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Programme for control of diarrhoeal diseases

SEVENTH PROGRAMME REPORT

1988-1989

World Health Organization

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1. INTRODUCTION

The WHO Diarrhoeal Diseases Control (CDD) Programme was initiated in 1980 with the specific objective of reducing diarrhoea-associated mortality, morbidity, and malnutrition among infants and young children in developing countries. Since its inception, the Programme has provided technical and financial support to more than 110 developing countries implementing national diarrhoeal diseases control programmes. It has also awarded support to scientists in more than 80 countries who are seeking better ways of delivering services and new or improved tools for control.

This report describes the activities undertaken by the Programme during the 1988-1989 biennium[1]. It contains information on activities carried out in support of national CDD programmes and describes the results of WHO-supported research that came to completion during the biennium. The format of the report has been modified to include more specific examples of country activities and more information on research results in the hope that this will give readers a better picture of the Programme's activities and achievements. As will be seen, considerable progress has been made world-wide during the past decade in the management of diarrhoea cases in children. By the end of 1988, some 60% of the developing world's 1.3 thousand million children under 5 years of age had access to life-saving oral rehydration salts (ORS) and one-third of all diarrhoea cases in under-fives were receiving oral rehydration therapy (ORT)[2]. At the same time, important efforts were made to develop a more effective ORS solution, improve the management of persistent diarrhoea, and find effective ways of preventing the occurrence of diarrhoea. Progress in these areas has undoubtedly averted many deaths from diarrhoea during the past decade and should permit national programmes to achieve an even greater impact during the next decade.

As in previous years, some of the activities described in the report were supported by international agencies other than WHO, or by bilateral or non-governmental organizations. The continued efforts of all these parties in support of national CDD programmes and researchers will be required in order to achieve the Programme's targets through the approaches outlined in the report.

During the 1988-1989 biennium the Programme was able to raise financial support from 20 contributors to meet its needs. It is hoped that the resources required for planned activities in the early 1990s will also be found. The ultimate success of national control efforts will depend in great part on the Programme's ability to continue to mobilize the required financial and human resources world-wide. ■

[1] See also: Interim Programme Report 1988. Document WHO/CDD/89.31.

[2] The term oral rehydration therapy (ORT), as used throughout this report, is defined as the administration of fluid by mouth to prevent or correct the dehydration that is a consequence of diarrhoea.

2. HEALTH SERVICES

In 1988-1989, the Programme continued to provide support to countries for a variety of activities. Particular emphasis was given to the training of health care providers in supervisory and case management skills. The Programme widened its range of tools by completing developmental work in several areas, particularly that concerned with new training materials and evaluation methodologies. New programme areas in which a significant increase in activity occurred include communication in support of case management, promotion of breast-feeding, and promotion of a more rational use of drugs in the treatment of diarrhoea.

2.1 Planning and implementation

During the biennium the number of countries with CDD programmes remained stable at around 110. While the precise status of plans and their implementation is unknown for some countries owing to an absence of reports, it is known that 52 countries revised their plans of action at least once in the biennium and that 20 of these countries revised their plans annually. These estimates refer to countries that undertook a complete revision of their plan including, for example, the setting of programme targets and the preparation of annual plans of activities. The Programme continued to emphasize the need to update plans, based on realistic estimates, in order to achieve higher levels of coverage in the training of health staff. A decentralization of planning in larger countries was encouraged. Programme staff in several regions have given more time to assisting countries in planning and have coordinated their efforts with those of UNICEF and the United States Agency for International Development (USAID). In several countries, careful planning from the outset had produced well-managed, sustainable programmes by the end of 1989 (see Box 1).

CDD programmes in at least 25 countries prepared policy statements on diarrhoea case management and, in several, the policy was officially endorsed by the Ministry of Health; these include Bangladesh, India, Kenya, Pakistan (see Box 2), Papua New Guinea, and the Philippines. One module of the WHO CDD Programme Managers' Course, which has now been attended by most programme managers, is devoted to the development of national policies. As recommended in this module, the policy statements of countries cover home fluids, referral, and the use of ORS (indications for use, packaging, distribution points, etc.), intravenous therapy, and drugs. Some policy statements also covered preventive strategies.

The CDD programme in Viet Nam: good planning produces results 1

Since its inception in 1982, the CDD Programme in Viet Nam has been characterized by the preparation of detailed plans, which were periodically revised following programme reviews and carefully implemented. The plan of action for 1982-1986 foresaw an expansion of activities from an initial four provinces (of the country's 40) to 13. It was calculated that 30% of the country's *communes* and 35% of children under 5 years would be covered by CDD programme activities. These goals were achieved (see graph). Viet Nam is one of a few countries that have planned, and adhered to, phased geographical expansion.

Training in supervisory skills started in 1982 and has continued until now in keeping with the training plans. WHO/UNICEF collaboration with the Ministry of Health in the supply of ORS has been continuous since 1983 to ensure that the projected ORS needs were met. Beginning in 1990, UNICEF will provide packets manufactured locally. In 1983 the first CDD household survey was conducted and, by the end of 1985, 31 provincial urban and rural surveys had been completed. In 1984, WHO collaboration began in clinical management training and, by 1989, four Diarrhoea Training Units were functioning.

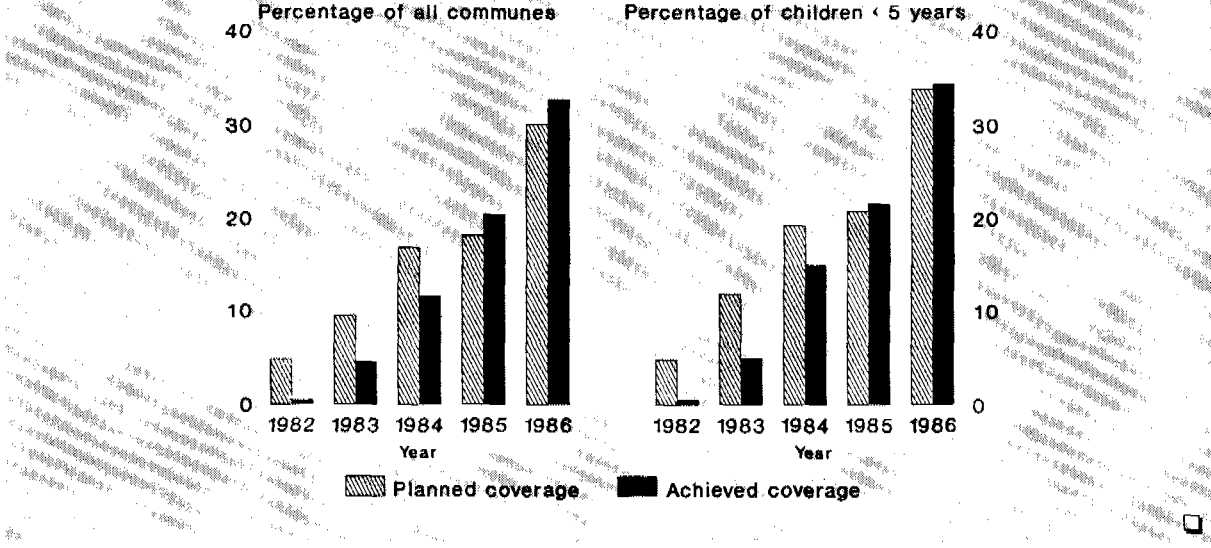
In 1986, in order to obtain better information for use in planning and monitoring the programme's activities, a detailed reporting system based on Provincial Programme Profiles was introduced in the 29 provinces where the programme was under way at that time. Using these, comprehensive reports were prepared for each of the country's four regions in preparation for the first externally assisted programme review in 1987. Although it identified a number of problems, the review concluded that very satisfactory progress had been made and recommended that geographical expansion of the programme be accelerated.

The five-year plan starting in 1987 called for expansion to all 40 provinces by 1991, to cover an estimated 60% of *communes* and 68% of children under 5 years of age. By the end of 1988, 35 provinces and 51% of the under-5 population were covered. Revisions to the plan, including detailed training targets, were made in 1988 and 1989. The most recent of these set an ORS access target, for the nation as a whole, of 80% for 1990.

A household survey of 3600 children conducted in 1988 in Thai Binh Province (where programme activities started only in 1986) found impressive results. Of 140 children with diarrhoea in the past 24 hours, 99% had received increased amounts of fluids, 75% ORS, 19% sugar-salt solution, and 69% one or another type of rice water. Of the caretakers claiming to have given ORS, 88% were able to produce the packet or the solution and 91% were able to demonstrate correct preparation.

In keeping with the excellent progress made by the programme, its range of activities is being broadened. In 1989, in collaboration with WHO, plans were made and activities initiated to introduce appropriate CDD training into nursing and medical schools, to improve communication activities, and to intensify the promotion of breast-feeding.

Planned and achieved CDD programme coverage, 1982-1986



Pakistan's statement of national policy on diarrhoea case management 2

Control of diarrhoeal diseases will be a priority effort of the country's National Diarrhoeal Disease Control Programme. Improved case management is the primary strategy for decreasing diarrhoeal mortality in children under 5 years of age and is considered a leading strategy for other effective preventive strategies.

At this stage the Programme will focus on improving case management in major health facilities and at the household level.

Providers of ORS will include health facilities, vaccinators, private practitioners and pharmacists.

HOME THERAPY

Family members can give early treatment at home to a child with diarrhoea. They should give the child increased fluids and continue to feed the child.

The recommended fluids for home therapy is boiled rice water and lentil soup. ORS is also suitable for home therapy.

It is important that a child with diarrhoea continue to be given food. Recommended foods include mixture of rice and lentils with added oil. Yogurt and bananas are also suitable.

Family members should seek treatment beyond the home for a child with diarrhoea if the child has any of these signs:

- passes many stools
- is thirsty and/or irritable
- has sunken eyes
- has a fever
- does not eat or drink normally
- seems not to be getting better

Families should seek treatment at the nearest health facility. If a mother has used ORS before and knows how to administer it, she may choose to purchase packets from a pharmacy to use at home.

ORS

ORS packets will be of a one-litre size and clearly indicated as "Oral Rehydration Salts" in addition to any brand name.

ORS should be given by health facilities to all diarrhoea cases with signs of dehydration who are able to drink and are not severely dehydrated. Packets should be given to mothers who have come to a health facility seeking help for a child with diarrhoea, even if the child has no signs of dehydration. Such mothers should be taught to give a child with diarrhoea increased fluids and to continue to feed the child, and be shown how to mix and give the solution. Messages regarding breastfeeding, personal hygiene and weaning practices should always be emphasized at any possible occasion.

Outpatients and ORT area should be given enough packets of ORS for the episode (about 2 one-litre packets).

ORS will be provided free of charge at government health facilities and by vaccinators. Pharmacists and grocery shops will be encouraged to sell ORS at the reasonable profit.

INTRAVENOUS FLUIDS

All children who develop two or more signs of severe dehydration will be given or referred for IV therapy. Ringer's lactate solution is most recommended.

USE OF DRUGS

The use of antibiotics for treatment of diarrhoea is usually not appropriate and should be avoided. When there is blood in the stool and the diarrhoea has continued for less than 14 days, the health workers should treat for shigella dysentery and give ampicillin, cotrimoxazole or Nalidixic acid. When patient is above 2 years of age and severely dehydrated and cholera is known to be currently occurring in the area, the health worker should suspect cholera and give tetracycline.

No antidiarrhoeal drugs should be used. Their production or importation will be limited.

PREVENTION

Strategies for prevention of diarrhoea will be adopted and incorporated into the Programme as the case management strategy develops. ❑

2.2 Training

During the biennium the Programme continued to give high priority to training in programme management, supervisory skills, and the management of diarrhoea cases. Training materials that had been revised during the previous biennium were widely distributed and used, and translated into a number of languages. Additional training materials were developed to broaden the range of situations in which training in diarrhoea case management can be achieved, and work began on the development of further materials for new audiences (see Box 3).

Training materials prepared by WHO **3**

The following training materials are currently or will shortly be available from WHO. Some are described in more detail in the text.

1. Programme Managers' Training Course: seven modules dealing with programme planning, implementation, monitoring and evaluation, and diarrhoea treatment and prevention, for national and provincial managers of CDD programmes.
2. Supervisory Skills Training Course: seven modules covering various tasks in supervising a CDD programme for those in charge of health areas or facilities.
3. Diarrhoea Training Unit: a Director's Guide and Teaching Materials which include lecture notes, accompanying slide sets, and guidelines for running a six-day clinical management training course. The lecture notes and slides are also available separately.
4. A short course on diarrhoea case management: a three-day course to train staff at smaller hospitals or health facilities.
5. A self-teaching training course on diarrhoea case management: a set of modules for health staff who are unable to attend a course.
6. A package of materials to improve the teaching of diarrhoeal disease treatment and prevention in medical schools: a set of notes for students and guidelines for instructors (available in 1990).
7. A package of materials to improve the teaching of diarrhoeal disease treatment and prevention in nurse and paramedical training schools: these materials are adapted from the above training materials (available in 1990).

❑

Good progress was made in increasing training coverage; however, the vast number of health personnel to be trained continues to represent a major challenge to the Programme in the new decade.

2.2.1 Programme Managers' Training Course

Thirty-nine CDD Programme Managers' Training courses were conducted in 1988-1989, compared with five during the previous biennium. These courses were attended by over 1000 participants from more than 80 countries. Thirteen of the courses were regional or interregional and 26 were national. The revised training modules were used in all courses. These modules give attention to developing a national policy for CDD programmes, planning and monitoring programme activities, implementing additional interventions for the prevention of diarrhoeal disease, and evaluating programme progress. Priority was given by the Programme to the training of national CDD programme managers; at the same time, the number of national courses held reflects the considerable interest shown by larger countries in using these materials to train provincial CDD managers (see Box 4).

In 1990 the Programme will continue to expand the training of CDD programme managers and other senior health staff at the national and provincial levels using these materials, which are now available in English, French, Spanish, and Chinese.

CDD programme managers' training in the Western Pacific Region **4**

The Western Pacific Region was the first to hold a Programme Managers' Course using the course materials revised in 1987. The course was held in August 1988 and attendance was intentionally limited to participants from six countries (Laos, Malaysia, Papua New Guinea, Philippines, Viet Nam). This was to ensure that a number of people from at least the larger countries could be trained at the same time to form a core resource group for the planning and implementation of diarrhoeal diseases control activities in their countries.

As well as working through the course modules, the participants had to draft a national policy statement on diarrhoea case management and to prepare or update an outline of a plan of action, including revised subtargets for key programme indicators. It was found particularly useful to translate the concepts of the training course immediately into concrete statements related to the participants' specific countries. These formed the basis for more detailed plans, which were revised and updated during WHO staff visits and at the 1989 regional CDD programme managers' meeting.

Subsequent to the 1988 course, several countries expressed interest in conducting the same activity nationally to train provincial public health administrators with responsibility for implementing the CDD programme. Courses have since been held in China, Malaysia, Papua New Guinea (2 courses), Philippines, and Viet Nam (3 courses). Further national courses are planned in 1990.

This approach is ensuring that key health personnel at national and provincial levels fully understand the objectives and approach of the national CDD programme and can participate more fully in its planning and implementation. ❑

2.2.2 Supervisory Skills Training Course

The revised set of materials for supervisory skills training continued to be extensively used during the biennium (see Box 5). According to country reports, more than 80 supervisory skills courses were held in each year to train national health staff. Altogether, since 1983, when this particular set of training materials was introduced, reports received by WHO indicate that almost 15 000 health workers have attended over 400 training courses. Since use of the supervisory skills modules has been integrated into ongoing regular training activities in many countries, these numbers certainly represent an underestimate of the coverage achieved. Combined courses are also conducted, at which the CDD materials are used together with modules from the Mid-Level Managers' Course of the Expanded Programme on Immunization (EPI) and modules on the management of acute respiratory infections. Some countries have successfully used the CDD modules in combination with materials on malaria control and other elements of primary health care. A revised module on birth spacing, developed as a collaborative effort by the CDD Programme, EPI, and the Division of Family Health, became available during the biennium. Some countries also used an additional module "Talking with Mothers" (produced by the Technologies for Primary Health Care Project [PRITECH] of the USAID), which aims at strengthening the interpersonal communication component of CDD case management.

The variety of training materials available to countries for training supervisory staff allows them to select particular materials dealing with high priority issues relevant to their individual situation. The CDD supervisory skills training modules have been translated into a number of languages including Arabic, Chinese, French, Indonesian, Nepali, Portuguese, and Spanish, thus making them accessible to large numbers of health workers throughout the world. In response to a recommendation of its Technical Advisory Group, the Programme plans in early 1990 to undertake an evaluation of the supervisory skills training conducted in two countries (Nepal, United Republic of Tanzania).

It is estimated that, at the end of the biennium, 16% of health staff with supervisory responsibilities had been trained in 24 of the largest countries with operational CDD programmes. The overall coverage for all countries with CDD programmes, based on available information, is about 17%.

Figure 1 shows estimates of the number of supervisory health personnel to be trained and the coverage achieved by the end of 1989, by WHO region. Coverage is highest in the Region of the Americas and the Western Pacific Region.

The Supervisory Skills Training Course **5**

This course is aimed at all middle and lower-level supervisors of health services. It presents general principles of supervision that are applicable to any health programme, using examples that are relevant to diarrhoeal diseases control. The course comprises seven modules as follows:

Community involvement: Participants learn how to define and calculate access to health services, how to find out about those services and the health problems of the community, and how to work with the community to plan improvements.

Treatment of diarrhoea: All aspects of diarrhoea case management are covered, namely, educating family members, assessing and treating cases, and recording data. Exercises with cases are included.

Prevention of diarrhoea: This module describes seven interventions for the prevention of diarrhoea and teaches participants how to assess community practices and decide which preventive activities need to be emphasized.

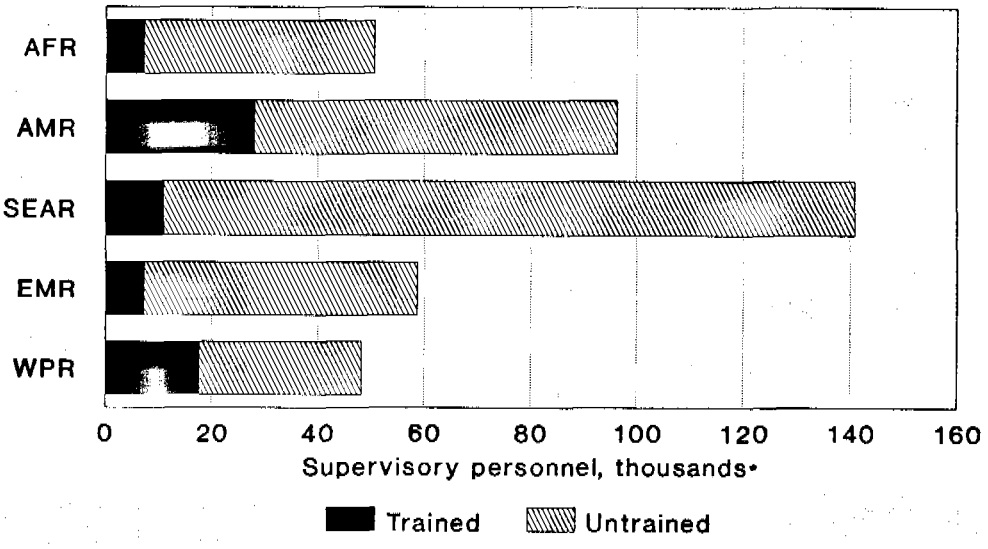
Targets: Participants learn how to estimate the past use of health services, consider ways of increasing use, set targets for the coming year (particularly for use and access rates), and estimate the supplies needed.

Planning and monitoring: The planning, scheduling, and monitoring of health workers' activities and performance are covered in this module. It also deals with problem solving and feedback to health workers.

Training: A simple approach to task analysis is presented along with a selection of methods for training, and for the planning and evaluation of such activities. The module explains the need for all training to include information, demonstration, and practice.

Evaluating progress: The module describes methods of collecting data to monitor health services and provides guidelines for summarizing and analysing data on their use each month and taking appropriate follow-up action. It also discusses the annual calculation of use rates and their comparison with targets, and the reassessment of community health problems and needs. The module concludes with guidelines for using the evaluation findings to plan services in the coming year. ❑

Figure 1: Supervisory skills training coverage, by WHO region, 1989



* Given the absence of data for some countries, the number of supervisors is estimated to be 10% of all health staff

AFR = African Region
AMR = Region of the Americas
SEAR = South-East Asia Region
EMR = Eastern Mediterranean Region
WPR = Western Pacific Region

2.2.3 Training in diarrhoea case management

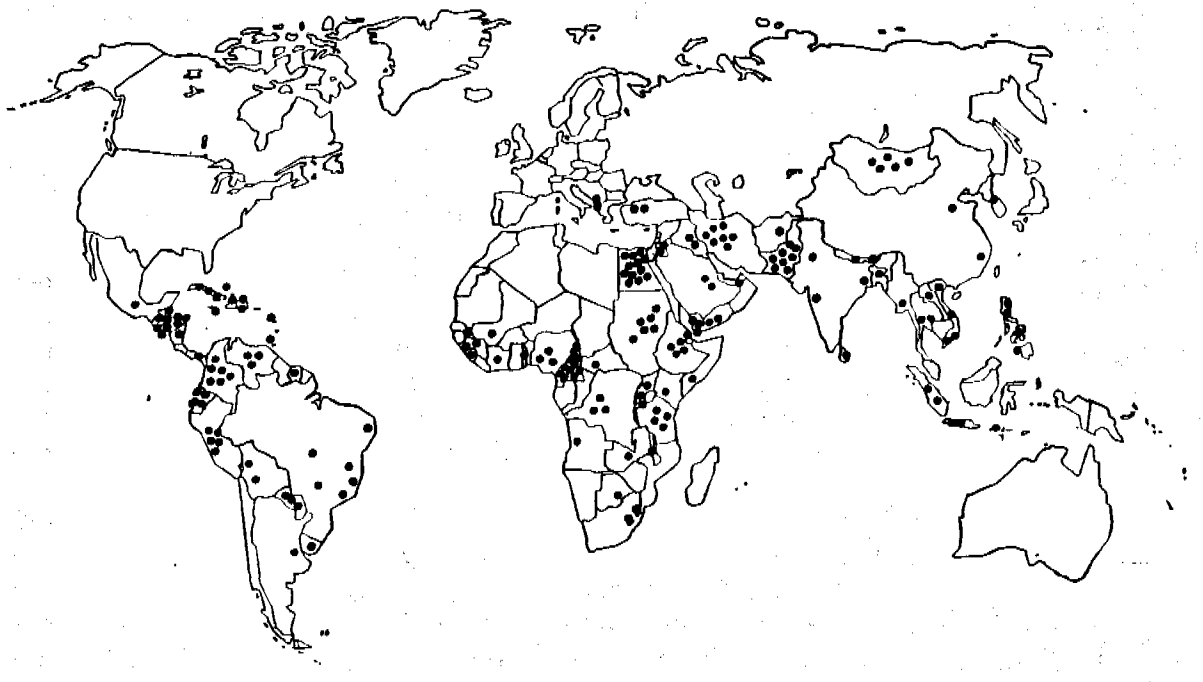
During the biennium the Programme gave high priority to establishing and upgrading diarrhoea training units (DTUs), i.e., facilities where diarrhoea case management of a high quality is practised and adequate training can be provided to health staff. As defined by the Programme, a DTU should meet the following criteria:

- It should receive regularly a sufficient number of diarrhoea cases for teaching purposes, both as outpatients and inpatients.
- It should have at least one senior physician who has adequate experience in treating acute diarrhoea along the lines advocated by WHO, especially using ORT.
- It should regularly hold training courses on the treatment of diarrhoea for health workers. Such courses should be designed according to the principles laid down in the document "Diarrhoea Training Unit – Director's Guide" (CDD/SER/86.1 Rev.1, 1988). They should include clinical demonstrations and the participants should practise treating diarrhoea cases.
- It should make educational materials available to the participants for use both during and after training.
- It should assist in follow-up activities to help trainees set up a diarrhoea treatment or training unit in their own facility.

According to information received up to the end of 1988, there are some 200 DTUs in over 70 countries in all WHO regions (Figure 2). Most of these units are located in large hospitals with a significant number of paediatric diarrhoea cases and staff trained in proper case management. They include four regional DTUs in the African Region. The units in Angola, Ethiopia, and Zaire continued to train staff at intercountry courses as in previous years, and the unit in Zambia became functional in 1989, when it held its first intercountry course.

In view of the possibility that some DTUs may not meet all the criteria listed above, the Programme initiated a review in 1989 to assess the current status and training activities of existing DTUs; responses were received from 61 such units. The findings showed that more that 80% were using WHO training materials in their original or a translated version, and about 50% were using locally produced materials. Practically all the DTUs that responded to the survey questionnaire reported having the following four work areas: reception/triage area, ORT area, diarrhoea ward, and lecture or conference room. Trainees typically have the opportunity to assess and treat from three to five diarrhoea patients each. Each year about 80 formal training courses are being conducted in these 61 units. In addition, continuous "on-site" training of clinical staff is taking place.

Figure 2: Diarrhoea Training Units (DTUs) in developing countries, 1988



To assist in ensuring good quality training, the Programme widely distributed a new set of training materials for DTUs. It includes a revised "Director's Guide"; a proposed agenda for a six-day clinical management course, full and abbreviated texts of six lectures on major aspects of the control of diarrhoeal diseases (with accompanying slides); case presentation notes; and guidelines for improving current curative practices and organizing new DTUs. This training package is available in English, French, and Spanish. The Programme will continue to support DTU training, and early in 1990 the first of a group of WHO consultants will be trained to help national CDD programmes in establishing new DTUs and maintaining existing units.

As a result of these training efforts it is estimated that, by the end of 1989, the proportion of physicians, nurses, and other paramedical staff trained in diarrhoea case management, in 24 of the largest countries with CDD programmes, was 11%. Available information suggests that the same level applies in all countries with CDD programmes. This represents an increase of 38% in the number of staff trained in all countries, as compared with the figure reported for 1987, but it is still considerably less than the Programme's target for 1989 of 20%.

In view of the difficulties involved in training the large numbers of health workers who are responsible for the management of diarrhoea cases at DTUs, the Programme pursued its efforts to develop two alternative approaches for case management training. At the end of 1989 a field-test was carried out of a three-day "Diarrhoea Management Training Course" designed for health staff working at small and medium-sized health facilities who are unable, for financial and logistic reasons, to attend courses at DTUs. The course proved successful and the final version is in preparation. The second approach is a self-teaching package, which is being designed for health staff working in small peripheral health centres. It is envisaged that this package will be supplemented by supervised "on-site" training. Both of these materials will be made available to countries in 1990.

All the Programme's training materials on diarrhoea case management emphasize the need for "hands-on" experience in learning to assess and treat children with diarrhoea. However, course facilitators sometimes find that there are too few cases of diarrhoea available to demonstrate the signs of dehydration and permit participants to practise the assessment of children. For example, in health facility surveys in four African countries, it was found that although 68% of the 873 health workers interviewed had been trained in case management, only 26% of those trained had actually managed a case of diarrhoea during the training (see Box 16). Therefore, to supplement the written training materials, production began in 1989 of a videotape illustrating the signs and symptoms of dehydration. Selected cases from a video on diarrhoea case management produced by UNICEF/India are presented to demonstrate how to assess children using the approach recommended in the revised WHO diarrhoea treatment

chart (see below). The videotape also provides three practice case studies to check that participants have learnt correctly how to assess the signs of dehydration.

To permit the video to be used in different language settings, no text is used on the screen. Instead, symbols are used to identify different steps in the assessment of dehydration.

2.2.4 Revision of the diarrhoea treatment chart

All the Programme's case management training materials centre on, or include, training in the use of a revised diarrhoea treatment chart entitled "Management of the Patient with Diarrhoea". This chart, which is used world-wide to train and guide health workers in the management of patients with diarrhoea, was revised in 1989 and is now available for distribution. Changes in the chart are based on extensive experience with the previous chart and recent research findings, especially with regard to the importance of feeding during diarrhoea and initial home-based management of patients with persistent diarrhoea. The major objectives in revising the chart, and the ways in which they were achieved, are described below:

- **Simplify the criteria for assessing dehydration and improve their precision:** Several of the assessment criteria used previously have been eliminated, either because it has proved difficult to teach health workers to identify them reliably or because they were not sufficiently specific for detecting dehydration. Among the criteria that remain, several are now emphasized as being of special importance; at least one of these "key" criteria must be present for a particular category of dehydration to be diagnosed (see Figure 3). Based upon previous experience, it is expected that this scheme will be easier to teach and will help workers to assess hydration status accurately.

- **Give greater emphasis to improved feeding during and after diarrhoea, and describe how this should be done:** It is now firmly established that energy-rich foods should continue to be given in frequent small feeds during diarrhoea, and that extra food should be given during convalescence (see section 3.3.1[b]). When this is done, the adverse effects of diarrhoea on nutritional state can largely be prevented. The revised treatment chart describes in greater detail the foods that should be given to children with diarrhoea and ways of incorporating feeding into early home management.

- **Describe in greater detail the management of patients with severe dehydration:** The chart now provides specific guidelines concerning the amount and type of fluid to be given, the rate of fluid administration, and the method of monitoring patients being treated for severe, life-threatening dehydration.

Figure 3: Excerpt from the revised WHO diarrhoea treatment chart "Management of the Patient with Diarrhoea": assessment of hydration status

FIRST, ASSESS YOUR PATIENT FOR DEHYDRATION

		A	B	C
1. LOOK AT:	CONDITION	Well, alert	* Restless, irritable *	* Lethargic or unconscious; floppy *
	EYES	Normal	Sunken	Very sunken and dry
	TEARS	Present	Absent	Absent
	MOUTH and TONGUE	Moist	Dry	Very dry
	THIRST	Drinks normally, not thirsty	*Thirsty, drinks eagerly *	* Drinks poorly or not able to drink *
2. FEEL:	SKIN PINCH	Goes back quickly	* Goes back slowly *	* Goes back very slowly *
3. DECIDE:		The patient has NO SIGNS OF DEHYDRATION	If the patient has two or more signs, including at least one * sign *, there is SOME DEHYDRATION	If the patient has two or more signs, including at least one * sign *, there is SEVERE DEHYDRATION
4. TREAT:		Use Treatment Plan A	Weigh the patient, if possible, and use Treatment Plan B	Weigh the patient and use Treatment Plan C URGENTLY

- **Provide guidelines for the initial, home-based management of patients with persistent diarrhoea:** Rehydration therapy reduces deaths due to dehydration, but does not have a major impact on mortality caused by persistent diarrhoea (i.e., diarrhoea that lasts at least 14 days). In some countries, nearly half the diarrhoea-associated deaths now occur in children with persistent diarrhoea. The revised chart describes how these patients can initially be treated at home, namely, by temporarily reducing the amount of animal milk in their diet while assuring a full energy intake. The guidelines reflect recent research findings which have shown that nearly 50% of patients with persistent diarrhoea improve rapidly when animal milk is restricted and other energy-rich foods are given in its place (see section 3.3.1[b]).

- **Emphasize the limited role of antibiotics and antiparasitic agents in the treatment of diarrhoea, and the need to avoid entirely antidiarrhoeal drugs:** Further research has confirmed that antibiotics should be given only to patients with bloody diarrhoea or suspected cholera, that few patients require treatment for amoebiasis or giardiasis, and that none of the antidiarrhoeal drugs have practical value for treating children with diarrhoea (see section 2.4). These points are given increased prominence in the revised chart.

2.2.5 Training in medical schools

The Programme is giving increased emphasis to this topic, in view of the fact that in the longer term an improvement of undergraduate training is essential to enable physicians to support CDD programme strategies by treating diarrhoea cases correctly. The initial step was the development, in collaboration with PRITECH, of a package of materials for use in medical schools during paediatric training. This included a student's textbook describing relevant aspects of the pathogenesis, treatment, and prevention of diarrhoea; an "activity library" providing guidance on innovative methods of teaching about diarrhoeal diseases; an instructor's manual containing methods for evaluating current training and planning future training; a collection of reference materials; and a set of examination questions.

The package was used in 1988 in workshops on medical education held in the Philippines (for six medical schools) and Indonesia (for eight medical schools). The workshops were attended by heads of departments of paediatrics and other faculty responsible for teaching about diarrhoeal diseases. Their major objective was to develop a workplan for introducing an improved curriculum (teaching module) on diarrhoeal diseases, establishing or strengthening a diarrhoea training unit in each school, implementing innovative methods for interactive teaching (such as role plays, debates, simulated cases), and training all paediatric faculty and residents in the CDD case management strategy. In both countries, follow-up visits to all schools have found that substantial progress has been made in the majority towards all these objectives. Plans have been made in the Philippines to provide the student's text to all medical students, to strengthen remaining areas of weakness in the six participating schools, and to extend the project to the remaining 20 schools in the country. A similar follow-up is being carried out in Indonesia.

In October 1988 the first meeting of an Informal Task Force to Improve CDD Teaching in Medical Schools was held in Geneva. During this meeting international experts in medical education discussed the teaching of the clinical and public health aspects of diarrhoeal diseases control, reviewed the package of training materials and suggested revisions, and discussed ways of using the materials to improve teaching about diarrhoeal diseases in medical schools. As a result of their recommendations, a revised and shortened version of the student's textbook was prepared and revisions were made to other components of the training package. The revised materials will be introduced into more countries during workshops similar to those held in the Philippines and Indonesia and attended by representatives of several medical schools. During 1990 such workshops will be held in Nigeria, Pakistan, and Viet Nam, and plans will be developed to expand this activity to cover other interested countries. Members of the Informal Task Force will serve as facilitators for the workshops, along with CDD Programme staff.

2.2.6 Training in nursing and paramedical schools

The Programme also continued to cooperate with countries in enhancing CDD teaching in nursing and other paramedical schools. In 1988-1989, 17 curriculum modification workshops were conducted in 15 countries. Many of these workshops took place in collaboration with EPI, using training modules from the CDD Supervisory Skills and the EPI Mid-level Managers' Training Courses. Of particular interest is the initiative of the Region of the Americas (see Box 6). Detailed guidelines for revising curricula and developing lesson plans are now under preparation, to be distributed together with a set of existing training materials that have been adapted for use in schools of this type. It is anticipated that they will be given a wide distribution in 1990. To ensure the sustainability of this activity and assess its impact, the Programme has developed a plan to monitor and periodically evaluate the results of the workshops held in different institutions.

Improving CDD training in nursing schools: experience in the Americas **6**

Since mid-1988, the regional CDD Programme has actively collaborated with a number of schools of nursing in the Americas. Training courses using the Programme's supervisory skills modules were organized in collaboration with the respective ministries of health and national associations of schools of nursing. Generally, the participants were nursing school staff in charge of teaching public health and/or MCH, school directors, and representatives of the national association.

