



CENTRE
FOR HEALTH AND
POPULATION RESEARCH

ANNUAL REPORT 1997

ICDDR,B: CENTRE FOR HEALTH AND POPULATION RESEARCH



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CENTRE
FOR HEALTH AND
POPULATION RESEARCH

ICDDR,B

Centre for Health and Population Research

ICDDR,B, or "The Centre", was established in 1978 as successor to the Cholera Research Laboratory created in 1960 to study the epidemiology, treatment, and prevention of cholera. The Centre is an independent, international, non-profit organization for research, education, training, clinical services, and information dissemination. Located in Dhaka, the capital city of Bangladesh, the Centre is the only truly international health research institution based in a developing country. The results of research conducted over the years at the Centre provide guidelines for policy makers, implementing agencies, and health professionals in Bangladesh and around the globe. Researchers at the Centre have made major scientific achievements in diarrhoeal disease control, maternal and child health, nutrition, and population sciences. These significant contributions have been recognized worldwide.

How is the Centre Organized?

The Centre is governed by a distinguished multinational Board of Trustees comprising researchers, educators, public health administrators, and representatives of the Government of Bangladesh. The Board appoints a Director and four Division Directors who head the Centre's four scientific divisions. The Director's Division provides support to the scientific divisions. The Director's Division includes Administration and Personnel Department, Finance Department, Training and Education Department, External Relations and Institutional Development Department, Dissemination and Information Services Centre (DISC), Audiovisual Department, and the Director's Office.

The **Clinical Sciences Division (CSD)** staffed with physicians and scientists trained in paediatrics, general medicine, gastroenterology, infectious diseases, nutrition, and epidemiology is engaged in: (i) hospital- and community-based clinical research in the fields of infectious diseases and nutrition; (ii) hospital care to more than 110,000 patients annually at the Clinical Research and Service Centre in Dhaka; (iii) preventive health care to mothers and children; and (iv) training in case management of diarrhoeal diseases and research methodology. Research activities are along the themes of case management (nutritional, fluid, and pharmacological therapies), pathophysiology, and preventive, maternal and child health.

The **Public Health Sciences Division (PHSD)**, staffed with public health professionals, epidemiologists, social scientists and economists, focuses on the evaluation of population-based interventions to improve child health, reproductive and sexual health, and evaluates public health programmes. Research includes such areas as: reproductive health; risky sexual behaviours; family planning; safe motherhood; child health at the community level; epidemiological patterns and transmission of infectious diseases (especially diarrhoeal, acute respiratory and nutrition-related illnesses); health care delivery services; illness prevention through education; behaviour modification; and vaccine trials. The Division has the responsibility of conducting field studies at Matlab involving 210,000 people under the Demographic Surveillance System (DSS) and 110,000 people under the Maternal and Child Health-Family Planning (MCH-FP) Project.

The **Laboratory Sciences Division (LSD)** has a research programme with branches in enteric bacteriology, molecular genetics, environmental microbiology, immunology, virology, parasitology, reproductive tract infections, acute respiratory infections, and nutritional biochemistry; and a laboratory service programme with branches in clinical pathology, histopathology, biochemistry, and microbiology.

(See inside of the back cover...)

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Mission Statement

The fundamental mission of the Centre is to develop and disseminate solutions to major health and population problems facing the world, with emphasis on simple and cost-effective methods of prevention and management



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ICDDR,B: Centre for Health and Population Research publishes a journal, two newsletters, one bilingual staff news bulletin, scientific reports, monographs, working papers, and special publications on subjects relating to diarrhoeal diseases, population and reproductive health, and on nutrition. Details of some of these publications may be found under the section ICDDR,B Publications 1977, p.125 of this report.

Cover: Based on a painting "Don't tell me there's no hope at all" by Asem Ansari

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Preface

This nineteenth Annual Report of the Centre documents many aspects of the activities during 1997, including research, support for research, health services, training, dissemination, and administration.

Scientific papers, abstracts and other documents produced and published by the Centre's staff, alumni, and by visiting scientists are also listed in the report. Many of the research works included here were initiated in previous years and hence documented in earlier reports. The studies that were completed during 1997 presented the final results. Some of the studies initiated earlier are still ongoing. Preliminary findings from these studies are reported in this document.

If you have any comments on this report or would like to have more information about the Centre or the works described here, please write to the Centre at the address given on the opposite page.



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Director's Report



*Prof. Robert M. Suskind
Director*

For the year 1997, the Centre's progress is marked by administrative transitions, new initiatives and review of its objectives and agenda as we prepare for the third decade of the Centre's research and programme implementation in child survival and reproductive health. The scope of activities has expanded to include: conducting research in new areas of infectious diseases; widening the spectrum of our operations research in Bangladesh; strengthening our collaboration with the Government of Bangladesh, regional institutions, and the NGO community; and enhancing our internal capacity through increased interdivisional collaboration and the identification of new sources of support for the Centre. Such expansion will secure the future of the Centre as we prepare for entry into the next millennium.

The administrative transition includes my appointment as new Director of the Centre following eight years of leadership under the direction of Dr. Demissie Habte whose tenure concluded in September 1997. In June 1997, the Board of Trustees appointed Mr. Jacques O. Martin, Head of Human Resources Division of Swiss Development Cooperation, as its new Chairman.

The Centre continued to feel the impact of the worldwide changes in resources dedicated to development assistance. Changes in the level of support to the Centre from the aid agencies of the various donor governments reflect the shifting strategic plans and priorities of each donor in their provision of foreign assistance, support for international healthcare initiatives and population programmes worldwide. Consequently, the Centre experienced a further decline in donor support in some cases, particularly where donor countries have decided to give priority to sectors of the economy other than the healthcare sector. In other cases, donors have shifted resources into specific project support and severely limited support for the Centre's core overhead expenditures. Ultimately, the resources that support essential entities within the Centre, such as the Dhaka and Matlab hospitals and the administrative structure of the Centre are insufficient, creating an overall shortfall in the Centre's budget.



*Dr. Jon Rhode, member of the
Board of Trustees*



*Dr. Demissie Habte, the
outgoing Director of the Centre*



*Dr. Maureen Law, Chairperson
of the Board of Trustees*

While the budgetary constraints continue to impact the overall financial condition of the Centre, research initiatives and findings have, nonetheless, continued with significant progress. Several new donors that support our scientific research activities and embrace our achievements have entered our portfolio. Collaboration has strengthened between the Government of Bangladesh and the Centre as well as between the Centre and NGOs in Bangladesh, regionally and internationally. Such activities are well-documented in this report. Achievements in research and service activities in each of the scientific divisions in 1997 are notable. The Clinical Sciences Division developed and tested a protocol to standardize the clinical management of severely malnourished children, which produced dramatic results. Compared to routine management, protocolized clinical management resulted in a 47% reduction in mortality during the acute phase and 55% greater weight gain during the nutritional rehabilitation phase of treatment. In the area of

micronutrient research, clinical studies concluded that zinc supplementation reduced diarrhoea and accelerated recovery from persistent diarrhoea. Other important research findings showed that a single large dose of vitamin A significantly enhanced clinical recovery from shigellosis, indicating an adjunctive role of vitamin A in the treatment of children with acute shigellosis. These important outcomes for malnutrition and micronutrient research have application not only in Bangladesh, but globally as well.

Laboratory Sciences Division had several important accomplishments through its continued research in characterizing diarrhoeal disease agents and in new research in reproductive health. Through our continued monitoring of *V. cholerae* O139 Bengal, a new clone was detected. Such monitoring provides important information about the evolution of new clones and their impending spread. A recent survey of rotaviruses that cause infection in Bangladesh identified 2 of the 4 serotypes covered by a recently developed rotavirus vaccine. This suggests a potential role for this vaccine in Bangladesh. Aetiological studies in a Dhaka slum population and in a women's health clinic demonstrated the importance of the Centre's continued work in tracking reproductive tract infections and sexually transmitted diseases (RTI/STD) in Bangladesh.



The June BOT Meeting in London

As we move toward sustainability of global health initiatives, improved preventive measures in child survival and reproductive health are critical. The Public Health Sciences Division increased this knowledge through the development and testing of new prevention measures in the framework of community-based approaches. Notably, in a controlled village-based trial, household nutrition education for the promotion of beta-carotene-rich foods in children was shown to substantially improve dietary intake. The Mirzapur Birth Cohort follow-up study for the epidemiology of diarrhoea and ARI was successfully completed, and the laboratory and statistical analyses are continuing. A study conducted by the Reproductive and Sexual Health Programme found that introduction of high-quality antenatal and delivery care at the union level increased deliveries at the health centre.



Mr. Tim Fischer, Hon'ble Deputy Prime Minister of Australia, presenting the AusAID's annual contribution to Director Dr. Demissie Habte. The Australian High Commissioner to Bangladesh H.E. Mr. Charles Stuart (extreme left) is also seen



Mr. Peter Goldmark, President of the Rockefeller Foundation, Looking at a mother and her son in the Centre's hospital

Identification of patterns in population growth and solutions to health problems has been facilitated through the use of the Demographic Surveillance System (DSS) and the Record Keeping System (RKS) as components of the Matlab Programme. DSS and RKS have provided surveillance data since 1966 and 1977 respectively in part of Matlab thana, a rural area of Bangladesh with a population of 210,000. This data collection system is a unique tool for health and population research in developing countries because of its longevity and accuracy. DSS and RKS have been indispensable in the evaluation of the impact of health interventions carried out in Matlab because they provide the numerators and denominators of demographic and epidemiological parameters, such as birth and death rates, cholera incidence rates and contraceptive use rates. 1997 gave rise to an initiative to set new long-term objectives for Matlab. These objectives included expanding the Safe Motherhood programme in Reproductive Health and testing the validity of the global strategies of the Integrated Management of Childhood Illnesses (IMCI) initiative.



Both new and the outgoing Directors of the Centre with Dr. Didier Leboulleux, Medical Director of Rhone-Poulenc Rorer (RPR), Asia region (2nd from left) and Mr. A.K.M. Shamsuddin, Managing Director of RPR, Bangladesh (extreme right)



The November BOT Meeting in Dhaka

The Health and Population Extension Division entered into a new phase where rural and urban operations research activities in maternal-child health and family planning (MCH-FP) were consolidated into a single operations research portfolio--the Operations Research Project (ORP). The hallmark of the ORP in this phase is the Centre's partnership with the Ministry of Health and Family Welfare and NGOs under the USAID-funded National Integrated Population and Health Programme (NIPHP). The concept of an essential services package (ESP) developed by HPED and adopted by the Government of Bangladesh provides for delivery of essential healthcare services at every level from the community to the tertiary level of care. These services address child survival and reproductive healthcare needs and are currently being field-tested by ORP. The ESP will be part of the NIPHP contribution to the Health and Population Sector Plan, sponsored by the Government of Bangladesh, the World Bank, and the donor community, which is scheduled to be initiated in June 1998.



Part of the audience at the Centre's 6th Annual Scientific Conference (ASCON VI)



Prof. A.K. Azad Chowdhury, Vice Chancellor of the University of Dhaka, Presenting the inaugural address in ASCON VI

The Centre's role as a regional and global resource was reflected in the participation by local, regional and global participants in two major conferences during 1997. The "Zinc and Health In South Asia" symposium and workshop brought together investigators, planners, and policy makers in South Asia to critically review the results of recent zinc research and define future questions and programmatic implications.

It also provided a forum to share experiences in research on zinc, nutrition and their potential implications on health and diseases in South Asia. The theme of the Sixth Annual Scientific Conference (ASCON VI) was "Reproductive Tract Infections and Sexually Transmitted Infections" and drew participation of colleagues from the Government of Bangladesh, international research community and from the NGO sector. The quality of the participation reflected the high quality of RTI/STI research underway both at the Centre and throughout Bangladesh. More importantly for the Centre, it reflected our commitment to collaborate with other researchers both within Bangladesh and from abroad.

The significance of the Centre as a valued research institution internationally and its ability to conduct high-quality RTI/STI research is also reflected in the agreement by the Government of Bangladesh in 1997 to designate the Centre as the first institution in Bangladesh to conduct the first ever national sentinel surveillance of HIV/AIDS on behalf of the Government and UNAIDS. The ability of the Centre to undertake this critical research under the auspices of the Government of Bangladesh is yet another example of its unique capacity as a research institution and the expanding nature of its collaboration with the Government of Bangladesh.

Finding solutions to malnutrition in South Asia, and specifically in Bangladesh, has become an important initiative for the Government of Bangladesh, the donor community, other institutions, and NGOs in Bangladesh, resulting in the creation of the Bangladesh Integrated Nutrition Project (BINP). The BINP has three components: community-based nutrition, intersectoral linkage, and institutional development. In 1997, the Centre was mandated to be the sole source of operations research for the community-based nutrition component and is working in coordination with the Ministry of Health and Family Welfare and the leading national institutes involved in nutrition research. Additionally, the Centre provides technical assistance along with World Bank and UNICEF.

To maintain excellence, the Centre is updating its facilities and infrastructure. The Computer Upgrade Project (Phase 1), funded by DfID of the United Kingdom, was completed. An on-line Internet system was introduced on the Dhaka campus during 1997 that allows scientists and researchers to take advantage of the information superhighway. The Centre's Web site (<http://www.icddrb.org>) was initiated during the year on its own server for the Internet.

Finally, the training component of the Centre becomes increasingly important as we expand both our collaborative efforts and our research agenda at the Centre. In 1997, 529 trainees from 27 countries attended programmes on research methodology, epidemiology, and laboratory research. The faculty is drawn from the Centre's scientists and researchers who bring with them superior academic credentials as well as broad knowledge in laboratory, clinical and community-based research, international experience and technical expertise. The Centre also sent scientists in 1997 to international and regional conferences to present their findings. Dissemination of information and the publishing of scientific results remain critical to the Centre and ensure its continued status as an internationally renowned scientific research institution.

Robert M. Suskind
Director

Achievements of the Centre over the years...

