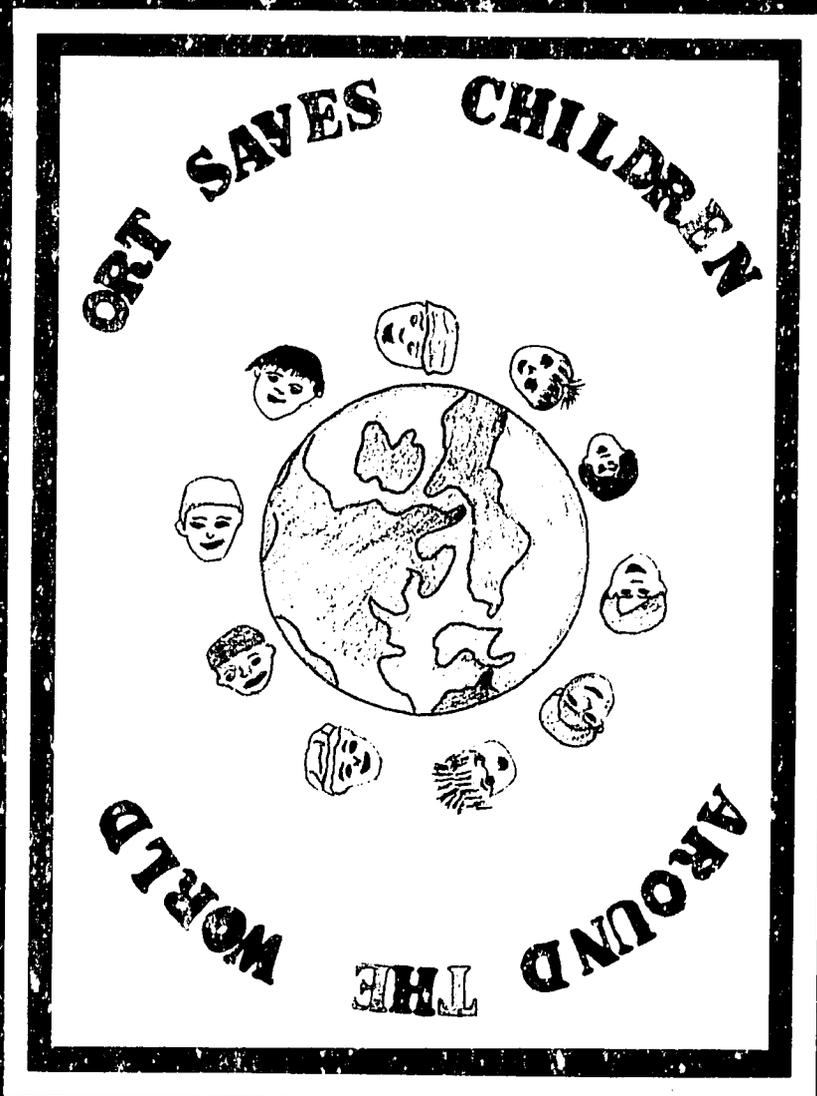


ICORT II PROCEEDINGS



Second International Conference
on Oral Rehydration Therapy

REPORT II

PROCEEDINGS

Prepared for the
Agency for International Development
Office of Health
Bureau of Science and Technology

**Second International Conference
on Oral Rehydration Therapy**

December 10-13, 1985
Washington, DC

Sponsored by
The U.S. Agency for International Development (USAID)
in cooperation with
The International Centre for Diarrhoeal Disease Research/Bangladesh (ICDDR/B),
The United Nations Children's Fund (UNICEF),
The United Nations Development Programme (UNDP),
The World Bank, and
The World Health Organization (WHO)

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FOREWORD

As Administrator of the Agency for International Development, it was a great privilege for me to host the Second International Conference on Oral Rehydration Therapy (ICORT II), held December 10-13, 1985. This conference was sponsored by AID in cooperation with the International Centre for Diarrhoeal Disease Research/Bangladesh (ICDDR/B), the United Nations Children's Fund (UNICEF), the United Nations Development Programme (UNDP), the World Bank, and the World Health Organization (WHO).

At the first ICORT conference two years earlier, I called upon the governments of developing countries, other international donors, and private groups around the world to join the United States in an effort to attain near universal availability of oral rehydration therapy within ten years. ICORT II demonstrated the commitment each of you has made toward that goal. The conference high-

lighted the successes you have achieved and identified ways to overcome major barriers to implementing programs in the field.

At ICORT II, we renewed our pledge to make oral rehydration therapy universally available. It is now up to all of us—health workers, program managers, developing countries, private organizations, donor countries, and international organizations—to work individually and collectively to make ORT universally available and to close the gap between ORT availability and effective use.

Together, through this important health program, we can improve the quality of life in the world.

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ACKNOWLEDGEMENTS

In the year since some 1,200 international participants from nearly 100 countries arrived in Washington, D.C., for the Second International Conference on Oral Rehydration Therapy (ICORT II), all of us have had a chance to reflect on the conference and its outcome.

We believe that ICORT II accomplished much. We heard from international leaders about economic development and health policy directions as well as renowned international experts on the new developments in oral rehydration technology. We shared experiences in implementing programs as well as lessons learned from these efforts. We discussed issues and strategies for meeting future needs. Most importantly, we committed ourselves to targets and goals for the next years. These are major achievements and ones we should be proud of.

The success of ICORT II could not have been achieved without the active participation of many people, especially those who—over the course of the preceding year—planned, coordinated, and organized the conference. First, we had strong leadership from AID Administrator Mr. M. Peter McPherson. Six international organizations actively participated in ICORT II planning sessions, funded international participants, and made presentations at the conference. Special thanks must go to the leaders and staff of the International Centre for Diarrhoeal Disease Research/Bangladesh, the United Nations Children's Fund, the United Nations

Development Programme, the World Bank, and the World Health Organization, for it was those organizations that made possible the extensive participation of so many countries in ICORT II. Members of the Technical Advisory Committee—both as a group and individually—provided valuable advice regarding not only the overall design of the conference, but also speakers and essential international donor and developing country participation.

An important feature of the conference was the series of panels on major implementation topics. Panel participants spent two days in Washington prior to the meeting to discuss these topics and the format for presentation. Facilitators and individual panel members contributed to these discussions and then designed formats for their respective sessions.

Creativity in information exchange was clearly evident in the country posters. The quality of these posters as well as their number (over 60) is a tribute to the dedication and imagination of the country diarrheal disease program managers and staff who pulled together valuable information and skillfully displayed it at the conference.

AID staff who deserve special recognition are: Dr. Ann Van Dusen for her leadership and support at many critical moments during the planning; Mrs. Anne Tinker for providing guidance and assistance throughout the entire year of planning and conducting the conference; Dr. Carl Kendall,

chairperson of the Technical Advisory Committee; Mr. Robert Clay for his day-to-day liaison with everyone else while serving as the focal point for technical review and guidance, organization, donor coordination, information dissemination, and the myriad other tasks associated with designing and carrying out a successful international conference.

The excellent logistical support was due to the hard work of staff at Creative Associates. Special mention must go to Ms. Linda Ladislaus-Sanei for her key role in assuring the success of the conference. Many others were also involved. Special thanks are due those who gave the key state-of-the-art presentations; the staffs at USAID Missions, UNICEF country offices, WHO regional offices, the World Bank, and various project contractors, as well as staff and volunteers from the many private voluntary organizations that assisted in making arrangements for participants and poster development. We appreciate all of your efforts.

Finally, this acknowledgement would be incomplete without giving recognition to the millions of

committed people around the world who are carrying out the day-to-day tasks of controlling diarrheal disease in each country. These include millions of government health workers, pharmacists, administrators, community volunteers, and, most importantly, mothers and children. They are the foundation for all the work that has been done and remains to be done. It is indeed fitting that the ICORT II Proceedings should feature on its cover the hopes of our effort as seen by a child. If we remain committed to this vision, we will surely succeed in our efforts.

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PROLOGUE

Oral rehydration therapy (ORT) is recognized now, as it was in 1983 at the time of the first International Conference on Oral Rehydration Therapy (ICORT I), as a powerful, effective intervention to reduce the high childhood mortality due to diarrhea. Prior to ICORT I, 38 countries had initiated national programs to control diarrheal diseases, yet many countries with high rates of diarrheal mortality still did not have such programs. Thus, ICORT I was largely promotional, with a focus on the technical aspects of ORT and on its successful applications. Much has happened in the two-and-one-half years between ICORT I and ICORT II.

By the end of 1985, at the time of ICORT II, 104 developing countries, with an estimated 98 percent of the total world population in need, had developed plans for national Diarrheal Disease Control Programs. Eighty of these countries had overcome the difficulties of moving from planning to actual implementation. Other countries still faced these initial difficulties, including failure to set priorities appropriately, inability or unwillingness to allocate sufficient financial resources, and inattention to adequate ministerial-level coordination. Yet, most countries had successfully begun to implement Diarrheal Disease Control Programs and many had years of experience to share at ICORT II. This experience was sufficient to further document the importance of ORT for reducing diarrheal mortality

and for improving the growth of children. This experience also demonstrated the important role effective ORT programs can have in building the commitment to primary health care and in developing the infrastructure needed to deliver health services to the community. Some striking successes were described in the plenary presentations, in the country poster sessions, and in informal discussions.

Experience in implementing programs also identified some common shortcomings in areas such as logistics, training, supervision, communications, community participation, integration with other health activities, and evaluation. The recognition of these common problems allowed ICORT II to provide a forum for discussing ways to overcome them. Panel sessions, with international panelists and an actively participating audience, provided an invaluable opportunity for the 1,200 persons from over 100 countries to share their observations and strategies for conducting programs.

By the time of ICORT II, appropriate feeding during diarrhea was recognized as a critical component of ORT, in addition to adequate fluid and electrolyte replacement. Optimal dietary management was found to be relevant for recovery from the acute episode and also for prevention of nutritional deterioration due to the numerous diarrheal episodes suffered by developing country children. Such dietary strategies may be even more

critical in populations where children already have an inadequate or marginal diet. Presentations in the plenary session and in the clinical management seminar dealt with the close linkage between diarrhea and nutrition and reiterated a consensus that "diarrhea is a nutritional disease, and dietary therapy is an important component to management."

The oral rehydration solution itself has had some changes in the last several years. Trisodium citrate has been substituted for sodium bicarbonate, to simplify packaging and improve the product shelf life. Other modifications, like the addition of amino acids or peptides to glucose or even the use of rice or other cereal powders for preparing the solutions, offer the exciting prospects of a solution that can reduce stool volume, fluid requirements, and diarrheal duration. Before the application of such solutions in national Diarrheal Disease Control Programs, additional studies are needed to determine what type of solutions and what feeding during diarrhea will best optimize the replacement of fluids and nutrients.

With renewed hope that ORT could substantially reduce childhood mortality related to diarrheal dehydration and improve nutritional status of developing country children, ICORT II participants could also turn their attention to future priorities for Diarrheal Disease Control Programs. Prolonged and inflammatory, non-dehydrating diarrheas continue to be important causes of mortality and their effective management will need to be accomplished to achieve optimal reduction of diarrhea-

associated mortality. Furthermore, even with effective case management efforts, high rates of diarrheal morbidity will continue until effective preventive strategies can be implemented. These strategies, such as improved domestic hygiene and use of new vaccines for enteric diseases, when combined with ORT provide even more powerful means to reduce the burden of diarrheal diseases in developing countries.

ICORT II demonstrated the consensus that exists among the international development agencies and developing country health professionals that diarrheal diseases constitute a serious problem and that effective programs to control that problem must be implemented now. The commitments previously made and reaffirmed at ICORT II by the Agency for International Development, the International Centre for Diarrhoeal Disease Research, Bangladesh, the United Nations Children's Fund, the United Nations Development Programme, the World Bank, and the World Health Organization to assist these efforts will undoubtedly help. However, the commitment made by health professionals and governments of developing countries is the crucial element and it was this commitment above all that was so obvious at ICORT II.

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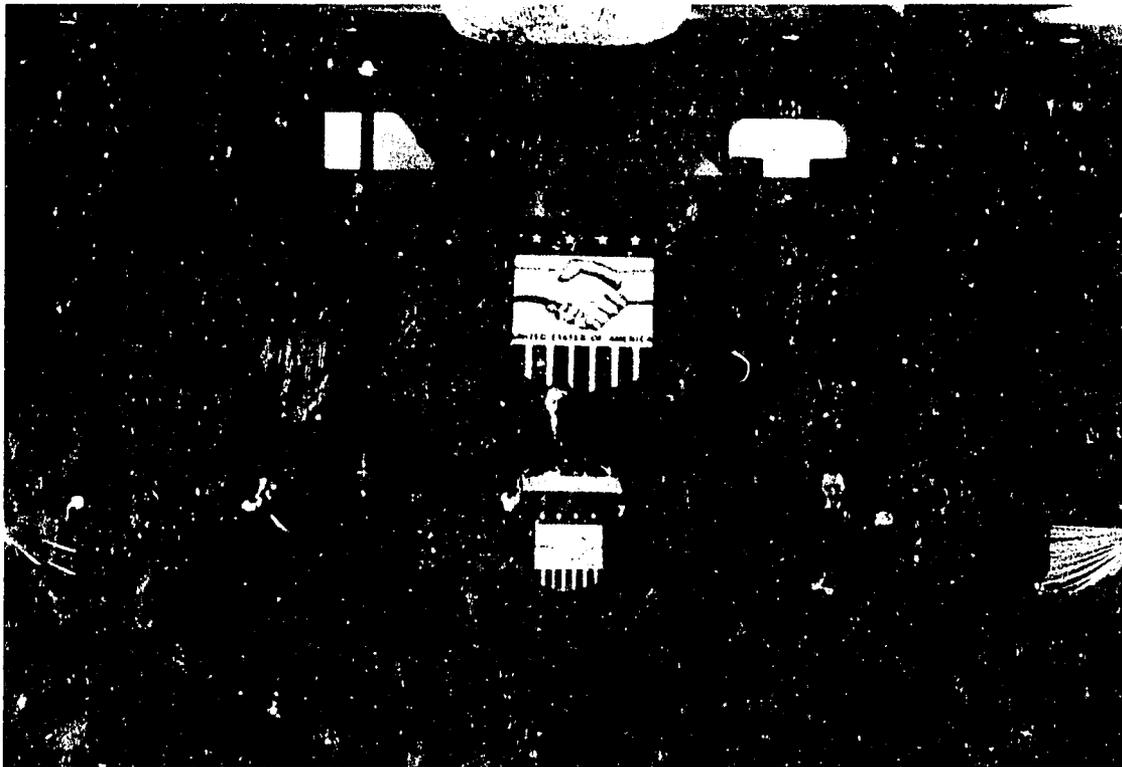
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1.

Inaugural Session



Inaugural Session Welcoming Address: Mr. M. Peter McPherson, AID. On the podium (from left to right): Mr. James Grant, UNICEF; Mr. Bradford Morse, UNDP; Dr. Mamdouh Gabr, Cairo University, Keynote; Mr. McPherson; Dr. Nyle C. Brady, AID; Dr. Halldan Mahler, WHO; Dr. Roger Eeckels, ICDDR/B; and Mr. John North, World Bank. Photo by Frank Nesbitt.

WELCOMING ADDRESS

MR. M. PETER MCPHERSON

Administrator

Agency for International Development (AID)

Washington, D.C., USA

I am pleased to officially open the Second International Conference on Oral Rehydration Therapy or ICORT II. Let me welcome you to the U.S. Capital and to a week of productive talks and discussions.

This conference is truly a major international event. Close to twelve hundred people representing nearly one hundred countries are here tonight. We are gathered to learn more about ways to save an estimated five million children who die every year from diarrhea. Over the last few years we have seen growing interest in this problem. We have seen increased appreciation of the effective treatment that can save millions of these lives—oral rehydration therapy (ORT).

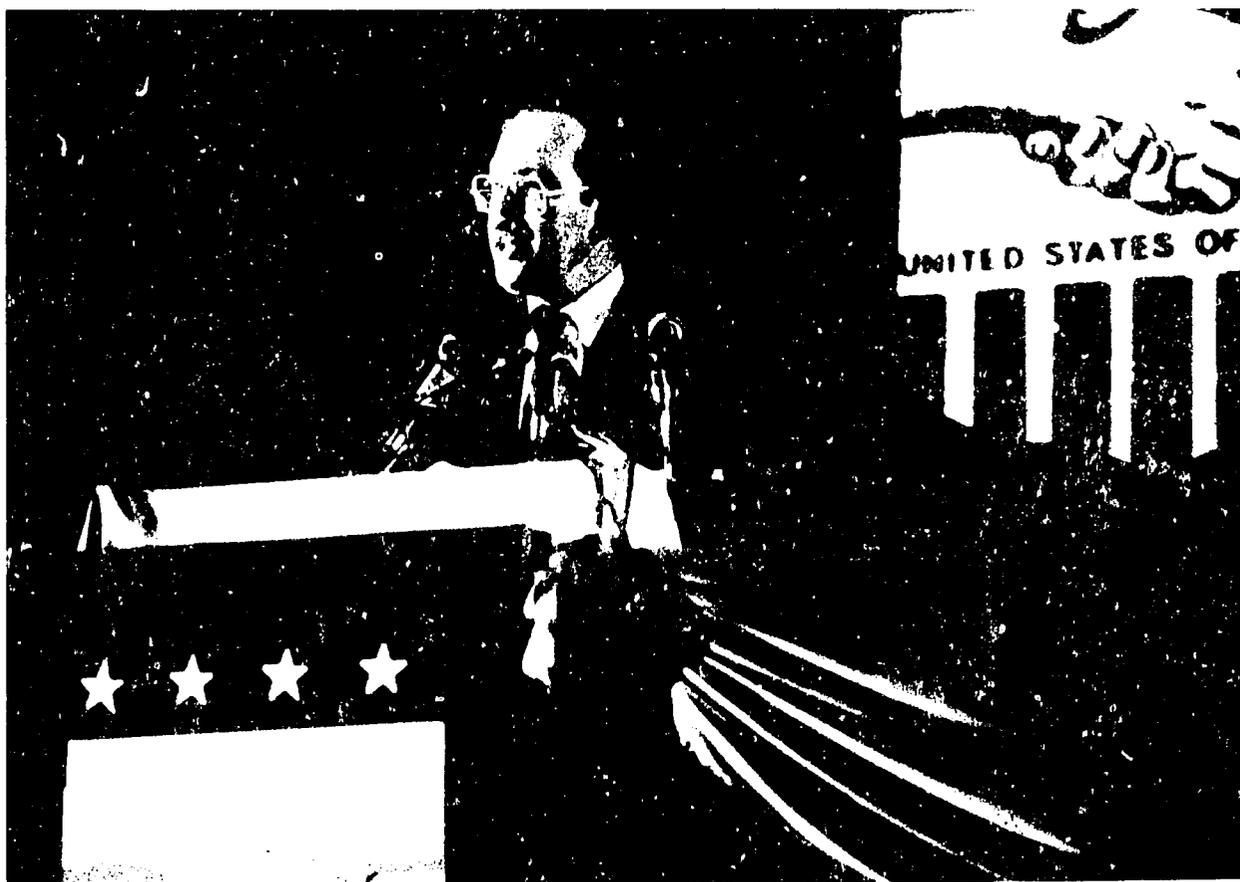
It was just two-and-one-half years ago that the first ICORT was held. My participation in that con-

ference and subsequent discussions with scientists and leaders from around the world have strengthened my conviction that we *can* and *should* increase our support for ORT.

This technology can be administered in hospitals, clinics, communities, and in homes. It is safe, effective, and inexpensive. Most importantly, it can save millions of lives.

At ICORT I, I read a statement to the governments and peoples of the world. I would like to repeat and reflect on that statement again today. In 1983 I called upon governments in developing countries, donors, and private groups around the world to increase their efforts to save children's lives through this therapy. We wish all to feel our sense of urgency, our sense that we can save millions of children.

My statement continued: "To that end, we ask the world community, and we pledge our efforts, to make substantial progress to having this therapy widely available within five years. We challenge each developing country government to deter-



Mr. M. Peter McPherson, AID. Photo by Pat Lanza Field.

mine specific goals for ORT use in their land. World-wide doubling of the use of ORT each year for the next five years is a reasonable goal. . . . Further, we ask the world community, and we pledge ourselves to the effort, to attain near universal availability of the therapy within ten years. These are practical goals—goals that must be achieved.”

These were the goals we laid out in June 1983. I know that you are as pleased as I am that significant progress has been made worldwide over the past years.

- ORT is now widely recognized as appropriate and desirable at all levels of the health system.
- Many countries have developed policies and plans to address the diarrhea problem.
- Mothers are now regarded as key to the treatment of diarrhea.
- There is agreement that integrated communication channels, such as face-to-face, print, and radio and television, are necessary to promote ORT messages.

Within AID, financial support for ORT has been considerably increased since the 1983 conference. With strong Congressional support, our commitment for ORT exceeded \$45 million in fiscal year 1985. That is almost triple our funding of 1983. This funding has made it possible for AID to assist over 50 countries in the development of their ORT programs.

I said in my Closing Remarks at ICORT I that AID was prepared to undertake five specific tasks in the effort to make ORT widely available. These were:

1. To continue our long standing support of research on diarrhea.
2. To include ORT to the maximum extent possible through our primary health care programs worldwide.
3. To report on the findings of ICORT I and to urge our representatives abroad to seek new opportunities to strengthen ORT efforts.
4. To launch the Primary Health Care Technologies Project (PRITECH) to assist in the development of new worldwide programs.
5. To develop a collaborative program with the Peace Corps to promote ORT at the community level.

Not only has AID fulfilled these pledges, but we are actively pursuing many new avenues in order to further expand the availability and use of ORT. Let me highlight a few of these areas for you.

AID believes that each country needs a sound and feasible national strategy to control diarrheal diseases. Through the AID-funded PRITECH project, we have assisted over 27 countries in developing these critical plans. We have also provided essential technical assistance to governments and private organizations for their implementation. We have coordinated this work closely with other donor agencies, many of whose representatives are seated here on the podium tonight.

We have continued and expanded our innovative activities in ORT communication and social marketing. We regard this as a top priority for the future. The AID-supported Communication for Child Survival or HEALTHCOM project, launched on the heels of our successful project for Mass Media and Health Practices, will expand our understanding in this area to new countries and new types of environments.

Innovative radio and television programs are combined in this project with graphic approaches to spread the message of ORT. In this way, large populations may be reached effectively at very low cost. Evaluations from Stanford University show that in one project area in Honduras, diarrhea-related deaths in children under five dropped from 40 percent to 24 percent during the first two-year period.

In The Gambia, West Africa, less than 1 percent of mothers had correct knowledge of how to prepare a sugar/salt solution. After the two-year project, more than 70 percent of mothers knew how to mix the sugar/salt solution correctly.

AID believes that, where feasible, production of oral rehydration salts (ORS) should be carried out in the developing countries. One of the accomplishments in the ORT field these past few years has been just such a shift of ORS production from developed to developing country. In fact, in 1985, for the first time, developing countries will become the world's largest supplier of ORS. To support this trend, AID has launched a new project, called SUPPORT or Supply, Production and Promotion of ORT. It will provide loans and technical assistance for domestic private sector companies so they can produce ORS locally. We also use marketing expertise to assist in pricing, advertising, and improving the distribution system. During this past year alone, the U.S. government provided over 7 million ORS packets for use in developing countries.

AID is proud to have been a major supporter of basic and applied research in the field of diarrhea. Through the Primary Health Care Operations Research Project (PRICOR) we support numerous research activities into the actual operation of ORT programs. We have supported the International Centre for Diarrhoeal Disease Research in Bang-

ladesh since its inception. We also contribute directly to many research projects that are funded through the World Health Organization (WHO) and various American universities. To complement these efforts, we have launched the Applied Diarrheal Disease Research Project (ADDR), which supports collaborative biomedical and behavioral diarrheal disease research in developing country institutions.

Over this period we have broadened our research attention to the critical question of "What after rehydration?" A new AID project, Dietary Management of Diarrhea, will examine the important questions of nutrition during and after diarrhea. It should provide critical data and field experience for all programs.

As a former Peace Corps Volunteer, I have personally experienced the value of community-level programs. I am very pleased that AID and the Peace Corps have developed three new projects to support volunteer activities in ORT. These projects provide training materials, workshops and conferences, technical assistance, and even small grants to assist volunteers, so they can develop ORT activities in their host country.

Also, as suggested at ICORT I, we have helped organize regional workshops in Africa and Asia. These workshops gave national leaders an opportunity to share experiences with each other in small group settings and helped stimulate further interest in ORT. We will be supporting similar workshops in the Near East in 1986.

Information about ORT is now reaching more countries and people than ever before. We are pleased to join UNICEF and WHO in the support of the newsletter, *Dialogue on Diarrhoea*. With AID support, the newsletter has increased circulation to 100,000 readers. That's a 500 percent increase in one year. This publication now has one of the largest circulations of newsletters in the world. We have also supported numerous tapes, films, and other publications so the ORT message can be widely disseminated.

In 1985, AID launched the Child Survival Action Program. This effort has greatly increased the resources available to our projects. It has also expanded the role that private volunteer agencies will play in ORT.

In a few minutes, you will be hearing from our keynote speaker, Dr. Mamdouh Gabr, about the remarkable success of the ORT project in Egypt. This project is one of the most comprehensive of those supported by AID and has provided us with many important lessons. We all look forward to hearing more about this exciting program and its excellent outcomes. I commend Dr. Gabr for his early support and valuable work that helped make

this joint Egypt/AID effort so successful.

These are a few of AID's activities and accomplishments in the field of ORT. I'm sure the other cooperating agency representatives on this podium and many of you in our audience have similar stories to tell.

The facts are clear—governments, donors, private groups, and the people of the world have felt the sense of urgency at ICORT I . . . the sense that we can save millions of children. However, we are still far from total success. There continue to be many children who die because they do not have access to this technology or who do not receive proper ORT treatment.

Although global usage rates have risen over the past several years, they remain below 4 percent and worldwide access rates are estimated at roughly 33 percent. We pledge our continued support of efforts to make ORT universal in the next ten years. As with any development program, we face many barriers and constraints in achieving our goals.

As we prepare to spend the next three days discussing ways to overcome implementation problems in ORT programs, I would like you to keep several critical questions in mind.

- How do we get beyond the current low worldwide levels of ORT access and actual use?
- What is the best means to get this simple, effective technology into the homes of those who need it most?
- When ORT is accessible, how do we ensure effective use?
- How do we draw on the potential and talents of the private sector to complement those in the public domain?
- How do we integrate ORT efforts with related primary health care activities such as sanitation and nutrition?
- How do we institutionalize these efforts so that successes will be long lasting rather than short term?
- How can governments and the donor agencies represented here best work together to achieve these goals?

These are all difficult questions. But they *must* be addressed and their answers tested against our real world experiences. The goal of universal ORT coverage presents a complexity of problems that must be met with realistic and practical solutions.

I'm pleased to see some special friends of ours here today. They are the fourth, fifth, and sixth grade students at the Glencarlyn Elementary School in

Arlington, Virginia. Glencarlyn School has been "adopted" by AID as part of the Administration's "Adopt A School" program. These youngsters have been learning about oral rehydration therapy from AID scientists and health officers who have visited their school. Following their briefing, the students prepared posters about ORT. Their work is being displayed around the conference center. I'd like to have the students stand up for a moment so we can all see who you are.

During this conference, AID will be assessing our strategy to promote ORT over the next five years and we stand willing and able to help provide

leadership in this effort.

We in this room are very much aware of the major work that remains to be done. This is a key reason why AID and the other five cooperating agencies agreed to convene this meeting. Though each country must develop its own strategy and solutions for its individual problems, we recognize that an international forum is needed—needed for ORT implementers to share their experiences and discuss ways to overcome the major barriers to implementing programs in this field.

I wish you the best of luck for a productive and successful conference.

OPENING ADDRESS

DR. HALFDAN MAHLER

Director-General

World Health Organization (WHO)

Geneva, Switzerland

It is an honor and privilege for me to again be invited to participate in an international conference that is concerned with one of the most important public health problems facing the developing world today. There can be no doubt in any of our minds that the diarrheal diseases are one of the main killers of the cherished infants and young children in the developing countries. They are also a major contributor to malnutrition and have an undeniably negative effect on the quality of life of both the young and their parents, who must provide their care and are also so often themselves afflicted that they cannot reach their economic and intellectual potential. Since you last met some two-and-one-half years ago, we have seen, especially on the African continent, the devastating, catastrophic, and synergistic effect that diarrhea and malnutrition can inflict on those who do not have the bare necessities of life.

Last time we met I dwelt at some length on the proper place of oral rehydration therapy in any scheme for diarrheal disease control through the pursuit of a broader strategy for health development that forms part of socioeconomic development. Such a global strategy to achieve "Health for All" has recently been reaffirmed by the Member States of the World Health Organization. Again they have strongly advocated that control of diarrheal diseases—or for that matter almost all health problems—requires a combination of social action and infrastructural development starting with primary health care and use of appropriate and affordable technologies. It also requires multise-

ctoral action and more specifically the combined action of the health sector with those sectors involved in education, rural or urban development, and water resource development.

I continue to see no other way to approach health development, especially during these difficult economic times and in an era when more money is spent by many countries in one day on arms than in a full year on health. When our dollars are marginal, we must focus our energies on those actions that will help relieve the suffering of the vast majority of persons living in developing countries who know so well poverty and disease—both old and new—and as a result often produce more children to provide them with economic security, only to find themselves poorer than before. I repeat here my conviction that the developing countries can break out of this poverty equilibrium through improvements in health of their people, at a cost they can afford, if they receive appropriate and enlightened support from the international community. By this I mean support that allows the developing countries *themselves* to strengthen their own economies and guarantee their own social development.

The topic of this conference is highly relevant to the implementation of this global strategy. As more and more countries are gaining experience in oral rehydration therapy, its potential contribution to overall primary health care has become apparent. Nothing can be of greater concern to a mother than her child who is ill with diarrhea and vomiting, refuses to eat, has lost weight, and is not able to smile or play. When she uses oral therapy as she has been taught by a health worker, and within a mere four to six hours sees her child return to much of his or her normal self, she gains confidence in the health system. This curative action opens the

way for the mother to be convinced of other important measures for diarrheal disease control—about the importance of continued breastfeeding, preparation of hygienic, locally available weaning foods, using clean water and latrines, washing her hands, and bringing her infant for immunizations, especially against measles. It makes her more receptive to guidance on the action she needs to take for her child with a respiratory infection or high fever from malaria and gives her confidence that her child *will* survive. And it convinces her that she can take action to stop herself from having more.

This curative action also gives mothers and other family members confidence in *their* ability to care for themselves. One of the unique qualities of oral rehydration therapy as an intervention is that it can be initiated at home by families. It is also families themselves who must recognize when their child needs oral rehydration salts or other care from community health workers. Can you think of any better way to mobilize communities to participate in their care, or to inspire new confidence in a population that has been disillusioned by the inability of its health care system to successfully overcome the illness and death to which it has become unfortunately so accustomed?

This curative action also links the treatment of disease and the need for good nutrition. As children who are malnourished are more susceptible to death from diarrhea and other illness, it is critical to identify ways to prevent such malnutrition from occurring. While scarcity of food is a major contributor to malnutrition in some areas, especially during drought and famine, an important cause of malnutrition in many countries is the withholding of food from children with diarrhea by family members, often upon the advice of health workers. Oral rehydration therapy in the total sense must not only be the giving of rehydration fluids to prevent or correct dehydration but also—and equally—the administration of locally available, easily digestible foods in quantities greater than normal during and especially immediately after the diarrheal episode.

The successful implementation of diarrheal disease control programs is the challenge that many of you in this room are facing. And a difficult challenge it is in the face of reduced health budgets, new diseases, natural disasters, and armed conflicts. Under these types of circumstances, it is clear that the mere distribution of oral rehydration salts or catchy advertisements on the radio will be insufficient to ensure program success. Oral rehydration therapy can significantly reduce diarrhea mortality, improve nutritional status, and dramatically reduce the costs to the health system for treating diarrhea, but only if it is used correctly.

And such use requires sound program planning, careful attention to program management, due emphasis on monitoring and supervision, and practical evaluation. There are no “magic bullets” or short cuts. Successful delivery of oral rehydration therapy requires implementation of training, supervisory, logistical, and educational activities in a manner that will ensure its long-term benefit for the population.

Proper use of ORT and application of other diarrheal control strategies also require sound operational research. By this I mean research that is undertaken in countries by *national* institutes and scientists in collaboration with those responsible for implementation of health services activities. Those of us in the international community who are supporting such research must accelerate efforts to strengthen the capabilities of national institutes so they can undertake the necessary studies. There is also the need for more fundamental research to develop more effective rehydration solutions that can cut down on diarrheal losses and to identify those nutrients that are best absorbed during and after diarrhea.

We must also pursue intervention-oriented research to examine the impact of other health interventions—such as vitamin A distribution—on diarrheal mortality and morbidity, and pursue innovative ways to prevent shigellosis, a disease that is continuing to spread in its intensity and virulence. Hopefully, our biotechnologists will develop a vaccine to prevent this disease as well as rotavirus diarrhea, and improved vaccines against cholera and typhoid fever, though let us remember that their use can only be ensured through development of adequate health infrastructure and logistical systems. Please note that the research I am advocating is research that is highly relevant to the needs of countries and will provide tools that can be delivered through the primary health care approach.

Your diligent efforts to implement national diarrheal disease control programs *are* paying off. After only a mere five years, more than one-third of the young children in developing countries worldwide already have access to oral rehydration salts. Use of these salts may have saved at least 200,000 lives this year. In 40 of your countries you have had the courage to undertake program evaluations to identify not only your successes, but also your constraints and failures. Many of these reviews have shown how overall primary health care systems can be strengthened. These types of analytical, systematic, and critical efforts undertaken by countries themselves with their own resources are important milestones for achieving diarrheal disease control.

Recently, as a response to impatience with progress in the development of primary health care and searching for a means to mobilize political commitment and public action for health, campaign-style approaches have been used in some countries to accelerate a specific health intervention. Well, as far as WHO is concerned, its job is to work with countries so that *they* can obtain the information *they* need to determine which interventions and which strategies are most appropriate. I would add that the history of all international developmental efforts over the past three decades has shown that these too should support national efforts and on no account supplant them.

In different countries this package of appropriate interventions will vary—it may or may not focus *primarily* on immunization, malaria control, schis-

tosomiasis control, water and sanitation, essential drugs, child spacing, or diarrheal disease control. The decision to focus on only one of these, at the expense of other high priorities, is a national decision; WHO's role has been to provide objective information on the advantages and disadvantages of that approach in the light of experience.

For example, there are countries in Africa, Asia, and Latin America where diarrheal control activities have had to be delayed in order for staff to carry out immunization campaigns, when it has by no means been clear that this was the best choice.

Once such a choice is made, however, WHO's role also involves helping countries assess the ultimate impact and the cost of such a single-focus, short-duration approach as compared with the primary health care approach. Where campaign



(Left to right): Dr. Marndouh Gabr, Cairo University; Dr. Halfdan Mahler, WHO; Dr. Roger Eeckels, ICDDR B. Photo by Pat Lanza Field

approaches strengthen the health infrastructure, contribute to sustained improvements in coverage, and provide a basis for other primary health care interventions, they are promising. Without adequate medium- and long-term planning, however, such "Crusades" may weaken the infrastructure, raise expectations but not long-term coverage, and detract from other priority interventions and primary health care itself. That, I am afraid, is the stark reality of the weakness of health infrastructures in so many developing countries, and it is our duty to help strengthen them and in no way to contribute to weakening them further.

Please do not misunderstand me. I use immunization only as an example. I am the last person to want to delay the attainment of the goal of immunizing all the world's children by 1990. After all, that was a decision of the World Health Assembly. But it has to be achieved as part of national primary health care schemes so that there will be a permanent, strong health infrastructure in place to carry on immunization beyond 1990 and for as long as the epidemiological situation demands—possibly forever. My remarks apply to any other component of primary health care, including diarrheal disease control. Particular emphasis to any one program is acceptable if it really does act as an entry point to primary health care in general; it is not acceptable if it acts as an exit point from primary health care. Building blocks—yes! Stumbling blocks—no!

I am impatient too—I think we are all impatient—to see the health of the world improve as much and as quickly as possible. As I said to the World Health Assembly two-and-one-half years ago, I am

all for positive impatience that leads to better and speedier action along lines agreed to collectively in the Health Assembly; but I am all against negative impatience if it imposes fragmented action from above. As the famous American football coach Vince Lombardi said, "*Be quick, but don't hurry.*" The results I cited earlier show clearly that oral rehydration therapy *is* taking hold, using the primary health care approach. Highly publicized short-term campaigns have a role in this only where they contribute to the maintenance or creation of a long-term sustainable program. The strategies involved in short-term political mobilization often have little to do with the long-term health and well-being of the population.

I am well aware of the enormous commitment that the international community is making to diarrheal disease control—including bilateral agencies like the United States Agency for International Development, multinational agencies such as the United Nations Children's Fund, the United Nations Development Programme, the World Health Organization, and the World Bank, many non-governmental organizations such as the League of Red Cross and Red Crescent Societies, and research institutes like the International Centre for Diarrhoeal Disease Research in Bangladesh. My appeal is that all these bodies approach diarrheal disease control and oral rehydration therapy collectively and as agreed at Alma Ata and reaffirmed in Geneva last year—through primary health care. These bodies must use their resources to allow countries to move forward themselves by implementing programs that will contribute to better health and overall development.

KEYNOTE STATE OF THE ISSUES ADDRESS

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INTRODUCTION

Since most of us met two-and-one-half years ago at ICORT I, the use of oral rehydration therapy (ORT) has expanded throughout the world to more than 95 developing countries, with more than a four-fold increase in the production of oral rehydration packets, which should exceed 250 million by the end of 1985 (1, 2). Well-conducted surveys from several countries have shown that, by the end of

1983, 3 to 45 percent of diarrheal episodes were actually treated with oral rehydration salts (ORS), with an average of 4 percent (1). WHO's conservative estimate for the end of 1985 gives a minimal ORS use figure of 8 percent (2).

Reliable data on the impact of ORT on diarrhea mortality are now available from several countries (3a-k) both on the effect on infant and preschool child mortality, as well as on diarrhea-specific mortality, diarrhea hospital admissions, and deaths. (See Tables 1 and 2.) These promising data give us hope for the original WHO assumption that ORT can prevent 67 percent of deaths due to diarrhea (4).

The interaction between diarrhea and malnu-

TABLE 1
IMPACT OF ORAL REHYDRATION ON CHILD MORTALITY, TOTAL OR DIARRHEA-SPECIFIC, IN SEVERAL COUNTRIES

REF.	COUNTRY	MORTALITY ²	ORT ERA	CHILD MORTALITY ¹		
				AGES 0-1	AGES 0-2	AGES 0-5
Egypt:						
3a	Alexandria ³	T	Pre-ORT Post-ORT	(2477) (1397)		
3b	Rural ⁴	DS	Pre-ORT Post-ORT			15.0 0/00 7.6 0/00
3c	Honduras ⁵	DS	Pre-ORT Post-ORT	(47) (24)	(62) (33)	(82) (42)
3d	Gaza	DS	Gastroenteritis-associated fatalities below 3 years reduced by 35.6 percent in 1980 and by 53.2 percent in 1981 compared to 1977; ORT introduced in 1979.			
3e	Philippines	DS	Pre-ORT Post-ORT	— —	— —	2.1% 1.3%
3f	Colombia	DS	Pre-ORT Post-ORT	14.9% 6.3%	— —	5.6% 2.0%
3g	Papua New Guinea	DS	Pre-ORT Post-ORT	5.0% 3.9%	— —	3.3% 1.3%
3h	Tonga	T	Pre-ORT Post-ORT	— —	— —	(28) (1)

¹Number of deaths in parentheses; other figures are rates.

²T = Total Deaths; DS = Diarrhea-Specific Deaths.

³All registered deaths during diarrhea season, May-August, when 65 to 75 percent of deaths are due to diarrhea. Pre-ORT figures are for 1982. The program commenced in 1983. Post-ORT figures are for 1985.

⁴Deaths per 1000 children per 6 months, diarrhea-specific.

⁵Study looked at records in three counties of Honduras for child mortality figures, ages 0-5 years. Data classified in three ways: those deaths having nothing to do with diarrhea; those deaths directly resulting from diarrhea; and those deaths where diarrhea was involved in any way. Of the 370 cases registered, 206 deaths occurred in the two years before ORT intervention and 172 in the two years after ORT intervention (intervention commenced in March, 1981). Figures presented are those diarrhea-specific and diarrhea-related deaths.

TABLE 2
IMPACT OF ORAL REHYDRATION ON DIARRHEAL DISEASE IN HOSPITAL

REF.	COUNTRY	ORT ERA	DIARRHEA NUMBERS	ADMISSIONS RATE PERCENT	CASE FATALITY RATE PERCENT
3i	Haiti	Pre-ORT Post-ORT	5131 2758		14.1 1.9
3j	Nigeria	Pre-ORT Post-ORT			17.0 3.0
3k	WHO Study (14 hospitals)	Pre-ORT Post-ORT		16.8 5.3	0.8 0.2

3d Gaza
 Compared to 1977, diarrheal-related hospital admissions reduced by 35.3 percent in 1980 and 42 percent in 1981; hospital deaths from diarrhea reduced by 34.4 percent in 1980 and 37.5 percent in 1981.

trition is well-established. With the known consequences of malnutrition on physical, mental, and emotional development (6), a much larger, unquantifiable number of children have been spared further threat to their lives, as well as the insult of a life-long handicap through oral rehydration therapy. *Never in the history of medicine has so much been done for so many with so simple a technology and so little expenditure.*

Are we, however, satisfied? If we were, we would not have gathered here today. Many more million deaths and handicaps from diarrhea can be averted if we carefully perfect and correctly implement and expand our program for oral rehydration. I shall attempt in the next few minutes to identify some of the problems related to these issues and suggest possible approaches and actions to overcome them.

The main problem areas and the specific constraints related to them, as well as the required approaches, are listed in Table 3. Because of the shortage of time, I will not refer to every detail in this table but will select only some of these issues for discussion, drawing mainly from the Egyptian experience, as well as the various WHO and UNICEF reports.

COORDINATION AT COUNTRY LEVEL

ORT is one of the rare areas where donor organizations, international, bilateral, governmental, and non-governmental bodies are attempting to cooperate with one another. They help third world countries to develop diarrheal disease control plans of action, offer financial support and technical assistance, and participate in training programs and research activities. Interest may vary at the central level, but coordination at the local level is a must. Conflict between the bureaucracies of different foreign and local organizations might impede rapid program implementation especially if donor agencies deal with different departments or even Ministries in the same country. Even worse, there might be a variety of different messages being transmitted to the public by different agencies in the same country (7).

One of the main reasons for the success of the Egyptian experience was the establishment of *one supreme committee for the project where all diarrhea control inputs from different sources are directed, one implementation policy is adopted, and a single program executed.* Because of unforeseen logistic difficulties, contingency plans should always be available to avoid bureaucratic delays.

INTEGRATION IN THE PRIMARY HEALTH CARE SYSTEM

The integration of ORT programs into primary health care services is necessary not only to save funds but to coordinate all activities related to diarrhea control. During the initial phase, however, the program should be allowed *autonomy*.

Oral rehydration is a new and different approach that shortcuts classic and more costly preventive measures. It deals with the most important cause of morbidity and mortality in developing countries. To be effective, it needs to move quickly with independence and flexibility that allows it to work freely with all governmental as well as private organizations.

In Egypt, the Under Secretary of the Ministry of Health for Primary Health Care heads the steering committee of the program in which all senior members of his department participate. Though semi-independent, the program is using and providing training for all the primary health care network and its personnel, and is so phased as to ultimately merge completely in that activity.

In this matter, we should not follow slogans blindfolded. There are countries where the primary health care system will not develop before ten, twenty years, or even more. We cannot wait. If a simple program for oral rehydration can be accomplished in these countries in the next few years, we must go ahead and save the children. When an ORT program is carried out successfully, it can act as the foundation upon which the rest of the primary health care components can be built.

TAILORING ORT PROGRAMS

Although the prevalence, etiology, and effects of diarrhea differ little from one developing country to another, socioeconomic, cultural, and ethnographic conditions differ tremendously, necessitating a different plan of action not only for each country but sometimes for each region. In Egypt, where health services are available within a distance of five kilometers and where more than 80 to 98 percent of families watch television or listen to the radio, the implementation plan is unlikely to resemble that adopted in other countries where such services are scarce.

Cultures and attitudes must be taken into consideration. One of the reasons for the early failure of ORT in the Menoufia province in Egypt in the late 1970s was the linkage between the distribution of ORS packets and contraceptive devices—the rumor quickly circulated that ORS would sterilize children (8, 9).

