman, PRICOR study monitor (Chevy Chase).

TRAINING MOTHERS TO USE CRT IN RURAL LIBERIA

Severe budgetary constraints in Liberia have limited the delivery of primary health care (PHC) services, including the distribution of prepackaged UNICEF oral rehydration salts (ORS). This situation has left many rural areas of the country largely unserved by health workers and oral rehydration therapy (ORT) programs. From 1984 to 1986, researchers from the University of Liberia and the Ministry of Health and Social Welfare undertook an operations research study to design the most effective ORT program for remote areas where there are no health workers. The research team realized that training volunteer workers to serve in these areas would be the most feasible approach. The study had two objectives: to identify which of several possible home-mixed CRT solutions the caretakers would prefer and to develop and test alternative strategies for training mothers to prepare and administer the chosen solution.

Early in the study, researchers identified two teaching strategies and four possible home-mixed solutions. Realizing that the testing of each possible combination would be expensive and time consuming, the study team conducted a pilot study to try to eliminate some of the options. After collecting baseline information on caretaker knowledge, attitudes, and practices (KAP) and socioeconomic data, volunteer village trainers were selected and taught to mix the four ORT solutions. These volunteers would, in turn, train caretakers, either individually or in small groups, to perform this task. The researchers then divided the caretakers who had children under 5 and who lived in the pilot area into two groups according to the type of CRT training method they would receive (individual or group).

To determine which CRT solution(s) the mothers preferred, each caretaker was taught to prepare all four solutions. Results from the post-test interviews with caretakers indicated that most of the mothers favored a salt-sugar solution flavored with orange.

To determine which training method was more effective, researchers identified 21 indicators of CRT and diarrhea KAP and tested caretakers on these indicators before and after the CRT training intervention. Because the results from the pilot test did not show conclusive differences in the effectiveness of the two teaching methods in improving mothers' KAP, the researchers then conducted the full-scale field test among 15 randomly selected villages.

Before the field test, the 15 villages were stratified into three groups. This division was based on socioeconomic indicators considered likely to influence CRT use. One village from each group was randomly selected as the control village, and the other four were divided according to the training strategy. In half the villages, volunteers were trained to teach mothers individually and in the other half, volunteers were trained to teach mothers in groups. The salt-sugar-orange solution was the only CRS solution used in the field test. To determine which strategy was more effective, 21 indicators of mothers' KAP were measured for all mothers in the 15 test and control villages. A total of approximately 400 mothers were trained.

The results from the pre- and post-test interviews for all experimental villages showed that both methods of training significantly increased caretaker knowledge and awareness of the nature, causes, and effects of diarrhea and the ways to treat diarrhea with ORS. Comparison of the 13 indicators designed to detect differences in the effectiveness of the two teaching strategies shows only a slight superiority of individual training over group training. However, the caretaker dropout rate was significantly lower among the group-trained caretakers. The researchers suggest that this may be due to the fact that the trainers are neither paid nor sufficiently motivated to make the number of required visits to individual caretakers' homes to complete the training. These results indicate that group training may be the most efficient way of training caretakers using limited volunteer time.

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This study was conducted from June 1984 through March 1986 by the Dogliotti College of Medicine, University of Liberia, in cooperation with the Liberian Ministry of Health. Further information is available from the principal investigator, Dr. Moses Galakpai, A.M. Dogliotti College of Medicine, Department of Preventive Medicine, University of Liberia, Monrovia, Liberia, or from Dr. Jeanne Newman, PRICCR study monitor (Chevy Chase).

ORAL REHABILITATION THERAPY STUDIES
 STUDY PROBLEMS, OBJECTIVES, PROPOSED SOLUTIONS, AND RESULTS

STUDY	SUBJECTS ADDRESSED	PROBLEM	OBJECTIVE	PROPOSED SOLUTION	RESULTS	COMMENTS
Swaziland/ Dunn, Dlamini	CIW, CF, CO, ORT	MOH cannot afford to pay rural health motivators (RHM) more than very small monthly stipend; community unwilling to support RHM preventive services; RHM task speci- fication ambiguous.	Improve scope and quality of RHM services; identify most appropriate way of sustaining them through community financing	Refresher courses (including home-based ORT) for RHMs, so their services are better ap- preciated by community and generate in-kind (food or labor) payments for RHM	Chief assigned field to RHM & community to pre- pare land for planting. Community did so, but due to external circum- stances, too late for planting. Community will repeat in time for next planting season. Small (n=64) evaluation showed that 95% of res- pondents knew of ORT and 35% knew correct formula.	MOH area superior of RHM: trying to expand approach to second chieftianship