Since 1960, the Cholera Research Laboratory (CRL) and its successor ICDDR,B has been recognized as the leading international health research centre located in a developing country. CRL conducted research that now forms the core of the world's knowledge of diarrhoeal diseases, and led to the development of Oral Rehydration Solution (ORS). CRL was internationalized and renamed ICDDR,B in 1978 to become one of the most important and influential health research institutions in the world. The work of CRL/ICDDR,B is often cited as the authority for important health and population-related decisions taken by multilateral, governments, and development agencies throughout the world. Indeed, many of the Centre's alumni have become influential policy makers in these agencies.

- 1960 The Cholera Research Laboratory is established
- 1963 The Matlab field station is started and the first of a series of cholera vaccine trials is launched
- 1966 The Demographic Surveillance System (DSS) is established
- 1968 The first successful clinical trials of Oral Rehydration Solution are concluded
- 1969 The relationship between stoppage of breast-feeding and the resumption of menstruation is demonstrated
- 1971 Bangladesh becomes an independent nation
- 1973 The shift from classical to El Tor cholera is identified
- 1977 Maternal-child health and family planning interventions begin in Matlab
- 1978 The Government of Bangladesh Ordinance establishing ICDDR,B is signed
- 1981 The new Dhaka hospital is built, and the Urban Volunteer Programme is initiated
- 1982 Classical cholera returns; field-testing of cereal Oral Rehydration Solution begins and the MCH-FP Extension Project starts up
- 1983 The first issue of the Journal of Diarrhoeal Diseases Research is published
- 1984 ICDDR,B receives UNICEF's Maurice Pate award
- 1985 The full Expanded Programme of Immunization activities is tested in Matlab and the WC/BS cholera vaccine trial is launched
- 1987 ICDDR,B receives USAID's "Science and Technology for Development" award
- 1988 The treatment of and research on acute respiratory infection (ARI) begins
- 1989 The Matlab Record-Keeping System is especially adapted for government use and extended to the national family planning programme
- 1990 The new Matlab Health and Research Centre opens

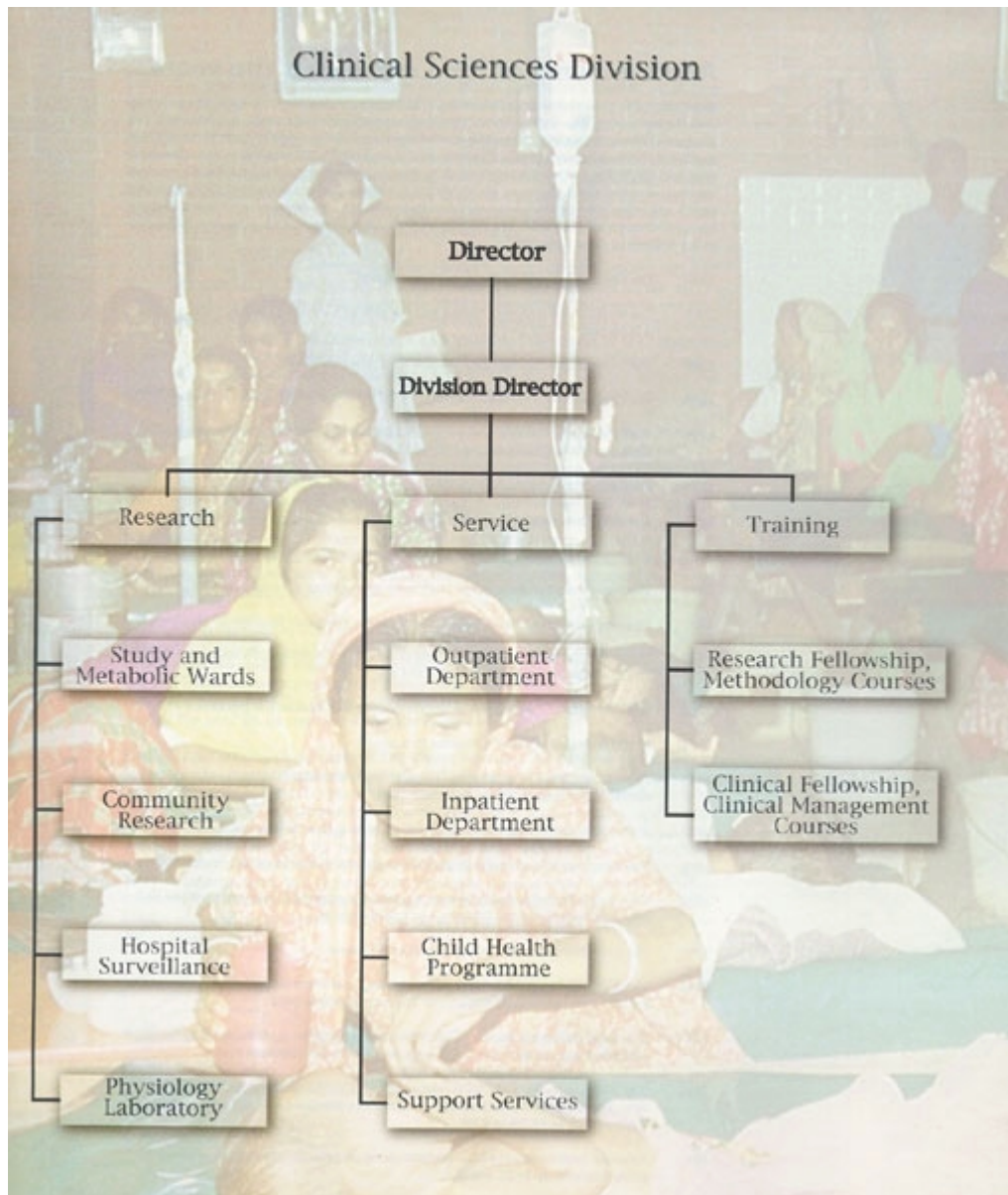
1992 The ICDDR,B-Bangladesh Rural Advancement Committee (BRAC) study commences and the new Sasakawa International Training Centre is built

1993 New laboratories are built and equipped, and a new *Vibrio cholerae* O139 Bengal is identified and characterized, and work on vaccine development begins

1994 The 25th anniversary of ORS is celebrated; an ICDDR,B cholera epidemic team goes to Goma to assist Rwandan refugees, identifies pathogens, and reduces mortality from as high as 48.7% to <1%

1995 Maternal immunization with a pneumococcal polysaccharide vaccine is shown to protect infants up to 22 weeks.

1996 First official visit to the Centre by a Prime Minister of the host country.



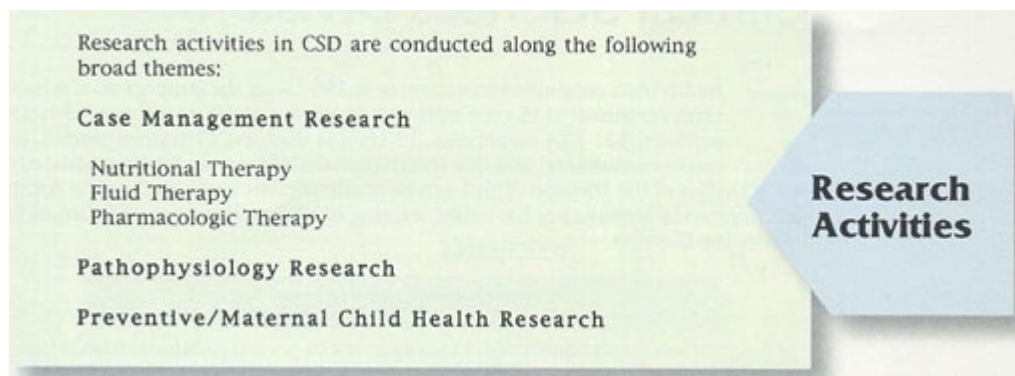
The Division conducted its activities in 1997 with the support of 176 fixed-term personnel (135 core staff and 41 project staff). Moreover, 63 health workers, 121 CSA employees, 13 trainee doctors, 15 trainee nurses, two nurse consultants, and one international child survival fellow assisted in the activities of the Division. Three senior paediatricians and a radiologist continued to provide consultancy for better training of the staff doctors and clinical fellows of the Division.



*Division Director
George J. Fuchs*

Division Highlights

- ❑ A protocol to standardize the management of severely malnourished children with diarrhoea was developed. Protocolized clinical management resulted in a 47% reduction in mortality during the acute phase and 55% greater weight gain during the nutritional rehabilitation phase compared to routine management.
- ❑ A trial in adults with cholera demonstrated no difference in efficacy between reduced osmolarity ORS (RO-ORS) and standard ORS (WHO-ORS). Of note, the risk of hyponatraemia was greater in the RO-ORS than in the WHO-ORS group. However, none of the hyponatraemic patients in either group was symptomatic.
- ❑ ICDDR,B contributed 158 of the 675 children to a multi-centre (five-site) trial on RO-ORS and WHO-ORS in children with acute watery diarrhoea. No significant differences were observed in stool output or diarrhoea duration, but the risk of unscheduled intravenous fluids was less in the RO-ORS compared to WHO-ORS group.
- ❑ A single large dose of vitamin A (VA) significantly enhanced clinical recovery from shigellosis, indicating an adjunctive role of vitamin A in the treatment of children with acute shigellosis. Another trial observed that a single large dose of VA at delivery increased breastmilk VA concentration and resulted in reduced duration of respiratory tract infections and of febrile illness in infants.
- ❑ Zinc, but not VA, supplementation substantially reduced stool output and accelerated recovery from persistent diarrhoea. Reduced osmolarity ORS was found to be more effective than standard ORS in the management of persistent diarrhoea in another study.
- ❑ The Division, with the Nutrition Working Group, conducted the symposium "Zinc and Health in South Asia" and a workshop at the Centre on 15-16 May 1997 which was co-sponsored by UNICEF and The Sparkman Center, University of Alabama at Birmingham. The first day (symposium) reviewed the regional experiences in zinc and health research. The second day (workshop) made policy recommendations relevant to programme application and prioritization of future research on zinc.
- ❑ Antimicrobial trials continue to result in simplified regimens as well as new treatment options. Ciprofloxacin was observed to be well-tolerated and safe in the treatment of shigellosis in children. Ampicillin was shown to be an inexpensive, effective alternative agent in the treatment of cholera in children.
- ❑ ICDDR,B, with CSD taking the lead, agreed to coordinate and conduct operations research for the Bangladesh Integrated Nutrition Project (BINP) in collaboration with the Government of Bangladesh. The aim of BINP is to improve the nutritional status of adolescent girls and pregnant women and young children aged less than two years through nutrition education and a food supplement intervention.
- ❑ Nitric oxide, an important regulator of intestinal cell function, has been found to be significantly elevated in children with cholera and shigellosis.



Case management Research

Nutritional Therapy

Standardized Clinical Management of the Acute Phase of Severely Malnourished Children with Diarrhoea

Pls: T. Ahmed, R.M. Suskind, and G.J. Fuchs

Funded by: USAID, Government of Japan, and ICDDR,B

Severely malnourished hospitalized children have a high mortality rate. To reduce this mortality, a standardized treatment protocol was developed and implemented at the ICDDR,B hospital in January 1997. Key points of the protocol included standardized use of rehydration fluids, slower rehydration, aggressive but deliberate feeding, micronutrient supplementation, antibiotic therapy and timely management of complications. Outcome and cost of treatment were compared among the protocol and the comparison groups of severely malnourished children with diarrhoea. The protocol group (PG) consisted of children admitted to the hospital from 1 January to 30 June 1997. Children admitted from 1 January to 30 June 1996, who received conventional, non-protocolized treatment, formed the comparison group (CG). The same physicians treated both the groups.

Sixty percent of the children in the PG were successfully rehydrated with ORS rather than intravenous fluids compared to 29.3% in the CG ($p=0.00001$). Use of expensive antibiotics was reduced in the PG ($p=0.001$). PG children had fewer episodes of hypoglycaemia (15 vs. 26, $p=0.02$). Costs of laboratory tests, intravenous fluids and antibiotics were significantly less in the PG. Thirty children (9%) in the PG died compared to 49 (17%) in the CG ($p=0.003$; OR 0.49, 95% CI 0.3-0.08).

The results of the study indicate that standardized management under the protocol resulted in a 47% reduction in mortality among severely malnourished children with diarrhoea and reduced the risk of death by 51%. It also resulted in fewer episodes of hypoglycaemia. The use of intravenous fluids was less, thereby reducing the risk of sodium and fluid overload. In addition, the use of expensive antibiotics as well as cost of laboratory tests, antibiotics and intravenous fluids were minimized. The use of a standardized approach, even by experienced physicians, should be considered in the care of all ill children who are severely malnourished.

Assessment of a Standardized Dietary Management Protocol for the Catch-up Growth Phase of Nutritional Rehabilitation in Very Severely Malnourished Children

Pls: T. Ahmed, S. Adhikary, G.J. Fuchs, and R.M. Suskind

Funded by: UNICEF

A standardized dietary management protocol for very severely malnourished children recovering from diarrhoea was introduced recently in the Nutrition Rehabilitation Unit (NRU) of the Clinical Research and Service Centre (CRSC). Three types of diets prepared from inexpensive, locally-available foods were used in the protocol with the source of protein mostly from vegetables. In the protocol, calorie and protein intakes were increased gradually in a programmed schedule. Outcome of children on standardized feeding was compared with that on the conventional feeding schedule in which the feedings were offered *ad libitum* to the children eight times per day.

Admission anthropometric indices of 150 children consecutively enrolled in each group were comparable, and the mean duration of stay in the hospital was 15 days. Children on protocolized feeding had a greater energy intake at discharge (220 vs. 180 kcal/kg.day, $p<0.0001$) and exhibited greater weight gain (11.8 vs. 7.6 g/kg.day, $p<0.0001$). Further analysis is in progress.