During the one-week course, the participants reviewed the modules of the CDD Supervisory Skills Course, including the course methodology as explained in the facilitator's guide. Modules on the treatment of acute respiratory infections and a module on growth monitoring prepared by the Regional Office, which can be taught using a similar methodology, were often included. The course directors and facilitators stimulated discussions on ways of utilizing the modules in the teaching activities, and requested from each participant a plan for introducing the course in his/her school's curriculum. On the last day, each school presented its plan during a general meeting, after which there was a group discussion. The associations of schools of nursing coordinated the distribution of the teaching modules to the schools in collaboration with the local PAHO/WHO office and the national CDD programme.

In order to provide sufficient teaching modules to the schools involved, the regional CDD Programme has printed 2000 modules at PASCAP (Program for Health Training for Central America and Panama, a PAHO centre in Costa Rica) for the Central American countries, and is printing 5000 in Colombia for the five Andean countries.

This regional activity has been very successful. Many of the schools are now using the Supervisory Skills Course and students receive a set of modules to use in their activities after graduation. A summary of the courses held is presented below.

Training courses held for nursing schools

Date	Place	No. of schools represented	No. of participants
August 1988	Peru	22	44
November 1988	Guatemala	17*	31
January 1989	Colombia	22	58
May 1989	Ecuador	11	32
September 1989	Venezuela	9	23
November 1989	Bolivia	6	24
Total: 6 courses		87	212

*Costa Rica 2, El Salvador 4, Guatemala 3, Honduras 3, Nicaragua 2 (6 remain to be covered), Panama 1, Dominican Republic 2 (2 remain).

❑

2.2.7 Training and provision of advice to other providers of ORS

During the biennium the Programme began to develop training methods and materials for providers of health care other than staff employed in the government health system. Following a review of potential providers, it was decided to concentrate initially on "pharmacists and other licensed sellers of drugs" and "traditional healers". For the first group, a contract was signed late in 1989 with the firm "Management Sciences for Health", in the USA, to develop a manual that can be used by national CDD programmes to assess the extent to which pharmacists and other licensed sellers are providing advice and care for diarrhoea, describe their practices, and implement training interventions to change their behaviour. This project is expected to take two years to complete. In the meantime, several countries are gaining experience in the training of small general retailers as distributors of ORS.

A small group of experts was convened to advise on possible activities to improve the training of traditional healers. It recommended that, as an initial step, the Programme document examples of successful collaboration between national CDD programmes and traditional healer groups in a few African countries. A proposal has been submitted to the Programme for this activity. It is expected that this approach will provide valuable information on methods of extending the participation of traditional healers in national programmes.

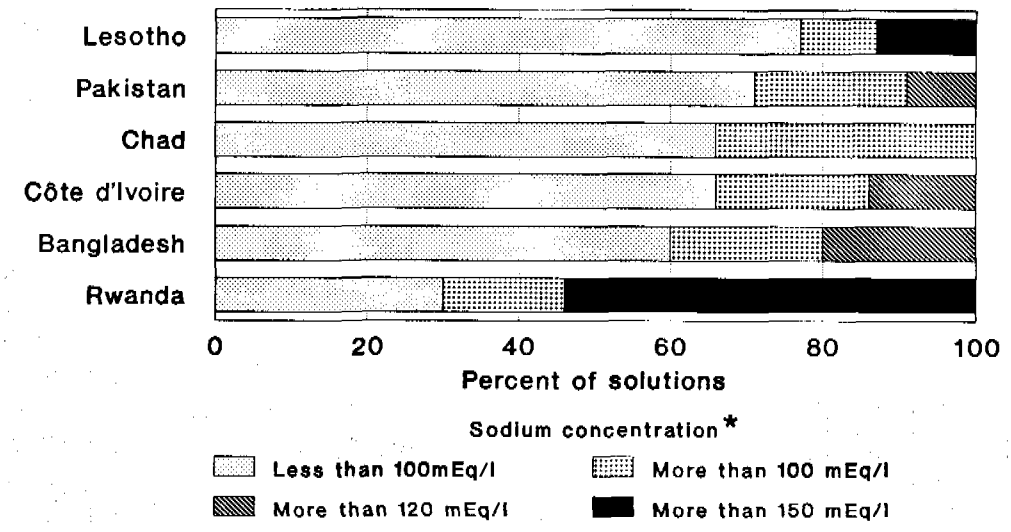
A number of countries have made efforts to inform private medical practitioners about up-to-date approaches to diarrhoea case management, the most notable example being India, where a large UNICEF-supported project contacted medical practitioners through local branches of the Indian Medical Association. By the end of 1989, around 35 000 doctors had attended half-day orientation sessions involving lectures, videos on case management, and discussion. An evaluation of this project is planned in 1990.

2.3 Increasing access to oral rehydration therapy (ORT)

2.3.1 ORT in the home

Experience accumulating from a number of countries suggests that caretakers have difficulty in retaining special recipes for the preparation of fluids. For example, data collected from six countries have demonstrated that sugar-and-salt solutions are often prepared incorrectly, resulting in dangerously high sodium concentrations (Figure 4). This experience suggests that there is a need to shift the emphasis away from a particular sodium content in home fluids, and thus from solutions based on recipes specifically designed for use in diarrhoea (and which are unfamiliar to the caretaker), towards more commonly available and used fluids that are likely to be consumed in large volumes. However, the Programme remains interested in assisting countries that have chosen special fluids (e.g., specially prepared cereal gruels with added salt) to evaluate their use, as well as in supporting implementation research to determine the factors affecting the adoption and sustained use of ORT (see section 3.3.3[b]).

Figure 4: Sodium concentrations of sugar-salt solutions prepared by child caretakers in 6 countries



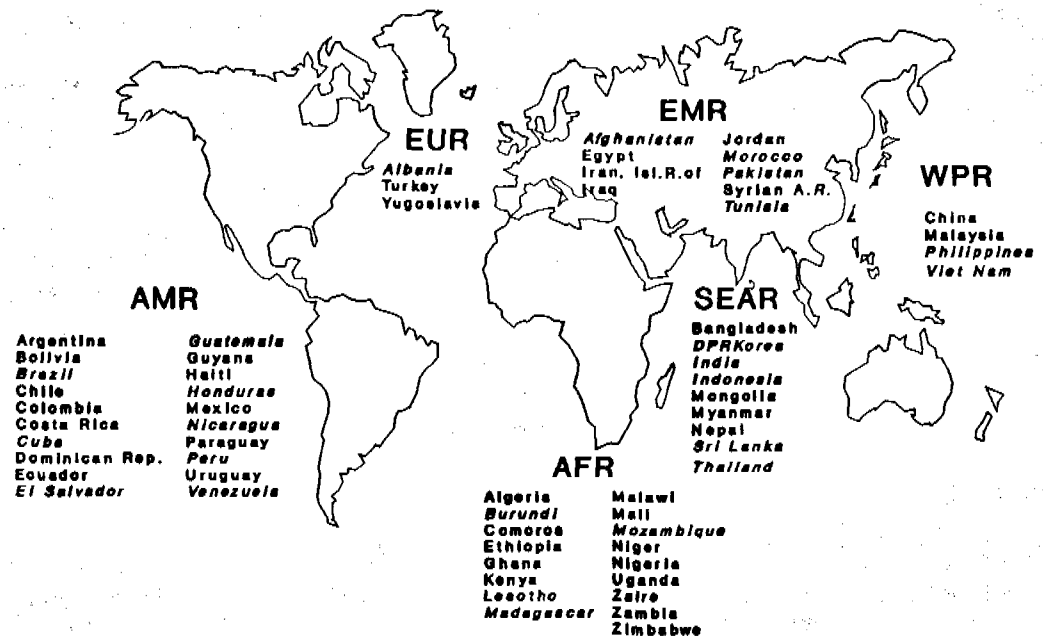
* Concentrations >100 mEq/l are considered potentially dangerous

The use of cereal-based ORS and cereal-based home fluids has been a much discussed topic. The distinction between the former – a defined, packaged, complete rehydration product – and the latter is important. The positive research findings with respect to cereal-based ORS in severely-purging patients (see section 3.3.1[a]) cannot be extrapolated to simpler, less well-defined cereal-based solutions prepared in the home and used mostly for mild diarrhoea. While some optimism seems appropriate with regard to the future role of cereal-based ORS early in diarrhoea, it remains for the present an issue requiring further research. In the meantime, cereal-based home solutions (gruels) should be used where they are readily available because of their relative safety and potential antidiarrhoeal properties.

2.3.2 ORS production and supply

One of the Programme's targets for 1989 was to make ORS accessible to 80% of the developing world's population. An associated target was the establishment of local ORS production in 60 developing countries. *The latter goal was achieved during the biennium when three UNICEF/WHO-supported ORS production facilities (in Burundi, Cuba, and Madagascar) became operational, bringing the total number of countries currently known to be producing ORS to 62 (see Figure 5 and Box 7).*

Figure 5: Developing countries producing ORS, by WHO region, 1989



Countries that received WHO/UNICEF technical cooperation in 1988-1989 are shown in *italics*

ORS production has also expanded in the industrialized nations: 23 such countries were producing ORS by the end of 1989. Although most of the packets produced in these countries are for exportation to developing countries, *the information collected by the Programme suggests that over 75% of the ORS or similar products available in developing countries are now produced locally in these countries* (Figure 6). From the same Figure it can be seen that, between 1986 and 1988, the reported total ORS supply has fluctuated between 300 and 350 million litre equivalents per year. This amount would be sufficient to provide ORS to the estimated 10% of all cases of childhood diarrhoea that develop dehydration and need treatment with ORS; however, this cannot be assumed because a certain proportion of all ORS is used for the prevention of dehydration and in older age groups. It is not known how much of the ORS that is being used is reaching the cases needing it most. Demand for ORS can be expected to increase as access to it improves through the training of more providers; however, this may be offset to some extent by the more widespread use of home solutions early in diarrhoea to prevent dehydration.

By the end of 1989, 460 manufacturers of ORS or similar products indicated for rehydration were known to the Programme. Of these, about 80% are located in developing countries, which explains in part the increase in local production of ORS. The

products are promoted under almost 200 different brand names, and about 80% of them conform to the composition recommended by WHO and UNICEF. One reason for this development is that WHO and UNICEF will only purchase the standard formula of ORS. This has exerted some influence on manufacturers to conform; however, some of the most widely used products (e.g., in India) still do not correspond to the WHO-recommended composition.

Programme staff provided technical cooperation in ORS production to 23 developing countries producing ORS (see Figure 5) and the USSR during 1988-1989, always in coordination with UNICEF. While in the past the service requested was mainly advice on ORS production in general, more recently the requests have been for advice on the maintenance of good manufacturing conditions and quality control assurance. An exchange of experience between manufacturers (including commercial companies) has been possible through closer contacts and follow-up. The Programme's collaboration in this area consists of arranging for independent quality control analysis of ORS produced in developing countries.

Local production of ORS in Burundi 7

Burundi is one of the first countries in Africa to have initiated the production of ORS; in 1980, the "Office National Pharmaceutique" (ONAPHA) began to manufacture the WHO/UNICEF-recommended formula containing sodium bicarbonate. At that time, the product was dispensed in quantities of 1 kg and simply packed in polyethylene bags. Besides the operational problems associated with this method of packaging, the Ministry of Health was soon faced with other difficulties related to the poor stability of this formula.

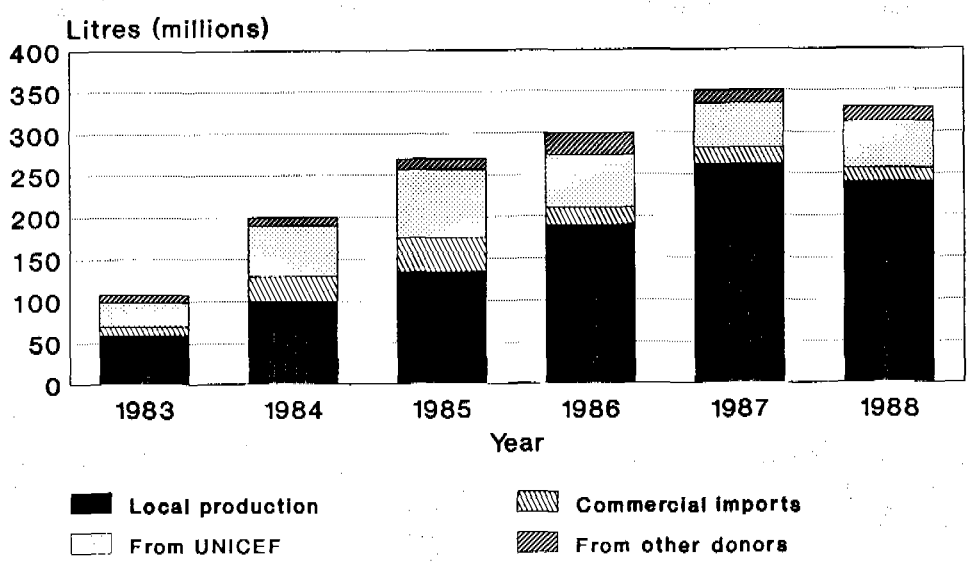
To overcome these problems, an agreement to create an ORS production unit was reached in 1986 between the Ministry and UNICEF. UNICEF accepted to supply the production equipment, laboratory instruments, and raw materials, and the Ministry agreed to make certain structural changes to available premises as recommended by WHO and UNICEF. Technical cooperation was provided by the WHO/UNICEF ORS Production Engineer throughout the development of the project.

Special attention was given to ensuring optimal integration of this production unit within the existing premises of the Central Medical Store. This required an extensive reorganization of warehouses and the installation of goods-handling equipment and fittings over a three-year period. Although construction work and progress were considerably hampered by political unrest, lack of funds, and changes in personnel, the local authorities and the international agencies remained firmly committed to the project. The production equipment was received early in 1988, and its installation was completed in June of that year. The first batch of ORS was produced in September 1988 with the assistance of a consultant provided by UNICEF, who also ensured that the staff were adequately trained in production and quality control.

The national CDD programme played an important role in selecting an appropriate dose, packaging material, and label design. The only universally available container in Burundi is a local beer bottle, with a capacity of 750 ml. Since it was felt that the use of this bottle for the preparation of ORS could be misinterpreted as a promotional scheme for beer, it was decided to keep the dose of 1000 ml as the national standard and to produce and make widely available one-litre plastic mixing containers. ORS is now packaged in a polyethylene bag (allowing foreign currency savings), with a well-designed label carrying illustrated instructions on how to measure the required quantity of water and prepare and administer the solution.

The production capacity is about 1-1.5 million packets per year, which should be more than sufficient to cover the country's requirements. Any surplus capacity could eventually be used to supply ORS to neighbouring countries, especially since the equipment can produce any dose and labels with country-specific designs and text in other languages. The production unit is equipped with a quality control laboratory which assures the safety and quality of the ORS. It is therefore hoped that the ORS production unit will not only be a first step in modern drug production, but will also stimulate the establishment of a better control system for imported drugs in general, and eventually be a milestone in this field for the Region as a whole. ❑

Figure 6: Supply of ORS or similar products in developing countries, 1983-1988



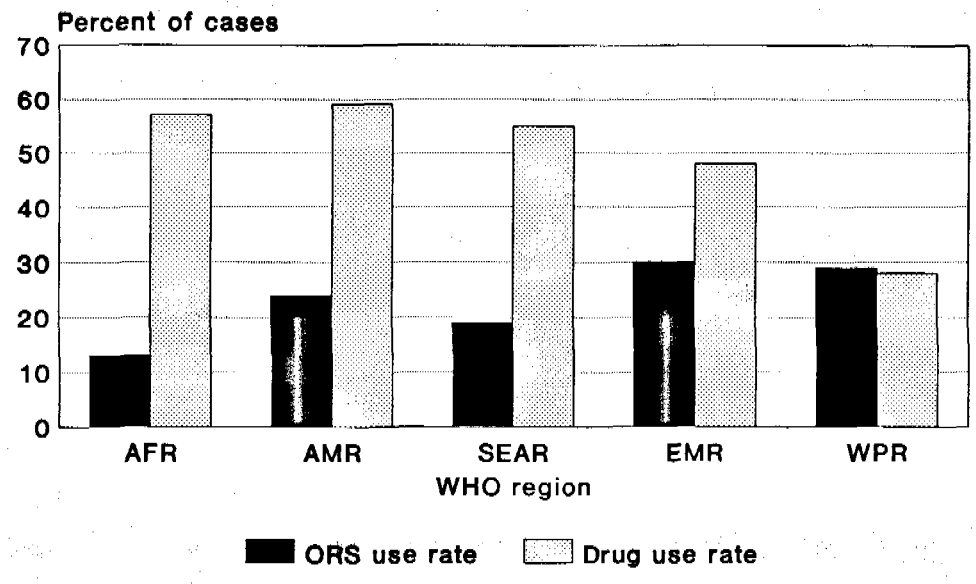
An important factor in assuring the quality of ORS is the availability of an officially recognized monograph for the recommended formulations. To the satisfaction of the Programme, ORS has been included in the latest editions of the two most prestigious pharmacopoeias: "The United States Pharmacopoeia", Supplement 8 (released 15 August 1988), and the "British Pharmacopoeia", 1988, Volume II (effective 1 December 1988). In both, "Oral Rehydration Salts" embraces, among other formulations, the two products recommended by WHO and UNICEF which are known as "ORS-citrate" and "ORS-bicarbonate". These generic names and their associated compositions have thus gained important official recognition.

2.4 Promoting the rational use of drugs for diarrhoea in children

Despite significant progress in increasing access to and use of ORT (see section 2.6.9), correct case management of children with diarrhoea, including the judicious use of antibiotics for cholera and dysentery, remains in many places the exception rather than the rule. The results from 140 surveys of current patterns of diarrhoea treatment, conducted by the CDD Programme in 47 countries, show that antidiarrhoeals and antibiotics continue to be widely used (see Figure 7). In several countries, more detailed surveys of drug use during diarrhoea have been conducted (see Box 8). The problems associated with the extensive misuse of drugs are multiple: diversion of attention from appropriate diarrhoea treatment leading to reduced compliance with ORT and feeding;

unnecessarily high treatment costs; adverse reactions; and increased spread of antibiotic resistance. In 1988, the Programme undertook more focused activities to promote a more rational use of drugs for diarrhoea in children.

Figure 7: Comparison of ORS and drug use rates (from 140 household surveys* in 47 countries), by WHO region, up to 1989



* Surveys where both ORS and drug use rates were estimated

As an initial step, the Programme reviewed the literature on the efficacy and side-effects of some antidiarrhoeals and antibiotics used commonly for the treatment of diarrhoea in children. This resulted in the preparation of a series of review articles which summarize available information on hydroxyquinolines, diphenoxylate, loperamide, kaolin and pectin, neomycin, and streptomycin. Information on charcoal, sulfonamides, smectite, and attapulgite will be reviewed in 1990. These drug reviews will be issued by WHO in a single volume in 1990 and widely disseminated to national CDD programme managers, health policy makers, health workers, and their trainers and supervisors. Much interest has already been expressed and the articles in draft form have provided support for important actions in a few countries.

Documenting excessive drug use for diarrhoea 8

In many countries, surveys in health facilities and the community have shown the rate of drug use during diarrhoea to be high. In an attempt to understand the problem better and thus develop more effective interventions, several countries have examined in greater detail the patterns of drug use in the treatment of childhood diarrhoea. Two examples are given below:

INDONESIA

In 1987, the Ministry of Health of Indonesia, with support from USAID, initiated a study of procedures for drug selection and procurement for health facilities. The second phase of the study examined in detail the prescribing of drugs in relation to 4060 cases of childhood illness, including diarrhoea. The results of the study, contained in a report entitled: "Where does the tetracycline go?"[1], are striking:

- nearly 60% of patients received prescriptions for four or more drugs;
- the average number of drugs per case for all diagnoses was 3.8, and one in four drugs used was injectable;
- 88% of under-fives were treated with an antibiotic; however, oral antibiotics were on average prescribed in doses sufficient for two days only.

With respect to the treatment of diarrhoea, the number of drugs prescribed per case was similar (4.0 for children <5 years, 3.8 for older children). In addition:

- antibiotics were prescribed more than twice as often as ORS and over 50% of cases that received an antibiotic were given two or more;
- more vitamins and minerals were prescribed than ORS.

The report pointed out that the use of multiple drugs in diarrhoea treatment distracts attention from the use of ORS and reduces the likelihood that any of the drugs will be used correctly. It suggests that the total current expenditure on diarrhoea treatment would be adequate to cover all needed treatment; a change in prescribing habits would help to ensure that this money was spent appropriately. The report notes that most diarrhoea cases are treated by non-doctors and urges that this be considered in training and supervisory activities.

PERU

A meeting held in Lima in November 1989 brought together representatives of the Ministry of Health, various governmental and non-governmental agencies, universities and research institutions, USAID, and WHO to discuss the problem of excessive drug use in the treatment of diarrhoea. Six presentations were made on the extent of the problem, following which discussions were held and recommendations made.

In national surveys conducted in 1984 and 1986, between 33 and 62% of cases of childhood diarrhoea were found to be treated with drugs, including antibiotics and antidiarrhoeals (most commonly, loperamide). A study in Canto Grande in 1987-1988 found a combination of chloramphenicol and tetracycline to be freely available and widely used, and confirmed the use of laxatives and purgatives in the treatment of diarrhoea. Another study in Lima and Callejon de Huaylas showed that 57% of episodes of diarrhoea for which a medical consultation was sought received antibiotics and 55% antidiarrhoeals[2].

The cost of drugs used in the treatment of diarrhoea in Peru was estimated to be US$ 2.5 million annually; treatment of a single episode required 3-14% of a typical monthly salary.

These findings and other details included in the report clearly demonstrate the magnitude of the problem and the importance of implementing the recommendations made by the meeting.

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[1] In: *Child Survival Pharmaceuticals in Indonesia, Part II ("CSP-II")*. Jakarta, Ministry of Health (1988)

[2] *Medicamentos inapropiados en diarrea: La magnitud del problema.* Colleccion Cientifica No.1. Peru, Organizacion Panamericana de la Salud (1989)

In addition, instructions on the use of antibiotics and antiparasitic drugs have been included in the revised chart "Management of the Patient with Diarrhoea" (Figure 8).

Figure 8: Excerpt from the revised WHO diarrhoea treatment chart "Management of the Patient with Diarrhoea"

Use of drugs for children with diarrhoea

- ANTIBIOTICS should ONLY be used for dysentery and suspected cholera. Otherwise, they are ineffective and should NOT be given.
- ANTIPARASITIC drugs should ONLY be used for:
  - Amoebiasis, after antibiotic treatment of bloody diarrhoea for **Shigella** has failed ***or*** trophozoites of **E. histolytica** containing red blood cells are seen in the faeces.
  - Giardiasis, when diarrhoea has lasted at least 14 days ***and*** cysts or trophozoites of **Giardia** are seen in faeces or small bowel fluid.
- ANTIDIARRHOEAL DRUGS and ANTIEMETICS should NEVER be used. None has proven pratical value. Some are dangerous.

Currently, a protocol is being developed to assess drug use at the household level; this will form an addendum to the CDD household survey manual for use by countries that are interested in obtaining such information. The information could be of help in designing and targeting interventions to improve drug use behaviour. The Programme is also exploring ways of changing pharmacists' advice and sales habits (see section 2.2.7).

At the same time, the Programme is formulating an approach that will facilitate the preparation of national plans of action to achieve a more rational use of drugs. Some initial developmental work was undertaken during visits to Jordan and the Syrian Arab Republic in 1989. It is hoped that national programmes can play a significant role in improving drug use through information dissemination, advice to drug regulatory authorities, training, health education, monitoring, and evaluation. The strategies that can be used in implementing these activities can be broadly classified as regulatory, managerial, and educational. Particular approaches and the selection of activities related to drug regulation, supply, prescription, dispensing, and utilization need to be country-specific. However, the Programme is developing a set of guidelines to help countries select, plan, and implement appropriate interventions. It will then provide support to selected countries to enable them to implement such interventions. In these activities, the collaboration of national CDD programmes with other relevant programmes/divisions within and outside the ministry of health and, in some areas, with non-governmental organizations (NGOs) will be essential.

A concrete example of the Programme's involvement in influencing drug regulation is the action taken by various countries in the Eastern Mediterranean Region (see Box 9). In addition, at two meetings in 1989 (in the South-East Asia and Western Pacific Regions), CDD programme managers reviewed the drug use problem and proposed activities that could be undertaken by national programmes.

Action to improve national policies on antidiarrhoeal drugs: results from the Eastern Mediterranean Region **9**

A unanimous recommendation of the EMR Programme Managers' Meeting held in Cairo, Egypt, in June 1988, was that governments should take positive action to improve official policies aimed at rationalizing the use of antidiarrhoeal drugs. Several countries in the Region, among them Iraq, Jordan, Pakistan, and Yemen, had already taken some action.

Accordingly, a circular letter was dispatched in August 1988 from the Regional Director to all Member States recommending that antidiarrhoeal combination drug preparations should not be used in children, and that loperamide, diphenoxylate, hydroxyquinolines, and liquid oral preparations of streptomycin should be deregistered for use in young children.

One Member State (Syrian Arab Republic) is known to have implemented the recommendations, and another (Oman) prohibited the importation or marketing of any antidiarrhoeal preparation containing an antimicrobial. Three other countries (Cyprus, Egypt, and Lebanon) initiated discussions with appropriate technical and regulatory bodies, and one Member State that had already taken some action (Pakistan) considered implementing stronger regulations.

In April 1989, a second letter from the Regional Director complimented Member States on the action taken, urged further action, and transmitted newly prepared scientific background material for use by national regulatory bodies in their deliberations on drug policy.

In 1989, Programme staff participated in an evaluation of the actions taken in Jordan to rationalize drug use in the treatment of diarrhoea. It was found that a significant number of antidiarrhoeals had been deregistered and consideration was being given to removing several other ineffective products from the market. Mass media campaigns have been widely used to promote ORS and may have had some impact on the prescribing habits of health professionals as well as on consumers. Numerous training courses in diarrhoea case management have been held for government health workers. Efforts directed specifically at pharmacists and physicians have included seminars on diarrhoea treatment supported by professional organizations, UNICEF, and the Ministry of Health. The Jordanian experience showed that, by obtaining the support of the Paediatric Society, the Doctors' Syndicate, and the Pharmacists' Syndicate, a large audience could be reached, including private practitioners. ❑

2.5 Communication

As national CDD programmes engage in the active promotion of correct case management in the home, and as they expand training efforts to include peripheral health staff in close contact with the general population, improved health education and communication approaches become increasingly important. In response to requests from public and private institutions, over 3000 copies of the manual "Communication: A Guide for Managers of National CDD Programmes" (document CDD/SER/87.2) have been distributed, in English, French, and Spanish.

During the biennium, the planning and implementation of a communication component in national CDD programmes was emphasized at several regional and sub-regional programme managers meetings. Exercises in communication planning have been developed, based on the manual, and were field-tested at one

of these meetings. These exercises are being revised and will be used at future regional and sub-regional programme managers meetings, when appropriate.

Numerous countries with established CDD programmes have requested assistance in the development of all or part of their communication component. During the biennium the joint WHO/UNICEF CDD Communications Officer visited Algeria, Ethiopia, Indonesia, Sudan, United Republic of Tanzania, Viet Nam, and Zaire, to assess interest and recommend the most appropriate form of support. Collaboration has been initiated and activities have been planned in four countries (see Boxes 10 and 11).

It has been found in the countries visited that many of the activities recommended in the WHO CDD communication manual, including stepwise planning, qualitative research, pre-testing of materials, and training in interpersonal communication techniques, require skills that are unfamiliar to the CDD programme manager or his/her staff. For this reason, the Programme needs to commit a significant amount of staff and consultant time to regular return visits to countries during the developmental and early implementation phases of CDD communication interventions. This effort complements and supports the investment in personnel time and resources made by national CDD programmes.

It is also evident that there is a need to develop practical exercises that national programmes can use in the training of health personnel in techniques of interpersonal communication for behaviour change, and in the planning of health education activities. These exercises will focus on identifying current behaviour patterns, defining behaviours to be changed, identifying factors that determine those behaviours, using educational materials, and planning and conducting effective communication activities. The exercises developed for workshops that have already been conducted or are planned in various countries (United Republic of Tanzania, Viet Nam, Zaire) will be compiled and made available to programmes upon request.

2.6 Evaluating Programme progress

The activities of the Programme in this area reflect the priority given to training to improve diarrhoea case management. While further efforts were made to collect information in all Programme areas, particular attention was given to refining the methodologies for assessing correct management of diarrhoea cases in the home and the health facility.

2.6.1 Country programme profiles

This instrument for sharing data among countries, WHO, and other interested agencies, designed during the previous biennium, contains information under 11 headings covering planning, training, ORS production, evaluation, and other activities (see "Sixth Programme Report, 1986-1987", document WHO/CDD/88.28, for a complete list of headings).

Developing a communication component in a national CDD programme: findings from three countries 10

The WHO CDD Programme has increased its support to countries for communication activities. Each country has different potentialities to exploit (e.g., existing health education efforts, well-defined community organizations) and different constraints to overcome. Some examples, and the national CDD programmes' responses to them, are outlined below.

Current situation	Planned responses and activities
ETHIOPIA	
Strong local government and organization	Distribute materials through health sector and alternative sources, e.g., women's groups, peasants' association
Health-focused radio drama series planned by the Ministry of Health, Ministry of Information, and UNICEF	Communicate CDD policy to all health workers and NGOs involved in health communication
Strong adult education programme using mass media	Provide programme with appropriate information/ messages
Few data on which to base policy on home fluids, or communication messages	Conduct baseline quantitative study and qualitative research for policy definition and message development
Few, outdated, printed pictorial materials	Develop educational messages/materials based on qualitative research
Information and advice on CDD given by health workers often inconsistent	Reinforce CDD clinical management training and add exercises in interpersonal techniques
Multiple ethnic and language groups	First sets of messages to target largest groups
SUDAN	
Most CDD communication carried out at local level	Designate CDD staff at national level to monitor and advise on all CDD-related communication activities
Numerous materials produced by national programme	Evaluate distribution and use of current printed materials
Social mobilization planning and qualitative research previously begun in one pilot province	Develop plan and messages for pilot region based on qualitative research and incorporating social mobilization activities
Gezira University staff submitted proposal for quantitative KAP survey in pilot provinces	Design KAP instrument after qualitative research completed; implement before pilot intervention begins
Many NGOs involved	Provide all NGOs with technically accurate, consistent messages
VIET NAM	
New printed materials produced	Develop plan for distribution of materials
Radio and loudspeakers proliferate	Explore use of mass media
Household survey results can serve as baseline data	Examine usefulness for communications planning and means of obtaining additional information as required
Staff need training in interpersonal communication techniques	Assess training needs; design and hold workshops for key staff
No messages for highland populations	Plan formative research for message development aimed at these populations
Need to decrease inappropriate use of drugs	Target private medical sector ❑

Plans for communications in the United Republic of Tanzania 11

Since it began in early 1985, the Tanzanian national CDD programme has concentrated on policy development, procurement and distribution of ORS packets, and staff training. In 1987, on the basis of a national review, programme guidelines were revised to emphasize correct case management in health facilities and in the home. To address this issue, the programme has increased its training efforts which should soon reach the peripheral-level health staff who are in closest contact with the population. The programme is also developing a workable policy on home therapy. Sugar-salt solution, originally promoted as the recommended home fluid, has been shown to pose certain problems in its application, particularly in such matters as the adoption of a standardized recipe and correct (safe) preparation by mothers and health workers. The programme is actively engaged in identifying other appropriate fluids that could be promoted for the prevention of dehydration.

These two activities, promotion of home therapy and increased involvement of peripheral-level staff, require the support of a comprehensive communications component. Furthermore, the Tanzanian Minister of Health recently issued a statement confirming the Ministry's commitment to Information, Education, and Communication (IEC) activities, and encouraging all programmes to give this component added importance. Thus, in 1988, the national CDD programme approached WHO with a request for assistance in designing a comprehensive communication intervention for diarrhoeal diseases control.

An initial assessment revealed that most health-related printed materials treated multiple subjects and were aimed at a relatively educated population. Health personnel had little or no training in interpersonal communication techniques. Various methods of preparing sugar-salt solution were being promoted in government facilities and by NGOs; the recent policy shift to other home-available fluids has not yet reached the level where its adoption is most needed.

Two staff members of the Health Education Unit were designated as the CDD communication coordinators. After assessing the current situation and various possible communication channels, it was decided to:

1. Develop appropriate, visually clear pictorial materials.
2. Hold workshops on techniques of interpersonal communication and effective use of the new materials.
3. Involve other ministries and political bodies (particularly women's groups) in the distribution of materials.
4. Promote community participation and active discussion using traditional theatre performances.
5. Explore the use of the mass media (radio).

By late 1989, a CDD communications plan had been drafted for the next 2 1/2 years in collaboration with WHO and UNICEF. The preparation phase is well under way; focus group discussions with caretakers of children under 5 years of age and individual interviews with health workers will provide the information needed to develop appropriate messages and materials. A quantitative study is also planned, which will allow the formulation of measurable communication objectives and serve as the basis for evaluation when it is repeated two years after the intervention begins. ❑

Since 1987, each Member State has received annually a profile of its CDD programme, containing data then available to WHO, with a request to update it. While the number of countries using the profiles has been relatively low in some regions, the quality of the data received is steadily improving. During 1988, CDD staff in the WHO regional offices were briefed on how to use the computerized database, and by the end of 1989 all such staff were updating information at the regional offices and sending it to headquarters on diskettes. This facilitates the monitoring of CDD activities globally and enables the Programme to provide information on many individual country programmes. The weakest part of this information exchange process remains the obtaining

of reliable estimates of different programme indicators from data available in countries. The Programme will therefore continue to assist countries in collecting and presenting information that is useful for managing their national programmes.

In the Region of the Americas and the Western Pacific Region, a number of countries have introduced provincial programme profiles (modelled on the WHO example) to facilitate the monitoring of CDD activities in the country.

2.6.2 Programme reviews

In both 1988 and 1989, Programme reviews were conducted in 11 countries (Table 1). Most of these reviews included another element of primary health care (most often EPI) and many were conducted in collaboration with UNICEF and/or bilateral agencies. Examples of the findings of three programme reviews are shown in Box 12.

Table 1: Countries conducting programme reviews in 1988-1989

1988	1989
Argentina	China (2 provinces)
Bhutan	Cuba
Bolivia	Democratic Yemen
Kiribati	Honduras
Lesotho	India
Mali	Laos
Maldives	Malawi
Mexico	Nigeria
Niger	Papua New Guinea (1 province)
Pakistan	Philippines (1 province)
Papua New Guinea (1 province)	Sudan

It has become evident that regular and appropriate use of available evaluation tools reduces the need for major evaluation exercises. Unfortunately, many of the programme reviews conducted in recent years have tended to further document already well-known problems, and have allowed little time for discussions on how to deal with them. The Programme is now advising countries interested in undertaking programme reviews to use a small group of reviewers and focus on finding possible solutions to problems that have already been identified. To facilitate this process, a revision of the Programme's protocol for comprehensive programme reviews was initiated during 1989 and will be made available in 1990.

