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EIGHTH PROGRAMME REPORT 1990-1991

World Health Organization

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Programme for control of diarrhoeal diseases

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Contents

INTRODUCTION 1

The WHO Diarrhoeal Disease 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 all developing countries implementing national diarrhoeal diseases control programmes. It has also awarded support to over 400 research projects in more than 80 countries seeking better ways of delivering services and new or improved tools for control.

This report describes the activities undertaken by the Programme during the 1990-1991 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 or was initiated during the biennium. The format of the report, modified in 1990 to include more specific examples of country activities and research results, has been maintained in view of the positive response to this approach.

A world event of significance to the Programme during the biennium was the World Summit for Children, held in New York in September 1990. At the summit and subsequently, heads of state of almost all countries endorsed the goals previously set for diarrhoeal disease control. By the year 2000 diarrhoea mortality is to be reduced by half compared with the 1990 level, and diarrhoea morbidity by one quarter. In order to do this, an intensified effort will be required from all concerned. In April 1991, representatives of WHO and UNICEF met to discuss a joint strategy for their support to national diarrhoeal disease control programmes in the 1990s. Key indicators of progress and quantified targets for 1995 and 2000 were agreed upon. This closer alliance, along with the continued support of other organizations and agencies, is critical to the success of national CDD programmes in many countries.

In the biennium covered by this report, the global CDD Programme advanced on many fronts. In particular, training activities both in programme management and in case management, increased greatly in number as reflected in an increase in case management training coverage from 11% at the end of 1989 to 19% at the end of 1991. Continued expansion of training efforts, as described in this report, will be necessary to achieve the 1995 target of training 40% of all staff responsible for treatment of diarrhoea cases.

The rate of access to oral rehydration salts (ORS) of the population of developing countries was estimated to be 68% at the end of 1991, up from 63% at the end of 1989. Similarly, the ORT use rate rose to 38%. The Programme is striving to bring new vigour to current efforts to control diarrhoeal diseases and to look for innovative ways to expand those efforts beyond the public health sector and into the community. These needs are reflected in the ongoing developmental and implementation activities of the Programme.

Two areas in which programme activities were significantly increased in the biennium are the promotion, protection and support of breast-feeding and the rational use of drugs in diarrhoea case management. Both have provided new challenges and the need to develop appropriate strategies and tools.

[1] See also: Interim Programme Report 1990. Document WHO/CDD/91.36.

The research activities of the Programme have continued and evolved during the biennium so that the wide range of projects supported now responds more than ever before to the needs of programme implementation. This focus is balanced by forward-looking research aimed at defining and testing future interventions for the prevention of diarrhoea, including field trials of candidate vaccines.

Many of the activities described in this report were carried out by national country programmes with minimal or no input from external sources. In a few countries especially, CDD programmes are now well integrated into the overall delivery of primary health care. Some of the activities described were supported by international organizations other than WHO, or by bilateral or non-governmental agencies; this support remains important.

During the 1990-1991 biennium the Programme received financial support from 17 contributors. This support has been generous but must continue and, if possible, expand in the remaining years of the decade if the Programme, along with national governments, UNICEF and its other partners, is to reach its targets for the year 2000.

HEALTH SERVICES 2

In the 1990-1991 biennium, the Programme expanded its technical cooperation with national programmes, with continued emphasis on managerial and clinical training, and evaluation of programme implementation.

The main developmental activities of the health services component included the completion of new training packages to extend and decentralize case management training. Materials and tools approaching readiness for wide field application were the new problem-solving review process, guidelines to assess and plan activities to improve the rational use of drugs, and the packages for medical education, nurses' training and distance learning for peripheral health workers. The completion of these methods and materials in 1992 will further enable the Programme to assist countries in the implementation of national CDD programmes.

The Programme increased its activities in the promotion of breast-feeding through a full-time staff member focusing on the development of training materials and assistance to countries in planning and implementing activities to increase exclusive breast-feeding.

At the end of 1991, a training coordinator and a technical officer joined the Programme to strengthen further its support to the planning and management of national CDD programmes, in particular the planning and follow-up of comprehensive training plans, and the monitoring of programme progress globally and in the largest developing countries. Medical officers were also assigned to countries (Bangladesh, Ethiopia and Indonesia) to assist programme managers in the implementation of national programmes.

Planning and implementation

During the biennium, national CDD policies and plans were established in Namibia and in several provinces of China, bringing the total number of countries with plans of operations to 129, covering 99% of the total population of developing countries. The extent of implementation of national programmes varies and the information available to the Programme on their current operational status remains incomplete. At least 37 countries updated or revised their plans of action at least once in the biennium (see Table 1). Some countries revised their existing programme targets and subtargets in 1990-1991 (e.g., Bangladesh, Indonesia, Nigeria, and United Republic of Tanzania) and others established or revised national policy (see Box 1 for an example of national policy). These planning activities were carried out in collaboration with UNICEF and other international agencies in several countries.

The Programme continued to train programme managers in managerial skills, including how to set national policy, write programme objectives, targets and subtargets, plan and monitor programme activities, plan involvement in diarrhoea prevention, and evaluate progress.

To improve assistance in the monitoring of and support to the planning of national programmes, the Programme created a technical officer post in the services component which was filled at the end of 1991. Strong national programmes with realistic plans, including ongoing monitoring and evaluation activities, will be the cornerstone of efforts to attain the mortality reduction targets to which the Programme is committed. In this context, the Programme will try to pursue further collaboration in the implementation of programmes in countries bearing the greatest burden of the global diarrhoeal disease problem.

Table 1: Status of individual national CDD programmes, by WHO Region (showing year of activity)

Country	Plan prepared / Plan revised	Programme reviewed*
AFR		
Algeria	83 89	86 89
Angola	83	87
Benin	82 86	87 89 90
Botswana	81 90	84 90
Burkina Faso	86	
Burundi	81 85 86	87
Cameroon	81 84 87 89	
Central African Rep	82 86	86
Chad	84 86	88 89
Comoros	86 89	
Congo	80 84	86
Côte d'Ivoire	84 89	
Equatorial Guinea	86 89	
Ethiopia	80 86 87 89	84 87
Gabon	84 86	
Gambia	82	84
Ghana	82 88 91	85 89
Guinea	87 91	87
Guinea–Bissau	82	
Kenya	82 84 86 88	85 90
Lesotho	81	84 86 88
Liberia	81 84	89
Madagascar	84 89 91	
Malawi	84	84 86
Mali	83 85 88	88
Mauritania	83 89	
Mozambique	83 87 91	
Namibia	90	
Niger	83	85 88
Nigeria	85 86 91	84 89 91
Rwanda	87 90	
Sao Tome & Principe	83 86	87 89
Senegal	81 88	87 90
Seychelles	87	
Sierra Leone	81 87	
Swaziland	82 91	84 86 91
Tanzania, United Rep of	84 87 91	84 90
Togo	81 89 91	85 87
Uganda	84 91	87 91
Zaire	82 87	85 87
Zambia	86 88 89 90	84 88 90
Zimbabwe	83 86	84
AMR		
Antigua and Barbuda	87	
Argentina	84 87 88 89	88
Bahamas	87	91
Belize	80 83 88	83
Bolivia	84 88 89 91	85 88
Brazil	82 84 88 89	90
Chile	82	91
Colombia	80 83 89 91	84
Costa Rica	80 84	84
Cuba	84 89	89
Dominican Republic	84 89 90 91	91
Ecuador	79 87 89 90	82 85
El Salvador	78 85 89	85
Grenada	84 88	
Guatemala	85 86 89 91	85
Guyana	81 87 88	87
Haiti	82 85 87 89	85
Honduras	80 86 89	82 89
Jamaica	80 87 88	83 87
Mexico	84 89 90 91	88
Nicaragua	79 85 89 90	91
Panama	84 85 89 90	85
Paraguay	80 85	85
Peru	80 85 89	85
St Christopher & Nevis	85	85
St Lucia	87	87
St Vincent & Grenadines	85 88	88
Suriname	84 88 90	85
Trinidad and Tobago	86 88	
Uruguay	84 88 90	85
Venezuela	84 89	85
EMR		
Afghanistan	80 87 91	88 89 91
Bahrain	85 88	87 89
Cyprus	88	
Djibouti	84 87 89 91	
Egypt	81 84 90	84 86 88
Iran, Islamic Rep of	84 90 91	87 90
Iraq	85 88 90	87 88 90
Jordan	82 85 89	86
Kuwait	83	
Lebanon	87	
Libyan Arab Jamahiriya	86	
Morocco	79 83 88 90	90
Oman	84	90
Pakistan	82 86 88	84 88
Qatar	87	
Saudi Arabia	84 88	84 85 87
Somalia	83	
Sudan	83 89	91
Syrian Arab Republic	83	
Tunisia	80 87 88	82 85 88
United Arab Emirates	86 88	
Yemen	82 85 88 91	85 87
EUR		
Turkey	82 83 85 87	
Yugoslavia	85	
SEAR		
Bangladesh	82 83 87	86 91
Bhutan	82 87	85 88
Dem People's Rep of Korea	87	
India	82 86 88	89
Indonesia	81 85 87	83 86 90
Maldives	82 89	88
Mongolia	83 87 88 90	88
Myanmar	81 88	85 91
Nepal	82 86 88 91	86 91
Sri Lanka	79 82 87	86
Thailand	79 80 87 90	83 87
WPR		
China	84 89 90	89 90 91
Cook Islands	87	
Fiji	80 83 90	83
Kampuchea	82 91	91
Kiribati	82 90	88
Lao People's Dem Rep	82 88 90 91	85 89
Malaysia	79 88 90	
Marshall Island	83 87	
Micronesia	83 90	
New Caledonia	82	
Northern Mariana	83 90	
Palau	83 87	
Papua New Guinea	79 88 89 91	84 87
Philippines	80 89 90 91	82 85 90
Polynesia	81 89	89
Samoa	82 85 90	85
Solomon Islands	82 87	85
Tokelau	82	
Tonga	82 85	85
Tuvalu	83	
Vanuatu	83 87 90 91	86
Viet Nam	82 89 90 91	82 84 87

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

*Programme reviews include CDD comprehensive programme reviews, CDD desk reviews and joint PHC reviews with a CDD component, as reported to WHO.

Policy and planning in Nigeria 1

In 1991, the Federal Ministry of Health in Nigeria held a meeting with participants invited from UNICEF, WHO and USAID/CCCD (United States Agency for International Development/Combating Communicable Childhood Diseases), to review the national CDD programme (NCDDP) and to plan for 1991-1992. The working group consolidated the lessons learned from a decade of diarrhoeal disease activities, and drafted a national policy on diarrhoea case management and prevention to guide future programme efforts in training and health education. The policy, later endorsed by the Federal Ministry of Health, will ensure that all supporting agencies and nongovernmental organizations adhere to one approach. Targets for 1995 and subtargets were set for NCDDP activities, to help attain the Programme's goals: significant decreases in childhood diarrhoea mortality and morbidity.

The Nigerian national policy on diarrhoea case management and prevention

Home therapy policy

- Family members can give early treatment at home to a child with diarrhoea.
- They should give the child increased fluids and feed the child during and after diarrhoea, and breast-feeding should be continued. The three rules on home therapy are increased fluids, continued feeding and knowledge on when to seek help:
  - The recommended home fluid for treatment at home to prevent dehydration is sugar-salt solution (SSS). Other suitable fluids are: fruit juices diluted with clean water, gari water, coconut water and plain water.
  - A child with diarrhoea should also be given food during and after diarrhoea. The recommended foods include enriched pap and millet porridge. Yoghurt and banana are also suitable.
  - Family members should seek treatment outside the home for a child with diarrhoea if the child has any of the following signs: passes many stools, has sunken eyes, does not eat or drink normally, has a fever, has blood in stools, is thirsty and/or irritable, or seems not to be getting better within 24 hours.

Policy on case management at health facilities

- **Advice**

  All mothers should be taught to give a child with diarrhoea increased fluids and to continue to feed the child, and be shown how to prepare and give sugar-salt solution. Information on other suitable fluids, such as fruit juices, gari water, coconut water or plain water, should also be given.

  Messages regarding personal hygiene, exclusive breast-feeding and improved weaning practices should always be emphasized on every possible occasion.

- **Oral rehydration salts (ORS)**

  ORS packets will be of a standard size and formula, and should conform to WHO recommendations. ORS quality assurance will be reinforced.

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ORS solution should be given at health facilities (government and private) to diarrhoea cases with signs of dehydration, who are able to drink and are not severely dehydrated.

- **Intravenous fluid**

  All children with signs of severe dehydration will be given or referred for intravenous therapy. Ringer's lactate solution is recommended but, if this is not available, other acceptable solutions are normal saline, half-strength Darrow's solution and half-normal saline in 5% dextrose. Unsuitable solutions are plain glucose and dextrose solution.

- **Rational use of drugs**

  The routine use of antibiotics and antiparasitic drugs is not appropriate and should be avoided.

  The selective use of antibiotics includes the treatment of dysentery (blood in stool) with cotrimoxazole, ampicillin, nalidixic acid or according to antibiotic sensitivity in the area concerned. When cholera is suspected, adult patients shoud be given tetracycline, and children cotrimoxazole.

  No antidiarrhoeal drugs should be given to children as they are ineffective and some are harmful. Drugs that should not be given to children include: loperamide, diphenoxylate hydrochloride, hydroxyquinolines, kaolin, pectin, charcoal, smectite/attapulgite, neomycin, streptomycin and non-absorbable sulfonamides such as sulfaguanidine, succinylsulfathiazole, and phthaly-sulfathiazole.

Prevention

Priority preventive indications for the control of diarrhoeal disease are: exclusive breast-feeding for 4-6 months, improved weaning practices, hand-washing, use of clean water, use of latrines, correct disposal of childrens' stools and measles immunization.

The national diarrhoeal disease control programme will increase its collaboration with other divisions and ministries responsible for planning and implementing these preventive interventions, in relation to health education, nutrition, and water and sanitation.

This increased emphasis on national programme support for the next biennium requires an increase in staff time spent on direct country support activities, in particular in the planning and monitoring of implementation of national programmes. The first steps in this direction were taken during the last quarter of 1991, and are reflected in the Programme's workplan for 1992-1993.

Increased and more systematic cooperation with UNICEF in countries of mutual priority was initiated in 1991 and will be a major element in the commitment to intensifying support to national programmes.

National CDD programmes are planned and implemented as part of primary health care services using the existing health staff, facilities and logistics systems. The status of health care infrastructure and manpower development varies between countries, influencing the progress of national programmes. However, national CDD programmes can often contribute to the overall strengthening of the maternal and child health services, through planning, training, and communications activities. During the past biennium, the Programme has improved its collaboration with other programmes within WHO, as well as with other relevant agencies at international and national levels; for example, within WHO with Maternal and Child Health and Family Planning, and the Food and Nutrition Programme in the promotion of exclusive breast-feeding; with the Division of Drug Management and Policies, and the Action Programme on Essential Drugs, in the promotion of the rational use of drugs in the control of diarrhoeal disease; and with all related units in the prevention and control of cholera.

Training

During the biennium, training in programme management, supervisory skills and the clinical management of diarrhoea continued to be the Programme's priority activity. The main developmental achievements in this area were the completion of the "Guidelines for Conducting Clinical Training Courses at Health Centres and Small Hospitals" and their introduction to some countries through courses for the training of trainers (see Box 2). A new self-training course on clinical management of diarrhoea, called "Clinical Skills: A self-instructional course" was field-tested in Zambia and Egypt. Both courses aim at considerably increasing the proportion of health staff trained in effective case management by extending training beyond that provided in diarrhoea training units. With the completion of these important training materials in the 1990-1991 biennium, a wide range of training tools is now available to all national programmes. Other materials will be completed in 1992. Table 2 summarizes how the different materials available for both in-service and pre-service training should be used to train different target populations within and outside the public health system.

In 1992-1993, the Programme will continue to assist national CDD programmes in the implementation of clinical and managerial training. The Programme will place greater emphasis on assistance to countries in the planning of training, and in defining training strategies for different target groups, including appropriate use of the wide range of available training materials. More emphasis will also be given to close monitoring and evaluation of current training activities.

In the 1992-1993 biennium, the Programme will revise the managerial training packages: "Programme Management: A Training Course" and "Supervisory Skills".

Programme management training courses

In 1990-1991, the Programme continued to conduct training courses for managers of national CDD programmes: 40 training courses were conducted in 33 countries, and in addition 4 intercountry courses were held (Figure 1). Altogether more than 1200 health staff involved in managing a CDD programme at central or provincial level were trained. The courses allowed the participants to discuss in detail the national CDD policy, to review the national programme's achievements and constraints, and to carry out planning exercises. The set of training modules is now available in Chinese, English, Farsi, French, Portuguese and Spanish.

In 1991, a number of national CDD Programmes placed strong emphasis on high quality clinical training of health staff who work in small and medium-sized health facilities, to manage diarrhoea cases effectively. Many of these staff do not have access to the formal diarrhoea training unit (DTU) courses which are usually conducted in large teaching hospitals. Kenya, Nigeria and Zambia conducted training courses for trainers in diarrhoea case management in order to establish a core of experienced trainers who would be capable of organizing high quality case management training at the level of health centres and small hospitals.

The potential trainers were trained in the use of the WHO CDD training package "Guidelines for Conducting Clinical Training Courses at Health Centres and Small Hospitals", and assisted in preparing a plan of action to implement and accelerate case management training. When preparing these courses, attention was given to careful planning and strong administrative support. Certain criteria were considered for the selection of participants. It was found essential that future trainers should have previous experience of, and commitment to, correct diarrhoea case management and be willing to conduct at least two or three courses in the years following the training. The experiences of these three countries show that these courses can be conducted either in an established DTU, and/or in two or three closely located smaller health facilities where an oral rehydration therapy (ORT) unit is functioning and where there are sufficient numbers of diarrhoea patients to permit practical "hands-on" training. Course facilitators were briefed for two to three days preceding each course to review the course agenda, content and training methods to be used and to visit health facilities where training was to be conducted.

During the five-day courses, future trainers practised specific teaching skills: how to provide individual feedback, how to deliver presentations, how to organize practical sessions with diarrhoea patients, and how to conduct clinical drills. They also observed and commented on teacher-student interaction, discussing the ways of using different teaching methods in real working situations, and possible constraints and the ways to overcome them. Planning was an important component of the courses; future trainers were asked to work on planning exercises to develop a realistic training plan for their respective health areas.

Experience from Kenya, Nigeria and Zambia suggests that, with close follow-up, training of trainers can significantly boost countries' efforts to increase coverage in diarrhoea case management. In Zambia, one such course was followed within two months by 10 provincial training courses for about 200 health workers; in Kenya, 30 training courses were planned for about 400 participants; and in Nigeria, a national course was followed by four zonal clinical management training courses.

Table 2

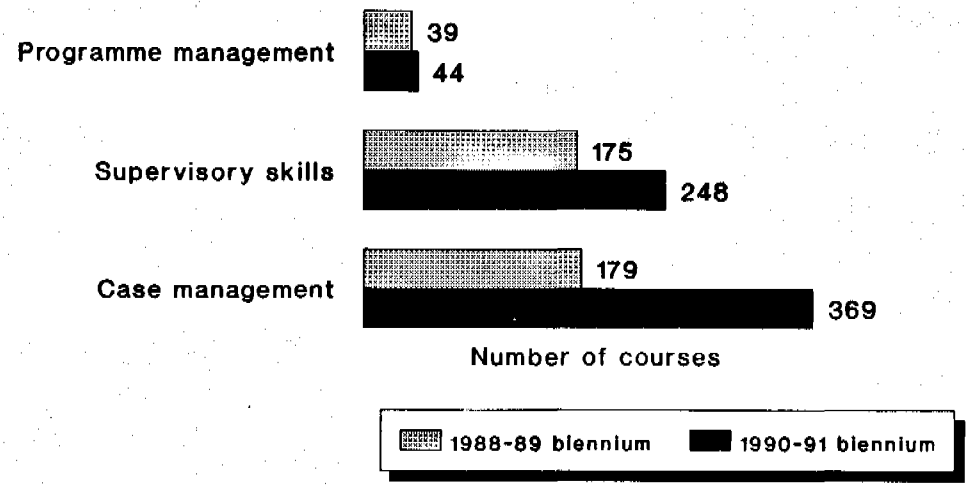
Training materials available to national programmes

Target Group	Training Materials	Usual Venue for Training
In-service Training		
Training of health staff in management and supervision		
National and provincial/ regional staff	Programme Managers Course	Training centre or hotel
Provincial and district level supervisors	Supervisory Skills Course	Training centre or hotel
Training of health staff responsible for case management		
Heads of diarrhoea training units, senior paediatricians	DTU package	DTU
Trainers (from DTUs, district hospitals, health centres)	Guidelines for conducting Clinical Training Courses at Health Centres and Small Hospitals	DTU
Health workers managing cases at hospitals or health centres	Guidelines for Conducting Clinical Training courses at Health Centres and Small Hospitals	Small hospital or health centre with ORT corner
Health workers without access to any of the above courses	Clinical Skills: A self-instructional course[a]	Their own peripheral facility
Pre-service Training		
Medical students and their trainers	Medical education training package[a]	Medical school and DTU
Nursing students and their trainers, nurses in training	Nursing education training package[a]	Nursing school, DTU and field placements

[a] To be completed in 1992 following field-testing.

Figure 1

CDD training courses
1988-1991



Supervisory skills training courses

Training in supervisory skills for national health staff involved in the supervision of CDD activities continued to be an important component of CDD activities at country level. The entire course and selected modules from the set were extensively used by countries to train health supervisors at district and peripheral levels. Approximately 250 training courses were reported to have been conducted in 1990-1991 (Figure 1). This figure represents only a part of the ongoing training that uses these materials. Some modules from the Supervisory Skills Training Course were adopted and integrated into combined training for primary health care supervisors. Course materials were often used in combination with the supervisory skills training modules of the Programme for the Control of Acute Respiratory Infections (ARI) and modules from the Mid-level Managers' Course of the Expanded Programme on Immunization (EPI). A new module "Management of the Patient with Diarrhoea", which includes a revised diarrhoea treatment chart, forms part of the current set, replacing the earlier module "Treatment of Diarrhoea".

It is estimated that, at the end of 1991, 31% of health staff with supervisory responsibilities had been trained in the 126 countries for which information was available.

The evaluation by an independent consultant of the supervisory skills training courses conducted during the biennium in Nepal, Philippines and the United Republic of Tanzania showed the course's effectiveness and relevance to national programmes. At the same time, it was suggested that the supervisory skills training be supplemented with decentralized clinical training of health staff by use of the four-day case management course and other training approaches. The evaluation exercise also found that, although the course is necessary to improve the management skills of peripheral health workers, this objective cannot be attained without reinforcing the training through regular, targeted supervision. National programmes should be urged to set aside adequate resources for monitoring and supervision, so that training courses realize their maximum potential.

In 1992-1993, the Programme will continue to promote the use of the supervisory skills training materials and commence their revision. A combined ARI/CDD supervisory skills course will be the aim of this revision.

Training in diarrhoea case management

The training of health staff in correct diarrhoea case management continued to be a cornerstone of the training efforts of the Programme. In 1990-1991, it was reported that more than 360 formal training courses were conducted in countries with operational CDD programmes (see Figure 1). Most of these courses were organized in 275 diarrhoea training units (DTUs) located in 88 countries. These DTUs were established primarily according to the guidelines developed by the Programme and presented in the document "Diarrhoea Training Unit, Director's Guide", which is now available in English, French, Spanish and Portuguese. Selected teaching materials from this guide have been translated into other languages. The global CDD Programme, together with some national CDD programmes (Brazil, Egypt, India, Philippines, Sri Lanka and others) continued to monitor the performance of DTUs in order to improve or ensure the quality of ongoing training activities, and to assist in the planning of their training courses. A survey of established DTUs showed that most of the DTU training included sufficient hands-on practice, with participants assessing and treating an average of three to five patients with diarrhoea per training course. About 60% of the DTUs reported regular follow-up of the training given. It was also found that many participants trained in DTUs subsequently established oral rehydration therapy (ORT) "corners" and diarrhoea treatment areas, where on-the-job training of local staff could be conducted. In order to facilitate decentralized training, the Programme prepared and started to use the case management training package "Guidelines for Conducting Clinical Training Courses at Health Centres and Small Hospitals", mentioned above. This training package consists of three components. Guidelines are provided on conducting clinical training in any health facility that has sufficient diarrhoea cases under 5 years of age, and enough space for two to eight trainees. The staff of the health facility should practise correct case management on a routine basis and be willing and able to serve as course instructors. The package also includes the module "Management of the Patient with Diarrhoea" from the CDD supervisory skills course, a participants' manual, a set of slides and a videotape on the assessment of dehydration. The package is now available in English, French and Spanish. Its translation into Portuguese and Chinese was initiated in late 1991. Widespread use of this set of materials commenced in 1991. An effective approach to facilitating the extensive use of this package has been the training of a core of trainers in individual countries, who would then ensure the replication and decentralization of training. In 1991, three intercountry courses for the training of trainers from 19 countries were conducted in Egypt, Honduras and Malawi. In addition, Kenya, Nigeria and Zambia conducted national courses (see also Box 2).

As a result of training efforts undertaken by the countries, it is estimated that, at the end of 1991, the proportion of health staff responsible for diarrhoea case management trained in the 24 largest countries was 17%. Coverage for the 126 countries for which information was available at the end of 1991 is estimated to be 19%.

During the biennium, the Programme completed the preparation of the first version of a self-instructional course for health workers who are unable to attend training courses at DTUs or elsewhere ("Clinical Skills: A self-instructional course"). It consists of eight booklets for self-instruction, a tutor's guide and an audio-cassette with dialogues and discussions. For those who do not have access to a cassette player, a transcript of the tape is included. Two training methods may be used with this training set: the assistance of tutors/supervisors can be provided, or the course can be taken entirely by correspondence. The first approach was tested in Egypt and Zambia in 1991. Further testing of this and the correspondence method are planned for 1992 before the package is finalized.

Evaluating case management training

The Programme believes that training is a necessary but not the only prerequisite to improving the quality of care at health facilities. The Programme is interested in identifying factors beyond training that influence health workers' performance and thus affect the impact of training. In collaboration with the USAID-funded PRITECH and Quality Assurance Projects, the Programme has developed a methodology to:

- assess the quality of DTU training;
- assess the ability of DTU trainees to apply their skills at the end of a course; and
- assess the strengths and weaknesses in the performance of DTU trainees in the field, and to identify the determinants of quality performance beyond training that could be affected by programme activities.

The evaluation has three parts corresponding to these objectives and includes observation of DTU courses, skills assessment using case simulations, and follow-up assessment of performance in health facilities using a modified version of the Programme's health facility survey.

As the Philippines has extensive experience of training in diarrhoea case management, and had expressed an interest in evaluating its efforts and in identifying activities that would improve health facility performance, the methodology was applied in collaboration with the Department of Health, starting in 1991. In September 1991, the first phase, evaluation of DTU training, was carried out during two training courses at different sites; the second phase, the follow-up evaluation of trainees at their health facilities, will be conducted in 1992.

The first phase showed that using case simulations to assess the trainees' ability to apply new knowledge and skills immediately after training, is useful in identifying strengths and weaknesses in the conduct of the training. The evaluation in the Philippines will guide the national programme in the planning and implementaion of training and other key activities. Following the second phase of the evaluation, the usefulness of the complete evaluation methodology for national programmes will be assessed.

Training in medical schools

The Programme continued to expand its efforts in this area, seeking to develop a flexible and effective strategy for strengthening teaching about diarrhoeal diseases in a wide variety of medical schools. The long-term objective is to incorporate in the schools' teaching programmes concepts of diarrhoea case management and prevention that accord with the policy of national programmes and prepare students to manage cases effectively through supervised, "hands-on" practice with patients.

During the biennium, considerable progress was made in developing a set of training materials for use in this initiative. These are based on materials originally developed in collaboration with PRITECH, but extensively revised following their initial use in Indonesia and the Philippines. They include a student manual, a set of reference readings, an instructor's manual, a guide to student evaluation, guidelines for conducting workshops to introduce the materials into medical schools, and a workbook for workshop participants.

The students' manual "Readings on Diarrhoea" describes key features of the epidemiology, pathogenesis, treatment and prevention of diarrhoeal diseases, linking these closely with CDD Programme strategies for disease control. The manual, first issued in 1990, is a

valuable resource for paediatric faculties and others who teach students about diarrhoeal disease. Chapters in the manual may also be assigned as individual reading for students, thus making it possible to use classroom time previously devoted to lectures for teaching in which students participate actively, such as discussions, student presentations, role plays, or demonstrations. It is intended that each student has a personal copy of this manual. The other materials developed for this initiative have been revised following their use in several workshops, and will be finalized in 1992.