Parenteral Magnesium in the Management of Ileus Associated with Diarrhoea in Severely Malnourished Children

PIs: T. Ahmed, M.A. Salam, and G.J. Fuchs

Funded by: USAID, Government of Japan, and ICDDR,B

Abdominal distension or ileus, which interferes with feeding, is a frequent complication in severely malnourished children with diarrhoea, and is commonly associated with depletion of magnesium and potassium. Magnesium helps potassium to enter into and be retained in the cells of the body. If magnesium therapy along with potassium supplementation is effective in resolving ileus, feeding can be initiated without further compromising nutritional status. This will also prevent unnecessary intravenous infusions that can be a cause of harmful fluid and salt overload.

In a double-blind controlled trial, severely malnourished children with diarrhoea and ileus were randomized to receive a single-dose intramuscular injection of 0.3 mL (maximum 2 mL) of either Magnesium sulphate solution (50% w/v) or normal saline per kg body weight. Potassium supplements were provided routinely. Ileus persisting beyond 24 hours with failure to tolerate oral feeds constitutes treatment failure. Of the 40 estimated cases, 14 patients have been enrolled so far.



A mother is anxiously looking at her malnourished child at the Nutrition Rehabilitation Unit

Four-cell Clinical Trial of Zinc and/or Vitamin A in Undernourished Children with Persistent Diarrhoea in Bangladesh

PIs: F. Khatun, S.K. Roy, N.R. Sarkar, N.M. Saifuddin, K.E. Islam, and G.J. Fuchs

Funded by PCC, ICDDR,B

The efficacy of vitamin A (VA) and/or zinc (Zn) supplementation on the clinical course of persistent diarrhoea was evaluated in 96 moderately malnourished children aged 6-36 months in a double-blind, randomized four-cell trial. Each group (n=24) received in a multi-vitamin syrup either Zn (20 mg elemental/day), VA (total 200,000 IU), both Zn plus VA, or the multi-vitamin control for 7 days. Cumulative stool weight was reduced significantly ($p < 0.0001$) in the Zn only and Zn plus VA groups compared to the VA only and the control groups. Cumulative stool frequency was also significantly less in Zn only ($p < 0.001$) compared to the control group. Clinical recovery rate was significantly faster in the Zn only and Zn plus VA groups than in the VA only ($p = 0.007$) or the control ($p = 0.007$) groups. These results indicate that Zn, but not VA, may be beneficial in the management of persistent diarrhoea in children. VA does not appear to confer any synergistic benefit.

Vegetable Protein Source for Refeeding Malnourished Children Recovering from Shigellosis

PI: I. Kabir

Funded by: Swiss Agency for Development and Cooperation (SDC) and International Atomic Energy Agency (IAEA), Vienna, Austria

The aims of the study are to evaluate the effect of a low-cost plant protein-based diet on catch-up growth, protein turn-over, and disease morbidity in children.

This study is being conducted on 90 malnourished children aged 24-60 months. The relative efficacy of a standard-protein diet (7.5% energy as protein) will be compared with two nutrient-dense diets: one animal protein-based diet with 15% energy as protein, and another diet with same energy content but based on plant protein. After clinical recovery from shigellosis, children

will be randomly assigned to three diet groups and will be fed for 21 days in hospital. Anthropometry, serum proteins, body composition, and protein turn-over will be measured and compared before and after dietary supplementation among the groups. The children will be followed up for three months to monitor growth and morbidity changes.

The study is ongoing. So far, 70 children have been enrolled. Metabolic balance studies have been completed in 30 children; isotope study has been done in 14 children. Follow-up data collection is in progress.

Clinical Efficacy of L-Glutamine in the Treatment of Persistent Diarrhoea in Children

PIs: I. Kabir and G.J. Fuchs

Funded by: USAID

The aims of the study are to evaluate whether glutamine supplementation improves the clinical outcome of children with persistent diarrhoea and to determine the possible role of reactive oxygen species (ROS) in the pathogenesis of persistent diarrhoea and malnutrition.

Ninety children with persistent diarrhoea will be given either a rice-based diet containing L-glutamine or egg albumin for seven days. Children will be studied in the Metabolic Study Ward, and eight-hourly ORS therapy, dietary intake, and stool output will be measured. Lactulose-mannitol ratio will be determined from a 24-h urine collection to determine the effect of L-glutamine on mucosal permeability. Serum proteins and antioxidant status will be measured before and after the dietary supplementation. The effects of glutamine supplementation will be determined by proportion of clinical cure, improvement of gut permeability, and antioxidative status between the groups. The study is ongoing, and five patients have been enrolled so far.

If glutamine-supplemented diet shows earlier clinical and nutritional recovery than standard treatment, it is likely to provide an important tool in the dietary management of persistent diarrhoea in children.

Fluid Therapy

For the past 20 years, the WHO formulation of ORS has been the standard for rehydration of children and adults with dehydration due to diarrhoea. Questions, however, remain about the ideal composition of ORS, especially regarding the sodium concentration and total osmolarity. The results of recent studies have suggested the possible superiority of different ORSs of reduced sodium and osmolarity compared to standard WHO-ORS, although the results are not conclusive.

ICDDR,B participated in two trials to evaluate the efficacy and safety of reduced osmolarity ORS (Na 75, glucose 75 mmol/L; osmolarity 245 mOsmol/L) and the standard WHO-ORS (Na 90, glucose 111 mmol/L; osmolarity 311 mOsmol/L) formulation. The first was done in adults with cholera in which ICDDR,B was the sole study site. The second study was a multi-centre trial in children with watery diarrhoea of any cause.

Efficacy of a Reduced Osmolarity Oral Rehydration Solution (RO-ORS) in Adult Patients with Cholera

PIs: N.H. Alam and G.J. Fuchs

Funded by: UNICEF, USAID, and WHO

A randomized, double-blind controlled clinical trial was conducted in 300 adult cholera patients to compare the efficacy of an RO-ORS (Na 75, glucose 75 mmol/L, and osmolarity 245 mOsmol/L) with the standard WHO/UNICEF-ORS (STD-ORS). Patients fulfilling the study criteria and completely rehydrated with IV fluid were randomized to receive one of the study ORSs to maintain hydration until diarrhoea ceased. No significant differences were observed between the two groups in major clinical outcomes: total stool outputs (g/kg body wt.: mean±SD, 212±99 vs. 207±101 and 284±162 vs. 273±156), ORS intake in mL/kg body wt. (372±173 vs. 364±165) and duration (h) of diarrhoea (mean±SD: 46.4±18 vs. 43±16). The risk of hyponatraemia was greater in the RO-ORS than in the STD-ORS groups. However, none of the hyponatraemic patients in either group was symptomatic.

A Multi-centre Study to Evaluate the Efficacy of Reduced Osmolarity ORS in Children with Acute Watery Diarrhoea

PIs: R.N. Majumder and G.J. Fuchs

Funded by: UNICEF and WHO

The Clinical Sciences Division participated in this multi-centre study to evaluate the efficacy and safety of a reduced osmolarity ORS (RO-ORS) compared to standard WHO-ORS in children aged 1-24 months with acute watery diarrhoea. Of the 675 children studied in five different countries, 158 were studied at the ICDDR,B's treatment centre in Dhaka.

Children with a history of diarrhoea of less than 72 hours duration attending the CRSC were studied till cessation of diarrhoea. Stool output in the children receiving RO-ORS was not significantly different from those receiving standard WHO-ORS (mL/kg, mean±SE: 114±4 vs. 125±5 at 24 h and 320±18 vs. 331±18 in total) and duration of diarrhoea (hour, mean±SE: 56±2 vs. 54±2). However, significantly fewer children required unscheduled intravenous fluid in the RO-ORS compared to WHO-ORS group. Although more children using RO-ORS than WHO-ORS (37±11 vs. 29±9) developed hyponatraemia (serum Na<130 mmol/L), the difference was not significant. The results of this study do not support the use of RO-ORS instead of the standard WHO-ORS as the single ORS therapy in diarrhoeal disease control programmes.

Reduced Osmolarity Oral Rehydration Solution in Children with Severe Persistent Diarrhoea

PI: S.A. Sarker

Funded by: USAID

Maintenance of fluid and electrolyte balance is an important part in the clinical management of persistent (>14 days) diarrhoea. The study compared the efficacy of a standard oral rehydration solution (WHO-ORS) with that of a reduced osmolarity ORS (RO-ORS) in a randomized, double-blind controlled clinical trial. Sixty children with severe persistent diarrhoea (stool output >80 mL.kg.day) were assigned to either WHO-ORS (mmol/L: sodium 90, potassium 20, chloride 80, citrate 10, glucose 111; osmolarity 311 mOsmol/L) or RO-ORS (mmol/L: sodium 60, potassium 14, chloride 57, citrate 6, glucose 80; osmolarity 217 mOsmol/L) for replacement of ongoing stool loss for seven days. Mean daily stool loss was significantly less ($p<0.05$) in children receiving RO-ORS than those who received WHO-ORS over the 7-day study period. Stool frequency in infants receiving RO-ORS was

also significantly less ($p < 0.05$) than those receiving WHO-ORS. There was no significant difference in ORS intakes between the groups. Both groups of children maintained normal serum electrolytes as determined on day 4 and 7. The findings of the study indicate that reduced osmolarity ORS is more effective than WHO-ORS for replacement of ongoing stool loss, and may be useful in the management of children with persistent diarrhoea.

Efficacy and Safety of a Reduced Osmolarity ORS with Low Sodium Concentration in the Treatment of Neonates and Young Infants with Acute Dehydrating Diarrhoea

PI: A.M. Khan

Funded by: USAID/Washington

This study is designed to compare the efficacy and safety of a reduced osmolarity oral rehydration solution (mmol/L: sodium 75, glucose 75, and osmolarity 245 mOsmol/L) and standard WHO-ORS (mmol/L: sodium 90, glucose 111, and osmolarity 311 mOsmol/L) in the treatment of neonates and young infants aged 0-2 months with acute dehydrating diarrhoea. In total, 96 children have been randomly assigned to one of the two groups. Stool output, intake of ORS, need for unscheduled IV fluids, duration of diarrhoea, and incidence of hyper- and hyponatraemia will be compared. The study is in progress.

Efficacy of a Reduced Glucose-ORS in the Treatment of Acute Watery Diarrhoea in Young Children

PIs: R.N. Mazumder and G.J. Fuchs

Funded by: UNICEF and WHO

Controversy about the ideal composition of an oral rehydration solution has not yet been resolved. In a recent multi-centre study, a hypotonic ORS (sodium 75 mEq/L, glucose 75 mEq/L) was not found to be superior to standard WHO/UNICEF-ORS (sodium 90 mEq/L, glucose 111 mEq/L), except in reducing the need for unscheduled intravenous fluid. In the present study, ORS has been modified to contain a reduced

amount of glucose (sodium 90 mEq/L, glucose 75 mEq/L) to evaluate its efficacy in reducing stool output and duration of diarrhoea compared to standard WHO/UNICEF-ORS. Children aged 1 to 24 month(s) with a history of watery diarrhoea of less than 72 hours duration attending the CRSC will be studied till cessation of diarrhoea. All intakes and outputs, including ORS, plain water, food, stool, urine, and vomitus, will be measured. On completion of the study, the key variables (stool in mL/kg, duration of diarrhoea, etc.) will be compared between the two groups. A total of 30 of the programmed 160 children already completed the protocol.



A physician of the Clinical Sciences Division is examining a patient who has recovered from diarrhoea and is ready to go home

Efficacy of a Reduced Glucose-ORS in Adult Patients with Cholera

PIs: R.N. Mazumder and G.J. Fuchs

Funded by: UNICEF and WHO

A recently completed trial at ICDDR,B of a hypotonic ORS for the treatment of adults with cholera has been shown to be associated with increased development of hyponatraemia compared to standard WHO/UNICEF-ORS. This double-blind, randomized trial is being conducted to determine the efficacy of an ORS with a reduced amount of glucose compared to standard WHO/UNICEF-ORS. Adults with severe dehydrating cholera attending the ICDDR,B treatment centre in Dhaka are enrolled for the study. All intakes and outputs, including ORS, plain water, food, stool, urine, and vomitus, are measured. All patients also receive oral erythromycin. Outcome measures, including stool volume, duration of diarrhoea, and the need for unscheduled IV fluids will be compared between the groups. Of the 252 estimated patients to be enrolled, 60 patients have been studied so far.

Effect of a Soluble Fibre (Partially Hydrolyzed Guar Gum)-supplemented Oral Rehydration Solution in the Treatment of Acute Non-cholera Diarrhoea in Children

PIs: N.H. Alam, R. Meier, and K. Gyr

Funded by: SANDOZ Nutrition, Switzerland

The effect of WHO/UNICEF standard ORS supplemented with a soluble fibre, partially hydrolyzed guar gum (Sun Fiber, Novartis Nutrition, Bern, Switzerland), was compared with the standard ORS without the fibre (control) in the treatment of acute non-cholera diarrhoea in children aged less than 2 years. Children receiving the fibre-containing ORS had reduced duration (h) of diarrhoea compared to the controls (mean±SEM, 74±4 vs. 90±6, p=0.03). Total stool weight till recovery was also significantly less in the fibre group than the control children (mean±SEM: 370±46 vs. 507±64 g/kg body wt., p=0.03). It is concluded that soluble fibres have therapeutic potential as an adjunct to standard ORS in the treatment of acute diarrhoea in children.

Pharmacologic Therapy

Comparison of Erythromycin, Ampicillin, and Tetracycline in the Treatment of Cholera in Children

*PIs: S.K. Roy, A. Islam, R. Ali, K.E. Islam, R.A. Khan, S.H. Ara, N.M. Saifuddin, and G.J. Fuchs.
Funded by: ICDDR,B*

A double-blind, randomized four-cell trial was conducted to compare a three-day course of ampicillin, erythromycin, or placebo with tetracycline in the treatment of 184 children with cholera aged 1-5 year(s) and having weight-for-age greater than 80%. Clinical recovery rates at 96 hours were: 91% in ampicillin ($p=0.16$), 96% in erythromycin ($p=0.40$), and 75% ($p=0.001$) in placebo groups compared to tetracycline (100%). This study indicates that, where antimicrobial sensitivity patterns of *Vibrio cholerae* allow, ampicillin can be used as an effective and inexpensive alternative antibiotic for treatment of cholera.