One country that has provided examples of specific action taken to resolve problems identified during programme reviews is Ethiopia (see Box 13).

Findings of CDD programme reviews: three examples 12

CHINA

A review of CDD activities in Shandong and Fujian Provinces was conducted in October 1989. The review team found that although mortality from diarrhoea had declined over the past few decades, diarrhoea was still one of the leading causes of childhood deaths.

Access to health care in the provinces visited was very good, virtually all villages having a Village Health Station. The team was impressed by the supervisory structure provided by the Anti-Epidemic Station network. These positive findings, coupled with a widespread knowledge of the concepts of dehydration and fluid replacement, form a good basis for the development of an effective CDD programme. However, the absence of a written policy statement on diarrhoea case management and the consequent variability in treatment practices and health education messages was considered to be a major constraint. Similarly, ORS supplies are very limited, impeding the wider use of ORS.

While it acknowledged the enormous progress made in China in improving water supplies, the review team noted that the full benefits of those advances could not be realized without giving greater attention to sanitation and domestic and personal hygiene.

The team recommended, among other things, that a national meeting be convened to agree on a policy for diarrhoea case management and to draw up detailed CDD programme plans for several provinces. It also urged that attention be given to the lack of ORS and to the development of clear, uniform health education messages on both the treatment and the prevention of diarrhoea.

NIGER

A national CDD programme was launched in Niger in 1982. The first five-year plan for 1984-1988 focused on extensive training and health education. Technical cooperation has been provided by the PRITECH Project, and the Government is firmly committed to developing the programme.

A comprehensive review of the programme was carried out in June/July 1988. At the time of the review a clear management structure had been established at the central level and was being introduced at the regional level. However, monitoring and supervision had proved inadequate. In the area of case management the programme had been remarkably successful in reducing the use of antibiotics and antidiarrhoeal drugs. Although in-service training had been provided to the majority of health staff, they had been given little practical experience during training. As a result, many health workers were not yet proficient in diarrhoea case management.

The programme had put special emphasis on the development of radio and television messages, and educational materials for health facilities. The diffusion of educational messages was successful in that virtually all mothers had heard of ORS (52 of 59 mothers interviewed) and the majority were able to prepare it correctly. Yet most mothers had not adopted the practice of giving ORS for diarrhoea. The rate of access to ORS was found to be low despite the fact that ORS is produced within the country.

The review team identified as priorities for the future: strengthening of monitoring and supervision, "hands-on" case management training, improved ORS distribution, and modification of communication messages to encourage the use of ORS in the home.

SUDAN

In January 1989, the national CDD programme in Sudan (established in 1985) underwent a comprehensive review. The review team interviewed health staff at all levels in three areas of the country.

The CDD programme was found to have made remarkable progress since its inception. A very effective CDD department had been established in the Ministry of Health and was assisting regions to establish programmes with increasing decentralization of authority and responsibility. ORT was found to be widely known and accepted. ORT corners had been established in a large number of health facilities and the use of antidiarrhoeal drugs in children in such facilities had virtually ceased. A total of 7000 health workers had been trained by the end of 1988, giving an estimated training coverage of 28%. A newsletter in English and Arabic had been used as a means of exchanging information and motivating peripheral health staff. A one-litre aluminium jug for mixing ORS had been successfully tested in some areas and 35 000 jugs had since been produced and distributed.

The review team recommended that a strong technical CDD unit be maintained at the central level but that activities be better integrated with PHC services at all levels. It noted that ORS and continued breast-feeding were well accepted, but that greater emphasis would have to be given to the need to increase fluid intake and continue feeding. Antibiotics and intravenous fluids were still too widely used. Deficiencies in ORS logistics were also noted. With regard to training, it was felt that a special effort should be made to target physicians and pharmacists through their respective training schools. ❑

Problem solving in Ethiopia 13

The national CDD programme of Ethiopia identified problems during a joint PHC review in 1985 and a comprehensive CDD programme review in 1987. Household surveys of morbidity, mortality, and treatment in urban and rural areas, and a sentinel surveillance trial in 1985-1986, had provided the programme with additional information. Many regional mid-level management training courses had been conducted, which had provided opportunities to learn problem-solving skills. The problems were analysed and action taken, the most significant measure being improved collaboration between the MCH, EPI, and CDD divisions of the Ministry of Health to achieve integrated, decentralized training.

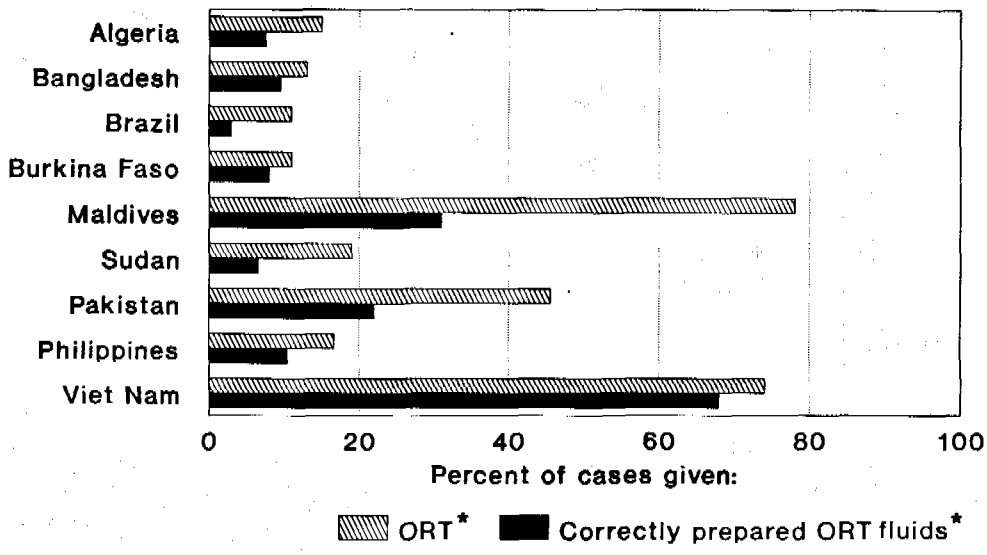
Major problems identified	Problem-solving activities
Low priority given to CDD reflected in, e.g., inadequate staffing	CDD plans endorsed and adopted; additional staff assigned to national CDD programme
Poor diarrhoea case management and few facilities preparing and administering ORS	Regional DTUs established; ORT utensils provided to health facilities to establish ORT corners
Low training coverage	Decentralization of MCH/EPI/CDD training courses to regional and district levels; incorporation of diarrhoeal disease control in nursing and health assistant curricula
Lack of health education on prevention and treatment	Production of promotional materials in local languages and plans for intensified communication efforts
Need to strengthen implementation of preventive strategies, e.g., breast-feeding	Situational analysis of breast-feeding planned
Poorly coordinated delivery of ORS; limited local production	Adoption of essential drugs policy and expansion of local ORS production in 1989 ❑

2.6.3 Assessing diarrhoea case management in the home

During the biennium the Programme completed a revision of its "Household Survey Manual" (CDD/SER/86.2 Rev.1, 1989), which describes in detail methods of measuring diarrhoea case management, morbidity, and mortality. The advantage of the revised methodology is that it estimates the proportion of children receiving **correct** case management in the home and not just the proportion of children receiving ORS/ORT. The revised protocol permits the collection of data on two key indicators which are receiving more attention in CDD programmes: the proportion of diarrhoea cases that received increased amounts of fluid, and the proportion of diarrhoea cases that received the same or increased amounts of food during the diarrhoea episode. It also assesses caretakers' knowledge of when to seek care outside the home. In all, it provides information on seven of the Programme's 13 key indicators of progress.

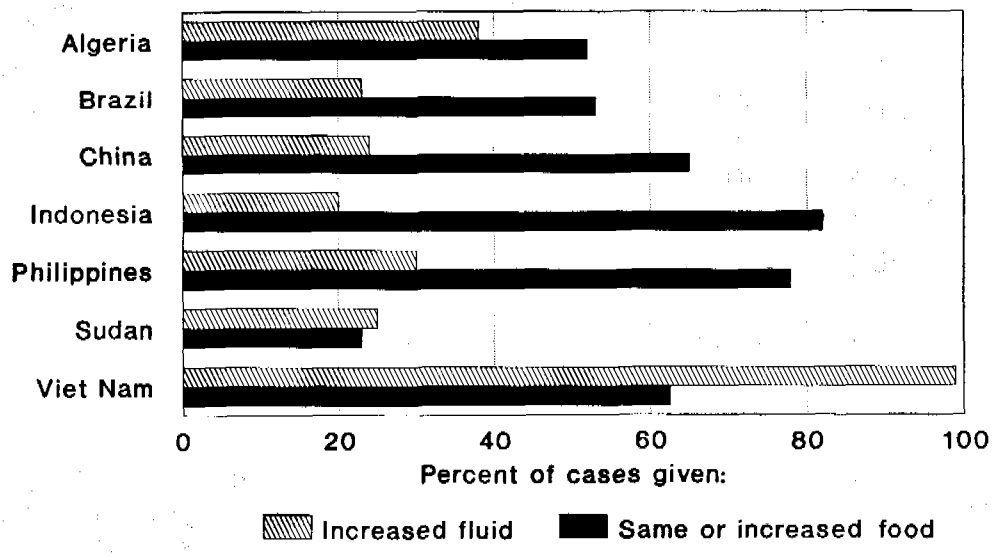
The revised protocol has been used in several countries. Figures 9 and 10 and Box 14 show examples of the data that can be collected using the survey. The data presented in Figure 9 show the proportion of caretakers who reported using ORT during their child's current episode of diarrhoea, and the proportion of caretakers who could demonstrate correct preparation of ORS solution or a

Figure 9: ORT use rates (from household surveys in 9 countries), 1987-1989



* ORS solution or a recommended home fluid (usually sugar-salt solution)

Figure 10: Increased fluid and continued feeding rates (from household surveys in 7 countries), 1987-1989



recommended home fluid. It is evident that some programmes need to concentrate on improving caretakers' knowledge of the correct method of preparing ORS and recommended home fluids. Figure 10 shows the proportion of diarrhoea cases that received increased amounts of fluid and the proportion that received the same or increased amounts of food during the diarrhoea episode. Fluid intake was increased in less than half the cases of diarrhoea in all but one of the surveys. In five of the seven surveys, the percentage of caretakers who continued to feed or gave the child more food during the diarrhoea episode was higher than the proportion who gave additional fluid. This type of information is helpful to programme managers in planning future educational messages and activities.

Brazil uses a household survey to evaluate a campaign to promote ORT

14

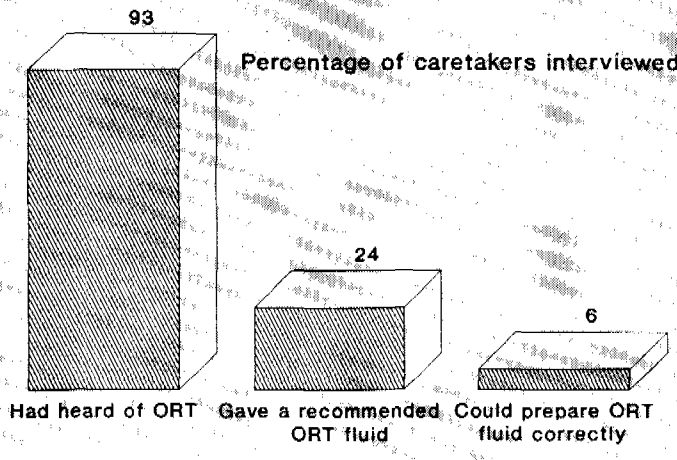
In order to evaluate an extensive campaign to promote ORT in the home, a household survey was conducted in northeast Brazil in April 1989. Prior to the study the communities surveyed had been extensively exposed to health education on diarrhoea case management. This included a radio and television campaign for the use of sugar-salt solutions prepared from two different recipes. At the same time, prepackaged ORS corresponding to the WHO formula was promoted through television and public health facilities; various commercial ORS products were also available.

In the 9467 households surveyed, 982 children had had diarrhoea in the last 15 days. Of these, 66% had not been taken anywhere for treatment, which underlines the importance of home management of diarrhoea. As many as 93% of the caretakers had heard of ORS or sugar-salt solution, but, as the figure shows, only 24% of the children had been given a recommended solution.

A wide variety of recipes were used for sugar-salt solution, many of which were incorrect. Only 6% of caretakers were able to demonstrate the preparation of ORS or sugar-salt solution correctly. Confusion had been created among the public because of the different methods of preparing oral rehydration solutions. Probably because the messages focused on type rather than quantity of fluid, there was little awareness among caretakers of the importance of increasing fluids when the child has diarrhoea.

The survey concluded that the problems related to correct mixing needed to be corrected before the radio and television messages were rebroadcast. The health education messages should refer to only one recipe for sugar-salt solution and research is required to determine the best method of preparation. In addition, emphasis should be given to each of the following elements of case management: continued feeding and giving an increased amount of fluid during diarrhoea, and using the appropriate fluid (i.e., sugar-salt solution to prevent dehydration and ORS to treat dehydration).

Comparison of ORT awareness, use and correct preparation rates



In one city, Cebu in the Philippines, the revised survey methodology has now been applied twice, with a two-year interval, and has indicated the achievements that have been made and the areas requiring future emphasis (see Box 15). Other countries are encouraged to use the survey instrument in this manner.

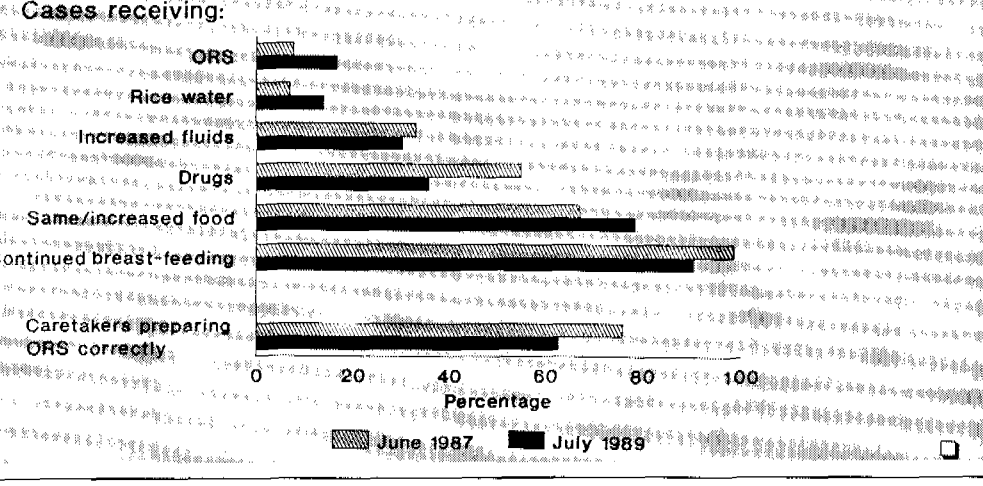
The Philippines: a comparison of two household surveys 15

CDD activities have been in progress in Region 7 of the Philippines since 1982. During the years 1987-1989 major emphasis was given to the training of health personnel. As part of an assessment of the impact of these accelerated activities, a second household survey was conducted in Metro Cebu in July 1989 as a follow-up to a similar survey undertaken two years earlier.

The two-week incidence rate was essentially unchanged; however, the seasonally adjusted diarrhoea incidence rate was lower (2.9 in 1987 and 2.1 in 1989), suggesting that the number of diarrhoea episodes per child per year may be decreasing. Significant changes in other CDD indicators were apparent, as can be seen from the figure below.

Between 1987 and 1989, the drug use rate fell from 55% to 36%, the ORS and rice-water use rates doubled, and there was a small increase in the percentage of caretakers giving the same or greater amounts of food during a diarrhoea episode; however, there was no change in the proportion of caretakers giving more fluid. ORS was prepared correctly by 63% of the caretakers, which was not a statistically significant change from the percentage (76%) in 1987. The comparison of these two surveys was useful as a means of identifying programme achievements and shortcomings. As a result, future activities will focus on the promotion of home fluids, increasing the amount of fluid given during diarrhoea, and teaching mothers how to prepare ORS.

Comparison of findings from two household surveys

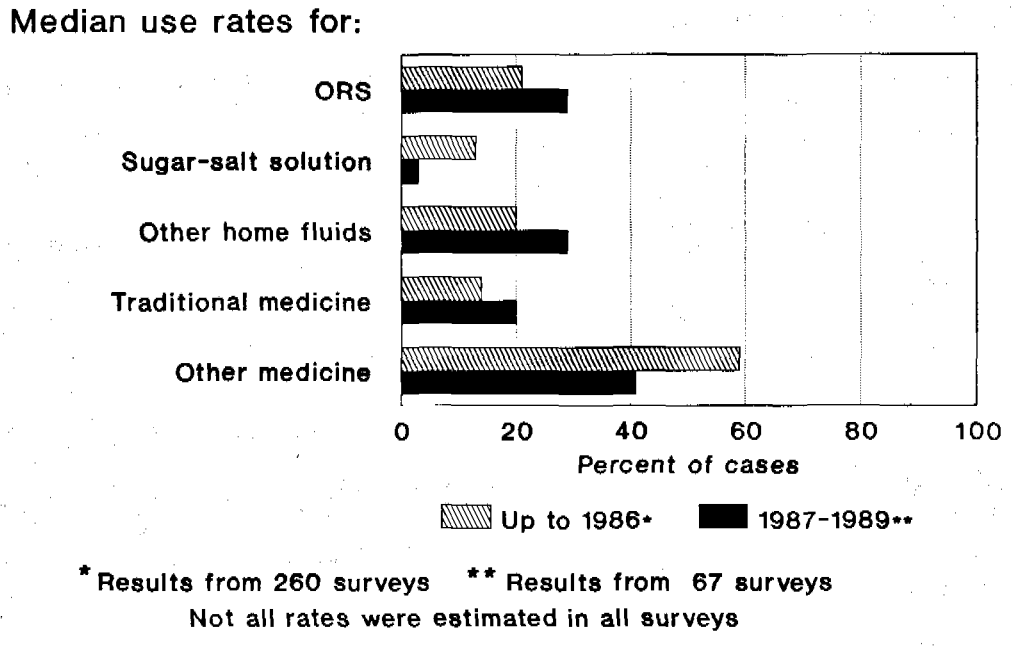


In 1988, the simpler mortality, morbidity, and treatment survey described in earlier versions of the "Household Survey Manual" continued to be used independently in many countries. Since its introduction, this method has been applied to around 350 surveys in over 70 countries. Selected results are presented in Figure 11. It can be seen that, according to the survey findings, there has been an increase in the proportion of diarrhoea cases receiving ORS, and, while the use of sugar-salt solution appears to have decreased, the use of other home fluids has increased. Although there appears to have been a decrease in the percentage treated with medicines other than traditional medicines, this proportion is still excessive.

2.6.4 Assessing diarrhoea case management in health facilities

Throughout 1988 and 1989, the Programme's efforts in this area were concentrated on expanding the health facility survey protocol into a detailed manual with guidelines for each step of the survey, including the analysis and interpretation of the results with a view to taking follow-up action. Using this survey, national CDD programmes can now obtain quantified estimates of four of the 13 key CDD Programme indicators (proportion of cases correctly assessed, proportion of cases correctly rehydrated, proportion of cases correctly advised on home care, and proportion of dysentery cases given appropriate antibiotics in health facilities), and also identify specific problems requiring remedial action. The manual will be available for general distribution in mid-1990 after it has been field-tested in Bangladesh in February. While work on the manual was in progress, many countries expressed interest in undertaking surveys of this kind and the CDD Programme offered advice and assistance in several of these activities.

Figure 11: Median treatment rates (from 327 household surveys in over 70 countries)



Although there are exceptions, many of the surveys conducted to date have reported similar findings, namely, that only about 50% of health workers take an adequate history and perform a complete physical examination of diarrhoea cases. Nevertheless, a high percentage of cases are correctly treated according to their true dehydration status. The part of case management that health workers seem to be weakest in is correctly advising caretakers on

diarrhoea treatment in the home. Health workers may be prevented from giving good advice because of lack of time and the absence of demonstration materials and communication skills. Results from four surveys in African countries undertaken in collaboration with PRITECH/Sahel are discussed in Box 16.

Diarrhoea treatment in health facilities in four countries of the Sahel, Africa

16

Between February 1988 and May 1989, four countries of the Sahel in Africa (Mali, Mauritania, Niger, and Senegal) conducted surveys of diarrhoea case management in their health facilities. In total, 873 health personnel in 258 health centres were interviewed and 298 cases of diarrhoea were observed during treatment. Using a standard protocol based on one developed by the WHO CDD Programme, the surveys collected a large amount of detailed information on knowledge and practices relating to diarrhoea treatment. Some of the results of the surveys are presented below.

Though no consistent trends in inter-country comparisons are apparent, the pattern is similar in all countries. Around half of the workers interviewed had correct knowledge of the case assessment process; however, a much smaller proportion demonstrated correct assessment of dehydration during observation of case management by the surveyors. Nevertheless, the correct treatment plan was selected in all countries in the majority of cases.

The objective of future training of health workers should therefore be to build on existing knowledge and practices so that the correct treatment is chosen for all cases. The country with the highest proportion of "hands-on" practice during training also had the highest proportion of workers with correct knowledge and the ability to demonstrate correct assessment of cases.

During the surveys, as well as the many quantified data collected, much information of a more qualitative nature was obtained. Specific problems related to case management were identified and described in detail, and appropriate emphasis can now be placed on them during training.

These surveys should lead to improvements in training and supervision and, if repeated after several years, will demonstrate the progress made in diarrhoea case management in these countries.

Percentage of personnel interviewed/observed who:	Mali	Mauritania	Niger	Senegal
Had been trained in case management	91	47	94	47
Treated cases during training	2	26	37	62
Had correct knowledge of assessment of diarrhoea	58	57	56	77
Demonstrated correct assessment of dehydration	29	20	15	46
Chose the correct treatment plan	96	89	81	92

❑

2.6.5 Measuring childhood mortality

The Programme is collaborating with the London School of Hygiene and Tropical Medicine and the UNICEF Regional Office for the Middle East and North Africa in developing a simpler and more accurate method for estimating mortality rates in children. The methodology, known as the "preceding birth technique", is based

on interviews with a randomly selected group of mothers in the community. Interviewers determine whether the child born alive before the mother's most recent delivery (that is, the "preceding birth") is still alive. Information collected on the fate of about 1000 births can be used to calculate an index of the risk of death before the age of 2 years.

In field-tests in Peru (December 1987) and more recently in the Gambia (March 1989), comparable child mortality estimates were obtained by three separate methods: the Brass indirect method (based on questioning mothers on total children born alive and total deaths), life-table calculations for births in the preceding five years, and the new preceding birth technique (see Box 17). As a result of this validation, the Programme is producing a manual describing field procedures for a baseline measurement using the Brass method along with the preceding birth technique, and follow-up surveys using only the simpler technique. It is expected that the preceding birth technique will prove to be sufficiently sensitive to identify changes in the rates of childhood mortality in the years between surveys.

2.6.6 Assessing the cost-effectiveness of ORT

In 1988, a manual entitled "Estimating Costs for Cost-Effectiveness Analysis" (CDD/SER/88.3) was completed and printed. It contains detailed guidelines on how to collect, analyse, and present data on the costs of various programme components. Three case studies demonstrate how to compare the costs of different options for district programmes, hospital-based diarrhoea treatment, and ORS importation and production. These guidelines help country programmes to present the costs and benefits of directing resources towards diarrhoea training units, ORS production and use, staff training, and other programme components aimed at improving the case management of diarrhoea. This method has been used in several countries (see Box 18) and others have expressed interest in applying it in 1990. It should prove valuable in identifying interventions that are cost-effective for countries that are particularly concerned about health financing issues.

2.6.7 Data from hospitals

As noted in previous reports, the Programme has not made a major effort systematically to collect data on diarrhoea case management from hospitals because of the difficulties in interpreting the data in the absence of detailed knowledge of such factors as changing patterns of treatment- seeking, behaviour changes in hospital staff, and admission policies. Nevertheless, reports sent to the Programme from individual hospitals tend to support the same conclusion: the establishment of oral rehydration units in hospital outpatient departments save lives and money and reduces the inpatient load (see Box 18).

Measuring diarrhoeal mortality in early childhood 17

The first trial of the new survey method for measuring childhood mortality took place in the urban slum communities of Lima, Peru, in November-December 1987 with the collaboration of the Instituto de Investigacion Nutricional. Altogether, 7542 women of reproductive age were interviewed using a questionnaire which measured childhood mortality in three different ways - by the Brass method, a short birth history, and the preceding birth technique (PBT). The results expressed as 2q0, the probability of dying between birth and age 2, were as follows:

Method	$1000\ {}_2q_0$	Period to which estimate refers (years before survey)
Brass	50	2.5
Birth history	48	2.5
PBT	49	3.1

Clearly, the "short-cut" PBT method appears to have performed as well as the other two more laborious techniques.

Although these comparisons are valuable, a stronger test of the method is its ability to produce figures similar to those obtained from a reliable independent source. However, areas where mortality is high and death registration is good are difficult to find. The British Medical Research Council (MRC) has been obtaining mortality data for some years in an area under continuous surveillance around Farafenni Town in Central Gambia. The MRC surveillance data include cause of death arrived at by an interview with the mother conducted by medically qualified personnel in the immediate post-mortem period. With the full cooperation of the MRC, a second study was conducted in February-March 1989 in which 3341 women of reproductive age were interviewed using questionnaires similar to those used in Lima.

The results, expressed in terms of both infant mortality ($_1q_0$) and mortality below age 5 ($_5q_0$), are summarized below:

Method	$1000\ {}_1q_0$	$1000\ {}_5q_0$	Approximate date of estimate
1. Brass			
1983 census	160	239	1981
1989 survey	208	310	1981
2. Birth history			
from 1989 survey	80	207	1986
3. 1982-1983 cohort follow-up survey	142	281	1982
4. Surveillance system (1982-1987)	117	235	1984
5. PBT - 1989 survey	118	211	1986

The results obtained by the Brass method indicate that the 1983 national population census probably undercounted some childhood deaths since the same method produced much higher mortality estimates from the 1989 survey data. The infant mortality results from the short birth history are disappointing, indicating that some dead children, probably those born some time ago, had been omitted. In the follow-up, the number of children studied was small but the mortality seems to have been very high in the early 1980s. (All the results indicate a steady but slow improvement in mortality in this area of the Gambia since the mid-1970s.) While the surveillance system data are not perfect, they are probably the most reliable for comparisons. Again, the simple PBT method has performed well, producing results that are very close to those obtained from the surveillance system (compare in particular the infant mortality rates in the last two rows of the preceding table).

The cause of death data are complex and the analysis is as yet incomplete. The ages at death seem broadly comparable overall.

Age at death	MRC surveillance (%) (n = 615)	1989 PBT survey (%) (n = 1437)
0-11 months	42.9	42.1
12-23 months	16.7	21.9
24-35 months	16.7	18.0
36-47 months	7.8	8.6
48-59 months	3.7	3.1
5-9 years	2.4	2.2
10-14 years	1.0	1.1

The general causes of death (malaria, diarrhoeas, infectious diseases, and other acute conditions) seem to be in about the same proportions with both methods. Work is under way to improve the specificity and sensitivity of the measures and to compare causes of death for individual children.

Both experiments, and other trials conducted by UNICEF in Djibouti, Jordan, Democratic Yemen, and the Syrian Arab Republic, have produced results which suggest that the simpler methods proposed for measuring childhood mortality are performing well in comparison with other more complex methods and external sources. Analysis of the cause of death is more problematic since the causes reported are often culture and language-specific and thus difficult to classify. Further analysis of the Gambian results may produce some additional useful information. ❑

2.6.8 Other evaluation methods

The Programme has continued to monitor national efforts to set up sentinel reporting systems for CDD programmes. Such systems have been established in a number of countries, including Ethiopia, Guatemala, Indonesia, Malawi, Pakistan, and the Philippines; however, the current status of these systems varies considerably and their value as a tool for monitoring and evaluating programmes is unclear. Experience so far suggests that, for long-term sustainability, such systems may require levels of financing, commitment, or supervision that are disproportionate to the utility of the data obtained.

2.6.9 ORS access, ORS use, and ORT use rates[1]

As explained in section 2.6.1, the exchange of country programme profiles was the main method of collecting information on Programme indicators in 1988. The data thus obtained were supplemented by information obtained independently from other sources, including programme reviews, surveys, reports by consultants from various agencies, and ORS production figures. As in previous years, all available data were used to arrive at estimates of the proportion of the population of the developing countries that has access to ORS (ORS access rate) and the proportion of episodes of diarrhoea in children under 5 years of age in these countries that is treated with ORS (ORS use rate) and ORT (ORT use rate).

[1] These three terms are defined as follows:

ORS access rate: The percentage of population having reasonable access to a provider of ORS who is trained in its use and receives adequate supplies.

ORS use rate: The percentage of diarrhoea episodes in children under 5 years of age treated with ORS.

ORT use rate: The percentage of diarrhoea episodes in children under 5 years of age treated with ORS or a physiologically appropriate household solution (see footnote to Table 2).

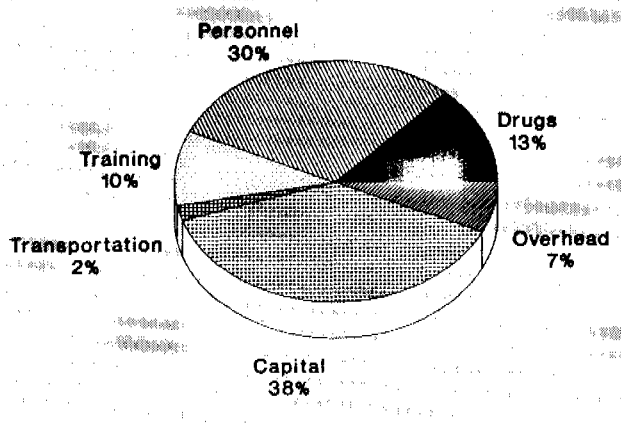
Making diarrhoea treatment more cost-effective in Lesotho 18

Applying the Programme's guidelines for analysing the cost of treating diarrhoea, the Lesotho Ministry of Health, with assistance from the Combating Childhood Communicable Diseases Project of USAID, identified ways of using financial resources more effectively and of increasing savings by practising good case management of children with diarrhoea.

Reducing Costs in Health Centres: the cost of treating a child with diarrhoea was studied in a sample of 20 health centres. The analysis included the costs of personnel, drugs, transportation, overheads, training, and capital expenditure. The cost per child treated for diarrhoea varied widely across the health facilities, from US$ 1.00 to $ 8.90, with an average of $ 4.50.

The profile of all CDD programme costs, shown in the figure below, revealed that personnel costs accounted for a relatively low proportion (30%) of the total cost. After the capital expenditures (including a large donor input to start the programme), the next highest cost was drugs (13%). Expenditure on drugs at the health centres varied greatly, but was as high as 53% of the total cost of treating a child for diarrhoea in some centres, suggesting that staff there were continuing to prescribe inappropriately large amounts of antibiotics and possibly other drugs for diarrhoea.

Distribution of costs of treating diarrhoea



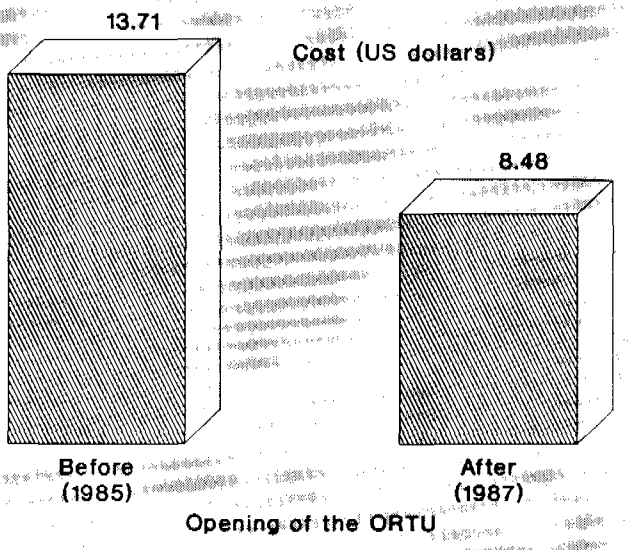
Also, it was found that the health centres with the highest unit costs generally were more remote and had a smaller trained staff. Costs were lower where staff had received a longer period of training in case management. While the poor accessibility of some centres was likely to continue to be a factor, it was concluded that something could be done to improve staff training. It was recommended that training efforts be concentrated where the greatest cost savings were likely to be achieved: on workers with less training in remote, small health centres that are difficult to supervise.

Reducing the Costs of Hospital Care: The WHO guidelines were also used to identify the savings made by opening an Oral Rehydration Therapy Unit (ORTU) at the Queen Elizabeth II Hospital in Maseru. As a part of an evaluation of the ORTU, a study was conducted which compared the cost-effectiveness of treating children under 5 years of age with diarrhoea one year prior to and one year after the establishment of the ORTU.

After the opening of the ORTU, the cost of treating an outpatient with diarrhoea was reduced, largely because of a decrease in the use of antibiotics: in the ORTU a child was more likely to be treated with ORS than with an antibiotic. Additional savings were made as a result of a reduction in the number of diarrhoea-related admissions to the paediatric ward of the hospital: in 1985, 376 (12%) of children under 5 with diarrhoea seen at the hospital were treated as inpatients compared with only 218 (6%) in 1987.

The length of stay for inpatients was also reduced, from an average of 5.7 to 3.4 days. Thus, the total cost per child treated for diarrhoea (inpatient and outpatient) decreased by 38% or $ 5.23, as seen in the graph below.