TABLE 3
OBSTACLES TO IMPLEMENTATION OF SUCCESSFUL ORT AND SUGGESTED REMEDIES

MAIN CONSTRAINTS	REQUIRED APPROACH
<p>LACK OF POLITICAL COMMITMENT</p> <ul style="list-style-type: none"> ● Lack of awareness of: <ul style="list-style-type: none"> · problem · consequences · correct approach ● Lack of concern 	<ul style="list-style-type: none"> ● Information dissemination role of UN agencies ● Show models of success (projects) ● Create public demand ● Demonstrate cost-effectiveness
<p>SCARCITY OF ECONOMIC RESOURCES</p> <ul style="list-style-type: none"> ● Inadequate resources ● Inefficient utilization ● Wrong distribution of funds 	<ul style="list-style-type: none"> ● Additional funds (consumer share----donors) ● Efficient use of funds ● Shift priorities
<p>ORGANIZATIONAL PROBLEMS</p> <ul style="list-style-type: none"> ● Vertical selective approach ● Nationwide expansion of pilot project ● Lack of coordination of different disciplines 	<ul style="list-style-type: none"> ● Autonomous organization within PHC system ● Involve key health personnel from all regions in project ● Phased expansion ● One administrative body for all diarrheal disease control activities
<p>MANAGERIAL PROBLEMS</p> <ul style="list-style-type: none"> ● Personnel ● Logistics and bureaucracy ● Inefficient procurement and distribution system 	<ul style="list-style-type: none"> ● Training and motivation ● Proper logistic planning ● Contingency plans ● Encourage local production ● Use private sector ● Use village depot holders ● Develop feedback system ● Create community demand
<p>PROBLEMS OF DISSEMINATION OF INFORMATION</p> <ul style="list-style-type: none"> ● Target group unidentified ● Content, format and timing of message unsuitable ● Service cannot cope with demand created by information campaign ● Funds not available for continuity 	<ul style="list-style-type: none"> ● Identify target ● Suit local culture ● Involve health profession ● Clear, simple, uniform message ● Ensure availability before launching campaign ● Government commitment
<p>PROBLEMS RELATED TO COMMUNITY PARTICIPATION</p> <ul style="list-style-type: none"> ● Lack of awareness ● Passivity ● Difficulty in ORS preparation ● Poor hygienic conditions ● Poor use of health sources 	<ul style="list-style-type: none"> ● Information dissemination ● Social marketing (motivation and involvement) ● Suitable package size, shelf life, ease of opening, available containers ● Information dissemination ● Health education ● Availability at local pharmacy and depot holders
<p>PROBLEMS RELATED TO HEALTH PERSONNEL</p> <ul style="list-style-type: none"> ● Basic education defective ● Lack of conviction of efficacy ● Lack of motivation ● Antidiarrheal drug abuse ● Exaggerate minor problems ● Conflict of interest 	<ul style="list-style-type: none"> ● Revise health schools' curricula ● Inservice training ● Participate in demonstration ● Involve physician in campaign ● Scientific proof ● Involve in research ● Demonstrate effectiveness ● Involve pharmacists ● Reasonable profit

SOCIAL MARKETING

Reducing diarrheal mortality is a social goal welcomed by all families. Creating a demand by these families for ORT is a major factor in assuring the success of such a program. Public demand will commit policymakers, will ensure availability at the local level, will stimulate local health workers and ensure their cooperation. Modern marketing techniques were used in Egypt to achieve this. The promotion campaign focused on the family, particularly the mother. Proper attention was paid to the size, logo, color, and ease of opening the ORS packet. A suitably sized container was widely distributed at a cheap price. The mass media campaign, which reached almost all the population, was phased gradually to ensure that the mother was made aware of ORS and properly instructed in its use and that the product was widely available before being publicized.

The results were very gratifying. Mothers quickly became aware of and used ORS (10). (See Table 4.) Heaps of ORS packets that had previously been stored for months in central health stores and were pushed to the periphery were rapidly used by the demanding public. Local production of ORS jumped from 3 million liters in 1983 to 15 million in 1985 (5).

It is true that the mass media campaigns were costly and a large proportion of AID funds were correctly and efficiently used for this purpose. Two remarks, however, are necessary.

1. Once ORS is widely used and found to be effective, further promotion will be minimal. The success of the treatment will ensure that public demand continues, as with any successful medication.
2. It is a pity that so much should be paid to mass media that, in most developing countries, are government run. A social, benevolent campaign of this type should not be charged for by governmental mass media agencies that are frequently engaged free-of-charge in politically oriented and often provocative campaigns.

To ensure community participation, Egyptian mothers were encouraged to observe the administration of oral rehydration to their children in rehydration units and were given a reasonable supply of ORS to continue treatment at home. ORS is also widely available at cost price in all pharmacies—private and governmental—that are widely distributed throughout Egypt. A system was devised in certain areas of Upper Egypt, where pharmacies are scarce, whereby village leaders act as depot holders for ORS.

ORT AND THE HEALTH PROFESSION

Health personnel should be involved from the beginning in all ORT program activities. Since the introduction of ORT in teaching curricula at medical and paramedical schools has occurred only recently, if at all, most health personnel, especially physicians and pediatricians, need to be convinced of the scientific value of ORT.

Traditionally, doctors and pharmacists prescribe antibiotics and advise starvation to treat diarrhea. They should be involved in research indicating the uselessness and possible harm of antibiotics for most pathogens associated with water diarrhea. In a recent study in Alexandria, Egypt, 94 percent of *shigella* strains and 98 percent of enterotoxigenic *Escherichia coli* were found to be resistant to commonly used antibiotics (11). The recovery rate was faster in those children receiving ORS alone than in those receiving antibiotics (12). In another study by the same group, antimotility drugs were not found to influence the disease's course or alter ORS needs (13).

Seminars and workshops to discuss these and related scientific aspects of oral rehydration are necessary to sensitize doctors to the new technology. During their training they should spend sufficient time in health units to observe the beneficial effects of this mode of therapy. *The cooperation of doctors is crucial for the success of oral rehydration.* Their word is well heard and respected in most developing countries, even where traditional healers are still prevalent. Medical curricula should

TABLE 4
MOTHERS SURVEYED BEFORE AND AFTER TELEVISION CAMPAIGN (10)

	Before Campaign	After Two Campaigns
Aware of Dehydration	32.0 Percent	90 Percent
Know about ORS	1.5 Percent	94 Percent
Ever Used ORS	5.0 Percent	50 Percent

be quickly changed not only to advocate oral rehydration but to stimulate doctors' interest by discussing the scientific background of intestinal absorptive mechanisms. Western textbooks that are commonly used by medical students and graduates in developing countries should include a chapter on ORT. Unfortunately, since infantile gastroenteritis is so rare in the developed world, this is often lacking.

The role of pharmacists has been referred to earlier. They also need to be convinced. A reasonable profit from the sale of ORS should be considered to compensate for the profit pharmacists would make from selling intestinal disinfectants.

ECONOMIC CONSTRAINTS

An important advantage of ORT is its low cost. A one-liter packet now costs less than 5 U.S. cents when mass produced and may cost 7 to 8 U.S. cents when produced on a smaller scale. The main cost incurred is not related to the package itself but to transport, wastage, distribution, information campaigns, etc. Most estimates give a cost of around 70 U.S. cents to 2 U.S. dollars per child per year in developing countries (1,14). Theoretically this amounts to 5 to 20 percent of the total health budget and is beyond the capabilities of most third world governments (15). This, however, should not be an impediment to the progress of the program. Innovative techniques, especially in production, packaging, etc., will reduce the cost of local production tremendously.

Three sources should share the support of ORT programs:

- *donor organizations*
- *local community*
- *government*

If ORT were to be made available to all patients in need all over the world, the cost of the required packets would not exceed 200 million U.S. dollars annually—an amount that is not beyond reach since many rich countries are willing to continue to donate to save the lives of more than three million children and prevent an even greater number of life-long handicaps resulting from malnutrition.

Managerial costs and local expenses should be the responsibility of each country, and met partly from the health services budget and partly from community resources. A study in Indonesia has shown that 46 percent of the expenses of treating diarrhea are met by individuals (14). It is the responsibility of the health personnel in the country

to demonstrate the cost-effectiveness of oral rehydration to government planners. For example, a water and sewage disposal project has been estimated to cost between 14 and 46 U.S. dollars per capita annually (16), so that averting a death through sanitation would cost almost 20 times as much as through oral rehydration (17). Also, in an Egyptian study, the successful ORT program in Alexandria resulted in a reduction in hospital expenses of about 100,000 U.S. dollars annually (18).

It is the country's responsibility to coordinate the contributions of the three possible sources to cover the cost of ORT in the most efficient way. United Nations agencies can provide the technical know-how to achieve this.

IMPACT OF SCIENTIFIC DEVELOPMENT ON ORT IMPLEMENTATION PROGRAMS

Further scientific research and development should be encouraged to perfect oral rehydration therapy. This includes progress both in basic scientific research and in field research related to program implementation, management, training, etc. Most of these subjects will be dealt with by eminent participants in this conference. I shall refer briefly to a few of them, particularly those related to the modification of implementation plans.

"Super ORS." It has been postulated that the addition of water-soluble organic substances to ORS could substantially improve its absorptive efficacy in the small intestine, thus reducing stool purging and the duration of diarrhea, an urgent mothers' demand. Studies on glycine-based and rice-based ORS have shown a reduction of 24 to 49 percent in stool volume and 30 percent in the duration of diarrhea, with a consequent decrease in the quantity of ORS required (19, 20). Further similar studies on amino acids, oligosaccharides, etc., are in progress. Constraints in implementation would include, apart from digestibility and acceptability, the need for cooking of cereal-based ORS and its short shelf life, extra expenses for other types of super ORS, the safety of the preparations, etc.

Modified Formulae. Although the efficacy of the classic ORS solution in treating all forms of dehydration has been amply documented, occasional reports of hypernatremia, especially in very young infants, have stimulated many research workers to suggest modified formulae. This has encouraged many multinational drug firms to produce and promote the sale of various oral rehydration formulae claiming different advantages. However, the presence of more than one prepa-

ration on the market might be disadvantageous. It could shake faith in the value of oral rehydration therapy as a whole. This might be exaggerated by conflicting commercial sale promotions for the different preparations.

For instance, in Egypt at one time there were two packets of the same ORS on the market—the one-liter UNICEF packet and the locally produced 200 ml packet. This resulted in various mishaps in some preparation and various laypeople making comparisons between the two products. The project succeeded in unifying and shifting all production to the 200 ml ORS packet, and the problem is now solved.

Each country is free to choose the size and composition it feels best, but at the present stage and until ORT is firmly established, I strongly endorse the availability of a single preparation on the market, though possibly from different sources.

Physicians might be alarmed more than the public by controversial scientific reports. *The project in each country should have a highly scientific team that is quickly responsive to all scientific issues raised or published.* It should seek the cooperation of the medical profession to resolve such issues. As an example, two years ago, reports appeared on a rise in cases of hypernatremia in two hospitals in Cairo following oral rehydration at home. Many physicians immediately blamed the sodium content of ORS. A highly scientific study was immediately set up in the same two hospitals and showed that these cases were related to incorrect mixing procedures by the mothers; the problem was solved once the mass media campaign concentrated on proper instructions in this respect.

Early Feeding and ORT. Recent studies have demonstrated efficient intestinal absorptive capacity in the child with diarrhea, even in the acute stage (21). The well-known relationship between diarrhea and malnutrition has led several workers to combine early feeding with oral rehydration, aiming not only to combat mortality via oral rehydration but also to combat morbidity through proper nutrition. Breastfeeding is effective and should be continued during the diarrheal episode. This is the habit of most mothers belonging to different cultures.

A study in Alexandria, Egypt, indicated that infants with diarrhea continuing breastfeeding regained their appetite more quickly, required less oral rehydration fluid, corrected their dehydration more rapidly, and had a higher weight gain than a control group (22). A recent study in American Indians using soy bean, lactose-free formula has shown similar results (23).

Coordination between oral rehydration and nutritional education is necessary and action should

be taken immediately to modify implementation policy to achieve this, through coordinated action between two departments in the same ministry or even different ministries if appropriate. The message, however, to the public should be clear: *oral rehydration saves the life of the child with diarrhea but is not in itself a form of nutrition. Appropriate nutrition should be encouraged in parallel with oral rehydration.*

RESEARCH AND EVALUATION

More research is certainly required to resolve these and other scientific issues, as well as to develop more feasible, cost-effective, flexible, and reproducible implementation plans. *Research, however, should not delay our plan of action.* Programs should extend globally as well as nationally. They should be so designed as to allow for modifications necessitated by the gain of better knowledge.

Although an evaluation component should always be built into ongoing programs, evaluation is better carried out by an independent, unbiased team. The team might include experts from international organizations or developed countries, and might follow guidelines set up by such organizations, but it must include local experts who know all about the possible constraints. An evaluation program should look at many minute details at the same time as it is evaluating the complete project. The success of many projects in developing countries frequently depends on giving great attention to minor details that can obstruct a broadly planned project.

CONCLUDING REMARKS

We are all grateful to AID and the other sponsoring organizations who made this meeting possible. We should make optimal use of this great gathering of people from the developed and developing world to define our goals for the next few years and find ways of achieving them. WHO has set very humble targets for the year 1989 (1). Now that we know almost all the facts, now that we have developed the means and tools to carry out an ORT program, now that we have models of success in several countries under different settings, it is our responsibility to surpass these targets both in time and quantity. If each one of us contributes to save the life of one more child one year ahead, we shall have contributed a great deal to humanity.

Truly and sincerely, in my 35 years' practice as a pediatrician in a developing country, I have not witnessed a greater advance in medicine. One day it will be said that the end of the twentieth century has opened a new era for mankind—the post-ORT era.

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2. General Session



ICORT II provided ample opportunities for participants to share their experiences. Photo by Frank Nesbitt.

NEW UNDERSTANDING OF THE DIARRHEAL DISEASE PROCESS AND NEW THERAPIES

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I am grateful to the Agency for International Development, WHO, UNICEF, World Bank, UNDP, and ICDDR,B for continuing to sponsor research and programs for child survival, and to AID especially for gathering all of us together here.

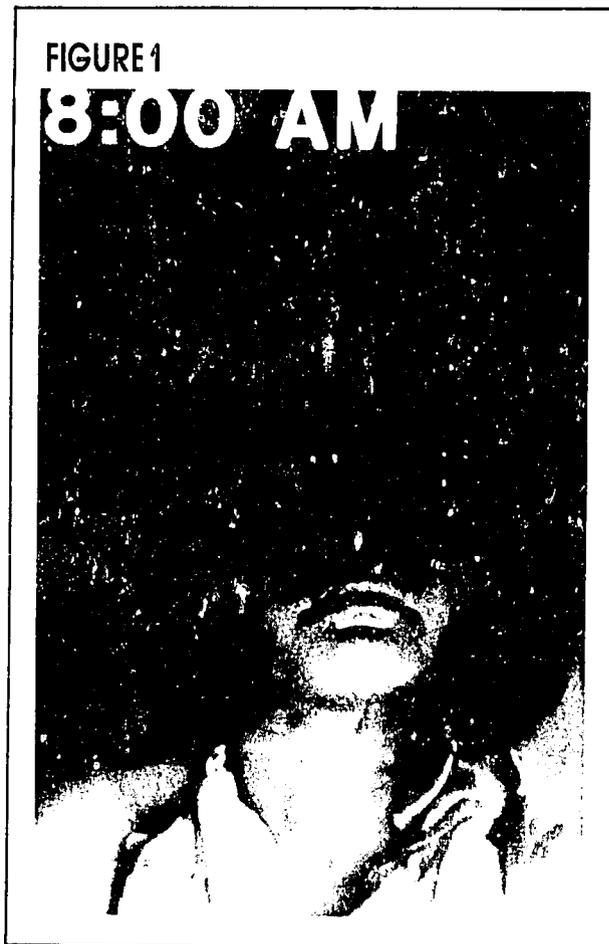
What an impressive audience you are! Public leaders, scientists, volunteers, teachers, clinicians, communicators, and private citizens of the world: you have the collective ability to rescue millions of children from malnutrition and death within a few years of this day. I hope what you will hear these next three days—from the podium, panels, poster sessions and from each other—will both inform and inspire you to achieve this humanitarian goal.

I am especially grateful for the honor of presenting to you this morning the best current knowledge of diarrheal disease and its treatment. As I prepared myself for this talk I realized how rich and complex the knowledge has become, how little I knew. Much of what you will hear this morning is what I have just had to learn.

There is one person who is not in this audience who I wish were; Dr. Robert S. Gordon died a few months ago, far too soon. He set up the Cholera Research Laboratory in Dhaka, now known as ICDDR,B. He designed the laboratories, began the research into treatment that preceded ORT, convinced a then-younger Dr. William Greenough and others, including myself, that a life of research and service in diarrheal disease and public health was worthwhile. Dr. Gordon was both a basic scientist and a human being who saw immediately how his work could be turned to public welfare. To his memory and that philosophy of science I dedicate this talk.

In the next half hour I hope to answer the following questions.

- How did this child, with diarrhea, come to lose so much fluid (Figure 1)?
- Are there any medicines his mother could have used to stop the diarrhea?
- What could oral rehydration therapy have done for this child?

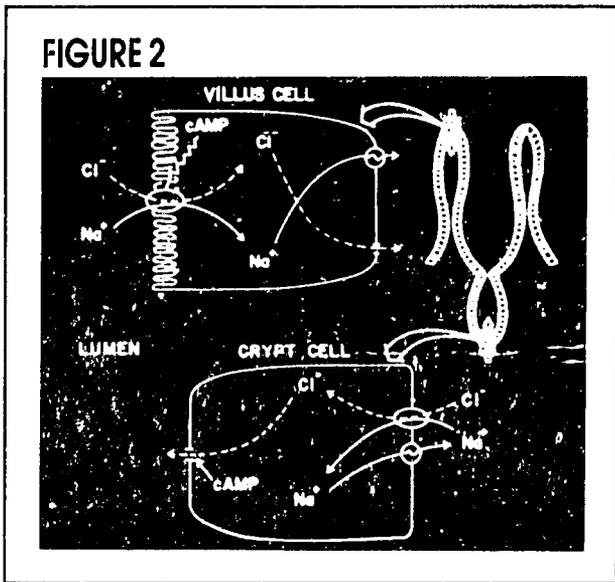


- What *caused* the diarrhea, according to our scientific view?
- What *caused* the diarrhea according to the mother's explanation, and how did she act on that knowledge?
- And finally, given the answers to these questions, how can we—all of us gathered here and our colleagues at home—apply our knowledge to save not only this child but all his worldwide sisters and brothers to come?

How did this child become so dehydrated? He has lost 15 percent of body weight, about 1.5 liters, in just two days, nearly all as watery diarrhea.

Between this child and the outside world stands the intestinal lining, a one-cell layer 1/250th of a centimeter thick (Figure 2). It has several functions:

- to protect from invading bacteria, parasites, and viruses;
- to secrete saltwater to help digest food;



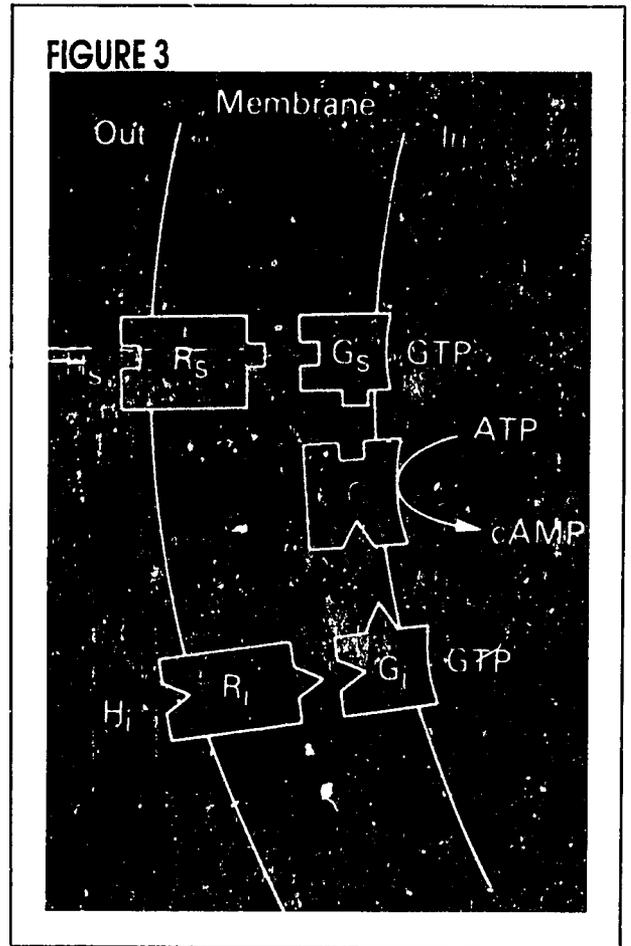
- to absorb the end-products of digestion and to reabsorb this saltwater into the bloodstream so that it is not lost to the outside.

Obviously something failed.

The small intestine one-cell layer lining is thrown up into finger-like protections called villi. At the base of the villi are the crypts. Crypt cells secrete saltwater; villus cells absorb saltwater. The crypt cells move up at a regular rate to become villus cells, changing their function on the way, and are replaced by newly born crypt cells. A complete turnover takes about three to five days, which is, coincidentally or not, the length of an average uncomplicated bout of diarrhea.

How do crypt cells know when to secrete, villus cells when to absorb? How do they coordinate these two different functions at different sites? The answer won a Nobel Prize. Each cell—be it from the kidney, intestine, lung—has its own different and specific work to do, but the signals used to inform cells when to do it and the cell machinery to effect the work are the same for all cells.

The signal is brought by a messenger. Let us call it the "first messenger" (Figure 3). It is stimulated by food, by danger, by many other external events. This first messenger may be a hormone: insulin or adrenaline, for example. It may be a chemical secreted by nerve endings: like acetylcholine or serotonin; or it may be one of several chemicals released by cells in response to infection, of which bradykinin is the most potent. These first messengers are admitted into the cell through receptors unique for each hormone. (In Figure 3 we see just the outer envelope membrane of a cell.) By basic enzyme chemistry the first messenger either creates or dismantles a "second messenger." Cyclic adenosine monophosphate, cyclic-AMP, is the



classic second messenger. It exists in virtually all cells, including bacteria, and is nearly as old as life itself. This compound activates "third messengers" that then cause the particular cell to function uniquely. In the intestinal crypt cells, for example, channels are created to permit chloride secretion (sodium and water follow); but channels are closed in villus cells to block absorption of salt and water. The net result is continued secretion for digestion.

Now the truly interesting part of the story: bacteria, such as *vibrio cholerae*, certain *Escherichia coli*, *Salmonella*, *Campylobacter*—elaborate toxins remarkably similar to each other in structure and function. They are called heat-labile toxins (or L.T.). Here we see (Figure 4) cholera toxin (it actually

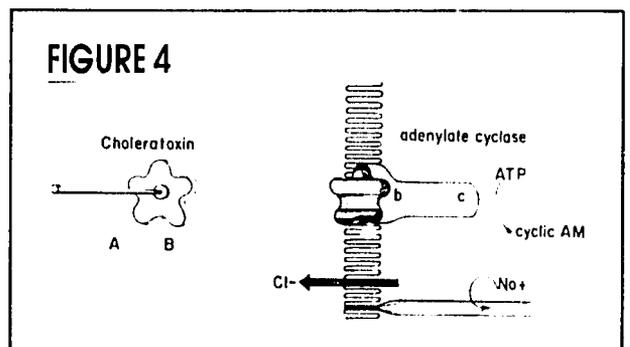
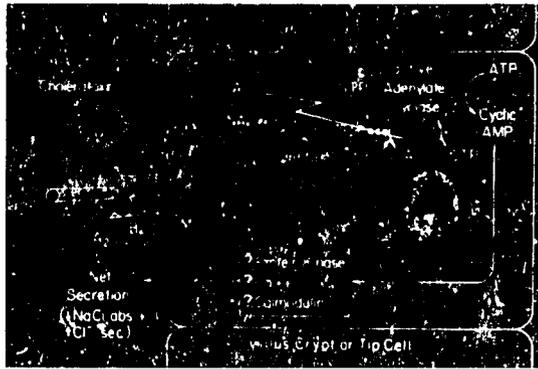


FIGURE 5



looks like this) whose binding unit, "B," has found a membrane receptor called GM₁ ganglioside, that lets it in; like a thief finding a back door to which it has a passkey. Then the active unit, "A," is injected into the cell. There the "A" unit steals a segment of an essential cell chemical--nicotinamide adenine dinucleotide (NAD)--transfers and locks that segment (called adenosine diphosphate ribose) onto the enzyme that creates cyclic AMP (the enzyme is called adenylate cyclase) (Figure 5). That enzyme then is no longer able to turn off. Cyclic AMP is thus continuously created; crypt cells cannot stop secreting, villus cells cannot stop malabsorbing salt. This is a "forever" reaction until all the cells are shed and new cells take over, in three to five days. Malnourished children have

prolonged diarrhea precisely because their cell renewal time may be five to ten days or longer; they simply don't have enough protein to make new cells quickly.

I learned something fascinating. *Bordetella pertussis*, the bacterium responsible for whooping cough, makes a toxin much like cholera toxin, which, however, blocks the enzyme that reverses the manufacture of cyclic AMP so that cyclic AMP of the respiratory tract, where the bacteria invade, remains on. Secretions and edema of the respiratory tract are prominent features of whooping cough.

If bacteria worked only one way our search for a counteracting chemical would be easy. But bacteria are older, thus wiser than we. There is compelling evidence that the classic cholera toxin (or even some other toxin made by the vibrio), besides posing as a first messenger, also stimulates our own internal first messengers, such as serotonin, that independently turn on secretion (Figure 6). In fact, there are many ways bacteria lock on secretion. Various strains of *Escherichia coli* and *Klebsiella* stimulate formation of cyclic GMP (with a class of related toxins called stable toxin or S.T.), *Salmonella*, perhaps *Shigella*, and even some *Escherichia coli* and vibrios, turn on first and second messengers that induce inflammation (such as prostaglandins stimulated by serotonin). *Entamoeba histolytica*, the protozoan causing amebic dysentery, actually secretes its own serotonin.

There are yet other ways bacteria cause diarrhea that they understand and we don't. One va-

FIGURE 6

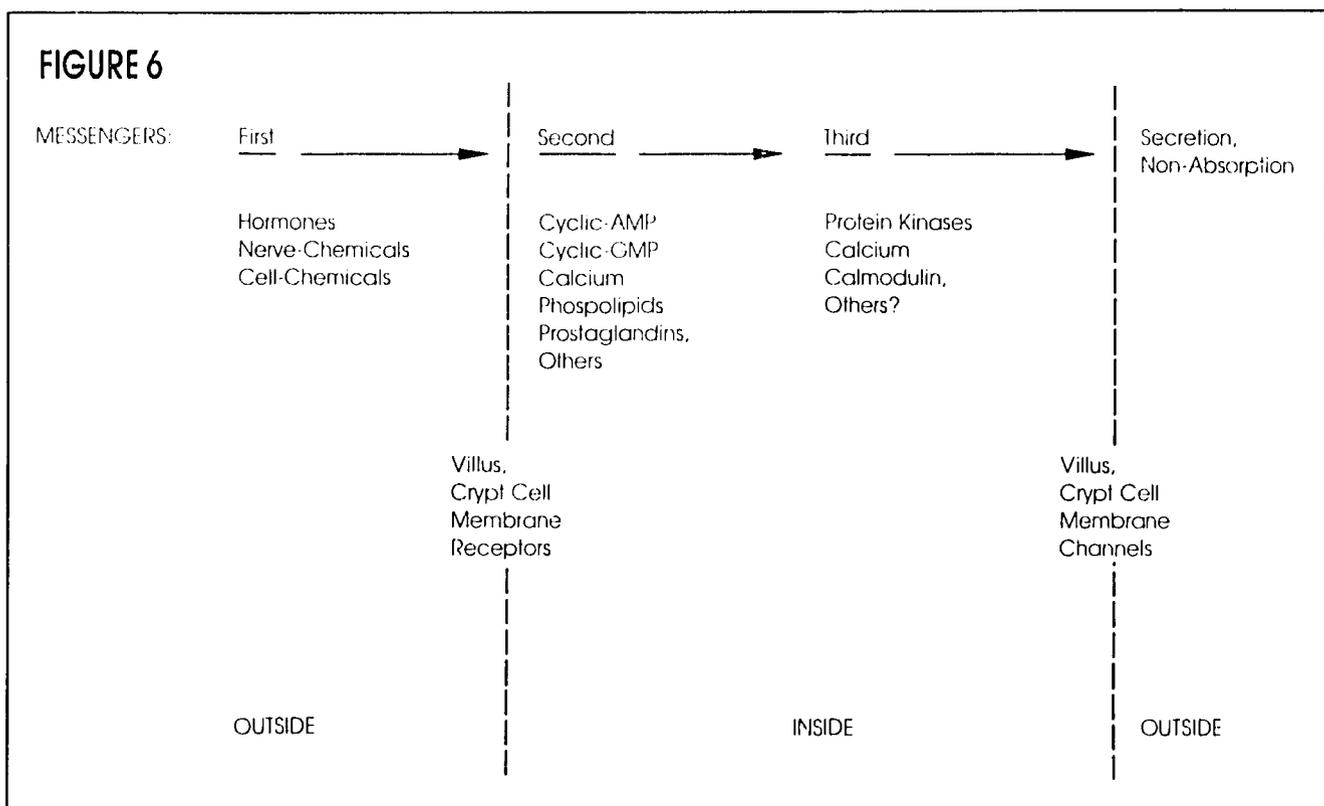
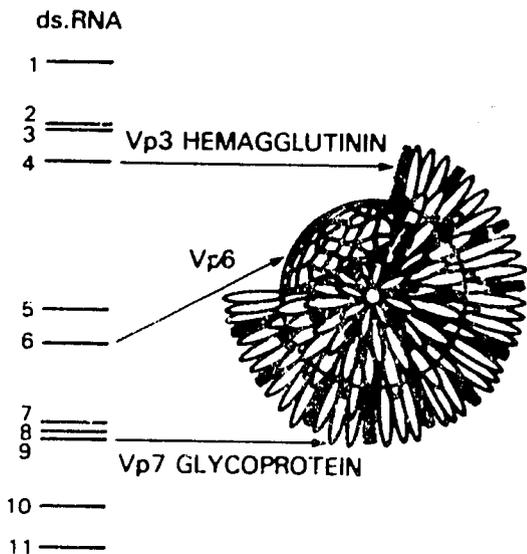


FIGURE 7

**ROTAVIRUS
GENE CODING ASSIGNMENTS**



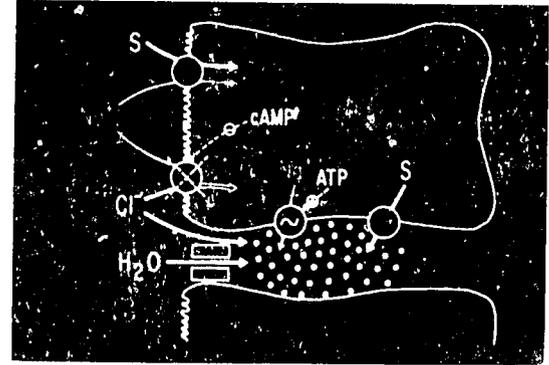
riety of *Escherichia coli*, the so-called enteropathogenic strains famous for nursery outbreaks, makes no toxin we can detect. It just lands on the cell membrane and dissolves it, perhaps burrowing its own channels for secretion.

Rotaviruses are much less subtle (Figure 7). They're not even alive, just an organized clump of genes and protein. They make no toxins. They invade villus cells, hijack their protein factories to make more virus, kill the villus cells, and get out. This leaves a population predominantly of crypt cells that predominantly secrete. Thus there is an imbalance between absorption and secretion much in favor of secretion.

The final step in secretion involves third messengers: these include calcium, a calcium-containing protein, and kinases (the last, a class of proteins that affect membrane structure) that then open or close channels (Figure 6).

The intimate knowledge of the sequential cell mechanisms causing secretion and absorption is exciting in its own right. But for virtually each step there is a drug that blocks that step. (Indeed, this is how the knowledge of the sequence of events has been gained.) The search is on for the magic medicine that will turn off diarrhea quickly. Some of the more promising drugs—chlorpromazine, loperamide, berberine, cholestyramine, aspirin—work at more than one step in this chain. But while these drugs work wonderfully in isolated intestine, or in

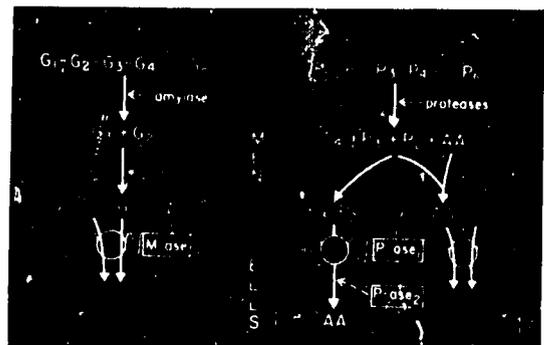
FIGURE 8



animals, they have been a major disappointment in clinical trials in humans. Effects, if any, are slight. Doses needed for a large effect give serious side-effects such as abdominal distension related to loperamide. Some drugs taste even worse than ORT or are too costly. If any drug is found that works, it will probably be at the step where membrane channels are created. I predict that a medicine that is simultaneously effective, safe, and cheap will *not* be found before the next ICORT.

But, what am I saying? We *do* have such a medicine. This medicine turns on an absorption channel that the bacteria seem to have overlooked. Even while bacterial toxins can block sodium chloride absorption, the sugar, glucose, continues to stimulate sodium absorption (Figure 8). Water and other salts are absorbed following osmotic and electrical forces, at a rate three to ten times greater than normal absorption without glucose. This mechanism is a latecomer in evolution and perhaps this is why bacteria neglect it. (They attack cyclic AMP and cyclic GMP principally as part of their billion-year-old warfare against other bacteria; diarrhea is just an historic accident.) The mechanism is there to speed absorption of salt and water by animals eating lots of carbohydrate and protein (Figure 9).

FIGURE 9



Not only does glucose—the digestive end-product of carbohydrate digestion—stimulate salt-water absorption, but so also do breakdown products of protein: amino acids and dipeptides (chains of two amino acids). The absorption of salt and water through these three channels is additive, two to three times greater than through a single channel. Dipeptides and glucose in chains (polysaccharides) actually move salt and water in faster than their single molecule constituents. The reason has to do with how close the digestive enzymes on the membrane lie to the sodium-glucose or sodium-amino acid carriers, the so-called “kinetic advantage.” Incidentally, both bicarbonate and citrate also independently stimulate sodium absorption. These facts, of course, are the basis for an enriched oral rehydration solution (ORS), potentially our most potent, cheapest, and safest anti-diarrheal medicine. I must emphasize the word “potentially” because we have only a limited clinical experience to report.

We now have three ways to proceed in implementing an enriched ORS, the medicine to slow down diarrhea while it rehydrates.

First Option. Let us find the optimal combination of chemicals (amino acid, dipeptides, glucose, or polysaccharide) and, with the ORT salts, package it as a medicine. There will be packaging problems, as glucose and amino acids do not preserve well together. The extra cost, however, may be offset by the savings on rehydration fluids and on useless medicines. Clinical trials with different chemical combinations are now underway worldwide, sponsored largely by WHO. The higher osmolality of such solutions may prove to be an obstacle to fluid absorption.

Second Option. Let us use food! Preliminary results suggest that cereal grains, especially rice, can reduce stool loss by about 30 to 50 percent when 30 to 50 grams are used in a liter of oral rehydration solution in place of glucose (these data courtesy of Drs. Molla of ICDDR B). Rehydration is faster and the solution tastes fine! If we pre-cook ground rice and add suspending agents, it may be possible to make an ORS that stays in suspension even in cold water. Packaging will be easier and cheaper than our standard WHO formula. This approach is being researched in Egypt. (Maize, millet, sorghum, potato are also being tested in other countries.)

Third Option. Mothers may prepare salt-cereal solutions at home. This approach has the usual advantages and constraints of any home-prepared solution. But be aware! Rice powder is *not* the same as rice-water. Rice-water has not nearly enough protein and the amount of carbohydrate varies greatly with how the rice-water is prepared.

Are there problems with cereal-ORS? Some children under three months old don't digest cereal easily and could get worse diarrhea. Some mothers may assume that this low-calorie milky fluid is food and continue feeding only this. If the solution is prepared with too little water, the rapid absorption of sodium by an enriched ORS may make hyponatremia more of a problem. Overriding these problems, perhaps, is the likelihood that mothers may more readily accept cereal-ORS and use it well. We need much more experience. At ICORT III you will hear about it.

I predict an enriched ORS will have far greater effect than just slowing down diarrhea. Plain old WHO formula, combined with early feeding, reduces stool loss by about 20 percent and protects nutrition over several months in children with recurrent episodes. Because loss of nutrients—protein, fat, and carbohydrate—is greater with greater stool output, an enriched ORS should have direct impact on nutrition. It has recently been observed in Bangladesh by the Drs. Molla that children regularly using rice-powder ORS prepared by their mothers suffered, over time, far less chronic diarrhea and twice greater weight gain over a month compared to standard ORS. Does an enriched ORS also speed healing of the intestine, perhaps by inducing absorptive enzymes?

Chronic or prolonged diarrhea may become an increasingly serious problem, especially as famine and poverty spread (Figure 10). Malnourished children have diarrhea longer (not necessarily more often), and prolonged diarrhea makes children more malnourished. This scheme suggests how the cycle begins and sustains itself. Acute infection can damage the intestinal cells to cause significant malabsorption of food. Bacteria normally found in the large intestine are enabled to swim upstream to the small intestine where they find the malabsorbed food much to their liking, and they perpetuate the damage, by direct action or by turning normal bile salts and fats into molecules that are injurious to cells. We may be worsening the process by fasting the child, by using antibiotics (now proved

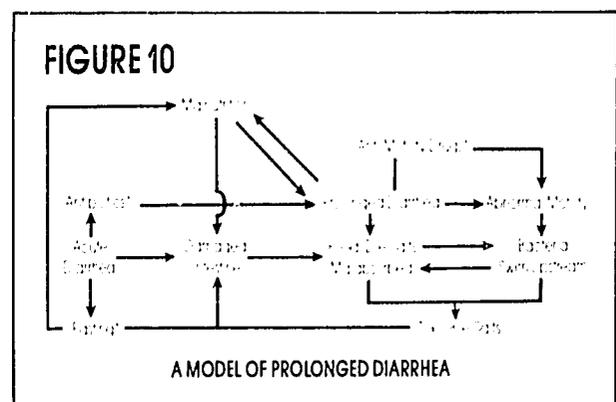
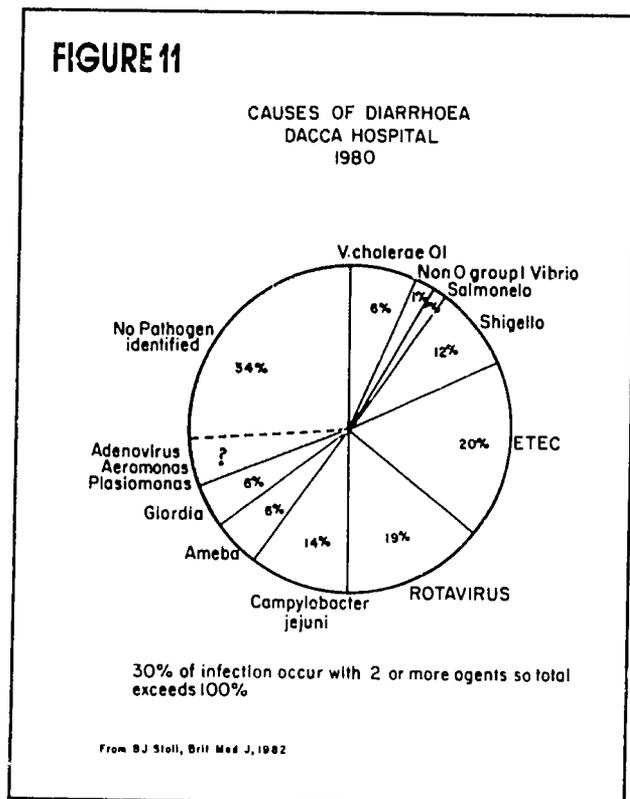


FIGURE 11



to *prolong* most cases of diarrhea), and by prescribing anti-motility drugs.

Speaking of bacteria that swim upstream, these tend to be bowel organisms we have not generally identified as pathogens, like *Klebsiella*, *Aeromonas*, *Enterococci*, usual strains of *Escherichia coli*. These bacteria may pick up the genes that code for toxin production. When we try to find the cause of common diarrhea in children in village studies, we can identify known bacterial, viral, parasitic pathogens in about 50 percent of cases. That means that in the approximately 50 percent remaining cases some other organisms that we have not considered as pathogens may in fact be causing diarrhea; they may be normal residents of the children's intestine turned vicious.

It is only in hospitalized children that we can identify major pathogens in up to 75 percent of cases, which means obviously that these species cause more serious, dehydrating illness (Figure 11). From numerous studies worldwide, the figures are remarkably similar. Each of these organisms carries its own clinical, nutritional, and public health significance.

- **Cholera:** Because of its epidemic form it frightens people and politicians into panic and denial, which make matters worse.
- **Shigella:** Epidemic dysentery due to the shiga variety should frighten people. It carries a high mortality and is resistant to most antibiotics.

Other *Shigella* strains cause prolonged diarrhea and malnutrition.

- **Enterotoxigenic *Escherichia coli*:** These cause the commonest illness in children and travelers and are most associated with weight loss and malnutrition.
- **Campylobacter:** This bacterium is mostly transmitted by fowl and domestic animals; it can cause dysentery, watery diarrhea, or prolonged diarrhea.
- **Giardia, Entameba:** Too much of our hazardous drug treatment is directed at these protozoan organisms, which cause less disease than the other pathogens. Another protozoan parasite has recently been shown to cause diarrhea in children, in about 5 percent of cases the *Cryptosporidium*. It is also a principal cause of diarrhea in AIDS patients.
- **Rotavirus:** This virus is seen in only five percent of cases of diarrhea found in a village but is present in 30 to 40 percent of children hospitalized with dehydration. This means that the effect of a vaccine against rotavirus might be more noticed by physicians and nurses than by mothers.

Time doesn't permit a detailed discussion of vaccines against diarrhea. One version of a rotavirus vaccine is in field trial in Europe and the United States, where it seems quite promising, but has not done well in several developing countries. We are still reaching for a potent cholera vaccine. The most recent candidate is a combination of the toxin binding unit plus whole-killed vibrios, given by mouth. It is safe and 85 percent effective after six months in Bangladesh.

Finally, recombinant DNA techniques can place *Shigella* and *Escherichia coli* genes for their respective toxins inside a live, non-virulent typhoid bacillus, given by mouth. The *Shigella*-typhoid vaccine has been proved safe and effective in volunteers. Dr. Richard Feachem will discuss the role of measles vaccine as a preventive against diarrhea. Vaccines to protect against the majority of cases of diarrhea are still several years away but the pace of their development has been accelerated markedly by the new biologic tools.

For now, we must continue to rely on oral rehydration therapy as our main weapon against dehydration, prolonged diarrhea, malnutrition, and death.

You all know that ORT is no longer just supportive treatment for mild or moderate cases in older infants. It is known now to be useful even in extreme situations. In Cairo, at the El Galaa Maternity Hos-

pital, premature neonates (as small as 1.5 kilograms) with nursery diarrhea are given WHO formula ORT and early feeding with excellent results in terms of much reduced mortality and shortened episodes. Similar results have been obtained in Costa Rica.

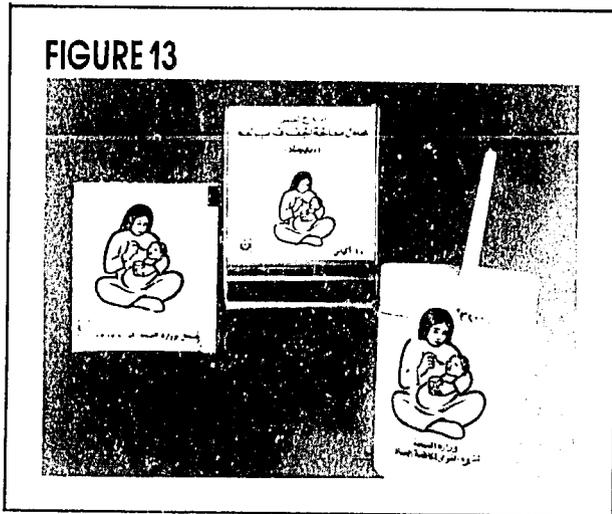
The following photos confirm that even some children in shock may be resuscitated with ORT. A recent study from Iran showed this as well, using a nasogastric tube to deliver ORT. Intravenous fluids will still be needed for most children in shock, but we now often try ORT while looking for the vein.

This child is in shock and intravenous fluids are far off (see Figure 12a). A syringe without needle is used to insert fluid into the child's mouth. He can, thank God, still swallow—5 cc's, one teaspoon, per minute (Figure 12b). After 750 cc's he is out of shock (Figure 12c). After one liter he can drink on his own (Figure 12d). After two liters he is rehydrated, but a bit lethargic; his mother still believes he will die (Figure 12e). But by the next day with more ORS and food . . . (Figure 12f).

We can now speak of efficacy on a national scale. Many of the poster sessions will demonstrate



FIGURE 13



falling death rates as ORT becomes more widely used. We must now guard rigorously against casualties of this treatment. If ORT is made with too little water or too much salt, some children will become hypernatremic, that is, their blood sodium concentration will rise to dangerous levels. In Egypt, the National Control of Diarrheal Diseases Project has advertised intensively on television how to prepare ORT, and a standard calibrated cup to match the packet has been distributed by the millions (Figure 13). The incidence of hypernatremia, seen at referral hospitals, is no longer elevated. But even as we save lives I am worried about what happens when television or radio campaigns end--and they do--or in programs in which a packet is just handed to the mother without much instruction and no standard container. Home-prepared solutions are even more variable in composition because measurements of salt and sugar by hand vary greatly.

On the other side, let me caution against the too-easy notion that home fluids with little salt can be effective (such as teas, decoctions, rice water). If a child has watery diarrhea and loses 2 percent of body weight--two large stools would do it--the kidney holds onto all the water it sees, the blood sodium concentration is lowered resulting in hyponatremia, which is in fact more dangerous to immediate survival than its opposite, hypernatremia.