Four workshops were held in the biennium to assist paediatric faculties in planning ways to strengthen the teaching of diarrhoeal disease control to their students. Two were held for the nine medical schools in Viet Nam and two for the 13 medical schools in Nigeria; this brings to six the number of countries, and to more than 60 the number of medical schools, that have participated in this initiative to date. During the workshops, participants learned current concepts of diarrhoea case management and prevention, took part in a variety of interactive teaching activities and practised case management in a DTU. They then developed workplans that would lead to an improvement in the content of teaching about diarrhoeal diseases in their schools, the use of innovative teaching methods, the establishment or strengthening of a DTU in the school's teaching hospital, and the training of paediatric faculty staff and other key staff in the WHO approach to case management.

During the coming biennium, efforts will focus on extending this initiative to a larger number of countries and medical schools. This will require the development of a task force of experienced medical educators who will work with individual countries that wish to take part in this effort.

Training in nursing and paramedical schools

To increase access to training, the Programme has developed materials to improve teaching about diarrhoeal disease in health training institutions. This effort began with national nursing curriculum workshops held jointly with the Expanded Programme on Immunization during 1990-1991. Experiences with materials used and created during planning meetings and workshops have been taken account of and incorporated into a package of sample materials for use by instructors of nurses and other health care workers in training courses (see Box 3). The aim is to introduce the sample materials at national curriculum workshops where they can be adapted to national policies, to the roles and clarification standards of nurses and other health care workers, and to the schedules of local training institutions and field-work placements.

The package "Strengthening the Teaching of Diarrhoeal Diseases in Basic Training Programmes: A Manual for Instructors of Nurses and other Health Care Workers" will be further tested during curriculum workshops conducted in 1992 and will be available, with the EPI materials, by the end of the year. It will contain:

- CDD curriculum: a sample course including topics, learning objectives, schedule, materials to use and student assessment activities.
- Course modules: two student modules from the CDD supervisory skills course, "Management of the Patient with Diarrhoea" and "Prevention of Diarrhoea", and a communication module developed with PRITECH, "Talking with Mothers".
- Lesson plan: a sample lesson plan to illustrate how to use the course modules in the classroom, and guidance on how to use active learning methods under different conditions, such as with large classes and minimal equipment.

- Field visits: guidelines for how to prepare and carry out field visits to enable students to practise case management and health education activities.

- Methods to assess student knowledge and skills: a checklist to evaluate performance of clinical skills, and examination questions on diarrhoeal disease to use in course work and in professional certification examinations.

- Field-work placements: guidelines on how to organize field-work placements to provide practical experience in diarrhoea case management.

- References: background materials for instructors to use on topics not covered in the modules.

- Teaching materials: including the wall chart "Management of the Patient with Diarrhoea", two slide sets and a videotape on how to assess dehydration.

Training of pharmacists and drug sellers

In collaboration with the firm Management Sciences for Health, Boston, USA, and the Department of Social Medicine of Harvard University Medical School, the Programme has developed a "Guide for improving the diarrhoea treatment practices of pharmacists and licensed drug sellers". Part one of the guide was field-tested in Indonesia in the last half of 1991. Using the methods recommended to assess the situation and the interventions most likely to be successful, the Indonesian Programme decided to develop short training courses supplemented by visits to individual pharmacies as the training methods to be used. Part two of the guide was completed in 1991, and contains guidelines for developing training interventions and methods of assessing the impact of these interventions on drug sellers' knowledge and practices. Indonesia will follow this part of the guide in carrying out and assessing its interventions in 1992.

A second field-test was started in late 1991 in Kenya, where the full guide will also be used. Both field-tests and a final version of the guide will be completed in 1992.

Case management in the home

The objectives of the management of diarrhoea cases at home are: to reduce the risk of dehydration; to minimize the nutritional damage caused by the diarrhoea episode; and to seek care outside the home as soon as certain danger signs appear. When used correctly, home-based oral rehydration therapy (ORT) combined with continued feeding, including continued breast-feeding, is sufficient treatment for at least 90% of acute diarrhoeal episodes.

Home-based ORT requires that fluid intake be increased as soon as diarrhoea starts, and continued throughout the illness; if possible, salt should be provided in the child's food or fluids to replace the faecal losses, along with carbohydrate or protein to aid its absorption. One approach has been to promote the use of specially prepared, salt-containing fluids, such as sugar-salt solution. However, this has had only limited success in most countries. Considerable effort in health education is required to teach families to prepare such fluids and to convince them to do so each time a child has diarrhoea. In addition, the ingredients are sometimes not available, mothers forget the recipe, the fluid is incorrectly prepared, or it is given in very small amounts as a "medicine".

During the biennium, the Programme has sought to define a more effective strategy for home-based ORT, one that makes use of fluids that mothers are already willing to give to a child with diarrhoea, and does not require a special recipe. This approach emphasizes the importance of increasing fluid intake by giving as much as the child wants to drink

Experience with the use of CDD modules in nurse training schools in the Sahel

3

In 1986, the need for curriculum materials for the pre-service training of health workers in diarrhoeal disease was raised during discussions between the WHO Regional Office for Africa and PRITECH, Sahel.

CDD coordinators and schools of nursing were approached in five countries - Burkina Faso, Mali, Mauritania, Niger and Senegal - with a request to participate with WHO and PRITECH in the development of a set of intermediate level, competency-based modules covering: an epidemiological overview of diarrhoeal diseases, clinical concepts, treatment and prevention, cholera, health education techniques, national CDD programme components, and a workbook to guide students in practical work. The modules, originally prepared in French, have been translated into English and Arabic for use in Gambia and Mauritania.

Of the 21 schools involved, 16 are now using the modules, although, in most cases, considerable follow-up has been required, both from CDD programme managers and from PRITECH in order for their use to be sustained over the years and to improve the quality of teaching.

Some of the lessons learned are as follows:

- Participation of schools in the development of the modules is a motivating factor in their subsequent use.
- For schools not involved in module development, a workshop for their introduction is important.
- The provision of a set of teaching materials available for teachers and students alike is an important motivating factor for the introduction of new content.
- The sustainability of module use is particularly vulnerable if the modules are taught only by part-time teachers, who tend to change frequently.
- The active involvement of the national CDD programme concerned is an important factor in adopting the modules and is necessary for effective problem-solving after initial adoption.
- The intervention of an outside agency is often necessary to support the follow-up efforts of the CDD programme.

The existence of the modules has strengthened the linkages, previously weak in most cases, between national CDD programmes and training schools, providing a possible model for other priority public health programmes.

In addition, their introduction and follow-up have revealed some generic problems with the teaching-learning process, leading to increased attention being given to improving:

- the use of participatory teaching methods;
- the case management abilities of teachers;
- the preparation of practical training (with patients) for students (students and supervisors);
- case management practice in health facilities that receive students for practical training (with patients).

using a variety of fluids commonly available in the home. Some examples are: rice water (or water in which another cereal has been cooked), fermented milk drinks, coconut water or soup, as well as ORS solution or sugar-salt solution. Plain water should also be given freely. Only a few fluids should be avoided, such as very sweet drinks and those with stimulant effects. When this approach is combined with continued feeding, including if possible, foods that normally contain some salt, the child will receive sufficient protein or carbohydrate to promote the absorption of any ingested salt and to facilitate reabsorption of a portion of the salt secreted into the intestine as part of the diarrhoeal process. Guidelines based on this approach will be implemented during 1992.

One approach to improving case management in the home has been the creation within communities of units which can provide immediate advice and support and, if required, ORS packets without caretakers needing to take their children to a health facility. This method of expanding access to trained assistance has been applied particularly in the Region of the Americas (see Box 4).

Communication

The Programme has defined new directions and priorities for communication activities, based on a review of the WHO CDD communication component conducted by a consultant in early 1991, and on extensive observations and experience with national programmes. The new focus retains the original strong emphasis on supporting national CDD programmes in planning and implementing a comprehensive communications component. In addition, it identifies two principal areas of need for the development of global tools for national programmes. These are: a guide for health workers to effectively and systematically advise mothers on case management in the home, and a method to help programme managers use radio productively in their local context.

In April 1990, a WHO/UNICEF scientific meeting on Household Management of Diarrhoea and Acute Respiratory Infections was held at the Johns Hopkins University, Baltimore, USA, with communication as one of the three principal agenda items. It was agreed at the meeting that the success of communication activities depends largely on two basic elements: clear planning and strong management at the national level, and a commitment by ministries of health to a long-term investment of finances and personnel time. The WHO CDD Programme continues to encourage this approach when collaborating with national CDD programmes in the development of a communication plan and budget within their annual or biennial operational plan.

During the biennium, the Programme collaborated on the planning and implementation of communication activities in China (Shandong Province), Ethiopia, Indonesia, Sudan, United Republic of Tanzania, and Viet Nam. In the United Republic of Tanzania and Viet Nam in particular, communication activities intensified as the biennium progressed.

Viet Nam implemented the first national training course in interpersonal communication (IPC) skills in July 1990. The course materials were developed with the national CDD programme staff, and concentrated on applying locally adapted messages. The training materials were subsequently revised, and a second course was held in May 1991. Since then, training courses have been held for provincial-level staff in six provinces. Plans have been developed to cover an additional six provinces in 1992, and to train district-level staff. The training exercises will be integrated into all clinical management courses by the end of 1992.

The national CDD programme in the United Republic of Tanzania carried out qualitative research on diarrhoea-related knowledge and practices at the community level, and then developed messages and pictorial materials based on the findings. Training exercises in IPC skills were developed appropriate to that country's context and to the pictorial materials. The first course to train facilitators was held in August 1991; facilitators then

Since 1984, when the model for CORUs now promoted by the CDD programme of the Regional Office for the Americas was developed in Cali, Colombia, approximately 18 000 units have been established in Colombia, Dominican Republic, Ecuador, Guatemala, Honduras, Nicaragua, Paraguay, Peru and Venezuela. They are now considered an important means of improving access to correct treatment of diarrhoea cases at the community level, and of increasing the rates for two key programme indicators: ORS access and ORT use. With the occurrence of cholera in Latin America, CORUs are being utilized to ensure that treatment with ORS solution is started early.

CORUs are established in homes and are run by volunteer personnel, mostly mothers, carefully selected and trained by the nearest health service. They are conveniently located within communities, so mothers can easily take their children to them when they suffer from diarrhoea.

Volunteers are trained to assess patients with diarrhoea, determine their dehydration status, treat patients to prevent dehydration and, if dehydration is present, start treatment with ORS solution and refer to the nearest health facility. They are also trained to teach mothers and family members how to manage diarrhoeal episodes at home, and how to apply home preventive measures (in particular, breast-feeding, and improved hygiene practices) to prevent future diarrhoeal episodes.

CORU staff work in coordination with a health institution nearby and attend regular meetings. A distinctive feature of the system is this continuous relationship with the local health services, which are in charge of monitoring the activities. When promoting the CORU approach, the regional CDD programme stresses the importance of this linkage with the local health services, the need to provide continuous support to the volunteer personnel in charge, and the importance of assuring adequate supplies of ORS and forms for record-keeping and patient referral.

The ministries of health of several countries have endorsed this model and are interested in increasing the number of CORUs as part of diarrhoeal disease and cholera control activities. UNICEF and USAID have provided support for the establishment of CORUs in urban marginal areas as well as in rural areas. In Ecuador and Peru, several nongovernmental organizations have also adopted the model and have established the majority of CORUs operating in these countries.

Preliminary reports by the national authorities have suggested a significant decrease (30%-40%) in the number of cases of diarrhoea consulting health care facilities, as more cases are treated at CORUs. Also, the number of children with severe dehydration needing intravenous rehydration has been reduced. In Cali, Colombia, a significant reduction in diarrhoeal-related mortality was documented in the area covered by the CORUs.

In the future, it will be important to carry out further evaluations to determine the efficacy and efficiency of CORUs, as well as to measure their impact in terms of reduction of morbidity and mortality. An evaluation of the role of CORUs in the management of cholera cases in Peru is being undertaken by UNICEF, in collaboration with the Programme.

CORUs represent an approach founded on basic principles of primary health care: community participation, self-care, self-determination, appropriate technology and interinstitutional and intersectoral coordination.

developed plans to train zonal- and district-level staff by mid-1992 (see Box 5). A process was also established whereby the national CDD programme materials (with practical instruction in their effective use) will be incorporated into the "Facts for Life" health education initiative. This process was developed and will be carried out in collaboration with UNICEF and the Tanzania Health Education Unit.

Improving interpersonal communication skills of health workers in the United Republic of Tanzania **5**

During 1989 and 1990, the first two years of implemention of the CDD communications plan in the United Republic of Tanzania, qualitative research was carried out in the form of interviews with focus groups and caretakers of children under 5 years of age and with health workers responsible for treating these children. Based on the information gathered, messages were developed to promote the rules of home case management and to address the most important misconceptions and practices that may interfere with the recommended care. By early 1991, drafts of three different materials (a large four-page flipchart on home case management, a poster depicting dehydration, and a flyer with clear pictorial instructions about mixing ORS) were developed and pretested. A drama script and songs for traditional village performances were also produced.

The first training of facilitators in interpersonal communication skills was undertaken in Iringa in August 1991. The course was based on training materials developed by the WHO CDD Programme in collaboration with the national programme; it focuses on the skills required by ORT-corner workers both to advise mothers better on managing a child's diarrhoea at home, and to use the new pictorial materials effectively.

The training took place in two cycles. In each cycle, six facilitators (zonal maternal and child health coordinators and national Health Education Unit staff) were trained for three days in the content and methodology of the training course. These facilitators then worked in pairs to train small groups of district-level health workers; this training lasted two days and was carried out with the cooperation of experienced trainers.

Each training session on communication skills was preceded by a day spent, both by facilitators and participants, in reviewing diarrhoea case management. A one-day meeting of all facilitators, directed by the national CDD programme manager, was held in the interim between cycles to develop training plans for the seven health zones; these plans were submitted to the programme manager. All subsequent training in communication skills will be integrated into regularly-planned clinical management training courses.

Both national programmes are expanding communication activities outside the public health sector. Viet Nam is promoting ORS via private pharmacists and physicians in urban areas, and is working with the Ministry of Education to include CDD in the basic training of preschool and kindergarten teachers. With UNICEF, the programme is also developing radio messages to be included in integrated health education broadcasts. The United Republic of Tanzania is in the process of refining a traditional drama presentation on CDD, and is developing short spots to be broadcast on national radio.

As described above, two principal areas have been identified which merit the development of practical, globally-applicable tools: advice given to mothers during a consultation, and the effective use of radio.

One such tool, "Advising mothers, a guide for health workers" is being prepared by the Programme. It suggests a systematic process that health workers can follow when advising mothers on how to manage a child with diarrhoea at home. The process will help the health worker to structure the conversation so as to ensure that all necessary information is covered, that advice focuses on what is essential, and that reinforcement is given for what a mother is already doing that is helpful. The guide also includes training exercises to help a health worker learn relevant interpersonal communication skills, such as using simple language and asking checking questions.

A related document, aimed at national programme managers, is also under development. This will propose a framework for adapting basic messages to the particular policy and context of a country, and will suggest some simple methods for doing this. These materials will be field-tested in mid-1992.

Another instrument to be developed in 1992, will focus on helping national programme managers to decide how best to use radio in their countries, to judge the value of various types of broadcasts, and to monitor and evaluate radio programming. It will include scripts and an audio-cassette of sample recordings.

Production and supply of oral rehydration salts

At the beginning of this decade, almost the entire global requirement of oral rehydration salts (ORS) was produced in industrialized countries. This situation has changed, as a result of the continuous advocacy and support of WHO and UNICEF. Today, four out of five of all ORS packets used where they are most needed in developing countries are produced there. In order to determine the Programme's future role in this field, a review and analysis of the experience to date was carried out in early 1990. A comprehensive report prepared by the Programme was discussed in April 1990 with UNICEF. It was agreed that the availability of an adequate ORS supply to all developing countries, rather than support to ORS production in a limited number of them, should become the main objective in future years. Since then, assistance to countries has been less narrow, supporting the most feasible and cost-effective choice among several alternatives: local ORS production in a government-run unit, expanded production and distribution by commercial manufacturers for use in both private and public sectors, importation and, in some cases, donations. The Programme has also assisted countries that are interested in the development of a national ORS standard. India is one country where progress was made towards standardization in 1991, in close collaboration with industry and the medical association (see Box 6).

During the April 1990 meeting in New York, it was also decided that higher priority for WHO/UNICEF assistance to ORS production should be given to countries with an established national CDD programme with a reasonable, current plan of action, high diarrhoea mortality and low ORS supply relative to demand. In addition, with the outbreak of cholera in Latin America, urgent priority had to be given to those countries affected (see Box 7).

The Programme also continued to assist countries already producing ORS, but which were either faced with specific technical problems, or required improvement of the control and assurance of the product's quality, or were having difficulties with sustaining local manufacture.

In order to identify problems in the global supply of ORS effectively, the Programme continued to compile and assess information from manufacturers and distributors of ORS (commercial and donor bodies) through an annual worldwide survey. This annual contact with manufacturers has allowed the Programme to establish an individual exchange of technical information and timely provision of advice on specific queries.

The number of companies producing ORS in India has constantly increased over the last few years, and it is estimated that there were more than 100 by the end of 1991. Their products vary with respect to composition, presentation and dose; at least 130 different products are available on the market. Although most of them conform to the formula recommended by WHO/UNICEF, there are some products that contain excessive quantities of one or two basic ingredients, for example, a product yielding 410 mmol/l of glucose in a composition very likely to cause osmotic diarrhoea. Some products contain flavouring, colouring, minerals, vitamins and other unnecessary ingredients.

This situation was brought to the attention of the National Food and Drug Administration, and measures were initiated to ensure that only safe and effective products are registered and made available to the market. Realizing that it may take some time to implement such specific measures, the Indian Medical Association (IMA) invited the Ministry of Health and Family Welfare (MOHFW), WHO, UNICEF and the local pharmaceutical industry to a joint meeting in early 1991 in Bombay. Their main concern was that physicians and other health professionals were unable to discriminate between the various products, and that they might therefore prescribe ineffective or even harmful products. A similar situation is observed in the public health system, except that the choice of a specific product remains with the state or district drug procurement officer.

In order to improve this situation, the MOHFW agreed to establish a national standard for ORS to be used in the public health system. This standard includes details with respect to the composition (the ORS-citrate formula recommended by WHO/UNICEF), the desired dose (for the preparation of one litre of solution), the size of the packet, the desired packaging material, the required text (accompanied by appropriate illustrations), the design of the label and the most appropriate colour. In addition, it was decided to adopt a uniform logo for all packets; it is commonly used on the promotional and educational material of the national CDD programme. Once this national standard is established, it will be communicated to all procurement officers throughout the country, so that all the ORS provided by the MOHFW in the country will be identical. The commercial products that conform to the WHO/UNICEF composition will be allowed to use the logo on their commercial packet with the statement "This product corresponds to the formula recommended by WHO". This logo will therefore help private practitioners to select the WHO/UNICEF recommended ORS composition, and to avoid prescription of undesired products.

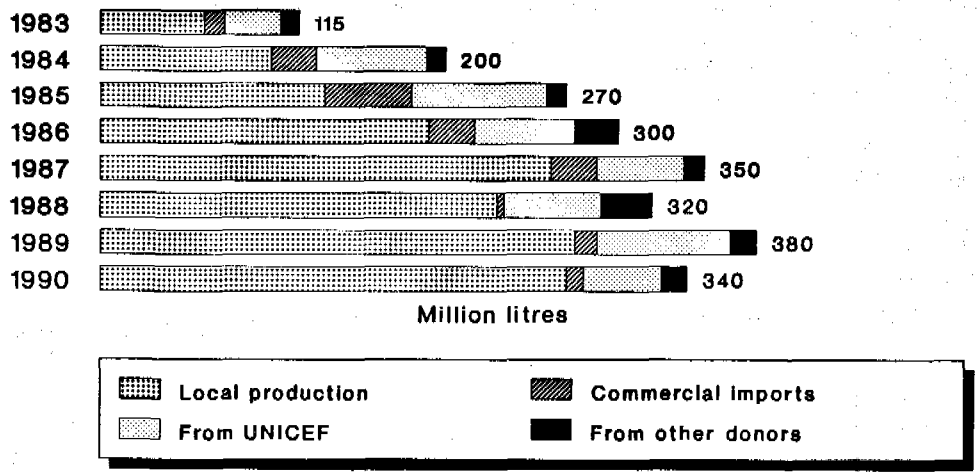
The local manufacture of ORS in developing countries has remained almost stable, at about 270 million packets annually, during the biennium (see Figure 2). By the end of 1990, commercial import and the donation of ORS (e.g., by UNICEF) had decreased so that the proportion of ORS produced locally rose to 80%. Latest data show that approximately 95% of all products for oral rehydration available in developing countries are of the compositions recommended by WHO and UNICEF. However, a large number of manufacturers still continue to produce the less stable formula containing sodium hydrogen carbonate.

The estimated annual ORS requirement of a public health system is influenced by the national policy on ORS (how and where ORS are to be used), the planned activities of the national CDD programme, and the proportion of the population that has access to the relevant services. Given the fact that in many countries the public health system only reaches a small portion of the total population, such an estimate may be much lower than the actual needs in a country. In only a few countries is this difference, or at least part of it, covered by the private local pharmaceutical industry or imports by trading companies.

So far, WHO and UNICEF have mainly concentrated their efforts on assuring the availability of ORS in government systems. With the outbreak of cholera in Latin America and the sudden requirements for large quantities of ORS, it became evident that the commercial production of ORS was equally important in meeting demands. In Peru, for example, where the promotion of ORS was, appropriately, a key element in the campaign against cholera, pharmacies had sold out of all products indicated for rehydration within a matter of weeks. The entire population then suddenly depended on supplies from the public health system and international donations. In order to improve this situation, the Ministry of Health felt it important to involve the local pharmaceutical industry in discussions on the crisis, in stimulating the production of ORS and in establishing closer collaboration for the promotion of ORS. As an immediate action, the Association of Local Pharmaceutical Manufacturers agreed to assist the Ministry of Health in assuring their ORS production, by lending equipment, labour, etc. The Ministry, in turn, promised to give top priority to the registration of ORS, regardless of whether they were produced locally or imported, provided that the composition conformed to that recommended by WHO/UNICEF. Similar encouraging initiatives have been taken in other Latin American countries, and it is hoped that such collaboration will eventually assure sufficient quantities of ORS, even when there is a sudden increase in demand owing to cholera outbreaks.

Figure 2

Supply of ORS or similar products in developing countries, 1983-1990



The data collected also suggest that ORS is becoming more accepted in industrialized countries, where a number of products in different forms and doses have been available commercially for several years and are promoted for the treatment of dehydration. Taking into account these products, it can be assumed that ORS for about 400 million litres of oral rehydration solution are produced worldwide every year.

During 1990-1991, the local manufacture of ORS was initiated in four additional countries (Somalia, Sudan, United Republic of Tanzania, and Yemen). On the other hand, production was discontinued in Comoros and Tunisia for economical and technical reasons. The number of developing countries currently known to produce ORS rose from 62 in 1989 to 64 by the end of 1991. With the inclusion of industrialized countries, ORS is now produced by about 450 manufacturers in a total of 84 different nations. Consultancy visits were made by the Programme's ORS production engineer to 19 countries in 1990-1991, always in collaboration with UNICEF field offices. These countries were: Bangladesh, Burundi, Chile, China, Colombia, Dominican Republic, Ecuador, Guatemala, India, Indonesia, Mexico, Myanmar, Nepal, Nigeria, Paraguay, Peru, Sudan, the former USSR, and Venezuela. During these visits, advice was given on the definition of national standards for composition and packaging of ORS, the management of ORS production units, and quality control. The Programme continued to arrange for independent chemical and microbiological testing of ORS for developing country manufacturers, and responded to requests for the testing of locally produced raw materials for ORS.

Promoting the rational use of drugs

In late 1990, WHO published "The rational use of drugs in the management of acute diarrhoea in children", a review of the literature on the efficacy and safety of the most commonly used antidiarrhoeal drugs. The Programme prepared the review in collaboration with experts from developed and developing countries. The drugs reviewed were: diphenoxylate hydrochloride, loperamide, streptomycin, neomycin, hydroxyquinolines, non-absorbable sulfonamides, kaolin and pectin, activated charcoal, and attapulgite/smectite. Shortly after publication, the review was distributed widely to health policy-makers, drug manufacturers, health professionals, trainers and educators of medical students, nurses, pharmacists, and other health workers. Major medical journals published book reviews, and encouraging comments were received from professionals worldwide.

To assist countries to assess drug use patterns at the household level, the Programme developed a drug use addendum to the household case management survey (see page 26).

During 1991, the Programme developed draft guidelines to assist national CDD programme managers in selecting and planning country activities to promote the rational use of drugs. The guidelines were field-tested in three countries (Bangladesh, Kenya and Nigeria) in the second half of 1991. They proved to be a useful tool for developing plans of action, and for strengthening collaboration with other divisions in ministries of health, (especially essential drugs programmes). However, they will be revised and improved before being made available for wider use in 1992.

In 1990 and 1991, on the basis of available information regarding the risks and lack of efficacy of antidiarrhoeal drugs in children, a number of countries took action to promote a more rational use of these drugs (see Table 3). The regional offices and national CDD programmes usually played an important role in initiating and supporting these activities. Action was also taken at a global level by two major drug manufacturers, which withdrew ineffective and/or unsafe drugs from the market in developing countries.

The Programme also started to review major paediatric and pharmaceutical reference works for their content on the management of acute diarrhoea in children; detailed comments on inappropriate text have been communicated to the publishers.

Table 3

Regulatory actions concerning antidiarrhoeal drugs for use in children

as reported to the World Health Organization
Programme for the Control of Diarrhoeal Diseases in 1990-1991

Country	Drugs affected	Action	Date
France	Brand name paediatric product containing loperamide	Restriction on use in children	August 1991
Indonesia	Paediatric formulations of loperamide	Banned	November 1990
	94 brand name antidiarrhoeal products containing antibiotic mixtures, hydroxyquinolines, non-absorbable sulfonamides, and other substances	Deregistration of solid and liquid formulations	October 1991
Lebanon	All products containing loperamide, diphenoxylate, diphenoxine and furazolidone. All liquid forms of streptomycin	Restriction on use in children, deregistration and banning of products	August 1991
Libyan Arab Jamahiriya	10 brand name antidiarrhoeal products, which include substances like antimotility drugs, antimicrobials, and adsorbents	Use in children banned	May 1990
Mexico	5 brand name paediatric products, containing loperamide and diphenoxylate	Deregistered	December 1990
Pakistan	Drop and syrup formulations of loperamide, diphenoxylate, and pipenzolate	Banned and deregistered	June 1990
Peru	Paediatric formulations of loperamide	Deregistered	October 1990
Philippines	Loperamide and Diphenoxylate	Deregistered	September 1991
Republic of Korea	Loperamide	Restriction on use in children	May 1991
Sri Lanka	Syrup formulations of loperamide	Deregistered	November 1990
Turkey	Drop and syrup formulations containing loperamide	Banned	September 1991

Research priorities in the field of rational use of drugs in diarrhoeal disease were prepared by the Programme and distributed among research institutes and individual researchers.

To improve the rational use of drugs at global and national levels, the Programme collaborates with the International Network for Rational Use of Drugs (INRUD), nongovernmental organizations involved in the rational use of drugs, pharmaceutical manufacturers and, in particular, with the WHO Division of Drug Management and Policies (DMP) and the Action Programme on Essential Drugs (DAP). So far, the collaboration has mainly involved exchange of information, participation in workshops, development of indicators, research, and training activities. Major collaborative efforts with these partners in the rational use of drugs is foreseen over the next decade.

Evaluating programme progress

Programme reviews

During the biennium, 17 programme reviews were conducted. In recent years the nature of such reviews has become more varied; many countries have moved away from the standard CDD comprehensive review protocol and have conducted smaller, shorter reviews which focus on specific programme areas and/or programme planning, often based on the results of household and/or health facility surveys. Thus, six of the 17 reviews followed the CDD comprehensive programme review protocol: Botswana, China (Ganzu and Yunnan Provinces), Myanmar, Nepal, Pakistan and Uganda; while others, in China (six provinces), Islamic Republic of Iran, Indonesia, Nigeria, Oman, Sudan, United Republic of Tanzania, and Viet Nam, focused on programme planning. In the Philippines, a desk review of over 70 recent programme documents was carried out, including reports of surveys and previous field assessments, and interviews were conducted with key management and support staff at the central level. Limited reviews were also conducted in Afghanistan and Yemen.