Evaluation of Chicken Egg Yolk Immunoglobulin (IgY) in the Treatment of Diarrhoea Due to Rotavirus

*PIs: S.A. Sarker, T. Casswall, and L. Hammarstrom
Funded by: Swedish Academy of Research and Cooperation (SAREC)/Karolinska Institute, Sweden*

Rotavirus is an important cause of morbidity and mortality in children throughout the world. This study aims at determining whether passive immunity using orally-administered egg yolk globulin can affect the clinical course of rotavirus diarrhoea in infants and children.

This is a randomized, double-blind, placebo-controlled clinical trial in which children are assigned to one of the two treatment groups: chicken egg yolk immunoglobulin (IgY) from immunized hens or IgY obtained from non-immunized hens (placebo). Stool output and frequency and clearance of faecal rotavirus will be compared between the two groups. If immunized IgY is found effective, this might have potential as a simple and economic approach in the management of rotavirus diarrhoea. Of the 90 required cases, 40 children have been enrolled so far.

Evaluation of Hyper-immune Bovine Colostrum (HBC) in Children with Rotavirus Diarrhoea

*PIs: S.A. Sarker and G.J. Fuchs
Funded by: North Field Laboratories Pty Ltd., South Australia*

Rotavirus is an important enteropathogen responsible for diarrhoea in infants and children, leading to a million deaths annually. Although oral rehydration therapy is safe and effective in most children with diarrhoea, it does not substantially reduce diarrhoeal severity and duration. This has resulted in the use of drugs that are ineffective and potentially harmful.

The use of hyper-immune bovine colostrum (HBC) in human has been shown to be effective as a prophylaxis against enteric infections. The purpose of this double-blind, placebo-controlled study is to investigate the efficacy of an orally-administered anti-rotavirus HBC in children with rotavirus diarrhoea. Of the 160 required cases, 110 children have been studied so far. If found efficacious, HBC therapy has the potential to be a safe, therapeutic intervention in children with rotavirus diarrhoea.

Efficacy and Safety of Ciprofloxacin in the Treatment of Childhood Shigellosis

*PIs: M.A. Salam, U. Dhar, W.A. Khan, and M.L. Bennis
Funded by: New England Medical Center, Boston, USA*

The efficacy and safety of ciprofloxacin was assessed in children with shigellosis. Children aged 2-15 years received either ciprofloxacin suspension (10 mg/kg, 12 hourly) or pivmecillinam tablets

(15-20 mg/kg, 8 hourly) for 5 days. Safety was evaluated in a total of 141 children (70 ciprofloxacin, 71 pivmecillinam) and clinical and bacteriologic efficacy determined in a subgroup of 120 children (60 in each group). Therapy was clinically successful in 48/60 (80%) children in the ciprofloxacin and 39/60 (65%) in the pivmecillinam group ($p=NS$); and bacteriologically successful in 60/60 (100%) children in the ciprofloxacin and in 54/60 (90%) in the pivmecillinam group ($p=0.03$). Arthropathy was not observed in any of the study children. It is concluded that the clinical efficacy of ciprofloxacin is similar, and the bacteriologic efficacy better than that of pivmecillinam, and that a 5-day course of ciprofloxacin is well-tolerated in children.

Single Dose Versus Conventional Three Divided Doses of Parenteral Gentamicin in Severely Malnourished Children with Sepsis

PIs: A.M. Khan and G.J. Fuchs

Funded by: USAID

A prospective, open, randomized clinical study has been conducted to compare the efficacy and safety of a daily single dose versus the conventional three divided doses of parenteral gentamicin in malnourished children. The effect of malnutrition on the pharmacokinetics of the daily single dose of gentamicin will also be determined. One hundred and fifty six malnourished children and 20 non-malnourished children aged 1 to 5 year(s) of either sex with sepsis and in which gentamicin is indicated will be randomly assigned to one of the two treatment schedules. Clinical and laboratory parameters as well as gentamicin-related toxicity evaluated by renal, auditory and vestibular function assessment will be compared. The results of this study are expected to have significant implications for the treatment of severely malnourished children.

Pathophysiology Research

Immunological Effects of Vitamin A and Zinc in a Placebo-controlled 4-cell Trial

PIs: S.K. Roy and T. Azim

Funded by: USAID

To evaluate the immunological effects after administration of vitamin A and to compare this with a known immunopotential mineral zinc, a randomized, double-blind study was conducted in 147 healthy children aged 1-3 years with a weight-for-age between 61 and 75% of the NCHS standard. Each group (n=35) received 200,000 IU vitamin A or 40 mg elemental zinc or both or placebo over 7 days. Proliferation of peripheral blood mononuclear cells in response to PHA, CON A and PWM stimulation was similar in all groups. However, granulocyte polarization was enhanced only after zinc supplementation. Data analysis is in progress.

Neurologic Manifestations of Shigellosis in Children

PIs: W.A. Khan, M.A. Salam, and M.L. Bennish

Funded by: ICDDR,B

To define the neurologic manifestations of shigellosis, 792 consecutive children aged <15 years admitted to Dhaka hospital of ICDDR,B were studied. Of them, 654 (83%) had normal mentation, 73 (9%) were unconscious, 41 (5%) had seizures, and 24 (3%) had an alleged history of seizure at home but without neurologic abnormalities during hospitalization. Children who developed seizures in hospital had a significantly higher median weight-for-age (67% vs. 57% of the NCHS median), higher median body (rectal) temperature (38.7°C vs. 37.9°C), lower mean serum sodium (126 mmol/L vs. 129 mmol/L), and were more frequently bacteraemic (27% vs. 12%) and hypoglycaemic (36% vs. 17%) compared to the children with normal mentation. Thirty-five (48%) of the unconscious children died in the hospital compared to 12 (29%) with seizure, 36 (6%) of the children with normal mentation, and none of the 24 children with only history of seizure at home ($p=0.081$, <0.001 , and <0.001 respectively). Both altered consciousness and seizures were associated with death in children with shigellosis. Prompt control of fever and correction of metabolic abnormalities might reduce the incidence of this potentially lethal complication.

Assessment of Glucose Malabsorption from Oral Rehydration Solutions Using D2-glucose in Young Children with Acute Watery Diarrhoea

PIs: R.N. Mazumder and G.J. Fuchs

Funded by: UNICEF and WHO

The optimum concentration of glucose in ORS has not yet been determined. The current standard formulation of ORS containing 111 mmol/L glucose is suspected to be a cause of high stool output and prolongation of diarrhoeal illness due to glucose malabsorption. Several studies have documented glucose malabsorption in children with acute diarrhoea, but it is unknown whether malabsorbed glucose comes from ORS or from food. To answer this question, ORS was labelled with the stable isotope glucose [D2] and balance studies performed in 34 children aged 1-24 month(s) with a history of watery diarrhoea for less than 72 hours. All intakes and outputs, including ORS, plain water, food, stool, urine, and vomitus, were measured. Samples were analyzed by gas chromatography and mass spectrometry. Data analysis is in progress.

Effects of Simultaneous Administration of Zinc and Vitamin A on the Bioavailability of Vitamin A in Children

PIs: M.M. Rahman and J.O. Alvarez

Funded by: Thrasher Research Fund through UAB, Alabama, USA

A randomized, double-blind, placebo-controlled, community-based trial is being conducted to evaluate the effect of simultaneous zinc and vitamin A administration on serum RBP and retinol,

morbidity due to diarrhoea and respiratory tract infections, and growth. Children aged 1-3 year(s) are randomly allocated to receive either 20 mg elemental zinc daily for 14 days or 200,000 IU vitamin A (single dose), both vitamin A plus zinc, or placebo. Blood samples will be collected on day 1, day 21, and after 3 months. Morbidity information will be collected weekly and anthropometric measurements will be recorded once monthly for 3 months and again on the 6th month. Enrolment of 800 subjects has been completed, and weekly follow-up is in progress.

Effect of Iron Supplementation on Growth and Intestinal Permeability of Iron-replete and Iron-deplete Children

PIs: T. Ahmed and G.J. Fuchs

Funded by: USAID

Iron-deficient children have impaired growth that can be corrected by iron supplementation. However, it has been reported recently that iron supplementation in iron-replete children has an adverse effect on growth. If confirmed, this will have major implications for iron supplementation programmes. This community-based study is investigating the effects of iron supplementation on growth and intestinal permeability in both normal and iron-deplete children. Endocrine and bone metabolism markers of growth and intestinal permeability will be determined before and one month after starting iron supplementation in 30 iron-deficient and 30 iron-replete children aged 1-5 year(s) without severe malnutrition. Growth will be monitored monthly for four months.

In total, 184 children have been screened so far on the basis of haemoglobin, serum ferritin, and serum transferrin receptor. Twenty-seven children fulfilling the criteria of the study have been enrolled. The study is expected to be completed by June 1998.

Does Helicobacter pylori Infection Cause Iron-deficiency Anaemia and Iron Treatment Failure in Children of Bangladesh?

PIs: S.A. Sarker and G.J. Fuchs

Funded by: National Institutes of Health (NIH)

The study will test the hypothesis that *H. pylori* (Hp), by causing gastritis and low acid output, interferes with iron uptake—a process that requires acid. The study proposes to investigate the role of Hp infection as a cause of iron-deficiency anaemia and treatment failure of iron supplementation in children of Bangladesh. A prospective, randomized, double-blind, placebo-controlled field trial is designed among five groups of children aged 2-5 years (65 in each group) with iron deficiency anaemia (IDA).

Children with Hp infection (four groups) and without Hp infection (one group) have been selected. Hp-infected children with IDA will be assigned to one of the four treatment groups: anti-Hp therapy alone, anti-Hp therapy plus iron, iron alone, or placebo. Children with IDA but without Hp infection (fifth group) will be treated with iron. Haemoglobin, serum ferritin, serum transferrin receptor concentrations after one month and three months will assess the effects. A subgroup of twenty children will be studied to assess iron absorption with application of double



Dr. Shafique A. Sarker (5th from left) is discussing about a patient to the doctors participating in an international course on the Clinical Management of Diarrhoeal Diseases

stable isotope technique and gastric acid output before and after Hp treatment. The results of the study are expected to have implications for the treatment and prevention of iron deficiency anaemia in children of the developing countries.

Study of Immune Disruption Caused by Measles and Its Association with Clinical Progress in Dhaka, Bangladesh

PIs were: S.M. Akramuzzan, F. Cutts, and V. ter Meulen

Funded by: European Union

This study investigated the potential association of acute measles with delayed morbidity and the role of preferential activation of type 2 T helper cells (TH2) as an underlying biological mechanism for delayed morbidity after measles. One hundred and thirty-seven acute measles cases and an equal number of age-matched controls were recruited from a peri-urban community, and 117 complicated measles cases and the same number of controls with other diseases were recruited from the hospital. Morbidity was monitored by weekly follow-up visits for 6 months after recruitment. Measles infection was confirmed by serology. Preferential activation of TH2 was evaluated by comparing response to DTH skin tests, responses to 3 doses of hepatitis B vaccine, and IFN-gamma and IL-5.

On the subsamples of measles cases and the controls aged 6-18 months (n=25 per group) and on two groups of children given measles vaccine at 6 and 9 months of age (n=25 in each age group), the study measured the lymphoproliferative response to stimulation with measles virus and cytokine profiles on supernatants of cultured peripheral blood mononuclear cells (PBMCs). The consequences of down-regulating CD46 and moesin on the surface of primary or persistently infected tissue culture cells on cell function will be determined. Data analysis is in progress.

Roles of Endotoxin, Cytokines, and Shiga Toxin in the Pathogenesis of Shigellosis

PIs: M.L. Bennish, M.A. Salam, and W.A. Khan

Funded by: USAID

Serum concentrations of endotoxin and cytokines, and stool concentration of Shiga toxin were compared in children with shigellosis with or without haemolytic uraemic syndrome (HUS) or leukaemoid reaction (LR). One hundred and fifty-seven children with shigellosis and 103 children with watery diarrhoea not due to *Shigella* (WD) were studied. Of the 157 children with shigellosis, 26 (17%) developed HUS, 36 developed LR, and 65 children infected with *S. dysenteriae* type 1 and 30 children infected with other species of *Shigella* developed neither HUS nor LR. Compared to children with WD, the mean peak endotoxin (5.0 vs. 0.51 units/mL, $p < 0.001$) and cytokine concentrations were significantly higher in children with shigellosis, and the highest in children who developed HUS. Among children with shigellosis, Shiga toxin was more frequently detected in stool samples of children who were infected with *S. dysenteriae* type 1 but had not developed HUS or LR.

Intestinal Transport of Different Electrolyte Solutions Across Small Intestine of Rabbit *in vitro*

PIs: S. Islam, G.J. Fuchs, and G.H. Rabbani

Funded by: USAID

Experiments were conducted to determine the relative effect of different electrolyte solutions in optimizing intestinal absorption of water and electrolytes. Five different types of ORSs containing high and low sodium and also different concentrations of carboxymethyl cellulose (CMC) were perfused in fifty-centimetre segments of rabbits ilea. Mean \pm SEM of water and sodium absorption with high sodium vs. low sodium was: 1.53 \pm 0.11 vs. 1.59 \pm 0.09 L/min/g of dry intestine (NS) and 0.24 \pm 0.21 vs. 0.58 \pm 0.09 M/min/g (NS) respectively. Secretion of water and sodium was observed when rabbits were perfused with electrolyte solutions containing different concentrations of CMC.

Water and sodium secretion from an electrolyte solution with 5 g/L CMC was significantly different ($p=0.01$ and 0.0004) compared to sodium with 10 g/L CMC. It was concluded that high and low sodium concentrations and addition of CMC to ORSs have no additional promoting effect on water and electrolytes transport across rabbit small intestine.