Artemis, the hunter, and her brother, Apollo, revenged an insult to their mother, Leto, by killing all twelve of Niobe's children. The word "toxin," which we so frequently use in discussing diarrheal disease, comes from the Greek term, "toxicon," a poison put on arrows (I thank Dr. Richard Guerrant for this reference). The Greek legend tells us that when Niobe saw her children die, "so lately young and strong, she sank down motionless, in stony grief. Dumb as a stone, her heart like a stone within her. Only her tears flowed and could not stop. Zeus

(in the only comfort he could give her) changed [her] into a stone which forever, night and day, was wet with tears." (Edith Hamilton, *Mythology*, Mentor Books, N.Y., 1940, pp. 238-9.)

The most tragic loss is loss of a child. How do mothers deal with diarrhea, at once so common, at once so dangerous? Numerous anthropologic studies from around the world show a remarkable uniformity of findings. A mother wants to know what caused the diarrhea, and how to remove the cause. She is less aware about dehydration as a separate problem. She would be comforted to know that diarrhea is self-limited, but with current average durations of illness of five to seven days, she wouldn't think this is self-limited.

Parents constantly attempt to explain the illness. A mild, uncomplicated case may be part of the stress of normal development such as teething, crawling, or getting too heated. Since 15 to 25 percent of children may have diarrhea on any one day, a caretaker is apt not to treat the child or to use simple fluid decoctions. If the episode is serious, the guardian will seek a variety of help and medicines (including ORT). In Egypt "serious" is when the child vomits. We need to know in each culture how the diagnosis of "serious" is made.

A third category of illness is when the diarrhea is prolonged, when there is wasting, or the fontanelle has become depressed. By this time a variety of folk illnesses are considered, each with a particular form of treatment. Many such treatments are actually drying and further dehydrating. Many parents, even when exposed to intensive health education, do not accept the physiologic concept of dehydration; putting more fluid in when it clearly is coming out makes no sense. We have a difficult job here. Maybe an enriched ORS will help us considerably.

As much as we need to know about the traditional explanations of diarrhea, we need also to understand the environment in which mothers work and live before designing a health education campaign for ORT. How much time does she have to rehydrate a child? Is it all at once or for a minute here and there? How about her use of measures and measuring? Does it even make sense to give a whole liter of clear salty-sweet fluid to an infant?

An exciting method of delivering ORT is being tried in several countries, Egypt and Brazil among them, that could solve a number of our ORT delivery problems simultaneously. This is to train a respected village mother, midwife, healer, to be the local ORT dispenser and teacher. This carries with it a number of ifs:

- if we supply her or him once or twice a year with packets;

- if she/he knows how to prepare a local cereal-based ORT;
- if she/he can have a standard container to calibrate the mothers' own containers;
- if she/he can sit with the mother, teach and guide her through ORT;
- if serious cases are referred to the nearest government or private practitioner;
- if a small service fee is charged.

You may use your imagination to see what problems of safety, access, effectiveness, education, and sustainability we can solve with such a scheme.

Diarrhea is only one cause of children's and parents' suffering. Children who die are caught in a web of their mothers' fatigue and poverty. Those born small or too soon after the last child are es-

pecially at risk for the cycle of illness and malnutrition. The girls who survive but who knew mostly illness may cast the same web over *their* children. We can shake and break this web, however, at many places.

Primarily, we require just and equitable societies that do not waste trillions of dollars on weapons. Following this we could easily attend to the education and empowerment of women, child spacing, water and sanitation, expanded programs for immunization, oral rehydration therapy. The programmatic challenge would then be to do all of these without hindering any one of them. Our much simpler task is to make ORT effective, safe, and widespread, thus giving hope to the mother that she can act to save her child in this way (Figure 14), and then in the many other ways modern science and public health discover.

FIGURE 14



DIARRHEA IS A NUTRITIONAL DISEASE

DR. JON ROHDE AND DR. ROBERT S. NORTHRUP
Management Sciences for Health
Boston, Massachusetts, USA

INTRODUCTION

I am quite certain that all of you who are clinicians in this audience would agree that a well-nourished child suffering from acute diarrhea is likely to have an excellent outcome with the use of oral rehydration therapy alone. Indeed all of us here have recognized the dramatic results that have been made possible by this simple yet scientific and wonderful technology. You have demonstrated the great effectiveness of oral fluids in more than one hundred countries throughout the world, an effectiveness that is only now coming to be recognized here in the North as the most scientific, technically advanced, most safe and effective way of dealing with acute dehydrating diarrhea.

But I am equally certain that all clinicians in this audience will join me in recognizing that diarrhea in a severely malnourished child poses a major and quite different clinical challenge. Indeed, the outcome in such children, even with the use of oral fluids, is much less certain. Each of us can recall from our own clinical experience the difficulty of managing diarrhea in the malnourished child, who often presents with severe dehydration and complex electrolyte disorders, and who is commonly intolerant to food or even to oral rehydration solutions. Surely, fluid therapy will be useful in such a child, but it is only part of what is needed. Given only fluid therapy, it is quite likely that the child will die, if not from this acute episode, very possibly a few weeks later when diarrhea strikes again.

The contrast between the well-nourished and the malnourished child and the differing clinical challenges they present related to diarrhea are critical to our thinking about what will make ORT programs a success or a failure. That is what I want to discuss with you this morning.

During the next half-hour, I will review with you the evidence for the devastating impact of malnutrition on child survival and particularly on the prognosis for outcome in diarrheal disease. I will contend that our view of diarrhea remains too focused on the stool to the neglect of the total child.

I will insist that we recognize that diarrhea is a nutritional disorder. Surely the fluid and electrolyte losses of diarrhea are now widely recognized as a form of acute malnutrition of those essential nu-

trients replaced by oral rehydration solution. But I will contend that even "successful" ORT programs that have case management strategies limited to rehydration, to fluid therapy alone, will continue to face large numbers of deaths associated with diarrhea. To avoid this, and to improve our overall impact on mortality, we must deal with the nutritional problems associated with diarrhea as well. *Diarrhea is a nutritional disease* and, I believe, can only be managed properly with appropriate feeding.

The failure of nutrition rehabilitation efforts to "cure" malnutrition, however, offers us no recourse but to deal with the problem before malnutrition develops, at the very youngest ages, during the first year or two of life. The peak incidence of growth faltering occurring simultaneously with the highest incidence of diarrhea, in late infancy, gives dramatic proof of the vicious cycle of diarrhea and malnutrition. I hope to convince you that the nutritional management of the diarrhea patient must be considered as important to the mother and to the health workers as the management of dehydration. To raise their awareness of this fact in time, before the child becomes frankly malnourished, they must have a mechanism, a tool, to make visible, to diagnose as it were, this nutritional effect of diarrhea. We need a diagnostic sign as clear, as unequivocal as a liquid stool. Only then can we expect appropriate action on their part. In my opinion, the best available diagnostic sign is growth faltering after diarrhea.

GROWTH MONITORING

The tool to see this growth faltering is growth monitoring, the regular recurrent assessment and discussion of the child's growth. By making the nutritional effect of diarrhea *visible* and tangible it provides also a therapeutic yardstick guiding and motivating the nutritional management of diarrhea in the child. I will contend that it is this missing element—the lack of awareness of the insidious but devastating effect of diarrhea on growth and, importantly, the need to see the dramatic recovery possible through feeding—that is the critical missing element of diarrhea management. In short, we all need feedback. Oral rehydration therapy is fluid, feeding, *and* feedback—through growth monitoring.

By using growth monitoring properly as a critical tool in diarrhea care, we can effectively change the focus on diarrheal programs, sometimes criti-

cized as being too categorical or vertical, toward a more comprehensive, integrated approach to managing illness and health in the child. Your primary health care systems can thus be strengthened, enhanced significantly in coverage and effectiveness, by integrating a nutritional strategy into the program of diarrheal disease management.

THE DIARRHEA/MALNUTRITION INTERACTION

Let us start by looking at the diarrhea/malnutrition interaction. Interestingly, the incidence of diarrhea appears to be no more frequent among the malnourished than their better nourished peers in a given setting. But on a second look, this is not surprising as everyone in a given environment is exposed similarly to a variety of infectious agents. There is undoubtedly a close association between the kind of environment where we encounter most malnutrition and that where diarrhea is found as well. *Poverty is the factor common to both.*

But data from numerous studies support our clinical impression that diarrhea lasts longer and is more severe in malnourished children. What then does increased severity in a given episode mean to the overall problem of diarrheal deaths? (Figure 1.)

Increased risk of death from all causes that can be attributed to undernutrition has been well documented. Kielman found a doubling of mortality for each 10 percent of weight-for-age under 80 percent of the standard. Chen found that below 63 percent of weight-for-age a steep rise in mortality occurs—up to four times or more the mortality rates of adequately nourished groups. A follow-up of children discharged from ICDDR/B showed that subsequent mortality was 140 per thousand in those whose nutritional state was worse than 55 percent of weight-for-age and only 10 per thousand in those greater than 75 percent, a relative risk of 14.

FIGURE 1

RISK OF DEATH FROM MALNUTRITION

- **2X** Per Each 10% Weight/Age Decrement¹
- **Worst Nourished 4X** Best Nourished²
- **Less Than 55% Weight/Age 14X** Greater Than 75% Weight/Age³

¹ Kielman/McCord ² Chen et al. ³ ICDDR/B

FIGURE 2

SEVERE MALNUTRITION IN DIARRHEA CASES (Gomez Third Degree)

Port-au-Prince — Haiti

Population	Clinic	Hospital	Diarrhea Deaths
3%	10%	35%	65%

In Haiti, where I have worked for the past five years, mortality at the University Hospital has been almost confined to the malnourished. While 15 percent of patients are severely malnourished, they contribute 85 percent of the diarrhea-related mortality. Since the opening of the ORT Unit, diarrhea deaths have been almost confined to the malnourished. A recent survey in the large, extremely poor Port-au-Prince slum called Cité Simone (Figure 2) found severe malnutrition, less than 60 percent of standard weight-for-age, in 3 percent of the young child population. Review of records in the diarrhea treatment unit serving this population showed that 10 percent of children admitted to that outpatient service had severe malnutrition. Among those requiring admission to the small hospital serving the city slum, 35 percent had severe malnutrition. Among the deaths in that hospital from diarrhea, over 65 percent were severely malnourished—65 percent of the deaths from 3 percent of the population.

In Figure 3, I have applied the Kielman relative risk calculations to a reasonable distribution of nutritional categories expressed in weight-for-age for a developing country. Half of all children are adequately nourished, above 80 percent of the standard. The other half is distributed as we see in the

FIGURE 3

NUTRITIONAL AND DIARRHEA MORTALITY

	NUTRITIONAL STATUS			
	Adequate > 80%	Mild - 70%	Moderate - 60%	Severe < 60%
Percent Children in Developing World (WHO)	50%	25%	20%	5%
Relative Risk of Death (Kielman)	1	2	4	8
Diarrhea Deaths (Millions)	1.14	1.14	1.82	0.91
Excess Diarrhea Deaths from Malnutrition (Millions)	0	0.57	1.36	0.80

FIGURE 4**DIARRHEA MORTALITY
Global Estimates**

Annual Diarrhea Deaths	5 Million
Excess Diarrhea Deaths Associated With Malnutrition	2.7 Million
Diarrheal Deaths If All Children Get Adequate Nutrition	2.3 Million

first line of the figure. The relative risk of death is taken as one for the normally nourished, doubling for each 10 percent fall in weight-for-age. Applied to the 5 million deaths estimated to occur annually in the developing world attributable to diarrhea, we see a distribution of diarrheal deaths by nutritional status as shown on the next line. If all increased risk associated with malnutrition were removed (Figure 4), that is, if we imagined that malnutrition did not exist in these populations, we see that the total number of deaths would be reduced to less than half—2.3 million cases that I am sure you *all* could manage very readily with oral rehydration therapy alone. This is the half of diarrhea deaths that the oral rehydration programs found in many of your countries could readily handle and be expected to cure almost entirely.

But how many of these children, normally nourished on the initial episode or two of diarrhea, will become malnourished in the course of time and become subject to a far greater risk of death in their next diarrheal episodes when their nutritional status has diminished?

The "excess deaths" shown in Figure 3, numbering 2.7 million, are those that we can reasonably attribute to the excess risk of being malnourished. They are the hard-to-manage cases, the complicated ones, difficult from both a financial as well as medical point of view. In fact, in a well-running ORT program, deaths of these malnourished children are likely to be the only ones that occur.

You may choose to use other estimates of percent population malnourished and different relative risks attributable to diarrhea, but the results will be similar. *Malnutrition, with all that it represents as a clinical problem, is the major underlying cause of death from diarrhea.* Now, given this, I would propose to you that your oral rehydration programs, at least as presently conceived and implemented in many countries, will not do much for this problem.

WHY IS NUTRITION NEGLECTED?

If malnutrition is such a great problem, then why do we not do more for nutrition? Of 850 million children under age five, 350 million are estimated to be undernourished, 100 million of those moderately or severely malnourished. Given the clarity of this situation, how ironic it is that nutrition remains the most neglected aspect of health care and, most notably, of primary health care. While we have seen a great enthusiasm for implementation of ORT programs, little interest or allocation is given to promoting good nutrition. Why is nutrition so assiduously neglected?

First, nutrition is an invisible attribute. Only its absence is readily noticed and then only in extreme cases.

Second, while malnutrition itself can be measured or detected at a given point in time, normal nutrition in a child implies regular, continuous growth. But growth and growth faltering take place too slowly and too imperceptibly to attract the attention of mothers or health workers in the same way as do more acute and dramatic problems like diarrhea.

Third, nutrition interventions are not discrete, not time limited. ORT is given for a discrete episode of diarrhea over a few days; nutrition happens every day. But, by projecting nutrition as a continuous daily need, we relegate it to the category of "natural behavior" like breathing or excretion. As a result, nutrition and particularly feeding are not considered health interventions. Nutrition is not viewed as a response to illness, but rather just a routine, normal part of life.

Fourth, improving nutrition in children requires active and sustained participation of mothers. Even successful diarrhea management is based on recurring contact with mothers and reinforcement of the basic message of how to prepare and give ORT. The message is defined and often repeated. On the other hand, clinical health workers are frustrated by the fact that there is no single approach, no single message or definitive answer to give a mother that will induce the desired nutritional response.

Next, nutrition activities are not the response to an acute felt need as is oral rehydration for diarrhea. In most cases, there is no demand on the part of consumers for nutrition, at least not until it is too late. In short, nutrition is frankly a bore. It requires continuous action on a daily basis, where even the result of correct behavior is difficult to perceive and certainly long in coming.

Nutrition is further neglected because to date actions aimed at treating malnutrition, or even at

preventing it, often do not seem to work. The extensive review of food supplement programs by Beaton and Ghassemi convinced even the enthusiasts that nutritional status is not often affected by food giveaways. Even nutrition rehabilitation is plagued with high failure rate, relapse, and extremely high unit costs. So nutrition is neglected because from all experience it does not seem to work. Is it any wonder that health workers lose heart and shift their efforts to interventions that pay off?

FOCUS ON LATE STAGES IS CAUSE OF FAILURE

Why is it that these efforts do not work? I believe a major reason that nutrition interventions are so frequently ineffective is because they all too often address only the final stages of malnutrition. This focus on the already severely malnourished child completely misses the opportunity to intervene at an early age, when the most severe *deficit in growth* is actually occurring, but is not yet visible. Inter-

ventions should be aimed at the period before the child actually becomes malnourished, when efforts to help are still practical and affordable, and are still likely to be effective.

We are used to seeing data on malnutrition portrayed as prevalence as shown on the graphs in Figures 5 and 6. We invariably see an increasing proportion of children malnourished with increased age—the problem appears to be greatest beyond two-years old. But let us look at growth and see when growth deficit occurs in these same populations (Figure 7). The major deviation from normal growth occurs between six and eighteen months of life. After two years, most children grow at the same rate as well-nourished populations—they just remain smaller due to the major deficits that occurred before age two, paralleling the normal growth curve at a lower level.

Note, on Figure 8, the correlation between peak age of diarrhea incidence and the age of major growth faltering. Data in the global review by Snyder and Merson show an even higher peak

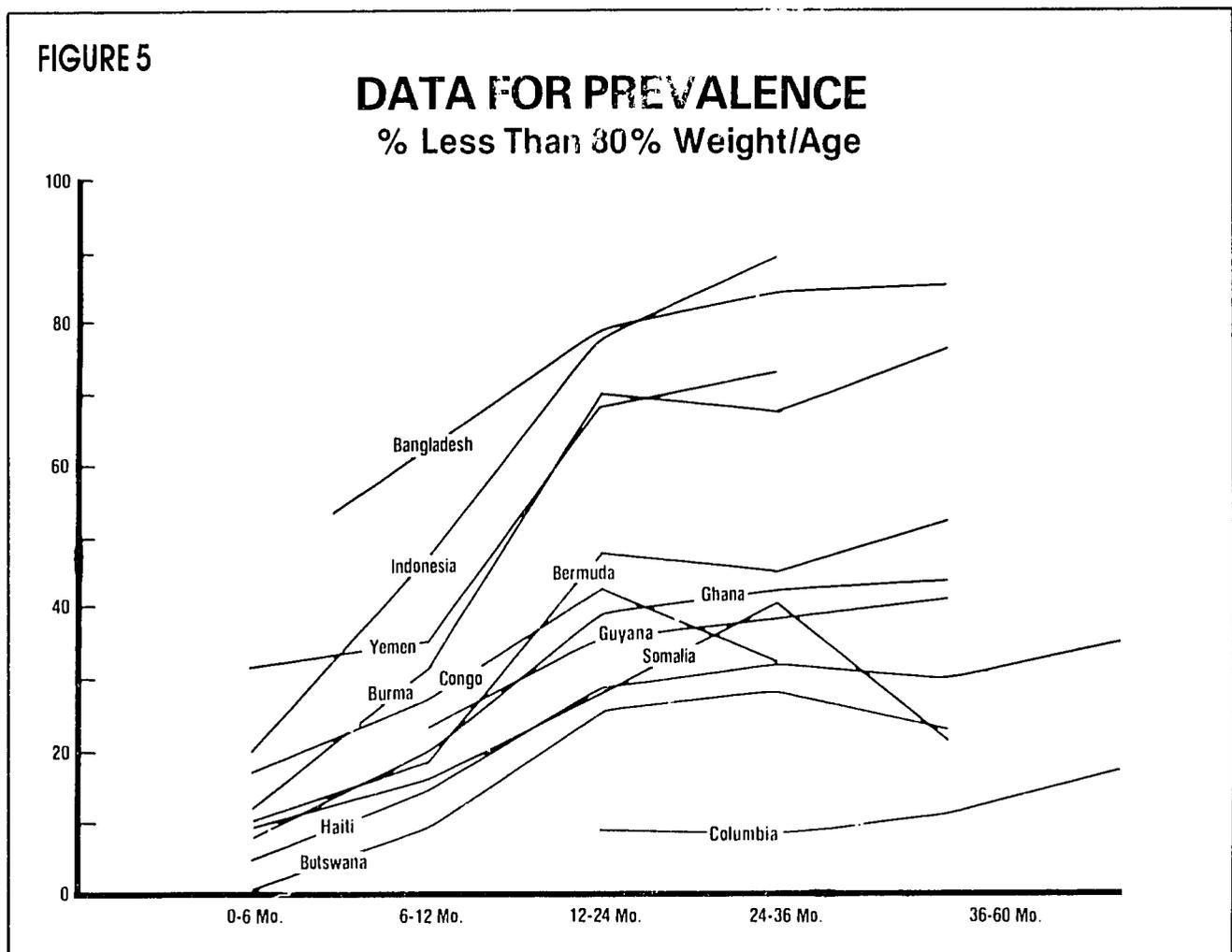


FIGURE 6

PREVALENCE OF MALNUTRITION % of Children Less Than 80% Weight/Age

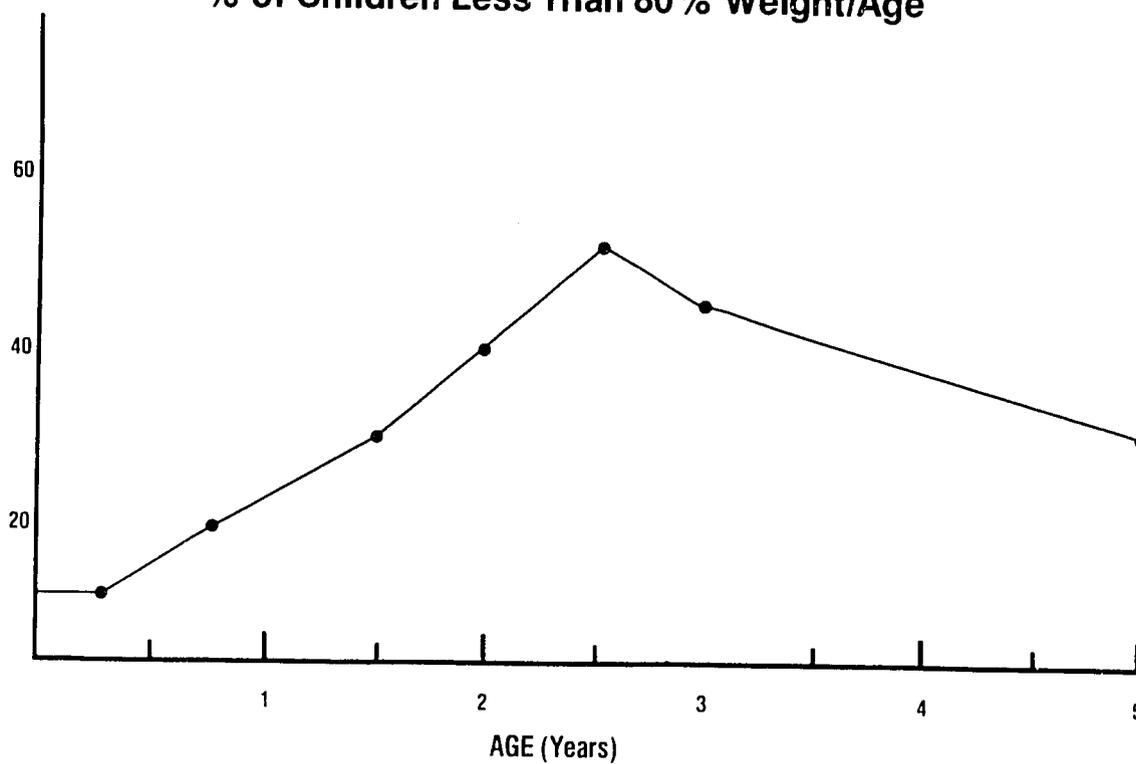


FIGURE 7

GROWTH DEFICIT % Of Expected Growth By Age Period

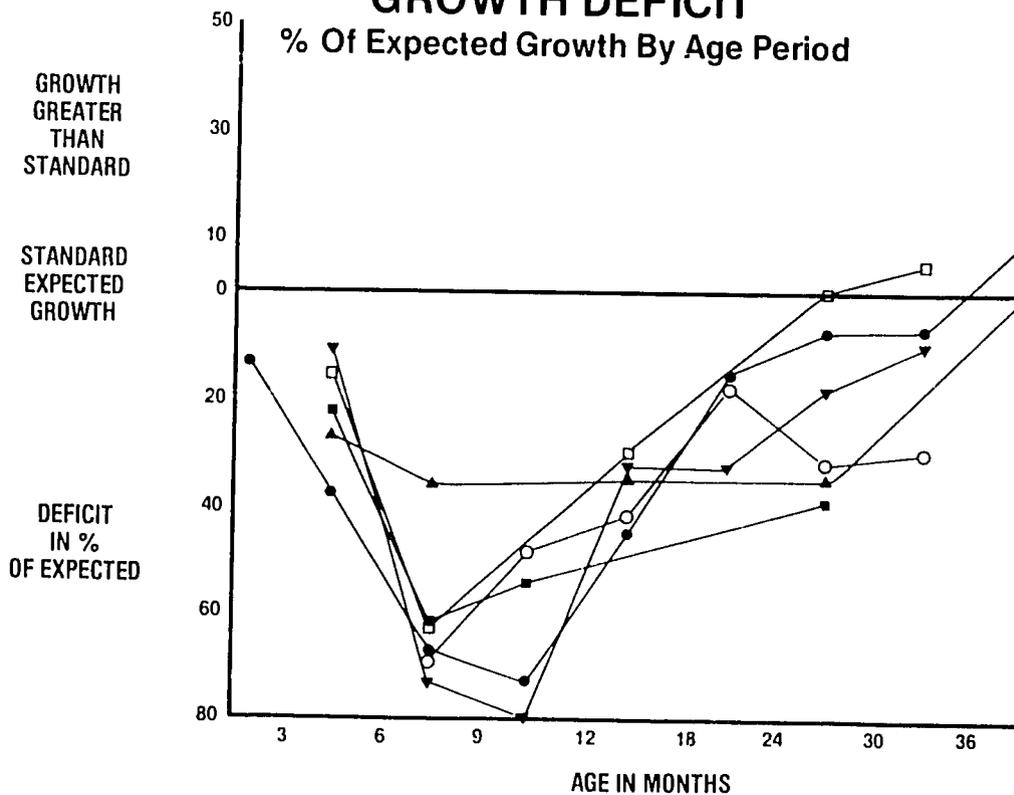
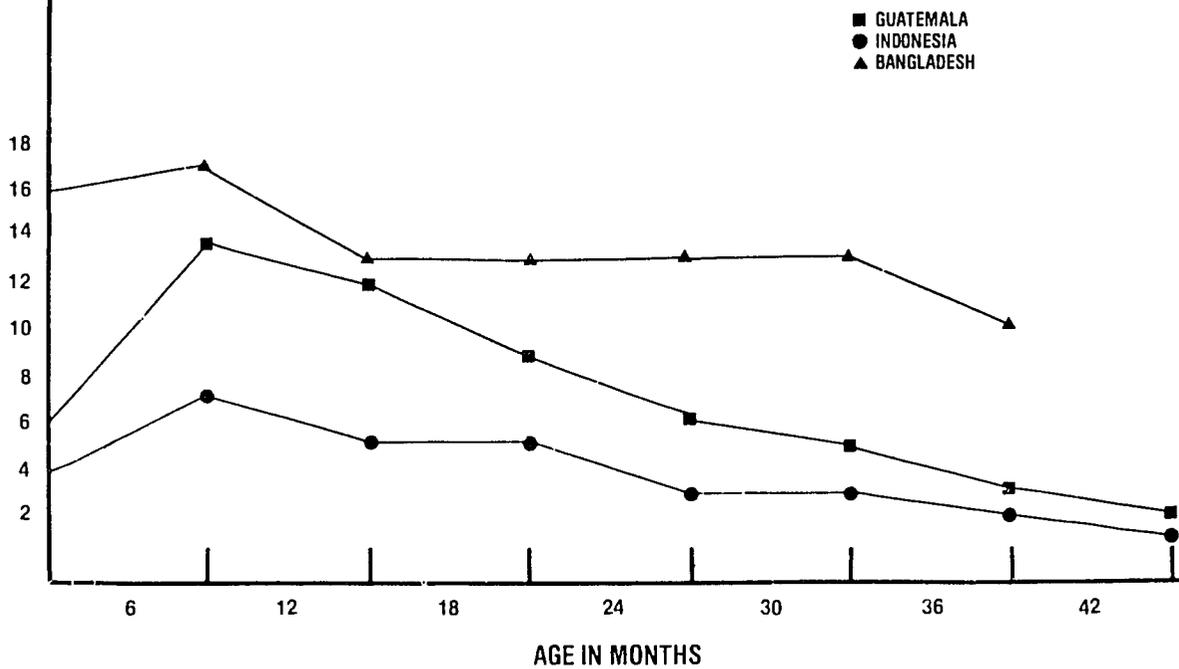


FIGURE 8

DIARRHEA PREVALENCE

% of Days Ill by Age



incidence in the first year, four to ten times as high as the incidence in the third and fourth years. Diarrhea is predominantly a problem of infancy, the same time period as growth faltering. This is, I believe, no mere coincidence as I will attempt to demonstrate.

We are all familiar with the kind of growth curve shown in Figure 9. During the early part of this period (ages 0 to 18 months), this child doubtless appeared well between episodes of diarrhea or other illness, certainly to her/his mother, probably also to a doctor as well. We would also expect that the child would have responded quite well to ORT during these episodes of diarrhea. Later, however, when the child had reached the status of severe malnutrition, the episodes of diarrhea were probably more severe and less easily treated with oral fluids alone, and nutritional intervention too was difficult and less effective.

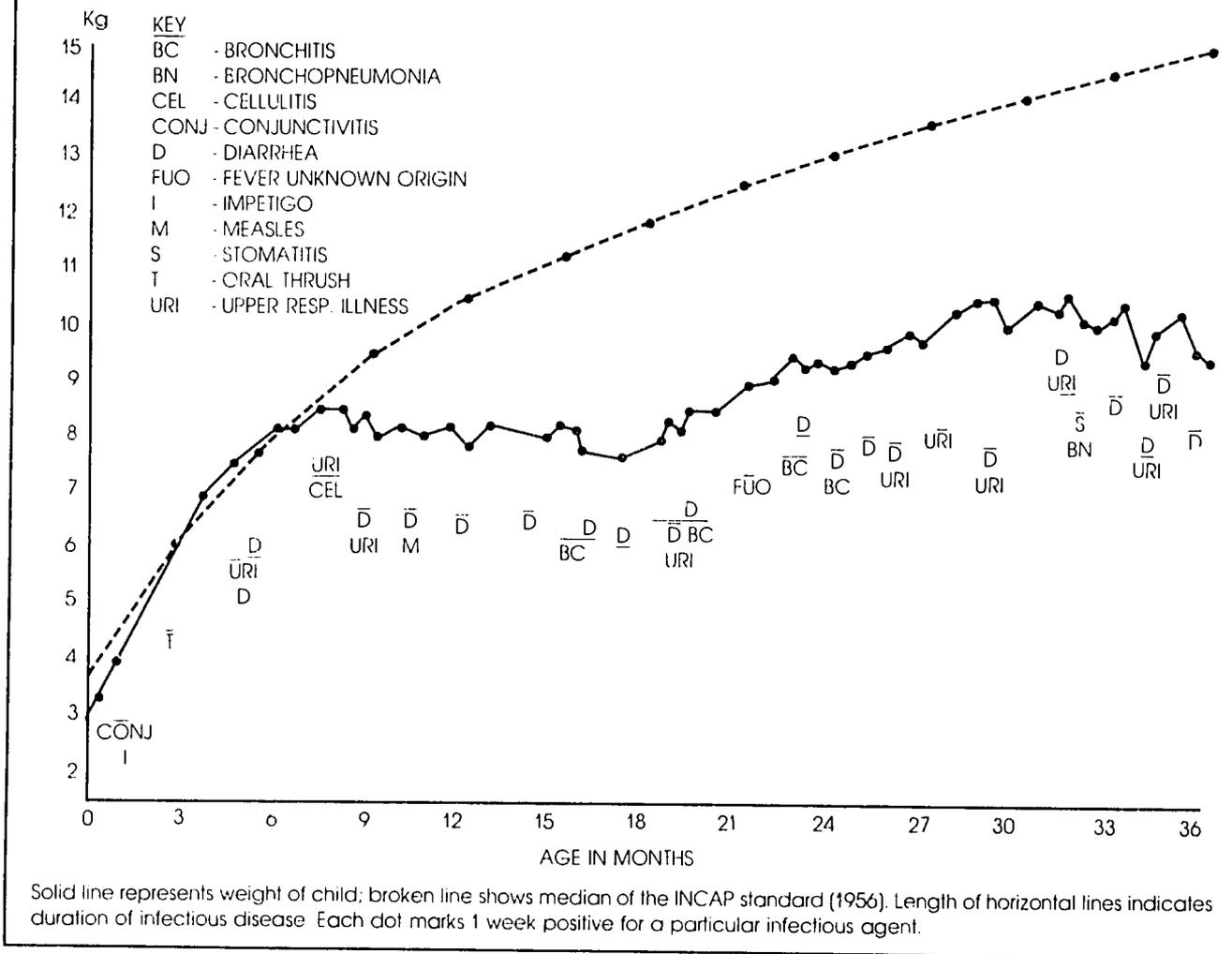
All too often our interventions are, in such older children, too late, aimed at children already severely malnourished, at the late and often irreversible effects of earlier growth deviation rather than at the growth deviation itself and at the diarrhea that causes it.

BEGIN EARLY AND AIM AT GROWTH FALTERING

The answer, it seems to me, to both malnutrition and diarrhea is to intervene earlier before the malnutrition becomes established, before permanent stunting occurs, and before the omnipresent diarrhea reaches that chronic stage when treatment is also difficult and often unsuccessful. To be effective, interventions must begin within the first year of life and their major nutritional impact will be seen before the child reaches two years of age.

A major target for such early nutritional intervention is obviously diarrhea. Indeed, the effect of diarrhea on growth has been documented in studies from many countries. Rowland, in The Gambia, calculated a weight deficit of 26 grams per day in the child ill with diarrhea amounting to a staggering 1.3 kilograms per year deficit during the first three years of life. Studies of Central American infants, ill up to 14 percent of the time with diarrheal illness, showed a deficit of 1.5 kilograms, by age five years, some 12 percent of their weight-for-age. Calculations have shown that a child ill with diarrhea loses approximately 2 percent of his body

FIGURE 9



weight per day. In the course of five or six episodes per year, each lasting five to seven days, this amounts to a nutritional setback of approximately one entire Gomez category (Figure 10). Again, calculate it however you may wish, diarrhea, although a discrete illness from which the child recovers, leads insidiously to significant protein energy malnutrition.

Let us look again at the growth curve of one of the children made famous by the outstanding longitudinal study of Leonardo Mata (Figure 9). Thanks to attentive curative health care this child survived, but the persistent onslaught of illness, especially diarrhea, continued relentlessly to take its toll on the nutritional status of this child. Rehydration treatment for acute diarrhea was critical to this child's survival. Yet rehydration alone gave the child little more than just another chance to get diarrhea again, and again be threatened acutely with death. With fluid treatment alone the long-term prognosis

for this child was poor, as the declining nutritional status would dictate the eventual outcome. Looking at this graph, I am confident that you will agree that diarrhea is a nutritional disease.

FEEDING IN DIARRHEA

With this evidence before us, who could argue with the statement that complete treatment of diarrhea requires feeding? Yet I am sure that most of you have faced personally the difficulty of convincing mothers, and also health workers, to feed a child with diarrhea. The concept of resting the gut is a popular one in traditional and modern societies alike. But just as too much rest in bed after a heart attack courts disaster, so resting the gut is now known to be a *mistaken concept*. Careful studies have shown that atrophy of the intestinal villi and a decrease in intestinal enzymes occurs

FIGURE 10**DIARRHEA EFFECT ON GROWTH**

Age(mo.)	Illness Prevalence (% Days ill)	Weight Deficit (Grams)
0-5	4-10%	190-476
6-11	8-17%	380-810
12-23	9-13%	854-1,230
24-35	4-10%	380-950

Total by 3 years 1.8 - 3.5 Kg.

almost within hours after the last exposure of the intestine to food. Thus the presence of nutrients in the intestinal lumen is essential to encounter these effects: *to maintain normal gut morphology*, *the replacement of gut mucosa*, and *the continued production of necessary digestive enzymes*.

There are special advantages to extra feeding during and after diarrhea. Studies have shown that malnourished children have a capacity for *catch-up growth*—growth at a faster than normal rate—when they are fed calories and protein above the normal requirements. In the immediate convalescent period after acute diarrhea there is a similar tendency for catch-up growth. If nutrients are offered to the intestine at that time, their absorption and metabolism for catch-up growth can be seen.

It is also important at this time to provide the child with *additional vitamin A* as diarrhea is associated with the acute onset of xerophthalmia. Furthermore, recent studies by Sommer and Tarwotjo in Indonesia showed an increase in diarrhea incidence of up to three times in vitamin A deficient children. It now appears that vitamin A plays a critical role in protection of the intestinal mucosa from infection, thereby reducing the susceptibility to recurring diarrhea. Reduced incidence of diarrhea is surely a desired program goal heretofore elusive. Vitamin A offers one answer.

FOOD IS THE REAL SUPER ORS

You have heard already this morning about *Super ORS*, the use of various nutrients, particularly starch and proteins, to increase the absorption of fluid. In fact, food is the real super ORS. When easily digested food is presented to the intestine it supports the reabsorption of the fluid found there, helping to stop diarrhea. This satisfies the mother and health worker, as well as replacing nutrient losses and initiating the all-important catch-up growth. Diarrhea is indeed a nutritional disease and feeding is therefore the only reasonable response for therapy.

FEEDBACK CONVINCES MOTHERS

But how do we get mothers to understand the importance of feeding, particularly extra feeding during the convalescent period? Recall if you will our difficulty of gaining acceptance for oral rehydration fluid. We had to urge people to look at the child, to stop worrying about the diarrhea so much and recognize that fluid replacement improved the child's strength, his/her appetite, his/her appearance and overall well-being. We followed the eminently sensible suggestion of the great pediatrician, Emmet Holt, "Treat the child, not the stool." Where we have succeeded in directing attention to these critical indicators of health in the child, we have brought about acceptance of ORT. To trigger an appropriate feeding response to the nutritional deficit produced by diarrhea, we need a similarly convincing indicator. This trigger, this indicator, is the *negative growth effect of diarrhea*. Growth monitoring or the regular assessment of growth in the child is the only method that I know of for visualizing that indicator.

Consider how impressed we all are with the graphic display of the nutritional impact of diarrhea shown in the studies by Dr. Mata. A similar graphic display on an actual weight chart can be used to demonstrate to a mother the nutritional impact of diarrhea on her own child to raise her awareness and concern and her interest in feeding him/her (Figure 11).

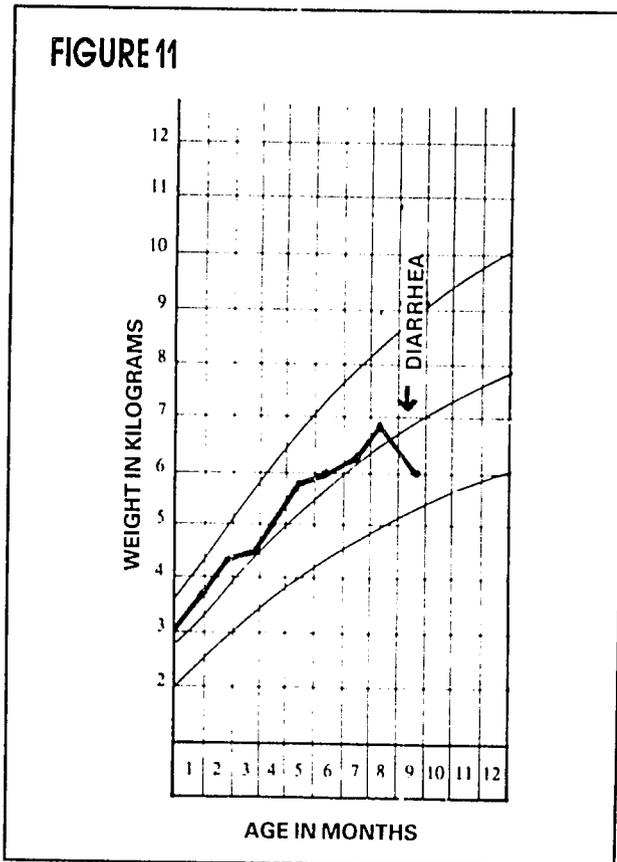
Now a mother may feed her child in response to our advice without any weighing or use of a growth chart. But how does she know she is having an effect? And if she doesn't know, perhaps she will stop her efforts too soon.

LACK OF EFFECTIVE FEEDBACK ON NUTRITIONAL EFFECT OF DIARRHEA

This points to a major reason for the neglect of adequate feeding and for the lack of appreciation in both parents and workers alike for the role of feeding during and after diarrhea; *there is no effective feedback*. Diarrhea is just not recognized for its contribution to creating malnutrition. Once stools become normal, the illness is over. Just looking at the child, who can tell that he or she has slipped one more notch down the nutritional scale?

With fluid and electrolyte losses, the more obvious deficits in diarrhea, the feedback loop is more obvious. The need for ORT and our response of giving ORT is triggered by the onset of diarrhea. In the patient, thirst is the feedback indicator and we can judge the child's fluid needs in large part

FIGURE 11



by the presence or absence of thirst. "Give ORS until the child doesn't want any more" is a nice description of a feedback-controlled function. Indeed, such feedback mechanisms are the basis for balancing most physiologic functions and most of our behavior as well. But in our nutritional management of diarrhea, we customarily have no handy feedback mechanism in place, no clear, objective, measurable, and visible effects to feedback into the response mechanism. We send out nutritional messages to the mother of the child with diarrhea, but we rarely learn whether they are internalized or acted upon. The mother who follows our nutrition messages in turn has no means to detect the results of her action, yet she is still expected to follow these directions, which all too often seem irrational or culturally alien to her. No wonder she often doesn't take our advice. How much blind faith can we reasonably expect?

EFFECTIVE GROWTH MONITORING

Growth monitoring can provide that critical feedback to stimulate or modify the subsequent feeding response. We must insist that we define growth monitoring as:

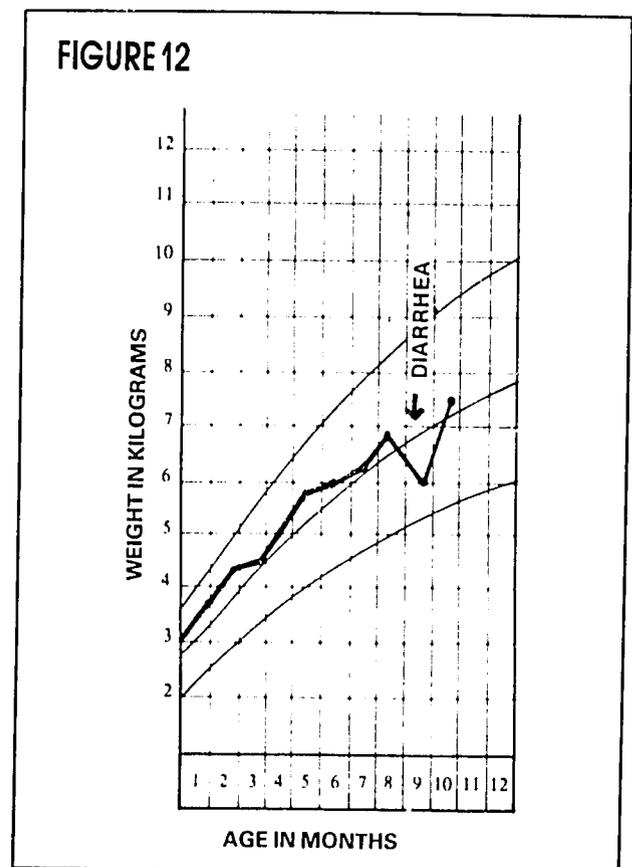
1. Measuring the growth objectively.

2. Recording it visibly and understandably.
3. Communicating it effectively to the mother.
4. Doing it regularly and continuously.

All four are necessary to make growth monitoring effective. By making perceptible the result of proper feeding, both when the child is well and particularly during and following acute diarrhea, growth monitoring can stimulate further action on the part of the mother. Growth monitoring, properly done, is in a very real sense the nervous system of individual health care. Successful feeding is demonstrated by the visual record of adequate growth, encouraging the mother to continue it such as in Figure 12. Deficient growth, made visible by growth monitoring, can now stimulate an appropriate corrective response, like crying or the onset of diarrhea. Weighing of the child, recording of the weight on a growth chart, and communicating the interpretation to the mother allows the mother to see growth. Done on a routine basis, for example monthly, and also done after acute illnesses like diarrhea, growth monitoring can reinforce appropriate feeding behavior and stimulate special corrective feeding when needed.

But growth monitoring must be more than just the measurement of growth. It requires an effective response by the mother. Let us consider the four

FIGURE 12



elements that must be present for an effective response to any stimulus.

1. **Perception**—*Awareness of the Problem.* Diarrhea is obvious and the mother wants it stopped. The growth effects of diarrhea require that the mother see the growth faltering and she can only do this by weighing the child. We must emphasize as one of our messages, along with our advice about fluid and feeding, that if your child has diarrhea, weigh him/her to check his/her growth.
2. **Motivation**—*The Desire to Respond.* We have successfully convinced mothers to be concerned about fluid loss and want to replace it. They must also be concerned about growth. We must create a demand for growth so that mothers are receptive to strategies for achieving it. Only if a mother has seen and becomes aware of regular growth can we expect this to occur.
3. **Knowledge and Skills**—*How to Manage Fluid and Feeding.* The mother must know how to make proper ORS and to use it. She requires precise, descriptive, and practical instructions that are clear to both the health worker and her. This has been widely achieved in ORT programs. Our nutrition messages must be similarly clear, directive, and culturally credible. They must be time-limited and appear to the mother like a prescription: "Give X amount of a particular food (hopefully familiar, cheap, and available), made by a precise recipe, four times a day until the pre-illness weight or growth trajectory is re-achieved."
4. **The Means to Act**—*Rehydration Fluids and Food.* Our programs have provided ORS packets or have confirmed the availability in the home of proper ingredients for sugar-salt solution, volume measures and other tools of rehydration. Logistics have been appreciated by all of you as an important program element. But what about food? Should our programs try to provide special food as well? In most countries, probably not. Surely we can hope for food redistribution even in the poorest home. Only a few hundred calories for a few days can make the difference in catch-up growth. Where food supplements are available, diarrhea offers a highly targeted use of these supplements to be given frequently for a brief period after illness. This reinforces our message and yet does not breed dependency.