Global generalizations of achievements and problems may not always be relevant to individual programmes at various stages of programme development. However, these generalizations can be used to help the Programme focus its technical and advisory inputs to achieve more effective country programmes. A few examples of common review findings and recommendations are given here. Programme planning is generally weak, resulting in unrealistic plans and poorly defined targets which cannot be attained. Insufficient staff and lack of, or delay in funding often present problems. Despite the tremendous efforts that many countries have put into training, achieving adequate coverage with diarrhoea case management training continues to be a challenge. The Programme has continued to develop and promote innovative ways of extending training coverage. Although diarrhoea case management at health facilities has improved, in that most children with diarrhoea receive ORS solution, there is a great need to improve further case management as ORS solution is often not administered correctly, inappropriate use of drugs is common, advice to the caretakers is often lacking, and knowledge and treatment of dysentery and persistent diarrhoea are frequently poor. The quantity and quality of supervision and monitoring are often unsatisfactory and constitute an area which the Programme will emphasize in the next biennium. Several of the programmes reviewed have begun incorporating and institutionalizing case management training into the curriculum of medical, nursing and paramedical schools. This appears to be a crucial activity and one that many countries are interested in pursuing.

Focused Programme Reviews. In 1991 a new problem-solving programme review process, which focuses on identifying specific problem areas and preparing solution-orientated action plans, was developed. It is carried out in two stages. In the first phase, a week-long exercise, programme achievements are noted and areas of poor programme performance are identified and prioritized using a set of defined criteria. In the second

phase, the review team analyses these priority problem areas in depth, collects more specific information to understand the problem better and develops practical solutions which are then integrated into national CDD workplans. This phase lasts two weeks and involves a team of national programme staff and external experts in the problem areas identified. There is an interval of 6-8 weeks between the two phases, to allow for the necessary preparatory work, which includes development and modification of data collection forms for the field visits conducted in the second phase.

A draft version of this new protocol was successfully field-tested in Bangladesh in late 1991 (see Box 8) and modifications based on this experience are being implemented. The instrument will be finalized by mid-1992, and many countries have already shown an interest in using it.

Focused Programme Review in Bangladesh **8**

The national CDD programme (NCDDP) in Bangladesh conducted a focused programme review in October-November 1991, using the new approach under development by the Programme. The review was conducted in two phases.

In the first phase, areas of focus were identified through a systematic approach. This was achieved by a review of the findings of the household and health facility surveys carried out in 1990, and by a review of the status of planned activities. Overall programme achievements were assessed and preparations were made for the in-depth review.

In the second phase, four review teams, including participants from the Ministry of Health, UNICEF, the World Bank, and WHO, analysed the following aspects of the NCDDP:

- planning and management at central and mid-level, and programme targets;
- case management training of health workers and the development of diarrhoea training units;
- case management and the rational use of drugs;
- communications activities in the NCDDP.

Major achievements noted were the designation of CDD staff at central and district level, the national policy statement on case management of diarrhoea, the establishment of the first national DTU with an active training programme, and the implementation of good quality evaluation activities.

The review resulted in a detailed workplan for 1992-1993 including activities to overcome constraints to programme implementation including a new training strategy and increased collaboration with other agencies involved in communications. National programme targets and subtargets for 1995 were revised. In 1991 the Programme assigned a Medical Officer to work with the national team, and with the continuous support of UNICEF and other agencies it should be possible to implement the plan and achieve the targeted reduction in diarrhoea-associated mortality.

Assessing diarrhoea case management in the home

The revised household survey methodology, which focuses on correct case management, continues to be used for national or regional surveys in many countries. During the biennium, the Programme supported 30 surveys, while a number of other surveys using the same methodology were conducted by national programmes without the support of WHO. A few national programmes (e.g., China, Indonesia, Philippines, Thailand and Viet Nam) routinely carry out one or two surveys a year as part of their ongoing evaluation activities. Surveys in two countries (Ecuador and Kenya) in 1990 were used as an opportunity to train consultants and regional office staff. The experience has shown that the training of such resource persons is an effective way of extending technical cooperation to more countries; further training will be scheduled for the current biennium.

Using the revised survey, data are collected on ORS and ORT use rates as well as on other important aspects of home case management, including the proportion of diarrhoea cases that receive normal or increased amounts of food, the proportion of diarrhoea cases that receive increased amounts of fluid, and the proportion of breast-fed infants that continue to breast-feed during diarrhoea. Table 4 provides some results for these indicators and others. Of the cases surveyed, 18.7% (median rate) received ORS, and more than half received ORS and/or a recommended home fluid (median rate, 55.9%). However, less than one-third of children (median rate, 30.4%) received increased amounts of fluid, which is an essential part of oral rehydration therapy. While most mothers continue to breast-feed during the episode of diarrhoea (median rate, 95.8%), in approximately one-third of cases, less food was offered or food was withheld completely.

Examples of ways in which the findings from case management surveys can be useful to national programmes are cited below:

To evaluate the progress of the national CDD Programme in Mexico the findings from two surveys carried out at different times were compared (see Box 9).

A survey in Vanuatu (March 1990) proved timely for programme planning purposes, as it highlighted the need to include the following activities in the action plan: identification of recommended home fluids, and establishment of ORT corners where mothers can be better advised on preparation of ORS and the importance of giving more fluids.

For assessment of programme progress in Cameroon, two surveys were conducted in two provinces where programme resources and implementation had been quite different (see Box 10).

During 1990-1991, the Programme developed and finalized an addendum to the household survey questionnaire which enables programme managers both to document and monitor drug use patterns and to obtain information that is useful for developing strategies for rational drug use. The addendum has been field-tested in four countries: Bangladesh, Myanmar, Nepal and Sri Lanka. In these countries the drug use rate was found to be two to three times greater than the ORS use rate. Over one-half of the diarrhoea cases were given one or more drugs and 5%-10% of cases were given four or more drugs. The source of drugs is more frequently the private rather than the public sector.

Although the CDD case management survey has been well received by country programmes, there have been many requests for an integrated household survey that covers both CDD and ARI. Developmental work therefore began in 1991, and in 1992 the Programme will test a household survey that incorporates questions on home case management of diarrhoea and acute respiratory infections. It will also look at breast-feeding practices.

Table 4
Results of household surveys of diarrhoea case management conducted in 1989–1991

	Number of surveys [a]	Survey sites	ORS use	RHF use [b,d]	ORT use [c,d]	Continued feeding	Continued breast-feeding	Drug use	Increased fluids	Correct knowledge about seeking care	Correct ORS preparation	Correct RHF preparation	Correct case management [e]
Bangladesh	4	4 divisions	11.1	15.4	23.3	84.6	98.2	42.7	26.4	24.2	38.4	38.6	22.3
Brazil	3	13 states	12.7	32.1	43.3	56.3	95.0	47.7	31.2	na	32.9	12.9	17.6
Botswana	1	national	44.8	28.0	73.0	95.0	91.0	5.0	44.0	84.0	77.7	64.0	41.8
Burundi	1	national	40.8	16.6	49.1	43.4	93.7	54.7	34.4	54.3	53.0	na	14.9
Cameroon	2	2 provinces	4.9	87.9	88.4	76.6	98.9	43.3	39.4	36.8	50.0	19.5	30.2
China	8	4 provinces	0.8	52.5	53.3	78.5	98.4	57.1	20.9	12.7	na	na	16.4
D.P.R. of Korea	4	4 regions	41.8	na	69.6	78.0	89.5	73.3	57.6	94.8	67.7	93.5	44.9
Ecuador	1	1 province	6.5	67.5	70.1	68.6	89.8	53.2	22.7	12.5	23.1	na	15.6
India	6	6 states	6.8	6.4	13.4	58.5	90.3	88.7	7.2	33.1	21.3	8.7	4.2
Indonesia	7	22 provinces	27.5	23.8	49.6	96.7	95.8	34.2	14.3	na	76.7	50.3	13.8
Iran (I.R. of)	1	1 province	51.0	23.0	74.0	43.0	49.0	57.0	68.0	na	na	na	29.2
Jordan	1	national	39.0	56.0	85.0	62.0	na	49.0	56.0	na	na	na	34.7
Kenya	6	6 districts	18.2	77.9	80.0	71.4	97.8	41.8	16.0	31.5	30.0	na	11.4
Malaysia	1	1 state	37.5	na	46.6	67.0	96.5	32.9	88.4	35.2	12.1	na	59.2
Maldives	1	1 island	17.8	8.9	26.7	61.9	100.0	73.3	41.0	20.0	14.3	0	25.4
Morocco	1	national	8.0	7.3	13.5	67.4	96.6	22.6	30.5	21.9	74.4	na	20.6
Mexico	1	11 states	19.2	63.2	67.3	58.9	76.7	54.0	36.2	na	59.1	na	21.3
Myanmar	1	1 division	16.7	5.3	19.3	79.2	96.7	67.5	11.9	19.3	5.9	na	9.4
Nepal	2	2 regions	9.2	5.3	14.1	67.9	99.1	22.6	18.4	22.3	27.1	18.1	12.5
Pakistan	3	4 districts	31.3	2.9	32.0	74.4	96.9	70.3	29.4	40.4	77.4	64.1	21.9
Philippines	3	3 regions	16.7	14.0	25.0	66.4	95.2	35.7	30.2	na	62.7	na	20.1
Sri Lanka	1	1 municipality	20.8	48.3	58.4	41.5	92.3	57.0	27.7	29.2	71.0	na	11.5
Syrian A.R.	1	national	17.0	82.0	90.5	na	68.2	67.0	61.6	na	69.7	na	na
U.R. of Tanzania	2	6 regions	36.9	na	77.5	78.2	98.9	25.4	12.5	26.7	49.6	na	9.8
Vanuatu	1	12 islands	20.3	46.3	66.7	53.4	94.2	12.2	29.8	55.0	na	na	15.9
Viet Nam	7	7 provinces	35.4	33.0	64.6	66.0	100.0	50.0	52.0	57.6	52.9	36.7	34.3
Minimum (%)			0.8	2.9	13.4	41.5	49.0	5.0	7.2	12.5	5.9	0	4.2
Maximum (%)			51.0	87.9	90.5	96.7	100.0	88.7	88.4	94.8	77.7	93.5	59.2
Median (%)			18.7	23.8	55.9	67.4	95.8	49.5	30.4	31.5	51.5	36.7	20.1

a Median rates are reported if more than one survey was conducted in a country.
b RHF use rate is the percentage of diarrhoea episodes in children under 5 years of age that receives a recommended home fluid.
c ORT use rate is the percentage of diarrhoea episodes in children under 5 years of age that receives ORS and/or a recommended home fluid.
d Note that RHF and ORT use rates are not directly comparable between countries owing to differences in the definitions of RHFs.
e Estimated percentage of diarrhoea cases in children under 5 years of age who received increased fluids and continued feeding.

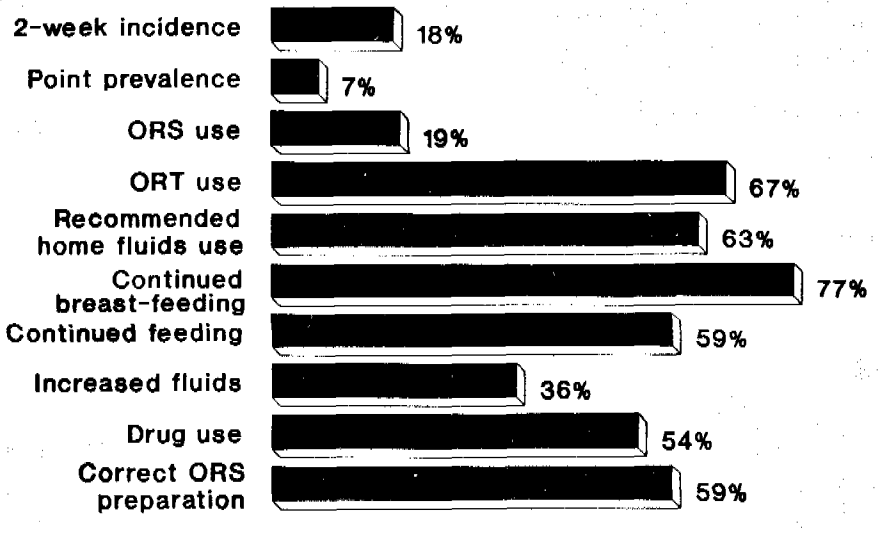
In order to evaluate the progress made by the national CDD programme in Mexico, the national authorities decided to conduct a household survey of diarrhoea case management in August 1991, in 11 states.

The results are being compared to those from a similar national survey conducted in 1985 to measure progress towards 1995 targets for prevention and case management. They serve to indicate where emphasis should be laid to strengthen training and communications activities.

Through the National Interagency Coordinating Committee for the Control of Diarrhoeal Disease, financial assistance for the survey was received from the Health Secretariat in Mexico, the WHO Regional Office for the Americas, UNICEF/Mexico, USAID/Mexico, and the USAID-supported PRITECH Project. This provides a concrete example of the interagency collaboration in Mexico which has been shown to be very effective in supporting national CDD activities.

Using the survey methodology recommended by the Programme, 14 019 children under 5 years of age were included in the survey. Data were collected for 19 indicators. Results for 10 indicators (mean overall values for 11 states), presented below show: an ORS use rate of 19%; a high recommended home fluid (RHF) use rate and ORT use rate; that most mothers continued to breast-feed during the diarrhoeal episode; that the majority of children were offered more or at least the same amount of food but the proportion of cases given an increased amount of fluid was generally lower; and that the use of medicines was still high.

CDD household case management survey
Mexico, 1991*



* Mean values for 11 states

Of most concern to the national authorities were the low rate for increased fluid intake and the high rate of drug use. These results illustrate the need for additional training in correct case management practices and increased information on the rational use of drugs, including the proper use of antibiotics.

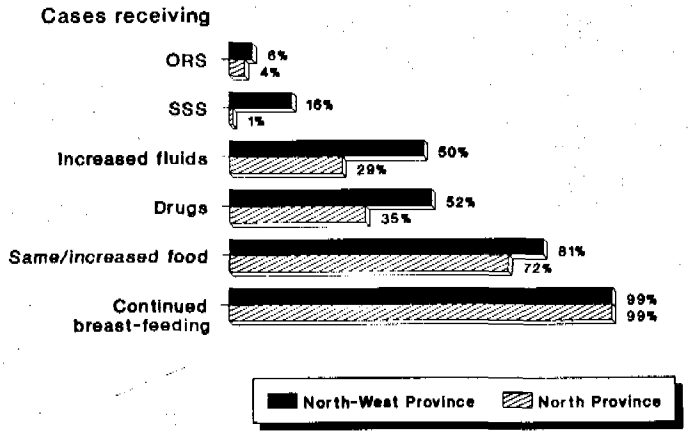
CDD household case management surveys in two provinces in Cameroon 10

The Cameroon national CDD programme (NCDDP) started implementing its 1987-1991 plan of action in April 1987. In order to assess the progress of this first plan of action and to collect baseline data for future evaluations of the NCDDP, household surveys were carried out in two provinces by the Ministry of Health in November 1991. The two provinces selected, North-West Province and North Province are very different in terms of their geographical features, socioeconomic development and cultural background, with the North-West Province being more developed. In addition, although major emphasis since the outset of the NCDDP in 1987 had been given to the training of health personnel in diarrhoea case management, the activities differed from one province to another. North-West Province had more resources available for implementation of the NCDDP, and had a functional diarrhoeal training unit (DTU) for the previous three years.

The results of the survey showed a striking difference in the incidence rates in the two provinces. The seasonally adjusted diarrhoea incidence in North Province appeared to be almost four times as high as that in North-West Province (7.5 episodes per child per year compared to 1.9). The high incidence in North Province is similar to those observed in Sahelian countries with similar geographical and socioeconomic conditions.

The findings for key CDD indicators for the two provinces can be seen in the figure. Oral rehydration salt (ORS) solution use rate was very low in both provinces; the sugar-salt solution (SSS) use rate was substantially higher in North-West Province. In addition to sugar-salt solution, the NCDDP promotes many other recommended home fluids, and the survey revealed that almost all children with diarrhoea were given recommended home fluids. However, only 50% of cases in North-West Province and 29% in North Province received increased amounts of fluid, which is an essential part of oral rehydration therapy. Both provinces had high rates of continued feeding and continued breast-feeding during diarrhoea. Drug use rates were also high in both provinces, but particularly so in the North-West Province, where access to services is better.

CDD household case management survey
Cameroon, 1991



The differences in the survey findings between the two provinces in part reflect differences in the CDD programme activities. The NCDDP will try to improve programme implementation in North Province by accelerating training and strengthening communication activities.

Assessing diarrhoea case management in health facilities

In 1990, the Programme finalized the manual for conducting surveys of case management in health facilities. During the biennium, the Programme supported surveys in the following countries: Bangladesh, Botswana, Egypt, Islamic Republic of Iran, Pakistan, Uganda, United Republic of Tanzania, and Viet Nam (two surveys). In addition, the methodology was used by governments independently (or in collaboration with USAID-funded projects) in Burkina Faso, Cameroon, Guatemala and Thailand.

The survey is designed to collect qualitative and quantitative information for the evaluation of the quality of case management in outpatient and inpatient facilities. This is achieved through observation of cases, interviews with health workers and caretakers, reviews of records and assessment of health facilities, and expert validation of health worker performance. The methodology emphasizes qualitative assessment, and problem identification and resolution.

As country programmes are at different stages of development and as different criteria were used to select facilities (i.e., one country surveyed only DTUs and hospitals in which staff had been trained at DTUs, while others assessed randomly-selected facilities) results are not directly comparable among countries. However, some general conclusions can be drawn.

ORS was frequently prescribed for children with diarrhoea. However, many children were sent home with ORS packets when they should have been given ORS solution under observation in the health facility. For those who were treated in the facility, the health workers frequently gave too little ORS solution. Although the health workers often gave the correct advice on ORS preparation and administration to caretakers of children with no dehydration, they often failed to check mothers' understanding of these messages. Interviews with mothers revealed that they had not understood some critical messages.

In the majority of cases, health workers made the correct conclusion about the child's hydration status. However, when cases were misclassified they were almost always assessed as being less dehydrated than they actually were. Misclassification was the result of failure to conduct adequate physical examinations. Health workers often assessed only a few of the signs and symptoms listed on the WHO Diarrhoea Management Chart. Review of records often brought to light irrational use of drugs, which health workers often attributed to caretakers' demand for drugs.

As the health facility survey methodology is new to many programme managers, and is demanding in terms of time and personnel, the Programme feels that most countries will initially need assistance with this activity. With this need in mind, a number of consultants were trained during surveys in Egypt (1990) and United Republic of Tanzania (1991) (see Box 11).

The health facility survey measures the four key programme indicators of the quality of case management in health facilities. Survey results for these indicators have revealed the need for national programmes to emphasize certain aspects of case management in their training activities.

In the next biennium, the Programme plans to assess and revise the instrument and to consider ways in which it could be combined with the health facility survey of ARI management now under development.

Measuring childhood mortality

The Programme continues to collaborate with the London School of Hygiene and Tropical Medicine (LSHTM), United Kingdom, to help countries determine childhood mortality rates. In 1991, the Programme contracted the LSHTM to conduct three mortality surveys. These surveys follow the methodology outlined in the Programme's manual which combines the indirect Brass method (child ever born/child surviving) and the preceding birth technique (PBT).

Health facility survey training in Egypt and the United Republic of Tanzania 11

The health facility survey on diarrhoea case management has been one of the Programme's major evaluation tools since the development of the new methodology in 1989. National CDD programmes conduct the survey to assess the quality of case management of children with diarrhoea in health facilities. The results also identify the supervision, training, treatment supplies and other supports needed to maintain good clinical care.

To meet the demand for persons able to assist countries in conducting surveys, the Programme sponsored survey training activities in Egypt and the United Republic of Tanzania in 1990-1991. Participating in these four-week courses were international consultants, WHO regional staff, and health workers from the two collaborating national programmes. There were 16 participants from Belgium, Ethiopia, France, Germany, Italy, Netherlands, Somalia, Sweden, Uganda, United Kingdom and United States of America; six participants from Egypt and 13 from the United Republic of Tanzania also received training.

The participants learned to conduct surveys and train others by practising all the steps in implementing a survey. During the first seven days, participants learned how to collect quantitative and qualitative data. In the classroom and in health facilities they observed case management practices, interviewed health workers and caretakers of children with diarrhoea, reviewed case records, and identified facility supports for proper case management. Since surveyors are required to evaluate case management practices, the participants also practised assessing and treating children with diarrhoea. Surveyor teams then went to the field for two weeks to conduct the survey in different areas of the country. They met again during the last week to analyse the data and develop recommendations for future CDD Programme activities.

Throughout this activity all participants had many opportunities to practise the following: training others, providing feedback, developing reliability in using the procedures, supervising field activities, and managing data collection. They led small groups through the steps of data analysis, and helped them identify and agree on practical recommendations. As a result, there is now a pool of skilled people prepared to assist other national CDD programmes in using this evaluation method to help improve the quality of care given to children with diarrhoea.

The first of these surveys has now been completed in Viet Nam and plans have been made for surveys in Bangladesh and Indonesia in 1992. During these surveys use of summary data from each sampling cluster will be compared with the conventional method of analysis in which data for all individuals are required. If the former proves to be reliable, data compilation and analysis will be much simplified and less time-consuming. These surveys will be used to test questions on causes of death, in particular, diarrhoea and acute respiratory infections.

In addition to the surveys to be conducted with the assistance of the LSHTM, surveys are also scheduled in Bolivia and the Islamic Republic of Iran in 1992.

Attempts have been made to examine mortality trends using methods other than special surveys. During the biennium, the WHO Regional Office for the Americas finalized a report that assessed mortality trends in Latin America for the years 1965-1990 (see Box 12).

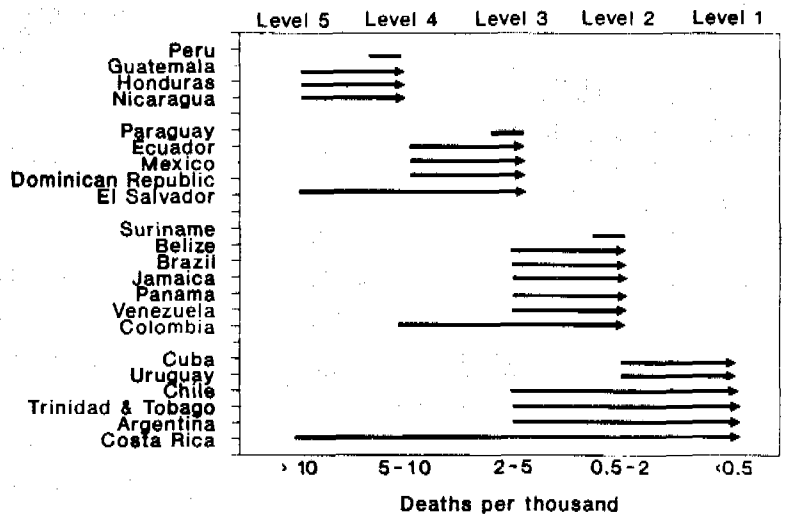
The principal objective of the Programme is to reduce infant and childhood mortality. Epidemiologists at the WHO Regional Office for the Americas have recently undertaken a review of mortality trends in Latin America for the period 1965-1990, during which time average life expectancy at birth increased from 51.8 to 66.6 years. Using data routinely reported to WHO through the Technical Information System (TIS), they calculated average annual overall and diarrhoea-specific mortality for five-year periods and examined national and regional trends. In nearly all countries, there was a decrease in the number of deaths, deaths due to diarrhoea at all ages, deaths due to diarrhoea in children under 5 years of age, and the proportion of all deaths which were attributed to diarrhoeal diseases. Most important, diarrhoea-specific childhood mortality rates declined in 22 of the 23 countries. The authors conclude that reduced mortality from diarrhoea, as a single cause, has contributed substantially to the decline in mortality from all causes and, consequently, to the increase in life expectancy at birth.

Two examples of large declines in the number of deaths due to diarrhoea and in the proportion of all deaths attributed to diarrhoea can be cited. In Chile, the reported number of deaths due to diarrhoea in children under five decreased by 95%, resulting in a decline in the diarrhoea-specific mortality rate from 3.72 to 0.17 diarrhoea deaths per 1000 children, and a decrease in proportional mortality from 90.2% to 37.1%. In Mexico, a 64% reduction in the number of deaths is reflected in a decline in diarrhoea-specific mortality from 7.46 to 2.17 per 1000, and a decrease in proportional mortality from 75.1% to 66.0%.

The authors classified the calculated annual diarrhoea-specific mortality rates, which, for reasons inherent in the use of routinely collected data are almost certainly underestimated, into five levels of severity, ranging from <0.5 per 1000 children to >10 per 1000. The progress made by each country during the 25-year period is shown in the figure below.

Changes in level of reported diarrhoea-specific mortality

Region of the Americas, 1965-1990



Although many countries have advanced one or two levels, it must be noted that a reported diarrhoea-specific childhood mortality rate of 0.5 per 1000 per year (the lowest reported) is seven times greater than that which existed in the United States of America and Canada at the start of the 25-year period. Diarrhoeal diseases, particularly in children, remain a significant problem in Latin American countries.

Country programme profiles

The CDD Programme's management information system was developed to help managers at country, regional and global levels to collect, analyse, interpret and summarize data needed to follow the progress of the Programme.

In 1987, a set of forms called the "Country Programme Profile" was designed to replace the "Management Information System" form used up to 1986. The profile consists of 11 sections containing data on planning, training, ORS production, and evaluation, and serves as a useful tool for sharing data among countries, within WHO, and with other organizations. In 1991, after four years of use, the country programme profile underwent comprehensive revision to reflect the improvements suggested by regional offices and countries. The new form is now significantly simpler and easier to use. The profile is accompanied by comprehensive notes on completion. In 1991, 84 completed country programme profiles were submitted to the Programme.

The computerized storage and retrieval system for Country Programme Profiles, CDDbase-2, was revised during the biennium and is now also much easier to use. The database has been installed at headquarters and in all WHO regional offices (except at the Regional Office for Europe). Regional staff have been trained in its operation and are responsible for ensuring the quality of reported data. The computer database is, like the country profile, available in English, French and Spanish.

In large countries, the preparation of a country profile for the whole country involves collecting data from a number of administrative units. To facilitate this, the Regional Office for the Americas has pioneered the development and use of a local CDD programme profile, a scaled-down version of the country profile (see Box 13).

During the biennium, through close work with the regions, problems with the country programme profile and the database were identified. As in any information system, the usefulness of the information derived is only as good as the accuracy and reliability of the data collected. Thus the Programme is developing approaches and specific measures to help countries to obtain more reliable figures. In some countries, the measurement of important parameters such as training coverage rates has proved difficult. In improving this aspect of the profiles, suggestions from the regional offices and country programme staff will be considered. In 1992-1993, country programme profile data will be fed back to the countries in the form of graphs, summary tables and simple historical data analyses. These will form the basis of discussions with countries for improving the quality of management information.

Other evaluation activities

During the biennium, the Programme continued to distribute its publications "Estimating costs for cost-effectiveness analysis: Guidelines for managers of diarrhoeal disease control programmes". A study in the Philippines in 1990 using these guidelines, showed large cost savings which were attributable to improvements in diarrhoea case management. The Ministry of Health was impressed with the findings of this study and a similar exercise will be implemented on a larger scale in 1992.

A cost-effectiveness study conducted in China in August 1991 is summarized in Box 14.

13

Local CDD programme profiles:

experience in the Region of the Americas

To facilitate the preparation of more accurate and reliable annual national CDD country programme profiles, the Regional Office for the Americas developed a local CDD programme profile in 1989. The local profile, as the name implies, is completed for a state, province or department of a country. Not only does it facilitate the computation of national figures, it also encourages the decentralization of collection and analysis of CDD data for management purposes.

Local programme profile forms provide valuable information on local level CDD training, and supervisory and health education activities. As this information tool becomes more established, the collection, quality and completeness of CDD indicators will improve.

In 1991, considerable efforts were made to improve data collection techniques. A Lotus 1-2-3 worksheet was developed for data entry and analysis which can also be tailored for individual country requirements, including translating the text into the local languages. Local profiles were prepared for eight states in Brazil, 22 health sectors in Colombia and 33 states in Mexico. Although the local programme profile was developed for use in larger countries, smaller countries, such as Argentina, Bolivia, Costa Rica and other Central American states have expressed an interest in using it.