STUDY	SUBJECTS ADDRESSED	PROBLEM	OBJECTIVE	PROPOSED SOLUTION	RESULTS	COMMENTS
Nigeria/ Ojofeltimi	CIM, ORT	Poor CIM coverage, partly due to inadequacies of current supervisory practices	Strengthen CIM effectiveness by improving supervision	Training for supervisors; guidelines/protocols for supervisory visits	Guidelines/protocols developed; recommendations and draft supervisory protocols presented to MOH, UNICEF, and WHO. Field test of solutions proposed to MOH.	
Sierra Leone/ Jalloh	ORT, CIM, CO	High diarrhea-related morbidity and mortality; ORT messages have not reached rural areas.	Develop ways of incorporating ORT into national health policy; train mothers in ORT	Train CIMs and village leaders to train mothers		Sugar not generally available in villages. Need to convince mothers to buy sugar and retain specifically for home ORS.
Somalia/ Lane	ORT, CF, CD	Lack of adequate supplies of basic drugs in rural areas	Develop strategies to improve PHC drug supply in rural areas	Use private sector as well as public to deliver drugs; prepare written "Guide to PHC Drug Use" for villagers; review PHC drug list and limit items	Alternative solutions developed and placed before decisionmakers, asking them to choose and implement	

MOBILIZING TRADITIONAL HEALERS TO DELIVER ORT

In northeastern Brazil diarrhea is a major source of morbidity and mortality among infants and small children. In rural areas, traditional healers have long been the first source of medical care for children suffering from diarrhea and other illnesses. The healers are available to the community 24 hours a day and work out of a desire to serve their community, without monetary incentives. A PRICOR study showed that these healers can be effective in preventing and treating dehydration and in reversing mothers' harmful health practices, at a very low cost. The objective of the study, conducted by faculty from the Federal University of Ceara and the University of Virginia, was to determine how best to mobilize and integrate traditional healers into the official health system to clinically manage diarrheal illnesses and to deliver oral rehydration therapy (ORT). The study was conducted in Pacatuba, a rural community of about 7,000 near Fortaleza, the capital of Ceara.

In the problem analysis, the researchers sought to understand the social, cultural, and medical systems in which the traditional healers work. Data was collected from surveys on the knowledge, attitudes, and practices of the community regarding the treatment of diarrhea/dehydration and child morbidity and mortality due to diarrheal diseases. Ethnographic analyses were undertaken of the health care delivery system and utilization patterns, and in-depth interviews were conducted to reconstruct patterns of household response to a diarrhea illness episode.

These analyses revealed some interesting findings on the incidence of diarrhea in the region and the possibility of using traditional healers to deliver ORT. First, the infant mortality rate was high, at almost 150/1,000, with over half the deaths due to diarrhea/dehydration. Mothers widely perceived diarrhea as a "fright disease", or other supernatural malady which requires the intervention of the traditional healer. Seventy-seven percent of mothers - representing all socioeconomic strata - first sought a traditional healer in cases of diarrhea. Knowledge of oral rehydration therapy in the community was high, but lack of service providers resulted in low utilization. Finally, mothers experienced serious problems with the modern health care system, including long waits, rationed appointments, extensive travel, and expensive and improperly prescribed drugs.

During Phase II of the study, the researchers worked with traditional healers to develop a strategy to involve them in the promotion and use of ORT. Group meetings were held during which the traditional healers had their first opportunity to share ideas with one another and participate in the formulation of a strategy for incorporating ORT into their healing rituals. They also participated in choosing an ORT recipe that was most acceptable to the target community. Forty-six popular healers in Pacatuba were trained in how to correctly prepare and administer ORS, and to teach mothers how to give the solution to their children at home.

The healers were provided with the basic equipment needed to prepare ORS, including measuring utensils, containers, and water filters. In several cases the community contributed by helping to build "curing rooms," simple mud and thatch room additions on the healers' homes where they could treat patients. A manual for

Instructing traditional healers was produced with substantial input from the healers, and guidelines were formulated to assess their clinical competency in the identification and treatment of diarrhea and dehydration. Healers were also taught to identify and refer severe cases that do not respond adequately to CRT.

The testing of the strategy began in October 1984, and after 12 months of activity, the impact of the traditional healers' efforts has been dramatic. A comparison of the responses of 204 mothers with children less than 5 years old before the PRICOR study with the responses of 226 mothers after the study showed a highly significant increase in mothers who know about homemade CRS, from 3% to 72% (p less than .001). Over half of the mothers surveyed had used the traditional healers' CRS, with the greatest number among the poorest families. Moreover, the traditional healers' promotion of CRT positively influenced mothers' feeding and medication use behaviours during diarrheal episodes. After the intervention, the number of mothers who believe they should continue breastfeeding during diarrheal episodes increased by 20.5 percentage points (p less than .001) and the number who believe that feeding should continue (not be withheld) increased by 13.0 percentage points (p less than .01). A significant decrease of 25.5 percentage points (p less than .0001) was shown in the number of mothers using expensive, commercially prepared CRS packets. The use of pre-diluted CRS dropped by 11.6 percentage points (p less than .01). The greatest percentage drops in the use of these expensive methods occurred in the poorest neighborhoods, where the traditional healers' homemade solutions enjoyed the greatest increase in popularity. A significant decrease (from 93% to 63%) was also shown in the number of poorest mothers who believe they must give pharmaceuticals to a child with diarrhea/dehydration.