CHILD WEIGHING IS NOT GROWTH MONITORING

Many experts have criticized growth monitoring programs as being ineffective, and indeed many or most are. The reason is that they stop with the first of these elements, perception, or in fact even fail to provide that to the mother. How many of you have visited child weighing programs in which the mothers line up with their children, the local health worker then takes the child from the mother and weighs it, marks the card, *closes it*, and then hands it and the child back to the mother, not even commenting on whether the weight has gone up or down? This sort of program fails even to provide perception or awareness of growth or its faltering, never mind the needed motivation, knowledge, and action. *No, child weighing is not growth monitoring. No, a weight chart is not enough*—possession of a weight chart alone is not likely to have much influence on the child's nutrition. Neither is ORS effective if taken one teaspoon three times daily. Like ORT, growth monitoring must be used properly if its health potential is to be realized.

Perception of growth, desire by the mother for growth, knowledge of appropriate feeding, and the availability of food—these together lead to growth, growth that is fed back through growth monitoring to the mother who sees the results of her action. Involving the mother in growth monitoring of her child, beginning at the very earliest age, will establish an appreciation for growth, even her demand for it. By including nutritional assessment in our management of diarrhea, diarrhea, often viewed by workers and mothers alike as a minor illness, will come to be seen for its growth effect and accepted as an important condition requiring a concerted feeding response.

ORT PROGRAMS NEED GROWTH MONITORING

This is important to keep in mind when looking at the programmatic implications of what we have been talking about. Telling the mother of a fifteen-month-old child with diarrhea that she should take the child to be weighed will be worth very little unless she has been involved on a continuous basis with a growth monitoring activity. No one will be able to detect the impact of that particular episode on the child's growth, and the child's nutritional state cannot be dramatically altered with even proper feeding following this single illness. So it becomes particularly important to ORT programs

that there be well-functioning growth monitoring running alongside to provide the mother with the knowledge and motivation she needs to understand the meaning of weight loss from that acute diarrheal episode and to take appropriate feeding action.

Does this mean that ORT programs should take on the job of starting and running growth monitoring activities? No more than I would counsel you to assume full responsibility for the many other programs impinging on child health and particularly diarrhea. We all know that the multiple tasks of running an effective ORT program alone are often more than can be managed effectively by the ORT program staff available to do them. But the critical importance of growth monitoring to the success of ORT programs in countries with significant malnutrition makes some sort of action to ensure the presence of a functioning growth monitoring program essential. Through active efforts, both at higher levels and at the level of the community, to strengthen nutrition efforts and ensure effective collaboration and service integration with them, ORT programs can support existing growth monitoring efforts. But where no growth monitoring activities presently exist, ORT programs should make every effort to bring them into existence, just to ensure that the success of their hard work to provide effective fluid therapy is not jeopardized by lack of the means to provide effective nutritional management of diarrhea.

GROWTH MONITORING BENEFITS FOR PRIMARY HEALTH CARE

The presence of a well-functioning growth monitoring program can provide additional benefit to the ORT program as well (Figure 13). The regular growth monitoring visit is an excellent time for the community health worker to demonstrate appropriate fluid therapy to mothers, as well as to emphasize the nutritional management of diarrhea. Indeed, done properly, growth monitoring is a strategy to bring the mother into contact with the health workers on a regular basis, more frequently and earlier in the child's life, even before illness strikes. It is a prospective activity and can prepare the mother to deal effectively with diarrhea and other illness, as well as being an ideal opportunity for preventive activities such as immunization or health education. By recording illness on the chart, mothers can see the effect of diarrhea on growth and be convinced of its importance just as we are. This lesson can occur even when the child is not acutely suffering from diarrhea, if the health worker

FIGURE 13

GROWTH MONITORING BENEFITS FOR PRIMARY HEALTH CARE

- DIARRHEA MANAGEMENT TEACHING
- REGULAR, FREQUENT, EARLY CONTACT
- IMMUNIZATION AND HEALTH EDUCATION
- HEALTH SYSTEM INTO THE COMMUNITY
- BENEFITS THE HEALTH WORKER
- MOTIVATES MOTHER AND HEALTH WORKER
- OBJECTIVE GOAL FOR COMMUNITY AND HEALTH SYSTEM

actively seeks to find out why the child has lost weight and discusses the cause, perhaps an episode of diarrhea two weeks earlier, with the mother. This is the occasion to reinforce your ORT messages as well as encourage feeding.

Doing growth monitoring in the village pulls primary health care out of the health facility and into the community, bringing about far higher coverage of basic services, especially ORT. In an isolated, rural area of Haiti totally deprived of routine health care, use of ORT rose from a baseline of 0 percent to 87 percent in one year through repeated instruction and demonstration of ORT at six weekly growth monitoring sessions done by a mobile team. "How else could we have contacted all those 8,000 mothers on repeated occasions to be sure they understand and use ORT correctly?" was the response of the program director when I asked the importance of growth monitoring. "Sure, house to house—but I cannot possibly afford it, and how would I reinforce the message even if I could teach house to house?" How else do you ensure the interaction necessary to really change behavior? By incorporating this strategy, a diarrhea program can evolve from a categorical approach to case management and rehydration to becoming a basic activity integrated with and supportive of primary health care.

The integration of categorical services such as diarrhea case management into growth monitoring can benefit the health worker as well as the mother and child. First, regular monitoring of growth will draw primary health care workers into interaction with the community on a continuing, regular basis. Second, the monthly weighing activity is the appropriate forum for the health worker to demonstrate proper use of ORT, or to distribute chloroquine for malaria, to immunize, or provide periodic high doses of vitamin A. Growth monitoring provides a handle for all health education. Third, growth

monitoring provides a clear, overall goal that can be measured: "*Growth for All*" now.

Recovery of pre-illness weight through extra attention to feeding is a clear goal and a time-limited one and a much more satisfying response to illness for both health worker and mother than the general and somewhat vague exhortations on nutrition that are the commonly seen approach. Finally, the feedback cycle, so important to the individual child and mother pair, works also to stimulate primary health care. Health workers themselves find growth monitoring a rewarding means of measuring the impact of their own interaction with mothers and of other programs designed to improve health of the communities. They see some results of their actions.

In Indonesia, villagers record the level of participation in their weighing program and the percentage of children gaining weight, recognizing that weight gain in the village as a whole is a reflection of the general health of the entire community. Feedback as a measure of nutritional health becomes the motivating tool for health workers and their supervisors can immediately see which communities are prospering and which need more attention.

COMPREHENSIVE DIARRHEA MANAGEMENT: TOOL FOR STRENGTHENING PHC

Our concern for diarrhea, perhaps the most common illness of childhood, has carried us in this discussion from acute dehydration to the underlying nutrition problems, to recognition of the importance of feeding in achieving full recovery from diarrhea. I see no other viable strategy option besides regular interaction with mothers, helping them to understand and deal with diarrhea properly. Somehow you just have to get health workers to talk and interact with individual mothers. I submit that growth monitoring sessions, properly organized, will provide both the initial trigger or stimulus to feeding and the continuing feedback to mothers necessary to maintain their efforts to obtain normal growth. It is this feedback, this interaction with mothers, this forum for dialogue that I urge you to build into your programs.

This comprehensive approach to the diarrhea problem at the community level can lead to a system of primary health care itself. For diarrhea is perhaps a model for many community health

problems and its resolution requires a truly broad-based approach, spanning the care of patients—effective health education, involvement of the mothers in the understanding of the care of their child, community action, mobilization of resources, environmental improvements and management, supervisory and evaluation functions extending to the entire community. Responding to diarrhea with adequate fluid, feeding, and feedback will lead to the kind of comprehensive approach that is the basis of effective primary health care.

Your experiences over the past few years have shown that you can implement high coverage, high impact, effective ORT programs. You should take pride in what you have accomplished and the systems you have developed to reach out to the millions to change attitudes and practices that result in measurable improvements in health.

The success of ORT programs is an exciting proof of your ability to make things happen in health. Let us not stop here at oral rehydration alone, but recognize the greater effect of diarrhea as a nutritional disease and the role of nutrition in all of health. Let us join with other elements of your health care system to include the necessary emphasis on feeding and develop a feedback system enabling sustained contact with mothers, a system that will strengthen the entire fabric of health care by incrementally expanding to embrace all facets of the total primary health care approach.

FLUID, FEEDING, AND FEEDBACK

Only a few years ago skeptics doubted the ability of mothers and health systems alike to bring oral fluid therapy into every home. Yet in this brief period you have made home rehydration an integral part of all of your programs. Many of you have recognized the importance of continued feeding in diarrhea and are working to incorporate those messages into your ORT programs as well. But even more important and most critical, we must not disregard the element critical to any dynamic living system—*feedback*. *Feedback to the mother, feedback to the health worker, feedback to the entire system*. This is the element that will ultimately make the whole system work.

Let us offer a *total* strategy on which to build "Health for All." A comprehensive approach to oral therapy for diarrhea with fluid, feeding, and *feedback* offers that strategy to primary health care programs in your countries throughout the world.

NON-CLINICAL INTERVENTIONS FOR DIARRHEA CONTROL: EFFECTIVENESS AND COSTS

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DEFINING A DIARRHEAL DISEASES CONTROL PROGRAM

Several development agencies, most notably WHO and UNICEF, and many developing country governments have made oral rehydration therapy (ORT) the cornerstone of their programs for diarrhea control. There are two main reasons for this. First, the development of ORT represented a true revolution in diarrhea therapy and brought the promise of treatment into every home in the world. Second, field research and evaluation have shown that ORT is an effective and relatively inexpensive method for dramatically reducing the mortality caused by acute watery diarrhea (Rohde, 1984). It is certainly understandable, and probably correct therefore, that ORT should continue to be the flagship of the international and national efforts to overcome the immense burden of sickness and death caused by diarrheal diseases. Evidence of this emphasis on ORT is clearly provided by the title of this conference and its predecessor.

The danger in emphasizing ORT, however, is that it may foster a belief that ORT equals diarrheal diseases control. Figure 1 indicates the probable efficacy of ORT in combatting diarrhea mortality and morbidity of three main clinical types. ORT is proven to be highly effective in preventing death from dehydration caused by acute watery episodes of diarrhea. Its role in preventing death from dysenteric or chronic diarrheas is believed to be limited but is not well documented at the present time.

The impact of an ORT program on overall diarrhea mortality rates in an area will depend, therefore, on the proportion of diarrhea deaths that are caused by acute watery episodes rather than dysenteric or chronic episodes. Where this proportion is high, ORT impact on diarrhea mortality may be high. Where, as may be the case in many areas, the proportion is low, the maximum impact of ORT on overall diarrhea mortality rates can only be modest.

ORT can be expected to have little or no impact on the morbidity rates of any type of diarrhea, although by limiting the nutritional damage during an acute watery episode, it might reduce the severity and duration of subsequent episodes.

ORT is probably a relevant and cost-effective intervention for diarrhea control in all countries. It is especially important in those countries where diarrhea mortality rather than morbidity is the main concern. In all countries, however, ORT should be complemented by other diarrhea control interventions designed to avert mortality not averted by ORT and to reduce morbidity rates. In this paper the effectiveness and costs of some of these other interventions are examined.

NON-CLINICAL INTERVENTIONS FOR DIARRHEA CONTROL

In 1982 the Diarrhoeal Diseases Control Programme of WHO (WHO/CDD) initiated a systematic study of interventions that might play a role in diarrhea control, excluding the clinical and case-management interventions (Feachem et al., 1983). A list of 18 interventions was drawn up (Figure 2) and an international group of specialists (Figure 3) mobilized to analyze the evidence concerning the effectiveness and feasibility of these interven-

FIGURE 1
THE POSSIBLE EFFECTIVENESS OF ORT IN REDUCING MORTALITY AND MORBIDITY FROM THREE CLINICAL TYPES OF DIARRHEA

	Diarrhea: Clinical type		
	acute watery	dysenteric	chronic
mortality	great	limited?	limited?
morbidity	none?	none	none

FIGURE 2 POTENTIAL NON-CLINICAL INTERVENTIONS FOR DIARRHEA CONTROL AMONG YOUNG CHILDREN

Strategy area	Potential Intervention	Reference to published analysis (where applicable)
Maternal health	<ul style="list-style-type: none"> • Preventing low-weight birth • Enhancing lactation 	Ashworth & Feachem (1985a) Ashworth & Feachem (1985b)
Child health	<ul style="list-style-type: none"> • Promoting breastfeeding • Improving weaning practices • Supplementary feeding program • Using growth charts • Increasing child spacing • Vitamin A supplementation 	Feachem & Koblinsky (1984) Ashworth & Feachem (1985c) Feachem (1983) in preparation in preparation in preparation
Immuno- and chemoprophylaxis	<ul style="list-style-type: none"> • Rotavirus immunization • Cholera immunization • Measles immunization • Chemoprophylaxis 	de Zoysa & Feachem (1985b) de Zoysa & Feachem (1985b) Feachem & Koblinsky (1983) de Zoysa & Feachem (1985a)
Interrupting transmission	<ul style="list-style-type: none"> • Improving water supply and sanitation facilities • Promoting personal and domestic hygiene • Improving food hygiene • Controlling zoonotic reservoirs • Controlling flies 	Esrey et al. (1985) Feachem (1984) in preparation in preparation in preparation
Epidemic control	<ul style="list-style-type: none"> • Epidemic surveillance, investigation, and control 	in preparation

FIGURE 3 PERSONS WORKING ON THE WHO/CDD STUDY AND COMPARATIVE ANALYSES OF EIGHTEEN INTERVENTIONS TO CONTROL DIARRHEAL DISEASES AMONG YOUNG CHILDREN

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Ancrew Creese	CDS, Swansea, UK
David de Ferranti	World Bank, Washington, D.C., USA
Isabelle de Zoysa	LSHTM, London, UK
Steven Esrey	Cornell, Ithaca, New York, USA
Richard Feachem	LSHTM, London, UK
Robert Hogan	WHO, Geneva, Switzerland
James Hughes	CDC, Atlanta, Georgia, USA
Marjorie Koblinsky	ICDDR,B, Dhaka, Bangladesh
Michael Merson	WHO, Geneva, Switzerland
Anne Mills	LSHTM, London, UK
Francois Orivel	IREE, Dijon, France
Margaret Phillips	LSHTM, London, UK
Diana Silimperi	YKHC, Alaska, USA

tions. For interventions found to be effective and feasible, more detailed studies of costs and cost-effectiveness have been initiated.

Analyses of the effectiveness and feasibility of 11 of the 18 interventions, using a standardized analytical approach, have been published while the remaining seven are in preparation (Figure 2). These reports are very detailed and the work is still in progress. This paper can provide no more than a

brief summary of the main results achieved to date.

Several interventions have been found to be ineffective, of limited feasibility, or too costly and so do not appear to have a major role in diarrheal diseases control programs in developing countries in the foreseeable future. These are:

- enhancing lactation,
- supplementary feeding programs,

- chemoprophylaxis,
- fly control.

Other interventions are of uncertain effectiveness, feasibility, or cost and require more research before their potential role in diarrheal diseases control programs can be assessed. These are:

- preventing low weight birth,
- using growth charts,
- increasing child spacing,
- vitamin A supplementation,
- improving food hygiene,
- control of zoonotic reservoirs,
- epidemic control.

The final group of interventions are those for which the evidence for high effectiveness and feasibility is reasonably strong. These are:

- promotion of breastfeeding,
- improving weaning practices,
- rotavirus immunization,
- cholera immunization (in special circumstances),
- measles immunization,
- improving water supply and sanitation facilities,
- promoting personal and domestic hygiene.

For these interventions, more detailed studies of costs and cost-effectiveness are now underway (Phillips et al., 1985a, 1985b). The remainder of this paper is devoted to a brief account of the evidence on effectiveness, feasibility, and costs of this final group of more promising interventions.

PROMOTION OF BREASTFEEDING

The literature on the relative risks of diarrhea morbidity to infants on different feeding modes suffers from several methodological problems. Thirty-five studies from 14 countries were reviewed (Feachem and Koblinsky, 1984); 83 percent of studies found that exclusive breastfeeding was protective compared to partial breastfeeding, 88 percent that exclusive breastfeeding was protective compared to no breastfeeding, and 76 percent that partial breastfeeding was protective compared to no breastfeeding. When infants receiving no

breast milk are contrasted with infants on exclusive or partial breastfeeding, the median relative risks are 3.0 for those aged 0 to 2 months, 2.4 for those aged 3 to 5 months, and 1.4 for those aged 6 to 11 months. Above 1 year of age no protective effect of breastfeeding on diarrhea morbidity is evident. When infants receiving no breast milk are contrasted with those on exclusive breastfeeding, median relative risks are 3.5 to 4.9 in the first 6 months of life.

There is limited, and mostly pre-1950, literature on the relative risks of diarrhea mortality for infants on different feeding modes. Nine studies from five countries were reviewed, most of which showed that breastfeeding protects substantially against death from diarrhea. When infants receiving no breast milk are contrasted with those on exclusive breastfeeding, the median relative risk of death from diarrhea during the first six months of life is 25.

Breastfeeding can be promoted by changes in hospital routine and by giving information and support to mothers. A review of 21 studies from eight countries shows that by such promotion the most likely reductions in the prevalence of non-breastfed infants are 40 percent among infants aged 0 to 2 months, 30 percent among those aged 3 to 5 months, and 10 percent among those between 6 months to 1 year old. Theoretical calculations based on these data show that such promotion can reduce diarrhea morbidity rates by 8 to 20 percent and diarrhea mortality rates by 24 to 27 percent in the first 6 months of life. For children aged 0 to 59 months, diarrhea rates would be reduced by 1 to 4 percent and mortality rates by 8 to 9 percent.

Detailed characterizations and costings of interventions to promote breastfeeding are now underway (Phillips et al., 1985a). Changes in hospital routine to promote early and continued breastfeeding may be achieved by conferences for senior hospital staff and by lobbying and educating staff at all levels. These changes may be achieved for less than \$2.50 [all costs in this paper are expressed in 1982 U.S. dollars] per mother-and-infant exposed, with costs being sensitive to the size of the hospital, salary levels, and the sophistication of the educational activities. Mass media programs in support of breastfeeding vary enormously in cost depending largely on the sophistication of the messages, their mode of delivery, and the size of the population being covered. With judicious selection, it should be possible in most countries to promote breastfeeding at a cost of \$5.00 or less per mother-and-infant exposed. This figure does not include the costs of providing creches, maternity leave, and breastfeeding breaks for mothers in formal employment. These latter costs may be 100 times greater than those for the other ac-

tivities mentioned above, but may be borne by employers rather than by the government.

We may imagine a poor community where 75 percent of infants under 3 months are exclusively breastfed and where the diarrhea morbidity and mortality rates are 220 and 1.4 per 100 children aged 0 to 59 months per year (Snyder and Merson, 1982). If a package of activities to promote breastfeeding costs \$5.00 per mother-and-infant exposed and reduces the 0 to 59 months diarrhea morbidity and mortality rates by 1 percent and 8 percent respectively (see above), the cost-effectiveness will be \$45.00 per diarrhea episode averted and \$890.00 per diarrhea death averted among children under 5 years of age.

IMPROVING WEANING PRACTICES

Evidence from 12 countries suggests that weaning education can improve the nutritional status of infants and young children (Ashworth and Feachem, 1985c). The effectiveness of weaning education depends in part upon the appropriateness of the design of the program with regard both to the content of the messages and their method of delivery. Face-to-face communication by locally recruited workers, reinforced by radio and other mass media, may be the most effective delivery mechanisms in some countries.

On the basis of theoretical calculations, it is estimated that weaning education can reduce diarrhea mortality rates by 2 to 12 percent in children under 5 years of age. These estimated mortality reductions exclude any effects of weaning education on food hygiene and any consequent reductions in both diarrhea morbidity and mortality rates. Also excluded from the analysis is the impact of including messages concerning feeding during and after diarrheal illness.

From the data assembled, cost-effectiveness estimates of weaning education as a method for reducing diarrhea mortality may be derived. The following assumptions are made:

- that both malnourished and well-nourished children participate and that the target age group is 6 to 23 months;
- that the annual cost of the program is \$5.00 per participating child;
- that a 10 percent reduction in diarrhea mortality rate over the first 5 years of life is achieved among participating children; and

- that the pre-intervention diarrhea mortality rate among children under 5 years of age is 1.4 per 100 children per year.

With these assumptions, the cost per diarrhea death averted in a child under 5 years is \$1,070.00. This figure is proportional to the cost per participating child and inversely proportional to the percentage reduction in mortality rate, which in turn is proportional to the pre-intervention prevalence of malnutrition. The cost per diarrhea death averted will be lower if it is possible to direct the program only to malnourished children. For instance, if only children who are 75 percent weight-for-age participate, and if the proportion of such children before the intervention is 40 percent, then with otherwise the same assumptions as above, the cost per diarrhea death averted will be \$430.00.

These tentative cost-effectiveness estimates are towards the lower end of the range of similar estimates being derived in this series of analyses of interventions for diarrhea control. They suggest that, despite the underestimation of effectiveness caused by excluding any effect of weaning education on food hygiene, weaning education may be an economically attractive diarrhea control measure in some countries.

ROTAVIRUS IMMUNIZATION

The potential impact of the new rotavirus vaccines currently under development and field trial has been analyzed (de Zoysa and Feachem, 1985b). In developing countries, rotavirus may be responsible for about 6 percent of all diarrhea episodes and 20 percent of all diarrhea deaths in children under 5 years of age (Figure 4). In industrialized countries these proportions may be higher. A rotavirus vaccination program that achieves a 60 percent coverage of children by an average age of 6 months with a vaccine having 80 percent efficacy, might reduce the diarrhea morbidity rate by 2.4 percent and the diarrhea mortality rate by 7.7 percent among children under 5 years of age.

Cost analysis by Phillips et al. (1985b) suggests that rotavirus vaccine could be added to an existing vaccination program for, on average, less than \$2.00 per child fully vaccinated. Assuming an annual diarrhea morbidity rate and mortality rate of 220 and 1.4 respectively, per 100 children under 5 years of age and a cost of \$2.00 per child vaccinated, the cost effectiveness of rotavirus immunization would be \$5.00 per diarrhea episode averted and \$220.00 per diarrhea death averted among children under 5 years of age.

FIGURE 4
IMPACT OF ROTAVIRUS IMMUNIZATION ON DIARRHEA MORBIDITY AND MORTALITY RATES
AMONG CHILDREN UNDER FIVE YEARS OF AGE IN DEVELOPING COUNTRIES^(a)

Age (months)	Proportion of diarrhea episodes		Proportion of diarrhea deaths	
	Caused by rotavirus (%)	Averted by rotavirus immunization ^(b) (%)	Caused by rotavirus (%)	Averted by rotavirus immunization ^(b) (%)
0-5	8	0.0	12	0.0
6-23	10	4.8	30	14.4
24-59	1	0.5	5	2.4
0-59	6	2.4	20	7.7

^(a)Assumptions include eighty percent vaccine efficacy, sixty percent program coverage, and an average age of full immunization of six months. For a full explanation of the derivation of these figures see de Zoysa and Feachem (1985b).

^(b)The computed proportions of episodes and deaths averted are directly proportional to the vaccine efficacy and the program coverage, and thus the effects of different values for these parameters may be readily computed.

CHOLERA IMMUNIZATION

The potential impact of the new cholera vaccines currently under development and field trial has been analyzed (de Zoysa and Feachem, 1985b). The impact of improved cholera vaccines depends on the prominence of cholera as a cause of diarrhea and this varies greatly from country to country. Taking the extreme example of Bangladesh, cholera may account for about 0.4 percent of all diarrhea episodes and 8 percent of all diarrhea deaths in children under 5 years of age (Figure 5). Values for the efficacy of a new cholera vaccine have to be assumed. A protective effi-

cacy of 64 percent has been found in challenge studies among adult U.S. volunteers receiving three oral doses of combined B subunit/whole-cell vaccine. A value for the efficacy of a new cholera vaccine of 70 percent is assumed here. The vaccination schedule for this vaccine is unknown at present. If a new vaccine does not give long-lasting protection, the optimal age of administration may be around 24 months, before the peak in age-specific cholera incidence rate. In this case it will not be delivered within the age range of the existing Expanded Program on Immunization (EPI) and so coverage may be low.

A cholera vaccination program that achieves

FIGURE 5
IMPACT OF CHOLERA IMMUNIZATION ON DIARRHEA MORBIDITY AND MORTALITY RATES
AMONG CHILDREN UNDER FIVE YEARS OF AGE IN BANGLADESH^(a)

Age (months)	Proportion of diarrhea episodes		Proportion of diarrhea deaths	
	Caused by <i>V. cholerae</i> (%)	Averted by cholera immunization ^(b) (%)	Caused by <i>V. cholerae</i> (%)	Averted by cholera immunization ^(b) (%)
0-23	0.2	0.0	5	0.0
24-59	0.6	0.3	20	8.4
0-59	0.4	0.1	8	1.7

^(a)Assumptions include seventy percent vaccine efficacy, sixty percent program coverage, and an average age of full immunization of two years. For a full explanation of the derivation of these figures see de Zoysa and Feachem (1985b).

^(b)The computed proportions of episodes and deaths averted are directly proportional to the vaccine efficacy and the program coverage, and thus the effects of different values for these parameters may be readily computed.

a 60 percent coverage of children at an average age of 24 months with a vaccine having 70 percent efficacy would reduce the diarrhea morbidity rate by 0.1 percent and the diarrhea mortality rate by 1.7 percent among children under 5 years of age in Bangladesh.

Cost analysis by Phillips et al. (1985b) suggests that cholera vaccination could be added to an existing vaccination program for, on average, less than \$4.00 per child fully vaccinated. Assuming an annual diarrhea morbidity rate and mortality rate of 220 and 1.4 respectively, per 100 children under 5 years of age and a cost of \$4.00 per child vaccinated, the cost-effectiveness of cholera immunization in Bangladesh would be \$220.00 per diarrhea case averted and \$2000.00 per diarrhea death averted among children under 5 years of age. These estimates are related to routinely administered vaccines and not their use in cholera outbreaks, when their cost-effectiveness could be substantially improved.

MEASLES IMMUNIZATION

The effects of measles immunization on diarrhea morbidity and mortality rates have been analyzed using data from field studies and theoretical calculations (Feachem and Koblinsky, 1983). Two types of measles-associated diarrhea are distinguished: with-measles diarrhea, which starts between 1 week pre-rash-onset and 4 weeks post-rash-onset; and post-measles diarrhea, which starts 4 to 26 weeks post-rash-onset. The etiology of these measles-associated diarrheas is unknown but some evidence points towards a frequently severe and dysenteric form of disease with *Shigella* playing a major role. A measles vaccination program that achieves a 60 percent coverage of children at 9 to 11 months of age, with a vaccine having 85 percent efficacy, might reduce the diarrhea morbidity rate by 1.8 percent and the diarrhea mortality rate by 13 percent among children under 5 years of age (Feachem and Koblinsky, 1983).

Cost analysis by Phillips et al. (1985b) suggests that measles vaccine could be added to an existing vaccination program for, on average, less than \$2.00 per child fully vaccinated. Assuming an annual diarrhea morbidity rate and mortality rate of 220 and 1.4, respectively, per 100 children under 5 years of age and a cost of \$2.00 per child vaccinated, the cost-effectiveness of measles immunization as a diarrhea control measure would be \$6.00 per diarrhea case averted and \$130.00 per diarrhea death averted among children under 5 years of age. These cost-effectiveness estimates

exclude the main benefits of measles immunization, namely the reduction of measles rates.

IMPROVING WATER SUPPLY AND SANITATION FACILITIES

A theoretical model has been developed that relates the level of ingestion of diarrhea-causing pathogens to the frequency of diarrhea in the community (Esrey et al., 1985). The implications of this model are that in poor communities an incremental improvement in water supply and sanitation facilities will have a greater impact on diarrhea mortality rates than on morbidity rates, a greater impact on the incidence rate of severe diarrhea than on that of mild diarrhea, and a greater impact on diarrhea caused by pathogens having high infectious doses than on diarrhea caused by pathogens having a low infectious dose.

The impact of water supply and sanitation on diarrhea-related infections, nutritional status, and mortality was analyzed by reviewing 67 studies from 28 countries (Esrey et al., 1985). The median reductions in diarrhea morbidity rates are 22 percent from all studies and 27 percent from a few better-designed studies. All studies of the impact on total mortality rates show a median reduction of 21 percent, while the few better-designed studies give a median reduction of 30 percent. Improvements in water quality have less of an impact than improvements in water availability or sanitation. There are no adequate data on the impact of improvements in water quality plus availability together with excreta disposal. Likewise, the available data do not permit an assessment of the advantages of adding a hygiene education component to a project, but analysis of hygiene education alone suggests that it may further enhance the impact (see below).

Taking all the evidence together, it is possible that well-designed projects combining water supply, excreta disposal, and hygiene education may achieve diarrhea morbidity rate reductions of 35 to 50 percent. It is to be expected that in any given project the impact on diarrhea mortality rates will be larger than that on diarrhea morbidity rates except in areas where other interventions such as oral rehydration programs have substantially reduced the risk of death from diarrhea.

Preliminary analysis of cost data from 87 developing countries suggests median annual costs of \$14.00 per capita for rural water supply and latrine projects and \$46.00 per capita for a combination of in-house water and sewerage in an urban area (Esrey et al., 1985). Special difficulties

are inherent in applying cost-effectiveness analysis to interventions having multiple benefits; water supply and sanitation interventions present these difficulties in an extreme form (Berman, 1982; Briscoe, 1984). In addition to their impact on diarrhea rates among young children, these interventions may avert diarrhea in other age groups, reduce the incidence of other infectious diseases, and have a variety of benefits unrelated to health. Studies on ways to overcome these analytical difficulties are in progress.

PROMOTING PERSONAL AND DOMESTIC HYGIENE

Interest in the role of education in disease control has increased considerably in recent years. It is probable that better-educated communities enjoy relative protection against several diseases compared to less-educated but otherwise similar communities. This protection may be conferred both by general education (as measured for instance by school attendance, adult literacy, or education of heads of households) and by disease-specific education. Disease-specific education can be preventive or therapeutic in content.

The effects of improving personal and domestic hygiene on diarrhea morbidity were reviewed using data from studies in hospitals, day care centers, and communities (Feachem, 1984). There is evidence that low educational attainment and certain religious customs predispose to diarrhea presumably because of behavioral factors.

The specific hygiene-related behavior that has been most studied is hand washing. Hospital studies suggest that enteric infections can spread via contaminated hands and that hands can be decontaminated by washing with soap and water. Three studies from Bangladesh, the United States, and Guatemala on the impact of hygiene education programs on diarrhea are reviewed in detail. Reductions in diarrhea incidence rates of between 14 and 48 percent were documented in these studies. Little is known on the impact of hygiene education programs on diarrheas of specific etiology or of their impact on diarrhea mortality. Information is lacking on the optimal design of such programs, on their costs, and on their dependence on pre-existing levels of sanitary facilities.

Diarrhea control can also be attempted by promoting the use of specific water purification or protection technologies in the home. The secondary transmission of cholera in Calcutta was reduced by encouraging families to add chlorine

tablets to stored water and was reduced still further by providing families with earthenware water storage vessels having a narrow inlet and a spout (NICED, 1985). The secondary transmission of cholera was also reduced in Dhaka by encouraging families to treat stored water with alum potash, which promotes sedimentation and lowers the pH (Kahn et al., 1984). However, home chlorination of stored water in a rural area of northeastern Brazil did not reduce diarrhea incidence rates although it greatly reduced the fecal contamination of the water (Kirchhoff et al., 1985).

CONCLUSIONS

The comparative cost-effectiveness of alternative interventions for reducing morbidity or mortality caused by specific communicable diseases is a relatively recent field of inquiry. The work on diarrhea control reported here was initiated in 1982 and is continuing. The main outcome thus far has been to focus attention on seven specific diarrhea control measures that are both effective and feasible. For some of these interventions, preliminary data on cost-effectiveness suggest that they can avert a diarrhea death in a child under 5 years of age for less than \$1,000.00. Three lines of further work are suggested by the results reported here.

First, those seven interventions known to be effective and feasible must be operationalized in developing countries. Not all interventions are appropriate everywhere. For instance, in rural India it would not in general be necessary to promote breastfeeding, whereas in Latin America and in urban areas throughout the world this intervention is likely to be a highly cost-effective method of controlling diarrhea morbidity and mortality. In Latin America, cholera vaccination would not be appropriate and indeed in most countries would be much less cost-effective than the data reported here for Bangladesh suggest. Both rotavirus and cholera vaccination must await the results of the current field trials of the new vaccines.

Each country must decide for itself which package of interventions is likely to be most effective and feasible. The method of implementation of these interventions will vary widely by intervention and by country. Measles immunization and water supply and sanitation are already being implemented in many countries, primarily for reasons other than diarrhea control. The diarrhea control program in a country should liaise closely with those responsible for these interventions and try to ensure that the benefits to diarrhea control from these activities are realized in practice.

The three educationally based interventions

aimed at improving breastfeeding, weaning, and hygiene are not being vigorously carried out in most countries today. There is great scope for new initiatives in this field with carefully designed and targeted messages being delivered through multiple channels. The techniques of social marketing may have much to offer.

Inclusion of rotavirus or cholera immunization must await the results of field trials of the new vaccines. Much will depend on the recommended vaccination schedule. For instance, rotavirus vaccination will be most easily and cheaply incorporated into existing EPI programs if it is given at the same time as oral polio vaccine. By contrast, cholera vaccination will be most problematic in terms of cost and coverage if it is given in multiple doses in the second year of life. There may be trade-offs between the optimum age of vaccination for the individual and the optimum for the community, bearing in mind that coverage may fall as recommended vaccination age rises.

Second, the predictions about effectiveness and cost made in the desk study reported here must be tested in the field. Interventions should be closely monitored and data on their impact on diarrhea, their costs, and many operational features should be collected and analyzed. For some interventions such as water supply and sanitation there is already an enormous amount of accumulated operational experience. For others, most notably weaning and hygiene promotion, relatively little is known and many countries have no prior experience of these activities. Detailed studies will sometimes be required to design educational programs that are capable of reaching mothers with comprehensible, relevant, and feasible advice.

Third, each analysis in the series (Figure 2) specifies areas of scientific uncertainty that require further research. Such research is especially important for the seven effective interventions and for the additional seven, listed under Non-Clinical Interventions for Diarrhea Control of this paper, for which effectiveness or feasibility cannot yet be determined. A new generation of intervention-focused research is required to address questions that will assist in the design or implementation of specific interventions. WHO/CDD have recently announced a new initiative to promote and fund research of this kind.

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THE CONTROL AND PREVENTION OF DIARRHEAL DISEASES AT THE NATIONAL LEVEL

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INTRODUCTION

Dr. Rohde told us this morning that diarrhea and poor diet interact in a vicious circle leading to malnutrition and frequently maiming and killing infants and young children. It appears certain that diarrhea has deleterious effects on nutrition and health through reduced food consumption, altered digestion and impaired absorption, and metabolic alterations, all of which eventually interfere with growth and development (Mata, 1983a; Mata, 1985). Invasive diarrhea often results in chronic loss of nutrients and cells (a protein-losing enteropathy), increasing the risk of malnutrition and death. The risk is greater for infants and young preschool children, but persons of other ages may also be affected. Recurrent or chronic diarrhea often causes debilitation, wastage, and stunting.

An episode of acute diarrhea may precipitate a child into severe protein-energy malnutrition, just as it occurs with other acute infections.

In some countries children experience only a few attacks of diarrhea per year (Snyder & Merson, 1982; WHO, 1983), but in others, as many as seven to nine episodes per child per year are observed (Mata, 1983b; Mata, 1985). This formidable force of infection sometimes accounts for 20 percent of the total span during the first three years of life, resulting in loss of time for stimulation and learning. Children with diarrhea may be described as smelly, irritable, fearful, and retarded. Such children may become detached from their families and can be the target for mistreatment and abuse by parents or attendants.

Those who have personally experienced severe diarrhea and dysentery can appreciate the misery and effects of such events. Untreated watery diarrhea with dehydration and invasive diarrhea with toxic manifestations often lead to death within hours or days of onset. In less developed countries, diarrhea is one of the main contributors to global mortality, particularly among infants. The correlation between diarrheal disease mortality and infant mortality is striking (regression coefficient = 0.95) since more than 80 percent of all diarrhea deaths occur among infants; a decrease in diarrhea deaths will inevitably be followed by a drastic reduction

in infant mortality (Mata, 1981). Therefore, the control and prevention of diarrheal diseases is one of the main priorities in the process of national development. Responsible scientists, politicians, and planners are rightly interested in bringing about the necessary interventions to attain such an aim.

UNDERSTANDING TRANSMISSION: NEED FOR INTERVENTION

It is now widely accepted that the majority of the diarrheas that occur in the general population are caused by a large variety of viruses, bacteria, and protozoa. Infectious enteric agents are transmitted by ingestion of food and water contaminated with feces or through contact of the mouth with fingers or utensils soiled with feces (Mata, 1983b; Mata, 1985).

All possible forms of transmission outlined in Table 1 are evident to the careful epidemiologist or anthropologist who works in rural settings (Mata, 1985). Transmission involves human-to-human, and less prominently, animal-to-human direct or indirect contact. *Campylobacter jejuni*, enterotoxigenic *Escherichia coli*, rotaviruses, and *Cryptosporidium sp.* are harbored by man and animals; animals may be important in rural settings because they may cohabit with children. Transmission is favored by cultural, religious, social, and economic factors but a better understanding of the complex web of causal factors is fundamental to strengthen efforts to develop diarrheal disease control programs.

Current knowledge about transmission indicates

that the empirical approach that has always been used to support and implement interventions to improve the sanitary environment was correct. Thus, building water supplies and sanitary facilities eventually led to significant control of disease, even though there was no proof in sight of its impact and cost/benefit. Actions were primarily triggered by a desire to improve the quality of life and were partly influenced by the germ theory of disease, as Pasteur's discoveries made the world deeply concerned about hygiene and sanitation. Governments began interventions to that end, and it is now evident that countries that successfully developed an infrastructure for water supply and sanitation eventually decreased their diarrhea morbidity and mortality rates through a process that lasted several decades.

Thus, the need to satisfy the basic human rights (food and water, housing, education, and health) and the influence of the germ theory of disease, which emphasized prevention of infection, have been the driving forces for improving the sanitary environment in the last 150 years. Interventions were implemented without waiting for scientific proof of whether they had an impact or whether they had a low cost/benefit. Recent analyses demonstrate that the empirical decision to intervene was justified as most interventions have a measurable impact. The analyses show that improving water supply and sanitary facilities, promoting personal and domestic hygiene, and improving weaning practices lead to significant reduction in diarrhea morbidity and mortality (Feachem, 1985). Also, actions that reduce the rate of low birth weight would also reduce some morbidity and mortality due to diarrhea (Ashworth & Feachem, 1985).

More recently many nations have been struggling to effect other interventions, such as promotion of breastfeeding, which prevents some diarrhea cases and averts some diarrhea deaths. Interventions resulting from recent scientific or technological achievement also have a measurable impact: measles immunization prevents some diarrhea cases and averts some diarrhea deaths (Feachem & Koblinsk, 1984); effective antibiotics avert most deaths due to severe invasive diarrhea (Mata et al., 1970); and the utilization of modern oral and intravenous salt solutions avert most deaths from acute watery diarrhea (Odio & Mohs, 1980; Mata, 1981).

The Rockefeller Foundation, the Pan American Health Organization (PAHO), the World Health Organization (WHO), the World Bank, and UNICEF have emphasized all along the need to implement the above-mentioned interventions. The role of PAHO has been outstanding in the Americas. The Conference of Punta del Este set specific goals for

TABLE 1
TRANSMISSION OF INFECTIOUS AGENTS
THAT CAUSE DIARRHEA

Human-to-Human	
anus-fingers-mouth	
feces-fingers-foods and drinking water-mouth	
feces-fomites-fingers-mouth	
feces-fomites-fingers-foods and drinking water-mouth	
feces-soil to water-foods and drinking water-mouth	
feces-soil-insects-foods-mouth	
anus-mouth	
Animal-to-human	
anus-fingers-mouth	
feces-fingers-foods and drinking water-mouth	
feces-soil to water-foods and drinking water-mouth	
feces-soil-insects-foods-mouth	
anus-mouth	

governments regarding expanding coverage of the population with basic services (for instance water supply and immunizations) in order to attain a reduction in childhood mortality. The accomplishments of this conference were reviewed a few years later in Santiago, Chile, and positive results were already visible in many countries. The important consideration, however, was the growing interest and concern of governments on health issues, the evident increase in responsibility, and the commitment to do something about prevailing deficiencies.

OBSERVABLE IMPROVEMENT IN DIARRHEA MORTALITY

Adequate data for calculation of diarrheal disease age-specific mortality rates are not available for many less developed countries, but they are available for most countries of the Americas (PAHO, 1980). Figure 1 shows diarrheal diseases mortality rates for infants and children 1 to 4 years old in the

Americas for 1973-77. The varying status of nations with regard to mortality rates suggests differences in attainment of control of the diarrhea problem. Canada and the United States had the lowest rates, while Paraguay, Ecuador, Guatemala, El Salvador, Peru, and Nicaragua had rates greater than 1,000 infant diarrhea deaths per 100,000 live births in the period 1973-77. Since infant diarrhea deaths in New York and other North American cities were as high at the turn of the century as the highest rates seen today in Latin America, one must ponder the likelihood that some improvement will operate in the future in these nations as they evolve their sanitary infrastructure. In fact, significant additional progress has been noted in Costa Rica, Cuba, and Chile in the last few years, an omen that other countries will improve in the near future.

Data on diarrheal diseases death rates corresponding to two separate years permit assessment of a possible decline as a function of time. The figures released for the Americas for the period 1970-78 (WHO, 1982) were used to calculate changes in a decade, as shown in Table 2. Countries were grouped in categories according to the current level of infant mortality. The nations in the "high infant mortality rate" group also had the highest diarrhea mortality rates (both in infants and preschool children) and also had the least pronounced variation in diarrhea mortality with time. It has been already mentioned that more than 80 percent of all the diarrhea deaths occur in infants and a very strong correlation exists between diarrheal disease and infant mortality rates (Mata, 1981). Three countries with high infant mortality, namely, Nicaragua, Ecuador, and Honduras, actually had an increase in diarrhea mortality during the observation period. The nations in the group of "middle infant mortality" showed a marked decline, excepting Uruguay where an increase in infant deaths was observed.

The most striking changes were in Chile, Costa Rica, and Cuba. The last two countries have been classified in the last few years in the category of nations with "low infant mortality rate," and it should be pointed out that the infant mortality rate in Chile in 1983 was quite close to that reported for Cuba and Costa Rica a few years earlier. The rates attained in these advanced less developed countries are so low now that the study of all diarrhea deaths at the national level to determine risk factors might be considered as part of the national surveillance program.

The most important consideration, however, is that most Latin American nations are experiencing a steady decline in diarrhea and infant mortalities in all probability due to the sustained efforts to improve the quality of life.

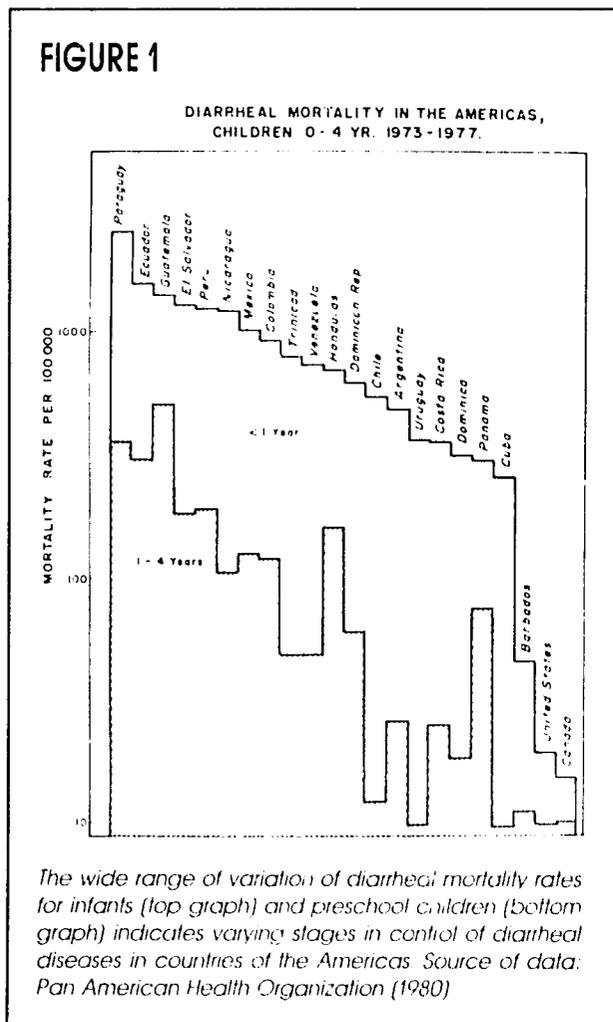


TABLE 2
EVOLUTION OF DIARRHEAL DISEASE DEATH RATES (PER 100,000) AND INFANT MORTALITY RATES (PER 1,000 LIVE BIRTHS) IN THE AMERICAS, 1970-78

Country	1970	1978	% Change	IMR c1980
High Infant Mortality				
Peru	1037	752	-27	100
Nicaragua	1225	1409	+15	90
Ecuador	969	1144	+18	80
Honduras	793	873	+10	80
El Salvador	1458	1345	-8	70
Guatemala	1818	1311	-28	70
Dominican Republic	1178	539	-54	60
Middle Infant Mortality				
Mexico	1802	1259	-30	50
Venezuela	875	601	-31	39
Uruguay	479	521	+9	38
Argentina	880	463	-48	36
Chile	1418	265	-81	32
Panama	589	306	-48	27
Low Infant Mortality				
Costa Rica	1509	195	87	21
Cuba	565	123	78	21

Source: WHO Wkly. Epidem. Rec. 57:353-355 (1982)

NATIONAL CONTROL OF DIARRHEA: THE CASE OF COSTA RICA

Despite the fact that Costa Rica is a small nation in area and population, it thrived relatively well with the inherited poverty and overt underdevelopment still prevailing in the early 1960's, by emphasizing education, health, and democracy (Mata & Rosero, 1986). The oldest data on per capita expenditures corresponding to the 1930's already revealed substantial investment in education and health as opposed to the military. In fact, during the period 1940-48 there was a virtual

dismantling of the army, which in 1948 consisted of just a few hundred underpaid "soldiers." The army was abolished one year after a brief civil war in 1948 by unanimous Congressional vote, and the budget for health and education eventually reached the high record of 50 to 60 U.S. dollars per capita in the 1970's, much in excess of expenditure in police and security.