In 1992, further efforts will be made to refine the CDD local programme profile and its accompanying worksheet. More countries will be encouraged to adopt this method of data collection, analysis and reporting. These efforts will help to improve the local planning of CDD activities and will assist in setting targets and measuring the impact of activities.

CDD programme reviews in Shangdong, Fujian, Gansu and Yunnan provinces in 1989 and 1990 had shown that diarrhoea case management diverges from recommendations given in the WHO and national guidelines; intravenous infusions and drugs are frequently over-prescribed, with financial as well as medical consequences. In order to inform policy-makers about the magnitude of these costs, a study was conducted in five townships in the Yunnan Province in August 1991. As routine records provided insufficient information, doctors in county and township hospitals were asked to describe how they would treat three hypothetical cases of diarrhoea. Village doctors were similarly interviewed but were presented with only the first two cases. The hypothetical cases were as follows:

Case 1 - a child aged 1 year, with a 2-day history of passing more than six watery stools a day and low grade fever.

Case 2 - a child aged 2 years, with a 1-day history of passing four bloody stools and a fever.

Case 3 - a child aged 1 year, with a 2-day history of more than six watery stools, low grade fever, barely responding, scarcely sucking at the breast, and with a sunken fontanelle and dry mouth.

The survey of doctors confirmed that antimicrobials were widely and inappropriately used to treat watery diarrhoea. Many doctors also prescribed parenteral antimicrobials rather than relying on cheaper, orally administered drugs. Doctors frequently requested more than one outpatient visit or unnecessarily admitted patients to hospital. A comparison was made between the costs of standard case management as recommended by WHO and the costs of the current treatment practices described by the doctors (see table below). In most settings, use of the standard WHO treatment would have reduced costs by a considerable amount.

Comparison of costs (in Yuan) of described current practices and WHO recommended standard treatment

	Case 1		Case 2		Case 3	
	Current	*Standard*	*Current*	*Standard*	*Current*	*Standard*
Village doctors	2.86	1.51	5.36	2.56	not asked	
Township doctors	3.76	2.13	113.37	3.20	210.78	5.84
Country doctors	5.72	4.89	6.67	6.14	8.95	8.41

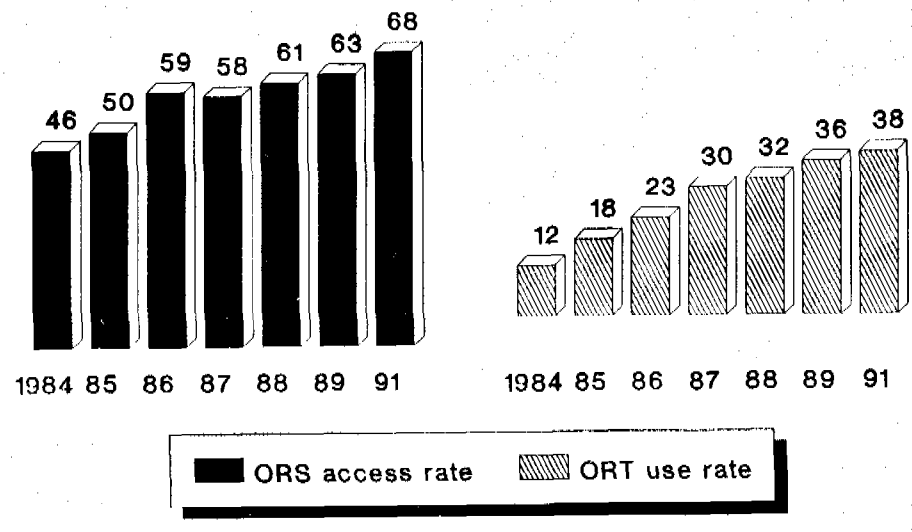
As a consequence of excessive prescriptions and unnecessary consultations and admissions, current diarrhoea treatment is very uneconomical. A major obstacle to changing these wasteful practices is the reliance of hospitals on the profits from drug and service sales not only to maintain supplies, but also to meet other expenses including salaries. Village doctors also depend on profits from drug sales to supplement their fees.

ORS access and ORT use rates[a]

The estimated ORS access and ORT use rates for developing countries, by WHO Region and globally, are presented in Figure 3 and Table 5. Country-specific data are given in Annex 1. For the majority of countries the ORS access, ORS use and ORT use rates are based on figures provided by national CDD programmes to the WHO Regional Offices using the CDD Country Programme Profiles. Other figures are based on estimates made by the Regional Offices, survey results and other available programme documents. Increased familiarity with the Country Programme Profiles, a higher rate of completion of the profiles, and improved efficiency of the computerized reporting system mean that from now onwards the Programme should be able to report on the last complete calendar year and not on the previous year as in the past. Thus, while the previous programme report covering 1990 contained figures for 1989, this report on the biennium contains figures for 1991. Of the 84 countries that completed profiles, almost all reported 1991 data; the regional and global estimates are therefore taken to represent the situation at the end of 1991.

Figure 3

Estimated global ORS access and ORT use rates, 1984-1991 (in per cent)



[a] The terms used in this section are defined as follows:

ORS access rate: The percentage of the population having access to a provider of ORS who is trained in its use and who 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 and/or a recommended fluid.

Table 5

Estimated ORS access and ORT use rates in children aged 0-4 years, 1983-1991, by WHO region and globally[a]

Region	ORS access rate					ORT use rate				
	1983	1985	1987	1989	1991	1984	1985	1987	1989	1991
Africa	5	22	38	52	57	4	8	19	36	40
Americas	9	44	62	68	68	12	10	39	48	54
Eastern Mediterranean	30	54	69	70	75	21	22	40	47	40
South-East Asia	43	69	64	64	68	14	25	29	19	20
Western Pacific[b]	29	45	57	69	82	27	32	34	39	34
Global[b]	24	50	58	63	68	12	18	30	36	38

[a] ORT use rates refer to the percentage of diarrhoea episodes in children under 5 years of age treated with ORT. In Programme reports before 1989, estimates of ORT use rates included only ORS and sugar-salt solutions (SSS), since data for other recommended home fluids were unavailable or unreliable. ORT here includes ORS or a recommended home fluid.

[b] Developing countries. Excluding China.

The global ORS access rate increased from 63% at the end of 1989 to 68% at the end of the 1990-1991 biennium. This reflects similar increases in all regions except the Region of the Americas which remained stable at 68%. The highest ORS access rate and greatest increase is seen in the Western Pacific Region, as a result of increases in two of the most populous countries, the Philippines and Viet Nam with increases of 29% and 11%, respectively. Although the African Region continues to have the lowest ORS access rate, ORS access in the Region increased by 7% during the biennium. Globally, of the countries that provided data, 38 reported increased ORS access rates, 30 reported the same rates as in 1989, and 14 countries reported a decrease. The high ORS access rates reported suggest that many national programmes are reporting the proportion of population that has physical access to ORS, without necessarily considering whether access is provided through a provider trained in the use of ORS.

Globally the ORS use rate remained the same, at 21%. Two regions, the Americas and the Eastern Mediterranean, reported decreases in ORS use. This was largely due to reported decreases in three large countries (Brazil, Mexico and Pakistan) where reliable data collected through household surveys revealed rates lower than those previously estimated by these countries. Although the global estimate for ORS use remained about the same, 43 countries reported an increase in ORS use during the biennium.

From 1989 to 1991 the global ORT use rate increased from 35% to 38%. This increase can be attributed to three Regions: Africa, the Americas and South-East Asia, where increases were noted in many countries, not only in one or two highly populated countries. The highest ORT use rate was in the Region of the Americas where increases were reported in 13 of the 23 countries for which new data were provided. In the South-East Asian Region, all but three countries reported an increase, and in the African Region, 14 of the 20 countries providing data reported higher ORT use rates. Globally, only 12 countries reported a decrease for the current biennium. This probably reflects the greater emphasis given by national programmes in recent years to the use of available home fluids to prevent dehydration.

In two regions decreases in ORT use rates were seen: in the Eastern Mediterranean Region the rate dropped from 47% to 40%, and in the Western Pacific Region it fell from 39% to 34%. This is largely a result of changes in the reported rates for three countries - Egypt, Pakistan and Viet Nam.

It is expected that during the next biennium many more countries will identify home fluids for recommendation, and promote them more vigourously. As a consequence, ORT rates are expected to continue to increase. This trend may already be evident: the median ORT use rate for 26 countries which conducted household surveys in 1989-91, was 55.9% (Table 4).

Redefinition of key indicators

The goals proclaimed by the World Summit for Children in 1990 provide a framework for a comprehensive strategy to improve child health in the current decade. The goal set for overall mortality reduction was: "Between 1990 and the year 2000, reduction of infant and under-five child mortality by one-third or to 50 and 70 per 1000 live births, respectively, whichever is less". This goal cannot be achieved without a concerted effort to control diarrhoeal diseases. UNICEF and WHO, recognizing this and the importance of close collaboration in their efforts, held a special meeting in April 1991 to develop a joint strategy for CDD in the 1990s. A major decision made during the meeting was that both agencies would standardize their assessment methods and evaluation instruments. A set of four core CDD indicators was developed which can serve as a minimal reporting requirement in countries where UNICEF and/or WHO are actively supporting national CDD programmes. These four indicators incorporate many of the WHO Programme's established 13 key indicators. Both organizations will work with national CDD programmes to follow the progress of these indicators. In addition to allowing managers at country level to assess programme status and achievements towards set targets, these new indicators should also be useful for global monitoring purposes. WHO is currently modifying the existing evaluation instruments (household and health facility surveys) to allow measurement of these indicators at country level in accordance with a standardized methodology. The four indicators are:

Use of ORT plus feeding: The proportion of diarrhoea episodes in children under 5 years that receive increased fluids and continued feeding.

Maternal knowledge: The proportion of mothers of children under 5 years who can state the three rules of home case management (increased fluids, continued feeding, when to seek care).

Access to ORS: The proportion of the population with a regular supply of ORS available in their community from a public or private source.

Access to case management through health facilities: The proportion of the population that lives within a reasonable distance of a health facility that has a regular supply of ORS and antibiotics, and that practises correct case management.

Interventions for the prevention of diarrhoea

Promotion, protection and support of breast-feeding

Many epidemiological studies have clearly demonstrated the beneficial effects of breast-feeding in reducing diarrhoeal morbidity and mortality in infants. The promotion of breast-feeding as a preventive intervention continues to receive special emphasis from the Programme. The promotion of exclusive breast-feeding for the first 4-6 months of life, and continued breast-feeding up to the age of 2 years or beyond in addition to adequate complementary foods, is recommended. During the 1990-1991 biennium, the Programme increased its activities to protect, promote and support breast-feeding.

In 1991, the Programme more clearly defined its approach to lactation management training and identified the priority target audiences. The aim is to develop two training courses, one for health workers in contact with mothers, and the other for senior health professionals. A consultant was contracted to develop guidelines for conducting breast-feeding counselling training courses for multipurpose health workers who deal directly with mothers. A pretest of the guidelines took place in October 1991, at the José Fabella Memorial Hospital in Manila, Philippines. Revisions are being made as a result of the pretest including an extension of the facilitators' training course from two and a half days to five days. A "Course Director's Guide" will be developed as part of the package. Another pretest of the revised materials is planned in an English-speaking country in the first half of 1992, and an internal review will be undertaken by Programme staff. The final version of the guidelines will then be fully field-tested and should be available by the end of 1992. The development of guidelines for senior health professionals will begin in 1992-1993.

In March 1991, the Director-General of WHO established the WHO Working Group on Infant Feeding to ensure coordination among the various WHO programmes that play a key role in promoting adequate nutrition among young children. The Programme is an active participant in the Working Group, which meets monthly. One outcome is the planned production, in 1992, of a series of fact-sheets entitled "Facts about Infant Feeding" which will summarize important information and disseminate it to the international health community.

The headquarters staff member responsible for breast-feeding visited Bolivia, Brazil, Kenya, Philippines and Viet Nam, to assist in the planning and implementation of activities. The following activities were supported at country level.

Bolivia: The Programme collaborated in the pretest of guidelines for assessing activities in support of breast-feeding, which was held in La Paz in August 1991. The feasibility of establishing a national lactation training centre (LTC) in Bolivia was also assessed.

Brazil: With the assistance of an external consultant, an evaluation of the breast-feeding training activities at the LTC in Sao Paulo, supported by the Programme, took place in May 1991 during a training course (see Box 15).

Islamic Republic of Iran: The Programme supported the visit of a legal adviser from WHO headquarters to assist in the elaboration of a national "Code of Marketing of Breast-Milk Substitutes". Further support is being considered.

Kenya: During a visit in January 1991, a proposal for breast-feeding training activities was developed and technical feedback was provided by the Programme. Further collaboration on training activities is being considered.

Philippines: A visit was made in 1990 to follow up on the implementation of previously developed rooming-in and breast-feeding guidelines developed in consultation with the Programme. A pretest of the "Breast-feeding Counselling Training Course" under development by the Programme was held in Manila in October 1991; 14 rural midwives, four nurses, and two rural doctors were trained in breast-feeding counselling skills over five days. An evaluation and follow-up of the training is planned for 1992.

United Republic of Tanzania: In order to assist training activities in breast-feeding, the Programme supported the participation of a senior health professional as part of a "core team" trained at the Wellstart Lactation Management Education Program, San Diego, USA. During the training course, a plan of activities for the United Republic of Tanzania was prepared. A follow-up visit to the country is proposed for 1992 to develop the training programme further.

Viet Nam: A situational analysis was carried out in 1990. The national CDD programme has translated the "WHO/UNICEF International Code of Marketing of Breast-Milk Substitutes" into Vietnamese, with support from UNICEF. The Programme is supporting printing and distribution. Further support will be provided to breast-feeding activities in Viet Nam in the 1992-1993 biennium.

In addition, the possibilities of Programme support to Angola, Ethiopia and Pakistan are being explored.

Training in lactation management skills at the Lactation Training Centre, Santos, Sao Paulo, Brazil 15

A lactation training centre (LTC), based on the Wellstart model adapted for developing countries, was established in Santos, Sao Paulo, Brazil in 1990. The Programme has provided financial and technical support to training activities since its establishment. To date, around 100 health professionals have been trained. The training courses last 15 days and emphasis is given to "hands-on" training in lactation management. In November 1991, teams of health professionals from Mexico and Guatemala were trained.

The LTC expects to receive a team of health professionals from Angola in 1992 and/or to send a trainer to Angola to assist in establishing an LTC there, and to conduct the first course. A formal evaluation of this training centre is being undertaken, however, preliminary assessment suggests a positive impact on the practices of trainees and on the services of the institutions in which they work. Possible sites for another LTC in another region of Brazil, are being explored.

Development of breast-feeding indicators: A list of key breast-feeding indicators for the household level was developed initially by the Programme and reviewed by other interested groups inside and outside WHO. An informal interagency meeting involving SIDA (Swedish International Development Authority), UNICEF, USAID and WHO was held in June 1991 to reach a consensus on the definition of key indicators and specific methodologies for measuring them. The final report of this meeting has been distributed and wide promotion of these indicators will be undertaken. No consensus was reached on proposed breast-feeding indicators to be measured through inquiries at health facilities. It was agreed that this topic required further discussion and another interagency meeting is planned for this purpose in 1992.

A CDD Update issued by the Programme in August 1991, on the subject of "Breast-feeding and the Use of Water and Teas", highlighted the fact that supplements in the form of water and teas in early infancy are not necessary even in hot and arid climates.

The Programme also prepared a review article for publication in the journal *Health Policy and Planning*, entitled "Why promote breast-feeding in diarrhoeal disease control programmes?" It summarizes information on the impact of different modes of infant feeding on diarrhoea morbidity and mortality.

Other preventive interventions

During the biennium, the Programme continued to train programme managers in the identification and selection of priority preventive interventions to implement in collaboration with other relevant departments and ministries. The Programme Managers' and Supervisory Skills courses include a module describing the most effective interventions in reducing the incidence of diarrhoeal diseases in children, namely: the promotion of exclusive breast-feeding, improved weaning practices, use of clean water, hand-washing, use of latrines, disposal of children's stools and measles immunization. It gives specific suggestions on what families should do and what support health workers can give, and proposes operational approaches to implementation.

An important step was taken in 1991 to increase collaboration between the Programme and the WHO's Community Water and Sanitation Unit (CWS) with the aims of strengthening the role of WHO in the area of hygiene education, and of identifying the opportunities for providing joint, improved support to national health programmes in this area. Information has been exchanged on the development of methods for behavioural assessment, intervention design and evaluation, supported by the CDD Programme, and projects have been identified by CWS that would profit from collaboration with the Programme. In 1992, in addition to expanding the collaboration to include other units within WHO and other institutions, an expert consultation will be convened, jointly sponsored by CDD and CWS. This consultation will have the objectives of reaching consensus on the key modifiable "minimum complex" of hygiene behaviours that should be considered in interventions to reduce diarrhoeal morbidity, and of identifying and recommending approaches for the promotion of improved hygiene behaviours.

The Programme has also worked closely with the CWS Unit in the Global Task Force on Cholera Control, as prevention is an essential component of the Task Force's activities.

Control of cholera

In January 1991, cholera broke out in the coastal departments of Peru, spreading rapidly to all departments of the country and to the neighbouring countries of Ecuador and Colombia. It was to become the largest cholera epidemic of the current pandemic, causing 301 277 cases and 2829 deaths in Peru by the end of the year. The epidemic spread progressively to 10 other Latin American countries resulting in 366 228 cases and 3893 deaths (a case fatality rate of 1.06%) reported to WHO from this region in 1991.

In Africa, 135 969 cases and 12 648 deaths were reported in 1991. The overall case fatality rate of cholera in Africa (9.3%) was nearly 10 times as high as in the Americas. Other regions where cholera has been endemic, particularly in Asia, reported outbreaks in new areas (Figure 4).

In response to the urgent need to limit the spread of the epidemic and to control the social and economic effects of cholera, efforts were intensified to reinforce national CDD programmes in affected and threatened countries. A Global Task Force on Cholera Control was set up by the Director-General of WHO on 24 April 1991 to coordinate, in cooperation with the Regional Offices, the Organization's global action in relation to cholera control.

The CDD Programme has coordinated the work of the Task Force which brings together 10 WHO units and programmes. Programme staff have been actively involved in the Task Force's efforts to provide policy guidance, develop guidelines for case management, accelerate vaccine development and testing, and ensure adequate supplies of ORS in affected countries. Most of the Programme's usual activities are of direct relevance to cholera control, and have been intensified in countries affected by cholera. Additional activities specifically prompted by the occurrence of cholera outbreaks include intercountry coordination meetings at which Ministry of Health officials from all affected countries have been informed on appropriate control measures and at which coordination of efforts was discussed. Training courses have been held for trainers in case management and Programme staff have made visits to a number of countries to advise on other aspects of control.

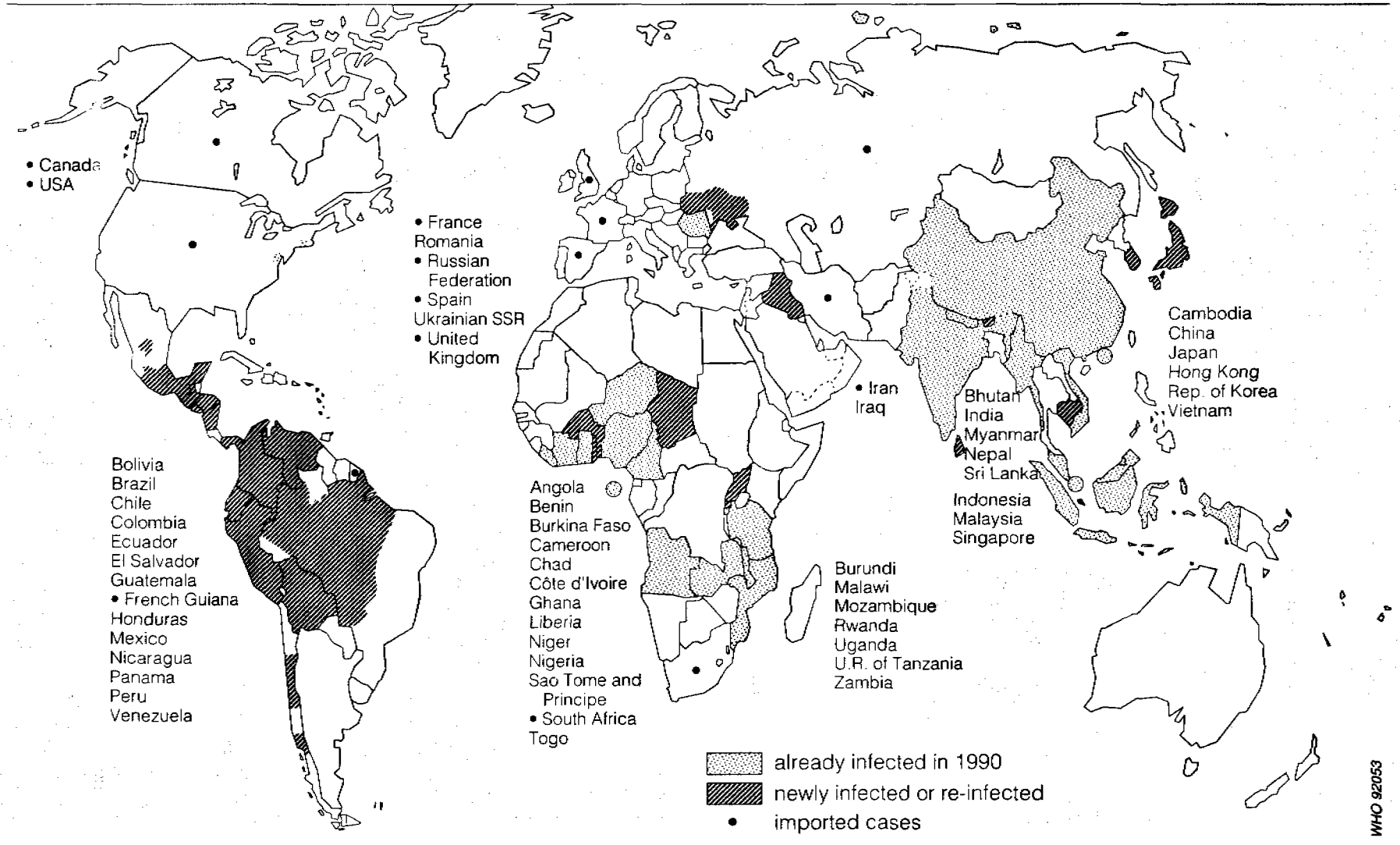
All countries in Latin America have responded by setting up cholera control commissions and all have developed plans of action. Several African countries have taken similar steps.

The Programme has coordinated the revision and preparation for publication of "Guidelines for Cholera Control" which will now include more detailed guidance on a number of issues. New guidelines, "Management of the Patient with Cholera", have been prepared and widely disseminated, as has information advising against the use of cholera vaccines. A number of other documents have been produced by the Task Force under the Programme's coordination.

The Programme will continue to coordinate and contribute to the Task Force's aims of intensifying assistance to national cholera control activities, enhancing information exchange, and accelerating research efforts. This will be greatly facilitated by the appointment, early in 1992, of a Medical Officer who will spend half of his time working with the Programme on cholera control and half working on WHO's initiative of intensified cooperation with countries in greatest need, many of which are affected by cholera.

Figure 4

Countries, or areas within countries, reporting cholera in 1991



Source: WHO/HST/SES (May 1992)

CHOLERAGRAFIX 1.5

Collaboration with other international and bilateral agencies

The programme maintains active collaboration with a number of agencies in support of national control programmes.

UNICEF: Collaboration with UNICEF increased significantly in 1991. A series of meetings to develop joint approaches and activities at global, regional and country levels was held. An important outcome of these discussions was the development of the core set of key programme indicators (described on page 40) and the definition of targets for these. UNICEF staff will play a particularly active role in the future, together with WHO staff, in supporting country programmes, including a greatly increased effort in training and the use of the key indicators to identify successful activities as well as problem areas. UNICEF and WHO will also collaborate in providing intensive support to a set of priority countries.

United States Agency for International Development (USAID): At the global level, the Programme is collaborating with (a) Technologies for Primary Health Care (PRITECH) Project, 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 United States Academy for Educational Development and has collaborated with 15 countries in the communication component of oral rehydration therapy and other child survival strategies; (c) the Quality Assurance Project, in the development of monitoring and evaluation methods; and (d) Project Support, managed by the Program for Appropriate Technology in Health (PATH), which is assisting national production of oral rehydration salts 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 has been active in 12 African countries. In addition, 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.

Swedish International Development Authority (SIDA): The Programme is collaborating with SIDA in the development of activities in relation to breast-feeding. Technical input was provided by SIDA in the development of breast-feeding indicators, and breast-feeding activities have been jointly supported in several countries. SIDA also supports the involvement of a Swedish paediatrician in the Programme's efforts to improve the teaching on diarrhoea in medical schools.

During 1990-1991, Associate Professional Officers were made available to work in national CDD programmes by: (a) SIDA for Guinea Bissau, Lao People's Democratic Republic, Viet Nam and Zambia; (b) the Danish International Development Agency (DANIDA) for Ghana, Liberia and Philippines; (c) the Government of Italy for Burundi; (d) the Finnish International Development Agency for Papua New Guinea and the WHO Regional Office for the Western Pacific; (e) the Government of the Netherlands for Pakistan, Peru, Sudan, Venezuela, and the WHO Regional Office for the Western Pacific; (f) the Government of Germany for Angola; (g) the Government of Belgium for Haiti; (h) the Government of Norway for Namibia; and (i) the Government of Austria for the Regional Office for Africa Sub-Region III.

Current status of the Programme

The status of a number of progress indicators at the end of 1989 and 1991 relating to targets for 1995 and 2000 is shown in Table 6. Two of the four key indicators selected by WHO and UNICEF for particular attention in the 1990s have not been measured to date; targets have been set and measurement will start in 1992. Access to case management through health facilities is a composite indicator which takes into account ORS and antibiotic supplies and the practices of health staff. Maternal knowledge of home case management will evaluate the effectiveness of a combination of communication approaches. The ORS access rate increased 7% during the biennium to reach 68%. A 1995 target of 80% has been set for this indicator, redefined as the proportion of the population of developing countries with a supply of ORS within their community; this target should be achievable. Perhaps the most important of all indicators for assessing likely impact on mortality is the case management rate, which is the proportion of all diarrhoea episodes in children under 5 years of age given an increased intake of acceptable fluids and continued feeding. This was estimated to be 19% at the end of 1989. At the end of 1991, based on results from 53 surveys in 24 countries during the biennium, it was estimated to be 21%. Achievement of the target of 50% set for 1995 will require a significant increase in activities to promote correct case management, in the home as well as through health facilities.

The ORT use rate increased slightly during the biennium, reaching 38% in 1991; it is estimated that this may have resulted in 1.1 million diarrhoea deaths being averted in that year.

During the biennium the Programme put a major emphasis on training activities, and as shown earlier in Figure 1, there was a large increase in the number of training courses held. This is reflected in the gains made in the two training coverage indicators; in both cases the rates almost doubled during the biennium.

Progress towards the 1995 target of 160 programme reviews is steady and expected to increase with the introduction in 1992 of the focused programme review method.

Table 6

Programme status and targets

	Status (%)		Target (%)	
Selected key indicators[a]	**1989**	**1991**	**1995**	**2000**
Maternal knowledge of the three rules of home case management	b	b	80	100
Access to case management through health facilities	b	b	80	95
ORS access rate	63	68	80	100
Case management rate (ORT plus continued feeding)	19	21	50	80
Other indicators				
ORT use rate	36	38	c	c
Supervisory skills training coverage	17	31	40	d
Case management training coverage	11	19	40	d
Programme reviews	81	98	160	d

[a] WHO and UNICEF have agreed to give priority to cooperating with countries in the measurement of these four indicators.

[b] Measurement to start in 1992.

[c] No targets set for 1995 and 2000 as this indicator is replaced by the case management rate.

[d] Targets not yet set for 2000.

RESEARCH 3

During the 1990-1991 biennium, the Programme continued to support research aimed at the development and evaluation of new or improved approaches for the treatment and prevention of diarrhoeal diseases. Increased attention was given to expanding research activities related to programme implementation, to assessing the effectiveness of selected diarrhoeal disease control interventions when delivered under usual programme conditions, and to identifying the key factors for their success.