Cost of treating a child, Queen Elizabeth II Hospital

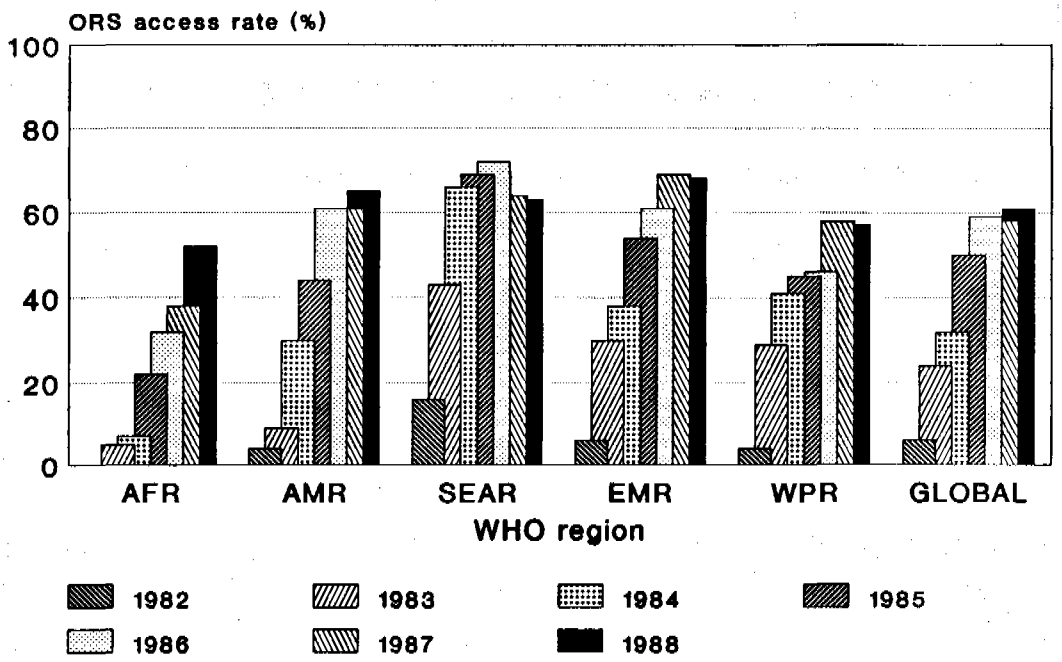


After subtraction of the costs of setting up the ORTU, the net savings for the hospital were achieved mainly by reducing admissions through better case management of outpatients. Furthermore, based on a seasonal analysis of these savings, the study concluded that opening the ORTU at weekends during the peak season for diarrhoea could result in additional savings for the hospital. ❑

Owing to the inevitable delays in compiling and reporting data, the figures available at the end of 1989 are for the calendar year 1988. It is of note that, whereas in previous years ORS use rate estimates were derived solely from ORS production and distribution figures in more than half of the countries, for at least one of the years of the biennium other information was available for 80% of the countries.

From the end of 1986 to the end of 1988, access to ORS increased in all WHO regions except South-East Asia, and gains were made in at least 58 countries in 1987 and 34 countries in 1988. However, the global access rate showed only a small increase from 58% to 61% (Figure 12, Annex 1). The small size of the global increase can be accounted for in part by the substantial drop in access rate reported by India between 1986 and 1987 after the supply of ORS to 300 000 Village Health Guides ceased. A stronger commitment to improve training coverage, communication efforts, and ORS supply and distribution will be necessary to increase world-wide access to ORS.

Figure 12: Estimated ORS access rates, by WHO region, 1982-1988



Between 1986 and 1987, the global ORS use rate rose from 14% to 19%; it stayed at that level in 1988. The ORT use rate rose from 23% in 1986 to 30% in 1987 and further, to 32%, in 1988 (Figures 13 and 14, Table 2). The global ORT use rate of 32% in 1988 may have averted 1.1 million deaths from diarrhoea in children under 5 years of age.

The ORS use rate more than doubled in the African Region during the biennium, mainly as a result of significant increases in reported rates for 1987 in Algeria and Kenya, and for both years in Ethiopia and Nigeria. In the South-East Asia and Western Pacific Regions, the ORS use rates declined in one or both years, owing mainly to significant reductions in reported rates from Bangladesh (for 1987), Indonesia (for 1988), and the Philippines (for 1987). These rates are probably a more realistic reflection of the situation in these countries than the figures reported in previous years.

From the end of 1986 to the end of 1988, the ORT use rate rose in all regions, reflecting both the increase in ORS use rates in some regions and the greater emphasis given by the Programme to the use of home-available fluids to prevent dehydration. The most marked increases were seen during these two years in the African Region, where the reported rate more than doubled, and in the Eastern Mediterranean Region. These can largely be accounted for by increases in Ethiopia (both years), Nigeria (1988), Islamic Republic of Iran (mostly in 1988), and Pakistan (mostly in 1988).

Figure 13: Estimated ORS use rates, by WHO region, 1983-1988

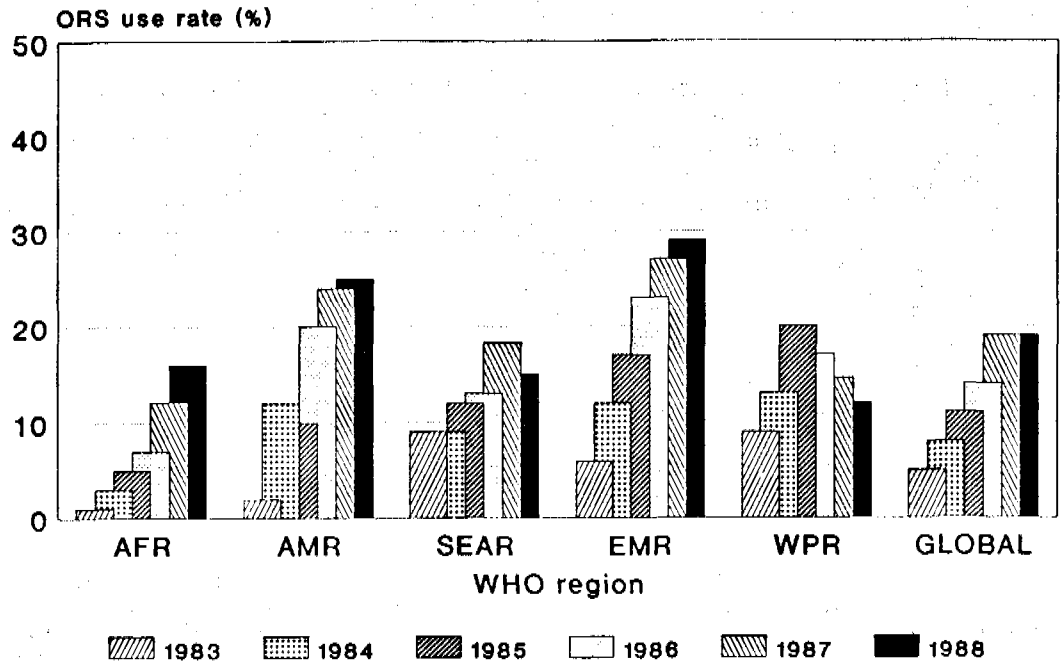


Figure 14: Estimated ORT use rates, by WHO region, 1984-1988

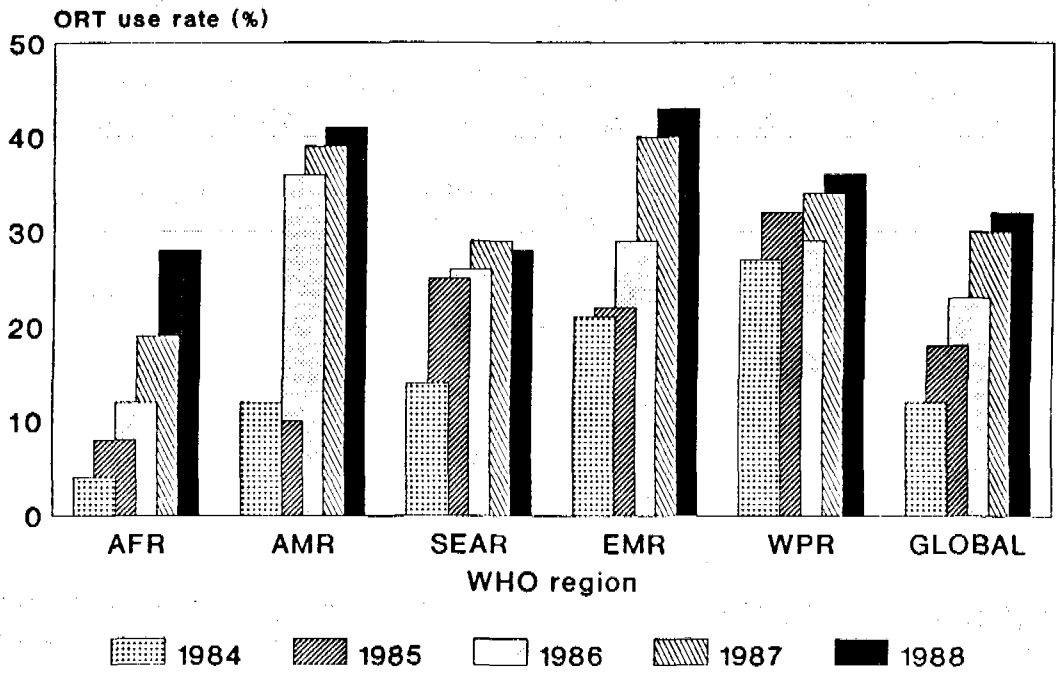


Table 2: Estimated use rates for ORS and ORT in children aged 0-4 years, 1983-1988, by WHO region and globally[a]

	ORS use rate						ORT use rate				
Region	1983	1984	1985	1986	1987	1988	1984	1985	1986	1987	1988
AFR	1	3	5	6	12	16	4	8	12	19	28
AMR	2	12	10	20	24	25	12	10	36	39	41
SEAR	9	9	12	13	18	15	14	25	26	29	28
EMR	6	12	17	23	27	32	21	22	29	40	43
WPR[b]	9	13	20	17	15	12	27	32	29	34	36
GLOBAL[b]	5	8	11	14	19	19	12	18	23	30	32

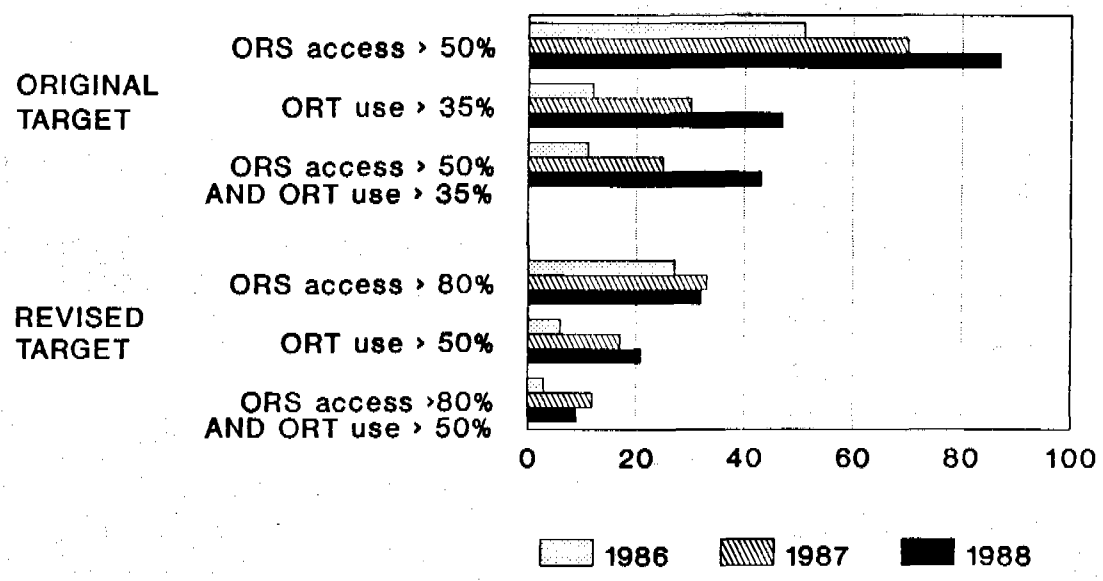
[a] Use rates refer to the percentage of diarrhoea episodes in children under 5 years of age treated with ORS or ORT, respectively. In Programme reports before 1989, estimates of ORT use rates included only ORS and sugar-salt solution (SSS), since data for other recommended home fluids were unavailable or unreliable. ORT is taken here to mean ORS, SSS, or other specified recommended home fluids (RHF). The midpoint between the sum of ORS and SSS or RHF and the greater of the values was used as the ORT use rate. All estimations were made assuming no use of ORS or ORT in countries for which no data were available.

[b] Excluding China

In 1987, at least 67 countries showed an increase in the ORT use rate; in 1988, increases occurred in at least 42 countries. As in the case of ORS access, the drop in the number of countries with increases in 1988 can be attributed in part to the fact that data were available from fewer countries.

At the beginning of the 1980s, the Programme set global targets of 50% for the ORS access rate and 35% for the ORT use rate. These were revised upwards to 80% and 50%, respectively, in 1986 in the light of progress made up to that time (see section 2.9). Figure 15 shows the numbers of countries achieving levels of ORS access and ORT use equivalent to the Programme's original and revised global targets for 1989. *By the end of 1988, 87 countries had achieved an ORS access rate of 50% and 47 countries an ORT use rate of 35% (the global target levels set originally for 1989); 43 countries had achieved both.* Levels equivalent to those set as the revised global targets, however, appear to have been beyond the reach of most countries (see also section 2.9).

Figure 15: ORS access and ORT use: number of countries achieving original and revised global targets for 1989



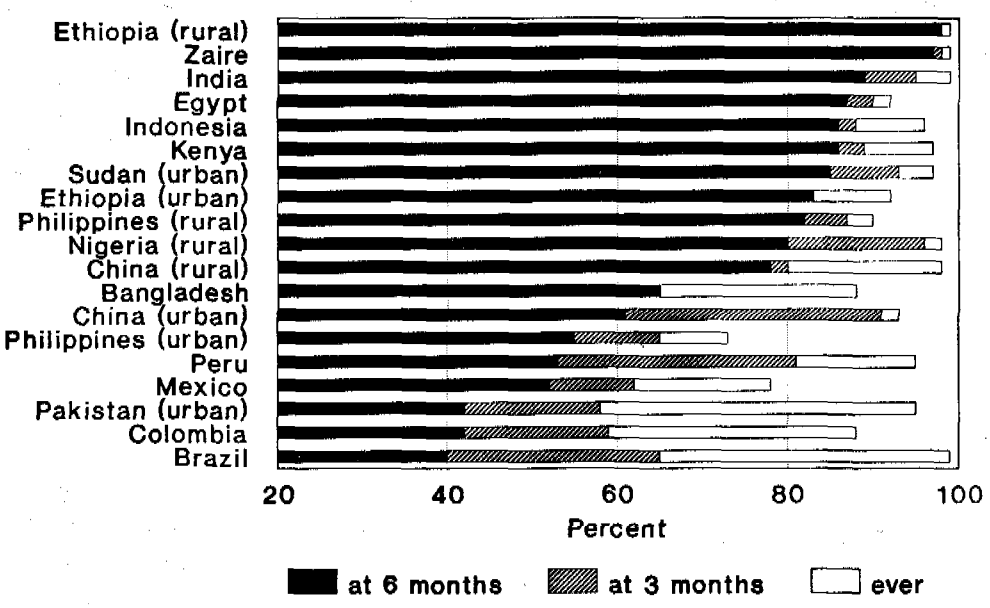
2.7 Interventions for the prevention of diarrhoea

In 1988, the services component of the Programme began to increase its activities in the area of diarrhoea prevention. Both the revised Supervisory Skills and the Programme Managers' Training Course contain a module devoted to interventions for the prevention of diarrhoea. These modules contain syntheses, expressed in simple terms, of current knowledge about breast-feeding, improved weaning practices, use of clean water, hand-washing, use of latrines, disposal of children's stools, and measles immunization. The summaries are followed by very specific suggestions as to what families should do and what support health workers can provide, and by proposed operational approaches to implementing the preventive interventions.

The beneficial effects of breast-feeding, in general and in the prevention of diarrhoeal disease morbidity and mortality in developing countries, are well documented and substantial. For example, non-breast-fed infants have a 25-fold greater risk of dying from diarrhoea in the first six months of life than exclusively breast-fed infants. Similarly, there is much evidence to show that breast-feeding rates in these countries are declining, especially in urban areas. Even when rates of initiation of breast-feeding are high, the practice is often not exclusive in the first four to six months of life, as recommended by WHO, and/or may be abandoned

after some months. (Breast-feeding rates in 16 of the larger countries with CDD programmes are shown in Figure 16). *It is for these reasons that the Programme has selected breast-feeding as the first preventive strategy to be promoted and supported as a major activity in countries.*

Figure 16: Breast-feeding rates in selected countries



Source: Division of Family Health, WHO, Geneva

During 1989, the Programme developed its approach to the support of breast-feeding activities through national CDD programmes. It is based on the premise that there are many factors affecting breast-feeding patterns in a specific society, and that a single intervention is unlikely to have a significant and sustainable long-term impact on breast-feeding practices. A breast-feeding programme should ideally involve many sectors and include some or all of the following elements:

- Training health professionals and other health workers;
- Restructuring health units, particularly maternity services;
- Reviewing and revising the curricula used in pre-service training of health professionals;
- Encouraging activities of NGOs, in particular, mothers' support groups;
- Promoting changes that facilitate breast-feeding among working women;

- Ensuring appropriate marketing and distribution of commercially prepared foods for infants and young children;
- Promoting breast-feeding through the media and other communication channels;
- Encouraging appropriate intervention and implementation research on breast-feeding, and helping to disseminate the results.

The activities to be supported through collaboration between WHO and a breast-feeding programme in a particular country will be based on available information regarding infant feeding practices, an analysis of existing activities and the agencies supporting them, and WHO's current involvement in such activities. Different approaches will undoubtedly be used in different countries, although some areas of collaboration may be appropriate in many countries (e.g., training of health professionals in lactation management). In these areas, the Programme may itself prepare materials if they do not already exist. Support will also be provided for implementation research (see section 3.3.3[a]).

Eight countries have to date been contacted through consultant visits to explore the possibility of collaboration in activities related to breast-feeding. The Programme will start to collaborate with these countries in 1990, when a full-time staff member will be available to work in this area.

2.8 Collaboration with other international and bilateral agencies

During the biennium, national CDD programmes received technical cooperation and financial support from a number of international and bilateral agencies. WHO considers it to be one of its responsibilities to coordinate such assistance, in order to ensure that countries receive consistent and correct technical advice and donors do not duplicate their financial assistance. Active collaboration exists with a number of agencies, as described below:

- As noted in various places in this report, **UNICEF** and WHO are cooperating in a number of important programme areas, in particular communication and ORS production. In many countries, the bulk of external financial assistance to national CDD programmes comes from UNICEF country funds. During the biennium, the UNICEF Training Division in New York prepared a training course to strengthen the technical knowledge of UNICEF programme officers and better familiarize them with operational aspects of national CDD programmes. WHO assisted in the development of this course, which is based on the WHO CDD Programme Managers' Course, and participated in its field-test at the UNICEF Middle East and North Africa Office in Amman, Jordan, in April 1989. This course will be organized in all UNICEF regions during the 1990-1991 biennium.

- **Associate Professional Officers:** Associate Professional Officers have been made available to work in national CDD programmes by (a) the Swedish International Development Agency (SIDA) - for Bolivia, Ethiopia, Guinea Bissau, Kenya, Viet Nam, and the WHO Intercountry Health Development Team III in Zimbabwe; (b) the Danish International Development Agency (DANIDA) - for Liberia and Sudan; (c) the Government of Italy - for Burundi, the Philippines, and the Western Pacific Regional Office; (d) the Finnish Development Agency (FINNIDA) - for Papua New Guinea and the Western Pacific Regional Office; (e) the Government of the Netherlands - for Brazil, Ghana, Nepal, Peru, Sudan, and the Western Pacific Regional Office; (f) the Government of the Federal Republic of Germany - for Nigeria and the WHO Intercountry Health Development Team II in Burundi; and (g) the Government of Belgium - for Haiti.

  Some of these bilateral agencies also provided support for national CDD programmes, e.g., SIDA in Ethiopia, DANIDA in Kenya.

- **US Agency for International Development (USAID):** At the global level, the Programme is collaborating with (a) Technologies for Primary Health Care (PRITECH), which has been active in some 20 countries and has provided particularly important support to the countries of the Sahel in West Africa; (b) HEALTHCOM, which is directed by the US Academy for Educational Development and has collaborated with 15 countries in the communication component of ORT and other child survival strategies; and (c) "Project Support", managed by the Program for Appropriate Technology in Health (PATH), which is assisting national ORS production in the private sector in six countries. At the regional level, the Regional Office for Africa is collaborating with the Combating Childhood Communicable Diseases (CCCD) Project which is at present active in 12 African countries. Also, the Regional Office for the Americas is working closely with the Institute of Nutrition of Central America and Panama (INCAP) in training, evaluation, and operational research activities in the six Central American countries, supported by USAID. At the national level, the Programme has collaborated closely with USAID in a number of countries, including Egypt, Indonesia, Pakistan, Philippines, and Sudan.

- **Interagency Coordinating Committee:** To assist in guiding CDD activities in the Region of the Americas and in coordinating the support provided by PAHO, UNICEF, and USAID, a regional Interagency

Coordinating Committee (ICC) composed of representatives of these three agencies was established in 1989. At its first meeting on 8 March, the Committee agreed to convene a special task force to prepare a five-year CDD Regional Plan of Action. The plan was completed in late 1989; it contains recommendations for CDD programmes at the regional and national levels, provides guidelines for their development and for the provision of support to national governments by the three agencies, and establishes regional targets in respect of correct management of diarrhoea cases. During the 1990-1991 biennium, the regional ICC will meet at least twice a year. At the national level, it is hoped that an ICC can be established in all countries in the Region in which these agencies are providing support to CDD activities; in many countries this will be done by expanding the ICCs that are already in place to coordinate assistance to national EPI programmes.

- **International League of Red Cross and Red Crescent Societies:** The Programme has collaborated with the Child Alive Project of the League in countries where the project has been active, namely Bangladesh, Colombia, Honduras, India, and Sierra Leone. In November 1989, the Programme participated in an evaluation of the Child Alive Rehydration and Training Centre in Freetown, Sierra Leone; this centre was established by the League with support from the United Nations Development Programme, and is an important venue for clinical management training of health staff in the country.

- **Non-governmental organizations (NGOs):** In many countries, NGOs provide health services for a substantial proportion of the population. Thus, the Programme has continued its efforts to provide information to NGOs and, when requested, to organize training courses for NGO staff. In addition, NGO staff participate in CDD briefing courses held quarterly in Geneva (see section 4). The Programme participates in the annual training course Health Emergencies in Large Populations (HELP) organized by the International Committee of the Red Cross. It has also provided financial assistance to Medico-Lions Clubs de France to enable it to distribute ORS packets through its chapters in French-speaking Africa.

  The Region of the Americas has been particularly active in exploiting the potential of NGOs, whose members and staff, both in the health sector and in other community projects, can serve as useful providers of diarrhoea treatment and advice (see Box 19).

Working with non-governmental organizations in the Americas 19

Collaboration with non-governmental organizations (NGOs) in the Region of the Americas started in 1988 with the International Seton Institute. The regional CDD programme, together with the Institute, conducted CDD supervisory skills training for Sisters of Charity, who have in turn trained other sisters and auxiliary health staff. In 1988-89, 316 persons were trained in this way in Bolivia, Ecuador, El Salvador, Guatemala, Honduras, and Peru.

In June 1989, the National Confederation of NGOs of Colombia organized an international meeting to discuss strategies to achieve a better coordination of NGO activities with those of ministries of health and international and bilateral agencies of technical cooperation. NGOs from Bolivia, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Honduras, Nicaragua, and Peru participated, together with staff from UNICEF, USAID, and WHO. The group recommended that NGOs should strengthen their capabilities for planning and evaluation, and for analysing the cost-effectiveness of their interventions.

During the meeting, the content and training methodology of the CDD Supervisory Skills Course were described by Programme staff and NGO personnel who were acquainted with it. It was recommended that NGOs collaborating with WHO and ministries of health use this course to train their personnel.

As a consequence, a training course was held in Cali, Colombia, for the National Confederation of NGOs to prepare a group of 25 course facilitators. A further 25 persons were trained in collaboration with the Save the Children Federation in the Dominican Republic, and the Ministry of Health in that country is training selected personnel from local NGOs. Training plans have been drawn up in collaboration with ministries of health and Foster Parents International in Central America and the Andean countries. The NGOs will pay the course and travel costs and WHO will provide training modules and some course facilitators. Further courses are scheduled for 1990. ❑

- **International Children's Centre (ICC), Paris:** The Programme continued to participate in various technical and managerial training courses organized by the ICC for health staff from French-speaking developing countries.

2.9 Current status and future targets of the Programme

The current status of the Programme in relation to the original and revised global targets for 1989 and the targets for 1995 is presented in Table 3.

It can be seen that the original 1989 target for the number of operational programmes has been passed; however, because of the difficulty of ascertaining the exact status of programmes in many smaller countries, it has not been possible to determine whether the revised target of 115 countries has been achieved.

With respect to the ORS access rate, the original 1989 target of 50% was surpassed at the end of 1988; although figures are not yet available for 1989, it is unlikely that the revised target of 80% will be achieved. It is now estimated that this level will be reached in 1995. The situation is very similar for the ORT use rate; however, the treatment-related target set for 1995 has been made more demanding: 50% of cases are to receive correct case management, i.e., ORS or a recommended home fluid and continued feeding.

In the area of training, the targeted coverage (20%) for supervisory skills was almost achieved and a target of 40% has been set for 1995. However, the case management training coverage stood

only at 11%, slightly more than half of the projected value. It is clear that a major increase in clinical training will be required to achieve the 1995 target of 40% coverage of health staff with diarrhoea case management responsibilities.

The 1989 targets set for programme reviews and number of developing countries producing ORS have been achieved. It is not considered appropriate, at this stage, to set a target for a larger number of ORS-producing countries.

It is to the credit of national CDD programmes world-wide that most of the original 1989 targets were met. That none of the revised targets could be achieved indicates that a greater commitment to diarrhoeal diseases control will be needed in order to meet the targets established for 1995. A concerted effort on the part of all concerned will be required in the 1990s to achieve adequate progress and, as a consequence, the desired impact on childhood mortality.

Table 3: Programme targets and status

Category	Original 1989 target	Status at end of 1987	1988	1989	Revised 1989 target[a]	1995 Target
Operational programmes (No.)	80	96	100	100	115	[c]
ORS access rate (%)	50	58	58	[b]	80	80
ORT use rate (%)	35	30	34	[b]	50	[c]
Case-management rate (%) [d]	[e]				[e]	50
Supervisory skills training coverage	2000 staff	7%	8%	17%	20%	40%
Case management training coverage (%)	[e]	6	8	11	20	40
Programme reviews (No.)	80	59	71	93	80	160
Developing countries producing ORS (No.)	60	55	58	61	60	[c]

[a] Revised in 1986.
[b] Figure for 1989 will be available in 1991.
[c] No target set for 1995.
[d] Percentage of diarrhoea cases in children below age 5 treated with ORS or a recommended home solution and receiving continued feeding.
[e] Not set as a target at the time.

■

3. RESEARCH

3.1 Research policy and management

In the 1988-1989 biennium the Programme continued to support clinical, epidemiological, and laboratory research on priority topics. Increasing emphasis was also given to intervention-related research to develop and evaluate new or improved measures to prevent childhood diarrhoea. This research was guided by three scientific working groups (SWGs), which specifically focused on the development of improved treatment methods (SWG on Case Management [CMT]), the identification of interventions (other than vaccines) for preventing diarrhoea or reducing its severity (SWG on Epidemiology and Disease Prevention [EDP]), and vaccine development and evaluation (SWG on Immunology, Microbiology, and Vaccine Development [IMV]). Based on a recommendation made in 1987 by the Programme's Technical Advisory Group (TAG), operational research was reoriented to focus entirely on solving problems encountered in the establishment or operation of national CDD programmes and was placed within the services component. In accordance with another TAG recommendation, steps were taken globally to develop implementation research activities, i.e., studies to determine the feasibility and impact of measures to prevent or treat diarrhoea when delivered in the context of national control programmes.

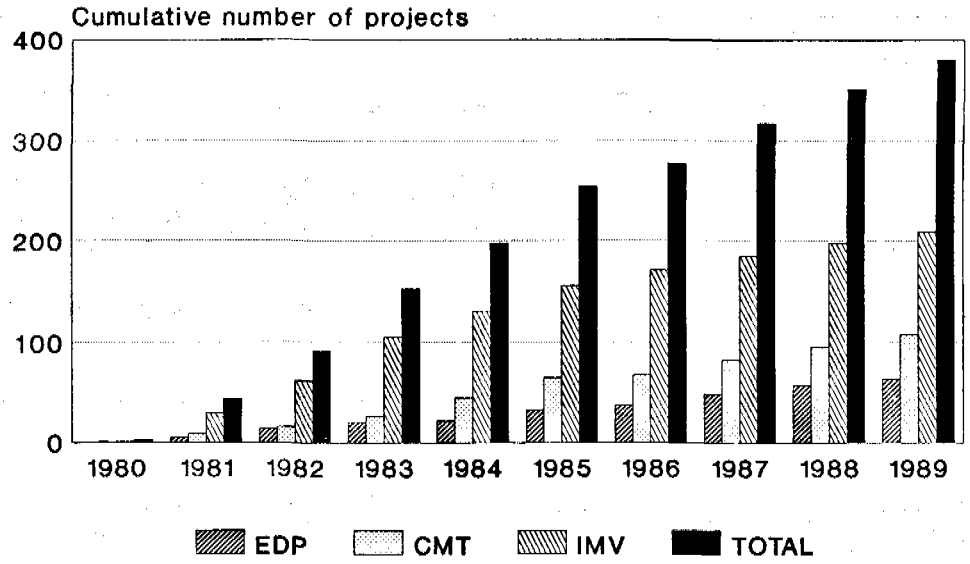
3.2 Activities of scientific working groups (SWGs)

The three global SWGs each met twice in both 1988 and 1989 to review the progress of ongoing or completed projects, consider the provision of support to new projects, and advise on the most appropriate strategies to achieve the Programme's research objectives. *Altogether, they awarded support to 34 new projects in 1988 and 31 in 1989, bringing the total number of projects supported by the SWGs to 382 (Figure 17), of which 267 (70%) have been completed.* The 65 new projects are being carried out in 24 countries; 83% of the projects are in developing countries. The topics being studied are summarized in Table 4.

Table 4: Major topics of new projects funded during 1988-1989

Topic	No. of new projects
Development of improved ORS formulations	11
Dietary management of acute and persistent diarrhoea	7
Drugs for the management of acute diarrhoea, persistent diarrhoea, or dysentery	5
Risk factors for severe/persistent diarrhoea	3
Infant feeding practices	3
Personal and domestic hygiene	5
Development of improved diagnostic methods	2
Epidemiology of specific enteropathogens	5
Vaccine development	4
Vaccine evaluation	12
Research strengthening and training awards	7

Figure 17: Research projects supported by Scientific Working Groups*, 1980-1989



*Until 31 December 1985 projects received support from the Steering Committees of the SWGs on Viral Diarrhoeas, Bacterial Enteric Infections, and Drug Development and Management of Acute Diarrhoea. These projects have been reassigned according to the priorities of the current SWGs

3.3 Research projects

The following sections summarize information that has emerged from completed studies and highlights ongoing projects of particular importance. A list of articles reporting the results of WHO-supported research published since the Fifth Programme Report is given in Annex 3.

3.3.1 SWG on Case Management

During 1988-1989 this SWG continued to focus on improved methods for the treatment of diarrhoea. Highest priority was given to developing improved ORS formulations, defining appropriate dietary regimens for acute or persistent diarrhoea, and examining the effectiveness of antidiarrhoeal drugs and antibiotics in the management of acute diarrhoea, persistent diarrhoea, and shigellosis.

a) Improved ORS formulations

Research on this topic is seeking to develop an improved ORS formulation that will appreciably reduce the volume and duration of diarrhoea while efficiently correcting dehydration and maintaining hydration. Such a solution would, if successfully developed, combine the benefits of oral rehydration with those of an antidiarrhoeal medication. A total of 38 projects has been supported to date by the SWG/CMT in which the standard WHO/UNICEF ORS has been compared with experimental formulations (Table 5).

Table 5: WHO-supported clinical trials on improved ORS

	Ingredients	Amount per litre	Number of studies	Sites
1.	Glucose plus glycine and/or glycyl-glycine	 12-20 g 8 g	 5	**Costa Rica, Indonesia, Peru, Philippines, Thailand**
2.	Maltodextrin (MD25) glycine and/or glycyl-glycine	 20 g 8 g	 7	**Myanmar**[a], **Egypt**[b], **India**[a], **Nigeria, Venezuela**
3.	Maltodextrin (MD02)	50 g	4	**Bangladesh, Egypt, India, Indonesia**
4.	Glucose plus L-alanine	16 g 8 g	 4	Bangladesh[a], **India,** Philippines
5.	Glucose plus L-alanine	16 g 5 g	1 1	Bangladesh[b], Philippines
6.	**Glucose plus** **L-alanine**	9 g 5 g	 1	Egypt
7.	**Glucose plus** L-glutamine	16 g 13 g	 1	Indonesia
8.	Glucose plus L-glutamine	9 g 7 g	1 1	Brazil, India
9.	Rice-based ORS	30 g	1	**Senegal**
10.	Rice-based ORS	50 g	8	Bangladesh, Chile, **Egypt, India**[b], **Indonesia,** Madagascar[c], Mexico, Peru
11.	Mung bean powder	50 g	1	**India**[b]
12.	Sorghum powder	50 g	1	**Rwanda**
13.	Maize powder	50 g	1	Cameroon

[a]Two studies were conducted in this country with this formula.
[b]A single study evaluating 2 experimental solutions.
[c]In severely malnourished children.

Countries typeset in **bold face** are where studies have been completed

i. Cereal-based ORS

Rice-based ORS: *A recently completed clinical trial conducted in Indonesia and the preliminary results of another trial undertaken in Chile have confirmed the greater efficacy of rice-based ORS as compared with standard ORS.* In the Indonesian study conducted in adult cholera patients, the rate of stool output during the first 24 hours was reduced by 20%, the total stool output by 30%, and the ORS intake by 30% in the group receiving rice-based ORS. In the Chilean study, conducted in children under 3 years of age with acute diarrhoea, the duration of diarrhoea was reduced by 25% in the group treated with rice-based ORS.

A review was prepared by the Programme of these and earlier controlled clinical trials conducted to evaluate the efficacy of rice-based ORS in patients with acute diarrhoea. The review indicated that, while rice-ORS has considerable benefits in the treatment of high-output diarrhoea such as cholera (see Box 20), its effect in less severe diarrhoea needs to be more thoroughly assessed. An outpatient study is therefore planned in Bangladesh to measure the magnitude of the reduction in the duration of diarrhoea in young children with acute, non-cholera diarrhoea treated with rice-based ORS. The review also suggested that early feeding with a rice-based diet does not confer to glucose-based ORS the benefits of rice-based ORS. However, more studies are needed on this topic, especially in young children with acute, non-cholera diarrhoea, since these observations were made in studies in which most patients had cholera and the amount of rice actually taken by the patients was only determined in one study. A multicentre clinical trial to address this issue is planned to start in 1990 with WHO support. In addition, clinical trials are under way to investigate the safety and efficacy of rice-based ORS in severely malnourished children (Madagascar), in infants under 6 months of age (Mexico), and in a population with a high prevalence of glucose intolerance (Peru). There is concern that in these three groups of patients the rice starch may be digested and absorbed too slowly to be effective in reducing stool output.