It is not surprising that interventions were commenced, developed, and eventually completed in Costa Rica between 1930 and 1970 (see Table 3). While most interventions were begun in the 1930's and 1940's, the greatest accomplishments oc-

TABLE 3
INTERVENTIONS AGAINST DIARRHEAL DISEASES EFFECTED IN COSTA RICA

Intervention	Decade of Intervention*		
	commenced	developed	80% completed
Water and Sanitation	late 1930's	1940	late 1969 & 1970
Personal and Home Hygiene	1930	1940 & 1950	1960 & 1970
Weaning practices	late 1940's	1960	1970
Breastfeeding	late 1960's	late 1960's	1980
Chemothorapy	1960	1970	late 1970's
Rehydration, intravenous	1960	1970	late 1970's
Measles immunization	late 1960's	1970	1980
Rehydration, oral	late 1970's	late 1970's	1980

*estimates from historical records (Mata & Rosero, 1986)

curred in the 1960's and 1970's (water supply, sanitation, personal and domestic hygiene, weaning practices, immunization, and breastfeeding). Interventions that led to an improved maternal nutrition and health (adequate growth in childhood and adolescence, maternal education and hygiene, child spacing, prenatal care, detection and care of the high-risk pregnancy, and improvement of delivery conditions) were also implemented; the rate of low birth weight infants was about 7.5 percent in 1975, a very low figure (Mata et al., 1978; Mata, 1983c).

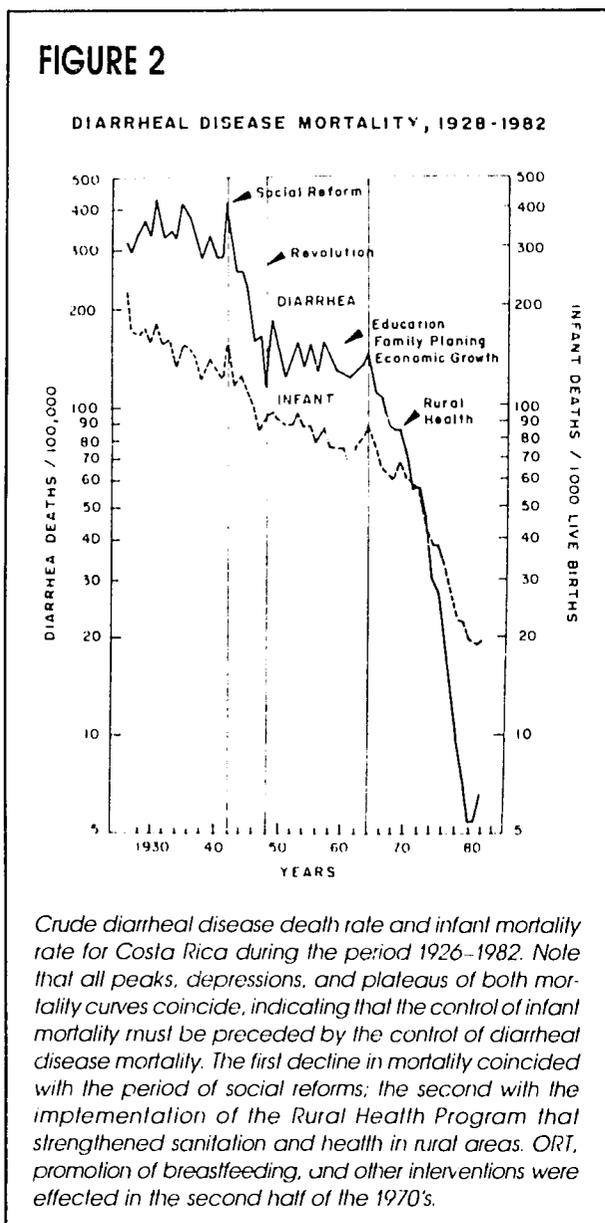
Each intervention or group of interventions probably accounted for some part of the rapid decrease in infant mortality and diarrheal disease mortality, particularly after the mid-1960's (Figure 2). But definitive data on the contribution of each

intervention to the evolution of the mortalities in Costa Rica might never be obtained. Diarrhea and infant mortality were extremely high in the 1930's (about 250 per 100,000 population and more than 200 per 1,000 live births respectively) and were often greater than the highest rates recorded in contemporary times in countries with a serious diarrhea problem.

The period 1940 to 1948 was characterized by significant social, health, and educational achievement (labor legislation, minimum wages, paid vacations, social security, expanding of the grammar and high school system, founding of the University of Costa Rica, improving water supply and sanitation, expanding roads). This period witnessed the first striking reduction in infant and diarrheal mortalities, but the advancement was temporarily halted by the civil war of 1948, which was accompanied by social disruption. During this period there was migration from rural areas to cities, adoption of bottle-feeding with the upsurge of modern pediatrics, and excessive population growth (Costa Rica attained the fastest growth rate in the Americas during that period). While efforts to maintain and expand social, education, and health gains of the previous period continued, the diarrhea and infant mortality rates remained high and practically unaffected for 15 years.

By the mid-1960's, women in Costa Rica had attained almost the same level of education and political participation as men; moreover, this coincided with significant advances in family planning. The decline in fertility between 1960 and 1970 has been the fastest ever recorded in the Americas (Ortega, 1977). Undoubtedly, the reduction in fertility must have resulted in improvement in maternal nutrition and health, and consequently in a significant reduction in rates of prematurity and fetal growth retardation; this, in turn, must have determined part of the new decline in infant deaths from diarrhea and other causes in subsequent years (Mata et al., 1978).

The abrupt reduction in mortality that characterized the decade of 1970 (see Figure 2 again) coincided with ongoing interventions and with the establishment of the Rural Health Program (RHP), actually a primary health care intervention beginning in 1971 and expanding in 1973 to 1975 (Mohs, 1981). When malaria eradication was consolidated in the 1960's, health workers shifted to the care of about 600,000 rural people (30 percent of the then total population) living in scattered communities with less than 500 persons each. The duties of these workers were to reach the farthest points in the country to update the census, vaccinate (against poliomyelitis, diphtheria, tetanus, measles, smallpox and tuberculosis), survey and treat



malaria, treat intestinal helminthiasis, administer iron to pregnant women, educate in health and family planning, distribute contraceptives, do prenatal care, refer cases to regional health centers and hospitals, and organize health committees and promote community organizations. One of the main actions of the RHP was to build rural water supplies, sewers, and latrines.

The impact of the RHP has been assessed by a model of regressions that enter economic factors (food production, income, roads, growth, etc.), social variables (literacy, schooling, political participation, etc.), health variables (sanitation, water supply, nutritional status, child spacing, immunizations, diarrhea mortality, infant mortality, etc.), and several other variables (Rosero, 1985). The model (Figure 3) clearly showed that during the decade of 1970 most of the change in infant mortality can be explained by the interventions of the RHP (primary care), and, to a lesser extent, by treatment in health posts, health centers, and regional hospitals (secondary care). Economic development appeared to be less important than these two packages of interventions. Decreased fertility had a small contribution according to the model, but it is possible that this variable might have influenced infant mortality in preceding years.

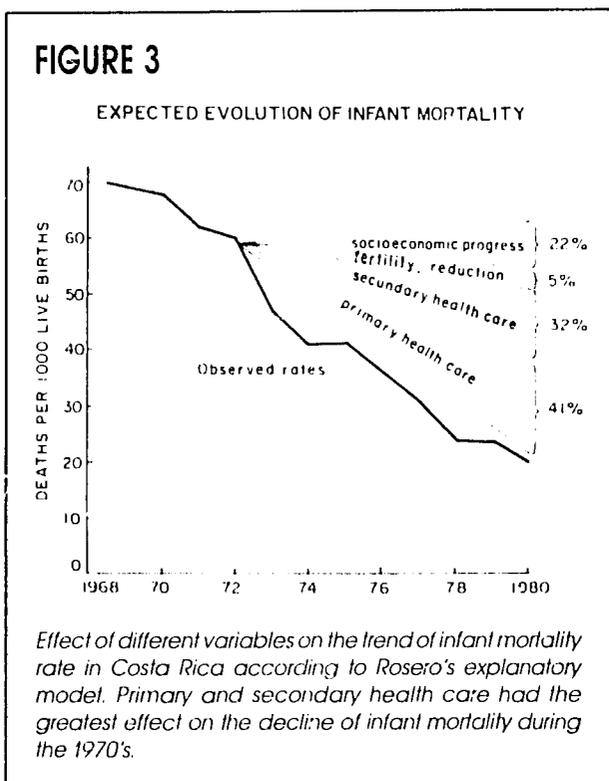
A costly food distribution program was implemented in the late 1970's without apparent effect on the nutritional status and on infant mortality (Mata, 1983; Mata & Rosero, 1986). No changes were noted

in calorie intake of families or individuals in urban and rural areas between 1966 and 1982 (Mata, 1983) but a dramatic reduction in the incidence of severe calorie-protein malnutrition was observed in the intervening period. In fact, kwashiorkor has virtually disappeared from the country.

It is difficult, if not impossible, to determine at present the impact on diarrhea mortality of other interventions effected in Costa Rica in the late 1970's, namely, promotion of breastfeeding, chemotherapy, measles immunization, and rapid intravenous and oral rehydration therapy, all successfully implemented. For example, promotion of breastfeeding resulting from shifting from mother-infant separation and formula-feeding hospital practice to rooming-in, resulted in almost universal breastfeeding for at least one month, while more than 80 percent of infants nationwide were breastfed for at least three months. Furthermore, most infants who had to be separated from their mothers for medical reasons (hyaline membrane disease, congenital defects, and so forth) were given pooled colostrum and milk from donating mothers (Mata et al., 1984). A remarkable reduction was noted in hospital cases and deaths of early neonatal diarrhea, but the total impact on the overall diarrhea mortality is unknown.

A national program of distribution of oral rehydration packages was also started in the late 1950's that undoubtedly saved many lives (Mata, 1981; Lopez, 1982). Again, it is difficult to know the impact of such a program on the overall diarrhea mortality because the decline in diarrhea mortality was clearly in effect in the preceding period (see Figure 2 again). Regarding chemotherapy directed against properly diagnosed infectious diseases, Costa Rica has benefited from such an intervention since the late 1960's owing to the extensive urban and rural network of hospitals and health services. Bacterial diseases that respond to specific treatment with antimicrobials have been considerably controlled, for example, rheumatic and scarlet fevers, shigellosis, and chronic recurrent otitis media.

Nevertheless, Costa Rica might not be a good example to show the impact of these recent interventions, but serves as a model to demonstrate that holistic interventions aiming at interrupting transmission definitely result in monumental decreases in diarrheal disease mortality. Whatever doubt there was that such a decrease in mortality might have not been accompanied by a concomitant decrease in the incidence of diarrhea vanished after calculation of morbidity rates in a typical rural region (Puriscal); rates in this region were found to be exceedingly low, about 10 times less than the usual rates observed in traditional



societies (Mata, 1982). Also, there are data on prevalence and intensity of infection with intestinal helminths for the years 1966 and 1982, at the national level, that clearly reveal a marked decline in prevalence and worm load, almost to the point of eradication (Mata et al., 1986).

The cost of interventions is high. Costa Rica is presently investing about 7 to 8 percent of its gross national product in health. The cost of interventions might be found too high by politicians, but it is certainly low when compared with the cost of weapons and even more so when weighed against the value of happiness and human life.

ORAL REHYDRATION THERAPY (ORT): IMPACT AND COST/BENEFIT

The value of ORT as a life-saving measure is unquestionable and was vividly demonstrated during cholera epidemics and civil strife in the Indian subcontinent. Experiments to document the impact of ORT, however, are difficult and time consuming and may fall in the fringe of the ethical issue. They are complicated by the lack of research capability in many countries where diarrhea is a priority problem deserving implementation of ORT and other suitable interventions.

Data collected in nine hospitals throughout the world showed, with one exception, a consistently large and significant reduction in the rate of hospital admissions due to diarrheal disease and in the diarrhea case-fatality rate after introduction of ORT (see Table 4) (WHO, 1984). The one exception (Matlab Treatment Center of ICDDR/B) might have been due to successful use of ORT in outpatients resulting in a significant reduction in admission of

mild and moderate cases of diarrhea. This change likely resulted in a relative increase in admission of very severe cases in the post-ORT versus the pre-ORT period.

The dramatic effect of ORT was observed in the National Children's Hospital in Costa Rica, shortly after the adoption of ORT (Nalin et al., 1978). ORT was used in about 90 percent of the diarrhea cases with dehydration; the rest were treated with rapid intravenous fluids. Table 5 shows a 90 percent reduction in case fatality within a year of commencement of ORT. The case fatality has remained very low ever since (Odio & Mohs, 1980). An even more dramatic effect was recorded in a traditional rural population in Bangladesh where a relatively inexpensive distribution system for sachets of oral rehydration salts was followed by a marked decrease in diarrhea and child deaths (Rahaman et al., 1979).

Dr. Merson reviewed some WHO activities oriented towards development of diarrheal disease control programs in a large number of developing countries throughout the world (WHO, 1985). These programs include oral rehydration therapy (ORT) as one of their strong components. There is urgent need for data on impact and cost/benefit of ORT, to provide guidance on its values separate from that of other measures included in the primary health care package. Such information is required by international organizations such as WHO, UNICEF, and USAID, that are presently engaged in child survival programs. Unfortunately, there is scarce information on the subject due in part to the fact that treatment programs require the use of some intravenous fluid therapy; this makes it difficult to accurately estimate the impact and cost of ORT alone.

TABLE 4
IMPACT OF ORAL REHYDRATION THERAPY (ORT) ON DIARRHEA ADMISSION AND CASE-FATALITY RATES IN NINE HOSPITALS

Hospital	Percent Change	
	Admissions	Fatalities
Dhaka ICDDR, B, Bangladesh	-82	0
Matlab ICDDR, B, Bangladesh	+40	+11
National Children's, Costa Rica	-58	-45
Al Shatby Children's, Egypt	-71	-83
Bustamante Children's, Jamaica	-81	-75
Kanti Children's, Nepal	-70	-93
Port Moresby General, Papua New Guinea	-53	-12
National Children's, The Philippines	-37	-71
Children's, Thailand	-15	-50

Adapted from *WHO Wkly. Epidem. Rec.* 59:361-363 (1984)

TABLE 5
DIARRHEA CASE-FATALITY RATIO (CFR), NATIONAL CHILDREN'S HOSPITAL, COSTA RICA,
BEFORE AND AFTER ORAL REHYDRATION THERAPY

Year	Rehydration method	Number of diarrhea cases	Number of deaths*	CFR per 1000
1977	slow IV	5974	18	3.0
1978	ORT (90%) +	6000	2	0.3**

*After 48 hours of interment

**A 90 percent reduction (significant)

Adapted from Odio & Mohs (1980)

Our own experience in a rural area of Costa Rica indicates that staffing a program of ORT is not necessary as the new activities can be readily absorbed by existing health personnel. Auxiliary nurses and other health workers can be effectively trained in the ORT procedures used in the hospital; mothers can use their own children with diarrhea as models for training; the knowledge can be effectively transferred to mothers and then from mother-to-mother (Jimenez et al., 1982). The pilot study in Puriscal was the base for adoption of sachets for eight-ounce bottles (Mata, 1981), and the ORT technique developed in the hospital, (Pizarro et al., 1979) for a successful national program (Lopez, 1982).

Limited information available indicates that ORT has a low cost, apparently the lowest of all interventions (excepting breastfeeding) known to avert deaths from dehydrating diarrhea (Table 6). The cost in the cholera treatment center in Dhaka,

Bangladesh, was 11 U.S. dollars per capita and 94 U.S. dollars per death averted (Sack, 1985). In a treatment center in rural Matlab, Bangladesh, the cost was 40 U.S. cents per capita and 2.2 U.S. dollars per death averted (Samadi et al., 1983). It was 38 U.S. cents per capita and 16 U.S. dollars per death averted in a community-based distribution program in Teknaf, Bangladesh (Rahaman, 1985). Estimates for the treatment centers in Dhaka and Matlab include costs of treating approximately 90 percent of the diarrhea cases with ORT and about 10 percent (the most severe ones) with intravenous fluids.

Data for national programs are scarce. In two countries, Egypt and Zaire, the cost ranged from 50 U.S. dollars to 240 U.S. dollars per death averted (Hirschhorn, 1983; Kielmann, 1983; Shepard, 1983). The cost per capita of the national program in Egypt was close to that obtained in community-based studies in Bangladesh.

TABLE 6
COST OF REHYDRATION THERAPY (MAINLY ORAL) IN THE MANAGEMENT OF DIARRHEAL DISEASES

Setting (Source)	U.S. dollars per:	
	capita	death averted
Treatment center Dhaka (Sack)	11.00	94.00
Rural program Matlab (Samadi et al.)	0.40	22.00
Teknaf (Rahaman)	0.38	16.00
National program Egypt (Hirschhorn)		50.00
Egypt (Kielmann)	0.57	73.00
Zaire (Shepard)		240.00

IS ORT THE END OF THE SEARCH?

While it has not been possible to determine the impact of ORT programs in most countries operating them, most agree that they are useful. Lack of impact or apparent negative effects of ORT are interpreted as due to environmental, cultural or managerial constraints that have interfered with proper delivery of the intervention. The various reports on the benefits of ORT are definitively encouraging. They pertain to countries as diverse as Bangladesh, Costa Rica, Egypt, Honduras, Papua New Guinea, the Philippines, and Tonga (Rahman et al., 1979; Odio & Mohs, 1980; Mata, 1981; Lasch et al., 1983; USAID, 1983; Frankel & Lehmann, 1984; WHO, 1984; Clow, 1985; Gabr, 1985). However, some gross failures have been reported (Teckce, 1983; Williamson, 1983) and there might be other similar cases that went unreported for the reason that negative results usually are not published.

While most data support the rationale for ORT, serious consideration should be given to the fact that it is primarily a life-saving measure and not a means to prevent or correct basic deficiencies in the affected population. Most clinicians and field workers engaged in oral rehydration programs recognize that diarrhea persists in an important proportion of rehydrated children, perhaps as much as 5 to 19 percent. In fact, chronic diarrhea develops in about 1 to 5 percent of children after recovering from an attack of acute diarrhea; chronic diarrhea may eventually kill children through wasting and malnutrition. A recent study in Bangladesh showed that a considerable proportion of malnourished children with diarrhea who had been treated for dehydration in the treatment center died in their homes within three months of discharge either from diarrhea (chronic or acute) or from other infections (Roy et al., 1983). Mortality and malnutrition in these children were definitely in excess of rates seen in the general population, once corrected for age and other factors. This study suggests that ORT may spare death from a particular episode of acute diarrhea but not from a new diarrhea attack or another illness striking later on once the child has returned to his deprived environment. Obviously, malnutrition is an underlying factor enhancing the deleterious effects of infection.

CEREAL-BASED ORS

The possibility of doing more than merely correcting the electrolyte imbalance and fluid loss in

diarrheal disease is the wish of every devoted practitioner. There has been much theoretical discussion about feeding during and after acute illness, but there is not enough information on the practicality and benefits of such prescription, nor on the feeding regimes and techniques that are more suitable for ill and convalescent children. One of the complicating issues is anorexia—very common in children with diarrhea—as it interferes with proper feeding even under adequate environmental conditions.

The Mollas in Bangladesh found that absorption of nutrients is impaired during and in the weeks following an attack of acute diarrhea, but considerable absorption occurs if children are fed properly (Molla et al., 1982a; Molla et al., 1983). This work was followed by demonstration that cereal-based oral rehydration solution had a similar therapeutic effect on the electrolyte imbalance as that of the standard ORS, while it shows several advantages (Molla et al., 1982b). Previous work by Nalin and co-workers had shown that ORS containing both glucose and glycine enhanced sodium and water absorption to a greater extent than solutions containing either glucose or glycine alone (Nalin et al., 1970), a finding that led to the concept of super-ORS, of potential significance for further improvement of oral rehydration (Merson, 1985).

Cereal-based ORS actually brings a prescription followed by millions of women throughout the world since ancient times to more accurate scientific description and recommendation. Cereal-based ORS is prepared by dissolving about 50 grams of rice powder in 1 liter of water with heating to produce a gruel; regular WHO oral rehydration salts without glucose are then added to the gruel, which is now ready to be used. Administration is by spoon or by cup involving the mother or attendants in the treatment. Molla has found that children prefer and readily accept rice-based ORS over glucose-based ORS (Molla, 1985). Furthermore, children receiving this ORS have less purging, gain more weight, and develop less chronic diarrhea than children given the standard ORS. Cereal-based ORS generally is less expensive than ORS, and it can be readily prepared and administered at home by very poor rural women (Rahman et al., 1985). There is a large variety of cereals in developing countries of potential use for this ORS. Such cereals could be prescribed according to prevalent dietary habits, removing the dependence on imported manufactured ORS or of raw materials for their preparation, but much more research is needed.

The possibility of improving the nutritional status of children concomitantly with the correction of

fluid and electrolyte imbalance is one of the most exciting developments of today's public health practice, particularly in view of the suspicion that ORT may not modify infant mortality in countries where malnutrition is rampant.

COMMENT

There is a genuine concern throughout the world about decreasing the burden of diarrhea in order to diminish suffering, malnutrition, and risk of death of children, especially in the less developed countries. This concern puts pressure on finding practical solutions for its control, and ORT was thought to be one of the measures that could have a rapid impact. However, it is evident from the evolution of health in industrial nations, and in a few transitional countries (Costa Rica, Cuba, Chile), that eventual control and prevention depend more on holistic and sustained interventions that alter the environment and interrupt transmission, than on a life-saving measure like ORT. Holistic interventions have a greater influence on the host and the quality of life because they act on the determinants of disease transmission and because they have a long-lasting effect.

Nevertheless, the importance of ORT among the constellation of existing measures should not be neglected as it has a dramatic effect in lowering mortality in severely dehydrated children, including infants and small neonates. Benefits extend not only to hospital and clinic patients but also to people living under very rustic conditions such as in rural sparse areas. While there is no doubt of the value of ORT for survival of children who are adequately nourished or who have mild or moderate malnutrition, its importance for severely malnourished children is less certain. Malnourished children and children with other handicaps may be spared from immediate death from diarrhea by the benefit of ORT, but they remain susceptible to new complications, malnutrition, and even death from a new episode of diarrhea, chronic diarrhea, or other infectious disease.

Yet, the effective implementation of ORT has added advantages, in addition to saving lives. ORT generates a new attitude among poor urbanites and villagers, especially women, regarding the feasibility and importance of preserving life, particularly of well-nourished children. Its impact on malnourished children may be less evident to poor women. But even under the worst of the situations, to spare death in what appears miraculous fashion has considerable meaning, especially for deprived slum and village people.

It must not be forgotten, however, that ORT can

do little if anything to improve the environment that prompts the occurrence of diarrhea. Nevertheless, there is hope that through the infrastructure to deliver the intervention, mothers will acquire relevant information about interruption of disease transmission, feeding children during and after acute disease, family planning, and other facets of health education.

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INTRODUCTION TO IMPLEMENTATION ISSUES

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During the next few minutes, I will highlight key themes that have emerged from the presentations to date, so that the working groups beginning this afternoon can deal with these issues in more detail. Last night, the speakers discussed how much progress has been made since ICORT I. The number of countries implementing ORT programs has doubled. WHO estimates that one-third of the developing world's children have access to Oral Rehydration Salts today. However, global ORS usage rates still remain below ten percent. The challenge still before us is clear.

This morning, the speakers have brought us up-to-date on the most recent advances in science. ORT, still potentially the most important medical advance of the century, continues to be improved upon. Citrate can be substituted for bicarbonate in ORS to obtain better stability. Research on Super ORS suggests a potential to reduce stool loss by as much as one-half and cut duration by one-third. It appears likely that vitamin A plays a critical role in protecting the intestinal mucosa from future infection.

Dr. Rohde has highlighted nutrition management as well as dehydration management for diarrhea and the importance of growth monitoring as well as ORS use. However, experience to date with growth monitoring suggests much more needs to be done to develop cost-effective and feasible approaches. Dr. Rohde strongly stated that ORT programs must be more than just ORS oriented. ORT should include: fluid to rehydrate, feeding to replenish nutrients, and feedback to mothers, health workers, and the health system. Simply stated, ORT is fluid, feeding, and feedback.

Feedback, especially to mothers, is often overlooked. I have seen this not only in visits over the last year-and-one-half to programs in Senegal, Bangladesh, Haiti, and Ecuador but also in my personal experience as a mother. The mother is inevitably the focal point of successful ORT implementation—not the packet, or cases treated by the system, not even the child. She is the primary caregiver and de facto nurse 24 hours a day and the one to act when diarrhea begins, at home. While it has not yet been mentioned, I think we would all agree that reaching women even before they become mothers will have the greatest impact on dehydration and nutrition management

during diarrhea, not to mention low birth weight and the other diarrheal disease control measures Dr. Feachem has identified.

Dr. Feachem has pointed out that we need to learn much more about effectively promoting educationally based interventions aimed at improving breastfeeding, weaning, and hygiene. Finally, Dr. Mata has described the decreases that have occurred in diarrheal death rates in the Americas. However, while declines in diarrhea-associated mortality have been demonstrated in a few well-managed programs and in countries with relatively low infant mortality rates, the dilemma still remains that in the home, particularly in countries where infant mortality is highest, insufficient progress has been made. Perhaps we are witnessing the natural evolution of change brought about by a new technology. But how can we achieve a revolution of declining diarrhea deaths in those countries where the suffering is the greatest?

Science has clearly supplied us with the technology for this revolution. We must now take it to where the diarrhea is, to the clinics, the hospitals, and, most importantly, the homes. But while ORT is appealingly simple, implementing successful ORT programs is complex. We need more attention paid to the how—how do we get the science there and used—not just the what. Successful large-scale programs have included integrated communication approaches, adequate supply and distribution, and effectively trained and supervised health workers. The Egypt and Honduras experiences demonstrate the effectiveness of this systematic approach. The BRAC project in Bangladesh also illustrates the effectiveness of direct communication with mothers, incentives for health workers, and adequate supervision. Good supervision and adequate communication may indeed be the key factors needed to ensure effective ORT use.

Dr. Rohde's experience with growth monitoring demonstrates the same point—there is no use in simply weighing children without involving mothers in a systematic program to improve the health and nutrition of their children. How do we best make that interaction happen and make it effective?

We hope over the next two days you will help set the agenda for expanded ORT. How can countries successfully implement and institutionalize sustainable ORT programs? Where should countries and those providing external assistance put their resources? As Ministers of Health, as public health scientists, and as program managers who have worked extensively with ORT programs, you have valuable experience to help guide and advise us

as we find our way through the labyrinth of this undertaking. Implementation of ORT programs represents a real challenge to the flexibility, inventiveness, and stamina of public and private delivery systems. Indeed, it is an art as much as a science.

Building on the discussions we have had thus far, I would now like to raise a few questions for the six panels meeting this afternoon and tomorrow.

PANEL ONE, COMMUNICATIONS AND SOCIAL MARKETING

- How can we transfer what we have learned from the successful mass media programs in Egypt, The Gambia, and Honduras to other countries—and do it most cost-effectively?
- What messages will convince mothers about the importance of feeding, particularly extra feeding during the convalescent period, as Dr. Rohde has asked?
- How can we convince mothers to use a new and unfamiliar treatment at home that does not stop the diarrhea and to continue to use it effectively? As Dr. Hirschhorn rather graphically stated it, putting more fluid in when it is clearly coming out makes no sense.
- How can we more effectively involve promotion channels outside the formal health sector such as schoolteachers, students, church leaders, private industry?
- How can we ensure that our communication programs avoid superficial short-term solutions and focus on the most difficult elements over the long term to provide sustained success?

PANEL TWO, LOGISTICS AND DISTRIBUTION

- How can we ensure that supply is going to be there when we create demand with our communications programs?
- How can we best decide on the balance between home solutions and packets to deal with over one billion diarrheal episodes a year?
- How do we deal with the cost of packets to a health ministry over time, yet still avoid cutting off the poor if we support packet production in the private sector and offer them for sale?

- Do we know enough about the risks and benefits of flavored ORS, which comprise at least one-third of the commercial market?

PANEL THREE, HEALTH PERSONNEL TRAINING

- As Dr. Hirschhorn asked, to what extent can you train village mothers, midwives, and traditional healers to be local ORT dispensers?
- Is training the best way to get pharmacists on board? And to get doctors to stop using intravenous therapy and antibiotics?
- To return again to Dr. Rohde's message, how do we train health personnel to want to talk to mothers, not just treat their children?
- How can we be sure that ORT training is linked with subsequent supervision once the trainee goes back to work, so that the training actually gets put into action?

PANEL FOUR, SUPERVISION AND MONITORING

- This area is probably a universal weakness in primary health care programs, with diarrhea control no exception. WHO's courses for supervisors and managers have been very helpful, stressing the need to be specific and the need for supervisors to actually go into homes and assess effectiveness of ORT education. But we have seen the problems everywhere with getting mothers to use ORT effectively, not just to know about it. If we train the mother as a basic health worker, how do we supervise and monitor her?
- Most fundamentally, how can we just get supervisors to supervise?
- Moreover, how can we get underpaid, overworked health workers to teach overworked, underpaid mothers to give ORT?

PANEL FIVE, EVALUATION AND COST

- We need innovative kinds of operational research techniques, survey instruments, and observational studies to help us record and evaluate the effectiveness of diarrheal disease control interventions in the home. What should they be and who should use them, health workers or community people?

- Then again, how do we measure the influence of factors outside the ORT program on its success or failure?
- There is also the issue of cost. What is the least expensive approach that will still produce the impact we want? What is the cost-effectiveness, not just the effectiveness, of each of the components of the program?

PANEL SIX, INTEGRATING ORT WITH OTHER HEALTH ACTIVITIES

- As Dr. Mahler stressed last night, how can we ensure that ORT program activities and benefits are sustained beyond the life of a donor-supported project? Is integration the key to this? If so, how do we best integrate ORT with other PHC activities and still save the child?

- How can we best provide that mix of services that includes all the kinds of interventions Dr. Feachem talked about that have an impact on diarrheal deaths?

We all will have four opportunities to participate in group discussions on the six selected implementation topics and to try to answer these and other questions. These panels are designed not to be one-and-one-half-hour presentations by the panelists, but rather real opportunities for group participation and discussion. We need your input so please don't hold back. In fact, these concurrent panels are the core of this meeting. It is there that the agenda for the future will be set. We also encourage you to attend the poster sessions that graphically describe country-specific experiences in the various panel areas. A great deal of effort has gone into making these posters a very valuable resource.



One of the outstanding elements of ICORT II for information exchange was the country poster sessions. Photo by Pat Lanza Field.

In conclusion, we see three important tasks for the panel groups.

1. Identify characteristics of successful projects and approaches that haven't worked so we don't repeat the errors of the past and can build constructively on experience.
2. Set the priorities for our work in diarrheal disease control and ORT over the next three to four years.
3. Define areas where donor inputs can be most useful or are not wanted. This is your chance to speak to the donor community clearly.

Countries and likewise donors are constantly

juggling limited resources with competing demands. Choices must be made among various health initiatives—what about clean water versus ORT for example? What is an appropriate balance between ORT, immunizations, and family planning? Within ORT, what kinds of assistance are needed? We at AID hope that the recommendations from each panel, which we will hear on Friday, will truly represent the best critical thinking available from each of us here, as persons striving to take this remarkable therapy—ORT—to all the children in the world who need it.

As the great Bengali poet Tagore said, "Every child comes with the message that God is not yet discouraged of man."

3. Executive Lunch



Dr. Ruth T. Tshabalala, Swaziland, and Dr. A. Sulaiman, Nigeria. Photo by Pat Lanza Field.

BEYOND ORT: RESPONDING TO POVERTY AND MALNUTRITION

MR. BRADFORD MORSE

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I am highly honored to have been invited to take part in this critically important Conference. Evidently, fresh marvels are being wrought in what is already regarded as one of the most significant medical advances of this century—an advance all the more remarkable for its origins in the simple compounds of salt, sugar, and water. I consider myself fortunate to have this opportunity to keep abreast of these new developments and to learn about their enormous life-preserving potential.

I may add that my interest in ORT goes beyond the layman's curiosity about a miracle lifesaver for millions that costs a few cents per patient. Cost-effective therapies and their popularization are in most cases the results of cost-intensive basic research and social marketing. In our Global Programme at UNDP, we recognized this back in 1978 when we ventured to put up some 5 million U.S. dollars of seed money to establish the global Diarrhoeal Diseases Control Programme with the World Health Organization, UNICEF, and other donors. Indeed, we remain the single largest donor to this vital effort.

One-and-one-half million dollars of that early UNDP contribution went to one of the pioneers in ORT, the Cholera Research Laboratory in Bangladesh, which in 1979 became—under the auspices of UNDP—The International Centre for Diarrhoeal Disease Research. As we all know, over the last seven years the Centre has proven to be a world class leader in this branch of biomedical research and development, attracting additional support—including USAID sponsorship—for its work not only in ORT but in vaccine development, environmental studies, and nutrition. It remains a major force in refining and promoting the practice of ORT in the developing world today. Naturally, we in UNDP look upon the large-scale human dividends from our initial investment with satisfaction; and I am extremely pleased that working ties between the Centre, The World Bank, UNICEF, WHO, USAID, and UNDP continue to be productive as evidenced by our most recent collaboration in preparing for ICORT II. I am further pleased to inform you that today the United Nations Capital Development Fund, which comes under UNDP's management umbrella, has approved a grant of over 600,000 U.S. dollars as an addition to the resources of the ICDDR/B.

Thanks to the impact of ORT itself and through

conferences like this, the public-at-large has come to understand more about the true causes of wide human suffering and the means available for alleviating such misery. Twenty years ago, very few people in industrialized societies appreciated the fact that a minor health inconvenience in our affluent society was an implacable killer in scores of developing countries. Still less would anyone have connected salt, sugar, and water with the remedy. Today, new connections challenge our consciousness, connections most sharply exposed by the systemic crisis in Africa. While ORT remains a blessing for which we must all give thanks, and one with a clear mission in that troubled region, events in Africa remind us that the lethal dehydration it combats is an agent dispatched by even greater adversaries.

As Director of the United Nations Office for Emergency Operations in Africa, I have had all-too-many occasions to note that the real decimators in Africa are poverty and malnutrition. They were the killers that in one year alone—1984—took the lives of millions of African children under the age of five. It was malnutrition that sapped its young victims' resistance and handed them over to malaria, cholera, sleeping sickness, yellow fever, and other endemic diseases. Ailments children in industrialized societies no longer even hear of, like measles, took their grim opening and turned deadly. Many of the victims also suffered from chronic diarrhea that as often as not terminated their suffering. Poverty abetted the slaughter. It showed its hand in scarce or nutritionally inadequate food, impure water, overcrowded and contaminated dwellings, poor sanitation, and patchy maternal education—those many contributing factors not directly in the health sector to which the great majority of developing country illnesses can be traced.

Of course what overtook Africa in 1984 had been building for years. In the past decade, poverty and malnutrition have moved ever more freely through many African countries, themselves captive to their colonial legacies, a turbulent world economy, and the unwise policy choices of governments and their aid partners in the early days of nationhood. In fourteen sub-Saharan countries, income per person at this time is less than what it was in the early 1970s. Food imports, woefully unsuited to most local needs, continue to account for one-fifth of these countries' domestic consumption today. Paradoxically, while sub-Saharan Africa's capacity to feed its rising population declines, its production of non-food export crops like cotton or tobacco is on the increase. This bias in favor of cash crops to generate foreign exchange prevails in many parts of

the region. A remnant of the colonial economy, this bias is now explained by reference to comparative advantage to the hard realities of international markets that do little to encourage weak participants to diversify their traditional trade patterns.

In fact, most African leaders and their aid partners saw export-led growth as the swiftest approach to the industrialized models beckoning from the North. The essence of that strategy is the promotion of an industrial urban economy requiring cheap food supplies and subsidized food prices. Regrettably, this strategy has in too many cases led to reduced incentives for domestic food production and excessive food imports. When, under multiple difficulties, including unprecedented debt service costs, such urban strategies are unable to contribute to the actual carrying capacities of nations, their claims on human and material resources rapidly become exigent, draining fragile economies to the point of insolvency. Health is an early casualty in the urban areas and in the countryside.

Drought has given poverty and malnutrition hideous scope in Africa; but it is clear that they were gathering force well before the advent of the present emergency. They and the multiple factors on which they thrive are the result of a crisis of development.

The true nature and interconnected causes of that crisis are now being grasped by donors and African governments alike. They must also be appreciated by the wider public on whose support all development aid depends. The lessons are plain enough. Lasting results, be they in health or agriculture or transport or any other area, will be obtained only if the right political choices and policies are made and followed through by affected governments and supported by donors in persistent, comprehensive, multisectoral, and integrated development approaches. The crisis is systemic and the corresponding response must, simply must, be holistic.

There is a growing convergence of views among African leaders and their external partners as to what the right policy choices are. Chronic food deficits have driven home the point that rural development and greater incentives for domestic food production are first priorities although there are different ideas as to how this shift could be achieved. There is an emerging consensus on the importance of rehabilitating and maintaining existing investments in infrastructure instead of initiating new ones. And there is substantial agreement that greater planning and implementation capabilities must be introduced into public administrations.

Agreements do not automatically become

achievements in this or any other sphere of human endeavor. Undoubtedly, the development path for Africa will remain exceptionally arduous for several years to come, not least because external resources sufficient to support these policy changes are not yet visible on the international horizon. But African governments themselves know that the hard decisions they are now taking must be made to stick. Development institutions are morally obliged to do their utmost to help in this respect.

Within its limited resources, UNDP has responded to Africa's needs at two levels. At the program and project level, we have redoubled our traditional emphasis on integrated approaches with a stronger rural bias. In the health sector, for instance, we continue to advocate integrated rural health care programs over metropolitan medical and training facilities with their built-in urban focus.

Moreover, we seek a balance between measures for the prevention, control, and treatment of disease. In Botswana, Chad, Sierra Leone, Somalia, Togo, Zambia, and Zimbabwe, we are programming three-and-one-half million dollars, made available to us from USAID's Child Survival Fund, into projects where immunization campaigns, domestic hygiene, maternal education, and training for rural health workers rank equally with ORT as health care priorities.

Thanks to UNDP's program of Vaccine Quality Control with WHO, children not only in Africa but worldwide are routinely inoculated with tested vaccines of proven potency against diphtheria, tetanus, whooping cough, tuberculosis, and polio. In research-intensive programs like the Diarrhoeal Disease Control Programme I earlier mentioned, we attempt to encourage a balanced mix of laboratory work, field trials, training, and institution building so that local capabilities are built up to sustain global research efforts at the regional and national levels. Here I congratulate you who have effectively participated in these efforts.

I have already alluded to the crucial place of safe and adequate water supplies in developing country health matters. Since 1980 and the launch of the International Drinking Water Supply and Sanitation Decade, we and our associated funds have invested some 85 million U.S. dollars in projects in Africa dealing with low-cost sanitation methods, rural handpump development, and integrated resource recovery. A special project also focuses on the needs and vital contributions of developing country women who bear water as well as children, and epitomize the intimate link between health, water supply, and cultural practices.

Many of these Water Decade projects are closely coordinated with our related activities in the agricultural and health sectors, and with programs

sponsored by donor partners like the World Bank and WHO, which are our closest collaborators in this field. I do not claim that these "lateral" ingredients of primary health care we support are by any means complete solutions, but I do think they point the right way. Moreover, I believe the evidence is that they provide the solid foundation on which more vertical approaches to health care must be based.

A second—and comparatively new—response we offer to some eighteen African countries is through our support for their major aid review meetings with their principal external partners in a process of "round table" consultations. These are now based on careful sectoral analyses and provide a coordinated means by which governments can analyze the substantive implications of the development strategies they wish to pursue, review them with their major aid partners, and jointly forge programs of sustained development cooperation. As a means of clarifying issues affecting the viability of technical assistance projects and programs—and therefore the availability of external funding—these consultations have demonstrable value. When utilized as a macroeconomic tool for mobilizing resources, for assessing national investment plans and budgets, and for identifying the institutional and human resource components of agricultural and health strategies, the round table process can assume the significance of a full-scale development cooperation blueprint. Not the least of its benefits are the collaborative in-country working relations that have already been facilitated in a number of cases between governments, UNDP, the World Bank, bilateral and other financing institutions, which have demonstrated the complementarity of technical and capital assistance in action.

Durable bridges out of Africa's emergency into

long-term development could well be constructed through this process if all partners involved assume and discharge their respective responsibilities.

I have expanded my theme beyond the immediate focus of this Conference; and I thank you for your indulgence. A wide look now at the prospects for Africa may be a permissible response to the sheer proportions of the calamity in that region. As far as vital health matters go, we can all agree that Africans and, indeed other developing peoples, will be healthy when their nations can afford the constituents of sound health—adequate and balanced nutrition, clean water, proper sanitation, decent shelter, and appropriate maternal education. We are a considerable way off even from these elementary goals. Meanwhile, in the case of sub-Saharan Africa, net capital inflows to the sub-region, including Official Development Assistance (ODA), continue to decline in real terms. The total external debt for the countries of this sub-region has created annual debt service costs approaching an average of 25 percent of the value of their exports—and the percentage is drastically higher in some countries. Without substantial infusions of external assistance in support of comprehensive economic reactivation policies, Africa's future will remain unhealthy in every sense.

I know that you who have selflessly devoted your lives to developing and perfecting treatments for human ills yearn more ardently than others for preventive measures that are fully effective. Prevention *is* better than cure. And that basic truth has as much relevance to a society as to an individual. ORT is certainly a highly cost-effective cure, but it is prevention through integrated development that must be applied if recurring emergencies, with all their tragic consequences, are to be averted in Africa. There is no other way.

4.

Concurrent Panel Summaries



Distribution and Logistics Panel (from left to right): Mr. Hans Faust, WHO, Switzerland; Mr. Roger Goodall, UNICEF, USA; Mr. Steve Fabricant, Facilitator, USA; Dr. Neyde Gloria Garrido, Brazil; Mr. Rudolph Boulos, Haiti. Photo by Pal Lanza Field.

COMMUNICATIONS AND SOCIAL MARKETING

Panel Chairperson:

DR. WILLIAM A. SMITH

Senior Vice President

Academy for Educational Development

Washington, D.C., USA

I. PRESENTATIONS

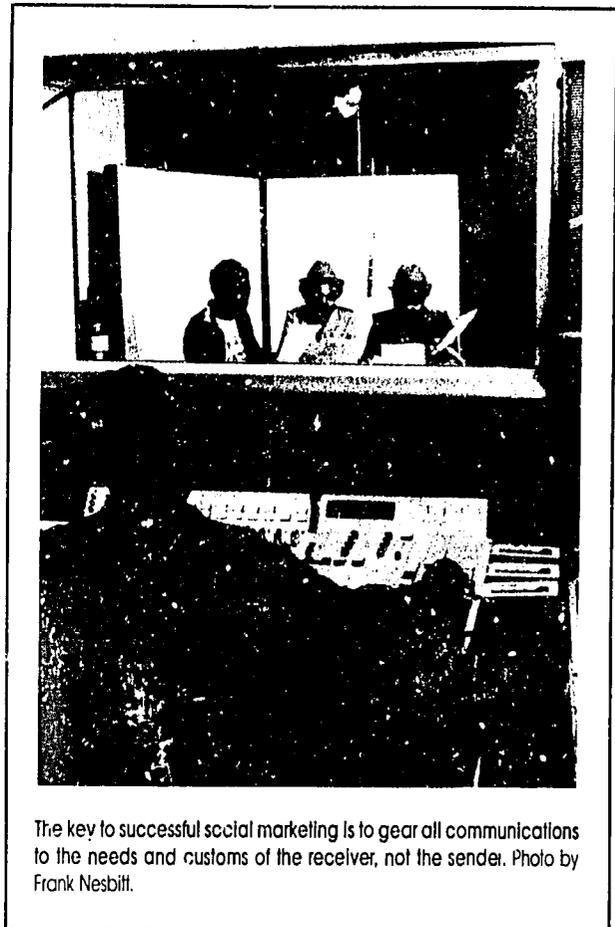
The Special Role of Health Communications¹

A successful child survival program requires three fundamental elements.