In accordance with a recommendation made in March 1990 by the Programme's Technical Advisory Group (TAG), the scientific working groups which had guided this research since 1986 were replaced by a core of experts to advise on priority issues for each study area. These advisers have been assisting the Programme in: (i) reviewing progress in priority research areas, including the progress and final reports of supported projects; (ii) defining research priorities; (iii) establishing study methods; (iv) reviewing research proposals; and (v) advising investigators on study design, implementation, and data analysis. In addition, an informal consultation with study advisers was held in December 1990 to review the findings from intervention-related projects, to define research priorities, and to discuss appropriate methodologies to address them.

Support was awarded to 18 new projects in both 1990 and 1991, bringing the total number of projects supported by the global Programme to 418 (Figure 5), of which 83 are in progress. The topics of the 36 new projects are summarized in Table 7. These projects are being implemented in 15 countries; 89% of the projects are in developing countries.

Figure 5

Research projects supported by the global Programme, 1980-1991

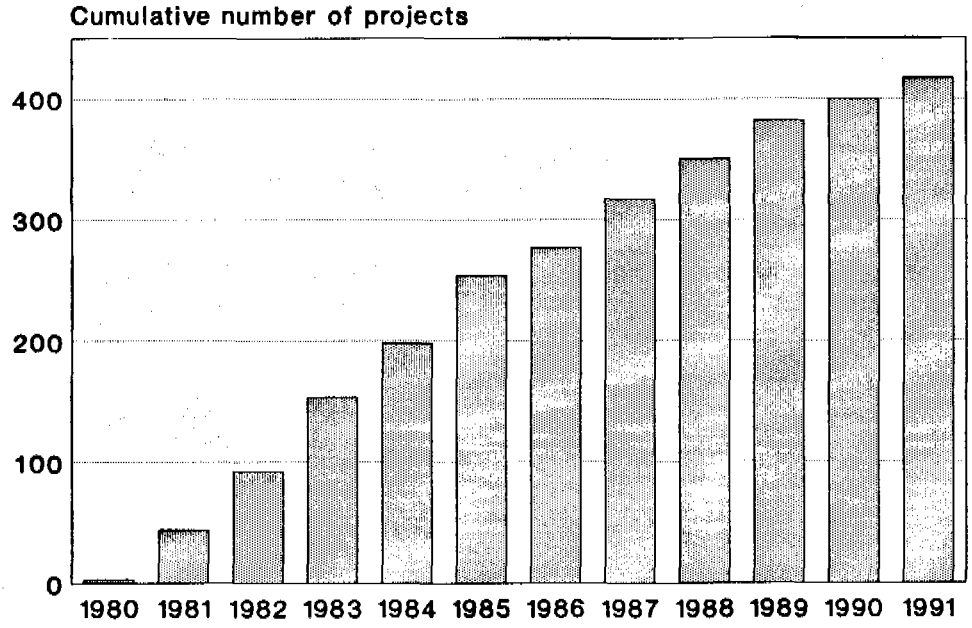


Table 7

New projects supported during 1990-1991, by major topic

Topic	No. of new projects
Clinical trials	7
Case management by health providers and at community level	6
Rational use of drugs	2
Infant feeding	9
Vitamin A supplementation	2
Personal and domestic hygiene	2
Vaccine development and evaluation	5
Epidemiology of severe diarrhoea and diarrhoeal death	2
Research strengthening	1

The following sections summarize information that has emerged from completed studies, and highlight ongoing projects of particular importance.

Case management research

During 1990-1991, the Programme 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 assessing the usefulness of antidiarrhoeal drugs and antibiotics in the management of persistent diarrhoea and shigellosis. Case management by health care providers and at community level were also topics of research. The rational use of drugs in the treatment of diarrhoea was added to the implementation research priorities during 1991.

Improved ORS formulations

The physiological principle that explains the effectiveness of ORS solution is the coupled active transport of sodium and glucose across the brush border membrane of the enterocyte, which results in passive absorption of water and other electrolytes. Many water-soluble organic molecules other than glucose can enhance the absorption of sodium from the small intestine. Optimum exploitation of this phenomenon could lead to the development of an improved ORS formulation that would not only successfully replace the deficit of salts and water in diarrhoea, but also actively induce the reabsorption of endogenous intestinal secretions, and thus reduce the volume and duration of diarrhoea, i.e., act as an absorption-promoting, antidiarrhoeal drug.

There are two groups of organic solutes that are absorbed efficiently and relatively independently of each other by the small intestine and that enhance the absorption of sodium and water:

- D-hexoses: **oligosaccharide mixtures** (several grades of maltodextrins also called glucose syrup solids or corn syrup solids) and **polysaccharides** (starch from rice or other cereals);

- amino acids: **glycine**, **L-alanine**, **L-glutamine** and **dipeptides** of neutral amino acids.

Research to develop and test improved ORS formulations has focused on these two groups of organic solutes. Since 1980, a total of 40 projects has been supported by the Programme in which the standard WHO ORS solution has been compared with experimental formulations (Table 8).

Rice-based ORS

Several clinical trials have shown that an ORS solution containing cooked rice powder in place of the usual glucose substantially reduces the rate of stool loss due to acute diarrhoea. However, other studies have reported no significant benefit from such treatment in comparison with the standard WHO ORS solution. The subjects in the studies varied considerably and included infants, children and adults with both cholera and acute non-cholera diarrhoea. Moreover, in some studies the number of patients evaluated was most probably insufficient to support firm conclusions. In order to define more precisely the true benefit of rice ORS solution in relation to the WHO ORS solution, and to determine whether this benefit is related to patient age or etiology of diarrhoea, the Programme performed a meta-analysis using data from all available randomized clinical trials that compared these two ORS formulations. A summary of this meta-analysis, which will be published in the *British Medical Journal*, is presented below.

A review was undertaken of 13 clinical trials that compared the clinical effects of the standard WHO ORS solution and an ORS solution in which glucose was replaced by 50-80 g/l of cooked rice powder. These studies involved 1367 patients with cholera, severe cholera-like diarrhoea, or acute non-cholera diarrhoea; 668 received the standard WHO ORS solution and 699 the rice-based ORS.

Rice ORS solution significantly reduced the rate of stool output during the first 24 hours of treatment by 36% (95% confidence interval [CI] 28%-44%) in adults with cholera and by 32% (95% CI 19%-45%) in children with cholera. In contrast, the rate of stool loss in infants and children with acute non-cholera diarrhoea treated with rice ORS solution was only reduced by 18% (95% CI 6%-30%).

To examine the effect of rice ORS in infants and young children with non-cholera diarrhoea, two additional clinical trials have been undertaken. An outpatient study in Bangladesh measured the effect of treatment with rice-based ORS solution on total stool output and duration. Data collection is now completed and results will be available in early 1992. The second study, conducted in Egypt and Pakistan, investigated whether early feeding with a rice-based diet during treatment with glucose-based ORS solution produces the same benefits as rice-based ORS solution. The results from this study will be available in 1992.

Table 8

WHO-supported clinical trials on improved ORS

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

[a] Countries in **bold face** are where studies have been completed.

[b] One study evaluating two experimental solutions.

[c] Two studies were conducted in this country with this formula.

In addition, three clinical trials have been undertaken to investigate the safety and efficacy of a rice-based ORS solution in certain population groups. In studies conducted in Madagascar and Mexico the precooked rice included in the rice-based ORS solution was digested and absorbed efficiently in severely malnourished children as well as in infants below 6 months of age with acute diarrhoea, and the solution was at least as efficacious as glucose-based ORS solution in correcting dehydration and maintaining hydration in these patients. In a study conducted in Peru, in a population with a high rate of glucose intolerance, there was no statistically significant difference in the treatment failure rate due to this condition between patients receiving rice-based ORS solution and those treated with standard WHO ORS solution (18%). Moreover, amongst those successfully treated, total stool volume and duration of diarrhoea were similar in the two groups. Although rice-based ORS solution appears to be well digested and absorbed in infants and young children, malnourished or not, these studies have not shown this solution to have any advantages over the standard WHO ORS solution with regard to rate of stool loss and duration of diarrhoea in acute non-cholera diarrhoea.

Maltodextrin-based ORS formulations

Glucose polymers, such as maltodextrin, offer the possibility of augmenting the amount of glucose in the ORS formulation without increasing its osmolarity.

Four studies of an ORS formulation containing 50 g/l of a minimally hydrolysed maltodextrin (MD02) in place of glucose were undertaken in Bangladesh, Egypt, India and the Philippines. The results show that the replacement of glucose with glucose polymers in the ORS does not offer any added advantage in terms of a decrease in the duration of diarrhoea or stool output. The lack of added beneficial effect in these studies with maltodextrin-based ORS could be attributed to limited digestion and absorption of the maltodextrin, especially in young infants under 6 months of age who lack pancreatic amylase, leading to a release of fewer glucose molecules than expected. However, if only the data collected in infants and children above 6 months of age are considered, no differences are observed between the two treatment groups for the main outcome variables, including stool output and duration of diarrhoea. It is therefore improbable that the lack of differences between the two groups is a result of incomplete digestion of the maltodextrin by some of the patients in the studies. The results provide no grounds for recommending the use of ORS solutions containing 50 g/l of maltodextrin instead of glucose.

ORS containing glycine

A meta-analysis of seven randomized trials that compared the clinical effects of the standard WHO ORS and experimental ORS solutions containing glycine on 643 children with acute non-cholera diarrhoea was recently completed by the Programme (*Bulletin of the World Health Organization*, 69:541-548 [1991]). The results of the analysis show that neither stool output nor duration of diarrhoea was reduced by the experimental formulations. Only for weight gain was there a statistically significant difference between the treatment groups (those given the WHO ORS solution gained less weight). This probably reflects transient excess fluid retention within the gut lumen or tissues of the patients who received the glycine-containing solutions. In conclusion, ORS formulations that contain glycine are not clinically superior to the WHO ORS solution.

ORS containing L-alanine

Encouraging results with an ORS solution containing L-alanine and glucose (8 and 16 g/l, respectively) in adult cholera patients prompted studies in children under 3 years of age. Three L-alanine-containing ORS formulations of different osmolarities were tested in four clinical trials, three of which have been completed and fully analysed. The results of the three completed studies conducted in children with acute non-cholera diarrhoea are

summarized in Table 9. The encouraging results obtained in adult cholera patients were not confirmed by the three other studies conducted in children. The studies conducted in India and the Philippines on children with non-cholera diarrhoea, which evaluated the same L-alanine-containing ORS formulation as the one used in the study on adult cholera patients, found this formulation to have no beneficial effect on stool output and duration of diarrhoea. It was suggested that the hypertonicity of the experimental solution (380 mOsm/l compared with 311 mOsm/l for the WHO ORS solution) was responsible for these results. However, the results from the study conducted in Egypt, which evaluated the efficacy of an L-alanine-containing ORS solution of reduced osmolarity (300 mOsm/l), also did not show any appreciable advantage of the experimental ORS solution over standard WHO ORS solution.

Table 9

Differences in stool output and duration of diarrhoea between children with acute diarhoea treated with L-alanine containing ORS (glucose 90 mmol/l + L-alanine 90 mmol/l) and patients treated with WHO ORS solution

Study	Number of patients	Percentage reduction during treatment with L-alanine containing ORS in: Mean stool output (95% CI)	Mean duration of diarrhoea (95% CI)
India	125	2 (-35 to 39)	5 (-15 to 25)
Philippines	120	-24 (-50 to 2)	-17 (-33 to -1)
Egypt	100	18 (-12 to 49)	14 (-14 to 30)

From the results of these studies it can already be concluded that the addition of L-alanine to ORS solution is of no practical value: L-alanine, like glycine, probably has similar efficacy to glucose in enhancing sodium absorption from the bowel lumen so that if L-alanine is added to ORS solution, its potential beneficial effect is offset by the adverse effect of the hypertonicity its addition creates. The final results from the other study, in Bangladesh, which will be available in early 1992, will nevertheless be of considerable interest, since they should provide valuable information concerning the importance of osmolarity in ORS solutions.

ORS containing L-glutamine

The transport of L-glutamine, the principal metabolic fuel of the small bowel and the major circulating amino acid, across the brush border membrane is also coupled to sodium transport. However, unlike other amino acids, L-glutamine has the advantages of stimulating chloride absorption and reducing both small bowel injury induced by drugs and gut atrophy associated with full parenteral nutrition.

The three studies supported by the Programme to evaluate two L-glutamine-containing ORS formulations in adult cholera patients and children with non-cholera diarrhoea have now been completed and analysed. The first of these studies, conducted in adult cholera patients (Indonesia), showed that the ORS solution containing L-glutamine was more effective than the standard WHO ORS solution, total stool output being reduced by 30%. However, the two studies conducted in children with acute non-cholera diarrhoea, in Brazil and India, found this formulation to have no added beneficial effect on stool output and duration of diarrhoea when compared to standard WHO ORS solution. Therefore, it can already be concluded that the addition of L-glutamine to ORS solution is of no practical value.

No further studies of ORS formulations based on defined solutes are being planned at the present time.

Conclusions and recommendations on "improved" ORS formulations

Rice-based ORS:

The current evidence shows that rice ORS solution has sufficient advantage over WHO ORS solution to justify its use in children or adults with cholera where this is convenient. However, recommendations concerning its use in acute non-cholera diarrhoea can only be made after completion of ongoing studies in Bangladesh, Egypt and Pakistan.

Maltodextrin-based ORS:

There are no grounds for recommending the production and use of ORS solutions containing 50 g/l of maltodextrin (or glucose syrup solids) instead of glucose.

Amino-acid-containing ORS:

The currently available evidence does not justify the production and use of ORS solutions containing glycine, L-alanine or L-glutamine.

Low-osmolarity ORS

Results from a recently completed pilot study conducted in Egypt suggest that a small but significant proportion of dehydrated patients, who present with transient glucose malabsorption during acute diarrhoea, might benefit from using a low-osmolarity ORS solution in which glucose concentration has been slightly reduced. To investigate this observation further, a multicentre clinical trial comparing the standard WHO ORS formulation (311 mmol/l) to a low-osmolarity ORS solution (240 mmol/l) has been started in four countries (Brazil, India, Mexico and Peru). Results from these studies should be available in 1993.

Feeding during and after acute diarrhoea

A randomized, controlled trial conducted in Egypt examined the nutritional impact of the promotion of liberal feeding during acute diarrhoea and for one month thereafter in adequately nourished infants aged 4-12 months. The feeding intervention included nutritional education of the mothers while the children were hospitalized and during weekly follow-up visits, and the provision of food for the infants during convalescence. The control group received only routine dietary advice at the time of discharge. During the four-week follow-up, infants in the intervention group had significantly fewer days of diarrhoea and a significantly higher weight gain than infants in the control group. These results indicate that continued feeding during diarrhoea and increased energy intake during convalescence can prevent the negative impact of diarrhoea on growth in well-nourished children.

It has been well established for some time that full-strength cow's milk formula is safe and nutritionally beneficial in non-breast-fed children older than 6 months with acute diarrhoea. However, in infants below 6 months of age receiving exclusively or mostly animal milk, there has not been sufficient evidence that this feeding approach is safe. A multicentre, randomized, double-blind clinical trial, evaluating the impact of early feeding with full-strength cow's milk formula in non-breast-fed infants under 6 months of age, has recently been completed in Brazil and Guatemala. Analysis of the data collected in this study showed that total stool output, total number of stool motions, duration of diarrhoea, and total intake of ORS solution were similar in the two treatment groups. Weight gain in infants successfully treated was similar in both treatment groups. However, in infants considered as treatment failures weight gain was markedly better in the group receiving full-strength formula than in the group of infants receiving diluted formula. These results indicate that full-strength cow's milk formula is also safe and nutritionally beneficial in infants under 6 months of age with acute diarrhoea who are normally fed exclusively (or mainly) with animal milk. Clearly, these findings do not alter in any way the Programme's recommendation that infants under 4-6 months of age should be exclusively breast-fed, and that breast-feeding should continue during diarrhoea episodes.

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 in 1992.

No further clinical trials on feeding during acute diarrhoea are being planned.

Feeding during and after persistent diarrhoea

A number of studies have shown that fat is more effectively absorbed from vegetable oil, which contains a high proportion of polyunsaturated fatty acids, than from animal fat. It was therefore thought that a diet containing vegetable oil might help to increase fat absorption and reduce faecal losses of fat and energy during persistent diarrhoea, with a resultant improvement in nutritional status. A randomized, controlled clinical trial was conducted in Peru to compare the clinical and nutritional impacts of diets containing vegetable oil or animal fat in children with persistent diarrhoea. No difference was detected in the clinical and nutritional outcomes (fat absorption, faecal losses of fat and energy, and weight gain) in the two groups. These results suggest that substituting vegetable oil for animal fat confers no advantage in terms of duration of diarrhoea, nutrient absorption, or weight gain.

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. A study is in progress in Bangladesh to evaluate this issue.

Algorithm for the management of persistent diarrhoea

In recent years, centres in developing countries treating severely malnourished children with persistent diarrhoea have reported good results using simple cereal/pulse and cereal/milk dietary regimes. Although only part of this research was well controlled, the careful clinical observation of large series of patients has provided much useful information. The results of these studies were presented and discussed at a meeting held in Mombasa, Kenya, by the Applied Diarrheal Diseases Research Project (ADDR). Consensus was reached on a clinical management algorithm evolved during this meeting. The bases of this algorithm are:

- fluid therapy according to WHO CDD Programme guidelines;
- initial dietary therapy with low milk- or yoghurt-based diets (lactose load less than 3 g/kg/day) containing locally acceptable, available staples such as rice with some oil or sugar;
- appropriate indications for changes of diet in those responding poorly. Such diets must be based on chicken, egg or other locally available protein source with carbohydrates such as a mixture of rice and glucose, glucose alone or sucrose with added oil;
- vitamins and trace elements;
- antibiotics for systemic infections and bloody diarrhoea or when *Shigella* is isolated in stools.

At the Mombasa meeting, it was suggested that this algorithm be evaluated in a multicentre study conducted in developing countries. A workshop, held in collaboration with ADDR, was therefore organized in New Delhi, India, with investigators from six countries (Bangladesh, India, Mexico, Pakistan, Peru and Viet Nam) and a common research protocol developed. After external review, this protocol has been revised and approved and data collection will start in the six centres in early 1992. The objectives of this multicentre study are (i) to measure the performance of the treatment algorithm, and (ii) to determine factors associated with poor clinical outcome. The results should be available in mid-1993.

Drugs used in the management of diarrhoea

The Programme continued to support studies to evaluate antidiarrhoeal drugs that are widely used in children with acute diarrhoea. A randomized, controlled, double-blind clinical trial to examine the efficacy of smectite (a clay product closely related to kaolin and attapulgite) in the treatment of acute diarrhoea in children aged 3-24 months was completed in 1990 in Egypt. Total stool output was not significantly reduced in patients who received smectite; however, a small, but statistically significant decrease was observed in the number of liquid stools passed on the second and third days of treatment with smectite (4.5 stools/2 days compared with 5.4 stools/2 days). This modest effect of smectite on the number of diarrhoeal stools is not sufficient to indicate that smectite should be recommended for the treatment of acute diarrhoea.

A study is in progress in Bangladesh to evaluate the efficacy of single-dose doxycycline in the treatment of cholera in children.

A study is under way in Peru to examine the efficacy of cotrimoxazole (trimethoprim-sulfamethoxazole), an absorbable combined antibiotic, in the treatment of persistent diarrhoea. The results of this study should be available in 1992.

A study evaluating the efficacy of pivmecillinam in the treatment of dysentery in young children has just been completed in Guatemala. Results from this study should be available in early 1992.

Acceptability of ORS

An explanation frequently offered for the failure to give children ORS solution is that they refuse to drink it because of its taste. Many commercially produced ORS formulae are flavoured because it is believed that this will increase their acceptance for home use. Another frequently cited source of dissatisfaction with ORS solution is its failure to terminate or alleviate the symptoms of diarrhoea. This latter concern could potentially be addressed by rice-based ORS solution, for which some antidiarrhoeal effect has been demonstrated (see page 49). A study conducted in the Philippines compared the acceptability of three types of solution distributed through health centres: standard WHO ORS solution, precooked rice-based ORS solution and flavoured ORS solution. Mothers had no choice as to which type of solution they were given; children were assigned to one of the study groups. Acceptability was inferred only from the amount of ORS solution consumed. This was not significantly greater for flavoured or rice-based ORS solutions than for standard WHO ORS solution. In addition, there was no indication that telling people that rice-based solution would help to stop diarrhoea led to a higher intake.

In conclusion, there was no evidence that the use of rice-based or flavoured ORS solution in routine health centre practice led to the intake of higher volumes of solution than when standard WHO ORS was used.

Case management at community level

While the cost-effectiveness of interventions to improve diarrhoea treatment practices in the health sector is now well documented, efforts to promote correct case management in the home and at the community level have met with varying success for reasons that are not well understood.

Studies on the home use of ORT commonly report low rates of **correct** use of ORT (including prompt initiation of ORT, administration of a recommended fluid, administration of an adequate volume of fluid, and continuation of ORT until the end of the episode). Survey results often also demonstrate substantial gaps between ever-use and current use of ORT. For example, results of the Bangladesh 1987-1988 Diarrhoea Morbidity and Treatment Survey (DMTS) indicate that more than three-quarters of urban and more than two-thirds of rural mothers in Bangladesh reported prior use of ORT for the treatment of childhood diarrhoea, but fewer than 30% of recent diarrhoea episodes in children were treated with ORT. Further analyses of the DMTS data are under way, with Programme support, to document patterns of correct use of ORT and its essential elements, and to identify determinants of correct use and continuous use. Factors that are being examined include mothers' literacy, educational status, contacts with health personnel, exposure to communications on ORT, and perceptions of diarrhoea and ORT, including mothers' knowledge regarding correct use of ORT and their evaluation of its effectiveness. Results will be available during 1992.

In numerous settings, gruels and porridges made from staple cereals such as rice and maize meal are commonly given to young children during the weaning period, and, often diluted, to children of all ages and even adults during illness, including diarrhoea. They have been adopted for promotion as recommended home fluids in some national CDD programmes. Studies are being developed in Kenya and the Philippines to examine whether the promotion of cereal-based preparations as rehydrating fluids is compatible with local perceptions and practices concerning the administration of fluids and foods during diarrhoea. Approaches will be sought to ensure that they are given, along with other fluids, in sufficient quantities to replace losses during diarrhoea. These studies will also examine whether the promotion of these low-energy density preparations is compatible with good nutrition advice during and after diarrhoea, which usually emphasizes the enrichment of staple foods to increase their energy density and discourages the use of dilute mixtures. The results should assist the definition of policy regarding the choice of fluids and foods to recommend for the treatment of diarrhoea in the home, and the development of approaches for promoting them.

Important aspects in the promotion of case management is enhancing the ability of caretakers to identify children who are at risk of dehydration or other serious complications, and encouraging them to seek help promptly from trained health workers. Caretakers are advised to seek care outside the home if their child passes many watery stools, is very thirsty, vomits repeatedly, has blood in the stool, has a fever, or eats or drinks poorly. In many regions, however, care seeking practices do not fit well with these recommendations: there are delays in care seeking for children with clinical signs of dehydration or other complications, and caretakers commonly seek help from untrained providers, who may recommend inappropriate treatments or medications. A study has been completed in Peru to document patterns of care seeking practices during diarrhoea, and to investigate their determinants. Data analysis is still under way. Also in Peru, secondary analyses of data from completed studies of childhood diarrhoea are being conducted to examine how mothers recognize, label and respond to episodes of dysentery and persistent diarrhoea. The results from these studies should assist efforts to promote correct care seeking practices and to discourage the use of inappropriate medication.

Approaches to promote correct case management of diarrhoea at community level have included the development of community oral rehydration units (CORUs) (see Box 4). A pilot assessment of the operational characteristics of CORUs and of the knowledge of the CORU-volunteers regarding case management was conducted in two regions of Peru - Lima and Sullana - in the first months of 1991 during the cholera epidemic; 20 health facilities and 39 dependent CORUs were selected for study. The mean number of cases seen in each CORU in the month of March was 4.5. The knowledge of CORU volunteers was inadequate in a number of areas, including criteria for assessing hydration status, and essential points regarding the nutritional management of the episode and the prevention of further episodes. However, the majority (74%) of CORU volunteers had adequate knowledge of ORT procedures for treating non-dehydrated cases, including preparation and administration of ORS solution and recommended fluids (though knowledge about the appropriate use of drugs was not optimal - about a quarter recommended the use of antibiotics); and 85% of volunteers knew which cases require urgent referral (children with persistent diarrhoea, dysentery, severe dehydration and other illnesses). The knowledge of health workers attending cases of diarrhoea in the related health facilities was inadequate in similar areas, suggesting shared underlying deficiencies in training and supervision. Operational research in support of strengthened management systems to improve quality of care seems warranted, as well as evaluations in other settings of the performance and impact of the CORU strategy in promoting correct case management of childhood diarrhoea.

Rational use of drugs

A new topic, the use of drugs during diarrhoea, was added to the implementation research priorities during 1991 in support of the programme activities described on page 23. Research is planned to assist the selection of effective approaches to implementing regulatory, managerial and educational interventions to assure the appropriate use of drugs in the treatment of childhood diarrhoea, and to examine the performance and impact of ongoing programme efforts in this area.

An ethnographic study is under way in Guatemala to document patterns of drug use during childhood diarrhoea, sources of advice and supply, and drug costs and to assess the influences of Western and indigenous concepts of diarrhoeal diseases and their treatments. A previous survey showed that, in this setting, drugs are extensively used for treating childhood diarrhoea, and that they seem to have become integrated into folk medicine beliefs. Thus, iodine compounds are used for the treatment of "cold" diarrhoeas, which tend to occur in the rainy season, and antacids and purgatives are used for the treatment of "hot" diarrhoeas during the dry season.

A project will be conducted in Nepal to develop a short training course and supporting materials for licensed drug retailers, with the aim of improving their dispensing practices related to diarrhoeal diseases and acute respiratory infections. A number of drug retailers have already been reached through an orientation course developed in 1982 and implemented through government channels. Formative research will be carried out both to define the current dispensing practices of retailers, and the factors influencing them. The latter will be addressed in the training course.

Research is also being planned to evaluate the experience of selected countries in regulating the use of antidiarrhoeal drugs, to determine the most feasible and sustainable approaches to regulation and to identify the factors that maximize their impact.

Nutrition research

Breast-feeding

Epidemiological studies supported by the Programme and by other sources have shown that lack of breast-feeding is a major risk factor for diarrhoea in young children. Exclusive breast-feeding in the first 4-6 months of life and continued breast-feeding for at least the first year are associated with the lowest risks of diarrhoea. Yet exclusive breast-feeding (no supplements of any kind, including water) is rare, particularly after the first month of life, and predominant breast-feeding (only a few, non-nutritive supplements) is declining in many countries. Further research is being supported to test new approaches to the promotion, protection and support of breast-feeding and to examine the performance and impact of ongoing programme activities.

Available information indicates that improvements in maternity facilities, such as the training of staff in lactation management and the introduction of rooming-in, can increase rates of exclusive breast-feeding among mothers who deliver in such facilities. Other interventions are nevertheless required to support the continuation of exclusive breast-feeding after hospital discharge, and to promote its initiation in settings where a substantial proportion of the deliveries occur in the home. Studies are therefore being supported in Peru and the Philippines to measure the efficacy of community-based interventions to promote exclusive breast-feeding in the first 4-6 months of life and partial breast-feeding thereafter.

In Peru, exclusive breast-feeding is being promoted by health personnel in 10 peri-urban communities with the assistance of community leaders. After detailed formative research, communications materials including posters, mobiles, flipcharts and videotapes were developed. Group sessions organized through community associations explain, with the aid of videotapes, techniques that will help establish exclusive breast-feeding and solve the most frequent breast-feeding problems. Impact will be measured by the comparison of feeding patterns before and after the intervention. Detailed data are also being gathered on the intervention process to assist the interpretation of the impact results. Results will be available early in 1993.

The role of voluntary mother-counsellors in promoting improved infant feeding at community level is being assessed in peri-urban Manila, Philippines. In this study, trained mother-counsellors made monthly visits to pregnant women living in their neighbourhood, from the second trimester of pregnancy until delivery. Mothers were also visited within three days of delivery to reinforce messages given during pregnancy, encouraging frequent and exclusive breast-feeding, and to provide assistance in dealing with any problems. Home visits were made weekly during the first month after delivery, decreasing thereafter if progress was satisfactory. By the fourth month, the mother- counsellors started to

provide information on how to prepare adequately and offer weaning foods to the infants while continuing with breast-feeding. The evaluation of this intervention, designed as a randomized controlled trial, will yield important information on the impact of mother-to-mother support on the prevalence of exclusive breast-feeding. The process of the intervention and its various components are also being carefully evaluated. A recent review of the activities of organized mother-to-mother support activities commissioned by the Programme[4] has highlighted the need for more information of this kind.