Stability studies have been undertaken of ORS containing pre-cooked rice powder, in which the salts have been incorporated in the rice powder during pre-cooking and which forms a relatively stable suspension when reconstituted in water. The results showed that this formulation, packed in aluminium foil, is stable for at least one year when stored at 51°C and ambient humidity. It appears in fact to be more stable than the standard citrate-ORS kept under the same conditions. These results show that it is possible to use pre-cooked rice powder as a component of packaged ORS. However, recommendations concerning the production and possible use of this formulation need to await the outcome of the above-mentioned clinical trials and the field studies described in section (d) below.

What have we learnt from clinical trials of rice-based ORS? **20**

Thirteen clinical trials have been conducted in a total of 1272 patients with acute diarrhoea to compare rice-based ORS (containing 50-80 g per litre of cooked rice powder) and standard glucose-based ORS. In all studies, the rate of stool loss was less during the first 24 hours of treatment in patients given rice-based ORS than in those given standard ORS, the average percent reduction ranging from 3-53%. The benefit of rice-based ORS was greater in rapidly purging patients with cholera (six studies; average reduction in stool output during first 24 hours = 33%) than in young children with acute, non-cholera diarrhoea and lower purging rates (seven studies; average reduction = 17%). In four studies (three involving cholera patients), a rice-based diet was given to both groups following initial rehydration. Nevertheless, the rate of stool loss during the first 24 hours averaged 31% less in recipients of rice-based ORS than in controls given standard glucose-based ORS. The average duration of diarrhoea after the onset of therapy with rice-based ORS was reduced in five studies by 9-33%, and in three studies the mean total stool output was reduced by 21-49%.

These results indicate that (i) stool output during the first 24 hours of treatment is significantly reduced in patients with acute diarrhoea given rice-based ORS as compared with patients given standard ORS, the effect being twice as great in patients with rapid stool loss due to cholera as in cases with less severe, non-cholera diarrhoea; (ii) treatment with rice-based ORS also reduces the duration of diarrhoea, and this, combined with the effect on the rate of stool loss, leads to an even greater percent reduction in total stool output; (iii) the effect of rice-based ORS on total stool output in children with acute, non-cholera diarrhoea has not been precisely defined, but may be in the range of 30-35%; and (iv) feeding a rice-based diet to patients given standard ORS does not appear to cause the same reduction in the rate of stool output as treatment with rice-based ORS. ❑

Other cereal-based ORS formulations: A study has recently been completed in Rwanda to compare the outcome in children under 2 years of age with acute diarrhoea treated with either standard ORS or ORS containing 50 g of sorghum powder in place of glucose. The results showed that in those receiving the sorghum-based ORS the rate of stool output during the first 24 hours of treatment was reduced by 17%, the total stool output by 40%, and the mean duration of diarrhoea by 33%. These results suggest that cereals other than rice could effectively replace glucose in the standard ORS formulation for the treatment of dehydration, and may also form a suitable component of household solutions for early treatment of diarrhoea in the home.

ii. Improved ORS based on defined solutes

ORS containing minimally hydrolysed maltodextrin: The encouraging results with rice-based ORS prompted studies using similar amounts of another starch-like product: maltodextrin. Maltodextrin was selected for inclusion in ORS because it is readily soluble and relatively inexpensive. Four studies of an ORS preparation containing 50 g/l of a minimally hydrolysed maltodextrin (MD02) in place of glucose have been completed (Bangladesh, Egypt, India, Philippines).

The results from these studies showed no additional beneficial effect of this ORS formulation on stool output and duration of diarrhoea in children with acute diarrhoea when compared with glucose-based ORS. In addition, maltodextrin MD02 was found to be unsuitable for inclusion in ORS formulations because of its poor

stability when stored under tropical conditions. These results suggest that the beneficial effects of rice-based ORS are attributable, at least in part, to the absorption-promoting action of the proteins and amino acids that are present in rice but not in maltodextrin.

ORS containing L-alanine and glucose: Encouraging results with an ORS containing L-alanine and glucose (8 and 16 g/l, respectively) in adult cholera patients prompted studies with this solution in children under 3 years of age. The results from an initial study in India showed that an experimental solution containing 90 mM glucose and 90 mM L-alanine had no beneficial effect on stool output and duration of diarrhoea in young children with acute diarrhoea. However, the urine output in children receiving ORS with L-alanine was significantly higher, suggesting that the lack of impact of the experimental ORS might be a result of its greater osmolality compared with standard ORS (400 mOsm/l *vs* 331 mOsm/l). Two additional clinical trials have therefore been initiated to investigate the efficacy of two L-alanine-based ORS formulations of reduced total osmolality. In one study (Philippines) the total osmolality has been reduced by decreasing only the L-alanine content of the experimental ORS to 50 mM instead of 90 mM (total osmolality 360 mOsm/l), while in the other study (Egypt) both the L-alanine and the glucose content were reduced to 50 mM (total osmolality 320 mOsm/l). The results of these studies should provide valuable information concerning the importance of osmolality in ORS solutions.

ORS containing L-glutamine and glucose: A recently completed study (USA) which evaluated the *in vitro* absorption-promoting effects of L-glutamine has confirmed that L-glutamine, when given with glucose, is a stimulator of tissue metabolism and transport and a unique stimulator of electroneutral NaCl absorption across the normal and rotavirus-damaged pig intestine. Two clinical trials to evaluate the efficacy in young children of ORS containing glucose (50 mM) and L-glutamine (50 mM) (total osmolality 320 mOsm/l) have therefore been initiated in Brazil and India. Results will be available from these studies during 1990.

No further studies of ORS formulations based on defined solutes are planned until results are available from the above-mentioned ongoing studies.

iii. Studies of flavoured ORS

Many commercially-produced ORS formulas are flavoured (and/or coloured) in the belief that this will increase the acceptance of ORS for home use. However, concern has been expressed that flavoured ORS might be consumed more rapidly and in greater amounts, leading to over-hydration and hypernatraemia. One controlled clinical trial of an orange-flavoured and coloured ORS preparation was completed in Egypt with support from the Programme. In this study, children aged 3 to 36 months who were

not severely malnourished and were hospitalized for acute diarrhoea with moderate dehydration were offered the flavoured and coloured or the standard ORS *ad libitum* during maintenance therapy (after rehydration). No differences were observed between the study and the control groups with regard to ORS intake, time required for rehydration, and mean serum sodium concentration at 24 hours. However, the acceptability of ORS (based on the willingness of the patient to take ORS) was significantly improved with the flavoured ORS. *These results demonstrated that in a controlled hospital setting and under close supervision there is no adverse effect associated with the use of flavoured ORS during maintenance therapy; in particular, increased acceptability did not lead to over-consumption of flavoured ORS.* A community-based study is planned to start in 1990 to address the more important question of the influence of flavouring and colouring on acceptance and correct use of ORS for treatment of diarrhoea in the home.

b) Feeding during and after diarrhoea

i. Acute diarrhoea

Animal milk: *There is now compelling evidence, derived from a number of studies (some of which were supported by the Programme), that full-strength cow's milk formula is safe and nutritionally beneficial in non-breast-fed children older than 6 months with acute diarrhoea.* Therefore, a systematic restriction of milk intake by giving diluted milk during diarrhoea, which has the disadvantage of diminishing energy intake, is not necessary. This fact was confirmed in a recently completed study in Lima, Peru, which assessed nutrient absorption, weight gain, and faecal output in children given isocaloric diets based on (i) wheat noodles and cow's milk, (ii) wheat noodles and lactose-hydrolysed cow's milk, (iii) cow's milk, and (iv) hydrolysed cow's milk. The results from this study showed that, while stool output and duration of diarrhoea were increased in the latter two groups which received only milk, their nutritional outcome was not adversely affected. Three additional studies on the dietary management of diarrhoea with animal milk are under way. In Brazil and Guatemala, randomized, controlled clinical trials are evaluating the impact of early feeding with full-strength cow's milk formula in non-breast-fed infants under 6 months of age, for whom there is as yet no evidence that this feeding approach is safe. In India, a clinical trial is evaluating the effect of feeding yoghurt or whole-milk formula on the clinical course and nutritional response of severely malnourished children with diarrhoea. Final results will be available from these studies in 1990.

Continued feeding during diarrhoea: There is now general agreement that continued feeding during acute diarrhoea results in improved nutritional status and, in some cases, less severe diarrhoea. Continued feeding is therefore an essential component of case management of acute diarrhoea. However, very little information is available on the nutritional impact of "optimal"

feeding during convalescence from acute diarrhoea. To address this issue a study is in progress in Egypt to determine the nutritional impact of liberal feeding during acute diarrhoea and for one month thereafter in adequately nourished infants aged 4 to 12 months. The feeding intervention includes nutritional education of the mothers while the children are hospitalized and during weekly follow-up visits, and the provision of food for the infants during convalescence. A control group receives only routine dietary advice at the time of discharge. Preliminary results suggest that, after four weeks, weight gain is significantly higher in the study group. Provided that these results are confirmed in the final analysis, they suggest that continued feeding during diarrhoea and increased energy intake during convalescence can prevent the negative impact of diarrhoea upon growth, even in children who are not severely malnourished.

The results of these studies and of other clinical trials, some of which were supported by WHO, form a firm basis for the principles of the dietary management of acute diarrhoea described in Box 21.

Dietary management of acute diarrhoea: basic principles 21

1. Breast-feeding

Up to the age of 4-6 months, breast-feeding provides young infants with their entire normal daily requirements of water and nutrients. During diarrhoea, breast-feeding should not be reduced or stopped, but allowed as often as the infant desires it. In addition, other fluids should be given to replace the increased faecal losses of water and salts.

2. Other milk feeds

In children who take breast-milk substitutes, the milk or formula usually consumed can be reintroduced after rehydration has been completed. For children under 6 months of age who do not yet take soft foods, the milk should be diluted with an equal volume of plain water over a period of 48 hours.

Occasionally, however, diarrhoea may worsen when milk is given and signs of dehydration may reappear. For infants who normally take soft foods with animal milk, the amount of lactose in the diet should be temporarily reduced by either diluting the milk as described above or replacing it with yoghurt or a similar fermented milk product. At least half of the calories provided to these infants and children should be as non-milk foods, e.g., mixtures of cereals, pulses, and vegetable oil. Special lactose-free or hydrolysed protein formulas should be used only if clinical manifestations of milk intolerance are observed in spite of the above measures; they should never be used routinely.

3. Semi-solid and solid foods

From the age of 4-6 months, all children should be taking soft or semi-solid foods, in addition to breast milk. These foods should be offered as soon as the child is rehydrated. *There is no reason to restrict or delay feeding until diarrhoea stops.* Locally prepared foods should be used that are energy-rich and easily digested. When given alone, most staple foods do not provide sufficient calories for infants and young children, especially when they are prepared as drinks (e.g., cereal gruels). Therefore, foods should be offered that are composed of (i) complementary protein sources (e.g., mixtures of cooked cereal and pulses), (ii) complex carbohydrates (starches) rather than sugar (to avoid hyperosmolarity), and (iii) vegetable oil to increase energy content.

Children with diarrhoea often need coaxing to eat. Food should be offered to them in frequent small meals (at least six times a day).

4. Feeding after diarrhoea stops

Extra food should be given after diarrhoea stops. This can be done by giving one extra meal each day for at least two weeks, using the same energy-rich foods as described above. Children with significant undernutrition should continue to receive extra food until any deficit of weight-for-height has been recovered. ❑

ii. Persistent diarrhoea

In children under 5 years of age, 3-20% of all episodes of acute diarrhoea become persistent, i.e., they last more than 14 days. These episodes are often associated with a deterioration in nutritional status and lead more frequently to death than episodes of shorter duration. The main goal of their management should be to maintain the child's hydration and nutritional status while the intestinal damage is being repaired.

A number of studies have shown that milk intolerance can play an important role in persistent diarrhoea. Thus, one possible approach to the management of these children would be to reduce dietary lactose while maintaining a high energy intake. A study is therefore being supported in Algeria to compare the duration of diarrhoea and stool output in non-breast-fed children aged 3 to 36 months with persistent diarrhoea given a diet based on (i) yoghurt (in which the lactose content of milk is reduced by about 50% without appreciably affecting the energy content), or (ii) cow's milk formula. The results to date suggest that the duration of diarrhoea and stool output are significantly reduced in the group of children receiving the yoghurt diet (Table 6). A study is now planned in India to assess the impact of reducing the milk content of the diet of children with persistent diarrhoea by another approach, namely, giving them mixtures of milk and cereals.

Table 6: Impact of milk and yoghurt diets on clinical and nutritional outcomes of persistent diarrhoea in non-breast-fed children aged 3-36 months

Outcome	Milk (n = 35)	Yoghurt (n = 28)	
Mean total diarrhoeal stool output (g)	1341	762	p<0.01
Percentage of episodes that lasted more than five days after initiation of diet	46	11	p<0.01
Mean weight gain on discharge (as % of admission weight)	1.5	2.3	ns

Medium-chain fatty acids (i.e., fatty acids containing 8-12 carbon molecules) are better absorbed than fatty acids with longer carbon chains. This suggests that the use of foods that are rich in medium-chain fatty acids may help to increase fat absorption and reduce faecal losses of fat and energy during persistent diarrhoea,

with a resultant improvement in nutritional status. Further studies are in progress in Bangladesh and Peru to evaluate the impact of diets containing medium-chain triglycerides on the clinical course and nutritional status of children with persistent diarrhoea. The results from these studies will allow the Programme to develop a more precise set of guidelines for the dietary management of persistent diarrhoea.

c) Drugs in the management of diarrhoea and dysentery

Acute diarrhoea: The SWG/CMT continued to support studies to evaluate existing antidiarrhoeal drugs, which are widely used but of unproven value in the treatment of acute diarrhoea in children. A randomized, controlled, double-blind clinical trial is now under way in Egypt to examine the efficacy of smectite, a clay product closely related to kaolin and attapulgite, in the treatment of acute diarrhoea in children aged 3 to 24 months.

Persistent diarrhoea: Studies conducted in South Africa (with support from other sources) and in the USA (with support from the Programme), have shown that the treatment of children with persistent diarrhoea with oral gentamicin resulted in a significant clinical improvement, primarily in patients from whom *Escherichia coli* had been isolated. This has prompted two further clinical trials of this drug in Guatemala and India. In Guatemala, the efficacy of oral gentamicin was assessed in a community-based study in children aged 3 to 36 months with diarrhoea lasting 15-17 days prior to enrolment; a control group received a placebo. The results indicated that oral gentamicin had no significant effect on the clinical outcome (Table 7). Results will be available from the study in India during 1990. An additional study is planned in Peru to evaluate the efficacy of an absorbable antibiotic (co-trimoxazole) in the treatment of persistent diarrhoea.

Table 7: Effect of oral gentamicin on clinical outcome of persistent diarrhoea

Outcome	Gentamicin (n = 37)	Placebo (n = 33)
Successes[a]	15 (40%)	16 (48%)
Failures	22 (60%)	17 (52%)

[a] Treatment success was defined as cessation of diarrhoea (less than 4 stools in 24 hours, with a return to the child's normal stool consistency, as assessed by the mother) for at least 48 hours after the end of the 5-day treatment.

Shigellosis: In the last 20 years, in many developing countries, bacillary dysentery, especially in an epidemic form, has been a major public health problem and an important cause of death in children under 5 years. Moreover, an increasing proportion of *Shigella* strains of various serotypes isolated in different parts of the world are now resistant to the most commonly used antibiotics. There is therefore an urgent need to identify alternative antibiotics that are safe and effective for use in shigellosis. In Guatemala, a randomized, double-blind clinical trial is evaluating the efficacy of pivmecillinam (an amdinopenicillin). Studies are also planned to evaluate in young children the efficacy of the new fluoroquinolones (such as ciprofloxacin) in the treatment of shigellosis caused by strains that are resistant to conventional antibiotics. Finally, studies are planned to develop a simplified regimen for treatment (including single-dose therapy).

d) Field studies

The SWG/CMT is encouraging research to define optimal approaches for the promotion of correct case management of diarrhoea at the household level. A study is planned in Peru to investigate the determinants of care-seeking practices during childhood diarrhoea. The study will use ethnographic data collection techniques to determine the manner in which caretakers' perceptions of diarrhoea influence the sequence and timing of care-seeking, and to assess the role of situational factors (such as access to health care, availability and cost of drugs) in the decision-making process. The information collected will assist efforts to promote correct care-seeking practices and to discourage the use of inappropriate medication.

Another study is planned in Guatemala to assess the social, cultural, and environmental determinants of feeding during and after acute diarrhoea, and to design an educational intervention to promote improved feeding practices. In this study, rapid ethnographic and observational studies and formative research will be conducted, focusing on major gaps in knowledge which are hindering public health efforts to promote feeding during and after diarrhoea. Results from a number of research projects suggest that most children continue to be offered food at home during diarrhoea and that supplementary feeding during and after diarrhoea has a beneficial impact on the clinical outcome and nutritional status of ill children (see section [b] above). However, a number of issues still need to be addressed, e.g., to what extent does anorexia and/or vomiting impede proper feeding during diarrhoea, what are the perceptions of caretakers with regard to the need for extra feeding during convalescence, and can a nutritional benefit be achieved by promoting feeding only during and after diarrhoea or must general feeding practices also be improved?

A frequently cited source of dissatisfaction with ORT is its failure to relieve or alleviate the symptoms of diarrhoea. Rice-based ORS shows promise as an antidiarrhoeal agent that can satisfy both health providers and consumers in this regard (see section [a] above). Efforts are now under way to develop community trials to determine whether the promotion of packaged rice-based ORS can increase the rates of acceptance and correct use of ORT for the prevention of dehydration, especially when the rice-based product is promoted as having antidiarrhoeal properties.

3.3.2 SWG on Epidemiology and Disease Prevention

This SWG was formed in 1986 to stimulate and support research that will lead to the development of interventions to prevent diarrhoea or reduce its severity. Of highest priority are studies to develop approaches to improve infant feeding practices and personal and domestic hygiene, since interventions of this kind appear to have the greatest potential for inclusion in control programmes. Also of high priority are studies to evaluate the impact on diarrhoeal morbidity of vitamin A supplementation of young children. The SWG/EDP also supports research to define risk factors for severe diarrhoea (including acute dehydrating diarrhoea and acute dysentery), persistent diarrhoea, and diarrhoeal death. It is expected that the results of the research supported by the SWG/EDP will serve to direct and reinforce the Programme's global activities in the area of prevention in the next few years. The intervention-related projects supported by the SWG since its inception are listed in Table 8.

a) Infant feeding practices

Studies have been completed or are in progress to examine the role of infant feeding practices in the transmission of diarrhoeal disease. Particular emphasis has been given to identification of the determinants of such practices and to the development and evaluation of approaches to promote exclusive breast-feeding and improved weaning practices.

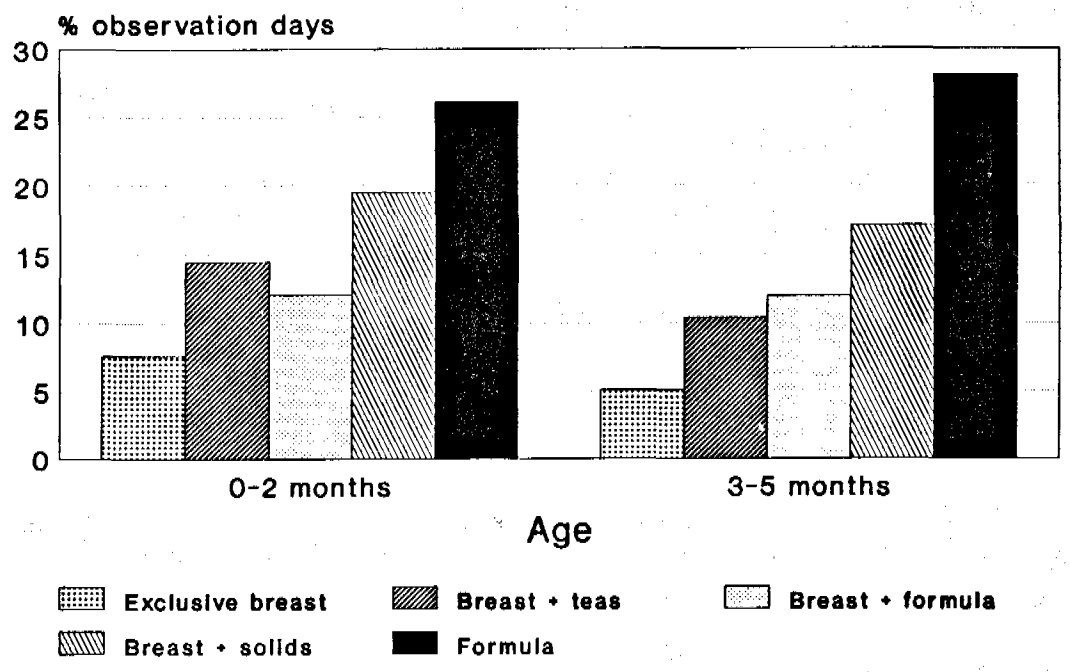
i. Role of breast-feeding

Important new information has been made available since 1986 which further defines the role of breast-feeding in protecting infants against diarrhoea, especially severe episodes. An analysis of two longitudinal studies (in Brazil and Peru) was completed during 1988-1989. In Peru, the prevalence of diarrhoea was doubled among otherwise exclusively breast-fed infants who were given teas and water during the first six months of life as compared with the prevalence among infants given **only** breast milk (Figure 18). The prevalence of diarrhoea among non-breast-fed infants aged 3 to 5 months was found to be over five times greater than among those exclusively breast-fed in the same period.

Table 8: Projects related to risk factors and interventions

Topic	Site	Type of study		
		Risk factor	Determinant	Intervention
Breast-feeding	Brazil	Completed	Completed	
	Iraq	Completed		
	Guatemala	Completed		
	Peru	Completed	Ongoing	Ongoing
	Philippines	Ongoing	Ongoing	Ongoing
	Turkey			Completed
Weaning practices	Myanmar	Completed		
	Kenya	Completed		
	Nigeria	Ongoing		
	Peru		Ongoing	Ongoing
Personal and domestic hygiene	Bangladesh			Ongoing
	China			Completed
	Guatemala		Ongoing	Ongoing
	Nigeria	Ongoing		
	Pakistan		Ongoing	
	Papua New Guinea	Completed		
	Peru	Ongoing	Ongoing	Ongoing
	Zaire		Ongoing	Ongoing
Vitamin A supplementation	India			Ongoing
	Brazil			Ongoing
Risk and prognostic factors for severe diarrhoea and diarrhoeal mortality:				
Dehydrating diarrhoea	Bangladesh	Ongoing		
	Brazil	Completed		
	Egypt	Ongoing		
	Philippines	Ongoing		
Diarrhoeal mortality	Brazil	Completed/ Ongoing		
Persistent diarrhoea	Bangladesh	Ongoing		
	India	Completed		
	Pakistan	Ongoing		
	Peru	Ongoing		
Shigellosis	Bangladesh	Ongoing		

Figure 18: Prevalence of diarrhoea by category of feeding (Huascar, Peru)



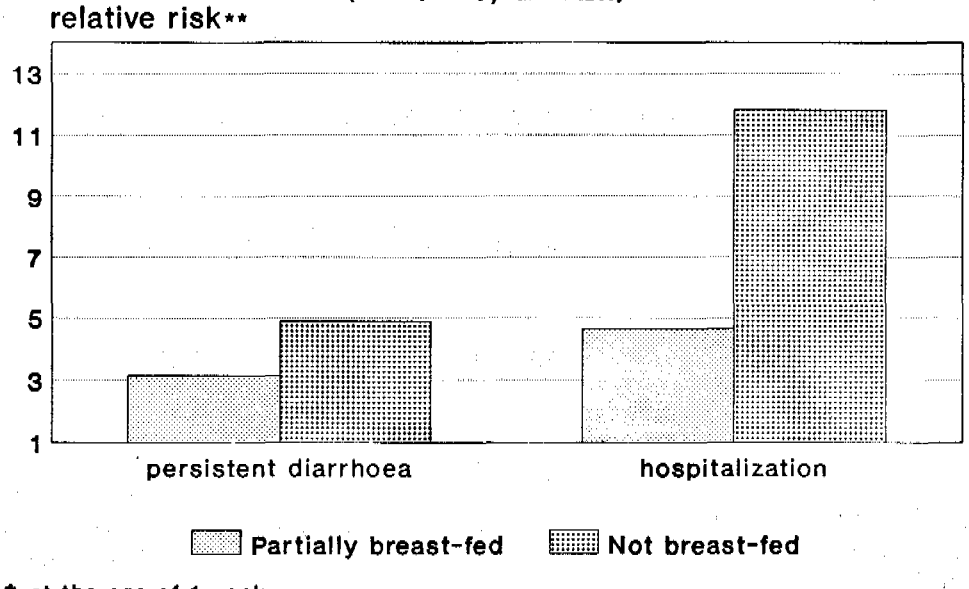
In Brazil, exclusive breast-feeding was found to be particularly protective against persistent diarrhoea or severe diarrhoea (requiring hospitalization), even after controlling for socioeconomic status. Infants who started to receive milk supplements in addition to breast-feeds in the first week of life were three times more likely to have persistent diarrhoea and five times more likely to be hospitalized for diarrhoea before the age of 3 months than infants of the same age who were exclusively breast-fed (Figure 19). The risks were even greater among the non-breast-fed. Infants who stopped breast-feeding during the first week of life were at five times higher risk of having persistent diarrhoea and twelve times higher risk of hospitalization for diarrhoea before the age of 3 months than those exclusively breast-fed. Such risk differentials, high as they are, still represent conservative estimates of the role of exclusive breast-feeding, since some of the children classified as breast-fed for the analysis would have been weaned before the age of 3 months. Also of considerable significance was the finding, in the same study, that the protection given by breast-feeding against diarrhoea was not uniform across different socioeconomic strata: it was observed to be more protective in the families of mothers with less schooling and in families of low income than in their counterparts with higher socioeconomic status. Data from

Bangladesh suggest that continued breast-feeding may protect against diarrhoeal morbidity and mortality well into the third year of life. However, results from both epidemiological and laboratory-based studies indicate that the protective effect is unlikely to persist after the termination of breast-feeding. Continued breast-feeding should therefore be promoted for as long as possible, at least for the first year of life.

ii. Role of bottle-feeding

A better understanding of the risks associated with early supplementation and the termination of breast-feeding was acquired through studies conducted in Peru and the Philippines, with support from the Programme, which investigated the risk of contamination of foods and fluids given in feeding bottles. In Peru, 35% of the bottle nipples and 23% of the feeding bottles sampled among those used by 135 infants were found to be contaminated with faecal bacteria. In the Philippines, between 88 and 96% of the feeds served in feeding bottles to infants under the age of 6 months were found to be contaminated with faecal bacteria. Unfortunately, feeding bottles are the preferred mode of giving liquid feeds to infants and young children in Brazil, Peru, and the Philippines. The risks and perceptions associated with the use of teas and feeding bottles are described in Box 22.

Figure 19: Relative risk of persistent and severe diarrhoea among infants under 3 months of age, by feeding mode* (Pelotas, Brazil)



* at the age of 1 week
** reference group: exclusively breast-fed

Teas and feeding bottles: risks and perceptions 22

A study of feeding practices, food and fluid contamination, and diarrhoeal morbidity was conducted among 153 infants followed during their first year of life in a poor, peri-urban community in Peru. It identified an increased risk of contamination associated with the use of feeding bottles. Teas, often used from the first month of life, had a low frequency of contamination soon after preparation (3% of 87 specimens) and, if served in a cup, also had a low frequency of contamination at the time of consumption (2% of 49 specimens). However, when the teas were served in feeding bottles, 31% of 74 specimens were contaminated ($p < 0.01$), and 20% had *E. coli* counts of 10^4 or more.

This information is being used in another study which aims to develop and test an intervention to promote exclusive breast-feeding in the first four months of life and to discourage the use of feeding bottles in the same setting. In-depth interviews with 26 mothers and one focus group discussion with nine mothers of infants and young children indicated that although mothers are often aware that the use of feeding bottles increases the risk of diarrhoea among young infants, they believe bottles are more practical and hygienic because they keep food and drinks warm for a longer period and cause less spillage and spoilage.

In Brazil, in-depth interviews with 21 mothers of young children and with other key informants, conducted in the context of a study on risk factors for severe diarrhoea, indicated that teas are given in feeding bottles from the first week of life to relieve thirst and pain (from colic, earache), prevent and treat colds, soothe fretful infants, and treat diarrhoea.

This information highlights the risk of contamination associated with teas given in feeding bottles. It indicates, however, that this practice is common and that it is little influenced by an increased awareness of the health risks involved. Interventions to discourage the use of feeding bottles and teas will have to deal with the fact that feeding bottles are considered to be the most practical way of giving drinks to infants and that teas are thought to be required by most infants because of their numerous preventive and therapeutic properties. ❑

These findings have important implications for ongoing efforts to promote breast-feeding. They indicate that the promotion of breast-feeding has a substantial impact on the most severe diarrhoeal episodes, especially among deprived families where the risk of morbidity is highest. In summary:

- *During the first 4-6 months of life breast-feeding should be the exclusive mode of feeding;*
- *The use of teas and water should be discouraged;*
- *The use of feeding bottles should be strongly discouraged;*
- *Breast-feeding should be continued for as long as possible, at least for the first year of life.*

iii. Interventions to promote breast-feeding

Studies to identify the determinants of infant feeding practices or to measure the efficacy of interventions to promote exclusive breast-feeding during the first 4-6 months of life and partial breast-feeding thereafter have been completed or are in progress in Brazil, Peru, Philippines, and Turkey. Epidemiological, anthropological, and communication methods were applied to describe infant feeding patterns, define the factors that shape those patterns, and develop interventions to promote breast-feeding.

Early termination of breast-feeding was associated in Brazil with lack of family support in the first week after delivery, initiation of breast-feeding 12 hours or more after birth, breast-feeding on schedule rather than on demand, the use of estrogen-based contraceptives, and the perception by the mother of unsatisfactory infant growth. It was not, however, related to the work status of the mother.

There is a need to learn more about the efficacy of different approaches to promote exclusive breast-feeding in the first 4-6 months of life and partial breast-feeding thereafter. Improvements in maternity services, such as the training of staff in lactation management and the introduction of rooming-in, have been shown to increase rates of initiation of breast-feeding among mothers who deliver in such facilities. Other interventions are required, however, to support the continuation of breast-feeding after discharge, and its initiation in settings where a substantial proportion of the deliveries occur in the home. Research is therefore being supported by the SWG/EDP in the Philippines (in cooperation with the International Development Research Centre) and Peru to evaluate community-based approaches to breast-feeding promotion. In Manila, a randomized, controlled trial is in progress to assess the role of voluntary mother-counsellors in promoting improved infant feeding practices through periodic home visits. In Lima, a study is under way to develop and evaluate a community-based intervention to promote improved infant feeding practices through existing community networks (such as mothers' clubs and other self-help groups). These studies are expected to generate important information on the usefulness of various approaches to promote exclusive breast-feeding during the first 4-6 months of life and appropriate weaning practices with continued breast-feeding thereafter.

b) Weaning practices

Support has been given to research on the role of food preparation, processing, and storage techniques in the transmission of diarrhoeal disease, identifying the major determinants of these practices, and developing interventions for their improvement.

Ethnographic studies have been conducted among poor, peri-urban families in Peru (in a project conducted in cooperation with the Thrasher Research Fund) to facilitate the design of messages and choice of communication channels to promote the use of weaning foods of higher energy content and to increase their bacteriological safety (see Box 23).

An observational study in Nigeria explored the prevalence of behavioural factors associated with increased risk of diarrhoea among weaning children. In half of the feeding episodes observed, the foods consumed were leftovers from other meals, and in only one-third of the feeding episodes had food been prepared at home. Food was often supplied by street vendors. Fermented foods were

prepared in 25% of the food preparation episodes observed, and used in about 10% of the feeds of children under 6 months and 30% of the feeds of children aged 6-11 months. A second study has just started in Nigeria to examine the potential for faecal contamination of these fermented, cereal-based weaning foods, which are usually more energy-dense, and likely to be bacteriologically safer than non-fermented foods.

Energy density and safety of weaning foods in Peru 23

An ethnographic study was conducted in Peru, in the context of a project to promote exclusive breast-feeding in the first four months of life and improved weaning practices thereafter (see Box 22). In-depth interviews were conducted with 26 mothers of children aged 5-15 months living in poor, peri-urban communities, to identify cultural and situational determinants of prevalent weaning practices.

Soups are believed by these mothers to be nutritionally complete foods that are good for children. Mothers are aware that young children have specific food requirements and believe that these are met by using certain ingredients, such as green leafy vegetables, which are infrequent in the adult diet, and by ensuring that the foods offered are of soft consistency. Refusal by the child, the cost of the ingredients, and lack of time for preparation were seen by these mothers as major constraints to the introduction of changes in child diets. Food is usually prepared once during the day. Foods are usually warmed, but not boiled, before serving. Mothers are aware of the risk of food spoilage (they notice, in particular, that soups go sour in the summer) but boiling is believed to damage the quality of some foods (porridges, for example, become too thick), takes longer, and is felt to be unnecessary because foods need to be cooled before they can be consumed, especially by young children.

Nevertheless, positive practices and concepts have been identified and will be built upon by the intervention which is now being developed. They include practices such as preparing special foods for young children, avoiding the use of foods left over from the previous day, keeping foods cool by placing them in a container in water, and boiling foods when they have been kept for long periods; and concepts related to the special food requirements of young children and to food spoilage. ❑

The projects under way in Peru and the Philippines for the promotion of breast-feeding (see section [a] above) have also developed communication approaches to increase the energy density of weaning foods and improve their safety. Another project will soon be initiated in Brazil, using ethnographic and observational research methods and small-scale behavioural trials, to identify weaning practices that are likely to increase the bacteriological safety of weaning foods and can be adopted by the families of children at high risk of diarrhoea.

Although the research results obtained so far have identified some basic principles for the development of interventions to improve weaning practices, further research is required to develop practical approaches for the preparation of weaning foods of increased energy density and safety, and for the promotion of such methods.

c) Personal and domestic hygiene

Studies supported by the Programme and completed in Nicaragua and Nigeria (the latter conducted in cooperation with UNICEF) indicated that water availability may be of greater importance

than water quality in the prevention of diarrhoea, possibly because it facilitates the adoption of improved hygienic practices[1]. These findings are in agreement with those of other recently completed epidemiological studies.

It is estimated that in certain settings the promotion of improved personal and domestic hygiene could reduce the incidence of diarrhoeal episodes by 14-48%[2]. Studies have been completed or are in progress to develop and evaluate ways of promoting improved practices and discouraging those associated with increased risk.