Invasive Properties of *Vibrio cholerae* O139 Bengal in a Rabbit Model: A Preliminary Study

PIs: A.M. Khan and G.H. Rabbani

Funded by: USAID

Because excessive faecal leukocytes have been observed in patients with *V. cholerae* O139 Bengal, experiments were conducted to investigate potential invasive properties of *V. cholerae* O139 Bengal. Six adult New Zealand white rabbits were used. Closed intestinal loops of 10 cm length were constructed using standard surgical procedures. The loops were inoculated with two millilitre per loop of live culture (bacterial count: 109/mL) of *V. cholerae* O139. Two loops were constructed in the small intestine of an additional rabbit. One loop was exposed to *V. cholerae* O139 and the other (control) to bacteria-free culture medium. After 18 hours, inflammatory changes were noted in the intestinal mucosa of all rabbits. Blood cultures revealed the growth of *V. cholerae* O139 in one animal, suggesting mucosal invasion followed by bacteraemia. While the gut wall of the control loop showed no signs of inflammation, definite signs of inflammation were present in that of the challenged one. These preliminary observations suggest that some strains of *V. cholerae* O139 may have invasive properties in rabbits.

Evaluation of Rice Fraction as an Antisecretory Component in Small Intestinal Loops in Rabbit *in vivo*

PIs: G.H. Rabbani, S. Islam, and G.J. Fuchs

Funded by: UNDP

Experiments were carried out to evaluate the antisecretory activity of a low-molecular-weight rice fraction in cholera toxin-treated small intestine of rabbit. A specific fraction of rice extracted from cooked rice powder by Hamilton et al. of McGill University, Montreal, has been shown to inhibit the response of intestinal epithelial crypt cells to adenosine cyclic monophosphate, a major intracellular mediator of secretion. Before proceeding to test in humans with cholera, these materials were tested using small intestinal loops in rabbits at ICDDR,B. A significant reduction in response to cholera toxin was observed in intestinal secretion, and a significant difference was found between the cholera loops and the control ($p=0.000$). Under none of the experimental conditions tried, and at no dose used ($p<0.025$) did the rice fraction reduce cholera-induced fluid accumulation. The reasons for not finding the true effect may be due to the use of a very short ligated loops and a small sample size. The study concludes that a better physiologic method and an increased sample size may give a favourable results.

Increased Nitrite Concentrations in Urine and Serum of Children with Shigellosis and Cholera

PIs: G.H. Rabbani, G.J. Fuchs, S. Islam, A.K. Chawdhury, A. Rahman, and M. Miller *Funded by: USAID*

Nitric oxide (NO) is an important central regulator of cell functions in many organs, including the gastrointestinal tract. Intestinal epithelia can synthesize NO which regulates splanchnic blood flow, motility, and ion transport. Although elevated concentrations of NO and its metabolites have been found in ulcerative colitis and Crohn's disease, very little information is available on the role of NO in enteric infections, including shigellosis and cholera. In this study, the concentrations of nitrite, a stable metabolite of NO was quantified using the Griess reaction in urine and serum of 24 patients aged 1-5 year(s) [10 shigellosis, 14 cholera]. Assessment was done on admission to hospital with acute diarrhoea and repeated at early convalescence period after 3-7 days of specific antimicrobial therapy. In children with shigellosis, urinary nitrite excretion (nM/mg creatinine) significantly increased during acute illness compared to early convalescence period

[median (range): 7061 (1046-18,264) vs. 4316 (2369-12,428), $p < 0.05$]. Serum nitrite concentration (micromol/L) also increased during acute illness compared to convalescence period [206 (159-214) vs. 104 (102-273), $p < 0.05$]. Similarly, in children with cholera, urinary nitrite excretions were elevated ($p < 0.05$) during acute illness [5450 (2250-7420) vs. 2225 (1220-3650)], but serum values were not different [458 (235-680) vs. 370 (170-695)]. These results indicate that NO production is increased both in acute shigellosis and cholera, more markedly in the former infection most probably as a reflection of colonic inflammation. The results also indicate a possible role of NO in the pathophysiology of shigellosis and cholera. Further, urinary nitrite excretion might be a useful marker of severity of these infections.

Helicobacter Pylori Infection As a Risk Factor for Acute Diarrhoea and Persistent Diarrhoea

PIs: P.K. Bardhan and S.A. Sarker

Funded by: USAID

Helicobacter pylori infection is a major cause of gastritis and hypochlorhydria, a known risk factor for enteric infections. In this prospective, clinic-based, case-control study, 100 children of either sex aged 4-36 months with diarrhoea for less than 3 days and 100 children with persistent diarrhoea for more than 15 days were examined. Control children matched for age and sex ($n=300$) were selected from the same neighbourhood and community as the cases. The severity of illness was ascertained by clinical history and physical examination, whereas *H. pylori* was determined by ¹³C-urea breath tests. Enrolment of cases and controls has been completed and data analysis is ongoing. A report of the results will be available in mid-1998.

Bioelectrical Impedance Analysis to Assess Fluid Distribution on Rehydration in Patients with Diarrhoea

PIs: M.I. Hossain and M.A. Khaled

Funded by: USAID and ICDDR,B

To estimate the intra- and extra-cellular body water compartments during rehydration of patients with cholera and non-cholera diarrhoea by a dual frequency bioimpedance analyzer (BIA), 30 adults with acute watery diarrhoea were studied. Total body water (TBW), intra-cellular water (ICW), and extra-cellular water (ECW) were measured at different phases of rehydration. Fluid compartments between cholera and non-cholera patients were compared. Cholera patients gained more TBW than non-cholera patients during recovery. Unlike patients with non-cholera diarrhoea, the gain in cholera patients was mainly contributed by the ICW [(mean \pm SD: 1.5 \pm 1.6 L vs. 3.0 \pm 1.2 L respectively, $p < 0.01$]. It was also observed that the recovery of ICW compartment in cholera patients occurred rapidly within the first two hours after infusion. Differential dynamics of body water compartments in cholera compared to non-cholera patients as observed in this study may contribute to understanding the mechanism of dehydration in diarrhoeal disease which might be helpful for improved case management. For a better understanding of fluid distribution in different hydration status, a multi-frequency BIA is now being used. In total, 19 patients have been enrolled into the new protocol so far.

Preventive/Maternal Child Health Research

Dietary Fat and Infection: Relationship with Vitamin A Status of Women and Their Infants

PIs: G.J. Fuchs and D.S. Alam

Funded by: Opportunities for Micronutrient Intervention (OMNI)/USAID

Increased intake of dark green leafy vegetables (DGLV) is promoted globally as a sustainable method to improve vitamin A (VA) status in developing countries. However, recent evidence indicates concern that this approach fails to improve VA status as predicted. Dietary fat, essential for maximal utilization and absorption of ingested provitamin A from DGLV, is extremely low in the same populations with VA deficiency around the world. Various types of infection also have the potential to inhibit VA absorption or increase urinary excretion of VA thereby worsening VA status.

A study done in collaboration with PHSD has been completed to investigate the effect of increasing dietary fat in pregnant and lactating women on VA status. The impact of infection is also being studied. Breastmilk and VA status of their infants as related to maternal dietary fat and infection will be assessed.

In this study, 676 pregnant women were enrolled to receive supplemental dietary fat during pregnancy and the first six months of lactation. Longitudinal assessment of provitamin A intake, quantification of dietary fat, retinol/carotenoids concentration of maternal/infant plasma and breastmilk, maternal/infant anthropometry, and assessment of maternal and infant morbidity due to infections including parasitosis have been completed. Data analysis is in progress.



A health worker is providing nutrition education to a group of mothers in the hospital

Evaluation of the Impact of a Home Gardening Programme in Rural Bangladesh

PIs: G.J. Fuchs, A.S.G. Faruque, and M. Khan

Funded by: Office of Nutrition, USAID

Vitamin A (VA) deficiency is a serious public health concern with long-term health and social consequences. The Helen Keller International (HKI) has an ongoing USAID-supported home gardening programme to promote the production and consumption of vegetables in rural Bangladesh. Home gardening should increase the supply of food within the household, increase income, and increase the quality of food consumed. This formed the premise that the home gardening programme would increase vegetable production in the home plot and reduce the vitamin A deficiency in household members. However, recent studies have suggested poorer-than-predicted efficacy of increased intake of dark green leafy vegetables (DGLV) to improve VA status, perhaps due to poorer-than-predicted bioavailability of preformed VA in the DGLV. It is, therefore, critical that the impact of the HKI Home Gardening Project be quantified. In this project, jointly undertaken by CSD and PHSD, both quantitative and qualitative research methods will be used for assessing the overall impact of the programme on: (a) vitamin A status of household members; (b) consumption of vegetables within the household, especially by young children, women of childbearing age, and lactating mothers; (c) income of the household; (d) effects on social structure and gender relations; (e) sustainability of HKI-introduced home gardening; and (f) nutritional status of young children and women of childbearing age. Approximately, 4,000 young children and women from the study and the control areas and from the randomly-selected HKI programme areas throughout Bangladesh will be enrolled. The project is in progress and is expected to be completed during 1998.

Zinc Supplementation during Pregnancy and Infancy: Effect on Birth-weight, Morbidity, Immunity, and Growth

PIs: S. Osendarp and G.J. Fuchs

Funded by: The Royal Netherlands Government and USAID

The effect of zinc supplementation during pregnancy on birth outcome was investigated in 559 poor urban women in a double-blind, placebo-controlled trial. Women were enrolled between 12 and 16 weeks' gestation and randomly assigned to receive either 30 mg elemental zinc/day or placebo till delivery. No differences were observed between 410 singleton infants in the zinc-supplemented and placebo-supplemented mothers in birth-weight or gestational age. In total, 357 infants completed the weekly follow-up from birth till 6 months postpartum for morbidity assessment and monthly anthropometrics. The immune response to BCG will also be evaluated. An additional cohort of infants was supplemented with 5 mg elemental zinc/day or placebo from 4 weeks till 6 months of age. The infants were vaccinated with oral polio vaccine and the combined DTP-*Haemophilus influenzae* type b (Hib) vaccine. A subsample was vaccinated with a 7-valent Pneumococcal polysaccharide conjugate vaccine. At 1 and 6 month(s) postpartum, sera were assayed for antibodies to all the vaccines. A total of 180 infants completed the follow-up, and analysis is in progress.



A nurse in a slum area of the Dhaka city, on her way to the residence of a mother-infant pair participating in the zinc and immunity study

Anaemia in Female Tea-garden Workers Using Different Methods of Haemoglobin Measurement

PIs: A.S.G. Faruque, L. Kiess, and G.J. Fuchs.

Funded by: USAID

ICDDR,B and Helen Keller International are engaged in a collaborative study to characterize the prevalence and aetiologies of anaemia and to assess a novel iron supplementation strategy. The HemoCue has been promoted as an accurate, simple, and inexpensive field device to measure haemoglobin. The study, therefore, compared three different methods: the cyanmethemoglobin, HemoCue, and haematocrit, to measure the haemoglobin in venous blood from a population of female workers in the tea garden area of Sylhet, Bangladesh.

Mean \pm SD haemoglobin concentrations (g/dL) of 90 women were: 12.9 \pm 2.2, 13.2 \pm 1.7, and 11.1 \pm 1.9 by cyanmethemoglobin, haematocrit (using a conversion factor), and HemoCue methods respectively. Both HemoCue and haematocrit methods significantly ($p=0.001$) correlated with cyanmethemoglobin method ($r=0.79$ and 0.81 respectively). Thirty-eight percent, 21%, and 69% of the women were anaemic (Hb <12 g/dL) by cyanmethemoglobin, haematocrit, and HemoCue method respectively. The HemoCue method had a sensitivity of 97%, specificity of 48%, and positive predictive value of 53%. Haematocrit method had a sensitivity of 47%, specificity of 94%, and positive predictive value of 84%. Compared to the cyanmethemoglobin method, the haematocrit method was superior to the HemoCue, particularly in terms of their positive predictive values. Thirty-nine percent, 42%, and 18% of the women were infected with hookworm, *Ascaris lumbricoides*, and *Trichuris trichiura* respectively. As expected, the prevalence of anaemia was greater among the hookworm-infected women than those with

ascariasis or *Trichuris* infections. None was positive for malarial parasite in the blood. The HemoCue method to quantify haemoglobin concentration appears to overestimate the prevalence of anaemia significantly in our population. It is concluded that the use of this method for population surveys and research should be reconsidered.

Clinical Significance and Risk Factors of Bacteraemia Due to *Acinetobacter* sp. in Diarrhoeal Patients

PIs: M.I. Hossain and G.J. Fuchs

Funded by: ICDDR,B

A previous study done by M.I. Hossain and G.J. Fuchs showed that *Acinetobacter* bacteraemia was associated with increased morbidity and mortality in patients admitted to the hospital. The present study aims at identifying risk factor(s) of *Acinetobacter* bacteraemia in diarrhoeal patients using an age-sex-matched case-control design. In total, 129 diarrhoeal patients admitted to hospital in 1996, with *Acinetobacter* sp.-positive blood culture and control patients without any bacteraemia were enrolled. Data analysis is in progress. The results of this study are expected to lead to the development of intervention strategies to reduce mortality in these patients.

Effects of Zinc Supplementation during Pregnancy or in Infancy on the Mental Development of Infants

PIs: J. Hamadani and S. Grantham-McGregor

Funded by: UNICEF

The objective of this study is to determine the effect of zinc supplementation vs. placebo during pregnancy or in early infancy on psychomotor development and behavioural change. Psychomotor development and behaviour of 600 infants will be assessed using Bayley Scales of Infant Development for psychomotor development and a modified version of Bayley and Wolke procedure. A modified version of the Bettye Caldwell Home Inventory, which includes questions and observation items, will be used for the assessment of psychosocial stimulation. Approximately, 400 of the 600 infants have been enrolled.