In Guatemala, the Programme has supported a study of the National Commission for the Promotion of Breast-feeding. This included a review of the activities of the Commission, a survey of public and social security maternity hospitals throughout the country, and documentation of the work of the local branch of the La Leche League International. The salient features of the review are described in Box 16. The investigations of the local branch of the La Leche League International provided useful insights into how mothers' support groups influence breast-feeding behaviour, and the steps needed to develop and replicate the groups, especially among poor, urban women. In particular, practical recommendations are made for the recruitment, training and supervision of the group leaders, and for the planning and organization of their activities.

Assessing promotion, protection and support of breast-feeding in Guatemala **16**

The Guatemalan Commission for the Promotion of Breast-feeding was officially established in 1981 as an independent body to stimulate and coordinate activities related to the promotion, protection and support of breast-feeding. The Commission brings together high-level delegates from a number of interested organizations, representing the governmental sectors of social welfare, health, education, trade, labour, planning, and agriculture, as well as private sectors, including the Institute for Social Security, and professional medical associations. Activities are carried out by a team of full-time technical support staff. Among the achievements of the Commission can be listed the adoption in 1983 of a Code of Marketing of Breast-Milk Substitutes and supporting legislation, the promulgation of official directives concerning policies and practices to be observed in public and Social Security hospitals related to rooming-in and the protection of breast-feeding, the modification of labour laws to protect working women, and training and educational programmes. Recent survey results demonstrate that excellent progress has been made in implementing the "Ten Steps to Successful Breast-feeding" in the public and Social Security maternity services. More work is planned to strengthen the monitoring and enforcement of the national Code, to further improve the protection of working women, and to reach the private medical sector. The Commission offers a model of an independent, multi-sectoral organization which benefits from high-level political and institutional support, and which gives priority to the development of clear policies and norms, to the careful planning and monitoring of activities, and to the best use of limited funding (largely from national and UNICEF sources): it is of interest to breast-feeding planners and advocates in other settings.

[4] Steel, A., Bershon, B., Huffman, S. & Kyenkya-Isabirye, M. Mother-to-mother activities to promote breastfeeding in developing countries: an analytical framework. Center to Prevent Childhood Malnutrition, Bethesda, 1991.

A situation analysis of breast-feeding is under way in Ethiopia. The first phase, including focus group discussions and interviews with key informants and mothers, has now been completed. A survey will be conducted among 1200 mothers of infants in Addis Ababa to determine the prevalence and duration of exclusive breast-feeding and other infant feeding practices, and to estimate the prevalence of the major determinants of breast-feeding that were identified during the qualitative research phase. This research will allow the national authorities to identify the optimal interventions to promote breast-feeding, and the Programme to develop more streamlined methods of obtaining the necessary information for more general use.

Weaning

Poor weaning practices have been identified in many communities in the developing world. They include too early an introduction of supplements, feeding young children infrequently or in inadequate amounts, and using foods either of low energy and nutrient density, or foods that are bacteriologically unsafe. Determining when to introduce supplements to optimize nutritional outcome and minimize risk of diarrhoea was identified as one of the priorities for research by the Programme, and a review of the available information was commissioned. The review confirms previous recommendations by WHO, that the time to start supplementation lies between the fourth and sixth months of life, but the available data do not allow greater precision. The Programme is now supporting, in collaboration with the Thrasher Research Fund, UNICEF and USAID, a randomized, controlled trial in Honduras, which will measure the effects of introducing supplementary foods to exclusively breast-fed infants at 4 and 6 months. Effects on growth, total energy intake and total breast-milk intake will be measured at 16, 21 and 26 weeks of life and compared among three groups: (i) infants receiving the supplements; (ii) infants receiving the supplements whose mothers are given recommendations for maintaining the frequency of breast-feeding; and (iii) infants exclusively breast-fed. The results from this study, which should be available by the end of 1993, are expected to assist the formulation of more specific recommendations regarding the timing of introduction of weaning foods.

Many studies have shown that inadequate dietary intake leads to impaired nutritional status and thereby increases the severity, the duration, and possibly the incidence of diarrhoeal episodes, thereby increasing the risk of death. Inadequate dietary intakes may result from feeding foods of low energy density, such as soups and gruels, or from feeding infrequently or in inadequate amounts. The ideal balance of different approaches to increasing dietary intake was identified as a priority for research. To address it, a randomized trial was recently initiated in Peru that will examine the joint effects of increasing the energy density of weaning foods and the frequency of feeding on the total energy intake among malnourished infants, aiming to generate specific recommendations for intervention design.

The Programme has supported a literature review to examine the potential role of traditional technologies, such as malting and fermentation, in increasing the energy density of weaning foods. Malting, although it has the potential to increase the density of weaning foods, has not yet been demonstrated as being effective in improving the energy intake of young children. The costs involved in terms of time, labour and space, and the perception that malting is associated with alcohol brewing, may constrain the feasibility of interventions to promote this technology. Fermentation, although it may increase the bacterial safety of weaning foods, is unlikely to have any substantial effect on their energy density.

Because inadequate maternal knowledge of nutritional principles is often perceived as a determinant of poor nutritional practices, expanding this knowledge is frequently chosen as the major intervention strategy. Experience has shown, however, that knowledge has many dimensions, and that changes in knowledge do not automatically lead to improved

practices. In an ongoing study in Brazil, the association between levels of maternal knowledge of feeding recommendations and observed practice is being examined to identify determinants of weaning behaviours and to provide guidance for future intervention design.

A study is under way in rural Guatemala to describe the feeding practices of young children during diarrhoea, convalescence and periods of health and to ascertain their determinants: it aims to develop and test an intervention to improve energy and nutrient intakes. Information for intervention guidance is presented in Box 17.

Feeding during and after diarrhoea **17**

In two Guatemalan villages, feeding practices and dietary intakes of children aged 6-24 months were assessed during an episode of diarrhoea, in the first five days following the end of an episode and during a period without diarrhoea. The objectives were to:

- examine the nutritional adequacy of current infant feeding practices;
- identify problems that hinder proper nutritional intake, and the resources available to solve these problems; and
- formulate specific recommendations for changes in behaviour that would lead to improved nutritional intake.

Information was collected on 26 children observed over 12-hour periods. The major findings were as follows:

- Dietary intakes in terms of energy, protein, iron and vitamin A were low. Mean energy intake among infants aged 6-12 months reached only 69% of the recommended level. Although it increased between 12 and 24 months, it was still 15% below the recommended level.
- The energy density of weaning foods was adequate. The mean energy density of the diet was 1.0 kcal/g and the densities of the eight main food items ranged from 1.5-4.0 kcal/g.
- The frequency of meals, although it could be improved, was not unduly low. Almost three-quarters of the children received between four and five meals a day. The mean frequency of feeding varied from 4.7 times/day among children with energy intakes equal or above the mean to 4.0 times/day among those with intakes below the mean.
- The quantities of food consumed by some children were very low. Children with energy intakes equal to or above the mean consumed over twice as much food in a day as those with intakes below the mean.

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- Maternal feeding behaviour was generally passive. The proportion of mothers who either placed the food in the child's mouth, helped the child in other ways during a meal, or encouraged him or her to eat was only 41% during periods of health. This increased to 74% during periods of diarrhoea.

- Diarrhoea was associated with energy intakes that were 24% lower than during periods of health, despite maintenance of breast-feeding frequency and the more active behaviour of mothers in offering food to the child during the episode. The total frequency of feeding was reduced, particularly in the low energy intake group, in which it fell by 30%. Dietary intakes did not increase in the first five days following an episode of diarrhoea.

Further details on these findings are presented in the following table.

Average frequency of feeding, and the energy density and quantities of food consumed by children 6-24 months of age, according to health status

Energy intake groups	Health status					
	Health			**Diarrhoea**		
	Frequency (meals/day)	Energy density (Kcal/g)	Quantity (g)	Frequency (meals/day)	Energy density (Kcal/g)	Quantity (g)
≥ Mean	4.7	0.97	699	3.9	1.0	639
< Mean	4.0	0.93	347	2.8	0.97	199

Analysis of data on the socioeconomic characteristics of the families concerned suggests that, although greater wealth was associated with a higher frequency of feeding and intake, food availability was not the primary determinant of low food intake nor the major constraint to promoting better weaning practices in this setting. In contrast with observations in Peru, where low energy density of weaning foods is the major weaning problem, in this setting the major limiting factor to adequate intake seems to be the quantity of food that is offered to young children. The intervention that is being designed will motivate mothers to play a more active role in feeding their children and to increase their child's intake by feeding them more frequently and offering more food at each serving.

The projects under way for the promotion of breast-feeding in Peru and the Philippines (see page 58) have developed communications approaches to promote increased energy intake during the weaning period. In Peru, two specific changes in behaviour have been identified as the keys to increasing energy intake, namely, increasing the frequency of feeding, and offering foods of higher energy density first during a meal. In the Philippines, improvements in both quantity and quality of weaning foods are promoted by the intervention.

Inadequate cooking and prolonged storage at ambient temperature have been associated with the survival and growth of bacteria in food. It is therefore likely that inadequate preparation, storage and handling of weaning foods, leading to the seeding and proliferation of enteric pathogens in these foods, are major risk factors for diarrhoea. However, few studies have been conducted either to identify the determinants of practices associated with a high risk of contamination of weaning foods, or to determine how practices already identified as unsafe can be discouraged and safer practices promoted.

In north-eastern Brazil a two-phase study was supported for developing an intervention to improve the safety of infant feeding in a poor, peri-urban population, by means of identifying specific behaviours to be promoted, and motivational approaches and points of resistance to be addressed. Phase I identified prevalent weaning practices that are likely to lead to increased bacteriological safety of weaning foods. Phase II evaluated, through small-scale behavioural trials, the ability and willingness of caretakers of infants at greatest risk of diarrhoea to adopt these beneficial practices, and the conditions under which they are more likely to do this. Results from this study, now under analysis, will be available in 1992.

In Nigeria, a fermented cereal paste called Ogi is commonly used for the preparation of weaning foods. This paste is of low pH and thus allows only limited bacterial growth. A supported study examined its potential for faecal contamination and showed, however, that the fermented paste is usually modified by cooking and diluting before being fed to children. As the pH of the prepared weaning food tends to rise with the passage of time after cooking, and as consumption can take place up to four days later, the risk of significant bacterial growth is considerable. Microbiological studies have recently been completed that will provide information on the effect of these preparation and feeding practices on the growth of faecal coliforms.

Vitamin A supplementation

Results from randomized, placebo-controlled trials recently conducted in India, Nepal and Sudan have raised new questions on the magnitude of the impact of vitamin A supplementation on diarrhoeal morbidity and mortality, and have highlighted the need for further information on the effects of supplementation, especially with regard to the incidence of severe diarrhoea. Support was provided by the Programme in 1990 for the implementation of two randomized, double-blind, placebo-controlled trials of vitamin A supplementation. These studies will measure the impact of vitamin A on diarrhoea and respiratory infections, as well as on nutritional status. Two approaches to vitamin A supplementation are being evaluated: periodic distribution of large doses of vitamin A at the community level, and selective administration of large doses of vitamin A to children attending a health facility for the treatment of diarrhoea. In north-eastern Brazil, 1200 children aged 6-36 months have been given 100 000-200 000 IU of vitamin A, or a placebo, every four months and have been followed prospectively for one year through thrice-weekly home visits. In India, 900 children aged 12-36 months attending a health facility for the treatment of diarrhoea have received 200 000 IU of vitamin A or a placebo and have been followed for 90 days after the end of the episode through twice-weekly home visits. Data collection is nearly complete at both sites and results should be available in 1992. The information generated by these studies will not only help to clarify the role of vitamin A in the prevention of diarrhoeal diseases, but will also provide guidance on the relative effectiveness of different approaches to supplementation.

Hygiene research

Determinants of hygiene behaviours

Most of the pathogenic organisms that cause diarrhoea are transmitted primarily or exclusively by the faecal-oral route. Interrupting direct transmission depends on improved personal and domestic hygiene. Hygiene promotion has been shown to reduce the incidence of diarrhoeal diseases among children under 5 years of age by 14-48%, in certain settings. Interventions to change hygienic practices, however, have been infrequently documented, and little information is available on their design, implementation and behavioural impact.

Work supported by the Programme and other sources in previous years has identified specific hygiene behaviours, such as hand-washing before feeding and after defecation, which can reduce the risk of diarrhoea transmission, but little is known about the determinants of these behaviours. Some are likely to be deeply rooted and may affect, positively or negatively, receptivity to proposed changes.

Studies with a common design to identify major determinants of hygiene behaviours believed to reduce the risk of diarrhoea were supported in Guatemala and Turkey. They focused on identifying determinants that may be of global relevance (such as availability of water and caretaker's time, and maternal knowledge and beliefs about cleanliness, contagion and disease causation) and on how these determinants affect people's practices. Data from these studies, now under analysis, are expected to be used in planning future interventions. The guidelines used for the design of these studies have been made available to other interested researchers.

Hand-washing

In many areas of the world, economic constraints limit the poorest families' access to soap. In such instances, alternative agents may be used for hand-washing, such as ashes, sand or mud. A study is ongoing in rural Bangladesh to describe hand-washing practices after defecation and to test the efficacy of common hand-washing agents and techniques in reducing hand contamination. Of 90 women under observation, all attempted to cleanse their hands following defecation. Water alone was used by 41%, the rest using water with mud (38%), soap (19%) or ash (2%). Of these women, 56% washed the left hand only, although in over 80% of the observations the left hand had already been in contact with the right by the time it was cleaned. No association was found between soap use and knowledge about the relationship between hand-washing and prevention of diarrhoea. Women who believed that hand-washing protects against disease were more likely to wash both hands, rub the fingers more than three times and rinse the hands with greater volumes of water. The efficacy of the most commonly used agents is now being examined under field conditions, in order to identify the minimum requirements for hand-washing after defecation (in terms of agents, frequency of rubbing, quality and quantity of water) to reduce faecal contamination of hands.

Water availability is a major factor in facilitating improvements in hygienic practices, as suggested by studies on the impact of water and sanitation projects on the incidence of diarrhoea. In Guatemala, in a setting where water is scarce, a project was supported to develop and evaluate an intervention which included the promotion of a simple water-saving device to improve hygiene. Information on the implementation of this project is presented in Box 18.

Promotion of hand-washing 18

In Santa Maria de Jesus, Guatemala, infant mortality is 146 per 1000 live births. One-quarter of infant deaths is attributable to diarrhoea. Children under 3 years of age suffer an average of eight episodes per year, 10% of them becoming persistent.

A project was started in Santa Maria de Jesus in 1989 with the aim of developing and evaluating an intervention to reduce diarrhoea morbidity by promoting improved personal and domestic hygiene.

Personal and domestic hygiene behaviours associated with increased risk of diarrhoea were identified in the community. Data were then collected on the key material, social and cultural determinants of these behaviours, as well as on the main audiences and the potential channels that should be taken into account in an intervention.

Hand-washing before feeding children younger than 3 years was chosen as the focus of the intervention, given its likely health impact and potential for being changed. A communications plan was then designed for the promotion of this behaviour in the community. The communications strategy focused on three "products":

- hand-washing (which was not performed correctly or at the desired time in the community);
- the "tippy-tap" (a water container adapted to deliver a thin stream of water when tipped over); and
- the "pretty corner" (an area close to the kitchen where the necessary material for correct hand-washing - soap, tippy-tap and a clean cloth - would be kept).

Following intense interpersonal communications through health promoters - including home visits to the mothers, home visits to fathers and monthly meetings with older children - tippy-taps were introduced in all intervention households. Detailed data were collected to monitor the adequacy of the intervention's inputs, to measure the families' responses to each of the promoted "products" and to measure changes in target behaviours and diarrhoea morbidity.

Preliminary results of this efficacy trial indicate that diarrhoea incidence, which was comparable between intervention and control groups before the intervention, was significantly lower in the intervention group after its implementation. Analysis is now under way to examine the process of adoption of the promoted "products" and the association between the various degrees of adoption and the reduction in diarrhoea rates. If the impact of the intervention on diarrhoea morbidity is confirmed, further work will be promoted to evaluate the effectiveness of the intervention when delivered under more realistic conditions.

Vaccine evaluation research

Vaccine-related research during the biennium continued to focus on the development of vaccines regarded as the most important for control of diarrhoeal diseases, i.e., vaccines against rotavirus diarrhoea, cholera, shigellosis and diseases caused by enterotoxigenic *Escherichia coli* (ETEC). Most efforts concerned evaluation of candidate vaccines in field trials; however, some work on the development of candidate vaccines was supported. Support was also provided for the evaluation of new vaccines for typhoid fever.

Rotavirus vaccines

During the biennium, the Programme supported studies to evaluate the safety, immunogenicity and efficacy of several candidate rotavirus vaccines. Some of the work was done in collaboration with other agencies, especially the United States National Institutes for Health and USAID.

Single serotype rhesus-human rotavirus vaccines

These vaccines consist of a rhesus rotavirus (RRV) host with an incorporated RNA segment that encodes production of a surface protein (VP7) of the human rotavirus. This protein determines the serotype of human rotavirus and is considered to be an important immunogen. Such reassortants have been made for human rotavirus serotypes 1, 2 and 4. RRV is used for serotype 3, as its VP7 is identical to that of human rotavirus serotype 3.

The vaccines, given at 2-3 months of age in a dose of 5×10^4 PFU, were shown to be safe in trials in Finland, Peru and the United States of America. Although some infants developed mild fever or a few loose stools after immunization, these effects were comparatively less frequent in Peru. The vaccines were also immunogenic. Serum IgA anti-rotavirus responses occurred more frequently than serotype-specific neutralizing antibody, and both responses were significantly more frequent in Finland and the United States than in Peru.

Vaccine efficacy is summarized in Table 10. In each study, most episodes of rotavirus diarrhoea were caused by serotype-1 rotavirus. The main findings are that: (i) single-serotype vaccines evoked protection that was not serotype-specific; (ii) protection lasted at least 2 years, but in some groups declined during the second or third year; and (iii) protection was much greater in developed than developing countries. It also appeared that vaccine efficacy was greatest in infants who showed a serum IgA antibody response after immunization and to severe episodes of disease.

These results are of value when interpreting studies which use multiple doses or which include all four serotypes in a single RRV-tetravalent vaccine. Such studies are especially relevant for developing countries, where the seroresponse to single-serotype vaccines and vaccine efficacy were low.

RRV-tetravalent vaccine

Efficacy trials of RRV-tetravalent vaccine containing rhesus-human reassortants corresponding to serotypes 1, 2 and 4, and RRV for serotype 3 (4×10^4 PFU/dose; one or three doses) are under way in Brazil with support from the Programme, and in Peru and the United States with support from other sources. Infants were aged 1-2 months when the first dose of vaccine was given. Initial results from the studies in Peru and the United States are shown in Table 11. These reveal that the efficacy of tetravalent vaccine is (i) greater in a developed country than a developing one, (ii) not greater than that of single-serotype vaccine, at least against serotype-1 disease, and (iii) not increased by giving multiple doses.

Table 10

Efficacy of one dose of single-serotype rotavirus vaccine against rotavirus diarrhoea (one dose, 5 x 10^4 PFU)

Duration of follow-up	Vaccine serotype		
	1	2	3
Finland[a]			
1 year	67[b]	67[b]	-
2 years	37[b]	67[b]	-
USA			
1 year	72[c]	-	79[c]
3 years	73[c]	-	59[c]
Peru[a]			
2 years	0[b]	8[b]	23[b]

[a] Study supported by the Programme.

[b] Percentage protection against all rotavirus diarrhoea (mostly serotype-1).

[c] Percentage protection against diarrhoea caused by serotype-1 rotavirus.

Table 11

Protection against rotavirus diarrhoea given by one dose (4 x 10^4 PFU) of serotype-1 or tetravalent rhesus-human rotavirus vaccine

Number of doses	Vaccine	
	Serotype-1	Tetravalent
USA		
3 doses	61[a]	57[a]
Peru		
1 dose	-	32[b]
3 doses	-	25[b]

[a] Percentage protection after 1 year against rotavirus diarrhoea caused mostly by serotype-1 rotavirus.

[b] Percentage protection after 1 year against rotavirus diarrhoea caused mostly by serotype-1 and serotype-2 rotavirus.

Based on these results and on studies showing low rates of serotype-specific antibody responses to one or three doses of tetravalent vaccine (4×10^4 PFU), studies were initiated to assess the safety, immunogenicity and efficacy of larger doses of RRV-tetravalent vaccine in the hope of improving vaccine efficacy, especially in developing countries. Two studies in Israel, supported by the Programme, showed that tetravalent vaccine was safe in newborn infants at doses of 4×10^4 and 4×10^5 PFU. They also showed that two doses were not more immunogenic than one dose, but that seroconversion following 4×10^5 PFU (65%) was significantly higher than with one or two doses of 4×10^4 PFU (40%). Additional studies in Venezuela, supported from other sources, have shown no further increase in seroconversion with one dose of 4×10^6 PFU. Thus, current studies of the efficacy of RRV-tetravalent vaccine are using one or more doses of 4×10^5 PFU. These include trials in Myanmar, supported by the Programme, and in the United States and Venezuela.

Other studies have examined several factors that would be of practical importance if the tetravalent vaccine were used for control of rotavirus diarrhoea. A study in Turkey has shown that infants taking breast milk probably do not need to drink a buffer solution before the vaccine is given, thus simplifying the immunization procedure. This study and one in Israel also suggest that taking breast milk does not interfere appreciably with the immunogenicity of the vaccine. In Thailand, a trial is under way to determine whether co-administration of tetravalent vaccine and live oral poliovaccine causes reduced serological responses to any component of either vaccine. This information is of considerable importance as it would be very desirable to give these live oral vaccines simultaneously.

WC3 bovine rotavirus vaccine and its reassortants

WC3 vaccine is an attenuated bovine rotavirus vaccine that is not related to human rotavirus serotypes. Trials of WC3 vaccine (10^7 PFU/dose) have been carried out in infants in the United States (one dose), and in the Central African Republic and China (two doses). These showed that the vaccine was safe and evoked 0-76% protection against rotavirus diarrhoea caused mostly by serotype 1. They also showed that WC3 evoked little or no immune response to serotype-1 or serotype-3 rotavirus, but that protection appeared to correlate with seroconversion to WC3 virus, which occurred in at least 60% of infants. The mechanism of this protection is unclear. The study in China, supported by the Programme, showed that WC3 vaccine caused 67% seroconversion to WC3 in infants aged 4-8 weeks, but none to serotypes 1 or 3. Neverthelesss, vaccinees showed 32% protection overall against rotavirus diarrhoea, protection being slightly greater during the first year than in the second year of follow-up. There was also a tendency for rotavirus diarrhoea to be milder and of shorter duration in vaccinees. In view of its inconsistent performance, which included poor performance in developing countries, no further studies with WC3 vaccine are planned.

WI79-9 is a genetic reassortant of WC3 that incorporates the gene encoding the VP7 antigen for human serotype 1. A small trial in the United States with WI79-9 (two doses, 10^7 PFU) showed 97% seroconversion to WC3, 22% to serotype 1, and 66% to serotype 3. There was 100% protection against disease caused by serotype-1 or serotype-3 rotavirus. Additional studies on the efficacy of WI79-9 or other reassortant vaccines based on WC3 would appear to be warranted.

M37 human rotavirus vaccine

The M37 human rotavirus vaccine is a naturally occurring, attenuated serotype-1 rotavirus with a VP4 surface protein that differs from that found in most virulent human rotaviruses. Epidemiological studies suggest that infection of neonates with this strain evokes significant protection against rotavirus diarrhoea. Studies in Finnish infants, supported by the Programme, showed that the vaccine was safe and that a single dose of 10^5 PFU was more immunogenic than one of 10^4 PFU. However, infants given the lower

dose showed no protection against naturally-occurring rotavirus diarrhoea and the number given the higher dose was too small to evaluate possible protection. Studies in Venezuela, supported by other sources, also show that a dose of 10^5 PFU of M37 is safe in young infants, but is less immunogenic, especially for serotypes 2 and 3, than a similar dose of RRV-tetravalent vaccine. No further studies are planned with this vaccine.

Other research related to rotavirus vaccines

There is growing evidence that another rotavirus surface antigen, VP4, plays a significant role in stimulating protective immunity. A study in the United States, supported by the Programme, has revealed four types of VP4 antigen and has shown their relation to VP7. One type, designated 1a, is found on rotavirus strains of serotypes 1, 2, and 3, and may be an essential component of a successful rotavirus vaccine. These studies have also led to cloning of VP4 in a baculovirus vector. This should permit the production of large amounts of the antigen for further studies, including its possible incorporation in an oral vaccine.

Studies in Mexico and the United States, funded from other sources, support the view that primary rotavirus infection evokes substantial protection against symptomatic reinfection. Initially, this naturally acquired immunity is largely serotype-specific, but with time (and possibly after subsequent infections) it broadens to include all serotypes.

Cholera vaccines

Efforts to develop new oral vaccines for the prevention of cholera have continued. These have involved the improvement and evaluation of both killed and live oral vaccines. The goal of these efforts is a vaccine that is a cost-effective tool for preventing cholera and for controlling the spread of *V. cholerae* O1 when used in conjunction with other control measures.

Killed whole-cell/B-subunit (WC/B) cholera vaccine

This candidate vaccine was evaluated in a large field trial in Bangladesh from 1985 to 1988, the results of which were summarized in the Seventh CDD Programme Report. These showed that the vaccine, given in three doses, was most effective in people over 5 years of age. Diminished vaccine efficacy was seen in young children, persons infected with the El Tor biotype of *V. cholerae* 01, and people with O blood group antigen. Efforts to improve vaccine efficacy and reduce its cost are under way in Sweden with Programme support. Using recombinant DNA techniques, strains of *V. cholerae* 01 have been developed that produce very large amounts of B subunit, but no holotoxin. These are being used to produce vaccine on a large scale for further field studies. Other work is in progress to determine how additional antigens, the El Tor mannose-sensitive haemagglutinin and the toxin-coregulated pilus antigen, can be incorporated in the vaccine and whether they enhance the vaccine's protective capacity. Work is also planned to simplify the vaccine formulation so that it would not need to be stored under refrigeration.

The Programme is collaborating with the WHO Regional Office for the Americas in planning and supporting additional trials of the vaccine in Latin America. These include studies of vaccine safety and immunogenicity in Brazil, Colombia and Mexico, and an eventual efficacy trial in one of these countries. Similar studies are also being planned in Peru with support from other sources. A major objective of these studies is to evaluate the vaccine in a setting where all disease is caused by the El Tor biotype of *V. cholerae* O1, where the level of naturally acquired immunity is much lower than in Bangladesh, and where a high proportion of the population have blood group O.

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

This candidate live oral cholera vaccine is based on a strain of *V. cholerae* O1 that lacks the genes which encode for the toxic A subunit of cholera toxin. When given in a single dose of 5 x 10^8 CFU to volunteers in the United States, the vaccine was found to be safe and immunogenic, evoking substantial protection against experimental cholera. Further studies in Indonesia and Thailand confirmed the vaccine's safety, but suggested that immunogenicity was improved by increasing the dose to 5 x 10^9 CFU. Efforts are now under way to evaluate vaccine safety and immunogenicity in larger groups of adults and children in Latin America, including a study in Chile supported by the Programme. The results of these studies will be the basis for plans for an eventual trial of vaccine efficacy.

Shigella vaccines

No candidate vaccine is ready for field trial in humans. Efforts to develop suitable candidates have been supported by the Programme and other sources, with highest priority given to vaccines for disease caused by *S. flexneri* and *S. dysenteriae*, type 1. The Programme has supported efforts in France and Sweden to develop safe but immunogenic mutants of virulent *Shigella* for use as live oral vaccines. Two approaches have been followed. The first involves the development, by gene deletion, of strains that replicate poorly in humans. Candidate vaccines have been evaluated for safety and immunogenicity in monkeys and humans with encouraging results. The second approach involves mutants that lack the genes that encode specific virulence factors of *Shigella*. Other researchers, with support from other sources, have developed candidate oral vaccines based on live *Escherichia coli* that express potentially protective antigens of *Shigella*, or on a purified cell wall polysaccharide of *Shigella* that is conjugated to a protein carrier for parenteral injection. Once a candidate vaccine is considered ready for evaluation, the Programme will assist in the planning and support of field trials.