Ethnographic and observational studies conducted in Papua New Guinea indicated that protective behaviours, such as discarding food that has fallen in the dirt and avoiding the storage of food for more than 24 hours, were prevalent. However, detrimental practices were also observed: in a concurrent case-control study, keeping pigs in the home and sleeping with pigs, frequently observed practices, were found to be strong predictors of childhoood diarrhoea. A plausible interpretation of this finding is that pigs bring faeces into the family living areas on their hooves and snouts; this suggests that, at least in the study environment, domestic animals play a significant role as physical carriers of pathogens.

Hand-washing before preparing food and feeding children has been identified as an infrequent practice in poor communities in Nigeria, Papua New Guinea, and the Philippines. In Nigeria, hand-washing with soap was observed in less than 1% of food preparation and feeding episodes among under-fives. Rinsing the hands with water was a more common practice, observed before 27% of the feeding episodes. Projects under way in Guatemala, Pakistan, and Peru are using epidemiological and anthropological methods to identify specific hygienic practices associated with increased or decreased risk of diarrhoea, and to explore the cultural and situational factors that facilitate or constrain such practices.

Non-availability of soap may be perceived in some settings to be a major constraint to adequate hand-washing. An experimental study in Bangladesh is exploring the efficacy of hand-washing agents, such as ashes or mud (frequently used as an alternative to soap), in reducing hand contamination after defecation.

Data from a randomized, controlled, community-based trial conducted in Zaire to evaluate the impact of the promotion of improvements in excreta disposal, hand-washing before food preparation, and hand-washing before feeding are under analysis.

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[1] See: Interim Programme Report 1988. Document WHO/CDD/89.31.

[2] Esrey, S.A. Feachem, R.G. & Hughes, J.M. *Bulletin of the World Health Organization*, *63*: 757-772 (1985).

Further studies to assess the impact of educational interventions to promote specific changes in hygiene practices are planned in Guatemala and Peru, and will be based on the information obtained in the above risk factor studies. These projects will document the impact of the selected interventions on risk-related behaviour and, in Guatemala and Zaire, also on diarrhoeal morbidity.

Studies conducted so far have highlighted the importance of hygiene promotion in the reduction of diarrhoeal morbidity rates. Information presented in the section on risk factors for severe diarrhoea (section [e] below) suggests that improvements in personal and domestic hygiene may have a greater impact on episodes that become persistent or lead to hospitalization. Completed studies have identified some of the determinants of hygienic behaviours, which may be situational (e.g., availability of soap or water), or cultural (e.g., beliefs related to dirtiness and the transmission of diseases). Important information on ways in which positive practices can be encouraged, and those associated with increased risk of diarrhoea discouraged, is expected from ongoing and planned studies.

d) Vitamin A supplementation

Recent epidemiological studies suggest that, in areas where vitamin A deficiency is a public health problem, it may be associated with increased diarrhoeal morbidity and overall mortality among young children. Randomized, double-blind, placebo-controlled trials, designed according to guidelines prepared by the Programme, are to start in early 1990 in Brazil and India to measure the impact on diarrhoeal and respiratory morbidity, as well on nutritional status, of two approaches to vitamin A supplementation. These are, respectively: (i) periodic distribution of large doses of vitamin A to young children at the community level, and (ii) selective administration of vitamin A to children attending a health facility for the treatment of diarrhoea. If the level of impact on morbidity suggested by previous studies is confirmed, vitamin A supplementation will represent a major intervention for the control of diarrhoeal diseases. The information to be generated by these studies aims not only to confirm this significant role, but also to provide guidance on the most cost-effective approaches to delivering vitamin A supplements.

e) Risk and prognostic factors for severe diarrhoea

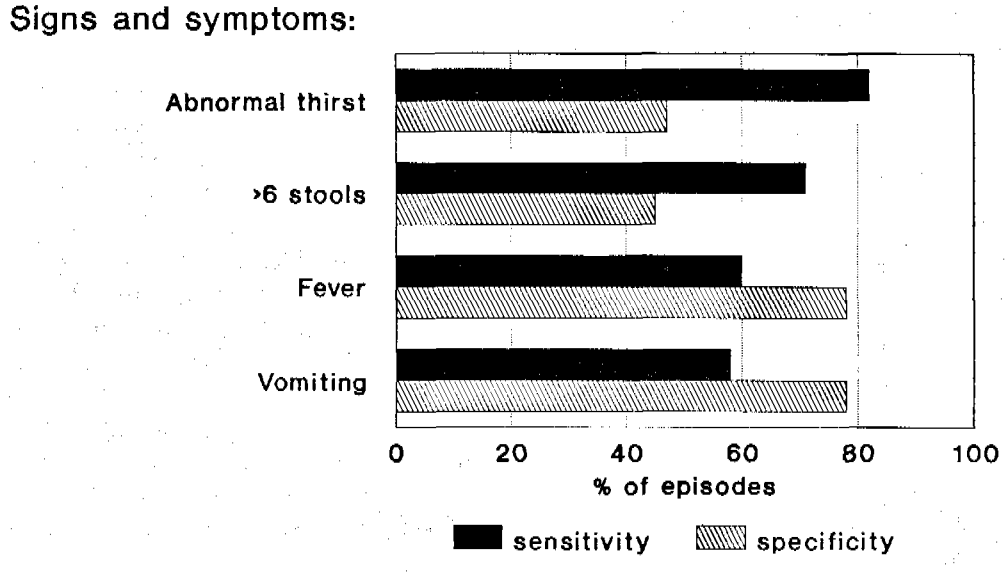
i. Dehydrating diarrhoea and diarrhoeal mortality

Case-control studies, using methodological guidelines developed by the Programme, have been conducted or are in progress in Bangladesh, Brazil, and Egypt to identify risk and prognostic factors for severe, dehydrating diarrhoea. In these studies, which were conducted in selected clinics, children under 24 months of age with moderate or severe diarrhoeal dehydration were enrolled

as cases. A clinical examination was conducted and a retrospective history recorded as to risk factors of interest. Similar information was then collected from control children, selected among those also attending the clinic for the treatment of diarrhoea but having little or no associated dehydration. The study in Brazil included an additional set of controls, recruited from the same neighbourhood as the cases.

Some of the results from the study in Brazil are presented in Figure 20. They indicate that abnormal thirst, high stooling rate, fever, and vomiting during the first 24 hours of the diarrhoea episode were of moderate sensitivity (being reported in more than 50% of the cases hospitalized for dehydration) and also of moderate specificity (45-78% of the children who did not report these signs and symptoms were not hospitalized for dehydration) as prognostic factors for dehydration requiring hospitalization. *Fever or vomiting, or both, in the first 24 hours of the episode were the best predictors:* approximately one-third of all children presented these signs in the first 24 hours of illness and these children included 75% of those needing hospitalization for dehydration.

Figure 20: Sensitivity and specificity of signs and symptoms* as prognostic factors for severe dehydration (Pelotas, Brazil)



*reported during the first 24 hours of the episode

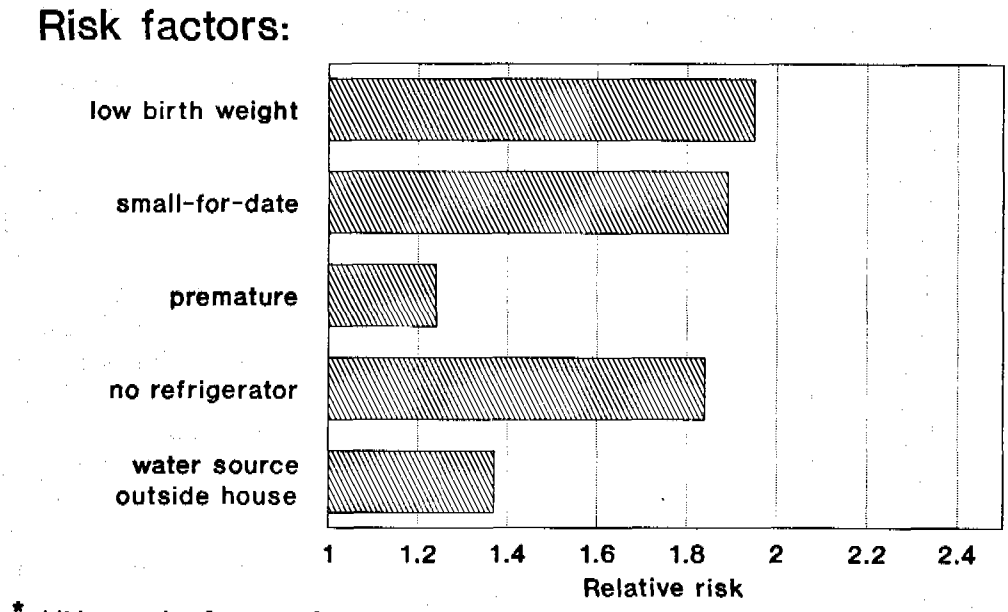
The results from the studies in Bangladesh and Egypt confirm the roles played by lack of breast-feeding and malnutrition in increasing the risk of dehydration during diarrhoeal episodes. The results from Bangladesh also show that frequent passage of stools (six or more stools in 24 hours) and vomiting are important prognostic signs for dehydration. Further analyses to investigate the roles of other risk factors are under way. None of these three studies were able to ascertain the role of early treatment in the home in reducing the risk of dehydration, because there was a strong association between the perceived severity of episodes and choices of therapy.

In Brazil, an ethnographic study was also undertaken, using a rapid assessment methodology. The study found that: (i) mothers had difficulty in differentiating between the terms dehydration and diarrhoea, (ii) mothers, even those who used ORS, did not have a correct understanding of the role of ORT in preventing or treating dehydration, (iii) approaches to ORT other than the use of ORS are less well known, and (iv) teas are widely used as part of the normal diet and for the treatment of diarrhoea, and they are better accepted by mothers for treatment purposes than ORS.

The information derived from these studies will assist national programme staff to develop care-seeking instructions for the caretakers of children with diarrhoea, based on identification of the early signs and symptoms presented by children at greatest risk of becoming dehydrated.

Risk factors for hospitalization with diarrhoeal or respiratory disease were also identified through the analysis of data from another study in Brazil (originally supported by the Overseas Development Agency of the United Kingdom) of 5914 children followed during the first two years of life (Figure 21). Children who were of low birth weight and small-for-gestational-age were found to be at significantly increased risk of hospitalization for diarrhoea during the first two years of life. Ownership of a refrigerator was associated, even after controlling for socioeconomic variables, with significant protection from severe diarrhoeal episodes, the risk of hospitalization for diarrhoea in the first 12-28 months of life being 84% higher among children whose families did not own a refrigerator. A short inter-gestational interval was strongly associated with an increased risk of hospitalization for diarrhoea at the age of 12-28 months. First-born children were at lowest risk, while children conceived within one year of the birth of the previous child were nearly twice as likely to be hospitalized for diarrhoea as first-born children. The risk of hospitalization for diarrhoea was also found to decrease with increasing maternal age. Further analysis of the data available from this study is in progress to describe the relative contribution of acute watery episodes, persistent episodes, and dysentery to the total diarrhoeal mortality in early childhood.

Figure 21: Risk factors for hospitalization with diarrhoea* (Pelotas, Brazil)



*children under 2 years of age

Another cohort study, conducted in the same setting among children followed weekly during the first six months of life, provided additional information on the risk factors for hospitalization because of diarrhoea. The risk of hospitalization decreased with education of the mother, and increased, even after controlling for family income, with: absence of indoor taps (RR=2.4), keeping food at room temperature (RR=3.5), and presence of signs of disruption of family life, such as alcohol abuse (RR=3.7) and mental illness (RR=4.6).

ii. Persistent diarrhoea

The SWG/EDP has provided support for research to distinguish groups of children who are at greater risk of persistent diarrhoea and identify interventions that are likely to reduce its incidence. *Longitudinal studies conducted in Bangladesh, Brazil, India, and Peru have provided important information describing the epidemiology of persistent diarrhoea and its risk and prognostic factors.* The results available to date from these studies can be summarized as follows:

- The incidence of persistent diarrhoea is highest in the youngest age groups, especially in the first year of life, and among low-birth-weight infants (Brazil) and those

of low weight-for-age (India). The median incidence measured in these studies was 0.3 episodes/child/year in the first year of life, persistent episodes accounting for 2-10% of the total number of diarrhoeal episodes observed.

- Dysenteric episodes and severe watery episodes (with fever and high frequency of stooling) were described as being more likely to become persistent in Bangladesh, India, and Peru. Blood or mucus in the stool, fever, and high frequency of stooling were found in Peru to be prognostic signs of high specificity, though of low sensitivity and low predictive value.

- In Brazil, environmental and behavioural risk factors were identified. After controlling for family income, the following were found to be significant: living in a house with an earthen floor (RR=3.7), dirty floor (RR=2.7), animals indoors (RR=3.1), water taps outside (RR=2.8), no refrigerator (RR=5.1), food kept at room temperature (RR=8.2), and siblings not dressed/shod (RR=4.6), as well as the presence of alcohol abuse (RR=3.4) and mental illness (RR=3.7) in the household.

Further results are forthcoming but the information available so far, given the level of risk associated with the studied factors, suggests that especially important roles can be played by the promotion of breast-feeding and improvements in household hygiene and food safety in preventing persistent episodes.

iii. Shigellosis

Because of the severe morbidity and significant mortality caused by shigellosis, and the difficulties in providing effective treatment, especially for infections due to antibiotic-resistant strains, there is a need to identify and develop better interventions for its prevention. A prospective study is being conducted in rural Bangladesh to evaluate risk factors for symptomatic *Shigella* infections among young children exposed to known shigellosis patients. Data collection has recently been completed and analysis is under way; the results are expected to be available by early 1991. Further studies will still be required to assist in the identification and development of effective preventive interventions. Support to such studies remains among the priorities of the SWG/EDP.

3.3.3 Implementation research

In accordance with recommendations made by the TAG, the Programme recently undertook a new initiative: the development of research to determine how interventions that are of proven value for the prevention or treatment of childhood diarrhoea can be successfully implemented using simple, inexpensive approaches that can be adapted to different socioeconomic, cultural, and environmental settings. The priority issues for implementation

research have been selected on the basis of available information concerning the efficacy, feasibility, and cost of interventions for the control of childhood diarrhoea and of recent experience in the implementation of national CDD programmes. *The two topics selected initially focus on interventions that have the potential to substantially reduce diarrhoeal morbidity or mortality, namely, the promotion of breast-feeding and the promotion of correct case management in the home.*

a) Promotion of breast-feeding

In addition to the services activities described in section 2.7 and the research supported by the SWG/EDP described in section 3.3.2 (a), implementation research will:

(1) evaluate selected interventions which are believed to be particularly cost-effective for the promotion and support of breast-feeding when delivered under usual programme conditions (in the studies supported by the SWG/EDP, described in section 3.3.2 [a], the intervention is delivered under tightly controlled conditions in order to measure the optimal impact). These include:

- Training of maternity services personnel: There is substantial evidence from research and pilot projects to show that the introduction of rooming-in and the training of maternity services staff in lactation management techniques can increase breast-feeding initiation rates. However, the impact and performance of these interventions when applied at the public health level in developing countries are not well documented. The Programme plans to support case studies/evaluations of established maternity services programmes to assess their effectiveness and identify the key factors for their success. Information of this kind should be of local and global importance for the development of breast-feeding activities.

- Activities of mothers' support groups: Such groups are well established and active in a number of countries, and are believed to play a significant role in promoting breast-feeding in the early months of life and in monitoring marketing practices in respect of breast-milk substitutes, "follow-up milks", and feeding bottles. As there have been very few reports of the characteristics and experience of mothers' support groups in developing countries, an assessment of their contribution to breast-feeding promotion efforts is of high priority for implementation research.

(2) conduct the preparatory research that might be required in some countries to describe breast-feeding patterns and identify factors influencing these patterns.

The nature of the breast-feeding problem varies considerably from one setting to another and is subject to rapid changes through the influence of a number of factors (including social and cultural factors, hospital practices, work patterns, availability and cost of breast-milk substitutes, legislation, and the status of breast-feeding promotion activities). The Programme is developing methods for the rapid assessment of breast-feeding patterns and their determinants, for use in countries where this information is not available or has not been analysed in a systematic way. The procedure would provide the basis for a situational analysis and the selection of promising interventions to be included in a breast-feeding programme. A situational analysis of this kind is planned in Ethiopia.

The sites selected for implementation research on breast-feeding will have to meet a number of criteria. Important among these will be the current status of the national CDD programme, which should be conducive to breast-feeding efforts and should have some pre-existing activity in this area.

b) Promotion of correct case management in the home

The major goal of national CDD programmes is to promote correct case management of childhood diarrhoea. While the cost-effectiveness of interventions to improve diarrhoea treatment practices in the formal health sector is now well documented, efforts to promote correct case management in the home have met with varying success, for reasons that are not well understood. Studies are being developed to evaluate the effectiveness of such efforts and identify factors that influence their success. Studies will also be conducted to address specific problems that are significant and recurrent in the implementation of CDD activities in a number of countries, and which cannot be solved by the application of existing managerial tools and require more formal research. These studies will usually involve in-depth evaluations of the experience of national CDD programmes.

Research questions that are considered to be of high priority include:

- What would be an appropriate process for selecting home fluids to be promoted for use during diarrhoea? This process should consider the acceptability of the fluids to be given in substantial quantities to young children with diarrhoea, the feasibility of preparing them, their potential effectiveness, and their safety.

- Does the promotion of food-based fluids (e.g., cereal gruels, soups) for early rehydration therapy in the home interfere with the promotion of correct feeding during and after diarrhoea (when the emphasis is on enriching staple foods to increase their energy density)?

- What are the determinants of correct use, as well as sporadic and non-use of ORT, as identified in household surveys?

- What is the impact of ongoing efforts to promote improved health-seeking behaviours and discourage the use of antidiarrhoeal drugs at the community level?

These implementation research activities are managed in close collaboration with the services component. Research support will be concentrated in a limited number of sites where there are research teams with an interest in and potential for conducting high quality research in the above priority areas. Efforts are under way to identify such institutions and determine what support is needed to enable them to carry out the required studies. Candidate institutions will include not only those traditionally dedicated to research, but also those involved in the implementation of CDD programmes, such as ministries of health and non-governmental organizations.

3.3.4 SWG on Immunology, Microbiology, and Vaccine Development

The work of this SWG continued to focus on the development and testing of vaccines considered to be of greatest importance for disease control, i.e., vaccines against rotavirus diarrhoea, cholera, shigellosis, and diarrhoea caused by enterotoxigenic *Escherichia coli* (ETEC). Where possible, efforts have centred on the evaluation of candidate vaccines in humans. However, more basic, developmental work has also been supported, especially in respect of *Shigella* and ETEC vaccines. The SWG also continued to support field trials of vaccines against typhoid fever.

a) Rotavirus vaccines

During 1988-1989 over 40% of the funds of the SWG/IMV were expended on field trials to assess the safety, immunogenicity, and efficacy of candidate oral vaccines against rotavirus diarrhoea (Table 9). Some of this work has been done in collaboration with other agencies (especially the United States National Institutes for Health and USAID) and with the pharmaceutical industry (Table 12).

i. Single serotype rhesus-human rotavirus vaccines

Rhesus-human reassortant rotavirus vaccines incorporate into a rhesus rotavirus (RRV) host an RNA segment encoding for a surface protein (VP7) of the human rotavirus. The VP7 protein determines the serotype of the rotavirus and is considered to be an important immunogen. Such reassortants have been prepared to correspond to human rotavirus serotypes 1, 2, and 4. It is not necessary to prepare a human serotype 3 reassortant since its VP7 protein is similar to that of the rhesus rotavirus.

Table 9: Efficacy trials of candidate rotavirus vaccines

Site	Vaccine	Vaccine dose (PFU)	Number of doses	Age at vaccination (months)
A. Single serotype rhesus-human rotavirus vaccines				
Finland[a]	serotype 1	10^4	1	2-4
	serotype 2	10^4	1	2-4
Peru[a]	serotype 1	10^4	1	2-3
	serotype 2	10^4	1	2-3
	rhesus rotavirus	10^4	1	2-3
USA	serotype 1	10^4	1	2-4
	rhesus rotavirus	10^4	1	2-4
B. Rhesus-human tetravalent vaccine				
Peru	tetravalent	10^4	1	2
	tetravalent	10^4	3	2-4
USA	tetravalent	10^4	3	2-6
	serotype 1	10^4	3	2-6
Brazil[a]	tetravalent	10^4	3	1-5
Myanmar[a]	tetravalent	10^5	3	0-5
C. WC3 bovine rotavirus vaccine				
Central African Republic	WC3	10^7	2	2-4
Israel	WC3	10^7	2	3-11
USA	WC3	10^7	2	3-7
China[a]	WC3	10^7	2	1-3

[a]Studies supported by the Programme

The SWG/IMV is supporting efficacy studies of these vaccines given in a single dose in Finland and Peru in infants aged 2-4 months and 2-3 months, respectively; two years of follow-up have now been completed in Finland and one year in Peru. In addition, a trial was carried out in the USA in infants aged 2-4 months with support from other sources. One objective of these studies is to examine whether rhesus-human reassortant vaccines for serotypes

1 or 2 induce specific protection against diarrhoea caused by rotavirus of the same serotype.

The studies in Finland and the USA demonstrated that, after a single dose, the serotype 1 and 2 reassortants and the rhesus rotavirus are effective in industrialized countries against seasonal rotavirus disease caused by rotavirus serotype 1. However, the serotype 1 vaccine was not found to be more effective than the other candidate vaccines against serotype 1 disease. A possible reason for this observation might be that exposure of vaccinated children to natural rotavirus induces booster responses which broaden the spectrum of immunity induced by the vaccine.

The results from these studies will be important in interpreting the results of studies of the RRV-tetravalent vaccine, which includes rhesus-human reassortant rotaviruses corresponding to serotypes 1, 2, and 4, and rhesus rotavirus for serotype 3. While it is not clear whether all these serotypes are necessary in the vaccine, they are likely to induce a broader spectrum of immunity than single serotype vaccines, particularly if given in multiple doses. Moreover, it seems that multiple doses of vaccine will be required in developing countries because of the lower "take" rate of these vaccines in such settings.

ii. RRV-tetravalent vaccine

The RRV-tetravalent vaccine at a dose level of 4×10^4 PFU is being evaluated in field trials in Peru and the USA, with support from other sources. A third trial, supported by WHO, has been initiated in Brazil. A fourth trial, to start in early 1990 in Myanmar, will assess the efficacy of a higher dose (4×10^5 PFU) of the vaccine. This dose level was not considered previously for field trials because it had resulted in a high rate of febrile reactions in safety studies in children aged 5-12 and 6 months in Finland and Sweden, respectively. However, in a recent safety study in Israel, febrile reactions were observed in less than 2% of neonates receiving 4×10^5 or 4×10^4 PFU of vaccine; this agrees with the experience in Peru and Venezuela, where the dose of 4×10^4 PFU caused a much lower rate of febrile reactions than that observed in developed countries. A probable explanation is that infants in developing countries have a much higher level of passively- acquired serum rotavirus antibodies than infants in industrialized countries. The level of maternal antibodies is highest at birth; it appears to protect against vaccine reactions, thus allowing the administration of a higher-titred vaccine to very young infants.

The present efficacy trials of RRV-tetravalent vaccine are designed to determine whether, for ease of administration, this vaccine given in three doses can be administered simultaneously with the current EPI vaccines. It is important that rotavirus vaccine should not compromise the take of oral poliovirus vaccine (OPV); nor should OPV interfere with the immunogenicity of rotavirus vaccine. A limited study in the USA suggested that there is no

interference between rhesus rotavirus and OPV; a more extensive study to examine this question is in progress in Thailand. Another study in Turkey will investigate whether breast-feeding affects the take of the vaccine.

iii. WC3 bovine rotavirus vaccine

In a trial in the USA, funded from other sources, one dose of the WC3 bovine rotavirus vaccine, at a titre of 10^7 PFU, induced 76% protection against all episodes of diarrhoea, and 100% protection against severe diarrhoea associated with rotavirus serotype 1. Four subsequent trials were initiated to evaluate this vaccine further, three with support from other sources (in Central African Republic, Israel, and USA) and one with support from the Programme (in China). Preliminary results from the study in the USA indicate that the vaccine provided only 20% protection. The trial in Israel remains inconclusive. In the trial in the Central African Republic, the rate of seroconversion was only 50% after two doses of vaccine given between 2.5 and 4.5 months of age; it showed no protection against all rotavirus diarrhoea and only 38% against severe rotavirus diarrhoea. The trial in China, which is investigating the efficacy of two doses of WC3 vaccine given between 1 and 3 months of age, is still in progress.

The conflicting results of the two trials in the USA have no obvious explanation. The low efficacy in the Central African Republic is comparable to that observed earlier in Africa with another attenuated bovine vaccine strain (RIT-4237). One dose of that vaccine failed to induce protection in Rwanda, and three doses resulted in only 33% protection in the Gambia; at both sites the seroconversion rates were less than 50%. *Taken together, these findings suggest that the immune response and protection evoked by bovine rotavirus vaccines are poor in children in developing countries, at least in Africa, which contrasts with the good protection usually observed in children in industrialized countries.* The results also demonstrate that the efficacy of rotavirus vaccine in developing countries cannot be reliably predicted from results obtained in industrialized countries, but must be determined by trials carried out in developing countries.

iv. M37 human rotavirus vaccine

The M37 human rotavirus vaccine, developed at the National Institutes of Health, USA, is derived from a "nursery" strain of rotavirus isolated in Venezuela. The M37 strain is a serotype 1 rotavirus that shows some cross-reactivity with other human rotavirus serotypes. The VP4 surface-protein of this strain is different from that of strains usually associated with rotavirus diarrhoea; it is assumed that changes in this protein and the relevant gene are responsible for its attenuation. No significant reactogenicity has been observed with this vaccine in studies in Venezuela. A safety and immunogenicity trial in Finnish infants aged 2-6 months, at dose levels of 10^4 and 10^5 PFU, is under way with WHO support. If successful, these studies may be followed by an efficacy trial in a developing country in 1990.

v. Cold-adapted human rotavirus vaccine

Support has been given to studies in Japan that aim to develop cold-adapted strains of human rotaviruses for eventual use as live oral attenuated vaccines. The investigators have successfully developed a serotype 1 strain that is cold-adapted but not temperature-sensitive; however, the candidate vaccine strain has not yet reached the stage of human trials.

vi. Immunity to rotavirus infection

The Programme has provided support to several studies on the mechanisms of immunity to rotavirus infection, the results of which may have a bearing on strategies for immunization with rotavirus vaccines. In Hong Kong, a longitudinal study compared the occurrence of postnatal rotavirus diarrhoea in infants who either had or had not experienced an asymptomatic rotavirus infection in the neonatal period. During follow-up, there was no difference in the incidence of cases, but the mean duration of rotavirus diarrhoea in the first group was 3.7 days compared with 6.7 days in the second group. This study confirmed earlier findings in Australia, which indicated that asymptomatic neonatal rotavirus infection induces partial protection against rotavirus diarrhoea in the first three years of life. These results suggest that neonatal immunization with rotavirus vaccines should be feasible.

b) Cholera vaccines

The SWG/IMV has continued to support efforts to develop new oral vaccines for the prevention of cholera. Both killed and live oral vaccines have been evaluated.

i. Killed whole-cell cholera vaccine

Killed whole-cell (WC) and whole-cell/B-subunit (WC/BS) vaccines have recently been tested in a large field trial in Bangladesh, in which 63 000 persons, including children aged 2-15 years and adult women, received three oral doses, at six-week intervals, of WC vaccine, WC/BS vaccine, or a placebo. Each dose of WC and WC/BS vaccine contained 1×10^{11} killed whole vibrios representing four different strains belonging to the Inaba and Ogawa serotypes and the classical and El Tor biotypes. The WC/BS vaccine also contained 1 mg of purified cholera toxin.

The main results after three years of follow-up are summarized in Table 10. Overall, the WC vaccine conferred 52% protection and the WC/BS vaccine 50% protection against culture-proven cholera. For both vaccines, protective efficacy was lower and of relatively short duration in children vaccinated at the age of 2-5 years; no protection was observed in this age group in the third year of follow-up. In contrast, the level of protection in persons aged 6 years or more exceeded 60% for both vaccines and was sustained during the entire follow-up period.

Table 10: Efficacy of oral whole-cell/B-subunit (WC/BS) cholera vaccine and whole-cell (WC) vaccine alone (Dhaka, Bangladesh)[a]

Age/Etiology	Vaccine efficacy (%)[b,c]	
	WC	WC/BS
Age		
Children 2-5 years	23	26
Persons > 6 years	68	63
All ages	52	50
Etiology		
Classical biotype	60	58
El Tor biotype	40	39

[a] Three doses of vaccine or placebo were given at intervals of six weeks.

[b] After three years of follow-up.

[c] None of the compared levels of protection for WC and WC/BS vaccine differ significantly ($p>0.05$).

The level and duration of protection observed in older children and adults are encouraging, but further research is required to develop a vaccine formulation that is more efficacious, particularly in young children. This might be achieved by increasing the El Tor component or changing the growth conditions of the organisms to obtain full expression of the toxin coregulated pilus antigen (TCPA). This antigen is responsible for the mucosal adhesion of *V. cholerae* and may be an important immunogen. Since it was unknown at the time the vaccine was formulated, neither the WC nor the WC/B vaccine contained TCPA. More work will also be required to develop a practical vaccine preparation that is more suitable for field use in developing countries than the current liquid vaccine, which requires storage at +4°C. A tablet or powder formulation would be a better alternative. Work to develop an improved oral killed cholera vaccine is in progress in Sweden.

ii. Live *V. cholerae* O1 vaccine strain CVD-103-HgR

The candidate live oral cholera vaccine that is currently of greatest interest is *V. cholerae* O1 strain CVD-103-HgR, developed in the USA. This strain lacks the genes encoding for the A (toxic) subunit of cholera toxin. A vaccine has been prepared which consists of two sachets: one for the lyophilized organisms and the other for buffer salts. The vaccine is reconstituted by adding the buffer salts to water, stirring, and adding the lyophilized bacteria.

In volunteer studies in the USA, the vaccine given at a dose of 5×10^8 organisms was almost non-reactogenic (3% of the adult volunteers developed very mild diarrhoea) and induced a vibriocidal antibody response in 91% of the subjects. The same dose was tested in adult Thai civilian volunteers in a trial supported by the Programme. No side-effects were observed and 83% of the vaccinees showed a significant vibriocidal antibody reponse. However, in a subsequent study in Thai military personnel, supported by other sources, a much lower serological response rate to the same vaccine was observed. This result might partly have been caused by incorrect procedures in reconstituting the vaccine and, possibly, by the ingestion of food shortly after vaccination. These findings emphasize the need for further research to develop a vaccine formulation that is easy to reconstitute and resistant to adverse conditions in developing countries. Current plans are to evaluate the safety and immunogenicity of the vaccine in Indonesian children.

c) Typhoid fever vaccines

i. Live oral Ty21a vaccine

The SWG has continued to support field trials in Chile and Indonesia to compare the efficacy of a new liquid formulation of live attenuated oral Ty21a typhoid vaccine with that of enteric-coated capsules given in three doses at intervals of two and seven days, respectively. Altogether, 85 000 schoolchildren in Chile and 22 000 persons aged 3-44 years in Indonesia participated in the trials. The trial in Chile was terminated after 37 months and the one in Indonesia after 30 months of follow-up.

The results of both trials (Table 11) indicate that the new liquid preparation of Ty21a vaccine is more efficacious, and that its efficacy was higher in Chile (for unknown reasons) and in adults. Experience gained in these and other trials of the vaccine supported by the Programme will be used to perform a cost-effectiveness analysis to assess the potential public health value of the Ty21a vaccine in developing countries.

ii. Vi antigen parenteral vaccine

Studies in Nepal and South Africa (both supported by other sources) have demonstrated that a single injection of parenteral Vi capsular polysaccharide antigen vaccine induces about 70% protection in subjects aged 5-44 years. As this vaccine does not require a cold chain, is relatively inexpensive, and has been well tolerated, it is a potential candidate for use in young children in developing countries, especially if it can be administered with existing EPI vaccinations. The need for vaccination of young children against typhoid fever has become apparent as a result of findings suggesting that the incidence of the disease is highest in young children, although the clinical picture is atypical. In Indonesia, for example, the annual incidence of culture-confirmed typhoid fever is 1.6 episodes per 100 children aged 3-6 years.

Table 11: Efficacy of live oral Ty21a typhoid vaccine (Indonesia and Chile)

Site	Immunization schedule	Age of vaccinees (years)	Vaccine formulation	Vaccine efficacy (%)
Indonesia	3 doses, 7-day intervals	3-14	liquid[a]	53[b]
			capsule	42
		15-44	liquid	64[b]
			capsule	58
Chile	3 doses, 2-day intervals	5-14	liquid	77[c]
			capsule	33

[a]Each vaccine dose contained 1-4 x 10^9 viable lyophilized bacteria.
[b]After 30 months of follow-up.
[c]After 37 months of follow-up.

Support was given by the SWG/IMV to a safety and immunogenicity trial of the Vi antigen vaccine in Indonesian children aged 1-9 years. Minor reactions were observed at the vaccination site in 14% of vaccinees; 98% of vaccinees demonstrated seroconversion to the Vi antigen. The immunogenicity of the vaccine will next be evaluated in children aged 6-12 months. If it is found to be immunogenic, an efficacy trial will be undertaken in young children.

d) *Shigella* vaccines

Because of the considerable disease burden and risk of death associated with shigellosis, especially in children aged 1-4 years, shigellae, particularly *S. dysenteriae* 1 and *S. flexneri*, are regarded as important target organisms for vaccine research. The SWG/IMV has provided support to work in France and Sweden aimed at developing genetically-engineered avirulent mutants of both organisms for use as candidate oral vaccines. In Sweden, an auxotrophic mutant strain of *S. flexneri*, serotype Y, was derived by deleting the Aro D gene; the resultant strain has retained its invasiveness in tissue culture cells but has only a limited survival time within the cells. In monkeys, prior infection with this strain induced protection against clinical dysentery and diarrhoea following challenge with virulent *S. flexneri*. Further work is in progress to develop (and evaluate in monkeys) a double-deletion mutant of *S. flexneri* 2a in which both Aro A and Aro D are deleted for additional safety. The goal is to develop a polyvalent live oral vaccine against the most prevalent serotypes of *S. flexneri* (these could include serotypes 2a, 2b, Y, 1a, 1b, and 3a, and possibly others). A polyvalent vaccine might be composed of individual auxotrophic strains of each of the serotypes, or hybrid strains

expressing the LPS-antigens of more than one serotype. A vaccine strain of *S. dysenteriae* 1, once developed, might be included in the same vaccine preparation.

e) Vaccines against enterotoxigenic *Escherichia coli* (ETEC)

No candidate vaccines are as yet available for ETEC diarrhoea. However, the SWG/IMV has given support to research that may guide efforts towards vaccine development. Collaborative research in Sweden and the United Kingdom has shown that colonization factor antigens (CFAs) of *E. coli* given orally to animals evoke protection against diarrhoea caused by strains that produce the homologous CFA. The SWG has also funded work in Sweden to prepare an experimental prototype vaccine using bacteria inactivated by a mild formalin treatment which preserves the antigenicity of CFAs. This prototype vaccine includes CFAs I, II, and IV, which were present in about 50% of the ETEC strains encountered in epidemiological surveys in different parts of the world. The prototype vaccine will be used for initial safety and immunogenicity studies in volunteers, while further research is being carried out to identify and characterize additional CFAs for incorporation in the vaccine. A candidate ETEC vaccine might also incorporate toxoids to induce antitoxic immunity against the heat-stable (ST) and heat-labile (LT) toxins of ETEC; WHO support has been given to studies in the United Kingdom to develop a hybrid ST-LT toxoid as an immunogen for such use.