Importance of Nosocomial Transmission of Measles and Validation of a Salivary IgM Assay for Diagnosis of Recent Measles Infection

PIs: S.M. Akramuzzaman

Funded by: Swiss Agency for Development and Cooperation (SDC)

This was a hospital-based case-control study to determine the risk of acquiring measles through nosocomial transmission. One hundred and ninety-eight confirmed measles cases aged 6-59 months, and 708 age-matched controls with other diseases were recruited in hospitals. Measles diagnosis was confirmed by serum IgM assay. On a subsample of the cases, saliva was collected for validation of salivary IgM assay against serology. Preliminary results show that hospital visit is an important risk factor for measles transmission.

Evaluation of a Newly-designed Osmotic Bag for Preventing Water Contamination of ORS and Therapeutic Milk during Preparation

PIs: S.K. Roy, C. Marshall, L. Sealby, A.J. Seal, and A. Tomkins

Funded by: UCB Osmotic Ltd., UK

A modified, semi-permeable, cellophane membrane has been developed and incorporated into a unique duplo-sachet system designed for the production of microbiologically safe ORS and therapeutic milk. For the assay of bacterial exclusion sachets were hydrated in water containing 10⁶ cfu/mL of *E. coli* for 7 hours. No coliforms were detected in the bag contents. Biochemical analysis of reconstituted product has revealed acceptable ionic composition and osmolality.

Impact of Peer Counsellors on Infant-feeding Practices of Mothers in the Urban Community

PIs: R. Haider, A. Ashworth, I. Kabir, and S.R.A. Huttly

Funded by: Swiss Agency for Development and Cooperation (SDC)

More than 90% of the mothers in Bangladesh have home deliveries and are not counselled on the importance of exclusive breast-feeding, resulting in early complementary feeding and increased infant illness. The objectives of this study are to assess the impact of mothers trained as peer counsellors in the urban community in supporting other mothers to: (a) achieve exclusive breast-feeding in the first five months of the baby's life, and (b) start appropriate complementary feeding at the onset of the sixth month. Forty localities in Dhaka were randomly classified as control and intervention areas. In the latter areas, 20 mothers were trained as peer counsellors who were responsible for counselling pregnant women in their neighbourhood and following them after delivery until the babies are one year old.

In total, 726 mothers have been enrolled in this project. Preliminary analysis indicate that significantly more mothers who received peer counselling achieved exclusive breast-feeding compared to the mothers who did not receive counselling.

Clinical Research and Service Centre

Chief Physician: M.A. Salam

A total of 114,987 patients attended the Clinical Research and Service Centre (CRSC) in 1997, which was 6421 (5.9%) higher than that in 1996. Due to consistent higher number of patient visits, pavilion on the south side of the CRSC remained busy in 1997. Of the total 114,987 patients, 62,250 (54.1%) required admission into the Short Stay Ward (SSW), 72% of whom were discharged within 24 hours; 4,969 (4.3%) were admitted into the General and Special Care Wards (GW and SCW) who were hospitalized for an average of 4.6 days; and 558 (0.5%) were admitted in the Clinical and Metabolic Study Wards of the CRSC under a total of 18 research protocols. Out of the 4,969 patients admitted in the GW and SCW, 292 (5.9%) died; and out of the 62,250 patients admitted into the SSW, 27 (0.04%) died. The overall death in the hospital was 0.28% compared to 0.35% in the previous year. An additional 17 persons were found dead on arrival at the CRSC compared to 25 in 1996.

Of the 5,531 patients admitted into the inpatient wards, excluding SSW, *V. cholerae* O1 was isolated from 1,148 (20.8%), *V. cholerae* O139 from 59 (1.1%), *Shigella* from 462 (8.4%) and *Salmonella* from 409 (7.4%) patients.

A total of 90,533 litre of intravenous and 481,367 litre of oral rehydration fluids (ratio 1:5.3) were used at the CRSC during 1997.

Travellers' Clinic

Coordinator: N.H. Alam

A total of 105 patients attended the clinic for consultation in 1997. As in the previous years, the clinic also processed several hundred clinical specimens submitted by various individuals and clinics within Dhaka for clinical pathology, microbiological investigations and biochemical tests, among others. Additionally, 31 endoscopic, 50 sigmoidoscopic examinations and vaccination of 257 individuals were performed by the clinic in 1997. Planning is in progress for modification and expansion of the Travellers' Clinic.

Clinical Research

Although research is done in all the wards of the CRSC, there are special research wards with support staff who have the expertise to implement more complex protocols. Various studies are conducted in the 15-bed Clinical Research Ward, including studies on the pathophysiology of diarrhoeal and other diseases, improved case management, development of improved ORS, vaccine studies, and therapeutic interventions in diarrhoeal diseases, development of therapeutic diets, among others.



Dr. Shahadat Hossain of CSD is examining a patient in the Short Stay Ward at CRSC

The Metabolic Research Ward has 12 beds for metabolic and nutrition balance studies. Research projects conducted in this ward include those designed to improve understanding of the nutritional impact of diarrhoeal diseases and to develop nutritional intervention strategies. It is expected that these studies will increase the knowledge of the pathophysiology of the complications seen in association with nutritional and diarrhoeal diseases and provide the basis for new and innovative interventions.

In total, 558 patients were admitted into the research wards under 18 different research protocols in 1997. They were hospitalized for an average of 3128 days.

Nursing Programme

Sixty-eight nursing personnel are currently working at CRSC: two nurse consultants, four nursing officers, 32 senior staff nurses, six assistant nurses, nine aid nurses and 15 fellow nurses. The overall goal of the programme is to establish the highest possible quality of nursing care at the CRSC and thus to contribute to meeting the aims of CSD.

Nurses receive patients, assess their conditions on arrival and refer them to appropriate wards/sections of the CRSC. Throughout the hospital stay, nurses provide comprehensive care, giving special emphasis on the assessment of hydration status and provision of fluid therapy. Nurses also participate in implementing research protocols and patient education, such as promotion of breast-feeding and growth monitoring.

As a part of the staff development programme, nurses underwent training programmes on breast-feeding (15), training on Dehydration Assessment (4), HIV/AIDS counselling (2), English language (16), infection control (2), ORS orientation (55), Trainers Training on HIV/AIDS (1), and Universal Precautions (6). An orientation for ten Fellow Nurses was also conducted at CRSC.

Nursing research activities initiated in 1997 included: incidence of needle stick injuries, time and motion study of nursing staff and nursing skills and attitudes at ICDDR,B.

Child Health Programme

Coordinators: T. Ahmed and M.A. Salam

Based upon the concept of "missed opportunities" it is possible to offer preventive healthcare services to children and their mothers in the curative setting of the hospital. With this background, the Child Health Programme (CHP) provides preventive as well as curative healthcare services to children and their mothers attending the CRSC. The services include: health education, immunization, nutritional rehabilitation of severely malnourished children, growth monitoring and family planning. The programme also conducts research and training with financial assistance from UNICEF.

During the year, 25,818 health education sessions were conducted with mothers and female attendants of patients on home management and prevention of diarrhoea, nutrition and importance of immunization, covering an estimated 154,908 persons. In total, 6,653 children aged less than 2 years (99% of the eligible children) were immunized against 6 vaccine-preventable diseases, making CRSC the largest immunization site in Bangladesh. Tetanus toxoid was administered to 19,123 women of childbearing age.

Nearly 80% of all children treated at the CRSC were malnourished. Among the most severely malnourished, 232 children were treated in the inpatient Nutrition Rehabilitation Unit (NRU), where a standardized feeding protocol is used with inexpensive, locally-available diets. In total, 1,582 severely malnourished children were treated in the outpatient nutritional follow-up unit of the programme.

Since birth spacing increases the ability of the mother to take care of her child, the programme provided family planning services to 221 parents of children attending the hospital. Orientation on activities of the programme and its importance as a model for primary healthcare is a part of the Centre's scheduled training courses. Trainees over the last one year included physicians from the USA and Bangladesh, medical students from Japan, Canada and the UK, and community nurses from the Maldives and from within the Centre.

Operations Research Programme of the Bangladesh Integrated Nutrition Project (BINP)

Programme Director: G.J. Fuchs

ICDDR,B recently agreed to coordinate and conduct the operations research component of the Bangladesh Integrated Nutrition Project (BINP) with the Government of Bangladesh. Two years ago, the Government of Bangladesh initiated the World Bank-funded BINP and is currently being operational in 6 thanas with an immediate extension to 17 other thanas. The BINP is a comprehensive, nationwide project to reduce malnutrition among children aged less than two years and Bangladeshi women through community-based nutrition interventions and comprehensive national and intersectoral initiatives for nutritional development. The operations research requirements for the BINP are substantial, especially in the initial stages of the programme. Major areas of the operations research agenda include: (1) assessment of strategies to improve the community-based nutrition interventions; (2) assessment of strategies to ensure sustainability of the activities initiated by the BINP; (3) assessment of cost-effectiveness of the project and strategies to improve cost-effectiveness; and (4) other critical issues, including fortification with micronutrients, development of an urban nutrition strategy and quality assurance of service delivery. ICDDR,B's involvement in the BINP's research activities will span the period from 15 November 1997 to 14 November 2001. While the ICDDR,B-BINP Operations Research Programme (ORP) is directed from the Clinical Sciences Division, it is a Centrewide activity with key participation of individuals from each of the Centre's scientific divisions. The total cost of the BINP-ORP contract is approximately US\$ 909,000 for a period of four years.

Hospital Surveillance Programme

PIs: G.J. Fuchs and A.S.G. Faruque

Funded by: UNDP and WHO

More than 110,000 patients attend ICDDR,B's diarrhoea treatment centre in Dhaka each year. This programme has been designed to provide information regarding clinical, epidemiological, and demographic characteristics of all patients who are treated at this hospital. The programme provides information on diarrhoeal diseases which:

- is reported to the Government to assist in health policy matters;
- enables the Centre to monitor the emergence of new enteric pathogens and changes in disease patterns, including drug sensitivity;
- provides a database to conduct epidemiological studies;
- assists in the identification and development of new areas of research; and
- is used for improving patient care and introduce preventive care.



Dr. George Fuchs, Director, Clinical Sciences Division (2nd from right) and Mr. Khondoker Mizanur Rahman, Project Director, BINP (4th from right) are exchanging the contract document between ICDDR,B and BINP

A systematic 2% subsample of all CRSC patients is enrolled into this continuous surveillance. To determine causative agents and drug sensitivity, an extensive microbiologic evaluation is done through stool examination and stool or rectal swab culture. Patients or their guardians are interviewed by the surveillance team to obtain information on patients' socio-economic and demographic characteristics, housing, and environmental conditions, feeding practices (particularly of infants and young children), and the use of drugs and fluid therapy at home. Clinical characteristics on presentation, anthropometric measurements and the treatment and outcome of treatment at the hospital are also recorded. During 1997, total number of patients enrolled in this programme was 2,300. This year's epidemic of cholera was caused mainly by *Vibrio cholerae* O1. The most common species of *Shigella* was *S. flexneri* (44%). The table shows the main aetiological agents isolated from these patients. Routine screening of ETEC, EPEC, and EA_gEC has also been incorporated into the surveillance system in 1997. Between July 1996 and June 1997, one or more of the pathogenic *Escherichia coli* were isolated from more than 35% of the patients. ETEC, EPEC, and EA_gEC accounted for 14%, 8%, and 8% of the enteric pathogens respectively.

Aetiological agents isolated from patients in the surveillance programme in 1997

Month	Number of patients	<i>V. cholerae</i> O1	<i>V. cholerae</i> O319	<i>Shigella</i>	<i>Salmonella</i>	Rotavirus	Other vibrios
Jan.	170	32	2	9	3	77	16
Feb.	107	12	0	4	3	41	25
March	226	61	2	14	2	33	42
April	296	120	5	13	6	18	48
May	316	103	2	15	2	39	45
June	200	47	5	8	5	33	25
July	169	27	6	6	7	54	26
August	152	12	3	8	2	31	40
Sept.	131	21	2	10	2	29	26
Oct.	190	47	7	19	3	35	38
Nov.	174	47	10	14	6	47	19
Dec.	169	33	10	18	4	59	13
Total	2300	562	54	138	45	496	363
(%)	-	24%	2%	6%	2%	22%	16%
Estimated*	115,000	28,100	2,700	6,900	2,250	24,800	18,150

*Extrapolated to the total number of patients attending CRSC from the 2% subsample

Physiology Laboratory

Coordinator: G.H. Rabbani

The Physiology Laboratory (PL), established in 1995, provides opportunities to CSD and LSD scientists for carrying out more basic research and has resources in laboratory and other equipment in support of the clinical and animal experimentation in selected fields with direct relevance to the clinical science programme.

Activities continued to be expanded in the laboratory during 1997. Experiments were carried out with Ussing Chamber technique to examine the changes in ion transport across the colonic epithelia in experimental shigellosis in rabbits. Government license was obtained for the use of isotopes enabling the initiation of isotope experiments. Dr. John McCleod from McGill University visited the lab and helped establish these protocols. Intestinal perfusion experiments were used in evaluating the effects of different carbohydrates on intestinal absorption. *In vitro* and *in vivo* animal experiments were conducted



Laboratory analyses are being done in physiology Laboratory of the Clinical Sciences Division

to examine the therapeutic effects of a plant extract (Hirtacin) on experimental shigellosis. Methods were also established to assess mediators of intestinal inflammation, including myeloperoxidase for studying pathogenesis of shigellosis. Other methods, including superoxide dismutase and dopamine beta-hydroxylase, are being established in collaboration with the Department of Biochemistry in the University of Dhaka.

Collaborative studies to examine specific mechanisms of cellular invasion by *Shigellae* are being developed in association with LSD scientists and Phillippe Sansonetti from the Pasteur Institute in Paris, who visited the laboratory in September 1997.

Other methods established previously, including nitric oxide, bioelectric impedance analysis (BIA), total radical antioxidant parameter (TRAP), have contributed to a variety of protocols.