Enterotoxigenic *Escherichia coli* (ETEC) vaccines

The Programme has supported work in Sweden that seeks to develop an effective killed oral ETEC vaccine. A prototype vaccine has been developed that contains formalin-killed ETEC strains that produce abundant amounts of several important colonization factor antigens (CFAs), including CFA I and CFA II. The vaccine also contains purified cholera toxin B subunit (CTB). The rationale for this composition is that it should evoke both antibacterial immunity (based on antibodies to CFAs) and antitoxic immunity (based on antibody to CTB). Studies with WC/B-subunit cholera vaccine have already shown that CTB protects for several months against diarrhoea caused by ETEC that produce the cholera-like heat-labile toxin.

Studies in Swedish volunteers have shown that the prototype ETEC vaccine is safe and immunogenic; at least 80% of volunteers developed intestinal antibody responses to the CFA antigens and B-subunit antigen after receiving two or three doses of vaccine. Studies are planned to evaluate the efficacy of the vaccine in travellers, who frequently develop ETEC diarrhoea, and in children in developing countries. If the vaccine proves effective, efforts will be made to improve its protective capacity by including killed *E. coli* that elaborate other CFAs and, possibly, by including a chimeric protein conjugate of *E. coli* ST toxin produced by a genetically engineered strain of *E. coli*.

Typhoid fever vaccines

The Programme has supported trials of two vaccines against typhoid fever, one oral, the other parenteral.

Live oral Ty21a vaccine

The trials of this vaccine, carried out in Chile and Indonesia with support from the Programme, were completed in 1990. These show the vaccine to be completely safe. The most effective formulation is one in which lyophilized bacteria are reconstituted in a buffer solution and then swallowed. The efficacy of the vaccine (three doses given at intervals of 2-7 days) ranged from 53% to 77%, was greater in adults (15-44 years) than in children (3-14 years), and was greater in Chile than in Indonesia, which has an attack rate 10 times as high. The major advantage of Ty21a vaccine in comparison with the classical parenteral killed bacterial vaccine is its complete lack of clinically significant adverse side-effects. Further studies of this vaccine are not planned.

Vi antigen parenteral vaccine

One dose of purified Vi antigen of *Salmonella typhi* given parenterally has few side-effects and induces about 70% protection against typhoid fever for at least 2 years. These data were obtained in subjects aged 5-44 years. Although typhoid fever occurs frequently in younger children, there was no information on the immunogenicity or efficacy of the vaccine in children below the age of 5 years. For this reason, the Programme supported studies in Indonesia to determine Vi vaccine immunogenicity in children aged 1-9 years. The results showed that a single dose of Vi vaccine induced fourfold or greater antibody responses in 97% of vaccinees. The seroconversion rates were not related to age, but the mean antibody responses were slightly lower in the youngest age group (12-23 months). Based on these results, an additional study is under way to determine Vi immunogenicity in infants aged 6, 9, or 12 months. When this study has been completed it will be possible to design a trial of Vi vaccine efficacy in young children. The objective will be to devise a practical scheme for immunizing young children against typhoid fever.

Use of new typhoid fever vaccines

Both of the above vaccines are licensed for use in a number of countries. Each appears to be as effective as the classical killed parenteral typhoid fever vaccine, but to have the advantage of being free from significant side-effects. Each vaccine could be used in public health programmes to control typhoid fever. However, this should be preceded by an estimation of the vaccine's cost-effectiveness in the setting in which it would be used. Until data are available on vaccine efficacy in infants, the earliest point at which immunization is likely to be practical is school entry.

Descriptive studies on severe diarrhoea and diarrhoeal deaths

Risk and prognostic factors for dehydration

Continued analyses of data collected in a case-control study supported by the Programme in southern Brazil confirmed the importance of low body weight in the first two years of life as a prognostic factor for dehydration. Children weighing less than 5 kg with diarrhoea were 70 times as likely to develop dehydration than those weighing 9 kg or more. Using 7 kg as a cut-off point, weight had a sensitivity of 75% and a specificity of 68% as a predictor of dehydration occurrence. These values were superior to those obtained from more complex measures of anthropometric status, such as weight/age, length/age or weight/length. Further analyses are planned to compare the characteristics of children who developed dehydrating diarrhoea with healthy age-matched community controls.

Risk factors for 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 particular need to identify and develop interventions for its prevention. A prospective study to evaluate risk factors for symptomatic *Shigella* infections among young children exposed to known shigellosis patients was recently completed in rural Bangladesh. The initial analyses of this rich data set have generated new information of special relevance for the selection of preventive interventions. They show that breast-feeding provided an overall 52% protective effect against shigellosis, after controlling for potentially confounding variables. The effect was particularly strong among young children, with a 90% reduction in risk being observed during the first year of life. Effects were also greater among malnourished children, and on episodes caused by antibiotic-resistant strains.

Clinical patterns of diarrhoeal deaths

The relative importance of dysentery and persistent diarrhoea as causes of diarrhoeal death are likely to increase with the successful implementation of oral rehydration therapy (ORT) and the resulting reduction in deaths due to acute diarrhoea. A multicentre study to determine the distribution of fatal diarrhoea episodes by clinical pattern in different settings, based on the secondary analysis of available data sets, was supported by the Programme. Results from this study are presented in Box 19.

Research training and strengthening

In 1990-1991, the Programme carried out the following research strengthening activities, seeking to enhance the capacity of institutions in developing countries to conduct high quality research on priority topics:

- Continued research strengthening support was provided to six institutes in Brazil, India, Peru and the Philippines with the aim of improving their facilities and their capacity to conduct research on the management and prevention of diarrhoeal diseases. All six institutes are currently conducting studies with support from the Programme.
- A workshop was held in Guatemala, in collaboration with the Institute of Nutrition of Central America and Panama, to assist 19 developing country researchers to design proposals for priority intervention-related research projects.
- A workshop was held in India, in collaboration with the Applied Diarrheal Disease Research Project, to develop a protocol for a multicentre study to evaluate the performance of an algorithm for the clinical management of persistent diarrhoea.
- A workshop was held in France, in collaboration with the Institut national de la Santé et de la Recherche médicale, to assist French-speaking investigators from six developing countries in the preparation of scientific manuscripts presenting the results of clinical trials.
- A workshop was held in the United Kingdom, in collaboration with the London School of Hygiene and Tropical Medicine, the United Kingdom Overseas Development Administration and the United Nations Development Programme, to suggest approaches for the assessment of behaviours in the evaluation of interventions concerned with the promotion of improved hygiene.
- Short-term training (from three weeks to three months) was provided to two researchers (from Myanmar and Peru) to improve their ability to carry out ongoing and future research on diarrhoeal diseases.

The relative importance of dysentery and persistent diarrhoea as causes of diarrhoeal death was examined in a multicentre study supported by the Programme. Existing data sets were sought that could fulfil the following criteria: (i) collection after 1980; (ii) information on at least 100 diarrhoeal deaths in under-fives; and (iii) identification of cases through population surveillance or, in the case of surveillance in health facilities, the proportion of deaths reaching the health facility was at least 70% and children referred from other inpatient facilities were excluded. Data sets from Bangladesh, Brazil, India and Senegal were made available for the analysis. The information on diarrhoeal mortality among infants made available from these four countries is presented in the table below.

Percentage distribution of infant death due to diarrhoea according to clinical pattern of illness

Clinical pattern of diarrhoea	Bangladesh n=108	Brazil n=227	India n=92	Senegal n=160
Acute watery	52	28	39	58
Persistent	26	62	47	36
Dysentery	22	10	14	6

Clinical patterns varied widely among the settings. While in Bangladesh and Senegal acute watery episodes were responsible for most infant diarrhoea deaths, in Brazil and India diarrhoea had been persistent in nearly half or more of the deaths. Dysentery was more frequently associated with diarrhoea deaths in Bangladesh than in the other three sites.

Limited data were available on CDD programme activities in the specific settings, thereby restricting the ability to link patterns of mortality with case management practices. Examination of CDD programme indicators shows that Senegal and Bangladesh, where acute watery diarrhoea deaths were the most frequent, had ORS and ORT use rates that were considerably lower than those reported for Brazil (respectively 5% and 14% compared to 20% for ORS use rates, and 27% and 26% compared to 45% for ORT use rates). ORS were used during the fatal episode for 63% of the infants in Brazil, and all but 10% of them were hospitalized at least once during the final episode. The ORT use rate in Ballabgarh, the study site in India, was reported by the investigators to be 45%.

Conclusions from only four settings with such wide variability should be drawn with care. The available data, nevertheless, are compatible with the initial assumption that the relative importance of dysentery and persistent diarrhoea as causes of diarrhoeal death increases with the successful implementation of ORT and the consequent reduction in acute watery diarrhoeal deaths.

- Long-term training was provided to a researcher from Brazil to enable her to commence a doctoral programme in medical anthropology.
- A "Conference on Persistent Diarrhoea: Epidemiology, Household and Clinical Management and Implications for Diarrhoeal Disease Control Programmes" was held in Kenya in collaboration with the Applied Diarrheal Disease Research Project. The proceedings from this meeting will be published in the journal *Acta Paediatrica Scandinavica.*
- Programme staff participated in three workshops (in China, Pakistan, and the Philippines) which brought together programme personnel, researchers and representatives from funding agencies in order to review national research activities related to the control of diarrhoeal diseases and to define priorities for future research, with emphasis on topics that are of greatest relevance to national CDD programme implementation (see Box 20).

Research documents and publications

The following documents commissioned or prepared by the Programme were issued:

- The last in a series of reviews on interventions for the control of diarrhoeal diseases among young children was completed in 1991 with the issue of the following document: Esrey, S.A. Interventions for the control of diarrhoeal diseases among young children: fly control. Document WHO/CDD/91.37.
- An updated review of the role of interventions to promote breast-feeding in the control of childhood diarrhoea was published: de Zoysa, I., Rea, M. & Martines, J. Why promote breastfeeding in diarrhoeal disease control programmes? *Health Policy and Planning, 6*(4): 371-379 (1991).
- A series of documents on the use of case-control methods in diarrhoeal disease research was completed in 1990 with the issue of the following document: Cousens, S.N. et al. Case-control studies of childhood diarrhoea: IV. Choice of control group. Document CDD/EDP/90.1.
- A new series on methodological issues in research on diarrhoeal diseases and acute respiratory infections was launched in 1991 with the preparation of two documents:

  Cousens, S.N. & Kirkwood, B.R. Outcome measures in prospective studies of childhood diarrhoea and respiratory infections: Choosing and using them. Document WHO/CDD/EDP/90.2.

  Cousens, S.N. A source of bias in studies of bi-directional associations: hypothetical example of malnutrition and diarrhoea. Document WHO/CDD/EDP/91.3.
- A published article and a Programme document presenting the status of our knowledge on improved ORS were prepared by the Programme:

  The international study group on improved ORS. Impact of glycine-containing ORS solutions on stool output and duration of diarrhoea: a meta-analysis of seven clinical trials. *Bulletin of the World Health Organization, 69*: 541-548 (1991).

  Recent advances in the development of improved ORS: Document CDD/CMT/91.1.

A list of recent articles reporting the results of research supported by the Programme is presented in Annex 3.

Essential national health research: identifying CDD research priorities in the Philippines 20

Improved communication between planners and implementers of health care services on the one side, and researchers on the other, should lead to more research that addresses programmatic issues and to the application by national programmes of the information generated by such research.

In 1991, a workshop was organized by the national CDD programme in the Philippines to identify: priorities for implementation and problem-solving research; research groups interested in conducting research in these priority areas; and mechanisms and funding sources for research support.

Staff from the Maternal and Child Health Division of the Ministry of Health, regional CDD coordinators, and representatives from nongovernmental organizations, universities, and international and bilateral agencies participated in the three-day workshop.

After reviewing information on the control of diarrhoeal diseases in the country and on implementation issues of particular concern to the national programme, researchers, planners and programme implementers worked in small groups to identify priority questions in the following areas: management of diarrhoea in health facilities, management of diarrhoea in the home, prevention of diarrhoea, and health education and communication. After preparing a first list of questions, the groups rated them according to the likelihood that their answers would result in increased programme efficiency and effectiveness. Issues taken into account included the adequacy of information already available, the potential for strengthening programme implementation, and research feasibility.

The small working groups then reported to a plenary session and summary lists of research topics were prepared, identifying whenever possible research institutions likely to conduct projects in priority topics, and possible sources of financial support.

Finally, the participants reviewed mechanisms for sustaining and institutionalizing this process of information exchange. A Subcommittee on CDD Research, formed by researchers, planners and implementers of health care services, has since been established. This Subcommittee will stimulate the development of proposals in priority areas by reviewing protocols, providing technical support and facilitating funding. In addition, it will periodically create the opportunity for researchers to share their findings with programme staff and for new questions of priority to be identified.

Collaborating Centres

The ten 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.

Collaboration with industry

In view of the priority being given to the development and evaluation of vaccines and of improved methods of treating and preventing 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 the studies benefiting from this collaboration have been described in the preceding sections of this report.

Table 12

Research collaboration with industry, 1990-1991

Company	Area of collaboration
Galactina (Switzerland)	Clinical trials of precooked rice-based ORS
Hoffmann-La Roche (Switzerland)	Field trials of vitamin A supplementation
Lederle Laboratories (USA)	Evaluation of an algorithm for the management of persistent diarrhoea (including use of multivitamin and mineral supplements)
Leo Pharmaceutical Products (Denmark)	Clinical trial of pivmecillinam for shigellosis
Pasteur-Mérieux (France)	Field trials of Vi typhoid vaccine and WC3 rotavirus vaccine
Pfizer (Switzerland)	Clinical trial of doxycycline for cholera
Swedish National Bacteriological Laboratory (Sweden)	Killed oral cholera vaccine studies
Swiss Serum and Vaccine Institute (Switzerland)	Live oral cholera vaccine (CVD 103) studies
Wyeth Ayerst Laboratories (USA)	Field trials of rotavirus vaccine

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 (seven projects were ongoing with Programme support in December 1991), and by managing a grant from the United Nations Development Programme to support research that is complementary to WHO's overall research effort. In total, the Centre received US$ 192 722 in support from the Programme during the biennium.

- The Programme is coordinating its research efforts with the USAID-supported Applied Diarrheal Disease Research (ADDR) Project (a project which promotes and supports applied research in developing countries). USAID is also providing support to enable staff from its HEALTHCOM (Communication for Child Survival) project to assist the Programme in developing implementation research activities, especially related to the promotion of correct case management of childhood diarrhoea. Finally, Programme staff regularly participate in meetings of the USAID Consultative Group on Vaccine Development. In 1990, regular meetings were initiated between USAID and representatives from agencies or organizations receiving support from USAID for diarrhoeal disease research (especially ADDR, ICDDR,B and the WHO/CDD Programme), to define complementary roles, and to review and coordinate activities.

- The Programme has established and is using mechanisms for the co-funding of projects with the Academy for Educational Development, the International Development Research Centre, the United Kingdom Overseas Development Administration, the Swedish Agency for Research Cooperation with Developing Countries, the Thrasher Research Fund, and UNICEF; specific projects receiving such co-funding have been described in the preceding sections of this report.

- In 1991 the Programme collaborated with the Swedish International Development Authority in supporting preparations for cholera vaccine field trials. In particular, the Authority agreed to make funds available for the provision of vaccine for field trials in Latin America. This is a major issue in view of the introduction of the disease to the continent and subsequent major epidemics in 1991.

INFORMATION SERVICES 4

The Programme was again very active in disseminating information and documentation on diarrhoeal diseases control, and continued to collaborate closely with other agencies and institutions in this regard.

Activity was particularly intense in 1991, as a result of the sudden worsening of the global cholera situation. Informing the public was an important task both to allay fears and obtain support for rational and effective control measures. In collaboration with the WHO Office of Information, multi-media campaigns were organized involving the production and dissemination of press releases, weekly updates and periodical analyses, and press conferences and interviews with senior WHO staff and other experts. Photographs and videotapes on cholera were distributed to the media, and a radio programme on cholera was produced and distributed to over 200 radio stations. In this way, both information on the extent of the pandemic and WHO recommendations were broadcase widely in the print and electronic media. In addition, technical guidelines for the management and control of cholera were made available to countries, often as part of a special "Cholera information kit".

Regular communication with health workers of all categories was maintained through publication of the quarterly newsletter "Dialogue on Diarrhoea", produced by the Appropriate Health Resources and Technologies Action Group (AHRTAG) Ltd, United Kingdom. Circulation of the English edition remained at 120 500 during the biennium, with additional print runs of 30 000 in India and 25 000 in Pakistan. The French edition continued to be distributed, with 16 000 copies, the Spanish with 20 000, and the Portuguese with 5000. The Tamil edition doubled its circulation to 50 000 copies. The Bangla and Chinese editions, with circulations of 40 000 and 10 000, continued to be published on an occasional basis. In addition, since 1990, the Health Learning Materials Centre in Nepal has regularly produced a newsletter in Nepali, containing materials from both "Dialogue on Diarrhoea" and "ARI News". An Urdu/English edition in Pakistan has also been started.

In 1990-1991, the Programme published 27 technical papers and issued 35 informal documents (see Annex 5). Of the documents, 20 were designed for wide use or for general information and were distributed through the mailing list, while the remaining 15 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 one issue of "Diarrhoeal Diseases: Recent analytical references", produced by the International Children's Centre, Paris. The mailing list currently contains just under 5000 addresses.

Staff of the Programme or designated representatives attended 14 international conferences and meetings in 1990-1991, including the Bellagio IV Conference on Protecting the World's Children, held in Bangkok in March 1990.

Briefing sessions for small groups of staff from nongovernmental organizations and other organizations continued to be held periodically, in collaboration with the WHO Expanded Programme on Immunization and Programme for the Control of Acute Respiratory Infections, to provide detailed information on the strategies, approaches and activities of the three programmes. Altogether, 10 one-week sessions were held in 1990-1991.

PROGRAMME REVIEW BODIES 5

Under the Programme's organizational structure, scientific and technical review of its activities is the responsibility of a Technical Advisory Group (TAG) composed of leading scientists and public health administrators from outside WHO, while review of the overall management of the Progamme is entrusted to a Management Review Committee (MRC) made up of representatives of four United Nations Organizations and specialized agencies (UNDP, UNICEF, World Bank, and WHO). The deliberations of these two bodies are considered once a year at a Meeting of Interested Parties (MIP) 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.

Technical Advisory Group (TAG)

During the biennium, the TAG met twice - on 7-8 March 1990 and 18-22 March 1991. In accordance with the agreement reached at the ninth Meeting of Interested Parties, the TAG changed its method of operation. A smaller group of members met in 1990 and this permitted a more detailed discussion of Programme activities, particularly in relation to important issues. The TAG:

- examined the plans for the management of research following the dissolution of the scientific working groups; assured itself that adequate peer review would be maintained and that the TAG would be kept fully informed of progress with respect to research priorities; and welcomed the efforts to improve integration of research and services activities;

- noted the reduced growth in the budget in the current biennium, and considered that services priorities should be protected and research priorities reallocated towards the needs of programme implementation; agreed to transfer a major part of the responsibility for vaccine development to the WHO progamme for Vaccine Development; and endorsed the proposed overall increase in the research budget;

- reviewed the activities of the services component, giving particular attention to the implementation of activities to improve medical education and training;

- considered that the Programme was healthy and responding creatively to challenges as they emerged, and that it was benefiting from the linkage with the ARI Programme.

At its twelfth meeting in 1991, the TAG:

- endorsed the priorities of the Programme, considered the coordination between the services and research components, and reviewed the experience to date with internal working groups on particular programme issues;

- expressed satisfaction with the progress made under the new research management mechanism;

- stressed the importance of linkages with other WHO programmes, notably the ARI Programme, the Community Water Supply and Sanitation unit and the Programme for Vaccine Development;

- concluded that despite the budgetary restrictions the Programme was performing well;

- decided to postpone a decision on the future method of work of the TAG until its meeting in 1992.

Management Review Committee (MRC)

The MRC met twice during the biennium - on 30 March 1990 in New York and on 11 April 1991 in Geneva - to review the progress, plans and financial situation of the Programme and the reports of the eleventh and twelfth meetings of the TAG.

At its meeting in 1990, the MRC endorsed the current management structure of the CDD and ARI Programmes, including the plans for the management of research; regretted that full support for the proposed 1990-1991 budget was not available but appreciated that priority activities of the CDD Programme were being maintained nevertheless; and discussed possible ways of obtaining increased support.

In 1991, the MRC emphasized the importance of following up on training activities and encouraged the Programme to ensure that the skills learned are correctly applied and sustained; suggested that the Programme pursue, in coordination with other appropriate programmes in WHO, ways of developing or adapting health education tools in the area of water and sanitation for use in the prevention of diarrhoea; examined the proposed programme budget for 1992-1993, and encouraged the Programme to conduct an active search for additional funding sources, especially in the light of the resolutions adopted by governments at the World Summit for Children.

Meeting of Interested Parties (MIP)

The tenth MIP, held on 28-29 June 1990, was attended by representatives of 46 governments and agencies. The Meeting considered the progress and plans of the Programme, including the report of the eleventh meeting of the TAG; reviewed the management of the Programme and its financial status, including the report of the tenth meeting of the MRC; and examined a report on services and research issues relating to the home management of diarrhoea. The participants:

- commended the Programme for the progress made despite a decrease in vaccine research activities;

- concurred with the emphasis being placed on diarrhoea prevention and urged the Programme to promote existing preventive interventions and develop additional ones;

- noted the new procedures for the management of research and recommended that they be reviewed in 1991;

- welcomed the broad and close collaboration with other agencies and organizations and urged the Programme to continue to coordinate its activities with those of other relevant programmes and units of WHO and of other organizations, in order to ensure the most effective use of available resources;

- strongly recommended the continued integration of diarrhoeal disease control activities in primary health care systems and encouraged the efforts being made to increase access to ORS and appropriate case management;

- accepted the financial report for 1988-1989 and the revised budget for 1990-1991, and noted the preliminary budget for 1992-1993.

The eleventh MIP was held on 27-28 June 1991 and attended by representatives of 40 governments and agencies. The Meeting reviewed the status and plans of the Programme, including the report of the twelfth meeting of the TAG; general management and financial matters, including the report of the eleventh meeting of the MRC; and a report on the results of surveys of diarrhoea case management. The participants:

- expressed agreement with and support for the priority activities and the balance between the research and services components of the Programme;

- discussed a presentation on the global cholera situation and the role played by WHO; noted resolution WHA44.6 adopted by the Forty-fourth World Health Assembly; and reaffirmed the importance of immediate notification of cases by affected countries;

- urged the Programme to continue to develop and monitor indicators of the outcome of Programme implementation at both the global and the country level;

- requested the Programme to strengthen collaboration with other agencies and WHO programmes and to provide the twelfth MIP with a description of the strategies being pursued to promote the integration of relevant activities in sustainable systems of primary health care;

- expressed concern at the fact that some doctors are still using inappropriate drugs in the management of diarrhoea and urged the Programme to extend its training activities to that category of health care provider;

- regretted the slow rate of progress in the utilization of appropriate case management in the home and called on the Programme to accelerate its efforts in that area;

- noted the financial situation of the Programme, including the revised budget for 1990-1991, endorsed the proposed programme budget for the 1992-1993 biennium, and urged the Programme to improve further its managerial efficiency.

RESOURCES AND OBLIGATIONS 6

The Programme's financial position at the end of the 1990-1991 biennium, under all sources of funds, is shown in Table 13.

Table 13

Diarrhoeal Diseases Control Programme, 1990-1991
Financial Position as at 31 December 1991 (US$)

Balance available on 1 January 1990	4 655 695
Amount received since 1 January 1990	20 971 562
Total available	25 627 257
Actual obligations 1990-1991	20 910 377
Balance carried forward to 1992-1993	4 716 880

The resources available to the Programme under all sources of funds for 1990-1991 and previous financial periods are presented in Table 1 of Annex 6. Since 1978, a total of 29 countries and agencies have contributed almost US$ 99 million to the Programme. Of the 20 countries and agencies that contributed in 1988-1989, 17 contributed during the 1990-1991 biennium.

Table 2 in Annex 6 is a summary of actual obligations for 1988-1989, estimated obligations (budget) for 1990-1991, and actual obligations for 1990-1991, by Programme component. Some explanations of the content of each Programme budget component and on actual expenditures follow.

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.

Health services

In the health services component, activities relate primarily to the development, implementation, and evaluation of national CDD programmes. A breakdown of activities under this component is given in Annex 6, Table 3, which showns actual obligations for 1988-1989, and estimated and actual obligations for 1990-1991. Activities carried out within the health services component are 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. The extensive work of the component required an increase in staff positions over previous biennia, making a total of nine professional staff (including two staff members seconded by UNICEF and supported equally by both WHO and UNICEF) and six general services staff. New staff positions were filled earlier than anticipated leading to an increase in staff salaries but a decrease in temporary staff costs.

An increase is shown under "strategies for prevention", as new activities in the promotion, protection and support of breast-feeding, as an important intervention for prevention of diarrhoea, began to be implemented.

The creation of the Global Task Force on Cholera Control to respond to the global situation of this disease necessitated emergency support to epidemic control until other sources of funds could be identified.

More was also spent on survey development, as household and facility surveys have become increasingly useful management tools and have undergone continuous modification to bring them in line with Programme approaches and priorities.

Less than anticipated was spent on ORS production and communications at the global level as support has been provided at regional and country level. Developmental work in communications also cost less than 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 programme reviews, as well as continuous monitoring of activities.

Although training activities increased very significantly, the difficulties of organizing large numbers of courses resulted in slower expansion than hoped for and lower expenditure. In addition, countries have been increasingly willing to carry the costs of training activities.

Research

The Research component involves the development of methods for treating and preventing diarrhoea in young children. These include improved ORS formulations, effective diets, and useful drugs; new or improved vaccines; and cost-effective preventive interventions. Support is also provided for 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 1988-1989, and estimated and actual obligations for 1990-1991, by area of activity.

"Coordination" includes staff, consultants, and duty travel to manage the component as a whole. All posts, namely three professional and three general services staff, were occupied throughout the biennium.

Considerably less was spent on research than budgeted. This underspending was mainly in the areas of epidemiology and disease prevention and implementation research, where it has continued to prove difficult to interest researchers in topics considered of priority to the Programme and to design adequate studies which often require multidisciplinary inputs. Also, although funding of contracts was approved in some cases during 1990-1991, there was no actual expenditure because of delays in obtaining ethical and administrative clearance.

Programme management and support

The responsibilities of programme management include planning, development, coordination, administration, information dissemination, and evaluation of the overall Programme. Table 5 in Annex 6 shows the actual obligations for 1988-1989, and estimated and actual obligations for 1990-1991. 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. Staff in the component during the biennium included four professional and five general services staff plus two short-term professional staff members. Overall, obligations were much as anticipated.