Traditional healers have demonstrated that they are capable of preparing safe salt and sugar solutions and are effective at conveying the value of CRT to mothers. The introduction of CRT through traditional healers did not change villagers' medical beliefs about the causes of diarrhea, but rather strengthened the healers' role in the community by the incorporation of CRT skills.

A cost analysis of the intervention showed that the costs of incorporating traditional healers into CRT delivery is quite low since the healers work without salaries and because the community supplied much of the materials needed to construct the curing rooms. The average cost of constructing a curing room was US\$ 16.12, and equipping it for CRT, US\$ 43.15. The operating expenses for the program, including biweekly supervision, salt, sugar and replacement supplies for preparing CRS, averaged US\$ 71.13 per month. The cost of sugar needed per month per healer was only US\$ 0.48, suggesting that the costs of providing salt and sugar for the traditional healers could be borne by the community.

Based on the successful experience with traditional healers in Pacatuba, the researchers are planning for the incorporation of traditional healers into a new large-scale child survival project that the Federal University of Ceara is implementing in 33 municipalities (counties) in Ceara with funding from Project HOPE and AID.

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This study was conducted from March 1984 to February 1986 jointly by researchers from the Federal University of Ceara, Brazil and the Division of Geographic Medicine in the Department of Medicine of the University of Virginia. Further information is available from the principal investigators, Dr. Marilyn K. Nations, Box 435, School of Medicine, University of Virginia Medical School, Charlottesville, VA 22903, and Dr. Maria Auxiliadora de Sousa, Caixa Postal 1574, Aldeota 60.000 Fortaleza, Ceara, Brazil, or from Dr. David Nicholas, PRICOR study monitor (Chevy Chase).

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PRICOR Primary Health Care Operations Research

Study Abstract

IMPROVING DISTRIBUTION OF ORS IN THE DOMINICAN REPUBLIC

Diarrheal diseases are a leading cause of death among infants in the Dominican Republic, where approximately 550,000 children are under 3 years old. A nationwide government campaign to promote the use of oral rehydration therapy (ORT) was being planned for 1984. The purpose of the PRICOR study was to assist the government to ensure the supply and distribution of oral rehydration salts (ORS) nationally and to determine an appropriate price for the packets. The study was thus concerned with developing solutions to a number of problems in the supply and distribution of ORS.

The study began with an inventory of the available health statistics to determine the incidence of diarrhea. However, the quality of the existing data was not high enough to support sound planning. It was therefore decided to conduct a survey to collect basic data on the incidence of diarrheal diseases and on the degree to which ORT was currently being used. This information was crucial for the development of solutions and to the government in planning a distribution program.

The survey, which examined records of 27 hospitals, 21 regional subcenters, and 91 rural clinics, gathered data on mortality, morbidity, and use of ORT. In the rural areas socioeconomic data and information on health practices was also collected. In the end, the survey data proved unreliable and, therefore, not as useful to the solution development as originally hoped. However, it was the only data available, so some tentative conclusions were drawn for general planning purposes.

A quantitative inventory model was formulated to determine the best way to order, transport, store, and distribute ORS. The application of this model required both information from the government on how it proposed to distribute ORS and data from the incidence and coverage survey. The information from the government was not available, and the model was applied using only the general conclusions drawn from the survey. The resulting recommendations emphasized the importance of developing nongovernmental supply channels and using as many kinds of organizations as possible, including private commercial distribution.

The study team developed a theoretical pricing model to determine the best pricing strategy for ORS. The principal operational problem was to determine a price that was high enough to cover most costs and a small margin for the retailers and yet low enough to be affordable. Due to the unreliable survey data, this model was applied using income and expenditure studies from the

central bank and time series data on prices and sales of essential medicines. The study assumed a two-tier pricing system. It recommended a price per packet of US\$.08 for the low and moderate-income market and a price of US\$.30 for the high-income market. Approximately 6.5 million packets would be made available each year. This would be enough to provide universal coverage in the D.R. assuming the use of four CRS packets per episode of diarrhea. The private pharmacies would provide about 25 percent of the packets and the government 75 percent.

The design of this study depended heavily on input from the Government of the Dominican Republic. However, since the resources and political support to move ahead in planning the national CRT program were not available, the government was unable to supply the necessary information needed to complete the PRICOR study. Nonetheless, recommendations based on the results of the technical analyses were made to the government in the areas of management information systems, inventory and distribution management, and pricing. These recommendations might serve as a framework of basic ideas and information for developing a complete distribution plan in a future CRT project.

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This study was conducted from December 1983 through April 1985 by the San Juan, Puerto Rico consulting firm of Clapp and Mayne, Inc., in cooperation with the Secretariat of Health and Social Assistance in the Dominican Republic. Further information is available from Dr. Jose A. Herrero, Km. 25, Autopista Duarte, Santo Domingo, Dominican Republic; from the principal investigator, Dr. Alan Udall, Clapp and Mayne, Inc., 1606 Ponce de Leon Avenue, San Juan, P.R. 00909, or from Dr. Jack Reynolds, PRICOR study monitor (Chevy Chase).