1. **A Product** can be either a commodity such as oral rehydration solution, a service such as immunization, or a new behavior such as hand washing. In the case of some commodities, such as ORS, however, there are also behaviors that must be learned in order to make the commodity effective (for example, correct mixing, correct administration, and monitoring the child's recovery). *Product* will be used throughout this section to describe both the commodities and behaviors being promoted.
2. **A Distribution System** makes the product available to the potential consumer. This approach includes not only creating a system that will permit the product to be available in the most convenient, reliable, and attractive manner possible to the consumer but also training providers to promote the product and to educate the consumer. *Distribution system*, as used here, refers to that element of any effective program that makes products available, including provider orientation and training.
3. **A Consumer** must decide to try the product, must use the product correctly, and must continue using it as needed. That person must also be the right one—the individual at greatest risk or the least served by the existing service delivery programs. *Consumer*, as used here, is not just anyone who uses child survival "products" but rather a special group of unserved, at-risk clients.

Lacking any one of the foregoing elements, a child survival program would be unable to meet the goals set by the international health community.

¹From a presentation by Dr. William A. Smith, Senior Vice President, The Academy for Educational Development.



The key to successful social marketing is to gear all communications to the needs and customs of the receiver, not the sender. Photo by Frank Nesbitt.

Health Communications has two primary functions within this structure. First, it must create a demand for the products and services required to make child survival a reality. Second, health communications must help ensure that one's products are acquired and that consumers will use them in a safe and effective way. These two roles, demand creation and appropriate use, are fundamental to a successful child survival activity. Both of these roles place the consumer in a pivotal role—for practical, not ideological, reasons. They move the child survival initiative out of the laboratory, out of the clinics and hospitals, and into the homes and minds of those people who need the service, who will decide to seek it out, and who will use it properly.

Demand Creation. Demand creation is more than simply publicity regarding product availability. As commercial marketers have shown, the consumer must know the relative advantages of the new product compared to more familiar ones. The consumers must believe that the new product will meet their own goals for it. But demand creation also means changing fundamental beliefs about life and one's own ability to affect life—

persuading individuals and communities that are often traditional and fatalistic that their children can grow up healthy and motivating them to demand that they do so. As UNICEF's Tarzie Vittachi puts it:

We must communicate the message that Fate is Not Destiny. Fate is what happens to us. Destiny is what should and could happen to us. If two of the four children born to a family died from a preventable disease, people would readily accept the possibility of acting to change that Fate if it is presented to them in a simple, credible way. . . . What is needed is to communicate the information and knowledge needed to bring about that change, thereby converting latent demand into articulate and, putatively, effective demand to which supply is the response (*Assignment Children*, 1984).

Viewed from this perspective, demand creation implies and involves more than popularization or even educating consumers about a product. It involves the mobilization of individuals and communities to take enthusiastic collective action in support of child survival initiatives. Several programs, such as the immunization programs in Colombia, Brazil, and Burkina Faso, have already done so. Collective action, as applied to individual consumer decisions, raises a whole new arena of opportunities and obstacles for the communications planner.

In promoting a new perfume, demand creation can be quite straightforward, although not necessarily simple. In designing child survival products and messages, however, it becomes complex. First, often little is known about what the marketplace is like. What are the other products, what do they cost, and what are their perceived benefits? What constitutes acceptable levels of costs for a new behavior in a particular society? How can a product be positioned to meet the needs that rural mothers define for themselves, for example, that she does not have to travel for hours to reach an immunization post or that she can avoid the public embarrassment of not knowing which end of the growth monitoring chart to read. Second, the ability to design new products is limited by the available technology. In public health one is often faced with the problem of "selling" mothers a "product" that has immediate, unpleasant consequences. It is still not possible to make an immunization painless nor a condom comfortable.

Some products, however, can be modified to improve consumer acceptance. The plastic mixing and measuring bag for ORT in Ecuador, the Egyptian ORT cup, the Peruvian immunization card

are but a few examples of innovative products resulting from consumer-oriented research. Such research is a principal contribution that health communications can make to increase consumer demand. By analyzing consumer needs and wants, by carefully understanding the existing marketplace, it is possible not only sometimes to find new ways to sell difficult products but also to help reshape the product itself to meet consumer needs.

Much work has been done in designing a more understandable growth chart and in finding better messages related to breastfeeding. Prevention behaviors offer a special challenge, yet there is hope that careful research may lead to further improvements in this area as well. This research can also lead to new messages, new vocabulary, and new appeals that address particular consumer needs.

It is now clear, for example, that rural women in Honduras want to perceive Litrosol, the locally produced ORS, as an effective modern medicine—not as a local home-remedy. They want a remedy for diarrhea—not a remedy for dehydration, which they do not understand. Indeed, they want one so desperately that they have been quite clear in refuting messages on the radio that say "Litrosol does not cure diarrhea." They believe Litrosol does cure diarrhea although it does not. These consumer needs—a search for a diarrhea treatment and an identification with modernity—are now fundamental parts of the message strategy used to sustain Litrosol's overall popularity.

In sum, demand creation is the result of products and services that respond to consumer's ideas of their own needs. To produce consumer demand it is essential to have accurate information on what those ideas are, permitting program designers to create better products, services and message appeals.

Appropriate Use. The promotion of appropriate product use is much less certain. Many socially beneficial products focus almost exclusively on demand creation alone. It is assumed that if a consumer purchases a product, he or she will use it properly. Field evidence shows, however, that this assumption is clearly unwarranted. Careful behavioral analysis, a fundamental part of the health communications approach, is essential to ensure that products and services are used properly as well as purchased widely.

Early research in Honduras, for example, showed that women gave far less ORS than required to rehydrate a child despite significant media messages to the contrary. While it was originally thought that mixing was going to be the primary problem, in fact it was ORS administration that presented the main obstacle. The second and third phases of the program shifted emphasis to the need for

replacement of fluid loss. This new emphasis was translated into rural vocabulary to say “to replace the liquid your child loses, give your child a glass of Litrosol after every movement.” This message proved much more acceptable—first because there was a clear cue, second because the volume prescribed carried more force validity than “a liter a day,” and third because the message explained why a glass per stool was advocated—“to replace what was lost.”

Correct use of child survival products and services is at the very heart of success, so much so that simple things are often taken for granted. Again in Honduras, it was thought that mothers might have a problem pouring the salts into the narrow neck of a Coke bottle. We discovered that mothers did it well but that nurses had considerably more difficulty. These early experiences showed that appropriate use could not be taken for granted. The most basic skill, if it was essential to the effectiveness of the procedure, required careful observation. The concern with appropriate use led to the conclusion that behavioral analysis was not an esoteric gimmick but a fundamental part of an effective program.

Use involves not only knowing what to do but also what sequence to do things in, when to begin them, and when to end them. It may require learning what instruments or tools are needed to make an activity work. In Swaziland, the Mass Media and Health Practices project (MMHP) focused on having each mother put together a rehydration kit (a clean measuring bottle, a bottle cap, and an instructional flyer) in a convenient place so that at the onset of a bout of diarrhea the tools for home management would be easily available. This procedure had the additional benefit of increasing the importance that mothers gave to the therapy itself.

Prevention behaviors will require a significantly different behavioral approach. Moving away from behaviors that are provoked by strong external stimuli, such as a bout of diarrhea, and into behaviors that have no external provocation, such as hand washing, will shift attention away from tools and toward reinforcing associations. Training family members to remind each other to wash their hands or narrowing the message to stress washing hands before food preparation may be much more effective. Whatever the solution, appropriate use, not only understanding and commitment to a behavior, is fundamental to success.

The Method: From the Honduras Experience²

An effective health communication strategy has three key components:

- pre-program planning and development;
- the educational intervention “self; and
- the monitoring and evaluation of knowledge, attitudes, and behavior during and after the campaign.

The planning and development stage emphasizes the collection of information needed to prepare an effective program and answer such questions as: Who in the total population should be selected as the principal audience? What communication channels are most appropriate for these people? What behavior should be promoted? What resources are needed to implement the program?

The market research to answer these questions includes the techniques of behavioral analysis and anthropology. In Honduras, for example, the key instructional issues were:

- remedy associated with diarrhea does not in fact stop the diarrhea;
- early determination by the mother of when the ORT solution is needed and timely access to the packets;
- difficulty in mixing ORT solutions in the rural home, i.e., the availability of a liter container and the use of the correct volume of water in relation to salts;
- sufficient administration of the solution; i.e., give the entire liter slowly over 24 hours, in spite of vomiting;
- willingness to continue feeding, especially breastfeeding, during episodes of diarrhea;
- identification of a cluster of prevention behaviors that are practical in rural terms and that serve as salient inhibitors of diarrheal morbidity.

A six-month field investigation included focus group interviews, direct observation of child care during diarrhea, and individual interviews with rural mothers, fathers, siblings, and grandparents. Village-based mixing trials and a physician/health provider survey were also done. The investigation included topics related to both treatment and prevention of diarrhea in the village and included vocabulary and local beliefs that would be useful in the development of specific campaign

²The methodology was developed by the Academy for Educational Development in Honduras for the HEALTHCOM Project (then called Mass Media and Health Practices) sponsored by the Agency for International Development.

messages.

The initial investigation resulted in a list of 104 treatment activities relevant for campaign messages. The principal treatment themes included diagnosis, acceptance of ORT, procurement of information, mixing, administration, the seeking of external help, and recovery. For prevention, the activities to be covered included breastfeeding, improved feeding practices, improved food preparation, improved food storage, improved personal hygiene, improved household hygiene, and enabling concepts.

No campaign could promote 104 messages successfully. Indeed, even one message from each of the above themes would be impossible to impart successfully. It is necessary to choose which of the potential messages has the best chance for acceptance, given the nature of the target audience and the characteristics of the message delivery system. Which would produce the most change with significance for reducing diarrheal mortality?

There are five criteria against which to answer these questions. First is the availability of ORT ingredients; second, needed skills or knowledge on the part of mothers. For instance, rural mothers may know that boiling water is good, but may not understand that it actually kills the parasites they fear. Third, is there an incentive like immediate improvement in the child's health? Fourth, there may be incentives for doing the "wrong" thing—like giving kaolin or purges. Fifth, there may be consequences that discourage the desired behavior. With ORT a child may vomit, for example, or the diarrhea may appear to increase.

After a rigorous selection process it was decided that breastfeeding, reheating foods, washing hands, and boiling water could be associated with a specific focus—infant care. Mothers would not be asked to do specific things but to recognize that an infant requires special care, and special care means breastfeeding, clean water, fresh foods, clean hands, etc.

Treatment of diarrhea presented a different set of problems. Field research indicated that mothers wanted five things from a diarrhea treatment: the cessation of diarrhea, the avoidance of vomiting, that the remedy be readily available, that it be respected, and that it be simple. Availability and respectability of the remedies had more to do with the distribution system and were therefore secondary concerns. The other three demands on the part of the mothers (cessation of diarrhea, no vomiting, and simplicity) were far more problematic. Oral rehydration solution does not halt diarrhea and in fact might increase the volume. In addition, if given too rapidly it may also induce vomiting.

Furthermore, it must be administered repeatedly, over a long period of time—24 hours—to be effective.

It was finally decided to construct the treatment theme around the simple concept that "children with diarrhea need liquids." Specific treatment advice was built around the theme "give liquids during diarrhea," which was repeated over and over again. Litrosol became a special remedy for dehydration, the loss of liquid during diarrhea.

These basic messages were then transformed into appealing language, structured into a sequenced dissemination plan, and divided into those that would be delivered by the media, in printed materials, and through trained health workers. The whole process of message selection, the critical first step, took more than seven months. Each step of the way was guided by the latest developments in behavior analysis and a set of criteria that raised practical, consumer-oriented questions and forced a systematic challenging of prejudices and anecdotal assertions acquired during the field investigation.

How the Egypt ORT Communication Campaign Succeeded³

Pilot social marketing of ORT began in Egypt on a limited scale in the city of Alexandria in the fall of 1983; the national effort began in January 1984. Since then multimedia campaigns have utilized television, radio, billboards, press, booklets, and interpersonal communication. These communication activities were synchronized with other social marketing elements, especially ORS production, distribution, and physician training.

The ORT campaign in Egypt is not yet finished, however. Some aspects of ORT still need more effort and time. Prevention of diarrhea is perhaps the most difficult aspect to manage because of the different environmental and structural changes that would need to be made. Better understanding of ORS mixing requirements, and of feeding during and after diarrhea episodes, including breastfeeding, are some areas requiring more emphasis in future activities.

Characteristics of the Egyptian society, culture, and media system may resemble or differ from those of other countries experiencing similar problems related to ORT. For example, Egypt is extremely fortunate in that more than 85 percent of its population has regular access to television and more than 90 percent owns radio sets. With these same resources, however, many public education

³From a presentation by Farag Elkamei, Media Advisor, John Snow, Inc.

efforts did not succeed in Egypt in the past. While such resources are a great asset, how the ORT campaign used them was the primary contributing factor towards achieving the campaign results. In global terms this is fortunate because it means that the Egyptian ORT program's achievements can be replicated in other countries as long as the same principles regarding media usage are followed.

Some of the most important factors in planning and implementing the successful Egyptian program follow.

- *The project carefully developed a communication strategy that included the use of the mass media, training, and market research.* There was a clear vision of the role mass media could play in inducing knowledge and behavioral changes.
- *Culturally relevant use of the media was of central concern.* Every culture has its own patterns of communication, preferred artistic tastes, formats, idols, etc. Characteristics of the Egyptian culture were closely observed in the design and production of the media messages. For example, a motherly, well-liked, and respected actress was chosen to star in the ORT messages on television. The vocabulary used, the way she dressed, and the accompanying visuals all made the audience identify with her and heed her advice.
- *The program was successful in integrating the sociological and anthropological research findings into the creative development of the media messages.* This input was made both before scriptwriting and at different stages where materials were pre-tested for technical and cultural relevance. Artists, producers, and other media talent seldom are aware of the importance of careful research for preparing effective communications. This was overcome by thorough supervision of all aspects of the media productions.
- *Closely related was the careful coordination of all aspects of the complex process of developing and implementing a media campaign.* Good coordination of these multiple steps and inputs, so that different pieces complemented and enhanced each other, was a key factor. For example, there was the need to coordinate the different elements in the same messages, such as content, vocabulary, visuals, and effects. Similarly, the different formats of the same message had to be coordinated in order to make the best impact. Furthermore, different messages had

to be properly organized, coordinated, and phased.

- *The campaign was successful in securing the consent of medical authorities on the technical content of campaign messages.* The project could have bogged down in differences of opinion on the technical details. Considerable attention and effort were given to reconciling these differences of opinion and arriving at technically correct messages that were accepted by different medical authorities. No messages were presented without this technical review and approval.

The mass media campaign was only one element of the overall campaign of the project to reduce diarrheal disease and associated mortality. There was constant attention to coordinating the media campaign with the work of the other divisions. For example, it was important that all research findings be carefully processed for their relevance to the media campaign. The presentation of mass media messages had to be coordinated with production and the actual availability of ORS in the health facilities and pharmacies, not to create demand ahead of ability to supply the product. It was essential that the messages being presented in mass media correspond and be supported by the content being provided in the training programs.

The result of this planning and coordination has been three television campaigns utilizing 30-second and one-minute spot announcements. There were eight different spots in 1984 and ten different spots in 1985. The messages included recognition of dehydration, proper preparation and use of ORS, importance of breastfeeding and continued nutrition, and prevention through personal hygiene. Mothers have learned to mix the solution correctly, as shown by direct mixing trials conducted in homes and hospitals and tracking the decreasing incidence of hypernatremia in hospitalized cases. National radio, newspapers, magazines, pamphlets, and local events have also been used. In every case, the message content was consistent but tailored for the media channel and the particular audience.

A communication revolution has been quietly taking place in developing countries. Large segments of most countries' populations now have access to radio and/or television, giving mass media an enormous potential for communicating with and educating many people. When the media has been ineffective in educating its audience it is because of incorrect media usage rather than the character of mass media. *Effective media use is the key to successful ORT social marketing.*

II. DISCUSSION: COMMUNICATIONS AND SOCIAL MARKETING GROUP

Following the presentation, three discussion topics were suggested.

1. What lessons have we learned? Are there failures and successes from which we can all learn? Often more is learned from our failures than our successes.
2. What are the future needs of CDD programs over the next three to four years?
3. What are our suggestions for the donors?

The group discussed program implementation problems, issues, and dilemmas and how they affect communication program efforts. What messages do we give mothers about oral rehydration therapy? What media can be used? How will I promote oral rehydration therapy so that mothers will find it acceptable? So they can follow the instructions on the package label? So they will know when to give ORS? The following highlights discussion points.

People

There are multiple audiences with varying information/communication requirements.

- Mothers: The users often have low levels of literacy.
- People who influence mothers: grandmothers, neighbors, friends.
- Medical professionals: physicians, nurses, health workers, midwives.

CDD programs that have achieved dramatic increases in the level of awareness and knowledge, leading into acceptance and eventual use of rehydration therapy, have achieved these results because of a conscious effort to plan the program on the basis of the user's needs. With the user as the starting point, the various elements of the program were then designed to meet the user's needs adequately.

Having a person in charge of the CDD program is important for a successful program. A four- to five-year commitment is desirable. A common problem is the frequency of changing program personnel and policy makers in the CDD program.

Promoting the use of oral rehydration therapy on a nationwide basis requires the combined, synergistic efforts of a number of government agencies including the Ministry of Health, the Ministry of Education, the Ministry of Information and Tourism, both at the national, policymaking level and at

the implementation, field unit level. In some countries, this is now a reality. In most countries, it is a painful process.

Product

Different packet sizes may be available in the same program causing difficulties in describing measurement. Some CDD programs will have to teach the home solution mixture because it is a low-cost alternative and packets may not be readily available.

Price

Public and private sector products will differ in price.

- Public sector addresses low-income markets.
- Private sector addresses higher-income markets.
- Rural families may still have no access to ORS.

In countries where a private sector exists, a partnership between the public and private sector may result in benefits to the national oral rehydration program. The public sector can concentrate its resources on meeting the needs of the low-income groups, which may not even belong to the cash economy. On the other hand, the private sector can address the needs of those groups that are able and willing to pay for products and services at a nominal, affordable price. Furthermore, collaboration can take the form of a sharing of resources and capabilities such as the private sector's strength in manufacturing and distribution. This collaboration, not always easy, may be the starting point of a mutually beneficial relationship.

Place/Distribution

The product must be available as stated by the communication program. Distribution and promotion must be coordinated.

Promotion

A consensus was reached on the following points.

- It is always better to have more than one medium for an ORT campaign.
- The messages in all channels of media (private and public) must be standardized to avoid contradictions and confusion.

Research

- A lot of "bad" research exists with inaccurate results.
- Some projects use little or no research.

- Some good research does exist. At the same time, big gaps in the research remain.
- It is important to know how to analyze and utilize research for decisionmaking.

FUTURE NEEDS OF THE ORT COMMUNICATION PROGRAMS

1. Good research is needed for formative evaluation and monitoring.
2. CDD programs need to focus on the target audiences and their specific information requirements.
3. The private and public sectors need to cooperate and take advantage of each other's strengths.
4. Messages should be standardized and multiple channels used.
5. Product positioning should be a focus, considering where ORS fits into the market.
6. The product should be available to low-income groups and compatible with the timing of communication program activities.
7. Prevention of diarrhea should be included in communication messages.
8. The campaign approach is not appropriate for every situation. ("Campaign" is here defined as a short-term, highly intensive effort.)
9. Selecting the appropriate media is critical.

ISSUES AND DILEMMAS

There are many issues that the international community working on diarrheal disease programs must focus on.

1. How can we sustain the campaign and at the same time ensure the cost-effectiveness of the communications and social marketing program.
2. Good research is essential to identify user needs and to serve as solid bases for CDD program implementation.
3. What messages about the product should the CDD Program Managers give and how does this affect acceptability of the product to mothers and to physicians?
 - Are oral rehydration solutions meant to stop diarrhea?

- Are they meant to stop or treat dehydration?
- Are they meant to prevent dehydration?

Mothers expect a medicine for diarrhea to *stop* diarrhea. Physicians, especially from the private sector, want to stop dehydration using intravenous therapy, which they can be in control of, rather than oral rehydration therapy, which can be used at home.

4. How does one create in the user's mind a purpose and function for water/sugar/salt homemade solutions vis-a-vis the oral rehydration packets, as well as related practices of extra feeding during and after diarrhea, hand washing, and breastfeeding. The usefulness of these products or practices must be clear to the mother. Confusion can easily lead to rejection of the product/practices.

ADDENDUM ONE: LESSONS LEARNED FROM PAST PROGRAMS

1. Far too often, ill-conceived messages have been pushed through weak channels at the wrong people with almost pitiful levels of resources.
2. Programs that seek to teach new behaviors, particularly to large, dispersed audiences, are better when they:
 - define through research what the health problem really is, whom it affects, how those people understand and respond to the problem, what obstacles they are likely to encounter, and how the audience can be influenced to change; and
 - segment general audiences.
3. Use marketing behavioral analysis and anthropological research to create message/products that are:
 - salient in solving the problem; and
 - actionable given all the real-life constraints on the audience segment.
4. Ensure the practical and timely availability of whatever materials, supplies, and equipment are needed for the audience to act on the advice being given.
5. Integrate various communication channels (print, radio, television, face-to-face discussions) around a single set of coherent themes for each segment.

6. Commit to the long haul.
7. Build in participation of local policymakers and training of project implementers.
8. Emphasize the need for communication projects to accompany and reinforce service availability.
9. Provide for coverage, timeliness, and credibility.
10. Have a complete plan, not a piecemeal one. One needs:
 - a product designed to meet consumer needs at a price they are willing to pay;
 - an adequate supply and distribution system;
 - a single set of simple, noncontradictory messages and an explicit linkage between what service providers, product distributors, radio, and print media tell the public; and
 - a series of simple print reminders of primary skills for each health technology.
11. Collaborate closely with health care providers—government and private, medical, traditional, and commercial.

ADDENDUM TWO: FIVE RESEARCH AREAS THAT HELP PROGRAM MANAGERS DEVELOP BETTER MESSAGES

1. What are mothers using now for diarrhea? What do they like about their present products? What do they expect a diarrhea remedy to do? How quickly do they expect it to work?
2. What do mothers expect to pay for a remedy that works? What attitude do they have towards give-away drugs and public health facilities? Where would they prefer to have ORS available? What distribution is most likely to be sustainable over time?
3. What liquid volume container is most com-

mon? What are mothers' views about the storage of medicine? Who is most likely to prepare the ORS mixture (mother, grandmother, siblings, health worker, other)?

4. What are mothers' expectations about the volume of medicine to give a child? Does it differ by age?
5. What does mother expect to happen when she gives the remedy? What do we predict will happen to the child and what words can we use to describe these clinical changes that a mother will understand?

ADDENDUM THREE: QUESTIONS MOST FREQUENTLY ASKED BY MOTHERS ABOUT ORAL REHYDRATION

1. "What is ORS good for . . . and why should I use it instead of what I am already using?"
2. "Where can I get ORS and how much does it cost?"
3. "If ORS is free, does it really work as well as a medicine I have to pay dearly for?"
4. "How do I prepare this ORS mixture?"
5. "How do I know if ORS is working or not? What should I expect to see happen?"
6. "Is ORS good for all diarrheas, or just those that other modern medicine is good for?"
7. "Can I give ORS to other family members?"
8. "Can I keep my other favorite remedy or do I have to give ORS alone?"
9. "Do I have to give a whole liter a day? My child won't drink so much."
10. "Is this really medicine or just salty water that the doctor is giving me because he ran out of real medicine?"
11. "Should I make the mixture stronger if my child is really sick?"

DISTRIBUTION AND LOGISTICS

Panel Chairperson:
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INTRODUCTION

Adequate availability and easy accessibility of ORS, both in terms of distance and time, are crucial factors in the management of oral rehydration therapy programs. Through our workshop and panel discussions of experiences in the implementation of ORT supply and distribution systems, we have identified some successful approaches, some which could not be considered effective, and several key issues that remain unresolved at the present time.

We have divided our discussions and conclusions into four areas:

- Policy Issues;
- Advances in ORS Local Production;
- Using the Private Sector; and
- Public Sector Distribution.

We have tried to keep our minds open and maintain a critical attitude. In looking at programs that appear successful in increasing availability and use of ORT, we note that in most cases they were successful in overcoming certain historical and philosophical barriers. Objective analysis of what policy and actions can be implemented with positive effect has allowed program managers to overcome some of these barriers.



Local production of ORS packets is a giant step toward creating a self-sustaining ORT program. Photo by Frank Nesbitt.

POLICY ISSUES

In the area of program policy, we agreed that the relative roles of ORS packets and home solutions must be clearly thought through and firmly established as the cornerstone of the CDD program. From this decision, all further distribution and logistics implementation activities are derived. We tended to agree that while the principles set forth in the WHO/UNICEF "red book" are technically sound, under some conditions it may cost a country as much or more resources to achieve a sustainable home solution, first line approach as it does to move ORS packets down to the household level.

Second, if the decision is taken to have ORS available at the household level, the use of the private sector should definitely be considered. We conclude that an active private sector takes nothing away from the public sector, except part of the cost burden. The Egypt program exemplifies this perfectly: exactly the same product is sold and given away free, yet 60 percent of ORS users choose to buy it from the private sector.

Third, a policy to make use of traditional healers and/or informal distribution channels has been shown to lead to increased public access to ORS. Traditional birth attendants have already been drawn into the primary health care system of many countries and ORT can be an obvious second bridge between traditional and "official" health care. Informal distribution through small shops and street vendors has increased access to ORS in some countries, with only modest amounts of training and control required. The idea that ORS is a potentially dangerous drug to be kept under tight control is a barrier to access in countries with scarce health resources.

The last policy issue concerns donors. Donor support in the form of ORS commodities may not be conducive to fostering self-sufficiency unless the inputs are coordinated and the level and duration of the inputs are unambiguously communicated to the host government. Governments should plan for self-sufficiency well in advance and should not hesitate to actively manage the donor support offered in order to achieve this goal.

ADVANCES IN LOCAL ORS PRODUCTION

Much practical experience has been gained through the rapid expansion of local ORS production in developing countries since the last ICORT. The results have been encouraging but some cautionary notes must be made. True self-sufficiency has proved illusory except where countries pro-

duce or have easy access to at least some of the basic materials. Production costs can be competitive with the benchmark UNICEF price, as demonstrated by examples from Asia, Latin America, and Africa, but only through skillful planning and management. Factors favoring low-cost production include efficient personnel, economical procurement of materials, appropriate choice of equipment, minimizing import and excise duties, and making maximum use of existing and added production facilities.

The adoption of the citrate-ORS formula has allowed the use of cheaper packaging material in many countries, and reliable, low-cost production machinery has been developed. Quality control requirements have been simplified and rationalized by WHO and should now be within the capability of any country considering local production.

The apparent failure of decentralized "cottage industry" production to offer significant economic or logistical advantages over factory production has been sadly noted.

USING THE PRIVATE SECTOR

The private commercial sector can and should be enlisted where possible as a partner in making ORS widely available. Where this has been done effectively, government has exercised a fair degree of control and at the same time offered significant active support. Some useful lessons have been learned.

- Product pricing is a critical and highly complex problem. Low prices and retail price controls are by no means guarantees of wide coverage through sales. Mothers' willingness to pay must be balanced against the need for profit incentives all down the distribution system.
- Subsidies have been needed to encourage the private sector to launch a product that it may perceive as not very profitable. A particularly useful form of subsidy has been publicly supported mass media ORT promotion campaigns. Guaranteed offtake by government for a limited period has also been an attractive incentive to launch private sector production.
- A key factor in achieving the goal of wide private sector coverage has been the active involvement of the person who will ultimately contact the mother, be it a pharmacist, medicine seller, or small general shopkeeper.

- Competition in the marketplace can lead to greater effective ORS usage, but there are choices to be made. One possibility is to permit a diversity of dosage forms, usually corresponding to a range of retail prices. However, if the public has already been sensitized to a specific product, such as the standard ORS packet, by means of an effective public promotional campaign, a more appropriate strategy might be to encourage brand competition among similar products. Regarding coloring and flavoring, it is evident that valid arguments exist pro and con, and that these issues need to be carefully researched from the perspectives of safety and maximizing utilization by children with diarrhea. It has been observed that mothers tend to approve the taste of citrate-ORS more than the older formula.
- The difficulty and high cost of obtaining import licenses and hard currency have been a serious barrier to private sector production and distribution of ORS in some countries. Governments must be aware of the need for inter-ministerial cooperation to reduce these obstacles.

PUBLIC SECTOR DISTRIBUTION

We note with regret that most public sector drug logistics systems are operating poorly at best and are ill prepared to cope with the increased demand for ORS that we are trying so hard to create. One solution that works is to exploit all possible channels. These may include cooperatives, PVOs, church groups, schools, or nutrition centers.

The opposite situation can also exist, with a public sector pipeline full of packets but with little demand by users. A distribution system cannot be said to exist unless the demand is created and sustained by mass media, mother-to-mother communication, or other means. These promotional activities can also help minimize problems of misuse of ORS through their educational content. A pitfall to be avoided is the suggestion that ORS will stop diarrhea. Promotional messages for either public or private sector ORS distribution should be carefully tested before use.

We found wide agreement on the inadvisability of creating a distribution system exclusively for ORS. ORS should be treated in the same way as other essential drugs and ORT should not be given priority over other child survival interventions.

A policy of cost recovery can help make a CDD program more sustainable in the absence of donor assistance. It has been shown that charging for ORS increases confidence in the product and therapy.

HEALTH PERSONNEL TRAINING

Panel Chairperson:

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The first problem that the panel on Health Personnel Training faced was our name. The word "training," according to our panelists, often refers to efforts to change behavior in which the trainee becomes an object and the method is manipulation. Education is a preferable word and approach. Education aims at producing understanding. In education the trainer learns from the trainees, joins the group rather than being outside it, or looking down upon the trainees. So our panel preferred the word "education." When we refer to training, trainer, or trainee we will be implying this broader concept of education as discussed.

The phrase "health personnel" was a problem also. Traditionally, "health personnel" means medical persons, doctors, nurses, and so forth. But it is also important that children be trained to teach their parents. Community leaders need education to encourage the members of the community to use ORT.

Finally, and perhaps most importantly, the mother as the true basic health worker needs education, not only to assist her own child but also to act as a communicator and educator to her neighbor. So it is not just the health system, but in a sense the whole community system that we need to educate, including the community's health personnel.

A number of the issues that our panel discussed arose from the fact that training is not always successful. We heard from many countries instances where doctors do not use ORT and are hard to convince of the value of ORT in comparison to

antibiotics and IV's, despite having received training. Mothers too often fail to understand dehydration, or mix sugar/salt solutions incorrectly, even though someone has presented the information to them. However, we also found many instances of effective, exciting training innovations, and I would like to convey our impressions of both the problems and the possibilities.

We heard about clinical teaching units—ORT units where medical students and doctors are learning about ORT effectively. We heard about community teaching methods with village health workers and mothers where innovative methods had made an effective impact on knowledge and behavior. We found that it is important to be concerned about the whole training or educational system, not just the training encounter itself. What comes before and what follows after are just as important as what happens at the encounter between the educator and the learners. Planning, selection of trainees, evaluation, follow-up, and subsequent supervision of the trainee are equally as important as the lecture or clinical activity where the information is exchanged.

What are some of the findings that emerged from our discussions with regard to clinical training of medical personnel in ORT? First of all, there is strong support for the importance of the teaching ORT unit within a teaching hospital. Such units, however, need to be well run, both with regard to clinical care of patients and with regard to the learning activities of the medical students and physicians being taught this new technique.

A critical aspect of this is effective triage. We heard of units where diarrhea patients are received mixed with many other patients, adults as well as children. Because of this they may wait for a long time without attention being paid to dehydration.

On the other hand, we heard of units where a procedure had been established whereby all patients with diarrhea are effectively directed on arrival to a rehydration unit for quick screening and rehydration. Using oral fluids for all patients who are able to drink, even if severely dehydrated, is important for teaching units to provide an example of the remarkable effectiveness of ORT to trainees addicted to intravenous therapy. In short, a teach-



Health professionals must be trained to implement the national ORT plan. Photo by Frank Nesbitt.

ing ORT unit needs to be a model of appropriate diarrhea case management.

The second component in an effective unit is an emphasis on the effective education of the mother, not just on correct fluid therapy of the child. This emphasis was implemented in some units by evaluating the student or physician trainee not only on whether the patient is well hydrated but also on whether the mother can answer correctly questions about diarrhea, oral therapy, and appropriate feeding of the child with diarrhea.

Selection of the trainee is important. Obtaining trainees who have no barrier to implementing the training will avoid wasted efforts. Obtaining a commitment from the trainee's boss to allow changes to be put into place will be more effective if promised before the training, before the trainee can be admitted to the course, than after he returns home.

Sending teams is recommended—a doctor with the nurse from the same unit coming at the same time—so that both parts of the implementation team are motivated together. This has proven practical and helpful even when doctors have been sent out of the country, to ICCDR in Bangladesh, for example. Sending a whole implementation team together was strongly recommended. Also, the possibility of training a whole geographic area at once was suggested. This will discourage the patient who tries to shop around for a doctor willing to give intravenous treatment, since all will have been converted to ORT.

Training planners should ensure that ORS will be available at each of the trainees' home sites before the training begins. There is nothing more sure of dampening enthusiasm for ORT than a lack of the packets needed for therapy. Some countries, to avoid this being a problem, have trained their clinicians to substitute salt/sugar solution on the ward if they are unable to obtain ORS packets. Whichever strategy is taken, the training plans should take the availability of supplies into account.

Actual experience in managing cases personally during training is critical. The physician or medical student learning ORT should care him/herself for ten to fifteen patients effectively, actually using the spoon and cup, actually teaching the mother, to have had an adequate amount of experience.

Adequate time is needed. A quick one-day course may produce awareness of ORT yet fail to provide true understanding of it, resulting in failure to adopt it later into daily practice habits. Seven days or longer for trainers is probably necessary, though certainly difficult.

A number of variations in training approaches were described. The usual formal one-week approach may not be best. It may be easier for busy

physicians to schedule a mini-residency, a short one- or two-day period in an ORT unit, which could be repeated, allowing physicians in a region to catch up without taking a long time off their jobs. This can be particularly important for the doctor whose income is from private patients.

Training should include how the trainees are going to implement the new treatment approach once they get back to their own hospital ward at the district hospital or to their health center. For example, just how should they convince mothers that ORT is better than intravenous treatment, knowing that there is often a strong community preference for intravenous therapy? Just how should they convince the hospital administrator that the procedures on the ward or in the admission unit need to be changed? A broader definition of the skills and knowledge needed by the trainee should be used in planning the training; managing acute dehydration alone is just not enough. Feeding during diarrhea, the integration of ORT with nutrition and the other primary health care and child survival interventions, the prevention of diarrhea, and the broad responsibility of the physician for the whole community, even the patients who do not come to the center, are topics critical to the ultimate success of a diarrhea control program.

Finally, training should include follow-up. The training plan should include not only the training itself but the supervision and follow-up needed afterwards, helping the trainees manage the constraints they will face on returning home. Indeed, clear expectations of what the trainees are to do on returning home should be established before they leave the training site, for example, setting a date for a follow-up meeting where review of activities in the interim can be carried out, and defining the indicators for monitoring behavior subsequent to the training. We all know how a report form with critical indicators can influence behavior; thus, the use of a new report form that will include appropriate ORT behavior is encouraged. Communication directly with the trainees' supervisors should take place so that the supervisors can prod the trainees into action if necessary after they return home.

Shifting to community-oriented education, a number of points were stressed in the rich discussion that arose in this area. First of all and most importantly is the need to eliminate the gap between trainer and trainee. Language is particularly important in this. Some of our panelists objected to the words "oral rehydration therapy" as Latin words, incomprehensible to non-medical persons. Straightforward words more easily understood by the people should be used, they recommended, for example, the phrase "special drink" instead of

"oral rehydration solution." Clothing is also important. Western clothes worn by the trainer where the trainees wear traditional dress can be a barrier to communication. Position, too, can be important. Where the trainees sit on the floor while the trainer sits in a chair, two-way communication may be impossible and even one-way communication inhibited.

The importance of the attitude of the trainer toward the trainee was stressed over and over again. The trainer must be ready to learn from the trainee, from the mother, from the village health worker. Many know the old proverb, "Start with what they know, learn from them." That may be interpreted as stressing the importance of pre-training research. At a more fundamental level, however, it codifies the importance of continual discussion and interchange during an educational process between the facilitator/educator and trainees if education is to be fruitful.

Ways should be sought to link messages about ORT to familiar activities of life and to make learning them interesting. Striking examples are: from the Philippines, the five finger approach, tying ORT activities to five aspects of agricultural life; from Mexico, the use of a gourd doll to demonstrate graphically to children and adults the process of dehydration and rehydration; from Ecuador, the trainer's response to a mother wrinkling her face when she tasted the oral rehydration solution, saying: "Did you think that tasted bad? Your taste is not like your child's taste when your child is dehydrated. You must keep in mind that it will taste peculiar to you, but your child will drink it avidly when he or she is dehydrated"; finally, the use of games to make learning fun. These links and creative approaches take extra effort, but may be essential if training is to be effective.

Another critical area is training materials. The illegible, stenciled instructions on poor paper, which so often are given to mothers, may have a negative impact, even during the brief period before they wear out. For first generation literate persons, in comparison to those like us who have been reading and writing for many generations, the presentation of the material, the kind of paper, for example, the printing, and the layout, may be as important in convincing them as the message that it presents. Donors thus should aim at a much larger target audience, funding not only the distribution of those well-printed books from UNICEF or WHO materials to a few central locations, but aiming more broadly at having useful and attractive materials in the hands of every village health worker, even if possible in the home of every mother.

Community education, in its usual stress on rehydration, frequently leaves gaps in knowledge.

One especially critical gap is feeding, as Dr. Rohde emphasized on the first day of ICORT II. Another frequent gap is the identification of the child at risk, the dehydrated child who needs referral. Both of these need increased emphasis in community education programs and materials aimed at mothers. Indeed, there is no way to avoid our dependence upon the mother in these areas. We may be able to "medicalize" fluid therapy for diarrhea by emphasizing packets rather than sugar/salt solutions, thereby pushing the mother to come to the clinic for rehydration, but there is no way that we can "medicalize" that other part of ORT, feeding. Only the mother can carry out feeding in the home. And only the mother can decide when the child is becoming dehydrated and needs more intensive treatment than what she can provide. Our responsibility as educators must include helping her to understand the importance of feeding as well as of fluid and of referral at the appropriate time, well before the child becomes severely, irreversibly dehydrated.

All training efforts should be part of an overall ORT system plan, not activities planned and implemented in isolation. Training messages must be coordinated with mass media messages so that the mother gets the same information from the radio as she does from the health worker or the doctor. Problems are frequent when these are not linked together, as happened following the recent severe earthquakes in Mexico.

The design of training activities should be decentralized as much as possible to allow for necessary local adaptation. Clear national policies are needed to emphasize those fundamental elements that should remain constant, but they should be as limited as possible, consistent with the technical methodology of ORT and other aspects of training and program activities, and should be planned locally to fit the local situation and culture.

Funding and training activities should actively include the private sector, not just government or ministry of health personnel. Pharmacies, private doctors, and clinics provide more than half the care for diarrhea cases in many countries and need to be aggressively brought into the ORT camp.

Monitoring and evaluation should be built into training plans. These should include long-term evaluation of training, that is, of the behavior of the trainee after returning home and not just the usual evaluation that takes place at the end of the training session.

ORT training must be integrated with training for other primary health care activities or at least actively take such interaction into account. We know the peripheral health worker must integrate ORT-related activities with other PHC efforts. How can

we in reason avoid assisting him or her to do this efficiently, so that he or she will choose to undertake those activities that will have the maximum possible benefit to the public?

Lastly, operations research is needed—good, critical operations research to make training more effective. Training should be just as important a topic for research as the biomedical aspects of gastrointestinal absorption. If we wish training about ORT to become as effective as ORT itself, we need to focus the same kind of critical scientific thinking on training as we did previously on fluid therapy.

Donor support related to training should include:

- support to establish well-run ORT teaching units in every medical school;
- assistance to medical and other health manpower schools in conducting curriculum reform;
- support for dissemination of WHO materials and other ORT information beyond the health system to village health workers and to mothers in the community;

- support of training for private sector personnel, including non-governmental organizations and commercial vendors of diarrhea-related medicines as well as doctors in private practice;
- support not only to formal courses but also to somewhat more innovative approaches, such as the mini-residency; and
- support for operations research to define and solve problems related to training.

In conclusion, a persistent theme in our panels' discussions was the importance, indeed the centrality, of education. ORT demonstrates every day how knowledge can be power. Even the poorest, illiterate mother can prevent her child's death from diarrheal dehydration with fluid therapy. Seeing this and realizing that one does not have to accept fatalistically children dying can open that mother's mind to overcoming other problems as well: poverty, ignorance, injustice. ORT education can thus be the first step in awakening a community to the possibility of change. This makes our efforts to improve it even more important.

SUPERVISION AND MONITORING

Panel Chairperson:

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INTRODUCTION

In order to focus the workshop discussions, standard definitions for monitoring and evaluation were agreed upon. *Monitoring* was defined as "closely observing or assessing on a routine basis." Monitoring performance of health workers in delivering a health service and monitoring use of the service are ways that a supervisor of a local area assesses the effectiveness of the service. An important part of this definition is the word "routine." Monitoring is what is done on an ongoing basis and is thus distinguished from *evaluation*, which can be defined as "a less frequent and more structured assessment, concentrating on comparing achievements with goals."

While monitoring goes on at all levels of a pro-

gram, the panel concentrated on the sort of monitoring that supervisors or middle-level staff carry out. This level of staff includes district supervisors and those who direct either a health center or the work of a number of community health workers.

Two broad areas of monitoring were defined.

- Quantitative—how *much* work is being done?
- Qualitative—is the work being done *correctly*?

THE PROBLEM

The basic problem, emphasized by both panel members and participants, is that both quantitative and qualitative monitoring are too often simply not being done. When supervisors do monitor, it is most frequently quantitative. Assessment of the quality of work, the extent to which ORT is being used correctly, was highlighted as one of the major problems in the overall field of diarrheal disease control and primary health care at the present time.

CAUSES OF THE PROBLEM

Participants and panel members suggested a variety of reasons why monitoring was so often neglected.

1. The relationship between monitoring and desired program outputs is sometimes not recognized.
2. Systems for monitoring are not well understood.
3. Even when understood, systems are not implemented or used regularly.
4. Critical indicators to be monitored are not apparent.
5. Cultural traditions sometimes limit the degree to which a supervisor is comfortable in criticizing the work of others.

1. Relationship between monitoring and output

Nearly all diarrheal disease control programs

now have targets or measurable outputs specified in their Plans of Operations. The relationship between targets, such as a particular reduction in diarrhea mortality or a particular level of use of ORT, and the day-to-day activities of health care providers is often not fully appreciated.

2. Systems for monitoring are not well understood

In areas where the relationship between outputs or goals and monitoring are appreciated, it is not always clear how a systematic approach to monitoring can be developed.

3. Systems are not implemented or used regularly

Where a useful management system for monitoring has been put in place, there are often serious barriers to its implementation. Practical constraints such as lack of petrol or per diem limit the effectiveness of the best designed monitoring plans.

4. Critical indicators to be monitored are not apparent

While broad indicators for ORT are generally



Supervisors, field workers, and consumers need to recognize that monitoring is a crucial element in diarrheal disease control programs. Photo by Frank Nesbitt.

agreed upon (e.g., access to and use of ORT, correct assessment of dehydration status), few programs have had sufficient experience to know which precise indicators are the most critical to monitor.

5. Cultural traditions may limit the degree to which a supervisor is comfortable in criticizing the work of others

In many countries, cultural traditions make it difficult for one person to criticize the work of another. The separation of criticism of work, even if politely and positively managed, from criticism of the worker as an individual is difficult in all cultures.

POSSIBLE APPROACHES

1. Relationship between monitoring and output

The general feeling in the group was that if outputs and targets are established with the involvement of supervisory-level staff, the relationship between monitoring and program goals will be better understood. This bottom-up approach to planning in general, and to target setting in particular, was strongly advocated. Central-level planners should not establish goals that middle-level staff cannot carry out.

A related approach to this problem was to avoid planning that relied too exclusively on promotional campaigns. Many participants pointed out their experience with short-term, high-visibility campaigns, for which inadequate supervision and monitoring had been planned. The view of the group was that such campaigns can be critical in establishing ORT use—but only if adequate training, provision of supplies, and particularly monitoring and supervision of performance were established beforehand.

Decentralization of authority was felt to be another important means of relating goals to supervision. In some countries supervisors feel that there is little point in monitoring work since decisions for change are out of their hands. It was pointed out that such centralization is often more highly developed in other sectors, such as agriculture, and that health planners could learn from these experiences.

2. Systems for monitoring are not well understood

A number of useful systems for monitoring were discussed by the panel members and participants. The two basic questions asked were, "What should be monitored?" and "How should monitoring be done?"

Since supervisory time available for ORT is limited, it is important to be selective in deciding what

to monitor. WHO has suggested some questions to ask in deciding what to monitor for ORT or any other health service.

- Which items are most important to the success of the health service?
- Which are most difficult to do?
- Which are new to the health workers?
- Which will give the best idea of whether all items are done well?
- What do the people complain about?

One could consider monitoring both the activities of health workers and the results of those activities. The latter would involve looking into such areas as mothers' understanding and behavior and the outcome of the service (did the cases recover?). It may be best to start with activities, and when these seem to be satisfactory, to move on to results.

Next, decisions need to be made on *how* each item will be monitored. There are a number of possibilities.

- Observe health workers.
- Talk with health workers.
- Review records.
- Talk with mothers at the time of treatment.
- Make home visits.