3.4 Research training and strengthening

In its research strengthening activities, the Programme is seeking to enhance the capacity of institutions in developing countries to carry out high quality research on priority topics. In 1988-1989 this effort was broadened to place greater emphasis on training, with the goal of developing balanced, interdisciplinary research teams.

- Three workshops were held (in Brazil, India, and Peru) to assist 50 developing country researchers to design proposals for priority research projects, such as clinical trials, risk factor studies, and community-based intervention studies, for subsequent review and possible support by the Programme.

- Short-term training (from three weeks to three months) was provided to four researchers (one in China, one in Peru, and two in the Philippines) to improve their ability to carry out ongoing and future research on diarrhoeal diseases.

- Long-term training (for 36 and nine months, respectively) was provided to two researchers (one in Brazil and one in Myanmar). The former commenced a doctoral programme in medical anthropology and the latter received training in clinical research methods.

- The SWG/CMT continued to provide research strengthening support to four institutes (in Egypt, India, Myanmar, and Peru), and initiated support for an additional institute (in the Philippines), with the aim of improving their facilities and capability to conduct clinical trials on diarrhoeal diseases. All five institutes are currently conducting studies with support from the Programme.

- The SWG/EDP continued to provide research strengthening support to three institutes (in Myanmar, Peru, and the Philippines), and initiated support of a fourth (in Brazil), in an effort to improve the research facilities and capability of the institutes to carry out epidemiological, behavioural, and intervention-related research for the prevention of diarrhoeal diseases.

- The SWG/IMV continued to provide support to the Centre for the Trial of Vaccines against Infectious Diseases, at the Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand, to enable it to develop its facilities for conducting studies of the clinical protection conferred by candidate cholera vaccines.

- Two scientific meetings were held on: (i) "Improving infant feeding practices to prevent diarrhoea or reduce its severity; research issues", and (ii) "Development of vaccines for cholera and diarrhoea due to enterotoxigenic *Escherichia coli*". The report of the former was published in the *Bulletin of the World Health Organization*, *67*: 27-33 (1989) and copies were circulated widely. The report of the latter meeting will be published in Vol. 68, No.3 (1990) of the same journal.

- A series of documents was prepared to assist researchers in the design and analysis of priority research projects. These are:

  Cousens, S.N. et al. Case-control studies of childhood diarrhoea. I. Minimizing bias. Document CDD/EDP/88.2 (1988).

  Cousens, S.N. et al. Case-control studies of childhood diarrhoea. II. Sample size. Document CDD/EDP/88.3 (1988).

  Cousens, S.N. et al. Case-control studies of childhood diarrhoea. III. Matching. Document CDD/EDP/89.1 (1989).

3.5 Collaborating Centres

The 10 Collaborating Centres of the Programme continued to play an active role in support of research efforts, especially in the areas of epidemiology and vaccine development and evaluation. Activities of special importance have been described in relevant sections of the report. A list of the Centres with their full addresses is given in Annex 4.

3.6 Collaboration with industry

In view of the priority being given to the development and evaluation of vaccines and of improved methods of treating childhood diarrhoea, the Programme has maintained close collaboration with companies producing biologicals, pharmaceuticals, and diagnostic reagents, in particular those listed in Table 12. Details of these collaborative efforts are described in sections 3.3.1 and 3.3.3.

Table 12: Research collaboration with industry, 1988-1989

Company	Area of collaboration
Beaufour (France)	Clinical trial of smectite
Galactina (Switzerland)	Clinical trial of rice-based ORS
Institut Mérieux (France)	Field trial of oral cholera and oral rotavirus vaccines; testing of a typhoid (Vi) vaccine
Leo Pharmaceutical Products (Denmark)	Clinical trial of pivmecillinam
Niolab (India)	Clinical trial of gentamicin for persistent diarrhoea
Pfizer (USA)	Clinical trial of doxycycline for cholera
Roche (Switzerland)	Clinical trial of co-trimoxazole for persistent diarrhoea
Smith-Kline RIT (Belgium)	Field trial of oral rotavirus vaccine
Swiss Serum and Vaccine Institute (Switzerland)	Field trial of oral typhoid vaccine; development of oral cholera vaccine
Wyeth-Ayerst Research (USA)	Field trial of oral rotavirus vaccine

3.7 Collaboration with other agencies and organizations

During the biennium the Programme collaborated with several international agencies and organizations that have an interest in diarrhoeal diseases research. A few examples of such collaboration are provided below:

- The Programme is collaborating closely with the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), by directly supporting individual research projects at the Centre through the global SWGs (six new projects were supported during the biennium), and by overseeing a grant from the United Nations Development Programme which is supporting research that is highly complementary to the WHO Programme's overall research effort. In total, the Centre received US$ 1 080 296 in support from the Programme during the biennium. The Swedish Agency for Research Cooperation with Developing Countries (SAREC) and USAID have collaborated with the Programme in supporting the cholera vaccine trial at the Centre.

- The Programme has established and is using mechanisms for the co-funding of projects with the International Development Research Centre, Canada, the Overseas Development Administration of the United Kingdom, the Thrasher Research Fund, and UNICEF; specific projects receiving such co-funding have been described in the report.

- The Programme is coordinating its research efforts with two USAID projects which share common research objectives, namely; (i) the Applied Diarrhoeal Diseases Programme (a project to promote and support applied research in developing countries); and (ii) Dietary Management of Diarrhoea Project (a project to support research in Nigeria and Peru on feeding during and after diarrhoea, with emphasis on the use of culturally acceptable foods of proven nutritional value). USAID is also providing support to enable staff from its HEALTHCOM (Communication for Child Survival) project to assist the Programme in the communication aspects of intervention-related research projects and in implementation research on breast-feeding. Finally, Programme staff regularly participate in meetings of the USAID Consultative Group on Vaccine Development.

4. INFORMATION SERVICES

During the biennium the Programme continued to collaborate with other agencies and institutions in disseminating information and responding to requests for documentation on diarrhoeal diseases control.

The quarterly newsletter "Dialogue on Diarrhoea", produced by the Appropriate Health Resources and Technologies Action Group Ltd (AHRTAG), United Kingdom, remained an important channel of communication. Circulation of the English edition reached 120 500 in 1989, with additional print runs of 30 000 and 25 000 in India and Pakistan, respectively. The French edition was distributed in 16 000 copies, the Spanish in 20 000, the Portuguese in 5000, the Arabic in 15 000, and the Tamil in 25 000 copies. New in 1988 were Bangla and Chinese editions, with a circulation of 40 000 and 10 000 copies, respectively. Arrangements were finalized in 1989 for a combined Urdu/English edition for distribution in Pakistan; production will begin in March 1990 with an initial print run of 25 000. In addition, the Health Learning Materials Programme in Nepal has agreed to produce a newsletter in Nepali, starting in 1990, containing materials from both "Dialogue on Diarrhoea" and "ARI News". Other possibilities that are under investigation are translated versions in Indonesian and Vietnamese. A children's poster competition organized by AHRTAG in 1988 brought in some excellent entries, the best of which were exhibited at different venues, including the Third International Conference on Oral Rehydration Therapy and the tenth Meeting of Interested Parties of the CDD Programme.

In 1988-1989 the Programme published 15 technical papers and issued 29 informal documents (see Annex 5). Of the documents, 16 were designed for wide use or for general information and were distributed through the mailing list, while the remaining 13 were prepared for or based on specific activities of more limited interest. The Programme continued to distribute to developing countries its "Bibliography of Acute Diarrhoeal Diseases", which is produced twice a year in collaboration with the United States National Library of Medicine, and a bulletin entitled "Diarrhoeal Diseases: Recent analytical references", which is produced once or twice a year by the International Children's Centre, Paris. Following a poll check in 1988 to ascertain interest and check address information, the size of the mailing list was reduced by about 1500 addresses and now stands at a total of about 5000.

Staff of the Programme or designated representatives attended 16 international conferences and meetings in 1988-1989, including the Third International Conference on Oral Rehydration Therapy in Washington, DC, in December 1988, the Third African Conference on Diarrhoeal Diseases in Nairobi in April 1989, and the Fifth Asian Conference on Diarrhoeal Diseases in Kathmandu in September 1989. These occasions were used to promote the Programme's objectives, strategies, and activities and provided an opportunity to make new contacts and hold informal discussions with national health staff and scientific experts.

The media continued to show interest in diarrhoeal diseases control and the Programme provided information on several occasions; in particular, it collaborated with a television company in the United Kingdom in the production of a programme on the treatment of diarrhoea which focused on the inappropriate use of antidiarrhoeal drugs.

Briefing sessions for small groups of staff from NGOs and other organizations continued to be held periodically, in collaboration with EPI, to provide detailed information on the strategies, approaches, and activities of the two programmes; altogether, 10 one-week sessions were held in 1988-1989.

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5. PROGRAMME REVIEW BODIES

Under the Programme's organizational structure, scientific and technical review of its activities is the responsibility of a Technical Advisory Group composed of leading scientists and public health administrators from outside WHO, while review of the overall management of the Programme is entrusted to a Management Review Committee made up of representatives of four United Nations organizations and specialized agencies (UNDP, UNICEF, World Bank, WHO). The deliberations of these two bodies are considered once a year by a Meeting of Interested Parties attended by representatives of governments and agencies that are contributing or are interested in contributing to the Programme, and representatives of the governments of at least six developing countries.

5.1 Technical Advisory Group (TAG)

During the biennium the TAG met twice - on 14-18 March 1988 and on 13-17 March 1989. At these meetings the Group:

- endorsed the Programme's overall policy of directing its support to strengthening the capabilities of national CDD programmes;
- commended the Programme's efforts to assure the effectiveness of case management in health facilities and the home, and requested that information be made widely available to encourage national authorities to reduce the inappropriate use of antidiarrhoeal drugs;
- welcomed the new emphasis being given to correct management of dysentery and persistent diarrhoea and the plans to increase activities related to the reduction of diarrhoea morbidity;
- emphasized that training remains the highest priority and encouraged the Programme to strengthen, follow up, and analyse the impact of supervisory skills courses;
- noted with satisfaction that coordination with other agencies in communication activities has improved;
- endorsed the further efforts made by the Programme to focus its research support on fewer topics of high priority; emphasized that in the area of vaccine development the highest priority should be given to the organization of field trials of candidate vaccines, in particular rotavirus vaccines; and encouraged the pursuit of studies to develop an improved ORS, optimal diet therapy, and guidelines for early treatment of shigellosis, as well as research to learn more about the epidemiology, treatment, and prevention of persistent diarrhoea;
- noted the increasing proportion of projects funded in developing countries, and encouraged the Secretariat to expand its research strengthening activities;

- endorsed the directions outlined for the Programme in the WHO Medium-Term Programme for 1990-1995, and approved the final revision of the 1988-1989 budget and the proposed 1990-1991 budget; and

- decided that in future a full meeting of the TAG need be held only every two years, with a meeting of a subgroup in the intervening years to address selected issues in depth.

5.2 Management Review Committee (MRC)

The MRC met twice during the biennium - on 23 March 1988 in Washington, DC, and on 6 April 1989 in Paris - to review the progress and plans of the Programme and the reports of the ninth and tenth meetings of the TAG.

At its first meeting, the MRC also discussed a preliminary verbal report of the findings of an External Review Group, approved the financial report for the 1986-1987 biennium and the revised programme budget for 1988-1989, and reviewed a preliminary programme budget for 1990-1991.

At its second meeting, the Committee noted the difficult financial situation of the Programme and made specific suggestions as to how the required financial support might be obtained. It endorsed the current management structure of the CDD and Control of Acute Respiratory Infections (ARI) programmes and agreed that the MRC should be retained in its present format.

5.3 Meeting of Interested Parties (MIP)

The eighth MIP, held on 30 June - 1 July 1988, was attended by representatives of 42 governments and agencies. The Meeting considered the progress and plans of the Programme, including the report of the ninth meeting of the TAG, and reviewed the managment of the Programme and its financial status, including the report of the eighth meeting of the MRC.

The MIP also considered the report of an External Review Group which had conducted an in-depth review of the Programme's activities at the global, regional, and country levels. On the basis of this report the participants concluded that:

- the CDD Programme has contributed to the development of primary health care and the strengthening of the health service infrastructure in many countries;

- better coordination is required among external agencies and between them and ministries of health in implementing CDD programmes and, to assist in this process, WHO's capability in countries needs to be augmented;

- the Programme should retain its current management structure, except that the MRC should become an interagency committee; and

- the Programme should continue to focus its efforts on assuring correct case management, while gradually giving more priority in future to prevention-related activities.

The MIP endorsed all but one of the specific recommendations of the Group.

In addition, it accepted the Programme's financial report for the 1986-1987 biennium, endorsed the revised budget for 1988-1989, and approved the budgetary projections for 1990-1991.

The ninth MIP was held on 29-30 June 1989 and attended by the representatives of 37 governments and agencies. The Meeting reviewed the status and plans of the Programme, including the report of the tenth meeting of the TAG; general Programme management and financial matters, including the report of the ninth meeting of the MRC; and a report on intervention-related research. The participants:

- underlined the need for a smaller meeting of the TAG in alternate years to provide effective technical guidance for the Programme and the MIP;

- welcomed the Programme's new initiatives in the fields of prevention and social/behavioural research;

- endorsed the final revised budget for 1988-1989, approved the proposed programme budget for 1990-1991, and endorsed a contingency plan to be applied in the event of a shortfall in resources; and

- confirmed that the management structure of the CDD and ARI Programmes should remain as it is for the time being.

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6. RESOURCES AND OBLIGATIONS

The Programme's financial position at the end of the 1988-1989 biennium, under all sources of funds, is shown in Table 13.

Table 13: Diarrhoeal Diseases Control Programme, 1988-1989 Financial position (US$)

Balance available on 1 January 1988	4,849,518
Amount received since 1 January 1988[a]	20,888,444
Total available	25,737,962
Actual obligations 1988-1989	21,082,267
Balance carried forward to 1990-1991	4,655,695

[a] See Annex 6, Table 1.

The resources available to the Programme under all sources of funds for 1988-1989 and previous financial periods are presented in Table 1 of Annex 6. Since 1978, a total of 29 countries and agencies have contributed approximately US$ 78 million to the Programme. Of the 23 countries and agencies that contributed in 1986-1987, 20 contributed during the 1988-1989 biennium.

Table 2 in Annex 6 is a summary of actual obligations for 1986-1987, estimated obligations (budget) for 1988-1989, and actual obligations for 1988-1989, by Programme component.

The content of each Programme component is as follows:

6.1 Advisory and management meetings

These include annual meetings of the Technical Advisory Group, the Management Review Committee, and the Meeting of Interested Parties. Obligations were essentially as anticipated.

6.2 Health services

In the health services component, activities are concerned primarily with the development, implementation, and evaluation of national CDD programmes. A breakdown of activities under this component is given in Annex 6, Table 3, which shows actual obligations for 1986-1987, and estimated and actual obligations for 1988-1989. Activities carried out within the health services component have been described in section 2 of the report.

At the global and interregional level: "planning, evaluation, and coordination" includes staff, consultants, and duty travel to assist regional offices and countries in formulating, refining, and implementing plans of operation, in developing and implementing training and communication activities, in solving problems that arise in carrying out control programmes, in developing and maintaining ORS production facilities, and in monitoring and

evaluating national control efforts. This component was fully staffed with a professional staff of five (including two staff members seconded by UNICEF and supported equally by both WHO and UNICEF) and a general services staff of four throughout the biennium, and thus approximately the amount anticipated was required for staff salaries. The extensive work of the component required an increase in the amount provided for temporary staff and consultants.

Under "development of training and educational materials" are included the development, production, testing, and periodic modification of materials for management and technical training, and guidelines for communication activities. The development of new materials for clinical training, namely, a short course on case management and a self-learning package, was a priority activity during the biennium.

Under "training courses" is included all interregional training. Following the revision of the Programme Managers' Course there was a greater demand for interregional courses than had been anticipated.

At the regional level: "planning" includes provision for the development and revision of regional and country plans of operation; "operations" includes staff support, duty travel, problem solving, development of supply systems for ORS, and assistance in the development of locally suitable methods and materials for communication; "training" includes all regional and national management and technical courses, and support for the development of local training materials and courses; and "evaluation" includes provision for surveys and comprehensive programme reviews, as well as continuous monitoring of activities. The difference in obligations for the two financial periods reflects changes in national programme emphases. Less was spent on planning in 1988-1989 than anticipated since nearly all countries now have a national plan of operation and the modification of such plans has not yet become a major activity. More was spent on operations as a result of the increase in regional and country staff support and the greater attention paid to implementation issues. Training continued to be a priority area, as reflected in the level of obligations. The Programme had also to respond to more requests from countries for attention to monitoring and formal review of their activities.

6.3 Research

The research component is seeking to develop improved methods of treating and preventing diarrhoea in young children. These include improved ORS formulations, better diets, and effective drugs; new or improved vaccines and diagnostic tests; and cost-effective preventive interventions. Support is also provided to research on the most practical means of implementing effective interventions. The activities of the research component are described in section 3 of the report. Table 4 in Annex 6 shows actual obligations for 1986-1987, and estimated and actual obligations for 1988-1989, by area of activity.

"Coordination" includes staff, consultants, and duty travel to manage both the component as a whole and the activities of the scientific working groups (SWGs). All posts, namely four professional and five general services staff, were filled throughout the biennium. The need for more temporary staff and consultants than expected resulted in a greater increase than anticipated in the "other" category.

Under each of the specific research areas are included: the funding of project contracts, the costs of meetings, activities carried out with Collaborating Centres, and monitoring of the progress of projects. More proposals were considered and funded than anticipated. Contracts represented 60% of the obligations in each area.

6.4 Programme management and support

The responsibilities of programme management relate to planning, development, coordination, information dissemination, administration, and evaluation of the Programme as a whole. Table 5 in Annex 6 shows the actual obligations for 1986-1987, and estimated and actual obligations for 1988-1989. The estimates for programme management and support include the costs of staff salaries and allowances, temporary assistance, consultants, duty travel, and publications, together with other support costs such as common services and rental of space. Provision is now made for four professional and four general services posts, plus two long-term consultants. Thus, the obligations were greater than had been anticipated.

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ANNEX 1: WHO CDD ESTIMATES OF ORS ACCESS AND ORS/ORT USE RATES BY COUNTRY AND REGION 1988

	Population < 5 years	Estimated episodes diarrhoea per child < 5 years per year	Estimated total diarrhoea episodes < 5 years	Total ORS reported produced or imported (litres)	ORS produced or imported per 100 episodes (litres)	ORS access rate #	ORS use rate	ORT use rate
	x 1000		x 1000	x 1000		%	%	%
Algeria	4 050.2	2.5 n	10 125.5	2 000.0	19.8	48 n	15 n	16 n
Angola	1 737.1	2.0 n	3 474.3	1 358.0	39.1	50 a	12 n	12
Benin	877.0	5.5 n	4 823.6	349.3	7.2	60 a	11 a	26 n
Botswana	238.0	2.3 n	547.4	212.5	38.8	85 a	45 a	64 at
Burkina Faso	1 530.9	4.6 a	7 042.0	239.0	3.4	79 n	15 n	16 a
Burundi	943.5	4.2 n	3 962.5	522.5	13.2	60 n	30 g	30 g
Cameroon	1 818.5	2.4 b	4 364.3	633.6	14.5	36 f	16 b	24 be
Cape Verde	59.4	4.8 *	285.2	90.0	31.6	81 a	9 n	9
Central African Rep.	483.3	6.1 n	2 947.9	15.3	0.5	41 a	6 a	15 a
Chad	939.5	8.0 n	7 515.9	674.0	9.0	22 f	2 c	2
Comoros	90.6	5.2 b	471.0	124.3	26.4	70 a	13 b	83 bt
Congo	336.0	6.6 n	2 217.7	189.2	8.5	40 a	6 a	6
Côte d'Ivoire	2 404.0	3.9 n	9 375.6	431.0	4.6	12 f	4 n	16 b
Equatorial Guinea	70.9	7.2 n	510.7	84.0	16.4	70 a	17 a	21 n
Ethiopia	7 489.1	4.8 a	35 947.7	350.1	1.0	50 a	38 a	38
Gabon	149.5	3.3 n	493.4	70.5	14.3	70 a	4 b	10 a
Gambia	145.9	4.3 a	627.2	104.0	16.6	60 a	15 a	39 a
Ghana	2 583.1	6.8 n	17 564.9	310.7	1.8	38 a	7 a	21 a
Guinea	1 167.5	4.3 n	5 020.5	751.6	15.0	37 f	20 g	1
Guinea-Bissau	152.6	8.9 b	1 358.3	0.2	0.0	19 a	1 n	1
Kenya	5 080.4	4.0 n	20 321.7	6 045.5	29.7	74 f	22 bm	54 bm
Lesotho	287.3	8.8 n	2 527.8	250.0	9.9	50 g	27 n	68 n
Liberia	445.8	4.8 *	2 139.9	82.7	3.9	22 a	6 b	9 b
Madagascar	2 044.1	4.8 *	9 811.6	387.2	3.9	51 a	10 a	80 a
Malawi	1 538.3	6.0 a	9 229.9	126.6	1.4	56 a	14 a	14 a
Mali	1 701.4	2.7 a	4 593.8	24.4	0.5	46 a	2 n	3 n
Mauritania	348.2	9.8 n	3 412.0	256.8	7.5	30 a	13 ad	23
Mauritius	92.9	4.8 *	445.7	115.0	25.8	65 f	7 c	7
Mozambique	2 638.4	4.7 n	12 400.3	707.5	5.7	40 n	14 n	14
Niger	1 313.8	6.9 a	9 065.0	510.0	5.6	44 a	21 a	38 at
Nigeria	21 037.5	4.0 n	84 149.9	699.8	0.8	60 a	16 a	35 bme
Rwanda	1 360.4	2.8 n	3 809.1	1 205.4	31.6	79 f	8 c	24 n
Sao Tome & Principe	23.0	2.8 n	64.4	10.0	15.5	100 n	46 n	46
Senegal	1 253.3	6.5 a	8 146.7	764.5	9.4	16 a	5 b	27 bmt
Seychelles	14.2	4.8 *	68.1	0.0	0.0			
Sierra Leone	720.7	3.2 n	2 306.1	2.4	0.1	60 n	11 n	31 n
Swaziland	1 423.6	4.8 *	6 833.4	300.0	4.4		15 b	
Togo	598.4	7.0 n	4 188.6	0.7	0.0	56 n	20 b	21 be
Uganda	3 456.4	6.3 b	21 775.4	4 182.6	19.2	48 f	14 b	14 be
United Rep. Tanzania	5 192.8	5.0 n	25 964.1	378.7	1.5	61 n	11 n	14 n
Zaire	6 275.6	2.3 n	14 433.9	896.8	6.2	48 a	10 n	18 a
Zambia	1 628.2	6.5 n	10 583.1	1 727.0	16.3	74 n	32 n	59 n
Zimbabwe	1 609.0	4.8 *	7 723.3	126.6	1.6	70 a	1 n	26 n
AFR	87 350.1	4.4	382 669.4	27 309.5	7.1	52	16	28

	Population < 5 years	Estimated episodes diarrhoea per child < 5 years per year	Estimated total diarrhoea episodes < 5 years	Total ORS reported produced or imported (litres)	ORS produced or imported per 100 episodes (litres)	ORS access rate #	ORS use rate	ORT use rate
	x 1000		x 1000	x 1000		%	%	%
Antigua and Barbuda	7.2	3.0 *	21.5	6.0	27.9	70 n		
Argentina	3 150.7	3.0 *	9 452.0	1 340.0	14.2	52 a	13 a	13
Barbados	23.1	3.0 *	69.2	50.0	72.2	100 f	10 c	10
Belize	38.0	1.5 n	57.0	50.0	87.8	100 f	65 n	65
Bolivia	1 195.4	3.0 a	3 586.2	2 215.0	61.8	40 a	22 bm	26 b
Brazil	18 214.3	3.9 b	71 035.8	40 094.5	56.4	68 n	26 b	39 be
Chile	1 428.2	1.5 a	2 142.3	103.8	4.8	12 f	1 c	1
Colombia	3 991.5	4.8 n	19 159.1	4 711.7	24.6	62 f	6 c	12 n
Costa Rica	374.2	4.6 n	1 721.4	890.0	51.7	90 a	73 n	78 n
Cuba	774.6	3.0 n	2 323.8	537.6	23.1	100 a	75 a	75
Dominica	9.0	3.0 *	27.0	6.0	22.2	70 n		
Dominican Republic	942.0	7.0 a	6 593.7	428.6	6.5	50 n	30 a	51 a
Ecuador	1 565.2	4.1 a	6 417.2	1 138.9	17.7	55 a	24 n	24
El Salvador	803.7	4.0 a	3 214.8	2 491.3	77.5	79 a	45 a	45
Grenada	12.3	3.0 n	37.0	6.0	16.2	100 a		70 a
Guatemala	1 517.6	5.2 n	7 891.6	4 603.6	58.3	60 a	17 n	17
Guyana	115.3	3.0 n	346.0	50.0	14.5	36 f	10 n	10
Haiti	908.5	7.0 n	6 359.5	531.4	8.4	21 f	25 g	35 q
Honduras	821.9	3.0 a	2 465.7	2 708.6	109.9	60 a	40 d	66 a
Jamaica	299.0	1.0 n	299.0	173.6	58.1	76 a	10 a	15 a
Mexico	11 102.5	5.9 b	65 504.5	16 665.5	25.4	86 a	34 g	72 n
Nicaragua	645.7	2.0 a	1 291.4	3 000.0	232.3	75 a	38 a	38
Panama	286.7	3.0 a	860.2	775.5	90.2	49 a	41 ad	41
Paraguay	620.6	2.1 n	1 303.2	159.0	12.2	57 n	32 n	36 n
Peru	3 083.4	8.6 b	26 517.5	2 769.6	10.4	23 a	10 b	10
St Christopher & Nevis	5.1	3.0 *	15.2	3.0	19.8	100 n	2 n	2
St Lucia	17.9	3.0 *	53.8	5.0	9.3	85 n	57 n	75 n
St Vincent & Grenadines	16.4	3.0 *	49.1	20.0	40.7	100 a	98 a	98
Suriname	47.1	0.8 n	37.7	59.2	157.1	65 n	47 ad	47
Trinidad and Tobago	139.6	3.0 *	418.8	33.0	7.9	100 n	53 n	60 n
Uruguay	274.5	1.3 q	356.8	264.0	74.0	56 n	40 b	40
Venezuela	2 603.4	5.0 a	13 017.2	1 113.8	8.6	80 a	30 a	30
AMR	55 034.5	4.6	252 645.1	87 004.2	34.4	65	25	41
Bangladesh	18 028.4	5.2 n	93 747.6	24 191.6	25.8	60 a	17 a	32 a
Bhutan	22.1	4.1 n	90.8	400.0	440.6	54 n	40 n	40
DPR Korea	2 912.9	0.7 a	2 039.0	685.0	33.6	82 a	52 a	52
India	109 771.1	2.7 a	296 382.0	64 784.0	21.9	57 f	12 a	23 a
Indonesia	20 322.2	1.9 a	38 612.3	8 045.8	20.8	90 n	25 a	56 a
Maldives	33.1	2.7 n	89.3	21.0	23.5	59 f	8 n	12 n
Mongolia	354.4	3.4 n	1 205.0	184.0	15.3	50 n	41 n	59 n
Myanmar	5 345.2	2.7 n	14 432.0	2 010.1	13.9	35 f	21 n	21
Nepal	2 934.6	5.4 n	15 846.9	2 500.0	15.8	80 a	28 a	28
Sri Lanka	1 764.0	1.5 n	2 645.9	877.5	33.2	95 a	43 a	77 a
Thailand	5 503.8	2.0 n	11 007.6	3 600.0	32.7	81 a	19 a	30 a
SEAR	166 991.9	2.9	476 098.5	107 299.0	22.5	63	15	28

	Population < 5 years	Estimated episodes diarrhoea per child < 5 years per year	Estimated total diarrhoea episodes < 5 years	Total ORS reported produced or imported (litres)	ORS produced or imported per 100 episodes (litres)	ORS access rate #	ORS use rate	ORT use rate
	x 1000		x 1000	x 1000		%	%	%
Afghanistan	2 700.7	2.5 *	6 751.7	4 533.7	67.1	16 n	11 n	11
Bahrain	60.5	2.4 n	145.2	42.0	28.9	73 f	53 n	53
Cyprus	61.7	2.5 *	154.2	12.2	7.9	20 f	2 c	2
Democratic Yemen	432.7	2.1 n	908.7	350.0	38.5	27 n	10 n	10
Djibouti	71.4	2.8 b	200.0	203.3	101.7	76 n	46 b	51 b
Egypt	7 808.1	3.4 n	26 547.7	4 530.0	17.1	98 n	29 b	83 n
Iran (Islamic Rep.of)	9 540.0	2.7 a	25 758.1	15 312.9	59.4	70 a	35 b	38 b
Iraq	3 183.3	2.1 b	6 684.9	5 015.3	75.0	81 n	44 b	51 n
Jordan	783.8	2.0 b	1 567.7	436.5	27.8	70 f	37 n	53 a
Kuwait	284.9	2.5 *	712.3	100.0	14.0	33 f	4 a	4
Lebanon	371.4	2.5 *	928.5	323.7	34.9	21 n	3 a	10 n
Libyan Arab Jamahiriya	772.1	1.7 a	1 312.6	1 000.0	76.2	100 f	60 a	60 a
Morocco	3 577.5	7.5 n	26 831.0	6 564.0	24.5	38 n	6 b	45 be
Oman	255.8	2.5 *	639.6	1 000.0	156.4	100 f	19 n	19
Pakistan	21 616.7	2.5 a	54 041.8	33 170.2	61.4	74 a	42 n	42 n
Qatar	47.7	2.7 n	128.8	0.0	0.0	100 n	15 n	15
Saudi Arabia	2 366.3	2.0 n	4 732.7	2 470.0	52.2	96 n	29 b	32 be
Somalia	1 394.9	2.5 *	3 487.1	1 400.0	40.1	31 n	12 n	12
Sudan	4 275.6	4.4 n	18 812.8	12 022.9	63.9	39 n	23 n	25 n
Syrian Arab Republic	2 217.3	2.5 n	5 543.3	1 341.0	24.2	61 f	28 n	31 n
Tunisia	1 045.6	3.9 b	4 077.8	70.0	1.7	100 n	33 b	48 be
United Arab Emirates	160.0	2.1 n	336.1	2 500.0	743.9	78 n	13 n	13
Yemen	1 442.7	2.5 *	3 606.8	1 000.0	27.7	34 n	6 c	6
EMR	64 470.9	3.0	193 909.2	93 397.8	48.2	68	29	43
Brunei Darussalam	32.6	0.2 n	7.8	0.0	0.0			
Cambodia	1 297.6	4.5 n	5 839.3	145.0	2.5	6 f	6 n	6
Cook Islands	2.3	1.2 n	2.8	2.4	86.4	58 n	8 n	8
Fiji	91.5	2.5 n	228.8	273.0	119.3	100 f	16 n	16
Kiribati	7.8	2.5 n	19.6	24.0	122.7	100 f	19 n	19
Lao People's Dem.Rep.	637.3	3.4 n	2 166.8	408.0	18.8	65 a	12 a	30 a
Malaysia	2 182.2	1.3 b	2 836.9	600.0	7.0	95 a	15 a	20 a
Papua New Guinea	649.5	2.5 b	1 623.7	300.0	18.5	57 a	15 a	46 a
Philippines	8 745.9	2.8 n	24 488.6	11 458.1	46.8	60 a	10 n	14 n
Samoa	23.6	1.1 n	26.0	24.0	92.5	70 n	7 n	7
Solomon Islands	58.2	2.8 n	162.8	100.0	61.4	100 f	28 n	75
Tonga	16.1	4.1 a	66.0	25.0	37.9	100 f	30 a	30 a
Vanuatu	25.0	3.3 n	82.4	27.0	32.8	82 f	31 n	31
Viet Nam	8 986.1	2.2 a	19 769.4	4 438.9	22.5	51 a	17 a	74 b
WPR (excluding China)	22 755.7	2.5	57 320.7	17 825.5	31.1	57	12	36
China	105 394.8	3.2 b	333 047.5	1 030.0	0.8	5 g	1 b	30 b
GLOBE (excluding China)	396 603.0	3.4	1 362 642.9	332 835.9	24.4	61	19	32

Proportion of the population < 5 years with access to ORS.
* Regional median based on available country estimates.
a National CDD programme estimate (from CPR report CDD programme country profile or other CDD report).
b Based on household sample surveys.
c Based on total ORS reported as produced or imported in 1988 assuming that 50% of available ORS is used for cases < 5 years at a rate of 2 litres per episode.
d Reported use rate assumed to apply only to cases with access. Figure shown is access rate x use rate/100.
e Estimates for both ORS and sugar-salt solution (or recommended home fluid) use rates available. The midpoint between the sum and the greater of the two values is used as the ORT use rate.
f Based on total ORS reported as produced or imported in 1988.
Assumes that of 100 episodes of diarrhoea 10 will need ORS. As explained in (c) 40 litres of ORS are required to be available to treat 10 episodes. Thus 40 litres of ORS are assumed to provide access for 100 episodes of diarrhoea.
g Best estimate from available data.
m Data available for 1989 and 1986 or 1987. The 1988 estimate is interpolated.
n Estimate for 1987 used in the absence of new or more reliable data.
q From report survey or evaluation from various sources/agencies.
t Includes estimate for use of recommended home fluid other than sugar-salt solution.