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ALTERNATIVE METHODS OF MOTIVATING COMMUNITY HEALTH WORKERS

The Ministry of Health of Haiti has adopted a strategy of primary health care (PHC) to achieve the goal of "Health for all by the Year 2000." The success of this strategy depends largely on the ability to recruit and support government health workers, or non-government community health collaborators, who will provide community-based preventive PHC services. The recurrent cost of financing these peripheral-level workers is too high for either the government or private institutions to absorb. Save the Children Canada (AEDC), in collaboration with institutions associated with the Haitian Association of Voluntary Health Institutions (AOPS), conducted a study during the period 1984 - 1986 to examine the best ways of motivating the CHWs to provide preventive services that would encourage mothers to learn about, use, and maintain their competence in child survival interventions.

Given that subsidies from institutions managing the CHW programs were not an acceptable option, the researchers began by identifying alternative community financing mechanisms. These included: (1) funds from the community (fee-for-service at rally posts, contributions from existing community groups, prepayment for services); (2) volunteers; and (3) revenue-generating activities.

Data were collected in community surveys and intensive case studies to better understand the motivation problem and the feasibility of the proposed alternatives. Results from the surveys, carried out in three rural areas, showed that people are not willing to pay for preventive services. Communities perceive curative care as their primary health need and CHWs in the rural areas do not provide curative care. In fact, people perceive health care as a "service" delivered by an outside agency. While people understand the value of health promotion, they expressed no willingness to finance a health care delivery system. Given these constraints, the researchers and consultants then systematically evaluated the options using a multiple criteria utility assessment.

With regard to community funds, increasing revenues from fee-for-service activities at the rally posts (where health services are delivered from mobile units), was not acceptable to local institutions. This option was eliminated because the doctor-oriented, "curative" focus would detract from the four child survival interventions, and it would not generate enough money to regularly pay the CHWs (as demonstrated in Mirabalais). Local community groups often pool resources for special projects. However, most community groups agreed that although they appreciate the work of the CHWs and would like to encourage it, they did not normally have enough funds or community support to use existing funds to regularly finance a CHW. The prepayment scheme was not feasible because people were not willing to pay for preventive health services.

The second alternative for providing preventive services was volunteers. Existing volunteer projects were examined and it was found that they shared the common characteristic of being discrete activities of short duration. None were ongoing activities. Volunteers did not seem a likely source of energy for the preventive health work. The third major alternative considered was revenue-generating activities that would produce enough profit to reimburse the CHWs for their work. The major problem with these activities was that they usually did not provide incentives to the CHW to do preventive services.

The solution the group found most likely to motivate the CHWs to do preventive tasks was a combination of the prepaid scheme, the existing community groups, and a revenue-generating activity. It is based on traditional Haitian credit associations called "cengle" or "solde." In these traditional rotating credit schemes, friends contribute a fixed amount of money each month to a general fund and take turns receiving the entire pool. In the proposed health financing scheme, groups of mothers who can demonstrate competence in the four child survival interventions and whose children are fully immunized and participating in growth monitoring will be eligible to participate. These women, organized in small groups by their natural friendship networks, each pay an annual fee for her health card (which is used to support the CHW). The group decides the monthly contribution each person must make depending on how much they know that person can pay. The monthly contributions are used by the women as in a traditional cengle. However, the real attraction of the health card is not the cengle but the access that the affinity group then has to low-interest loans from the Bureau de Crédit Agricole (BCA) for income-generating activities. The pooled monthly member contributions are matched by a one-time grant from the institution sponsoring the CHW program. This matching grant is used as capital for the loan, kept at BCA. BCA will lend four times that amount to the group for income-generating activities. A counselor from the BCA will help the affinity groups develop feasible projects and a payback schedule. The affinity group is an essential component of the scheme as its cohesion is the reason people will be motivated to continue paying into the fund.

This project appears to have produced favorable results for a number of reasons. Credit schemes such as these are attractive to rural residents because there is great demand for credit, and private-source interest rates are very high. Because low-interest credit is so desirable, there is an economic incentive for the mothers to learn about the health interventions in order to have access to the pooled funds. As the CHW salary is based on the number of mothers who qualify for the health cards, the financing scheme cleverly links the promotion of preventive health interventions with revenue generation. Some of the groups have developed successful income-generating projects. One group bought a mature mango tree from which they will harvest and sell mangos. Another group bought a goat with their loan and have recently acquired another with their monthly contributions.

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This study was conducted from December 1984 through March 1986 by the Alliance pour l'Enfance et le Développement Communautaire, in collaboration with institutions associated with the Association des Œuvres Privées de Santé. Further information is available from the principal investigator, Dr. Antoine Augustin, Alliance pour l'Enfance et le Développement Communautaire, 3 Rue de Duncombe, Port-au-Prince, Haiti, or from Ms. Marty Pipp, PRICOR study monitor (Chevy Chase).