The WHO Supervisory Skills training course includes a worksheet that many countries have used to decide *what* and *how* to monitor (see Figure 1).

On the subject of "how to monitor" the question of "when to monitor" was discussed. In answering this question, the following additional questions were thought to be useful.

- How critical is it that the work be done correctly?
- Is this an item that is often done incorrectly?
- What monitoring method will be used?
- How many items will be monitored?
- What time constraints exist, if any?
- What is the likelihood that the item may change from satisfactory to unsatisfactory over a period of time?

Since monitoring is so easy to avoid, having a schedule of when supervisory visits are to occur and what they will involve may increase the likelihood that it will be done. At least it will be more difficult to avoid it if it is written down.

In establishing the monitoring system for super-

FIGURE 1

**WORKSHEET FOR MONITORING HEALTH WORKER
PERFORMANCE IN DELIVERY OF DIARRHOEA TREATMENT SERVICES**

	ITEM TO MONITOR	MOST IMPORTANT ITEMS	THE ITEM COULD BE MONITORED BY:					HOW OFTEN TO MONITOR THE ITEM	
			Observing health workers or the health care setting	Talking with health workers	Reviewing records	Talking with mothers at time of treatment	Making home visits to observe and talk with patients and mothers	Monthly	Quarterly
ACTIVITIES OF HEALTH WORKERS	Assessments of dehydration								
	Preparation of ORS								
	Provision of treatment								
	Instructions to mothers on what to do at home								
	Recording of treatment on patient records								
	Use of stock cards								
RESULTS OF ACTIVITIES OF HEALTH WORKERS	UNDERSTANDING OF MOTHERS	Mothers understanding of causes and risks of dehydration							
		Mothers understanding of signs and symptoms of dehydration							
		Mothers understanding of prevention of dehydration at home							
		Mothers understanding of how to prepare and give ORS							
		Mothers understanding of feeding during and after diarrhoea							
	LOGISTICS	Availability of stocks of ORS							
		Availability of ORS supplies (for example, measuring and mixing utensils)							
		Organization of treatment area							
	OUTCOME OF SERVICE	Clinical outcome: recovery, referral for further treatment, or death							
		Feeding practices of mothers during and after diarrhoea							
		Mothers practice of measures for prevention of diarrhoea							
Mothers satisfaction with service									

visors, a checklist can be a particularly useful tool. It reminds the supervisor of those critical items to look for in assessing performance, but impersonalizes them so as to help solve the "embarrassment of monitoring" problem. The checklist can be designed to focus on a few critical indicators. The checklist included in the WHO course (see Figure 2) lists general activity indicators a supervisor could use to monitor work performance. A health program may adapt this checklist to focus more specifically on particular activities. For example, "assessment of dehydration" could list critical indicators such as "amount of urine" or "skin pinch." One problem with checklists is that it may be too easy for the supervisor to just check "satisfactory" or "unsatisfactory." The narrative sections at the bottom of the WHO checklist, however, address this issue as they allow for more detailed comments and recommendations.

The panel and participants also suggested that the supervisor always try to find positive items to mention, so that any criticism required does not seem discouragingly harsh. It was also suggested that workers be asked to describe their own problems before the supervisor points them out. Some participants felt that if both the supervisor and the worker sign the checklist it will increase the likelihood that they have actually discussed problems.

A few participants thought that if clearly defined and agreed upon standards were developed, workers could routinely monitor their own performance. The checklist could serve as a useful reminder of important activities to perform.

3. Systems are not implemented or used regularly

The problem of maintaining useful monitoring and supervision, while serious, has been managed in some countries. The opportunity afforded by the exchange of experiences during workshop sessions was particularly fruitful in this area. Particular problems and solutions included the following.

Problem. Supervisors are looked on as critics rather than helpers of staff.

Response. Supervisors can carry supplies or pay checks. They can also take an active part in service delivery at the time of their visit.

Problem. Monitoring of work is inherently awkward, threatening to workers and embarrassing to supervisors.

Response. The selection of the right monitoring method can be important here. Table 1 lists five methods. Reviewing records is relatively easy but is useful only if records are well kept. It also does not tell you whether the services provided were

provided correctly. Home visits to follow up on patients are time consuming and perhaps should be regarded as something to be done once you have verified that health worker performance is acceptable through other means. Talking with mothers at the time of treatment (e.g., exit interviews) is easier and may be appropriate earlier in a program than home visits. Observing health staff as they work was felt to be indispensable and may be the most important *missing* aspect of supervisory monitoring. Talking with health workers is also critical. Since it is the essential observation of performance that is so difficult, the combination of observation and conversation has been found in a number of countries to be extremely helpful. Talking with workers is easier since one is not put in the position of being a cold, potentially harsh, indifferent judge. Asking workers if they know the signs of dehydration, however, is not the same as knowing whether or not they can actually identify and interpret them. If the observation and the talking go together, the idea that this process is being done in order to be helpful is easier to accept.

Problem. Supervisors are reluctant to monitor performance because they do not feel qualified in oral therapy themselves.

Response. Supervisors must become fully capable if they are to establish themselves as credible in the eyes of their subordinates. The WHO Supervisory Skills Training Course emphasizes this aspect of supervision. The module "Treatment of Diarrhoea," however, should be regarded only as an introduction to the subject, and further practice is essential.

Problem. Financial incentives, while undeniably helpful, are not feasible in many countries. Special arrangements to provide such incentives are difficult to maintain and can lead to dissatisfaction.

Response. Other forms of recognition and status are possible in most countries, and a number of participants gave examples. The involvement of supervisors in the planning process, particularly in establishing local, attainable goals, increases their commitment and is a natural incentive.

Problem. Practical barriers, such as lack of petrol or per diem, are beyond the control of supervisors.

Response. As noted previously, higher level management must recognize the importance of adequate supervision to attain program goals. If this is done, suitable administrative arrangements can be made to overcome practical barriers. A number of countries reported that persistent efforts on the part of supervisors have resulted in improvement in this area.

FIGURE 2

Name of Health Worker _____ Date _____ / _____ / _____
 Month day year

**CHECKLIST FOR MONITORING WORK PERFORMANCE
 DIARRHOEA TREATMENT SERVICE**

ACTIVITIES OF HEALTH WORKER:	Patient 1		Patient 2	
	Satisfactory	Unsatisfactory	Satisfactory	Unsatisfactory
Assessment of dehydration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Preparation of ORS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Provision of treatment	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Instructions to mothers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Recording of treatment on patient records	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MOTHERS UNDERSTANDING OF:				
Signs and symptoms of dehydration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Prevention of dehydration at home	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
How to prepare and give ORS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Feeding during and after diarrhoea	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
LOGISTICS				
Availability of stocks of ORS	Satisfactory <input type="checkbox"/>		Unsatisfactory <input type="checkbox"/>	

Description of problems identified, if any _____

Comments (for example, work done especially well; possible reasons for unsatisfactory responses; changes in performance since last time monitored) _____

Recommendations: _____

Signature of Supervisor _____

4. Critical indicators to be monitored are not apparent

The selection of those indicators that are most critical to monitor requires more experience and operational research. A number of indicators, however, have already proven useful and measurable. In monitoring the amount of work done, "How many diarrhea patients in the target age group received ORT during each month?" is the simplest, most basic question. For routine reporting systems it may be best to limit data to this simple level. In sentinel centers or in highly developed areas, additional information, such as prior treatment, degree of dehydration of patients on arrival, additional treatment given, numbers of patients referred elsewhere, and outcome, may be useful.

A chronic problem in nearly all countries is that data forms currently being used do not lend themselves to collection of this simple information. WHO's recommendation has been to try to modify existing forms rather than to create a separate new form for ORT. A convenient way to keep track of the number of children treated is to maintain a monthly graph. Differences from month to month need to be explained. Comparing the use of ORT services with the reports of supervisory visits can be helpful in interpreting changes in use from month to month. A supervisor who knows his or her area well could make an informed estimate of the most likely interpretation of use data and investigate to see what action can be taken.

Periodically, perhaps every quarter or every year, these monthly figures can be cumulated and the total compared with the target established for the area. Since this is a periodic rather than a continuous exercise, however, it can be considered part of evaluation rather than monitoring.

Monitoring of the effectiveness of treatment at home is not easy but a useful, indirect indicator is the number of cases of moderate or severe dehydration seen at health facilities.

5. Cultural traditions may limit the degree to which a supervisor is comfortable in criticizing the work of others

The problem of cultural barriers to useful supervision was an important item raised by a number of panel members and participants. In some countries it is proving extremely difficult to develop systems in which supervisors criticize the work of other staff. Relationships between staff are felt to be more subtle than so-called "western" models of supervision take into consideration.

Other countries, however, such as Indonesia and Nepal, where cultural traditions had originally been looked on as major problems, reported considerable success in using local adaptations of supervisory methods recommended by WHO and other agencies.

CONCLUSION

All of the groups felt that while there were certainly problems in developing good supervisory and monitoring systems, the number of successes reported was encouraging. All of the world's best programs, including Egypt, Honduras, Nicaragua, Philippines, and Thailand, had in common the careful attention given to supervision and monitoring.

Three points were emphasized in summarizing the work of the panel.

- Supervisory visits to monitor both the performance and the output of staff are critical and often weak links in many CDD programs.
- Decisions, to be changed with experience and through operational research, should be made on what supervisors should monitor and which methods they should use. Supervisory checklists are helpful.
- A basic job of management is to support and encourage supervision.

EVALUATION AND COST ISSUES

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INTRODUCTION

The chain of events in effectively delivering ORT involves many steps. The comprehensive evaluation of this sequence may involve a variety of process and impact indicators. Selected indicators for a CDD program, including those related to ORT, are outlined in Figure 1. Information on these indicators can be collected as part of a continuous monitoring or by periodic evaluation, which is the focus of this panel.

Selection of appropriate indicators must take into account what program components the evaluation is designed to assess and the feasibility of their measurement. Often this is achieved at the expense of some accuracy. Relatively crude indicators may, however, serve a useful purpose in the management process. Cost data can be a valuable component of evaluation and an important input into the decision-making process.

EVALUATION INDICATORS

Discussions centered on several key indicators for evaluation of ORT programs, namely: ORS access and use, ORT use, and diarrhea-associated mortality. The definition of these indicators may vary from country to country. For example, access might be primarily determined by distance from the health care facility providing ORS in one instance and by the ability to purchase packets in another. This issue highlighted the need for indicators to be clearly defined according to their specific setting.

In some situations, where the ORS use rate has been found to be lower than expected, further inquiry has been informative. Evidence from some countries indicates that mothers who know of ORS and have it available reserve it for cases they consider to need it. They appeared capable of discriminating between minor, self-limiting episodes of diarrhea and those of a more severe nature. Clearly not all cases of diarrhea need ORS physiologically. Why then try to persuade mothers to



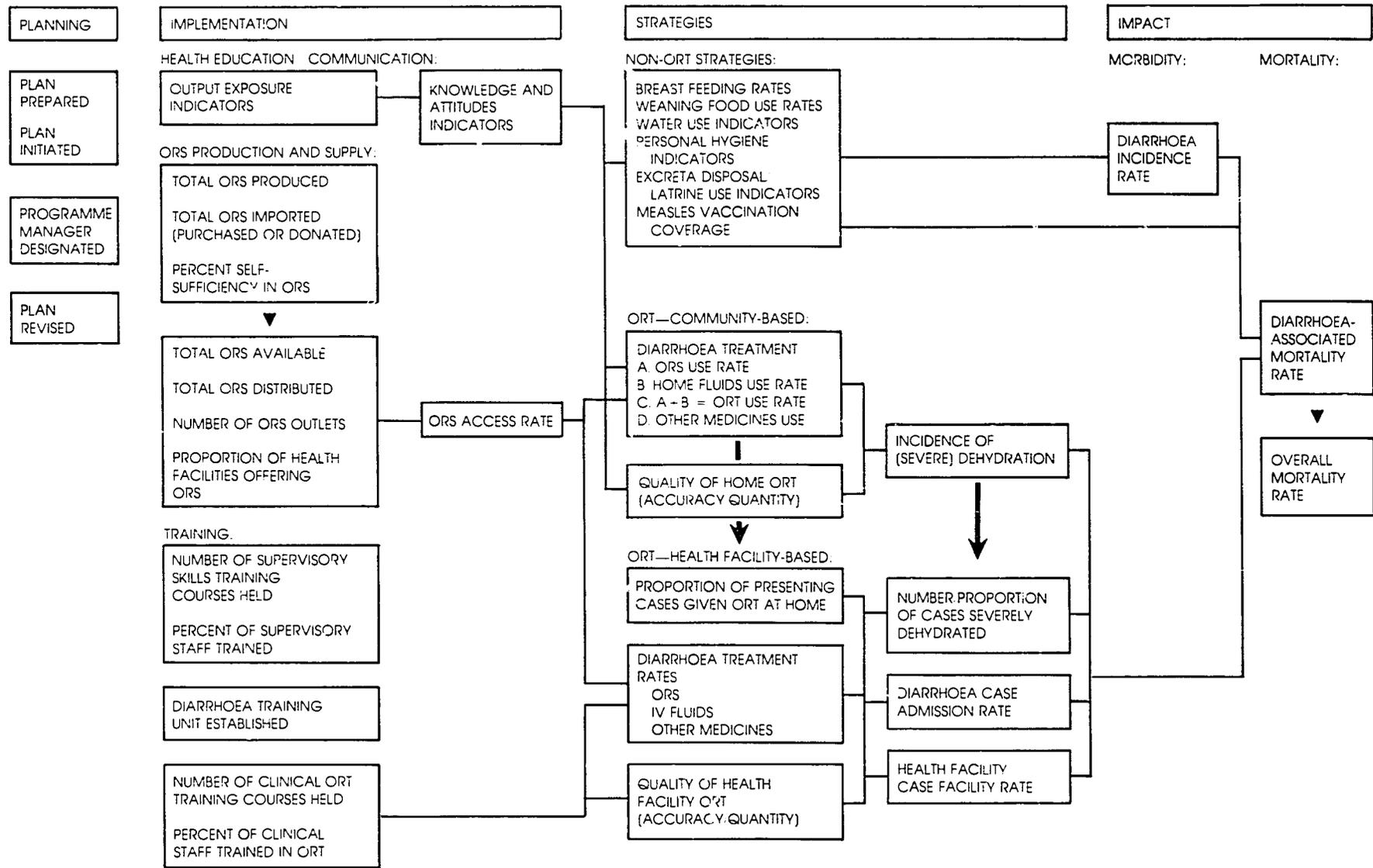
Collecting data on ORS use and mortality rates is important in evaluating the effectiveness of ORT programs. Photo by Robert Clay.

use it in all cases, as is implied in the pursuit of a 100 percent ORS use rate? Another problem arising from promoting ORS as a treatment for all episodes of diarrhea versus a dehydration therapy, is that mothers may become disillusioned with ORS when it does not cure the diarrhea.

How children needing ORS can be identified and what the targets for ORS use should be are major programmatic questions. One suggestion

FIGURE 1. SELECTED INDICATORS FOR EVALUATION OF A CDD PROGRAMME

In general, values of indicators are dependent on values of other indicators related to activities earlier in the sequence of events. The main inter-dependencies are shown by the connecting lines and arrows.



for this problem was that target usage should be defined according to the context of the ORT program. For example, in a situation where there are no health services available, a 100 percent user rate for ORS may be a necessary target. In a well-organized community health care system, where extensive use can be made of home-available solutions, the target for ORS utilization may be for the limited proportion of episodes that require it. Mothers may be taught to give ORS when there is a given number of watery stools within a certain time period. However, the appropriate target use rate remains difficult to define.

Clearly, ORS use rate is not a good indicator of effective use in all situations. The group identified the need to go beyond simple ORS use rates to evaluate the quality of ORT, including the type of fluids used, the accuracy of preparation, the promptness of commencing therapy, the quantities of fluid given, and the continuation of feeding. There is much yet to learn about this topic, particularly in relation to the use of home-prepared fluids.

Samples of solution analyzed for electrolyte and sugar content and observational studies of household solution preparation can be helpful for determining the quality of mixing of ORT solutions. Questions regarding the amount of fluid given and when the solution was started can further indicate effective use.

The group identified other indicators that may be important to evaluate, namely: changes in perception of diarrhea and its treatment; ORS production and distribution; and availability of local ingredients.

Measuring the impact of ORT on diarrhea-associated mortality and morbidity has proved difficult. Much of the mortality data available are of questionable validity. The need for assessment of the impact of ORT on mortality, including diarrhea-associated and overall mortality, is undeniable. However, additional resources are required for this, particularly in the areas of training and supervision of evaluation survey workers. An alternative method of acquiring mortality data arose during discussions. A community-based mortality reporting program, where a volunteer is responsible for reporting births, deaths, and events preceding the deaths for a number of families, has provided useful mortality data in some settings.

In early stages of program development, process indicators may be more important to measure, since it may be too soon to detect impact. The dynamics of community change must also be considered in the evaluation of impact. These issues highlight the need for appropriate timing of evaluations and the need to utilize a range of indicators for an accurate assessment.

The group discussed the difficulties in interpretation of health facility data in the absence of complementary community-based evaluation. Health facility indicators for which both the numerator and the denominator are derived from the facility records, e.g., facility case-fatality rates, may be useful. However, simply following the number of cases treated or even the number of severe cases seen may be very misleading and apt to misinterpretation.

In discussing methods of data collection, it was generally agreed that most routine surveillance systems have as yet provided data of limited value in evaluating program activities. Under such conditions, a sentinel reporting system, aiming for complete and accurate information from only a limited number of sites, may be an appropriate solution, if well implemented. An alternative method of data collection is a population-based sample survey. The group stressed that extra resources will need to be made available for either sentinel surveillance or a sample survey to function adequately.

It was considered that some of the evaluation issues raised could only be addressed through special studies, involving social scientists. For example, when there is a discrepancy between access and use rate, a special study assessing knowledge, attitudes, and practices may elucidate reasons for the discrepancy.

The need to take appropriate action based on the evaluation was emphasized. The panel discussion elucidated several factors likely to facilitate action. It was felt essential that the evaluation was wanted by the decisionmakers involved, that it was in the context of quantified program targets, that it collected information needed for the decision-making process, that the information be analyzed and disseminated in a timely fashion, and that the recommendations be realistic and specific.

COST ANALYSIS

To date, evaluations of ORT programs have concentrated on measurement of achievement at various levels. There is clearly considerable scope for improving the power of the results of these studies by incorporating some consideration of resource requirements.

Costs are estimated by determining the value of resources used in an activity. These resources may be characterized in a variety of ways. The cost of the components such as social marketing, ORS packets, salaries, etc., may be examined. The unit of analysis may be the financier, such as the government, community, or the household. The

need to specify the characterization of costs so that cost data can be more easily compared was raised.

Cost analysis can be complex and confusing. It is often difficult to know what costs to measure in an evaluation and how to measure them. The guiding principle in deciding the scope of costs is to measure those expenses relevant to the decisions that are to be made. What is the question you wish to answer and which program component costs must be considered in order to do that?

Cost analysis can aid in making decisions regarding the best use of scarce resources. It may be used as a promotional tool to advocate the utility of an ORT intervention; however, this must be represented cautiously. Clarification of the components of interventions often occurs as a beneficial offshoot of cost analysis since it forces the characterization of program components in order to measure them.

Cost data can be employed to address both questions of affordability and efficiency. Affordability addresses whether a particular group, namely government, community, or the household, has the necessary resources to implement the intervention. Cost data are summarized in terms of cost per unit population (cost per 100,000 population). In this assessment, immediate costs must be distinguished from recurrent and long-term costs, since these latter expenses are frequently the burden of the domestic government. Affordability is a concern for the providers of ORT programs, the consumers, and the donors. Important issues to consider in evaluating affordability at these different levels were discussed. To determine the feasibility for a provider to conduct an ORT program, the cost of the ORT program can be examined in relation to the total government health care cost. Measuring the value of all the project resources, including components such as volunteer time, is necessary when a program is considered for introduction into a new setting.

It may also be useful to know the affordability of treatment of diarrheal disease to the consumer. Such analysis could be accomplished with a household survey in which key questions on resources and cost of diarrhea treatment can be asked. The cost of ORT compared to the average wage and to the cost for current diarrhea therapy may be assessed. These analyses may be used to determine whether the cost of ORT treatment can be shifted from the provider to the consumer. It was stressed that costs must be considered country specific. What may be low costs relative to the health care budget in one country, may not be low in another.

Cost-effectiveness or efficiency addresses ques-

tions such as how can an ORT program be best delivered and is ORT an efficient use of resources compared with other interventions? To answer questions on cost-effectiveness, data on costs and impact are essential. Cost data include all of the costs of the ORT program. Impact or program effectiveness can be measured by program outputs (such as the number of children treated with ORT) or program outcomes (such as lives saved). Cost-effectiveness could then be expressed as cost per treated child or cost per life saved. The difficulties in separating out ORT program components of primary health care, such as the direct costs for communications or the time of community health workers, were discussed. Even more difficult may be determining the impact of the ORT component of a more comprehensive primary health care program. Nevertheless, the need to assess relative cost-effectiveness was still considered important.

Some examples of specific questions addressed through cost effectiveness analysis were raised for discussion.

- Can more extensive use of ORT decrease hospital costs?
- Should a low-income country utilize social marketing to promote ORT?
- Should resources for diarrheal disease control be concentrated on CRT or should resources be devoted to promotion of breastfeeding or other interventions?

In discussions it was clear that confusion existed concerning the nature of cost analyses and their appropriate use. There is a need for the wide dissemination of clear costing guidelines. Ways of improving systems for collecting appropriate cost data at minimum expense and effort need to be explored. There may be scope for incorporating collection of some cost data into existing evaluation efforts. For example, comprehensive reviews of ORT programs currently being conducted in many countries may provide an appropriate opportunity for gathering data on total costs of providing ORT.

CONCLUSION

In conclusion, discussion focused on the appropriate use of indicators of program success and on incorporation of cost analysis for evaluation of ORT programs. The need to redefine targets for ORS use and to move beyond the measurement of basic indicators, such as ORS access and use, to the quality of ORT use was identified. Furthermore, the need to develop and utilize costing guidelines and procedures as part of ORT program evaluation was noted.

INTEGRATION OF ORT WITH OTHER HEALTH ACTIVITIES★

Panel Chairperson:

DR. STEVE JOSEPH

Special Coordinator

Child Health and Survival Program

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Washington, D.C., USA

INTRODUCTION

This section summarizes comments from the panel discussions and the plenary sessions. As no consensus was reached on the many issues, experiences and suggestions from the participants are presented. Experiences from at least 31 different countries throughout Latin America, Africa, and Asia were presented during the panel discussions.

The participants made it clear that ORT has been integrated into numerous health activities. ORT, for example, has been added to such activities as

*Panel Summary prepared by Dr. W. Don Sutherland, Health Coordinator, League of Red Cross and Red Crescent Societies, Geneva, Switzerland.

maternal/child health (MCH) programs; additionally, two previously separated programs such as ORT and EPI (Expanded Program on Immunization) have been connected.

PURPOSE OF INTEGRATION

A number of reasons were given for integrating ORT with other health activities:

- to improve ORT coverage by combining ORT with other health programs and involving groups such as teachers, mothers clubs, etc.;
- to improve the impact on mortality and morbidity related to diarrhea;
- to increase self-reliance in health care at the community level (ORT is largely carried out in the homes or at health care institutions at the community level);
- where there is a successful ORT program, to improve the credibility of health workers and increase the coverage, efficiency, and effectiveness of other health interventions.



ORT programs need to be integrated into existing primary health care systems within each country. Photo by Frank Nesbill.

TIMING OF INTEGRATION

It was agreed that when diarrhea is identified as the major cause of mortality, there is justification for emphasizing an ORT program. As mortality declines, progress on morbidity reduction can be accelerated by integrating ORT with other activities. These activities would include:

- the promotion of breastfeeding;
- growth monitoring;
- immunization; and
- other important PHC interventions.

When access and use of ORT have achieved target levels, and ORT has become an accepted part of the health routine for mothers and health workers, intensive promotion and education are no longer needed. Then both funds and time can be channeled for work in these other closely related PHC priority areas.

CHOICE OF ACTIVITY TO COMBINE WITH

A limited number of disease problems have effective control strategies, and ORT should be integrated into one of these effective strategies. Among factors to be aware of, participants emphasized the following.

- ORT/diarrhea control strategies should be linked to other programs.
- Mass campaigns, such as immunization campaigns, are often difficult to maintain and will eventually have to be integrated into the primary health care program. Tying ORT to free-standing immunization campaigns, therefore, may create problems. There was, however, no consensus on this point and there was little information available to clarify this issue.
- As ORT has a short-term impact and is related to a specific disease episode, it might be best to combine it with preventive programs that are generally designed for long-term impact.

METHODS

It was thought that the best integration can occur with existing structures. Experience in some countries indicated that ORT can be integrated from the central level in the referral system out to the

periphery. Training was seen as a key issue, and three aspects of training were emphasized.

- Training of health workers in different tasks should be integrated; thus, trainers of the specific programs that are to be integrated could be brought together so that all training could be done at the same time.
- Health workers and program managers should emphasize training integration early in the curriculum.
- Training of donors and policymakers should take place at ongoing workshops and should stress the advantages of integration and strategies to implement it.

There was consensus in the panels that integration has to occur at the community level so that families and community health workers can be most effective in improving health. Oral rehydration therapy was seen by some as having a "vitalization" effect on primary health care programs. Finally, it was felt that integration not only requires leadership but ongoing support, planning, and supervision.

OBSTACLES

The first obstacle to integration that was identified by participants was the narrow targets of donors in their projects. This makes integration difficult. Donors are often restricted to short-term, high-visibility projects. Programs are difficult to maintain when the funding level or enthusiasm declines in a few years. Donors need to be willing to take a long-term approach.

The second obstacle to successful integration relates to the rigidity of government structures. Programs that could be combined with ORT activities may be located in Ministries other than the Ministry of Health (e.g., Ministry of Education, Public Works, etc.). A positive government policy towards integration is needed. Policymakers must be aware of the problems of programs and plan how to better combine activities.

A third major obstacle is the lack of resources. This lack of resources may make the integration of popular programs with less popular programs more difficult; it may appear that funds are being taken away from the popular program.

A fourth obstacle is the medical establishment. Doctors and nurses have been slow to accept the concept of oral rehydration therapy, making it difficult to integrate ORT into existing programs. This is specifically so at larger institutions. Specific planning for training workshops and general informa-

tion campaigns are necessary if ORT is to be integrated into medical management programs.

A fifth obstacle is the time available to the health worker. As more PHC elements are implemented, more tasks are added to what the community level health worker feels is already an impossible workload. Careful evaluation then of the health worker's time and selection of priorities for his or her work schedule are essential.

The final obstacle presented involves the politics involved in health care. The question arose, "Why should the control of rehydration be under the medical profession?" The plea was made to keep this form of therapy in the hands of the community as much as possible.

SUGGESTIONS ON HOW TO PROCEED

The following are suggestions from participants on how to proceed towards the successful integration of ORT with other health intervention programs.

- The following issues need to be addressed when designing integrated programs:
 - personnel
 - funding
 - training
 - logistics
 - supply of products, including ORS and other drugs
 - definition of target population
 - coverage intended
 - supervision
 - reporting
 - evaluation
- Donors should cooperate and coordinate their efforts toward the integration of health care delivery. Governments can play a role in guiding donors' efforts towards this end.

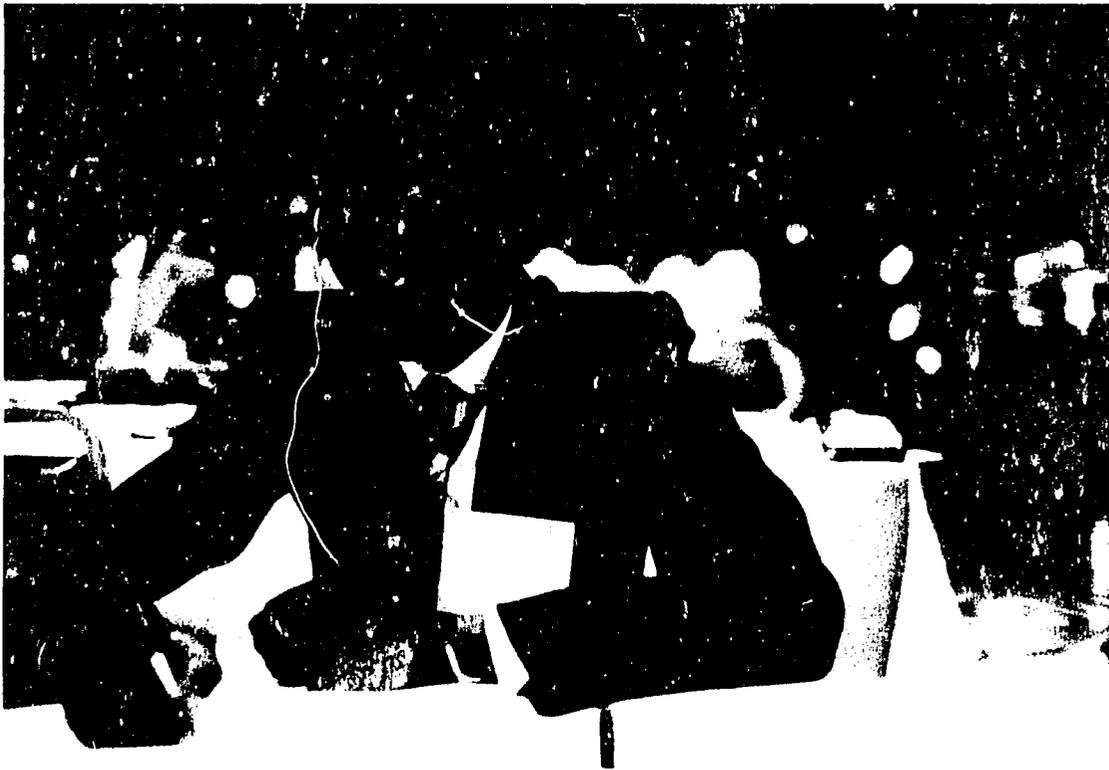
- Governments are encouraged to make the integration of health care delivery a priority.
- ORT can be added into an existing maternal/child health infrastructure by using the same manpower and the same institutions. Training programs should address new skill areas for all levels of personnel. A social learning approach can be employed by phasing the newly integrated program into one geographic area and later phasing into a new geographic area incorporating the lessons learned.
- Vertical integration can occur between, for instance, a Ministry of Health and other institutions, by combining resources, training, logistics, supervision, and evaluation.
- Horizontal integration can occur at the community level by offering to the community one health worker who can respond to all their health needs.

FINAL SUMMARY

Participants agreed that integration of ORT with other health activities was advantageous and essential. One of the participants expressed a point of view that was under-represented at ICORT II.

I just want to make a small plea on behalf of the mother and child. She would like to relate to one worker, not only about ORT for her child, but also about feeding, about growth, about immunization, about family planning, about everything. . . . Please donor agencies, please governments, please NGOs, please get your act together so that ultimately I may relate with confidence to one person . . . because only then will the whole thing work.

5. Clinical Management Seminar



Dr. Jean-Marie Sawadogo, Burkina-Faso. Photo by Pal Lanza Field.

CLINICAL MANAGEMENT SEMINAR SUMMARY

Panel Chairperson:

DR. BRADLEY SACK

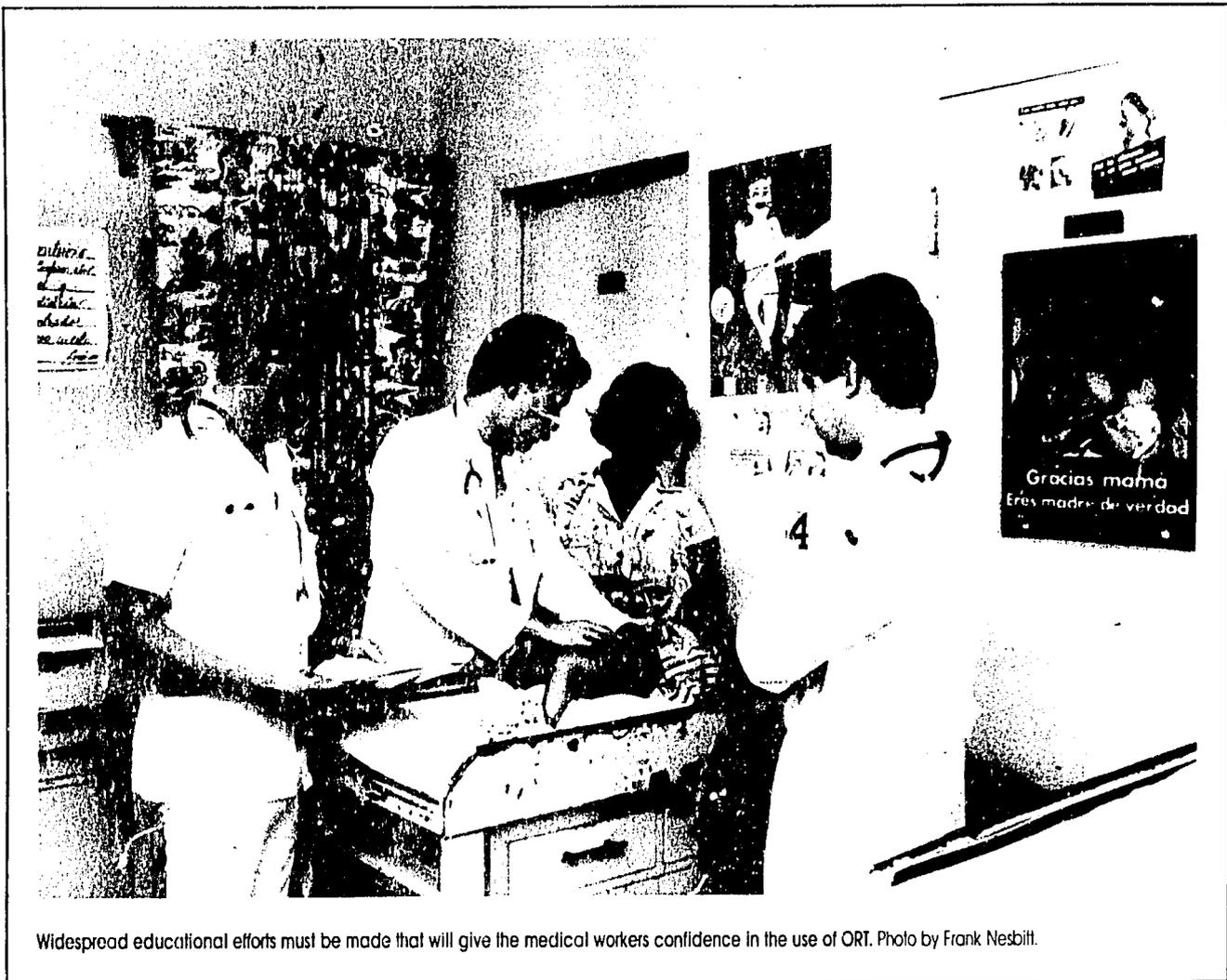
*School of Hygiene and Public Health
The Johns Hopkins University
Baltimore, Maryland, USA*

Dr. Sack introduced the session by pointing out some of the obstacles that remain in the full implementation of oral rehydration therapy on a global scale. These include the reluctance on the part of some in the medical profession to accept ORT as a safe and effective therapy for dehydration due to diarrheal disease. Reasons given include:

- fear of the development of hyponatremia;
- the fear of the introduction of early feeding during diarrhea; and
- the lack of understanding that ORT can be effectively used in all cases of diarrhea, except those in overt shock.

Oral rehydration therapy clearly goes against the grain of standard western pediatric teaching and practice because of its requirement for not "resting the bowel" but rather making it the prime therapeutic target. Furthermore, information on ORT has not yet been widely disseminated through textbooks of pediatrics or incorporated into medical school curricula. This seminar was arranged to address these clinical issues in the use of ORT in the hope that a better understanding of the efficacy and safety of ORT will emerge.

Dr. Mary Lou Clements discussed the issue of how to make ORT work at the health facility. Through the widespread effort of the World Health Organization and its CDD Programme and national training programs, a large number of medical personnel have been trained in the use and implementation of ORT, from the managerial to the clinical levels. As a result, the worldwide access to ORT has increased substantially, but there



Widespread educational efforts must be made that will give the medical workers confidence in the use of ORT. Photo by Frank Nesbitt.

remains a long way to go before complete access is possible. One of the reasons that ORT is not being used more widely at the health facility level is that it requires all of the health workers to change their usual practices of diarrhea treatment, which include almost universal use of intravenous solutions, antibiotics, and withholding of food. In order to effect these changes, widespread educational efforts must be made that will give the medical workers confidence in the use of this new methodology, ORT. Some more specific reasons why ORT may not be widely used in health facilities include:

- the economic incentive to use intravenous fluids; and
- some children may not take oral fluids well because of stomatitis, or because they are fatigued or drowsy from other medications, or because the fluid is not given at a comfortable temperature.

The use of ORT at health facilities can be increased through the establishment of ongoing training centers for all levels of health workers. Training should not only include lectures, but, even more importantly, practical, hands-on experience in the use of ORT. In this way all of the possible complications in the use of ORT can be appreciated and managed first-hand. Training should also include refresher courses and ways of establishing closer links between the home and the health facility through the education of mothers. The training unit should be adequately equipped with a weighing scale, facilities to keep children overnight, a triage area, and an area to accommodate mothers.

Personnel requirements for a training center include at least one well-trained person who should be designated chief of the unit and to whom all questions can ultimately be referred. There must be adequate supervision for around-the-clock clinical management of patients. Mothers must be allowed to remain with the children and thus help in the therapy as well as receive instruction about diarrhea management and prevention at the same time. Most importantly, the atmosphere in such a training unit should be a happy one because of the excellent clinical results and because the mothers can be eager participants in the care of their sick children.

Dr. Daniel Pizarro discussed the issue of the utilization of ORT in patients with moderate to severe dehydration. He traced the development of ORT through its use first in adults with cholera and later in children with all types of diarrhea, and even to neonates and low-birth-weight babies. In all situations, shock is the only clear-cut contraindication

to the use of ORT. In such situations intravenous fluids must be used; however, if intravenous fluids are not available, it is still worthwhile to place a nasogastric tube and to give ORT, since even some of these children will respond satisfactorily. Unfortunately, ORT is often thought of by the medical profession as being useful only for cases of mild dehydration. Summaries of studies were presented that indicated clearly the effectiveness of ORT in children who were moderately to severely dehydrated, but who were not in shock. The use of nasogastric tubes in children who for some reason would not take adequate quantities of ORS was stressed. The use of ORT in children with hyper- and hyponatremia was documented, as well as its use in children with severe acidosis or of low birth weight. The use of ORT should be extended in health facilities to include all children who are not in shock and who can take oral fluids by mouth (or nasogastric tube, if necessary). Oral rehydration therapy should be thought of as "first class" because of the results that it gives and because of its many advantages over intravenous therapy in this type of patient.

Dr. Mathuram Santosham discussed the use of ORT in patients with hyponatremia or hypernatremia. Of these two clinical states, hypernatremia is a more serious clinical problem, and is also the one seen more commonly in developed countries, because of the use (real and potential) of high-solute foods. Hypernatremia may be caused by:

- the improper use of intravenous fluids;
- the withholding of adequate amounts of free water; or
- by use of oral fluids that contain high levels of carbohydrates.

A high sodium intake alone, unless it is excessively great, is unlikely to produce hypernatremia because of homeostatic renal mechanisms. However, excess carbohydrates in formula may result in an osmotic load to the gut, if they are not completely absorbed, and thereby lead to increased amounts of diarrheal stools with a low sodium content, which can lead to hypernatremia. The increased solute load seen in boiled skim milk may also result in an osmotic-type diarrhea. The potential problems with ORS involve the mixing of the ingredients in water, and thus the education of mothers in the proper mixing procedures is essential.

Oral rehydration therapy has been shown to be effective in the treatment of both hypernatremia and hyponatremia. In the therapy of hypernatremia there is less of a problem with seizures than with intravenous therapy because of the slower

drop in serum sodium. Studies have been done comparing the sodium content of different oral rehydration solutions, using concentrations of 50 to 90 mEq sodium/liter, and all have been shown to be adequate for treatment of children with serum sodium concentrations outside the normal range. Some patients have developed asymptomatic hypernatremia using ORT, but in all cases this was transient and of no clinical importance.

Dr. Kenneth Brown discussed the importance of early feeding in the management of acute diarrheal diseases. Until recently the major emphasis on diarrheal therapy has involved only the solutions used to correct the dehydration. It is clear from new data, however, that dietary therapy is also an indispensable part of oral rehydration therapy. Just as fluid and electrolyte loss from the bowel leads to dehydration, so does a reduced assimilation of nutrients from the intestine during an acute episode of diarrhea lead to secondary nutritional depletions. The cumulative nutritional effects, which are the results of the multiple episodes of diarrhea and occur during the first few years of life, can be of major consequences to the child. There is a clear-cut relationship between multiple episodes of diarrhea and growth faltering, or in other words, there is a negative association between the prevalence of diarrhea in small children and weight gain. Furthermore, there is an association between the length of a diarrheal illness and the nutritional state; children who are poorly nourished have longer episodes of diarrhea.

During each episode of diarrhea, there is often a decrease in food intake. This is partially due to the accompanying anorexia, but behavioral issues may even be more important, such as the intentional withholding of food by the parents and health workers, or the substitution of more nutritionally dilute foods. Intestinal absorption is also impaired to some extent during an episode of diarrhea, which further accentuates the situation.

Strategies to reduce the nutritional consequences include:

- continued feeding during the diarrheal illness with complete foods; and
- increased feeding during the period of convalescence.

Continuing to feed during a diarrheal episode goes against traditional practices, and health personnel must be convinced of its value. It should be noted that the malabsorption is only partial and that some percentage of the food will be absorbed. Feeding is also important to prevent mucosal atrophy, and breastfeeding is important in the maintenance of lactation. The arguments against feeding during diarrhea include worry over

the osmotic effects of unabsorbed food, possible osmotic injury to the gut, and a possible enhancement of bacterial overgrowth in the small bowel. None of these negative effects has been clearly shown, except for the situation of lactose malabsorption that may accompany acute diarrheal illness in some children.

Dr. Brown then summarized the results of a study he had carried out with his colleagues in Lima, Peru, concerning the early feeding of different diets during acute diarrhea. This study demonstrated that the absorption of energy was directly related to the amount provided in the diet. Children fed the most complete formula gained the most weight; children on the other diets did not reach optimal weight gain until they were on the complete formulas. The weight differences were still significant at fifteen days following the onset of the study, suggesting that the continued intake of a complete, lactose-free diet during the diarrheal episode led to a more favorable nutritional outcome.

Additional studies of early feeding by other investigators were reviewed. In one study, the early feeding of lactose-free formula led to a forty percent decrease in stool volume and a shortening of the illness. In another study, children who continued to breastfeed during the diarrheal illness also had a diminished stool output as compared to controls. These studies also support the positive aspects of early feeding during diarrhea.

Areas that still require study include the early use of lactose-containing milks and other commonly available foods in the home. Also additional information is needed about particular food components, such as fiber, lectins, fat, vitamin A, and zinc. Another critical area for study is that of social determinants of feeding during diarrhea. *Diarrhea is a nutritional disease and dietary therapy is an important component to management.*

Dr. Dilip Mahalanabis discussed the development of improved oral rehydration solutions. The rationale for their development is that the present ORS does not shorten the illness nor improve the diarrheal output, both of which are seen as highly desirable by those providing the health care, particularly mothers. At present, large sums of money are being spent on ineffective medications in an attempt to carry out those objectives.

The present ORS uses glucose as the substrate to facilitate sodium absorption in the intestine. It is now known, however, that also neutral amino acids such as glycine and alanine, or di- and tripeptides also facilitate sodium absorption through independent mechanisms. By combining these effects, it may be possible to improve sodium absorption to the extent that stool volume and duration may be significantly affected.

Early studies in adults and children with cholera and other severe diarrheal diseases demonstrated that the addition of glycine to standard ORS containing glucose resulted in significantly reduced stool volume and duration. A more recent study in small children with milder diarrheas, however, was not able to show these differences. It seems clear that the osmolality of these solutions must not be too high, to avoid any negative osmotic effect of incompletely absorbed substrates.

Additional studies have been done using pre-cooked rice powder as the substrate for ORS and these have also shown a decrease in stool volume and duration. At present WHO is supporting a large number of clinical trials around the world in the testing of newer formulations of ORS that may offer these therapeutic advantages.