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ANNEX 2: NEW RESEARCH PROJECTS SUPPORTED BY THE PROGRAMME (FROM 1 JANUARY 1988 TO 31 DECEMBER 1989)

Project No.	Title	Principal investigator(s)/ institution(s)
1. SCIENTIFIC WORKING GROUP ON CASE MANAGEMENT		
HQ87177	Role of glutamine and alanine in promoting intestinal electrolyte and water absorption in experimental viral diarrhoea	Dr M. Rhoads Division of Pediatric Gastroenterology University of North Carolina Chapel Hill USA
HQ88009	Comparison of 2 L-alanine-glucose based ORS solutions with standard WHO ORS in adults and children with acute watery diarrhoea	Dr F.C. Patra International Centre for Diarrhoeal Disease Research, Bangladesh Dhaka Bangladesh
HQ88088	Effect of alanine plus glucose and glutamine plus glucose on salt and water absorption in the jejunum in acute cholera	Dr F. van Loon International Centre for Diarrhoeal Disease Research, Bangladesh Dhaka Bangladesh
HQ86034	Oral *vs* intravenous rehydration therapy for newborns and small infants	Dr E. Salazar Lindo Department of Pediatrics Hospital Cayetano Heredia Lima Peru
HQ87127	Trial to compare a precooked rice powder ORS and standard WHO citrate ORS for maintenance therapy of adult cholera patients	Dr M. Asril Moechtar Quarantine (I.D.) Hospital Jakarta Indonesia
HQ88050	Clinical trial on the efficacy and safety of using an ORS with L-alanine in the management of acute diarrhoea in children	Dr P.D. Santos Ocampo Department of Pediatrics University of the Philippines Philippines General Hospital Medical Centre Ermita, Manila Philippines
HQ88082	Controlled clinical trial comparing a rice-based ORS *vs* a glucose-based ORS in treating infants with acute diarrhoeal dehydration	Dr E. Chea-Woo Department of Pediatrics Universidad Peruana Cayetano Heredia Lima Peru
HQ87132	Development of an improved oral rehydration solution - phase II	Dr M.K. Bhan Department of Pediatrics All India Institute of Medical Sciences New Delhi India

HQ89016	Development of an improved oral rehydration solution - phase III	Dr M.K. Bhan Department of Pediatrics All India Institute of Medical Sciences New Delhi India
HQ89045	Efficacy of maltodextrin based ORS in the management of acute diarrhoea with dehydration in infancy - phase 2	Professor M. El-Mougi Alazhar Faculty of Medicine Cairo Egypt
HQ89106	A double-blind controlled clinical trial comparing glucose-glutamine-citrate ORS and standard WHO glucose-citrate ORS for the maintenance therapy of adult cholera patients	Dr H. Soepandji Infectious Diseases Hospital Jakarta Indonesia
HQ86154	Nutritional effect of milk-based diet *vs* milk-free diet on children with acute diarrhoea: a controlled follow-up clinical trial	Dr A.A. Madkour Department of Pediatrics Elshatby Children's Hospital Alexandria Egypt
HQ87152	Commercial soya-based formula diet *vs* home-made corn-based soya diet in the management of acute diarrhoea in children	Dr P.O. Abiodun Department of Child Health College of Medical Sciences University of Benin Benin City Nigeria
HQ88140	Efficacy and safety of "conventional regrading" *vs* continued full-strength milk feeding	Dr F. Penna Hospital das Clinicas Universidade Federal de Minas Gerais Belo Horizonte Brazil Dr F. Chew Institute of Nutrition of Central America and Panama Guatemala City Guatemala
HQ88145	Efficacy of feeding yoghurt in comparison to milk in malnourished children with acute diarrhoea	Dr M.K. Bhan Department of Pediatrics All India Institute of Medical Sciences New Delhi India
HQ88120	Comparative efficacy of pivmecillinan and cotrimoxazole in acute shigellosis in children	Dr D. Prado Patronato Pro-Departamento de Pediatria Hospital General San Juan de Dios Guatemala City Guatemala

HQ89043	Smectite in acute diarrhoea of children - a double-blind placebo controlled clinical trial	Dr A.A. Madkour Department of Pediatrics Elshatby Children's Hospital Alexandria Egypt
HQ88091	Clinical trial to evaluate efficacy of an antibiotic in the treatment of children under 25 months of age with persistent diarrhoea	Dr E. Chea-Woo Department of Pediatrics Universidad Peruana Cayetano Heredia Lima Peru Dr P. Alarcon Instituto de Investigacion Nutricional Lima Peru
HQ87034	Comparaison de l'effet du lait et du yaourt sur les diarrhées persistantes du nourrisson	Professeur M. Touhami Service de Pédiatrie C Clinique A. Cabral Oran Algeria
HQ87147	Controlled clinical trial with oral gentamicin to treat persistent diarrhoea	Dr B. Torun Institute of Nutrition of Central America and Panama Guatemala City Guatemala
HQ88129	Trial of coconut oil based chicken meat diet in persistent diarrhoea in children - a metabolic balance study	Dr P.K. Bardhan International Centre for Diarrhoeal Disease Research, Bangladesh Dhaka Bangladesh
HQ88131	Diets in persistent diarrhoea - importance of fat content and osmolality	Dr F. Perez Dr M.E. Penny Instituto de Investigacion Nutricional Lima Peru
HQ88141	Research strengthening of the diseases research unit in diarrhoeal case management	Dr P.D. Santos Ocampo Department of Pediatrics University of the Philippines Philippines General Hospital Ermita, Manila Philippines
HQ88024	Training in the conduct of clinical trials on diarrhoeal diseases	Dr Li-Ming Ye Fujian Provincial Hospital Fuzhou China
HQ88183	Training in clinical studies and techniques for investigation of intestinal digestion and absorption	Dr Myo Khin The Department of Medical Research Yangon Myanmar

HQ89100	L-alanine enriched ORS in the rehydration of children with acute diarrhoea	Dr A.A. Madkour Department of Pediatrics Elshatby Children's Hospital Alexandria Egypt

2. SCIENTIFIC WORKING GROUP ON EPIDEMIOLOGY AND DISEASE PREVENTION

HQ85171	Effects of health education and hand-washing on the prevention of diarrhoeal diseases in day-care centres in Shanghai	Dr Kang Lai-Yi Department of Epidemiology Shanghai Hygiene and Anti-Epidemic Centre Shanghai China
HQ86120	A descriptive epidemiological study of diarrhoeal diseases among under-fives in a rural Nigerian community	Dr C.O. Oyejide Department of Preventive and Social Medicine Institute of Child Health Ibadan Nigeria
HQ89095	Development of an appropriate hand-washing technique	Dr B. Hoque Amin International Centre for Diarrhoeal Disease Research, Bangladesh Dhaka Bangladesh
HQ88014	A descriptive study of the preparation, storage and administration of *ogi* and its potential safety at time of use	Professor T. Odugbemi Department of Microbiology and Parasitology College of Medicine University of Lagos Lagos Nigeria
HQ87037	A case-control study of risk factors for dehydrating diarrhoea	Dr A.S.G. Faruque Laboratory Sciences and Epidemiology Division International Centre for Diarrhoeal Disease Research, Bangladesh Dhaka Bangladesh
HQ87079	Epidemiology of persistent diarrhoea in Bangladeshi children	Dr A. Baqui Community Medicine Division International Centre for Diarrhoeal Disease Research, Bangladesh Dhaka Bangladesh
HQ88115	A study of the prevalence of diarrhoea in relation to personal hygiene and sanitation	Dr F. Fikree Department of Community Health Sciences Aga Khan University Karachi Pakistan

HQ87109	Risk factors for chronic diarrhoea in children 0-12 months	Dr F. Jalil Department of Pediatrics King Edward Medical College Lahore Pakistan
HQ87123	Health behavioural intervention to reduce diarrhoeal disease	Dr R. del Aguila Instituto de Investigacion Nutricional Lima Peru Dr C. Kendall Department of International Health School of Hygiene and Public Health The Johns Hopkins University Baltimore USA
HQ88095	Introduction of piped water in traditional rural Guatemalan households: evaluation of impact on behaviours related to water	Dr A.V. Bartlett Dr E. Hurtado Division of Nutrition and Health Institute of Nutrition of Central America and Panama Guatemala City Guatemala
HQ88116	Intervention to improve infant feeding related to diarrhoeal disease and growth, and evaluation of changes in behaviour	Dr H. Creed de Kanashiro Dr M. Fukumoto Instituto de Investigacion Nutricional Lima Peru
HQ88011	Institutional strengthening of the Pelotas epidemiology research group	Dr C.G. Victora Dr F. Barros Department of Social Medicine Faculty of Medicine Federal University of Pelotas Pelotas Brazil
HQ89025	Training on epidemiological data analysis	Dr M.P. Borja Department of Epidemiology College of Public Health University of the Philippines Ermita, Manila Philippines
HQ89026	Training in research methods in medical anthropology	Dr M.S. Tempongko Department of Public Health Administration College of Public Health University of the Philippines Ermita, Manila Philippines

HQ89084	Study grant for a Ph.D in medical anthropology	Ms C. Lombardi Epidemiology Research Centre Department of Social Medicine Faculty of Medicine Federal University of Pelotas Pelotas Brazil

3. SCIENTIFIC WORKING GROUP ON IMMUNOLOGY, MICROBIOLOGY AND VACCINE DEVELOPMENT

HQ86089	Studies on rotavirus infection in Thailand: (1) types of prevailing virus, and (2) relevance of faecal IgA response	Dr Y. Yamazi Department of Microbiology and Immunology Nippon Medical School Tokyo Japan Dr Boonyong Pongprot Faculty of Medicine Chiang Mai University Chiang Mai Thailand
HQ87121	Epidemiology and laboratory studies of adult rotavirus diarrhoea	Dr Tao Hung Department of Virus Morphology Institute of Virology China National Academy for Preventive Medicine Beijing China
HQ87144	Efficacy of rhesus rotavirus and human-rhesus rotavirus reassortant vaccines in Myanmar children	Dr Kyaw Moe Virology Research Division The Department of Medical Research Yangon Myanmar
HQ88016	Study comparing one and two doses of oral rhesus rotavirus vaccine (RRV-serotype 3) in healthy newborn subjects	Dr R. Dagan Department of Pediatrics Soroka Medical Center Beer-Sheva Israel
HQ88025	Antibody response and interaction between rhesus-human reassortants rotavirus vaccine and oral poliovirus vaccine	Dr Sricharoen Migasena Vaccine Trial Centre Faculty of Tropical Medicine Mahidol University Bangkok Thailand
HQ88081	Prospective serological study of HRV infection	Professor Mun Hong Ng Department of Microbiology University of Hong Kong Hong Kong

HQ88110	A phase 1 trial of rhesus-human reassortant rotavirus vaccine in breast-fed and non-breast-fed infants	Dr G. Kanra Pediatric Infectious Diseases Unit Faculty of Medicine Hacettepe University Ankara Turkey
HQ88136	Evaluation of hepatopathogenic potential of vaccine candidate rotaviruses in a blinded control study in mice	Dr M. Riepenhoff-Talty Division of Infectious Diseases and Virology Children's Hospital Buffalo USA
HQ89008	PRN serum antibody analysis of infants given RRV-tetravalent rotavirus vaccine in Belém, Brazil	Dr H. Clark The Wistar Institute Philadelphia USA
HQ89020	Safety and immunogenicity study comparing 1 and 2 doses of oral rhesus rotavirus tetravalent vaccine containing 10^5 PFU of each serotype	Dr R. Dagan Department of Pediatrics Soroka Medical Center Beer-Sheva Israel
HQ89022	Immunogenicity, safety and efficacy of rhesus-human reassortant rotavirus (RRV-tetravalent) vaccine in Belém, Brazil	Dr A. da Costa Linhares Virology Section Instituto Evandro Chagas Belém Brazil Dr N. Bellesi Clinica de Medicina Preventiva do Para Ltda Belém Brazil
HQ89085	To devise a serotyping scheme for the VP4 protein specificity of human rotaviruses	Dr M. Gorziglia Laboratory of Infectious Diseases National Institute of Allergy and Infectious Diseases Bethesda USA
HQ89094	Safety and immunogencity trial of M37 human nursery strain rotavirus vaccine in Finnish infants	Dr T. Ruuska Department of Clinical Sciences University of Tampere Tampere Finland
HQ87163	Enteric adenoviruses in Argentina	Dr S. Grinstein Virology-Serology Laboratory Ricardo Gutierrez Children's Hospital Buenos Aires Argentina
HQ86264	Reactogenicity and immunogenicity of *V. cholerae* vaccine CVD 103 (A-B+ cytotoxin negative, derivate of classic Inaba 569B)	Dr Sricharoen Migasena Vaccine Trial Centre Faculty of Tropical Medicine Mahidol University Bangkok Thailand

HQ87042	Reactogenicity to different doses of *Vibrio cholerae* in Thai adults	Dr Sricharoen Migasena Vaccine Trial Centre Faculty of Tropical Medicine Mahidol University Bangkok Thailand
HQ88125	A double-blind placebo-controlled efficacy trial of WC3 rotavirus vaccine against symptomatic rotavirus infection in children	Dr Liu Xiang-Yun Children's Hospital Shanghai Medical University Shanghai China
HQ89023	Development of a vaccine against enterotoxigenic *E. coli* diarrhoea	Dr A.-M. Svennerholm Department of Medical Microbiology University of Goeteborg Goeteborg Sweden
HQ87085	*E. coli* serotypes with defined enteropathogenic determinants as a cause of diarrhoea in children less than 6 months of age	Dr P. Echeverria Department of Bacteriology Armed Forces Research Institute of Medical Sciences Bangkok Thailand
HQ88017	Development and validation of improved diagnostic tests for enteropathogenic and enteroadherent *Escherichia coli*	Dr S. Knutton Institute of Child Health University of Birmingham Birmingham UK
HQ87081	Isolation and purification of *S. typhi* specific protein antigen	Dr Suttipant Sarasombath Division of Immunology Department of Microbiology Siriraj Hospital Bangkok Thailand
HQ88069	Double-blind placebo controlled trial testing the immunogenicity and side effects of parenteral Vi polysaccharide typhoid vaccine	Dr C.H. Simanjuntak National Institute of Health Research and Development Jakarta Indonesia
HQ88020	Homologous and heterologous protective immunity in a rabbit model of shigellosis	Dr D.A. Sack Department of International Health School of Hygiene and Public Health The Johns Hopkins University Baltimore USA
HQ88097	Safety, immunogenicity and efficacy of an auxotrophic oral live *Shigella flexneri* vaccine	Dr D.A. Herrington Center for Vaccine Development University of Maryland Baltimore USA

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ANNEX 3: PUBLICATIONS ARISING OUT OF RESEARCH SUPPORTED BY THE PROGRAMME

(The names of Principal Investigators of funded projects are typeset in **bold face**)

1. Scientific Working Group on Case Management

1986

Kassem, A.S., Aref, M.K., Madkour, A.A. & El-Sherbini, H. Study of the efficacy of a new "universal" intravenous fluid in the rehydration of cases of acute infantile diarrhea. *Bull Alex Fac Med, 22*: 655-662 (1986).

1987

Bhan, M.K., Ghai, O.P., Khoshoo, V., Vasudev, A.S., Bhatnagar, S., Arora, N.K., Rashmi & Stintzing, G. Efficacy of mung bean (lentil) and pop rice based rehydration solutions in comparison with the standard glucose electrolyte solution. *J Pedatr Gastroenterol Nutr, 6*: 392-399 (1987).

Brunsson, I. *Acute inflammatory diarrhoea in the small intestine. An experimental study of secretory mechanisms in rats and cats.* Göteborg, Department of Physiology, University of Göteborg (1987). [Principal Investigator: **Lundgren, O.**]

Butler, T., Dahms, B., Lindpaintner, K., Islam, M., **Azad, M.A.K.** & Anton, P. Segmental necrotising enterocolitis: pathological and clinical features of 22 cases in Bangladesh. *Gut, 28*: 1433-1438 (1987).

De Jonge, H.R. & Vaandrager, A.B. Signal transduction in mammalian enterocytes: protein phosphorylation and polyphospholnositide cycling in brush border membrane. *Dig Dis Sci, 32*: 794 (1987).

De Jonge, H.R. Potential targets for phenothiazines and isoquinoline sulfonamides in intestinal epithelium. *Dig Dis Sci, 32*: 797 (1987).

Eklund, S., Brunsson, I., Jodal, M. & **Lundgren, O.** Changes in cyclic 3'5'-adenosine monophosphate tissue concentration and net fluid transport in the cat's small intestine elicited by cholera toxin, arachidonic acid, vasoactive intestinal polypeptide and 5-hydroxytryptamine. *Acta Physiol Scand, 129*: 115-125 (1987).

Eklund, S. *Intramural reflex regulation of fluid secretion in the small intestine. An experimental study in cats and rats.* Göteborg, Department of Physiology, University of Göteborg (1986). [Principal Investigator: **Lundgren, O.**]

Kassem, A.S., Madkour, A.A., Madina, E.M., Massoud, M.N.Z., Abd-Rabo, M.A. & Abdel-Aal, A.N. Low sodium oral rehydration solution *versus* the W.H.O. formula in the correction of dehydration in children. *Alex J Pediatr, 1*: 133-140 (1987).

Kassem, A.S., Madkour, A.A., Madina, E.M.H., Massoud, M.N.Z., Hamouda, M.A. & El-Sawy, M. Serum sodium level in children receiving home-mixed oral rehydration solution. *Alex J Pediatr, 1*: 123-132 (1987).

Marin, L., Saner, G., Söküçü, S., Günoz, H., **Neyzi, O.** & **Zetterström, R.** Oral rehydration therapy in neonates and young infants with infectious diarrhoea. *Acta Paediatr Scand, 76*: 431-437 (1987).

1988

Brown, K.H., Gastanaduy, A.S., Saavedra, J.M., Lembcke, J., Rivas, D., Robertson, A.D., Yolken, R. & Sack, R.B. Effect of continued oral feeding on clinical and nutritional outcomes of acute diarrhea in children. *J Pediatr, 112*: 191-200 (1988).

Pizarro, D., Posada, G., Mahalanabis, D. & Sandi, L. Comparison of efficacy of a glucose/glycine/glycylglycine electrolyte solution versus the standard WHO/ORS in diarrheic dehydrated children. *J Pediatr Gastroenterol Nutr, 6*: 882-888 (1988).

Santos Ocampo, P.D., Bravo, L.C., Rogacion, J.M., Gonzales, G., Saniel, M. & Battad, G. Clinical trial on the efficacy and safety of added glycine and glycyl glycine to oral rehydration solution. *Philipp J Pediatr, 38*: 99-120 (1988).

Sjöqvist, A., Fahrenkrug, J., Jodal, M. & **Lundgren, O.** The effect of splanchnic nerve stimulation and neuropeptide Y on cholera secretion and release of vasoactive intestinal polypeptide in the feline small intestine. *Acta Physiol Scand, 133*: 289-295 (1988).

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Bhan, M.K., Sazawal, S., Bhatnagar, S., Bhandari, N., Guha, D.K. & Aggarwal, A. Glycine, glycyl-glycine and maltodextrin based oral rehydration solution: assessment of efficacy and safety in comparison to standard ORS. Submitted to *Gut*.

Bhan, M.K., Bhandari, N., Sazawal, S., Clemens, J., Raj, P., Levine, M.M. & Kaper, J.B. Longitudinal study of diarrhoeal disease among young children in rural North India. Submitted to the *Bull WHO*.

Bhan, M.K., Khoshoo, V., Puri, S., Jain, R., Jayashree, S., Bhatnagar, S. & Stintzing, G. Serum anti-gliadin antibody profile in childhood chronic diarrhoea due to coeliac disease and other causes in a developing country. Submitted to *J Trop Med Hyg*.

Bhan, M.K., Raj, P., Levine, M.M., Kaper, J.B., Bhandari, N., Srivastava, R., Kumar, R. & Sazawal, S. Enteroadherent-aggregative *Escherichia coli*: a cause of persistent diarrhea in a cohort of rural Indian children. *J Infect Dis, 159*: 1061-1064 (1989).

Bhandari, N., **Bhan, M.K.**, Sazawal, S., Clemens, J.D., Bhatnagar, S. & Khoshoo, V. Association of antecedent malnutrition with persistent diarrhoea: a case-control study. *Br Med J, 298*: 1284-1287 (1989).

Boudraa, G., **Touhami, M.**, Pochart, P., Soltana, R., Mary, J.Y. & Desjeux, J.F. Effets comparés du yaourt et du lait sur la diarrhée persistante du nourrisson et de l'enfant: résultats préliminaires. *In: Les laits fermentés. Actualité de la recherche*, pp. 229-232. Paris, John Libbey Eurotext Ltd. (1989).

Brown, K.H., Black, R.E., Lopez de Romaña, G. & Creed de Kanashiro, H. Infant feeding practices and their relationship with diarrheal and other diseases in Huascar (Lima), Peru. *Pediatrics, 83*: 31-41 (1989).

Elaraby, I.I., Madkour, A.A., Massoud, B.Z., Abdou, M.O., Hussein, M.M.H., Mouafi, E.W.E. & Marzouk, I. The use of chlorpromazine as an antisecretory agent in acute diarrhea of childhood. *Alex J Pediatr, 3*: 1-8 (1989).

Lembcke, J., Gastanaduy, A.S. & **Brown, K.H.** Prediction of total daily fecal excretion during acute childhood diarrhea. *J Pediatr Gastroenterol Nutr, 9*: 467-472 (1989).

Patra, F.C., Sack, D.A., Islam, A., Alam, A.N. & Mazumder, R.N. Oral rehydration formula containing alanine and glucose for treatment of diarrhoea: a controlled trial. *Br Med J, 298*: 1353-1356 (1989).

Saavedra, J.M. & **Brown, K.H.** A new approach to characterize whole gut transit in infants using a non-absorbable intestinal marker. Submitted to *Am J Clin Nutr.*

Santos-Ocampo., P.D., Gonzales, G.G., Bravo, L.C., Saniel, M. & Rogacion, J.M. The efficacy and safety of added glycine and glycyl-glycine to an oral rehydration solution. *Philip J Pediatr, 38*: 94-110 (1989).

Vaandrager, A.B., Ploemacher, M.C. & **De Jonge, H.R.** Phosphoinositide metabolism in intestinal brush borders. Submitted to *Am J Physiol.*

2. Scientific Working Group on Immunology, Microbiology and Vaccine Development

1986

Eklund, S. *Intramural regulation of fluid secretion in the small intestine. An experimental study in cats and rats.* Göteborg, Department of Physiology, University of Göteborg (1986). [Principal Investigator: **Lundgren, O.**]

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4. Regional Scientific Working Groups

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Americas

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ANNEX 4: COLLABORATING CENTRES

WHO Collaborating Centre for Reference and Research on *Salmonella*
Pasteur Institute
25, rue du Dr Roux
75724 Paris Cedex 15
France

WHO Collaborating Centre for Enteric *Campylobacter*
St Pieters Hospital
Free University of Brussels
Hoogstraat 322
1000 Brussels
Belgium

WHO Collaborating Centre for *Shigella*
Division of Bacterial Diseases
Centers for Infectious Diseases
Centers for Disease Control
Atlanta, GA 30333
USA

WHO Collaborating Centre for Reference and Research on Bacterial Vaccines
"Human" Institute for Serobacteriological Production and Research
1107 Budapest
Hungary

WHO Collaborating Centre for Phage-typing and Resistance of Enterobacteria
Central Public Health Laboratory
Colindale Avenue
London NW9 5HT
United Kingdom

WHO Collaborating Centre for Research, Training and Control in Diarrhoeal Diseases
International Centre for Diarrhoeal Disease Research, Bangladesh
G.P.O. Box 128
Dhaka 1000
Bangladesh

WHO Collaborating Centre for Diarrhoeal Diseases Research and Training
National Institute of Cholera and Enteric Diseases
(Indian Council of Medical Research)
P-33, CIT Road Scheme XM
Beliaghata
Calcutta 700 010
India

WHO Collaborating Centre for Environmental and Epidemiological Aspects of Diarrhoeal Diseases
Department of Epidemiology and Population Sciences
London School of Hygiene and Tropical Medicine
Keppel Street
London WC1 7HT
United Kingdom

WHO Collaborating Centre for Reference and Research on *Escherichia* and *Klebsiella*
Statens Seruminstitut
Amager Boulevard 80
DK 2300 Copenhagen S
Denmark

WHO Collaborating Centre for Research on Human Rotaviruses
Department of Gastroenterology
Royal Children's Hospital
Flemington Road
Parkville, Victoria 3052
Australia

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ANNEX 5: NEW PUBLICATIONS AND DOCUMENTS

1. Management and general interest

Diarrhoeal Diseases Control Programme

Sixth Programme report, 1986-1987. Document WHO/CDD/88.28

Interim Programme report, 1988. Document WHO/CDD/89.31

Report of the ninth meeting of the Technical Advisory Group. Document WHO/CDD/88.29

Report of the tenth meeting of the Technical Advisory Group. Document WHO/CDD/89.32

Report of the eighth meeting of the Management Review Committee. Document CDD/MRC/88.1

Report of the ninth meeting of the Management Review Committee. Document CDD/MRC/89.1

Report of the eighth Meeting of Interested Parties. Document CDD/MIP/88.13

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2. Health Services

National programme reports

Comprehensive programme review - Viet Nam. *Weekly epidemiological Record*, 1988, *63*: 293-298

Comprehensive programme review - Angola. *Weekly epidemiological Record*, 1988, *63*: 365-369

Comprehensive programme review - Niger. *Weekly epidemiological Record*, 1989, *64*: 157-159

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Training courses

Supervisory skills. 1987 revision

CDD programme management. 1988 revision

Manuals and guidelines

Guidelines for the control of epidemics due to *Shigella dysenteriae* 1. Document WHO/CDD/SER/88.12

Treatment and prevention of acute diarrhoea - Practical guidelines. 2nd ed., 1989

Diarrhoea training unit - Director's guide. Document CDD/SER/86.1 Rev. 1 (1988)

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Estimating costs for cost-effectiveness analysis - Guidelines for managers of diarrhoeal diseases control programmes. Document CDD/SER/88.3

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New guidelines - Cost-effectiveness analysis for CDD managers. CDD Update No. 6, April 1989

Technical papers

Impact of oral rehydration therapy on hospital admission and case-fatality rates for diarrhoeal disease: Results from 11 countries. *Weekly epidemiological Record*, 1988, *63*: 49-52

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Diarrhoeal dehydration - Easy to treat but best prevented. *World Health Forum*, 1989, *10*: 110-115

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3. Research

Scientific reviews

Development of vaccines against cholera and diarrhoea due to enterotoxigenic *Escherichia coli* - Report of a meeting. Document WHO/CDD/IMV/89.2 Rev. 1 (1989)

Research on improving infant feeding practices to prevent diarrhoea or reduce its severity: Memorandum from a JHU/WHO meeting. *Bulletin of the World Health Organization*, 1989, *67*: 27-33

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Cousens, S.N., Feachem, R.G., Kirkwood, B. et al. Case-control studies of childhood diarrhoea. I. Minimizing bias. Document CDD/EDP/88.2

Cousens, S.N., Feachem, R.G., Kirkwood, B. et al. Case-control studies of childhood diarrhoea. II. Sample size. Document CDD/EDP/88.3

Cousens, S.N., Feachem, R.G., Kirkwood, B. et al. Case-control studies of childhood diarrhoea. III. Matching. Document CDD/EDP/89.1

General

List of research projects funded since 1980, by Scientific Working Group and broad priority area. Document CDD/RES/89.1

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ANNEX 6: FINANCIAL STATUS 1978-1989

TABLE 1. RESOURCES RECEIVED BY THE PROGRAMME 1978-1989

SOURCE	1978-1983	1984-1985	1986-1987	1988-1989
REGULAR BUDGET	US$	US$	US$	US$
Global and Interregional	1,854,277	1,094,177	979,951	1,090,897
Regions	2,915,737	1,715,720	1,419,610	1,812,133
TOTAL REGULAR BUDGET	4,770,014	2,809,897	2,399,561	2,903,030
OTHER SOURCES				
Australia	377,037	323,840	268,442	418,665
Belgium	218,461	(54,545)	24,390	
Canada (CIDA)	406,504	449,596	441,088	501,536
China	50,000	50,000	50,000	50,000
Denmark (DANIDA)	984,393	985,120	1,241,628	1,294,292
Finland		402,050	727,049	940,797
France	60,606	78,394	90,833	97,984
India	20,000	40,000	40,000	
Italy			101,062	632,830
Japan	300,000	125,000	300,000	300,000
Kuwait	10,000			
Morocco	7,475			
Netherlands	869,822	985,611	910,617	971,829
Nigeria		6,680		
Norway	70,423	119,461	276,507	299,406
Sweden (SIDA/SAREC)	2,352,645	904,164	1,139,690	945,354
Switzerland	533,025	568,707	901,108	520,833
United Kingdom	1,019,380		330,320	1,200,977
United States of America	236,200	1,338,100	3,200,000	2,153,450
Pan American Health Organization	49,695			
United Nations Children's Fund	534,384	1,199,854	866,945	705,837
United Nations Development Programme	4,994,487	2,551,624	2,177,004	2,055,500
Arab Gulf Programme for United Nations Development Organizations (AGFUND)	1,975,000	525,000		1,000,000
International Development Research Centre (Canada)	464,419	289,872	162,016	184,594
Rotary International			5,000	
Sasakawa Health Trust Fund	25,000	31,135	23,436	
Thrasher Research Fund		20,000		
Ciba-Geigy		757,576	2,579,365	2,650,970
Special Account for the Cholera Programme	433,990			
Special Account for Miscellaneous Designated Contributions		333,707	732,653	
Other	4,150	1,490	549	800
Interest	941,165	682,870	717,490	1,059,760
TOTAL	21,708,275	15,525,203	19,706,753	20,888,444

TABLE 2: ACTUAL OBLIGATIONS INCURRED IN 1986-1987, ESTIMATED OBLIGATIONS FOR 1988-1989 (BUDGET), AND ACTUAL OBLIGATIONS FOR 1988-1989

Programme Component	Actual obligations 1986-1987	Estimated obligations 1988-1989	Actual obligations 1988-1989	
	US$	US$	US$	%
I. ADVISORY AND MANAGEMENT MEETINGS				
Global and interregional	203,983	220,000	170,063	0.8
II. HEALTH SERVICES				
Global and interregional	2,667,663	3,740,000	3,395,454	16.1
Regional	7,477,435	11,075,000	9,294,352	44.1
Sub-total	10,145,098	14,815,000	12,689,806	60.2
III. RESEARCH				
Global and interregional	6,277,292	8,371,000	6,882,227	32.6
IV. PROGRAMME MANAGEMENT AND SUPPORT				
Global and interregional	1,135,703	1,515,000	1,340,171	6.4
TOTAL				
Global and interregional	10,284,641	13,846,000	11,787,915	55.9
Regional	7,477,435	11,075,000	9,294,352	44.1
TOTAL	17,762,076	24,921,000	21,082,267	100.0

TABLE 3: HEALTH SERVICES

Programme Area	Actual obligations 1986-1987	Estimated obligations 1988-1989	Actual obligations 1988-1989	
	US$	US$	US$	%
GLOBAL AND INTERREGIONAL				
PLANNING, EVALUATION, AND COORDINATION				
Coordination				
(a) staff salaries and related costs	786,751	1,290,000	1,159,395	5.4
(b) other*	356,268	600,000	585,258	2.8
New strategies	19,414	50,000	15,505	0.1
Oral Rehydration Salts				
(a) production	12,252	15,000	14,547	0.1
(b) stock	8,048	10,000	3,410	0.0
Evaluation				
(a) comprehensive programme reviews	21,018	15,000	0	0.0
(b) management information system	90,510	120,000	60,047	0.3
(c) survey development	127,079	310,000	226,869	1.1
Miscellaneous	21,325	30,000	6,319	0.0
Sub-total	1,442,665	2,440,000	2,071,350	9.8
DEVELOPMENT OF TRAINING AND EDUCATIONAL MATERIALS				
Development of new materials	335,697	620,000	847,281	4.0
Communication activities	118,101	200,000	23,601	0.1
Modifications of management training	496,094	100,000	54,809	0.3
Sub-total	949,892	920,000	925,691	4.4
TRAINING COURSES				
Programme managers' courses	78,125	320,000	398,413	1.9
Testing new and revised courses	196,981	60,000	0	0.0
Sub-total	275,106	380,000	398,413	1.9
Total global and interregional	2,667,663	3,740,000	3,395,454	16.1
REGIONAL				
Planning	208,154	547,000	217,474	1.0
Operations	3,784,422	5,932,000	4,963,260	23.5
Training	2,669,723	3,551,000	3,425,540	16.3
Evaluation	815,136	1,045,000	688,078	3.3
Total regional	7,477,435	11,075,000	9,294,352	44.1
TOTAL HEALTH SERVICES	10,145,098	14,815,000	12,689,806	60.2

*Includes temporary staff, consultants, duty travel, contracts, internal reproduction, and miscellaneous supplies.

TABLE 4: RESEARCH

Programme Area	Actual obligations 1986-1987	Estimated obligations 1988-1989	Actual obligations 1988-1989	
	US$	US$	US$	%
COORDINATION				
Staff salaries and related costs	1,097,599	1,402,000	1,284,494	6.1
Other*	355,608	332,000	237,945	1.1
Sub-total	1,453,207	1,734,000	1,522,439	7.2
IMMUNOLOGY, MICROBIOLOGY AND VACCINE DEVELOPMENT (IMV)				
Contracts	2,239,139	1,798,000	1,699,122	8.1
SWG meetings	93,882	94,000	90,311	0.4
Other*	112,095	217,000	195,386	0.9
Sub-total	2,445,116	2,109,000	1,984,819	9.4
CASE MANAGEMENT (CMT)				
Contracts	786,634	1,335,000	1,167,779	5.5
SWG meetings	69,412	78,000	79,587	0.4
Other*	311,337	336,000	259,758	1.2
Sub-total	1,167,383	1,749,000	1,507,124	7.1
EPIDEMIOLOGY AND DISEASE PREVENTION (EDP)				
Contracts	829,460	1,934,000	1,262,684	6.0
SWG meetings	99,940	115,000	82,841	0.4
Other*	282,186	467,000	426,024	2.0
Sub-total	1,211,586	2,516,000	1,771,549	8.4
IMPLEMENTATION (IMP)				
Contracts		150,000	0	0.0
Other*		113,000	96,296	0.5
Sub-total	0	263,000	96,296	0.5
TOTAL RESEARCH	6,277,292	8,371,000	6,882,227	32.6

*Includes Collaborating Centres, special workshops, temporary staff, consultants, duty travel, fellowships, internal reproduction and miscellaneous supplies.

TABLE 5: PROGRAMME MANAGEMENT AND SUPPORT

Activity	Actual obligations 1986-1987	Estimated obligations 1988-1989	Actual obligations 1988-1989	
	US$	US$	US$	%
Staff salaries and related costs	731,072	915,000	796,561	3.8
Other*	404,631	600,000	543,610	2.6
TOTAL	1,135,703	1,515,000	1,340,171	6.4

*Includes temporary staff, consultants, duty travel, common services, rent, publications, and miscellaneous supplies.

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