**RESOURCE ALLOCATION IN PRIMARY HEALTH CARE PLANNING FOR HAITI:
OPTIMIZATION OF TASK ALLOCATION FOR COMMUNITY HEALTH WORKERS**

PRICOR researchers carried out a study to determine the best way for community health workers (CHWs) to allocate their time among four critical child survival interventions: growth monitoring, family planning, oral rehydration therapy (ORT), and immunization. Although CHWs bring information about these health services to underserved communities, the amount of time each can devote to training mothers in these interventions is limited. A systematic analysis has been made of CHWs' activities in one area served by a private voluntary organization in Haiti. Using estimates of probable use and use-effectiveness of each intervention in reducing child mortality, and an analysis of how much time it takes for a CHW to bring a mother to competency in each of the interventions, the researchers have developed a scheme to allocate CHW time most effectively among the four interventions. A field test of the time allocation scheme also examined the effect of targeting high-risk mothers instead of trying to teach all mothers about these interventions. An epidemiologic assessment was used to assign mothers to risk categories. The researchers have found that it is more efficient to concentrate the educational efforts of the CHWs on high-risk mothers.

During the initial problem analysis, it was discovered that the CHWs, who are essentially volunteers, can devote only 12 hours per week to health promotion. The remainder of their time is spent travelling, attending health rallying posts, maintaining vital statistics, and working at their own personal income-generating activities. With such limited time available, it was particularly important to help the CHWs maximize the health benefits to the community. Benefit in this case was measured as survival of children two years and under. Quantitative estimates were made of the increased probability of intervention use once taught, the effectiveness of reducing cause-specific mortality if the intervention is used, and the time necessary to teach a particular intervention.

Estimates of the probability of use were obtained from data available from other studies in Haiti. The effectiveness of the interventions was estimated from general medical knowledge. Data on the time needed to train mothers were generated for the study. High-risk mothers were identified through an existing population-based registration system, and included those who were aged 35 with four or more children, at least one of which was under 5; those with more than five children, one of which was under age 5; those with a child under 5 diagnosed as malnourished; or those who had lost a child within the past year.

Using the time allocation scheme developed earlier, the study team developed a plan to field test the effect of risk targeting. Because of the short time available for the field test, training was given to the mothers only in CRT and family planning. The study area was divided into three sub-areas. In the first, each CHW was asked to train all 300 mothers in CRT, and as many high risk mothers as possible (39) in family planning. The relative time spent on each intervention was in accordance with the allocation scheme. In the second area, CRT training was given only to the 60 highest-risk mothers; the time remaining for family planning education was sufficient to reach 48 of the high-risk mothers with this intervention. In the third area, the control, the CHWs continued to allocate their own time as before. All CHWs in all three groups were given special training, particularly in the area of teaching skills. CHWs received a stipend at the end of the study that depended on the percentage of mothers who were competent in the two interventions. Participating mothers who were successful in achieving competency received incentives, including the opportunity to purchase a health card and participate in rural credit clubs. (See study entitled: "Alternative Methods of Motivating Community Health Workers," Haiti).

The results of the field test showed that the targeted approach was both efficient and effective. Not surprisingly, CHWs found that it was much easier to deal with a limited and defined set of mothers at any one time. Moreover, the targeted approach did not appear to severely penalize the other mothers, because they acquired their knowledge at rally posts. The investigators conclude that it would be advantageous to institute a screening system to identify at-risk children. Also, village-level educational sessions for mothers of at-risk children could improve the communities' knowledge of key interventions. Such sessions would be especially effective in areas where a major educational effort already takes place at the rally posts.

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This study was conducted from November 1984 through March 1986 by Eye Care-Haiti, a private nonprofit organization providing primary health services and ophthalmic care in rural Haiti. Further information is available from Dr. Antoine Augustin, Eye Care-Haiti, P.O. Box 1319, Port-au-Prince, Haiti, or from Dr. Jeanne Newman, PRICOR study monitor (Chevy Chase).

COMMUNITY ORGANIZATION IN PROMOTING
EFFECTIVE USE OF ORT IN HAITI

Severe dehydration is responsible for one-half of the deaths of children under 5 in Haiti. A 1984-86 PRICOR study, carried out by researchers from the Association des Oeuvres Privées de Santé and the University of South Carolina School of Public Health, addressed the need to extend the use of oral rehydration therapy (ORT) to the rural areas of Haiti, even in villages without a resident agent de santé (health worker). The operational objective of the study was to mobilize existing community resources (formal groups, informal networks, institutions, and leadership) to increase the availability and use of oral rehydration salts (ORS), both packets and home mix, and to ensure appropriate caretaker preparation and administration of ORS. The project site was the Petit Goave Health District in the Western Public Health Region of Haiti.

During the problem analysis phase, a series of overlapping data collection instruments was used to identify the major obstacles to more effective caretaker use of ORT and to set priorities among these problems for operations research. To achieve these two objectives, the study team identified obstacles through: (1) surveys that provided information on household KAP, socioeconomic characteristics, ORS usage levels, willingness of community leaders and sellers to help promote ORS, and existing health facilities and ORT programs in the health district; (2) interviews with residents living at different distances from sales posts; and (3) focus groups. Twenty villages in the district were selected for inclusion in the study.