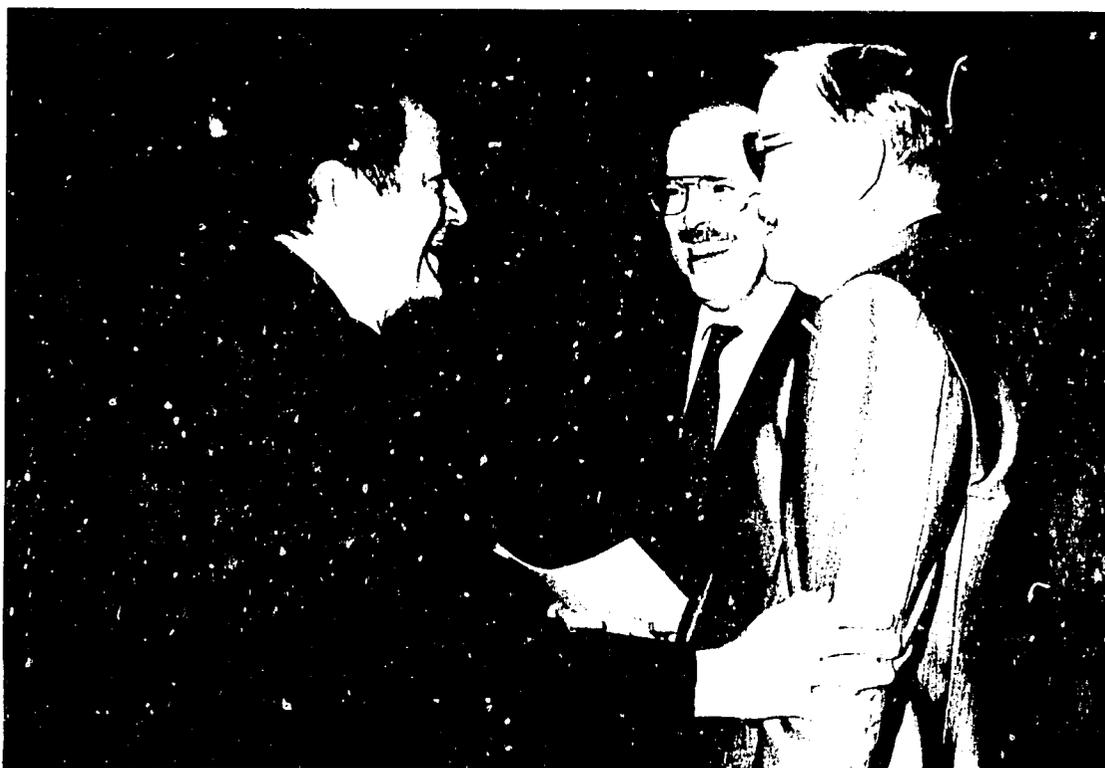
Early feeding may in fact convert standard ORS into an improved ORS in situ because of the large number and diversity of substrates added from the food. Although a number of studies have suggested that this may be true, all of the studies have not shown the same predictable effects. Three

studies in which breast milk, lactose-free formula, or full formula cows milk were fed early in the course of diarrheal illness resulted in a favorable therapeutic effect. However, two other studies either showed no effect or an increase in stool volume (with boiled rice).

In considering the use of pre-cooked formulas as part of ORS, one must be concerned with the shelf life of the product, its efficacy in very small children, and the possible confusion it could cause because of its being recognized as a food rather than an absorption-facilitating product. Particularly in the use of home-based ORS, such confusion could have marked negative nutritional consequences if the cereal-based ORS was seen as a food by the mother and other foods were thereby withheld.

In summary, improved oral rehydration solutions are possible and desirable, both at the home level as well as the "package" level. Further research needs to define their optimum composition, efficacy, and safety.

6. General Session Closing



Mr. James Grant, UNICEF; Mr. M. Peter McPherson, AID; Dr. Nyle C. Brady, AID. Photo by Pat Lanza Field.

SUMMARY ADDRESS

DR. MICHAEL MERSON

Director

Diarrhoeal Disease Control Programme

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Geneva, Switzerland

On Wednesday Dr. Norbert Hirschhorn referred to you as an impressive audience. It is now clear that this was an understatement. You have been an exceptionally enthusiastic, energetic, and highly motivated audience, attending plenary sessions, participating in panel sessions, demonstrating your ORT activities in poster sessions, and taking part in informal discussions at receptions and in corridors (often the most valuable part of any conference). To summarize all you have done and said is a formidable task. The best I can do is to focus on the highlights, allowing you to fill in the details based on your own experience.

But before doing so, I must offer a word of thanks from all of us to two persons who have made this the best run conference of this size I have ever attended. I am referring to Mr. Robert Clay of AID,

who for the past year has worked many long days and nights to ensure its success; and to Ms. Linda Ladislaus of Creative Associates, who was faced with the difficult challenge of simultaneously overcoming the procedural requirements of AID and the five cooperating agencies, making sure that all of you could attend this conference. To both of you and your dedicated, overworked staff we express our sincere appreciation for your efforts.

Perhaps the most outstanding feature of ICORT II is how it contrasted with ICORT I. At that conference, in mid-1983, many participants appeared hesitant, even doubtful. Some had used ORT in a limited hospital or field setting, but still were not convinced of its efficacy and safety when used on a large scale. Others had little knowledge of or experience with ORT and could not begin to imagine why one would organize a large conference on the topic. Only a few had experience in implementing ORT activities on a national scale and had realized the benefits of this simple technology. Most of the ICORT I panels discussed implementation issues based on theory rather than



ICORT II participants listen intently. Photo by Pat Lanza Field

experience, and the plenary sessions were designed primarily to convince the audience of the benefits of ORT.

What a difference two-and-one-half years have made. At ICORT II the plenary presentations have dealt primarily with how we can link ORT—now proven to be a highly effective intervention—with other health interventions to reduce diarrhea mortality and morbidity. The panel sessions were particularly stimulating as participants drew from and shared actual experiences. And the poster sessions—one of the real highlights of the conference—found program managers proudly displaying photographs, charts, and data, ready to explain their national ORT activities.

This growth of national diarrheal disease control (CDD) programs is borne out by some global figures. Between 1982 and 1985 the number of countries with such programs has doubled. Today, more than 95 percent of the developing world's population live in countries that have programs. Access to ORS has increased from 6 percent to almost 33 percent and annual ORS production from 60 million to 250 million packets. The great majority of packets are being produced in 45 developing countries, an impressive testimony to the capacity of the developing world to achieve self-sufficiency. The inclusion of trisodium citrate in the ORS formulation has made the product more stable and, if polyethylene packaging material is used, potentially less expensive.

Many countries have established a national policy for home-prepared ORT solutions. Some 40 countries have conducted an evaluation of their country programs and as many have undertaken large-scale diarrheal disease mortality and morbidity surveys. In a few countries, diarrheal mortality has already been reduced by 40 to 50 percent by widespread implementation of ORT; in many more countries mortality in hospitals has decreased by more than 50 percent. These are indeed impressive numbers.

As I have just mentioned, this accumulated experience has shown beyond a shadow of a doubt that ORT is a powerful intervention. It can significantly reduce diarrhea case-fatality rates, hospitalization rates, and mortality rates; when applied in the community it can reduce visits to fixed facilities; and when accompanied by messages on proper feeding during and after diarrhea it can reduce diarrhea-associated weight loss and malnutrition. ORT is remarkably cheap and at the same time saves money by diminishing the need for intravenous fluids and reducing hospital costs. It is also a simple technology, easily applied by mothers who can see its results in a very short time; thus, as Dr. Mahler pointed out, it paves the way for

convincing the mother of other important measures for diarrheal disease control and for introducing other primary health care interventions. As Professor Eeckels concluded, ORT does "reach the heart of mothers."

Many of you probably left ICORT I reasonably convinced that you should use and promote ORT but still doubtful of the benefits of feeding during diarrhea. That was not surprising given the number of years that medical schools have been teaching that feeding worsens diarrhea. But as Dr. Rohde so eloquently explained, and as elaborated at the Seminar on Clinical Management, we now know that feeding is not only possible, it is also highly beneficial and should be recommended during diarrhea and convalescence. Breastfeeding can shorten the duration of illness and decrease stool volume, while appropriate feeding of older infants and children is more likely to reduce the nutritional consequences of diarrhea than to induce lactose malabsorption.

Dr. Lincoln Chen, in his summary of ICORT I, told us that the task following that conference would be how to implement ORT. At ICORT II we have been shown—by Dr. Gabr, Dr. Mata, and many of the poster presenters—the key characteristics of successful national CDD programs. I believe these can be summarized as follows.

- First, CDD programs that have been successful have been founded on a strong political commitment. This has resulted in the creation of a national plan of operation, designation of a national program manager as a central focus for the CDD program, and the provision of sufficient financial resources. None of these programs is vertical; they have been integrated into a wider health program, but with the clear recognition that CDD has a high priority for action and is not just one more element added to an already overcrowded MCH or primary health care program.
- Second, these programs have adopted a clear strategy for the delivery and use of ORT in the home and in health facilities, which includes recommendations for feeding during diarrhea. This strategy, firmly supported by the medical profession, has provided the basis for the organization of clinical and managerial training activities that have sought to define the tasks required of mothers and health workers, and then provided them with appropriate practical and didactic training to carry out those tasks. It has also formed the basis for the improvement in the training of new physicians, nurses, and other paramed-

ical workers, upon whom future health care depends.

- Third, these programs have given due consideration to ensuring that adequate supplies of ORS packets are available when they are needed, through government and commercial channels, and that pharmacists and traditional practitioners receive training in the proper use of ORT. Care has been taken to design a standardized ORS packet for national use that suits the size of a nationally available container. And national authorities have had the courage—and it takes courage—to take the necessary steps to limit or stop the promotion and routine use of anti-diarrheal drugs and useless antibiotics in the treatment of childhood diarrhea.
- Fourth, these programs have given special attention to communications activities oriented towards the needs of consumers, not just providers. But they have undertaken these activities only after health workers, pharmacists, and mothers have been trained through more traditional approaches and adequate supplies have been made available.
- Fifth, these programs have recognized the importance of supervision, including the regular monitoring of both the quantity and quality of program activities. Such supervision is clearly required if ORT use is to be effective. Without it we may be faced with the scenario of high rates of access and reported use of ORT but little program impact. Similarly, a mere awareness of ORT without a genuine opportunity to transform that awareness into effective treatment will accomplish little.
- Sixth, these programs have had a plan for their evaluation from the outset. This has included the establishment of realistic and quantified targets, the undertaking of statistically valid baseline surveys, and the strengthening or initiation of routine or sentinel-based surveillance systems. As a result, it has been possible to demonstrate the impact of programs with regard both to the reduction of diarrheal disease mortality and the strengthening of national primary health care systems.

High-level commitment and focus, sound program planning, careful attention to program management, task-oriented training, well-researched communication activities, due emphasis on supervision and especially monitoring, and practical evaluation—these are the keys to successful national programs.

The panel summaries we have heard addressed many of the questions posed by Mrs. Tinker and have presented your views on how you can improve your programs and overcome the important constraints that you face in the years ahead. Some particular points seem to stand out.

1. The Communications and Social Marketing Panel has emphasized the importance of (a) using standardized messages and appropriate media and (b) focusing communication efforts on the specific information requirements of target audiences. It has reminded us that short-term, highly intensive efforts may be appropriate in some situations, but only if they are part of a longer-term strategy for program implementation. It has also called to our attention the fact that the ongoing communication activities in ORT in developing countries are transforming the health sector from one based exclusively on the extension of government services to one that makes use of multiple channels.
2. The Distribution and Logistics Panel has reminded us that government and private sectors must work hand-in-hand to develop a uniform formulation and packet label and to estimate packet needs. Local production may be relatively simple, but adequate distribution of packets throughout the health care system requires careful planning and monitoring of supplies.
3. We have been rightly advised by the Panel on Health Personnel Training that training on ORT for all health workers must include sufficient hands-on experience to give the worker confidence that he or she can practice ORT and can apply this technique even in environments where it has not been well accepted. Also, mothers can and must be taught to prepare and administer ORT solutions in the home, but we must remember that this task is not easy. Experience shows that mothers do not mix and give salt and sugar solutions correctly unless they receive repeated reinforcement and training.
4. The Supervision and Monitoring Panel has pointed out that proper monitoring is possible only if we determine precisely what items we want to monitor and how and when we wish to monitor them. Unfortunately for the supervisor, such monitoring is often an unpleasant and difficult task for which he or she is frequently inadequately trained and often poorly motivated. It must become a task in which he or she is both competent and comfortable

if ORT use is to be effective. Innovative ways must be found to encourage and perhaps decentralize supervision to make it effective.

5. The Evaluation and Cost Panel struggled admirably with indicators for the evaluation of ORT activities. Obtaining data on the use of both ORS and ORT is difficult but important. Novel approaches to measuring program impact need to be developed as well as ways of measuring effective ORT use. Measuring the cost and cost-effectiveness of ORT is important to determine optimal strategies for ORT delivery and to convince health administrators of the economic and social benefits of this intervention.
6. Finally, the Panel concerned with Integrating ORT with Other Health Activities counseled that an integrated program can only be as strong as its individual parts. These parts must be selected according to the public health problems of the country and the feasibility and cost of interventions to combat them. International and bilateral agencies must recognize that countries themselves need to make the difficult decision as to which programs should be given priority; support may then be given to countries to strengthen their capabilities to undertake those programs effectively.

We have also heard much at this conference about the new and exciting prospects for development of an ORT solution that can reduce stool volume, diarrhea duration, and fluid requirements. There is no doubt that such a solution would be invaluable in increasing ORT use since mothers understandably want to give their children something that will reduce their diarrhea. But speakers at this conference have appropriately cautioned that these solutions are only in the initial stage of research and are by no means ready for public health application. Solutions containing defined additives such as glycine and glycyl glycine may be costly and difficult to package and could cause osmotic diarrhea and consequently hypernatremia if not properly formulated. Solutions containing rice or other cereal powders, whether prepared in packets or at home, have the potentially perilous consequence of being confused with weaning foods; also, because they are made from cereals, they may discourage feeding during diarrhea. We have achieved excellent results with what we have

available to us now and must guard against changing our present approach until the scientific and operational issues have been satisfactorily resolved.

Mr. Morse and Dr. Feachem appealed to us to look beyond ORT as we gain success in its implementation. One cannot deny the importance of this appeal. Probably one-third of all diarrhea-associated deaths are due to shigellosis and persistent diarrhea and cannot be prevented through ORT alone. Thus prevention must be given more attention. Breastfeeding, proper weaning, use of safe water and latrines, good personal and domestic hygiene, measles immunization—these measures constitute a cost-effective, complementary package of interventions to decrease diarrheal disease mortality and morbidity. Perhaps by the end of this decade rotavirus immunization and vitamin A distribution will be added. Because of the frequency of diarrhea and the success of ORT, it offers an ideal entry point for educating mothers about these interventions. The challenge ahead is to define the technical and managerial components of each of these interventions so that their full impact can be realized.

WHO is pleased to have had the privilege of being one of the cooperating agencies in the organization of this conference. I believe the same holds true for the other cooperating organizations: UNICEF (whose efforts in the past five years have greatly accelerated ORT activities in many countries); UNDP (which has provided invaluable resources and invested great efforts in the combat of malnutrition, provision of safe water and sanitation, and support of biomedical research); the World Bank (which, through its new initiatives in health, population, and nutrition, has strengthened national health care systems); and the ICDDR/B (which through its research efforts has contributed important new scientific information on diarrhea treatment and prevention).

We are all grateful to AID, and in particular to its administrator, Mr. M. Peter McPherson, whose vision has inspired us all. Mr. McPherson has given health a high priority in his organization, especially the health of the 500 million young children living in developing countries. His and AID's commitment to ORT is an indication of this priority.

The contrast between ICORT I and ICORT II is striking, not just in terms of our accomplishments but also in the shift in our attitude, from doubt to confidence and from hesitancy to determination, to continue to follow the path so clearly and promisingly set out before us.

FUTURE DIRECTIONS

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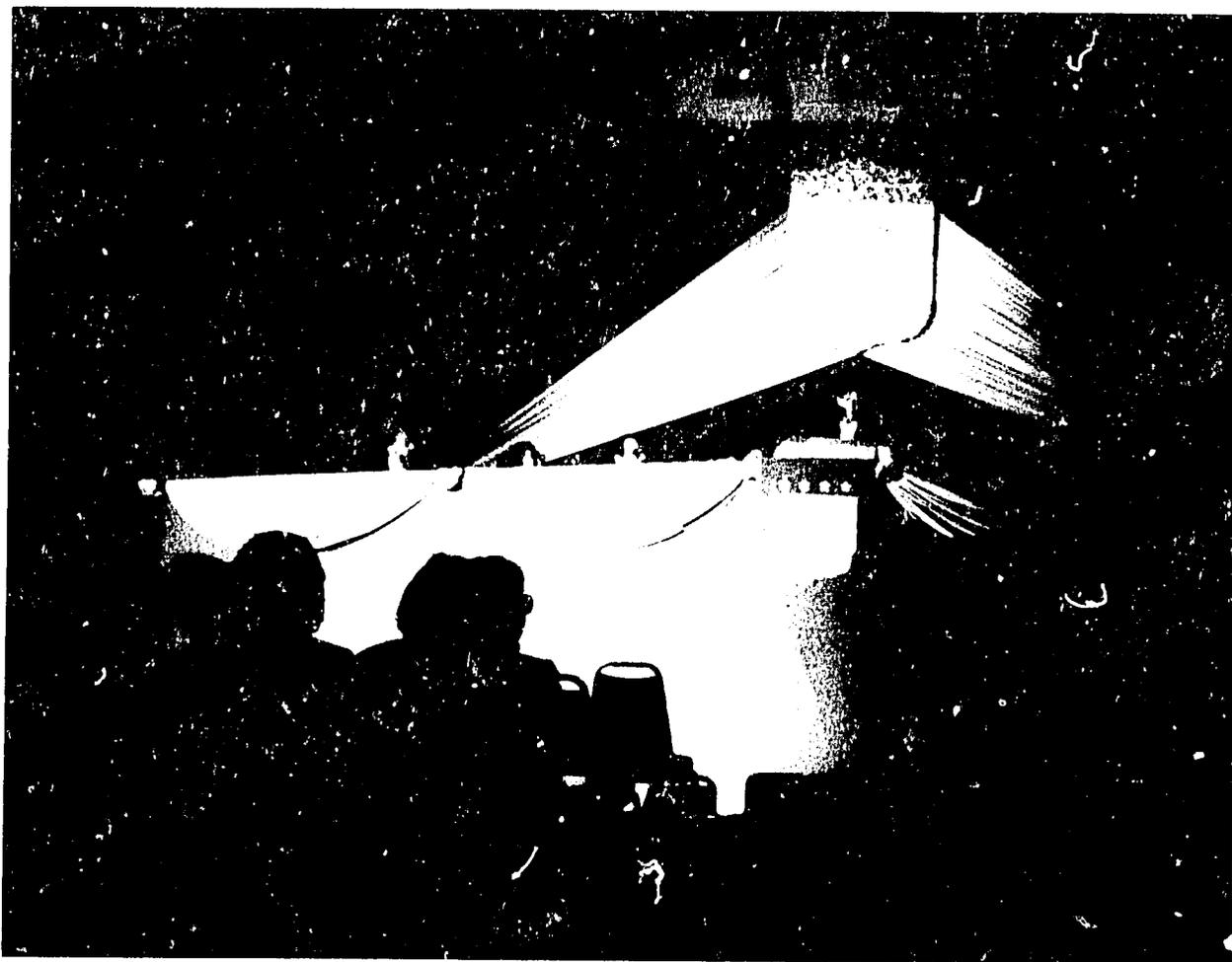
I should like to set the stage for the closing session of this remarkable conference by a look at the *challenges* before us and the *promises* of the future.

Over the last days I have listened to the description of the efforts of each of you to assess progress in delivering ORT: efforts in training, supervision, communications, marketing, logistics, and evaluation. I could feel the excitement, appreciate the achievements, and sense the frustrations. It is clear we have come a very long way. ORT has become an indispensable addition to our armamentarium to challenge diarrheal disease mortality at the community level. More countries have national ORT programs; more countries have or are planning

the production of ORS; and more countries are becoming aware of the value and necessity of marketing.

It was not long ago that the few bouts of dehydration that did receive treatment could only be treated intravenously by physicians in clinics. Now it can be prevented orally by parents in the child's own home—using either commercially prepared, prepacked salts or cheaper, home-prepared solutions. It is ORT's cheapness and its manageability by parents that holds out the hope of it being made universally available.

But we are *challenged* because overall ORT usage figures suggest that too few diarrheal episodes in countries where ORT has been introduced are being treated with ORT. The challenge is not only to increase usage in countries with national programs *but also* to begin national programs in a country like India that has in excess of ten million



Panel summaries (left to right): Dr. Donald Sulherland, Switzerland; Dr. Deanna Ashley, Jamaica; Mr. Rudolph Boulos, Haiti; and Dr. Cecilia Cabanero Verzosa, Philippines. Photo by Frank Nesbitt.

children—more children than all the 46 countries of Africa.

We are *challenged* because while we have increased access and increased usage in a large proportion of the communities where ORT is being used, significant errors are being made in its preparation, inhibiting its *effective use* and reducing its credibility.

We are *challenged* because worldwide the majority of physicians, community health workers, and pharmacists do not yet know about or do not accept oral rehydration therapy. All too many continue to prescribe drugs and advise mothers to withhold food during diarrhea.

We are *challenged* by the recognition that the mother as motivated caretaker must be nurtured with sensitive, interactive, sustained, demystified communications that are ever mindful of traditional health-seeking behaviors. Yet all too often the deliverer is a health worker who is overworked, underpaid, undersupervised, and sometimes incompletely trained. We have little data on what actually occurs in the home and how family behaviors can be influenced. We must find appropriate ways to ensure that acceptance is high.

We are *challenged* by the necessity to redouble our efforts with ORT, yet, simultaneously, to immunize these same children, provide nutrition and counseling, monitor their growth, and advise their mothers on child spacing and the importance of breastfeeding—all in the context of primary health care—all the while building and developing a sustainable, affordable infrastructure that will carry out these tasks.

We are *challenged* not to just integrate ORT with other health activities, but to do so at the level of the mother. Mothers care for the whole child, not merely the dehydration. Mothers must be shown that ORT makes sense as part of a larger plan of improving their child's health.

We are *challenged* because we recognize that ORT does not by itself reduce the risk of subsequent episodes of diarrheal disease in the same child—that ultimately dealing with infant and child mortality will necessitate understanding and dealing with all of the determinants of that mortality. Diarrhea will certainly recur in the presence of unsafe, inadequate water, inadequate personal hygiene and low levels of community sanitation. Poor nutritional status increases the risk of death due to diarrhea. Any nutritional risk is heightened by inappropriate feeding practices and concurrent infection. Thus competing risks of mortality, such as malaria, measles, and pneumonia, may negate the immediate benefits of ORT.

What of the *promises* of the future?

- The next several years will bring affirmation

of methods to ensure *effective usage* of home-prepared ORT.

- The next several years will see the development and use of new and innovative channels of communication with mothers to reinforce appropriate responses when diarrhea occurs and teach correct usage of ORT.
- We will see the increasing recognition and acceptance of the importance of the role of the mother as the central figure in ensuring the survival of her children—through home-prepared ORT, through mother-retained weight and immunization records that will indicate her appropriate responses, through breastfeeding and improved weaning foods, and through child spacing.
- We will see the testing and possibly the introduction of variations of the super ORS that will not only significantly reduce stool volume, frequency and duration, but that will contribute significantly to prevention of the nutrition drain.
- We will begin to see the widespread use of measles vaccine, which will have a major salutatory effect on the morbidity and mortality due to measles-associated diarrhea.
- We will see the testing of new or improved vaccines for shigella, typhoid fever, rotavirus, and cholera, and the development of a new generation of vaccines through genetic engineering and protein synthesis techniques, some of which may be available in the next decade.
- We will begin to see the accumulated effect of a decade of investment in water and sanitation projects and will rediscover and again reaffirm the necessity to invest in *primary prevention*.

Countries that have succeeded in reducing mortality due to diarrhea will turn to reducing the incidence of diarrhea through greater investment in health and hygiene education and safe and adequate amounts of water and sanitation.

We are no longer convincing each other that ORT works but rather discussing and sharing alternative mechanisms to bring ORT to mothers. ORT has, in Egypt for example, become a rallying point for primary health care, helping to cement confidence between the health system and people it serves.

Diarrheal diseases no longer need to be the inevitable scourge of infants and children. Diarrheal disease can now be controlled until we are able to provide primary prevention.

CLOSING ADDRESS

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It is a great pleasure for me to be with all of you at this Conference. We are all fellow colleagues in the one war we all seek, which is the war against diseases that ravage children around the world. The past two-and-one-half days have been exciting days at ICORT II, and all of us here must express our deep appreciation for AID in taking the leadership to mobilize this Conference in which so many other organizations have participated and supported, but for which AID's leadership has been indispensable.

When we met at ICORT I, it was very much a promotional meeting. It was the first time such a broad group had gotten together. This meeting has been much more an implementation meeting. Clearly the progress has been dramatic and in many ways what we have been discussing is the generation of problems that arise out of progress.

Dr. Mamdouh Gabr's presentation the opening evening provided a stimulating case history documenting how far the world and Egypt have come in the past two-and-one-half years in the battle against the greatest killer of children. As he noted, and it has been repeatedly noted, the supply of ORS packets, for example, has gone up from less than 30 million a year in 1981 to nearly 250 million in 1984-85—an eight-fold increase. In Egypt, the awareness and use of ORT has increased so dramatically that we have seen estimates of 160,000 to 280,000 lives saved in the past two years. That is a lot of lives. That is more than all the Hiroshima and Nagasaki deaths together. That is the equivalent of having avoided 30 Mexico City earthquakes. Somehow though this has not yet captured the headlines. It should, along with similar progress that is going on in other countries.

During this session we have been discussing two different sets of breakthroughs. One has been how to increase the breakthrough in medical knowledge that occurred with that original set of scientific documentations in the 1960s and early 1970s, that led to the historic *Lancet* quote that ORT represented "potentially the most important medical advance of this century." The second breakthrough, of course, is in social organization. The use of medical knowledge depends on social organization and this has stimulated all of us. Here we have had for ten years a cure for the dehydration that takes the lives of so many millions of

children but even today it is being used only by some 20 percent of the parents who should be using it. It is therefore the area of social organization—the breakthrough that has occurred in Egypt and is also occurring in somewhat less dramatic ways in Algeria, Haiti, Honduras, Indonesia, Nicaragua, and elsewhere—that is the second frontier.

I propose today to discuss ORT in the broader context of seeking to accelerate the well-being of children through Primary Health Care (PHC) on a stormy world scene. The past three years could well be described for children as the worst of years and also the best of years. The worst of years, as we all know, from the disastrous impact of the global recession and the various African emergencies that have impacted most heavily on the poorer countries and particularly on poorer families everywhere, including most of the industrial countries.

We have seen this in Africa in particular. More children died in Africa in 1980 than in 1970. The projections are—barring our success—that more will be dying in 1990 and the year 2000. Ghana illustrates one of the more severe examples. Although not hit directly by emergency conditions like Ethiopia or Sudan, Ghana's infant mortality rose from 80 to over 100. We have seen malnutrition go up by something like 50 percent in that society in four years. We have seen real government expenditures on health go down by more than 50 percent. We have seen use of health services fall off by one-third, as these services have been starved of drugs and other support.

But in another sense these have also been the best of years, and that is really what we are discussing at this meeting. As we can see from a variety of manifestations, we are at the start of possibly the greatest breakthrough for the health of children in recorded history. The most tangible manifestation of this breakthrough is the saving in 1985 of the lives of more than one million young children through the spread of two of the simplest technologies for the protection of the world's children: ORT and immunization against six killer diseases that have been taking the lives of more than four million small children a year and crippling a comparable number.

There are many other less tangible but important indications of this historic change. We see it in the convening of this Conference. We see it in the fact that two days ago, at a time of great financial stringency in the United States, the U.S. Congress made available some fifty million dollars more than was requested by the Administration for the sup-

port of child survival. We have seen it in the past month in India where the Government has started its effort to immunize all of its children by 1990 against the six diseases that last year took the lives of more than one million Indian children. This effort, undertaken as a "living memorial" to the late Prime Minister Indira Gandhi, will be paralleled by a push against dehydration, which took the lives of another million children in India.

We have seen progress in many other manifestations, some documented by the very useful report that AID has just published on what they have done in the past year with the more than doubling of funds that have come for child survival activities as the result of Congressional initiatives. You can see our progress documented in *The State of the World's Children, 1986* that UNICEF issued two days ago. You can also see it in the statements coming out of the Holy See, where strong messages are going to the Catholic Church around the world to get behind this potential for a child health revolution. You can see it from the document just issued by El-Alzhar, that leading center of Islamic thought, that has just published a major report on the relationship between The Holy Koran and Mohammad's sayings to child survival and child health. This is an invaluable new publication.

ICORTI, in the summer of 1983, met just six months after the United Nations had announced, following discussions that had involved people from AID, the World Bank, WHO, FAO, UNICEF, the United Nations University, and private academia, that a combination of scientific and social advances of recent years gave the world community the potential, for the first time, for so improving the health of children as to provide the potential for a virtual child health revolution that could cut, at low cost, the daily toll of more than 40,000 small children within eight, ten, or fifteen years. *If*, and this was the big *if*, the world community wanted it.

As we all know, this judgment was based upon several factors. The first factor was that there were a relatively small number of simple and inexpensive methods now available that have an especially powerful leverage on child survival and development. These low-cost methods of course include ORT, immunization of children, better weaning practices, return to breastfeeding, spacing of births, monitoring of the nutritional status of children to permit early action by parents, and maintaining vitamin A levels. John Evans of the World Bank called these methods "the GOBI package," citing the most low-cost interventions (Growth monitoring, Oral rehydration, Breastfeeding, and Immunization).

The second factor, and this really was in many ways the most important new factor, was the new

capacity for social mobilization to communicate to and involve parents in these methods—an improved capacity made possible by the unprecedented progress in development over the past 20 years, which had not previously been mobilized for the health and well-being of children. The base of this was the strengthening of PHC that had followed Alma Ata, the training of hundreds of thousands—millions—of auxiliary health workers and the bringing of facilities closer to the village level.

But equally important—and these are factors that we had not really structured for our purposes—were the radios that are in every home in India or the televisions that are available in four-fifths of Arab homes today. I was amazed recently in the two Yemens, to find television sets in the most remote villages in nearly every home. There is also a school in virtually every village today; over half of the mothers in the 20 to 30 age bracket today can read and write; and we have seen a tremendous expansion of farmers' organizations, of women's organizations, and on many unanticipated fronts, as well as the whole new capacity in religious structures—whether we are talking about the Christian, Islamic, or Buddhist—to communicate and to participate in this effort.

In effect, what we found in the fall of 1982 in this multi-agency examination was that there really is a much broader PHC infrastructure available than we had anticipated, because PHC infrastructure is not just the medical worker or the medical facility. It is the school and the radio—if they are used for these purposes. The PHC infrastructure can include the village priest if he will participate in this. We have sought to articulate the need to capture and to mobilize this vast infrastructure that comes from the tens and hundreds and billions of dollars invested in development from so many sources. How do we harness it for our purposes?

This links closely with the fact that somehow, in the 1950s and 1960s, we had lost sight of the fact that the front line of health is the family itself. What the technological advances have done is make it clear that these technologies simply give us a whole new capacity for self-health by and for families *if, and only if*, the societal structures of the world will help the parent to turn the key.

If you make a mother aware of the wonders of an ORS packet and it is not available at the store . . . if you make the parents aware of the wonders of immunization but then they cannot get their children immunized, then none of these advances are very useful. Likewise, if ORS packets are available, they are not of much use unless the people use them. The availability of immunization facilities are of little value unless mothers and fathers bring their children in three times. But what we have learned

now is that if we are prepared to mobilize all the channels of communication, we can make a great difference.

Let me say parenthetically that this potential for self-health in the developing world is being paralleled by a whole new understanding of the potential for self-health in the industrial world. It is very clear (the best work on this has come from the Centers for Disease Control in Atlanta) that to add a year's life to the average American male, medical facilities could spend tens of billions of dollars and that extra year still would not be assured. On the other hand, there are four simple measures that the average American male could take himself that would add ten years to his life: stop smoking, watch the quantity and quality of food intake, moderate alcohol intake, and exercise. The challenge, I think, for the health community in the industrial world, is how society can help the man and the woman follow these practices; many of our societal structures work against them today. We have much the same situation in the developing countries.

The challenge we face is how to mobilize the full range of these sectors that influence and affect people's lives. We know that radio and television can play a major role but we are not in a position to pay for hundreds of millions of dollars of television time. And how do we get all the schoolteachers in a country to take this on as a primary theme? We have seen in a country such as Egypt a very impressive mobilization—a multi-sectoral mobilization—and the same thing has happened in many countries with ORT.

Frankly, I was surprised that the most dramatic mobilization in the past two-and-one-half years has taken place not on the ORT front, as I had expected, but on the immunization front. As we have talked about the potential for a Child Survival Revolution in country after country, and tried to push forward on all fronts, it has been interesting to see what the countries themselves have identified as their greatest priority or leading edge. Some countries, like Egypt, Haiti, and Nicaragua, have focused on ORT. But the majority have put their first energies into immunization—and considerable energies at that!

In Colombia, for example, beginning in the spring of 1984, we saw the first pioneering of this form of complete national mobilization—the President himself taking the lead to immunize the country's children. He went to the principal opposition sources in the society, including the leading opposition newspaper, asking "Will you join in a major program for child survival?" He went to the Catholic Church, to the non-governmental organizations (NGOs), and to the labor unions. He involved the

Ministry of Education massively as well as, of course, the Ministry of Health as the basic coordinator. But he also called in every Governor and told them, "This is your responsibility and we expect you to achieve results in this." We saw in three short months a country go from a minority of the children immunized to the great majority immunized, something we would have said two years ago was impossible.

This is being repeated in country after country. Turkey, which (excluding Istanbul and Izmir) has an infant mortality rate not too different from India's, decided in February to plan for a breakthrough against the six major diseases that took the lives of 30,000 Turkish children last year and crippled another 30,000. By the time the first snows were falling at the end of November, early December, they had reached a national level of immunization of something like 85 percent. To do this involved total societal mobilization, led by the President and the Prime Minister, with three National Immunization periods for eight to ten days each. Fifty-four thousand Imams spoke out in support of the campaign; thousands of radio and television spots were broadcast; schoolteachers were called back two weeks early from summer vacation to work village-by-village, because it is the school system that is the strongest institution in the villages.

This form of societal mobilization, of course, leads us to questions Dr. Mahler and many others have touched upon here. First, how sustainable is this if you capture for PHC these sources that have other duties; and second, is this just going to be for immunization? If you avoid a lot of deaths through immunizing, those same children could die of diarrhea or many other causes unless there is parallel progress on other fronts. And then there is a third question that I hear often as UNICEF has pushed forward on the immunization front: Is UNICEF abandoning its priority of interest in ORT? These three questions are asked frequently.

Let me deal first with the second question on whether this is an entry point for a much broader approach to accelerating PHC. I think proof of the pudding is in the eating, and it is notable that in Colombia, El Salvador, Nicaragua, Nigeria, and Turkey, as these immunization programs have broken through they have been followed very quickly thereafter by a broadening into the other sectors, including notably ORT. Similarly, in Egypt, with the breakthrough on ORT, we are now getting a parallel movement toward massive forward progress on the immunization front. The same thing is happening in the much more loose, much different society of Haiti. This has been very encouraging, but it is true that we must keep this concern in mind.

Second, on the question of sustainability, again it pays to look at what has actually happened. We have not had that much time experience, but it is notable that in Colombia they have conducted national crusades of three national immunization days for two years. The second, completed ten days ago, is to be the end of the "crusade" approach, but the effort to keep immunization on a sustaining basis comes on a number of fronts. First, it is very clear that the whole health structure has changed; there is a new priority there. This kind of prevention has a new priority and I must say the health system is "walking tall" with what they have accomplished. Second, the national mobilization that took place has been followed in the schools. The primary school curriculum is being dramatically rewritten and not in a way that takes 15 years to get written and implemented; it is being done on a trial period of just a few months. All high school students, before they can get their certificate of graduation, must spend 100 hours in their final year at voluntary health services, 20 hours of which is a standard course about ORT, diarrhea prevention, importance of immunization, clean drinking water, washing hands, etc. And for the other 80 hours they are attached to health clinics to do the house-to-house census for immunization programs, to teach ORT and other measures.

The Churches, which on the Sundays before the National Immunization Days had devoted their sermons to what a responsible parent should do about immunization, now have a common training course for all parish priests on the range of child survival practices, which is also included in premarital counseling. When the babies are brought in for baptism, the questions often asked are: "Have you immunized this baby? If not, why not? Do you know about ORT?"

When you realize, as we were discussing about Egypt, that if more than one-third or 40 percent of your child deaths come from dehydration from diarrhea, why shouldn't the front line people, whether they are religious workers or schoolteachers, get involved with this set of activities? The Red Cross has permanently changed its structure to include "Child Alive" as their primary thrust to deal with these sets of major challenges. In different parts of society there has been a major restructuring. We are beginning to see the same thing coming in other countries that have moved along these lines. But clearly we need to be vigilant, and this is why we in UNICEF, internally, when we talk about the immunization push—UCI (Universal Child Immunization) by 1990—frequently we say "UCI to the third power." Obviously, you want the kids *immunized*, but it also must be *on a sustainable basis*, and it must be *an entry point* for a much broader pro-

motion of PHC.

Turning to the third question of UNICEF's commitment, let me stress that we do see the potential, as I said at the beginning, for an unprecedented breakthrough in the health of children over the next five or ten years. This cannot be achieved without a massive breakthrough on the diarrhea front. And it is for this reason that all of you working in this field can be confident that we will support ORT through every channel that we can. The question has been raised as to why it is that immunization has somehow taken off on a broader basis than ORT in many countries. There are those in this audience who can possibly give a better answer than I—Major General Burney from Pakistan, where they have been moving on all fronts simultaneously, for example—but I would say one reason is of course that the Expanded Program on Immunization (EPI) infrastructure existed in many countries since the 1970s, while ORT is a much later arrival on the scene. Particularly given the breakthrough on smallpox, there was this latent existing structure in countries there to be re-mobilized.

Second—and this is very important—on the immunization side there is less complication than on ORT where you are displacing traditional remedies or people have become accustomed to using antibiotics and intravenous rehydration. Hence, even though immunization requires more of an infrastructure to deliver than ORT, ORT has many more obstacles (if not enemies) to be overcome, and this does need to be taken into account.

But third, and I would say that in many countries this has been the biggest difference, is that immunization has been much more definable in quantifiable goals. The concept of Universal Child Immunization—of at least 80 percent of children immunized against the six major diseases—is very adaptable to a distinct national effort. It is very feasible for the President of a country to say to the Governors of every province or every state, "I will hold you accountable for achieving this goal." Then that governor can hold each district administrator accountable.

When you look at the success in Turkey or in Colombia, for example, one of the major reasons for success was that the top leadership of both countries made it very clear to their provincial administrators that they were responsible for mobilizing their total communities. All 67 Governors of Turkey were brought together for the first time in history for a *civil* purpose—not security—and given this responsibility. They went back and they told their Kaymakams at the next level down that they were responsible, and you could tell within 48 hours of the immunization days, more or less, how closely these goals were being achieved.

In Colombia, it was possible for President Betancur to pick up the phone at two o'clock in the afternoon on the first day of national immunization and call the Governors, because there was a reporting system, and ask "Why are you lagging?"; "How are you going to avoid being in the bottom two or three states next time?" So there is an accountability device for the effort.

We have not yet found in ORT the same way of mobilizing the total structure behind some kind of a goal that is accountable. I would say that this is one of the great challenges that lies ahead of us. Could we set a goal as to what it is we really would like to achieve by 1990 in terms of ORT awareness and use?

I quite agree with Dr. Gabr that the goals that were set in 1981 by WHO for 1989 are now really far too low, and they are not really goals today that a country can genuinely mobilize around in a massive way. Immunization and ORT are obviously the two leading edges. But although they may be the leading edges of this broad offensive to accelerate "PHC-for-All" by the year 2000, and to achieve a massive breakthrough for enhancing self-health for children, it is clear that far more must ultimately be involved.

This has come out clearly, I think, in these discussions here. It is not just ORT. There is a broad need to educate. How do you get a nutritional approach to diarrhea? How do you prevent diarrhea? If we can capture the channels of communication, they can be talking about family spacing and better weaning practices, not just immunization and ORT.

Let me conclude on the note that was captured by Shakespeare centuries ago.

There is a tide in the affairs of men,
Which, taken at the flood, leads on to
fortune. . . .

On such a full sea are we now afloat;
And we must take the current when it
serves,

Or lose our ventures.

I would argue, colleagues, that we are at just such a point today on the Child Survival Revolution and particularly on the ORT component. You in this hall are the pioneers in what is one of the most exciting revolutions of this century. I can assure you that UNICEF, on its part, will do everything possible to be your partner in bringing about this unparalleled breakthrough in all the countries of the world.

ICORT II CLOSING REMARKS

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We have come to the end of an extraordinarily successful meeting. Twelve hundred participants from some one hundred countries have shared their knowledge and experiences. And yet, you—the public health leaders assembled here—are only a fraction of the literally millions of health workers, volunteers, and parents who carry the ORT banner.

At ICORT I, I think it is fair to say that we reached scientific consensus about ORT. At ICORT II, from all I have seen and heard, we have taken a leap forward and achieved a consensus for action.

Dr. Merson has summarized the key points of the meeting and Mr. Grant has raised some important points. I would like to highlight just a few.

- You have said here that ORT has changed the face of health care delivery. You have applied your best creative energies and developed innovative solutions to some incredibly difficult problems.
 - You have said that ORT has led health care out of the clinics and into communities and homes. We know now that new communications and marketing techniques can revolutionize the delivery of health services. We now see the importance of political and community mobilization.
 - You have shown how the private sector can play a pivotal role.
 - For example, private voluntary organizations have mobilized their volunteers to educate and train health care workers and parents.
 - Private business is playing a big role, producing and distributing oral rehydration salts. Developing countries now lead the world in ORT production, in part due to these private sector efforts.
 - Private practitioners and pharmacists have endorsed ORT in country after country and have shown how critical their involvement is.
 - You have proven that dramatic results can be achieved
 - when the key elements are in place, and
 - when governments are committed to success.
- We have also learned that ORT by itself is not enough.
 - ORT should be intimately linked with proper feeding to decrease the nutritional consequences of diarrhea.
 - We have two principal thrusts for our child survival activities: ORT and immunization. These are the engines that can drive primary health care to the far reaches of every country. They are the foundation on which a sustainable health system can be built to deliver other critical interventions such as birth spacing and nutrition.
 - To quote Dr. Mahler, "ORT and immunization go hand-in-hand, complementing one another—one curative, one preventive; one immediately life-saving, one potentially life-saving."

Now it is time to look to the future.

Many of you in this room are returning to your countries where mortality rates are painfully high, where malnutrition is ever present, where epidemics of cholera persist, poverty abounds, and resources are scarce. You came to this conference because you know about ORT and wanted to know more. You came because ORT offered you an opportunity to improve the health of your people.

Your efforts and your enthusiasm give hope that the global objectives set for ORT by the World Health Assembly can be achieved. The objectives set a few years ago for 1989 were: 50 percent access to ORT; 35 percent use of ORT in children below age five; and a 25 percent reduction in deaths associated with diarrhea. When these targets were set, few thought they could be achieved. Even now it will not be easy. But this conference has convinced me that we can do it and do even more.

I propose that we translate these targets and stretch them and stretch ourselves.

- We should strive to make ORT accessible to virtually every child who needs it by 1990.
- We should seek 45 percent use of ORT by 1990.

Finally, we should achieve a common goal of, in laymen's terms, two million lives saved from death due to diarrhea in 1990. Now, in order to achieve these targets, knowledge of the correct use of ORT is essential.

The World Health Community has set ambitious targets to achieve universal immunization by 1990. Along with that effort, it makes sense to reach these

same parents and children with the message of ORT. We need to instill in them this knowledge so that they know how to use ORT, and use it effectively.

If we are to achieve the goal we have set forth, it is reasonable to expect that we must instill knowledge of the correct use of ORT in 80 percent of the parents of children-at-risk. This 80 percent target will be a helpful tool in tracking progress for some programs. However knowledge is not the goal itself. Our primary goal is reduction of deaths.

To achieve this goal, each of us must give our very best effort. Further, each country must make its contribution, in keeping with its resources and its own goals.

Some countries, such as Egypt, have achieved outstanding results as we have heard these past three days. We know that dramatic results are possible. Countries that have achieved those high levels, however, must set a goal to sustain these results—and even improve upon them. The challenge for countries just beginning, or who have not achieved such results with their program, is to set their own targets and apply their resources to achieving them.

Each donor must do its share and so must the private sector. ORT is low cost relative to the number of lives that can be saved. Private channels for distribution of ORS can further reduce the cost of programs. AID, for its part, intends to continue very substantial funding for ORT. In 1985 we provided some 45 million US dollars for ORT, up from 15 million US dollars only three years before. We will continue our record of maximum contribution.

There are other vital steps to achieve the goals I have discussed here today.

- We will need to close the gap between access and effective use of ORT. We need to teach, to train, and to promote so that those who have access, use ORT and use it correctly.
- We will need to improve donor coordination,

especially on the country level. In this way donor efforts can reinforce one another and contribute to real progress toward country targets.

- A key to better donor coordination lies in the developing countries themselves. Each of them must take the lead in pulling donors together behind their country plans. Plans with clear goals and divisions of responsibility are critical to mobilize resources and to efficient implementation.
- The World Bank, UNDP, UNICEF, WHO, and other donors who provide major health assistance in a particular country have an important responsibility to ensure donor coordination.
- Finally, we will need to continue our close communication on technical issues. We urge you to organize country and regional meetings to forge plans and share experiences and are prepared to help as appropriate. To that end, if it is desired and warranted, AID would be happy to host an ICORT III. We would of course want to consult with our co-sponsors, bilateral donors, and developing countries. At this time the situation is not clear but we stand ready as needed.

We have ambitious goals and a global vision. ORT can lead the overall development of health care. It shows that worldwide coverage of essential health services is in fact possible. And—by reaching into every home and community—ORT can catalyze the very process of development.

We have a goal. I believe we know what is needed to achieve it. Each death we prevent will help us reach our global target. Each health worker, each program manager, and every country has a crucial role to play.

If we accomplish this, together we can write one of the great chapters of human history.



ORT: A Global Solution. Photo by PRITECH.

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