Annex 1

WHO CDD estimates of ORS access and ORS/ORT use rates by country and region, 1991

	Population <5 years x 1000	Estimated episodes per child <5 years per year	Estimated total diarrhoea episodes <5 years x 1000	Total ORS reported produced or imported (litres) x 1000	ORS access rate %	ORS use rate %	ORT use rate %
Algeria	3931	2.6	10220.6	5799.0	78 n	22 nb	26 nb
Angola	1892	2.0	3784.8	1285.0	62 a	10 a	48 a
Benin	922	5.0	4612.0	13.3	75 a	45 a	45 a
Botswana	269	3.2	861.4		95 a	56 a	64 a
Burkina Faso	1673	4.6	7697.6	201.3	65 n	15 n	15 n
Burundi	1063	4.2	4466.3	818.0	90 n	41 b	49 b
Cameroon	2380	2.4	5711.5	2147.6	50 a	7 ab	84 ab
Cape Verde	69	4.8	329.3	137.5	81 n	5 n	5 n
Central African Rep	571	3.9	2226.1	170.8	49 a	13 a	24 a
Chad	1013	7.6	7700.3	685.6	24 a	15 a	15 a
Comoros	110	5.2	574.1	12.0	80 n	13 nb	79 nb
Congo	444	6.6	2927.8	147.0	70 a	3 a	26 a
Côte d'Ivoire	2525	3.9	9847.5	1815.0	26 n	4 n	16 n
Equatorial Guinea	63	1.9	119.3	360.0	80 a	35 a	40 a
Ethiopia	9589	4.8	46025.3	1944.0	50 n	27 nb	32 nb
Gabon	187	3.3	617.1	3.9	70 n	10 n	10 n
Gambia	160	4.2	672.8	161.7	80 a	15 a	48 a
Ghana	2842	3.0	8525.4	1082.7	33 n	7 n	21 n
Guinea	1155	4.6	5311.2	183.0	30 a	37 a	65 a
Guinea-Bissau	163	5.3	863.9	311.8	80 a	5 a	5 a
Kenya	4883	4.3	20998.6	1875.4	65 a	26 ab	69 ab
Lesotho	313	8.8	2757.9	150.0	50 n	27 n	68 n
Liberia	492	4.8	2360.6	152.4	22 n	6 n	9 n
Madagascar	2261	4.8	10854.7	401.3	60 a	10 n	11 n
Malawi	1878	6.0	11266.8	1174.0	56 n	14 n	14 n
Mali	1870	4.0	7478.4	34.0	95 n	14 n	41 n
Mauritania	380	9.8	3724.0	15.5	30 a	13 n	54 n
Mozambique	2860	4.7	13441.1	536.5	30 a	14 a	30 a
Niger	1594	6.5	10359.7	535.0	81 a	21 a	54 a
Nigeria	21742	4.3	93490.6	900.0	60 a	16 a	35 ab
Rwanda	1513	4.0	6052.0	764.5	41 n	8 n	24 n
Sao Tome & Principe	24	2.8	67.2	50.0	100 a	46 n	46 n
Senegal	1356	4.8	6506.9	201.5	16 n	5 nb	27 nb
Sierra Leone	782	3.2	2501.1	67.2	55 a	55 a	60 a
Swaziland	159	4.0	636.8	1425.0	90 n	15 nb	85 n
Togo	671	5.3	3557.4		60 n	11 n	33 n
Uganda	4076	5.0	20378.0	4800.9	30 a	18 ab	30 a
United Rep of Tanzania	5818	3.5	20363.0	5805.6	75 a	39 ab	83 ab
Zaire	6836	5.9	40334.8	745.8	50 a	16 a	45 a
Zambia	1822	5.1	9293.2	2360.2	89 a	80 a	89 a
Zimbabwe	1714	3.9	6684.6	83.1	70 n	1 n	77 n
AFR	**94065**	**4.4**	**416201.7**	**39356.9**	**57**	**20**	**40**

	Population <5 years x 1000	Estimated episodes per child <5 years per year	Estimated total diarrhoea episodes <5 years x 1000	Total ORS reported produced or imported (litres) x 1000	ORS access rate %	ORS use rate %	ORT use rate %
Antigua & Barbuda	7	3.0	22.2		100 a	50 a	50 a
Argentina	3238	3.0	9712.8	1100.0	60 c	36 c	70 c
Bahamas	60	3.0	180.0		95 a	45 a	45 a
Barbados	20	3.0	60.0	30.0	85 c	15 c	15 c
Belize	39	1.5	58.5	50.0	100 c	65 c	65 c
Bolivia	1299	3.0	3896.4	130.0	58 a	35 a	63 a
Brazil	19029	3.9	74211.5	25394.0	68 a	13 ab	62 ab
Chile	1484	1.5	2225.4	86.3	10 n	1 n	1 n
Colombia	4158	4.8	19960.3	3822.7	62 n	31 ab	40 e
Costa Rica	395	4.6	1818.8	390.0	90 a	73 a	78 n
Cuba	900	1.0	899.6	500.0	100 a	80 a	80 a
Dominica	9	3.0	27.0		100 c	50 c	50 c
Dominican Rep	986	7.0	6900.6	1252.6	13 n	25 b	31 b
Ecuador	1540	4.1	6312.4	402.7	55 a	25 ab	70 ab
El Salvador	862	4.1	3535.8	1085.1	84 n	45 n	45 n
Grenada	13	3.0	39.0		100 c	70 c	70 c
Guatemala	1644	5.2	8548.8	1042.1	40 a	19 a	24 ng
Guyana	94	3.0	281.4		100 c	15 c	15 c
Haiti	1011	7.0	7077.0	1227.1	52 c	15 c	20 c
Honduras	891	3.0	2673.6	1528.0	65 c	40 c	70 c
Jamaica	275	1.0	274.6		90 a	8 a	10 a
Mexico	11652	4.2	48936.7	19857.5	90 ab	22 ab	66 ab
Nicaragua	705	2.0	1409.6	1019.4	75 c	40 c	40 c
Panama	301	3.0	903.0	26.0	77 a	40 a	55 a
Paraguay	669	2.5	1672.0	332.4	91 a	39 a	42 a
Peru	2883	8.0	23062.4	928.5	23 n	11 n	25 n
St Christopher & Nevis	5	3.0	15.0		100 c	5 c	5 c
St Lucia	18	3.0	54.0		100 c	60 c	75 c
St Vincent & Grenadines	17	3.0	51.0		100 n	98 n	98 n
Suriname	54	2.0	107.2	5.3	88 a	46 n	47 n
Trinidad & Tobago	157	1.6	250.6	35.0	100 c	66 c	70 c
Uruguay	260	0.7	181.7	216.3	84 a	50 a	96 a
Venezuela	2763	3.0	8289.6	3025.0	95 a	70 a	80 a
AMR	**57435**	**4.1**	**233626.4**	**63485.9**	**68**	**22**	**54**
Bangladesh	19475	2.3	44793	24954.2	75 a	12 ab	26 ab
Bhutan	238	4.1	977	480.0	85 a	43 a	65 a
Dem Rep of Korea	2447	1.5	3670	342.5	100 a	45 ab	72 ab
India	116454	1.7	197972	71284.3	60 c	7 nb	14 bc
Indonesia	22947	0.9	20652	8062.2	92 c	28 ab	45 ab
Maldives	34	2.0	68	40.0	100 a	18 ab	27 ab
Mongolia	348	3.4	1183	145.0	70 a	41 n	59 n
Myanmar	5676	1.3	7379	4686.8	66 a	15 ab	19 ab
Nepal	3116	3.3	10282	3432.9	80 a	9 ab	14 ab
Sri Lanka	1808	0.6	1085	1097.9	95 a	55 ab	76 ab
Thailand	5637	1.8	10147	4623.0	90 a	40 a	43 a
SEAR	**178180**	**1.7**	**298207**	**119148.9**	**68**	**11**	**20**

	Population <5 years x 1000	Estimated episodes per child <5 years per year	Estimated total diarrhoea episodes <5 years x 1000	Total ORS reported produced or imported (litres) x 1000	ORS access rate %	ORS use rate %	ORT use rate %
Afghanistan	3206	3.8	12181.3	1154.7	32 a	12 a	26 a
Bahrain	66	2.4	157.4		100 a	60 a	73 a
Cyprus	62	2.7	168.5		35 n	4 n	4 n
Djibouti	77	2.8	216.7	64.0	80 a	47 ab	56 ab
Egypt	7588	3.4	25799.9	7580.6	95 a	58 a	58 a
Iran (Islamic Rep of)	8358	2.1	17551.0	21079.5	75 n	52 nb	71 nb
Iraq	3511	3.8	13342.6	5000.2	100 a	58 ab	70 ab
Jordan	712	1.3	925.3	858.4	95 a	39 ab	77 ab
Kuwait	267	2.7	719.8		75 a	10 a	10 a
Lebanon	388	2.5	970.5	245.9	90 n	3 n	10 n
Libyan Arab Jamahiriya	862	3.0	2586.0		69 n	48 n	60 n
Morocco	3819	8.0	30552.0	3891.5	70 a	8 ab	13 ab
Oman	301	2.5	752.5		100 n	19 n	19 n
Pakistan	23318	5.0	116588.0	30041.1	85 a	31 ab	34 ab
Qatar	52	2.7	140.4		75 a	20 a	20 a
Saudi Arabia	2664	2.0	5327.2		96 n	45 n	45 n
Somalia	1474	4.3	6337.3	209.5	31 a	12 a	78 a
Sudan	4656	4.5	20952.9	4581.3	22 a	31 ab	37 ab
Syrian Arab Republic	2493	2.5	6233.5	922.6	92 a	17 ab	89 ab
Tunisia	1119	3.9	4364.1	2012.0	100 a	33 a	63 a
United Arab Emirates	167	2.0	333.2		95 a	77 a	81 a
Yemen	2474	2.7	6679.8	696.4	16 n	6 n	6 n
EMR	**67633**	**4.0**	**272879.9**	**78337.5**	**75**	**32**	**40**
Brunei Darussalam				2.8			
Cambodia	1363	4.5	6135.3	1540.0	25 ng	6 n	6 n
Cook Islands	2	1.2	2.4	3.0	58 a	8 a	8 a
Fiji	93	2.5	233.3	120.0	100 a	16 a	16 a
Kiribati	8	3.5	26.6	44.0	90 a	65 a	84 a
Lao People's Dem. Rep.	738	5.2	3837.6	1001.0	65 c	12 a	30 a
Malaysia	2600	1.3	3380.0	850.0	95 a	35 ab	47 ab
Papua New Guinea	594	3.3	1961.7	301.0	95 a	15 a	46 a
Philippines	9262	3.0	27784.8	1087.5	85 a	17 ab	25 ab
Samoa	24	1.1	26.4	10.0	70 a	7 a	7 a
Solomon Islands	50	2.8	138.6	130.0	92 a	47 a	77 a
Tonga	17	4.1	69.7	10.0	90 a	25 a	25 a
Vanuatu	26	3.8	97.5	45.0	95 a	20 a	66 a
Viet Nam	9466	2.0	18932.8	3543.2	84 a	37 ab	53 ab
WPR (excluding China)	**24243**	**2.6**	**62626.8**	**8687.5**	**82**	**23**	**34**
China	113659	3.2	363708.2	1010.0	6 a	1 b	54 b
GLOBAL (excluding China)	**421556**	**3.0**	**1283542.0**	**309013.9**	**68**	**21**	**38**

a National CDD Programme estimate from CDD programme country profile or other programme report.

b Based on household surveys (CDD household surveys, demographic health surveys and others). If more than one survey median rates were used.

c Estimate from Regional Office.

e Estimates for both ORS and 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.

g Best estimate from data available.

n Estimate from 1989 or earlier used in absence of more recent and reliable data.

Annex 2

New research projects supported by the Programme (from 1 January 1990 to 31 December 1991)

Project Number/Title	Principal Investigator(s)/ Institution(s)
Case Management	
HQ88091 Multicentre placebo-controlled clinical trial to evaluate the efficacy of cotrimoxazole in the treatment of children under 24 months of age with persistent diarrhorea	**Peru:** Dr E. Chea-Woo Dr P. Alarcon Department of Paediatrics Universidad Peruana Cayetano Heredia, Lima
HQ89100 L-alanine enriched ORS in the rehydration of children with acute diarrhoea	**Egypt:** Dr A.A. Madkour Department of Paediatrics Elshatby Children's Hospital Alexandria
HQ89104 Study of the determinants of the help-seeking behaviour of mothers during childhood diarrhoea in a peri-urban slum of Lima, Peru	**Peru:** Dr P. Paredes Instituto de Investigacion Nutricional, Lima
HQ89120 Evaluation of a precooked ready-to-use rice ORS in reducing diarrhoea duration and in improving weight gain in infants and small children with mild diarrhoea attending the out-patient department	**Bangladesh:** Dr D. Mahalanabis International Centre for Diarrhoeal Disease Research, Bangladesh Dhaka
HQ90006 A pilot study of the operational characteristics and quality of care provided by the Community Oral Rehydration Units in Peru	**Peru:** Dr B. Benavides Dr E. Jacoby Instituto de Investigacion Nutricional, Lima
HQ90014 A clinical trial to assess the efficacy of a precooked rice-based ORS in children with acute non-cholera diarrhoea (a multicentre study)	**USA:** Dr M. Santosham Department of International Health The Johns Hopkins University Baltimore, MD **Egypt:** Professor I.M. Fayad Gastroenterology Unit Cairo University, Cairo
HQ90020 Randomized double-blind trial of single-dose doxycycline in the treatment of cholera in children	**Bangladesh:** Dr A.N. Alam International Centre for Diarrhoeal Disease Research, Bangladesh Dhaka

Project Number/Title	Principal Investigator(s)/ Institution(s)
HQ90025 Acceptability trial of rice-based and flavoured ORS	**Philippines:** Dr M. Saniel Research Institute for Tropical Medicine, Metro Manila
HQ90041 Dietary management of persistent diarrhoea in infants and children: a randomized single-blind controlled clinical trial comparing feeding milk-cereal diet and soy-based diet	**India:** Dr M.K. Bhan Department of Paediatrics All India Institute of Medical Sciences, New Delhi
HQ90042 Determinants of correct and continuous use of oral rehydration therapy in rural and urban Bangladesh	**USA:** Professor R.E. Black Department of International Health, School of Hygiene and Public Health The Johns Hopkins University Baltimore, MD
HQ90054 Social and cultural determinants of the use of drugs in the treatment of diarrhoeal diseases in children under five years of age in rural and urban Guatemala	**Guatemala:** Professor A. Méndez-Dominguez Universidad del Valle Guatemala City
HQ91002 Promoting safe dispensing and appropriate referral for diarrhoea, ARI and pregnancy by retail drug sellers in Nepal	**Nepal:** Professor K.K. Kafle Institute of Medicine Tribuhan University Kathmandu
HQ91022 Multicentre clinical trial of a low osmolarity ORS	**Peru:** Dr E. Chea-Woo Department of Paediatrics Universidad Peruana Cayetano Heredia, Lima **Mexico:** Dr I. Maulen Emergency Department Instituto Nacional de Pediatria Mexico City **Brazil:** Dr H. Ribeiro Department of Paediatrics Federal University of Bahia Salvador **India:** Dr M.K. Bhan Department of Paediatrics All India Institute of Medical Sciences, New Delhi
HQ91034 Secondary analysis of an anthropological survey of mothers' perceptions of persistent diarrhoea in the Central Sierra (Huaraz), Peru	**Peru:** Ms B.A.C. Yeager Instituto de Investigacion Nutricional, Lima

Project Number/Title	Principal Investigator(s)/ Institution(s)
HQ91041 Multicentre study to evaluate a treatment algorithm for persistent diarrhoea	**Viet Nam:** Dr Ngoc Thanh Pham Children's Hospital No. 1 Ho Chi Minh City **India:** Dr M.K. Bhan Department of Paediatrics All India Institute of Medical Research, New Delhi **Bangladesh:** Dr A.K. Mitra Dr H. Ashraf International Centre for Diarrhoeal Disease Research, Bangladesh Dhaka
Prevention of Diarrhoea	
HQ87115 Impact of vitamin A supplementation administered to children during acute diarrhoea on subsequent diarrhoeal morbidity and nutritional status	**India:** Dr M.K. Bhan Department of Paediatrics All India Institute of Medical Research, New Delhi
HQ88005 Impact of vitamin A supplementation on diarrhoea and acute respiratory infections in children	**Brazil:** Dr M. Barreto Federal University of Bahia Salvador
HQ89008 PRN serum antibody analysis of infants given human reassortant rotavirus vaccine, Belém, Brazil	**USA:** Dr F. Clark Wister Institute Philadelphia, PA
HQ89085 To devise a serotyping scheme for the VP4 protein specificity of human rotaviruses	**USA:** Dr M. Gorziglia National Institute of Allergies and Infectious Diseases Laboratory of Infectious Diseases Bethesda, MD
HQ89092 Weaning practices and contamination of weaning foods in slum areas of Fortaleza, Brazil	**Brazil:** Dr C. Monte Department of Social Medicine Federal University of Ceara Fortaleza
HQ89015 Community-based nutritional diarrhoea and convalescence. I. Design of an educational intervention	**Guatemala:** Dr J. Rivera Institute of Nutrition of Central American and Panama Guatemala City

Project Number/Title	Principal Investigator(s)/ Institution(s)
HQ89110 Situation analysis to study breast-feeding patterns and maternal behavioural factors associated with early cessation and supplementation of breast-feeding	**Ethiopia:** Dr T. Ketsela CDD Programme Ministry of Health Addis Ababa
HQ90010 Development and testing of improved B-subunit/whole-cell oral cholera vaccine	**Sweden:** Professor J. Holmgren Department of Medical Microbiology and Immunology University of Gothenburg Gothenburg
HQ90012 Double-blind controlled trial testing the immunogenicity and safety of parenteral Vi capsular polysaccharide antigen typhoid vaccine in Indonesian infants	**Indonesia:** Dr C. Simanjuntak Dr T. Pusponegoro National Institute of Health Research and Development Jakarta
HQ90021 Case study of the National Commission for the Promotion of Breast-feeding	**Guatemala:** Dr R.E. Giron de Arango Comision Nacional de Promocion de la Lactancia Materna Guatemala City
HQ90026 Material and cultural determinants of water-related behaviours, including personal and domestic hygiene in a highland Guatemalan community	**Guatemala:** Dr E. Hurtado Institute of Nutrition of Central America and Panama Guatemala City
HQ90033 Determinants of personal and domestic hygiene behaviours	**Turkey:** Dr D. Guris Hacettepe University Ankara
HQ91003 Optimal energy density of weaning foods for older infants and young children in developing countries	**USA:** Dr K.H. Brown Department of Nutrition University of California Davis, CA
HQ91019 Effects of introducing complementary foods on breast-milk intake of infants in Honduras	**USA:** Dr K.G. Dewey Department of Nutrition University of California Davis, CA
HQ91023 Use of pacifiers: patterns, contamination and association with diarrhoea frequency	**Brazil:** Dr C.G. Victora Department of Social Medicine Federal University of Pelotas Pelotas

Project Number/Title	Principal Investigator(s)/ Institution(s)
HQ91025 Studies of the clinical acceptability, immunogenicity and transmissibility of live oral cholera vaccine strain CVD 103-HgR in adults and children in Latin America	**USA:** Professor M.M. Levine Center for Vaccine Development University of Maryland School of Medicine, Baltimore, MD
HQ91027 Media presentations of follow-on milk foods	**Philippines:** Ms T.M.P. Bagasao Kabalikat Ng Pamilyang Pilipino Foundation, Manila
HQ91038 The relationship between beliefs and behaviours: infant feeding in Pelotas, Southern Brazil	**Brazil:** Dr C. Lombardi Department of Social Medicine Federal University of Pelotas Pelotas
Epidemiology of Severe Diarrhoea and Diarrhoeal Death	
HQ89083 Clinical pattern of diarrhoeal deaths in under fives	**Brazil:** Dr C.G. Victora Department of Social Medicine Federal University of Pelotas Pelotas
HQ91030 Risk factors for dehydrating diarrhoea in Southern Brazil	**Brazil:** Dr C.G. Victora Department of Social Medicine Federal University of Pelotas Pelotas
Research Strengthening	
HQ90016 Institution research strengthening for field studies on diarrhoea interventions and case management	**Philippines:** Dr M. Saniel Research Institute for Tropical Medicine, Metro Manila

Annex 3

Recent[1] publications arising out of research supported by the Programme

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

1987

Torian, B.E., Lukehart, S.A. & Stamm, W.E. Use of monoclonal antibodies to identify, characterize, and purify a 96,000-Dalton surface antigen of pathogenic *Entamoeba histolytica*. *J Infect Dis, 156*: 334-342 (1987).

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Grimwood, K., Coakley, J.C., Hudson, I.L., Bishop, R.F. & **Barnes, G.L.** Serum aspartate aminotransferase levels after rotavirus gastroenteritis. *J Pediatr, 112*: 597-600 (1988).

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1989

Bhan, M.K., Bhandari, N., Sazawal, S., Clemens, J., Raj, P., Levine, M.M. & Kaper, J.B. Descriptive epidemiology of persistent diarrhoea among young children in rural northern India. *Bull World Health Organization, 67*: 281-288 (1989).

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[1] Including all known publications since the Seventh Programme Report.

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McConnell, M.M. & Rowe, B. Prevalence of the putative colonization factors CFA/III and PCF0159:H4 in enterotoxigenic *Escherichia coli*. *J Infect Dis, 159*: 582-586 (1989).

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Publications arising out of research supported by the Regional Offices

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Annex 4

WHO Collaborating Centres working with the Programme

Australia:	WHO Collaborating Centre for Research on Human Rotaviruses Department of Gastroenterology Royal Children's Hospital Flemington Road Parkville, Victoria 3052
Bangladesh:	WHO Collaborating Centre for Research, Training and Control in Diarrhoeal Diseases International Centre for Diarrhoeal Disease Research, Bangladesh G.P.O. Box 128 Dhaka 100
Belgium:	Centre Collaborateur de l'OMS pour le Campylobacter entérique Hôpital St Pierre Rue Haute 322 1000 Bruxelles
Denmark:	WHO Collaborating Centre for Reference and Research on Escherichia and Klebsiella Statens Seruminstitut Amager Boulevard 80 DK 2300 Copenhagen S
France:	Centre collaborateur OMS de Référence et de Recherche pour les Salmonellae Institut Pasteur 25, rue du Dr Roux 75015 Paris
Hungary:	WHO Collaborating Centre for Reference and Research on Bacterial Vaccines "Human" Institute for Sero-bacteriological Production and Research 1107 Budapest
India:	WHO Collaborating Centre for Diarrhoeal Diseases Research and Training National Institute of Cholera and Enteric Diseases P-33, CIT Road Scheme XM Beliaghata P.O. Box - 177 Calcutta 700 016
United Kingdom:	WHO Collaborating Centre for Phage-typing and Resistance of Enterobacteria Central Public Health Laboratory Colindale Avenue London NW9 5HT
	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 WC1E 7HT
United States:	WHO Collaborating Centre for Shigella Division of Bacterial Diseases Center for Infectious Diseases Centers for Disease Control Atlanta, GA 30333

Annex 5

New publications and documents

Health services

National programme reports

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Annex 6

Financial status 1978-1991

Table 1

Resources received by the Programme, 1978-1991

SOURCE	1978-1985	1986-1987	1988-1989	1990-1991
REGULAR BUDGET	US$	US$	US$	US$
Global and Interregional	2 948 454	979 951	1 090 897	1 203 888
Regions	4 631 457	1 419 610	1 812 133	1 724 583
TOTAL REGULAR BUDGET	7 579 911	2 399 561	2 903 030	2 928 471
OTHER SOURCES				
Australia	700 877	268 442	418 665	505 570
Belgium	163 916	24 390		
Canada (CIDA)	856 100	441 088	501 536	213 109
China	100 000	50 000	50 000	50 000
Denmark (DANIDA)	1 969 513	1 241 628	1 294 292	770 826
Finland	402 050	727 049	940 797	1 204 948
France	139 000	90 833	97 984	664 070
India	60 000	40 000		
Italy		101 062	632 830	245 009
Japan	425 000	300 000	300 000	150 000
Kuwait	10 000			
Morocco	7 475			
Netherlands	1 855 433	910 617	971 829	1 170 641
Nigeria	6 680			
Norway	189 884	276 507	299 406	1 780 980
Sweden (SIDA/SAREC)	3 256 809	1 139 690	945 354	949 079
Switzerland	1 101 732	901 108	520 833	1 729 685
United Kingdom	1 019 380	330 320	1 200 977	1 653 775
United States of America	1 574 300	3 200 000	2 153 450	2 076 223
Pan American Health Organization	49 695			
United Nations Children's Fund	1 734 238	866 945	705 837	771 973
United Nations Development Programme	7 546 111	2 177 004	2 055 500	3 143 659

Table 1 continued

Resources received by the Programme, 1978-1991

SOURCE	1978-1985	1986-1987	1988-1989	1990-1991
	US$	US$	US$	US$
Arab Gulf Programme for United Nations Development Organizations (AGFUND)	2 500 000		1 000 000	
International Development Research Centre (Canada)	754 291	162 016	184 594	
Rotary International		5 000		
Sasakawa Health Trust Fund	56 135	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	5 640	549	800	154
Interest	1 624 035	717 490	1 059 760	963 390
TOTAL OTHER SOURCES	29 653 567	17 307 192	17 985 414	18 043 091
TOTAL	37 233 478	19 706 753	20 888 444	20 971 562

Table 2

Actual obligations incurred in 1988-1989, estimated obligations for 1990-1991 (budget), and actual obligations for 1990-1991

Programme Component	Actual obligations 1988-1989	Estimated obligations 1990-1991	Actual obligations 1990-1991	
	US$	US$	US$	%
I. ADVISORY AND MANAGEMENT MEETINGS				
Global and interregional	170 063	180 000	182 575	0.9
II. HEALTH SERVICES				
Global and interregional	3 395 454	4 540 000	4 318 768	20.7
Regional	9 294 352	11 544 000	10 048 478	48.1
Sub-total	12 689 806	16 084 000	14 367 246	68.7
III. RESEARCH				
Global and interregional	6 882 227	5 645 000	4 240 044	20.3
IV. PROGRAMME MANAGEMENT AND SUPPORT				
Global and interregional	1 340 171	2 177 000	2 120 515	10.1
TOTAL				
Global and interregional	11 787 915	12 542 000	10 861 902	51.9
Regional	9 294 352	11 544 000	10 048 478	48.1
TOTAL	21 082 267	24 086 000	20 910 380	100.0

Table 3

Health services

Programme area	Actual obligations 1988-1989	Estimated obligations 1990-1991	Actual obligations 1990-1991	
Global and Interregional	US$	US$	US$	%
PLANNING, EVALUATION, AND COORDINATION				
Coordination				
(a) Staff salaries and related costs	1 159 395	1 746 000	1 809 578	8.7
(b) Other*	585 258	1 000 000	974 607	4.7
Strategies for prevention	15 505	60 000	82 031	0.4
Oral Rehydration Salts				
(a) production	14 547	18 000	5 979	0.0
(b) stock	3 410	12 000	486	0.0
Evaluation				
(a) comprehensive programme reviews	0	8 000	0	0.0
(b) management information system	60 047	60 000	0	0.0
(c) survey development	226 869	200 000	351 037	1.7
Cholera control activities	0	0	67 133	0.3
Miscellaneous	6 319	16 000	(7 171)	0.0
Sub-total	2 071 350	3 120 000	3 283 680	15.7
DEVELOPMENT OF TRAINING AND EDUCATIONAL MATERIALS				
Development of new materials	847 281	600 000	536 046	2.6
Communications activities	23 601	250 000	18 406	0.1
Modifications of management training	54 809	20 000	0	0.0
Sub-total	925 691	870 000	554 452	2.7
TRAINING COURSES				
Courses and materials	398 413	400 000	406 015	1.9
Testing new and revised courses	0	150 000	74 621	0.4
Sub-total	398 413	550 000	480 636	2.3
Total global and interregional	3 395 454	4 540 000	4 318 768	20.7
Regional				
Planning	217 474	363 000	248 703	1.2
Operations	4 963 260	5 442 000	5 747 302	27.5
Training	3 425 540	4 763 000	3 115 882	14.9
Evaluation	688 078	976 000	936 591	4.5
Total regional	9 294 352	11 544 000	10 048 478	48.1
TOTAL HEALTH SERVICES	12 689 806	16 084 000	14 367 246	68.7

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

Table 4

Research

Programme area	Actual obligations 1988-1989	Estimated obligations 1990-1991	Actual obligations 1990-1991	
	US$	US$	US$	%
COORDINATION				
Staff salaries and related costs	1 284 494	1 202 000	1 185 378	5.7
Other*	237 945	120 000	92 901	0.4
Sub-total	1 522 439	1 322 000	1 278 279	6.1
IMMUNOLOGY, MICROBIOLOGY, AND VACCINE DEVELOPMENT (IMV)				
Contracts	1 699 122	550 000	318 760	1.5
Other*	285 697	150 000	177 772	0.9
Sub-total	1 984 819	700 000	496 532	2.4
CASE MANAGEMENT (CMT)				
Contracts	1 167 779	1 150 000	1 026 183	4.9
Other*	339 345	150 000	67 846	0.3
Sub-total	1 507 124	1 300 000	1 094 029	5.2
EPIDEMIOLOGY AND DISEASE PREVENTION (EDP)				
Contracts	1 262 684	1 600 000	935 192	4.5
Other*	508 865	173 000	125 913	0.6
Sub-total	1 771 549	1 773 000	1 061 105	5.1
IMPLEMENTATION (IMP)				
Contracts	0	450 000	258 772	1.2
Other*	96 296	100 000	51 327	0.2
Sub-total	96 296	550 000	310 099	1.5
TOTAL RESEARCH	6 882 227	5 645 000	4 240 044	20.3

*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 1988-1989	Estimated obligations 1990-1991	Actual obligations 1990-1991	
	US$	US$	US$	%
Staff salaries and related costs	796 561	1 196 000	1 288 021	6.2
Other*	543 610	981 000	832 494	4.0
TOTAL	1 340 171	2 177 000	2 120 515	10.1

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