Solution development began with an analysis of the studies mentioned above. Four priority sub-problems were identified: ORS availability, ORT usage, ORT preparation, and clinical treatment and referral of children with severe dehydration. The study team developed models for each of the sub-problems and presented them to members of the project policy committee (including members of the National Campaign Against Diarrhea). Using a nominal group process, the committee then examined each model and evaluated the variables in terms of both their individual importance and the extent to which they could be manipulated by the decisionmaker. Those variables that passed the tests were kept in the model and others were added at the suggestion of the policy committee. Community-based solution models were developed to address only the first three sub-problems. Based on the process described above, these solutions were then presented for review to the Petit Goave District Health Committee and to leaders in the intervention communities and revised as necessary.

To improve CRS availability, 28 new CRS sales posts were established in the intervention communities. Operators of these posts and operators in villages already having posts were trained in effective procedures for storing, promoting, and selling CRS. To increase the use of CRS and to improve preparation and administration of the solution, a community-based educational strategy was developed and modules prepared to train a wide variety of community leaders to promote CRT. Health workers from the District Health Office trained groups of village leaders in central locations. Agents de santé visited villages to reinforce community participation.

The solution validation phase consisted of five steps: (1) a pre-test of household KAP; (2) training of "agents de santé" (health workers) from the District Health Office to mobilize community leader participation; (3) training of school teachers, traditional birth attendants (TBAs), village leaders, and owners of CRS sales posts to promote CRS; (4) an intervention period of 2 1/2 months (reduced from the originally scheduled 11), during which the trained community resource leaders carried out CRT promotional activities; and (5) a household KAP post-test which was virtually the same as the pre-test.

The study was successful in identifying and developing significant community leadership resources and involving them in the CRT program. It demonstrated that a variety of village leaders could be mobilized and trained to serve as volunteers in a way that could reach a large percentage of a given target population. Forty-three percent of the households in the post-test indicated that one or more of the trained leaders had discussed using CRT with them, in home visits or at community meetings. Due in part perhaps to the limited intervention period, CRT use in the intervention villages did not increase significantly more than in the control villages. However, important gains were registered in the intervention villages in caretaker knowledge of diarrhea and correct preparation and appropriate administration of CRT. The investigators suggest that because of time limitations, not enough attention was given to determining how best these community leaders could be used, nor to linking these efforts to on-going national training programs. They recommend future operations research studies to determine how best each of these community resources could be used in CRT planning and related activities.

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This study was conducted from March 1984 to March 1986 by the Association des Oeuvres Privées de Santé (ACPS) and the University of South Carolina. Further information is available from Dr. Michel Cayemittes, ACPS, B.P. 76, Port-au-Prince, Haiti, or from Dr. William B. Ward, Department of Health Promotion and Education, School of Public Health, University of South Carolina, Columbia, South Carolina, 29208, or from Dr. Jeanne Newman, PRICOR study monitor (Chevy Chase).

A MARKET RESEARCH STUDY OF THE QUANTITATIVE AND QUALITATIVE ASPECTS OF THE MARKETING AND DISTRIBUTION OF ORAL REHYDRATION SALTS IN MEXICO

A market research study of oral rehydration salts (ORS) was carried out in Mexico by Promotora de Planificación Familiar (PROFAM), a Mexican nonprofit organization. Mexican health agencies have widely encouraged the use of packets of ORS granules to combat high infant morbidity and mortality from diarrheal diseases. PROFAM was interested in producing, marketing, and distributing an inexpensive, easy-to-use ORS tablet and wanted to know if the public would find this product acceptable. Since drugstores are a popular source of ORS products, it was decided that a survey of pharmacists would provide a relatively good measure of supply and demand for ORS.

The survey included 116 private drugstores: 55 in Mexico City, 30 in the hot region, and 31 in the temperate region. The researchers asked pharmacists and other drugstore personnel to answer questions regarding the distribution and sales of ORS, their knowledge of the purpose and correct use of ORS, the demand for ORS, and their opinions on the presentation of ORS products.

Distribution and Sales. Analysis of the survey results showed that the majority of the drugstores surveyed (99 percent) sell ORS products, more than half without a prescription. Although the prices are probably too high for many consumers who need ORS products (US\$.73 - .94 per 500 ml bottle), the pre-mixed liquid sells well. The pharmacists report that most sales are made to women.

Knowledge of Purpose and Use. Most of the pharmacists stated correctly that ORS products are used to treat dehydration caused by diarrheal diseases. Many of the pharmacists, however, were not sure of the directions for use. Only one of the ORS supplier companies occasionally provided the pharmacists with information on the purpose and the correct use of their ORS product. The pharmacists reported that pre-mixed liquid ORS products had the highest demand.

Demand and Presentation. The demand for ORS products was seasonal, with the largest quantities being bought in the spring and summer. A few pharmacists felt that demand could be increased by adding flavoring to existing ORS products. Opinions were mixed about the acceptability of an ORS tablet. On the one hand, many of the pharmacists thought that tablets would be easy for the consumer to use and more economical than other ORS products. On the other hand, many pharmacists feared that use of contaminated water to dissolve the

tablets would be a problem and that the tablets might be difficult to dissolve. When asked to indicate whether CRS tablets or granule packets would be more suitable, 33 percent of the pharmacists chose tablets, 48 percent chose granule packets, and 19 percent had no opinion. The investigators emphasized that these results are the opinions of pharmacy personnel and do not necessarily represent those of consumers.