Institutional Collaboration

At the national level, CSD undertook collaborative activities with: Bangladesh Integrated Nutrition Project (BINP); Bangladesh National Nutrition Council; Dhaka Shishu Hospital; Dhaka Medical College; Institute of Nutrition and Food Science, University of Dhaka; Institute of Public Health and Nutrition; and UNICEF/Bangladesh. At the international level, collaborative activities were undertaken with: Institute of Child Health, UK; International Atomic Energy Agency, Austria; Johns Hopkins University, USA; Karolinska Institute, Sweden; London School of Hygiene & Tropical Medicine, UK; Louisiana State University Medical Center, USA; Northfield Laboratories, Australia; Tufts University, USA; University of Alabama at Birmingham, USA; University of Basel, Switzerland; University of California-Davis, USA; Wageningen Agricultural University, The Netherlands; and World Health Organization, Geneva.

Persons who visited the Centre in connection with collaborative work with CSD were: Prof. Klaus Gyr, Head, Internal Medicine, Kantonsspital, Basel, Switzerland; Dr. Thomas Caswall, Paediatric Gastroenterologist, Department of Clinical Sciences, Huddinge Hospital, Karolinska Institute, Sweden; Dr. Philip Marshall, Technical & Operations Manager and Dr. Michelle Di Vito, Research Associate of Northfield Laboratories Pty. Ltd., Oakden, South Australia; Prof. Prakash Shetty, Director, Centre for Human Nutrition, London School of Hygiene & Tropical Medicine, London; Dr. Andrew Seal, Research Fellow, Centre for International Child Health, Institute of Child Health, London; Prof. M. Santosham, Department of International Health, Johns Hopkins University, Baltimore, Maryland, USA; Dr O. Fontaine, Medical Officer, WHO-Geneva; Prof. Anne Ferguson, Department of Gastroenterology, University of Edinburgh, UK.

Foreign Visits by CSD Personnel

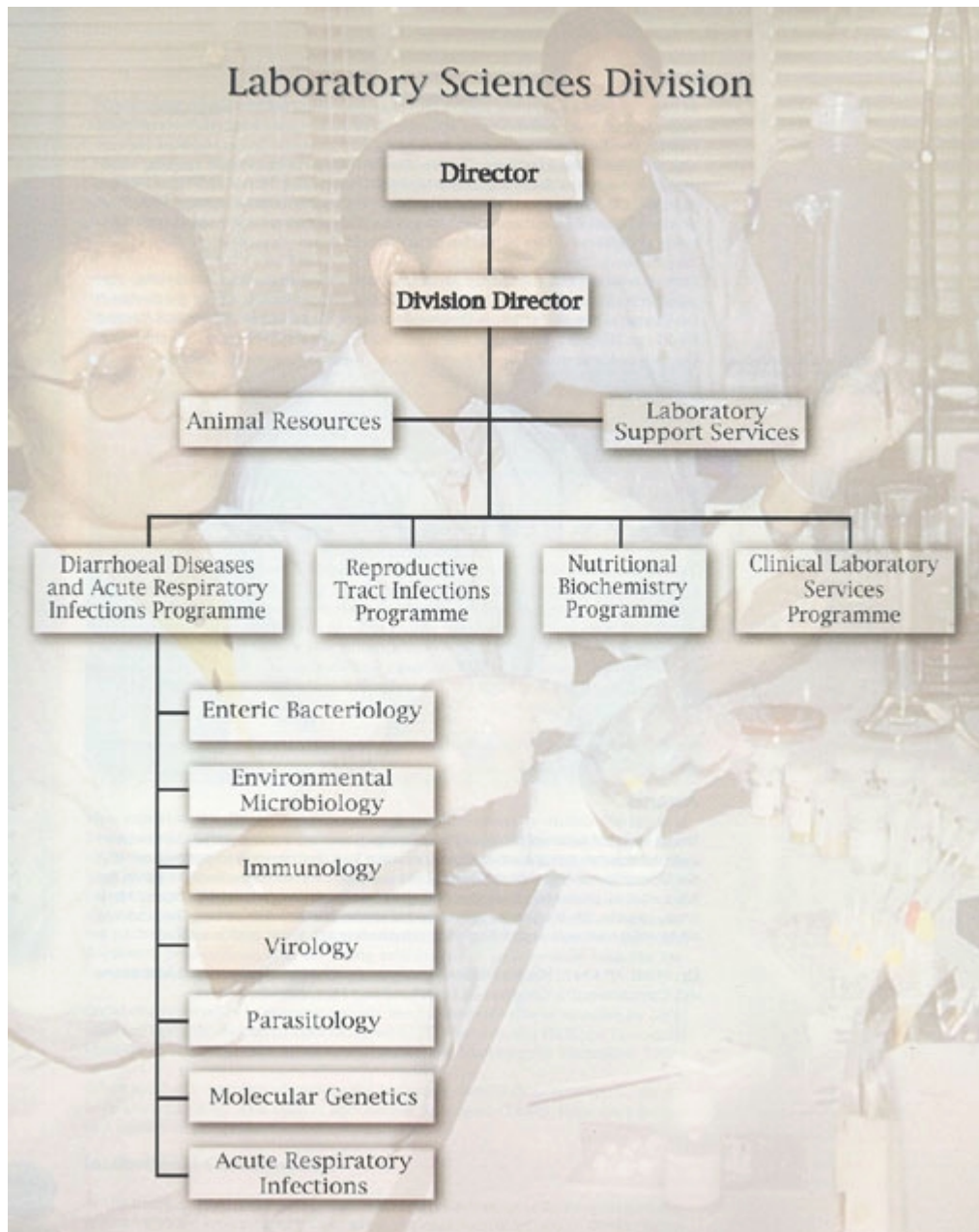
Twelve visits were made by the CSD personnel, either individually or in a team, to attend various international seminars, workshops, and meetings in 1997; one visited France in connection with laboratory analysis of specimens by gas chromatography and mass spectrometry; one visited India in connection with stable isotope assays and to develop institutional collaboration; one visited UK for collaborative research with the University of Edinburgh and another as a faculty to conduct a course on breast-feeding management and policy in the Institute of Child Health in London.

Eight personnel made overseas visits to receive training under the staff development programme.

Awards

Dr. M. Mujibur Rahman received Delta Omega Honorary Society (UPSILON Chapter) award for outstanding academic performance and contribution to public health at the University of Alabama at Birmingham and the IUNS Nutrition Award Finalist for his research presentation at the 16th International Congress of Nutrition, Montreal, Canada. Dr. Mujib was also included in the WHO's WHO among the students of American schools and colleges for outstanding academic performance.

Dr. Wasif Ali Khan, Medical Officer, received the Young Investigator Award at the 4th Commonwealth Congress on Diarrhoea and Malnutrition.



The Laboratory Sciences Division (LSD) is organized into four scientific programmes: (1) Diarrhoeal Diseases and Acute Respiratory Infections Programme, (2) Reproductive Tract Infections Programme, (3) Nutritional Biochemistry Programme, and (4) Clinical Laboratory Services Programme. The Division, at present, has 2 international-level scientists, 30 national-level scientists, and 118 support staff. During the year, 5 studies were completed, and 19 are ongoing.



*Interim Division Director
M. John Albert*

The objectives of the Division are as follows:

- ❑ Laboratory-based research on diarrhoea, respiratory tract infections, reproductive tract infections, emerging and re-emerging infectious diseases, and nutrition-related problems
- ❑ Diagnostic laboratory support to hospital, community, field, and environmental studies undertaken by the Centre's scientists
- ❑ Diagnostic laboratory support to patients attending the Clinical Research and Service Centre (CRSC) at Dhaka, the Matlab Diarrhoea Treatment Centre (DTC), and private patients
- ❑ Training of postgraduate students and professionals in laboratory research and laboratory diagnostic procedures.

Division Highlights

- ❑ Due to internal organizational restructuring, the organogram of the Division has changed. Previously, the Division was organized into Department of Laboratory Research and Department of Laboratory Services. In the changed organogram, the Division has been organized into four scientific programmes as mentioned above.
- ❑ In an effort to reduce manpower, 9 personnel have been given golden handshake. The Bacterial Genetics Laboratory has been merged with the Molecular Biology Laboratory to become Molecular Genetics Laboratory.
- ❑ With the retirement of a veterinary officer in the Animal Resources Branch (ARB), the Small Animal Clinic has been closed down. With further reorganization of the ARB, one scientist has been transferred to Parasitology Laboratory.
- ❑ The expertise of the Division on molecular genetics has been strengthened by the recruitment of an Assistant Scientist.
- ❑ The clinical laboratories introduced a number of tests for several hormones, and the full range of markers for hepatitis viruses.
- ❑ The service capability of Biomedical Engineering Cell has been strengthened by the procurement of new diagnostic equipment.

Diarrhoeal Diseases and Acute Respiratory Infections Programme

Head: M. John Albert

The Diarrhoeal Diseases and Acute Respiratory Infections Programme comprises the following laboratories:

- Enteric Bacteriology
- Environmental Microbiology
- Immunology
- Virology
- Parasitology
- Molecular Genetics
- Acute Respiratory Infections

The major activities of the laboratories are described below with their projects.

Enteric Bacteriology Laboratory

Head: M.J. Albert

The Laboratory is run by 11 personnel, including one Research Microbiologist, 1 Assistant Scientist and 7 support staff. The following is a brief summary of the studies and activities completed during 1997:



Association of *Providencia alcalifaciens* with Diarrhoea in Children

PIs: M. John Albert

and A.S.G. Faruque

Funded by: Government of Japan

In previous studies using laboratory animal models, it has been shown that *P. alcalifaciens* can cause invasive diarrhoea. To find an epidemiological association with diarrhoea, the isolation rate of *P. alcalifaciens* from stool specimens of 814 children <5 years of age with diarrhoea was compared with that of an equal number of matched community control children. *P. alcalifaciens* was isolated from 2.1% of the studied children and 0.49% of the control children ($p < 0.004$). Moreover, the children from whom *P. alcalifaciens* was isolated as the only pathogen had manifestations of invasive diarrhoea. This study showed that *P. alcalifaciens* is indeed an invasive diarrhoeal pathogen.

- *Providencia alcalifaciens* has been confirmed to be an invasive diarrhoeal pathogen in a case-control study on diarrhoea.
- A survey of rotaviruses causing infections in humans in different parts of Bangladesh suggested that the most common serotype is G4P8. Another serotype G9P6, a hybrid between a human and an animal strains, was found in 6% of the specimens.
- Monoclonal antibodies have been produced to a secretory protein of enteropathogenic *Escherichia coli* (EPEC) and the longus colonization antigen of enterotoxigenic *E. coli* (ETEC). These are being evaluated for development of simpler diagnostic tests.
- A new clone of *Vibrio cholerae* O139 Bengal currently causing cholera in different parts of Bangladesh has been detected. This clone has changed its phenotypic properties, including altered antibiogram and negative CAMP haemolysin, and seems to produce a disease of lesser severity compared to the initial clone that caused epidemic in 1992-1993.
- The majority of the antibody-secreting cells (ASCs) in the peripheral circulation of Bangladeshi diarrhoeal patients possessed homing receptors for both gut mucosa and systemic compartment, unlike the finding in the patients in developed countries where most of the ASCs have receptors for gut mucosa only.
- Aetiological studies of RTI/STI in Dhaka slum population and in a Women's Health Clinic showed a relatively low prevalence of infections. Several hundred serum samples tested from rural Matlab and urban Dhaka were found to be negative for HIV serology.

Production and Characterization of Monoclonal Antibodies to the Virulence-associated Antigens of Enteropathogenic *Escherichia coli* (EPEC) for Use as Diagnostic Reagents

PIs: M.J. Albert, F. Qadri, and T. Azim

CI: J.B. Kaper, University of Maryland School of Medicine, Baltimore, MD, USA

Funded by: USAID

EPEC are a major cause of diarrhoea in infants in developing countries. To develop simpler diagnostic tests, several virulence-associated antigens of EPEC were targeted. One such antigen

is EspD, a secreted protein involved in the production of characteristic pathologic lesion in the small intestinal mucosa of affected patients. A monoclonal antibody to this protein was derived, which showed a good promise of detecting EPEC strains in an enzyme-linked immunosorbent assay (ELISA).

Ecological and Epidemiological Studies of *Aeromonas* spp. in Bangladesh with Special Emphasis on Their Spread in the Environment and the Humans

PIs: M.J. Albert, M. Ansaruzzaman, A.S.G. Faruque, M.S. Islam, and A.K. Siddique

CIs: R. Möllby and I. Kühn, Microbiology and Tumor Biology Center, Karolinska Institute, Stockholm, Sweden; and R.B. Sack, Johns Hopkins University, Baltimore, MD, USA

Funded by: SIDA-SAREC, Sweden

Aeromonas spp. are suspected to cause diarrhoea. It is believed that these are a heterogeneous group, and certain subgroups cause diarrhoea in humans. Collection of *Aeromonas* spp. from different sources and their screening by PhP typing are ongoing. *Aeromonas* spp. isolated from human diarrhoeal cases and environmental samples from the four cholera sentinel surveillance sites in different parts of Bangladesh, and also from children with diarrhoea in Dhaka and matched healthy control children, will be screened by biochemical fingerprinting (PhP typing). These data will show the predominant PhP types of *Aeromonas* spp. for each ecological niche and possible circulation among different niches. Selected virulence properties will then be screened for in these isolates for possible identification of diarrhoeagenic clones.

Studies on the Capsule of *Vibrio cholerae* O139 Bengal

PIs: M.J. Albert and F. Qadri

CIs: A. Weintraub and P-E Jansson, Huddinge Hospital, Karolinska Institute, Stockholm, Sweden

Funded by: SIDA-SAREC

V. cholerae O139 Bengal possesses a capsule which is cross-reactive with lipopolysaccharide. The study aims at finding out whether the capsule confers on the organisms the abilities to resist phagocytosis and to invade tissue culture cells. Other objectives are: to find out whether monoclonal antibodies to the capsule protect suckling mouse against cholera on challenge with *V. cholerae* O139; to generate capsular antigen-based immunodiagnostic reagents; to find out the structural basis of cross-reaction between *V. cholerae* O139 and bacteria that share antigen(s); and to evaluate a PCR test based on primers corresponding to the genes that encode the capsule, for rapid diagnosis of O139 cholera.