Based on the study results and subsequent discussions, PROFAM decided not to proceed with the production of CRS tablets. The two major reasons for this decision were suitability and cost. The survey showed no particular consumer advantage of the CRS tablets over granule packets, and the tablets also cost slightly more than granule packets to produce. Instead, PROFAM will produce packets of granules that can be dissolved in an 8-ounce glass of water. The 8-ounce glass is a more convenient container for consumers than the 1-liter vessel required to dissolve existing granule packets. PROFAM was to begin manufacturing the packets as soon as they received Government approval.

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This study was conducted during July 1983 by Promotora de Planificación Familiar (PROFAM), a private, nonprofit Mexican association. Further information is available from Ing. Luis de la Macorra, President, PROFAM, Apartado Postal 34, El Pueblito, 76900 Villa Corregidora, Queretaro, Mexico, or from Dr. David Nicholas, PRICCR study monitor (Chevy Chase).

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ADDING NUTRITION REPLETION EDUCATION TO ORT PROGRAMS IN EGYPT

The prevention and treatment of childhood diarrhea and subsequent malnutrition was the subject of an operations research (OR) study carried out in 1985 through 1986 by researchers from the Nutrition Institute of Egypt. The study focused on children under 3 years old who were given oral rehydration therapy (ORT) at primary health care (PHC) units in rural lower Egypt, rural upper Egypt, and a suburban district near Cairo.

The health problem addressed by this study was the "diarrhea-malnutrition-diarrhea cycle" which had not been broken, although a national ORT program was in place and functioning relatively effectively. Researchers from the Nutrition Institute had observed that immediately following an episode of diarrhea, a child's body has an increased capacity to absorb nutrients and utilize calories in order to regain a healthy nutritional status. However, this nutritional "catching up" can occur only if the child is provided with nutritious foods during and after the bout of diarrhea. Traditional infant feeding practices in Egypt do not normally provide extra food for the child who is sick or has recently been sick. Thus, ORT was working relatively well for the short-term treatment of dehydration, but was not solving the long-term problem of nutritional depletion. The objective of the study was to develop ways to incorporate a nutrition repletion component into the existing ORT program of the Egyptian PHC system.

A Policy Committee composed of decisionmakers from the PHC system, the Nutrition Institute, and other relevant agencies participated in problem analysis. The existing system for ORT delivery was thoroughly described, and knowledge and data about feeding of children during diarrheal episodes was shared. This group concluded that there was a need to get more information to mothers and health providers on appropriate infant feeding practices during and after diarrhea. It was decided that health providers at PHC facilities would give this information to mothers when they brought their children in to be treated for diarrhea. Three different types of health centers would be included in the study: those participating in (1) the national ORT program alone, (2) both the ORT program and the Nutrition Education (NE) program, and (3) both the ORT program and the Strengthening Rural Health Delivery (SRHD) program.

The Policy Committee used a modified nominal group process to develop an educational message to teach mothers to replete their child nutritionally during and after an episode of diarrhea. The message was designed in such a way as to help mothers themselves decide what to feed their child during and

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after diarrhea, based on the foods available to them. The message finally developed consisted of three parts: (1) continue feeding your child when he/she has diarrhea, (2) if the child is breastfed, continue breastfeeding, and (3) the child may continue any foods that he/she had eaten previously, only the food should be boiled. During the period of the study, a TV/radio message was released by the National Diarrheal Disease Control Project (NDDCP) which encouraged mothers to breastfeed their children during and after diarrhea.

Before the introduction of the educational message in the health facilities, baseline surveys of more than 1,000 mothers, 341 health care providers, and 60 pharmacists were conducted. These surveys were administered at 104 health centers on days that the Maternal and Child Health (MCH) clinics met. A checklist for health facilities helped determine how CRT was being used in those facilities.

This initial survey revealed some interesting findings about infant feeding practices in the study areas. The majority of the mothers reported a "correct" usual diet for the child before 6 months and after 18 months of age. During the period of 7 to 18 months, a significant number of mothers continued to give their infants an unsupplemented milk diet (at a time when other sources of calories and nutrients become important). By the age of 18 to 24 months, about one quarter of the children were receiving a complex diet without any milk. A large proportion of the mothers (39 percent) reported that they had made a change in the child's diet during this illness. About 10 percent indicated that they had stopped feeding the child completely.

The directors of each of the three programs (CRT, NE, and SRHD) then incorporated the nutrition message into their clinics using their regular training and management techniques. Health care providers at the three different types of health units delivered the educational message to mothers who brought children in to be treated for diarrhea during a 3-month period. The message "feed your child any boiled foods" was unique to this PRICOR study, so if mothers did remember this advice, the researchers could be relatively certain that they had heard it from the health care providers at the study units.

About 3 months later, the research group carried out a post-intervention survey of mothers and health care providers. This version of the survey was slightly improved over the pre-intervention survey, so the results cannot readily be compared. It was apparent, however, that a significant proportion of mothers attending the health facilities had heard the educational message and made positive changes in their behavior as regards feeding during diarrhea and CRT use. Upon recommendation of the Policy Committee, the educational message tested in this study has been fully incorporated into the PHC system.

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This study was conducted by researchers from the Nutrition Institute from February 1985 through March 1986. Further information is available from the principal investigator, Dr. Osman Galal, Director, Nutrition Institute, 16 Kasr el Aini Street, Cairo, Egypt, or from Dr. Jeanne Newman, PRICOR study monitor (Chevy Chase).

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Study Abstract

IMPROVING ORS INVENTORY MANAGEMENT IN
RURAL HEALTH FACILITIES OF EGYPT

An operations research study of the availability, distribution, and inventory management of oral rehydration salts (ORS) during the period 1978-1985 was carried out by researchers from the Strengthening Rural Health Delivery (SRHD) Project in Egypt. The study focused on rural health facilities and surrounding communities in Fayoum Governorate (Upper Egypt) and Dakahlaya Governorate (Lower Egypt).

Although oral rehydration salts were introduced to government health facilities in Egypt in 1977, by 1983 initial results had shown less effect than anticipated in lowering mortality and morbidity from dehydration. The objective of this study was to improve the availability of ORS in rural communities and thus maximize the impact of the oral rehydration therapy (ORT) program in reducing childhood mortality. In order to analyze the problem, the study team examined the 1978-83 production/distribution system and the current (1984) availability and consumption of ORS at each level, from the center to the periphery. These data were then analyzed to identify the strengths and weaknesses of the production/distribution system.

At a solution development workshop early in 1985, feasible solutions for improving ORS availability and utilization were proposed to decisionmakers from the Ministry of Health and other agencies concerned with promoting ORT. The PRICOR researchers offered alternative solutions, including: (1) improve the ORS inventory management information system; (2) train health providers, including pharmacists, in ORT; (3) educate communities about ORT; and (4) distribute ORS through home visits by nurses or volunteers. The decisionmakers were first asked to rank a set of criteria for evaluating the alternative solutions. They then ranked the proposed solutions in order of importance. The solutions judged most promising as a result of this process were: (1) increase the demand for ORS through education of the community and training of health providers, including pharmacists; and (2) improve the inventory management system through an improved flow of information on ORS from the periphery to the center. Because major programs in public education and health provider training were already being carried out by the National Control of Diarrheal Diseases Project (NCDDP), it was decided that the SRHD/PRICOR project would focus on improving the flow of ORS inventory information.

The researchers developed a system of ORS reporting forms to facilitate the flow of information on levels of ORS consumption from rural health facilities to the center. They then field tested the forms in rural health facilities in

Fayoum and Dakaleya Governorates from May through October 1985. Data from the forms were supplemented by data abstracted from drug inventory books and clinic records at rural health facilities for the 18-month period, May 1984 through October 1985. Information from the individual health facilities was compiled on a district level form, and the district forms were compiled at the governorate level. Inventories of CRS stocks were carried out at both district and governorate level drugstores. A simple questionnaire was also designed and implemented to determine the attitudes of health facility physicians and their supervisors about the NCDDP information system.

The research team analyzed the data gathered through the new CRS inventory reporting system using three alternative mathematical inventory models. The objective of this exercise was to develop an analytical tool which could be used by the physician/manager at each level of the system to improve inventory management. Two of the models, a cost-based set of equations and a multiple regression model, produced poor or impractical results. The third, more useful model consisted of a set of equations relating both inventory and safety (buffer) stocks to seven key system variables: annual demand, lead time, variability in lead time, lead time demand, order frequency, order quantity, and acceptable stock-out level. This model produced valuable insights into inventory system dynamics, which were subsequently incorporated by the principal investigator into a simplified periodic ordering scheme. According to this scheme, CRS orders are placed monthly at the periphery, every 2 months at the district level, and quarterly at the governorate stores. The quantity to be ordered by the physician/manager at each level is estimated from three easily calculated parameters: average cycle demand, demand during the previous cycle, and inventory level at the close of the previous cycle. To minimize spoilage, managers should follow the inventory rule of "first in - first out" in distributing CRS. This system is being implemented throughout the SRHD project area and has been recommended to the NCDDP and the Ministry of Health for use elsewhere.

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This study was conducted from January 1984 to March 1986 by the Strengthening Rural Health Delivery (SRHD) Project of the Egyptian Ministry of Health. Further information is available from the principal investigator, Dr. Ahmed Nagaty, Director, Strengthening Rural Health Delivery Project, Nutrition Institute Building, 16 Kasr El Aini Street, Cairo, Egypt, or from Dr. Jeanne Newman PRICOR study monitor (Chevy Chase). The former principal investigator of the study was Dr. Youssef Tawfik, now at Management Sciences for Health in Boston, Massachusetts.

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