It has been demonstrated that the capsule confers partial resistance against phagocytosis. A PCR assay has also been developed for rapid diagnosis of *V. cholerae* O139. It has also been shown that the cross-reaction between *V. cholerae* O139 and *V. cholerae* O155 is due to sharing of the unique structure, D-galactose-4, 6-cyclophosphate between the two serogroups. Work on other aspects of the protocol is in progress.

Environmental Microbiology Laboratory

Head: Md. Sirajul Islam

The Environmental Microbiology Laboratory with 12 personnel provides inter-departmental services for testing environmental samples supplied from the Clinical Sciences Division and the Public Health Sciences Division. Various environmental samples from different national and international institutions of Bangladesh are also tested in this laboratory. In total, 891 samples, including rectal swabs, water, juice, detergent, etc., were tested in this laboratory during 1997.

Following is a brief description of the studies completed during the reporting year:

Survey of Culturable *V. cholerae*

PIs: M.S. Islam, M.J. Albert, and A. Felsenstein

Funded by: Belgian Administration for Development Cooperation (BADC)

The study investigated culturable *V. cholerae* O1 and O139 in four closed water systems in rural Bangladesh. Environmental samples (e.g., plants, water, phytoplankton, zooplankton, snails, and oysters) were collected at 15-day intervals. All these samples were enriched in alkaline peptone water and plated onto TCBS and TTGA media. Vibrios were isolated and identified following standard procedures. *V. cholerae* non-O1 strains were found to be the dominant flora, followed by *V. mimicus* during the study period.

Role of Various Aquatic Flora, Fauna and Physicochemical Conditions of Water in Maintaining Endemicity and Seasonality of Cholera in Bangladesh

PIs: M.S. Islam, M.J. Albert, A. Felsenstein, and Z. Rahim

Funded by: Swiss Agency for Development and Cooperation (SDC)

The study investigated the role of physicochemical conditions of water, including aquatic flora and fauna in maintaining endemicity and seasonality of cholera in Bangladesh. Various environmental samples, including plant, water, phytoplankton, zooplankton, snails, oysters etc., were collected at 15-day intervals from 4 ponds in an endemic area of Bangladesh. Polymerase chain reaction (PCR), fluorescent antibody (FA) and conventional culture techniques were used for detecting culturable and non-culturable *V. cholerae* O1 and O139. Different physicochemical parameters, such as pH, temperature, salinity, etc., were also monitored routinely. Viable but non-culturable *V. cholerae* O139 was detected from oysters, snails, and water using FA and PCR techniques.

Epidemiology and Ecology of *V. cholerae* in Bangladesh

PIs: M.S. Islam, A.K. Siddique, M. Yunus, and M.J. Albert

CIIs: A. Huq, R.R. Colwell, University of Maryland Biotechnology Institute, USA; and R.B. Sack, Johns Hopkins University, USA

Funded by: National Institutes of Health (NIH), USA

The study was designed to understand the ecology and epidemiology of *V. cholerae* O1 and O139, or in other words, to investigate how the environmental parameters influence the vibrio population in the aquatic environment and its relationship with cholera in the community. Various environmental samples (e.g., water, phytoplankton, zooplankton, sediment, etc.) were collected at 15-day intervals from four districts of Bangladesh. Physicochemical parameters of water (e.g., temperature, pH, salinity, conductivity, etc.) were also measured during sample collection. All samples were processed for detection of *V. cholerae* O1 and O139 following enrichment culture, fluorescent antibody (FA) and polymerase chain reaction (PCR) techniques. Water samples were also inoculated on LB agar plate to prepare colony blots for detection of *V. cholerae* O1 and O139 by hybridization with specific probes. *V. cholerae* non-O1 and *V. mimicus* were isolated using conventional culture technique. Both *V. cholerae* O1 and O139 were detected by FA technique in

various environmental samples. Toxigenic vibrios were also detected by colony blots. The data will be collected continuously for four years and be analyzed.

Immunology Laboratory

Head: Firdausi Qadri

Studies on diagnosis and immunological basis of diarrhoeal diseases are being carried out by 3 scientists and 6 support staff. Although the main emphasis of work has been on acute watery diarrhoea, and invasive and persistent diarrhoeas, new studies are being initiated, for example, in areas of acute respiratory tract infections. The objectives of the work carried out in the immunology laboratory are to strengthen and increase capabilities in rapid diagnosis of enteric pathogens using monoclonal antibodies and to contribute to understanding the immune responses of

diseases and compare these with responses resulting from immunization with vaccines. The activities include production of monoclonal antibodies and study of B- and T-cell responses and their mediators, and immunoregulatory molecules to understand the role of host defense mechanisms in these diseases. The work carried out is mainly targeted at analyzing the mucosal immune response because the diseases under study mainly affect mucosal sites.



Oligonucleotide synthesis machine in operation

Safety and Immunogenicity of an Oral Bivalent B Subunit *Vibrio cholerae* O1/O139 Whole Cell (BO1/O139 WC) Vaccine in Adult Bangladeshi Volunteers

PIs: F. Qadri, P.K. Bardhan, M.J. Albert, R.B. Sack; and A.-M. Svennerholm and J. Holmgren (University of Göteborg, Sweden)

Funded by: European Union

Twenty healthy adult male volunteers were given two doses of the vaccine, the second dose given after 14 days of the first one. The vaccine was found to be safe as it did not give rise to adverse effects. The vaccine induced vibriocidal antibodies, antibody-secreting cell (ASC) responses in blood and gut, and plasma and faecal antibodies to its important components. A comparison of the responses seen in the volunteers receiving the bivalent cholera vaccine with those seen in volunteers receiving a monovalent O1 cholera vaccine showed that the addition of the O139 component to the field-tested O1 cholera vaccine did not result in any adverse effects or in reduction of immunogenicity to the O1 component of the bivalent O1/O139 cholera vaccine.

Further Evaluation of the Oral ETEC Vaccine and Studies on the Immune Response in Acute Watery Diarrhoea

PIs: F. Qadri, D. Islam, R. Raqib, N.H. Alam, M.A. Salam; and A.-M. Svennerholm (University of Göteborg, Sweden)

Funded by: SIDA-SAREC

Cholera patients respond by producing systemic and local antibodies to the lipopolysaccharide, cholera toxin (CT) and the mannose-sensitive haemagglutinin (MSHA). Cholera and enterotoxigenic *E. coli* (ETEC) diarrhoea induce pathogen-specific ASCs in blood. The expression of homing receptors (HR) on the cells was studied in patients with diarrhoea caused by *V. cholerae* O1/O139 or ETEC. The gut HR a4b7 was expressed by 80% of the ASCs, indicating mucosal homing of these cells. However, the peripheral lymph node HR, L-selectin, was also expressed by 80% of the ASCs. These suggest an increased targeting of the systemic compartment of the immune system.

In addition to responses in the IgA and IgG isotypes, patients with cholera and ETEC diarrhoea respond with antibodies to cholera toxin in the IgE isotype. The levels of total IgE in serum of

patients as well as healthy controls are high--about 14 times higher than that seen in healthy Europeans. A wide array of cytokines can be detected during the course of the disease, in both cholera and ETEC diarrhoea. These were detected by ELISA and/or RT-PCR and included amongst others, IL-4, IL-5, IL-6, IL-8, IL-10, IL-12, IFN-gamma and TNF-alpha. Immunohistochemical staining of duodenal biopsies is being carried out for phenotyping cells and studying specific activation markers.

Immune Status of Children with Persistent Diarrhoea

PIs: T. Azim, F. Qadri, M.A. Salam, J. Hamadani, M.A. Wahed; and L.N. Islam (University of Dhaka)

Funded by: USAID

The aim of this study is to identify possible immunopathological factors underlying the development of persistent diarrhoea. In total, 245 children, 7-24 months old, were enrolled in the study, of whom 183 have finally been included. Of these children, 33 were healthy controls, 109 were affected with acute watery diarrhoea, and 41 with persistent diarrhoea. Rotavirus, *V. cholerae*, enteroaggregative *E. coli*, either alone or in combination, were commonly isolated from stools of children with persistent diarrhoea. Assays on neutrophils, peripheral blood mononuclear cells, plasma and stool have been completed, including antibodies and cytokines. Data analysis is ongoing.

Production of Monoclonal Antibodies

PIs: F. Qadri and M.J. Albert

Funded by: NIH and SAREC

Monoclonal antibodies have been produced to the lipopolysaccharide (LPS) of enteric pathogens, such as *Vibrio cholerae* and *Shigella* species. Specific antibodies produced to the LPS of *V. cholerae* O1 are being used for the detection of bacteria in the protocol entitled "Epidemiology and ecology of *Vibrio cholerae* infection in Bangladesh." Five hybridomas specific for the LPS of *Shigella dysenteriae* type 1 are being characterized for their rapid detection of bacteria. In addition, monoclonal antibodies have been generated to longus, a pilus antigen of ETEC.

Further Studies on Systemic and Local Immune Responses in Shigellosis to Formulate a Protective Vaccine

PIs: D. Islam, R. Raqib, N.H. Alam; and J. Andersson, B. Christensson, B. Wretling (Karolinska Institute, Stockholm, Sweden)

Funded by: SIDA-SAREC

The objective of the project is to study the development of immune defense mechanisms of natural *Shigella* infection in children and adults. In addition, characterization of inflammation at the local site, and effector mechanisms responsible for tissue damage and eradication of *Shigella* will also be studied. For successful vaccine development against shigellosis, both efficient antigen presentation and specific T-cell activation would be required. The study will also focus on identifying the antigen-specific T-cells that may provide help for both cell-mediated and antibody-mediated immune responses. So far, 31 patients and 30 controls have been recruited. Part of the analyses is being done, which include: (a) estimation of cytokines and inflammatory molecules, such as lactoferrin, leukotriene B-4, prostaglandin E2, nitrate/nitrite and superoxide dismutase in plasma, stool and urine; (b) immunohistochemical staining of both cryostat- and paraffin-embedded tissues; (c) TCR V- β repertoire in both rectal tissue specimens and cells from peripheral blood by RT-PCR technique; and (d) isolation, culture, and cloning of separated T-cells from rectal biopsies of *Shigella*-infected patients.

Virology Laboratory

Head: Tasnim Azim

The Virology Laboratory is run by a total of 9 personnel, including two scientists, and seven support staff. The lab is involved in studies on the viral aetiology of diarrhoea with emphasis on Group A rotavirus and is also responsible for conducting tests for HIV related to surveillance and research. In addition, the laboratory provides research support for studies on measles virus, hepatitis B virus and respiratory viruses.

Distribution of Group A Rotavirus P Types in Bangladesh

PIs: L. Unicomb, T. Azim; and J. Gentsch (CDC, Atlanta, USA)

Funded by: WHO/Geneva, Switzerland

To determine the prevailing rotavirus types in Bangladesh, 958 stool samples have been tested using a combination of ELISAs and reverse transcriptase-PCR (RT-PCR). These samples were collected from five cities/towns of Bangladesh, including Dhaka, Matlab, Sylhet, and Mirzapur during July 1987-June 1997. Results show that the most common serotype is G4P8. An unusual serotype G9P6, possibly representing a hybrid between a human and an animal strain, was found in approximately 6% of the samples.

Preparation for the Introduction of Rotavirus Vaccines for Routine Childhood Immunization in Bangladesh

PIs: L. Unicomb, T. Azim, M.A. Salam; and J. Gentsch and R. Glass (CDC, Atlanta, USA)

Funded by: USAID/Washington, USA

Children aged 7-24 months attending the Clinical Research and Service Centre (CRSC) of ICDDR,B with <4 days of watery diarrhoea due to rotavirus have been enrolled in the study. From these children, peripheral blood (5 mL) and stool are collected on enrolment and 3 weeks later during convalescence. The aim of the study is to describe the immune response (humoral and cellular) in natural rotavirus infection in Bangladeshi children which should be mimicked by vaccines to rotavirus. So far, 12 children with rotavirus infection in the absence of other infections (enteric or respiratory) have been recruited with complete follow-up.

Parasitology Laboratory

Head: Rashidul Haque

The Parasitology Laboratory with two scientists and 3 support staff continued to work on the diagnosis and epidemiology of amoebic infections. Apart from studies on *Entamoeba histolytica* infection, a new area of interest of the laboratory is helminthic infection and micronutrient deficiency.

Rapid Diagnosis of Pathogenic *Entamoeba histolytica*

PI: Rashidul Haque

CI: William Petri, Jr., University of Virginia, USA

Funded by: University of Virginia and WHO

The study evaluated a PCR technique for detection of *Entamoeba histolytica*, and compared it with isoenzyme analysis and a commercial *E. histolytica* antigen detection test. The nested PCR used in this study is based on amplification of the small subunit ribosomal RNA gene of *E. histolytica* and *E. dispar*.

PCR and antigen detection had comparable sensitivities when performed directly on stool specimens, identifying 87% (46/53) and 85% (45/53) respectively of *E. histolytica* infections identified by isoenzyme analysis. PCR and isoenzyme identification of *E. histolytica* agreed in 96% (51/53) of amoebic cultures. The correlation of antigen detection with PCR for identification of *E. histolytica* in stool was 93% (45/48). All three techniques for specific identification of *E. histolytica* in stool showed excellent correlation, antigen detection being the most rapid and technically simple.

Field Evaluation and Further Characterization of a Pathogenicity-specific Monoclonal Antibody Against *E. histolytica*

PIs: Rashidul Haque and David Warhurst (London School of Hygiene & Tropical Medicine)

Funded by: LSH&TM and Commission for European Communities (CEC)

The study evaluated the applicability of a recently developed polymerase chain reaction-solution hybridization enzyme-linked immunosorbent assay (PCR-SHELA) for the differential diagnosis of *E. histolytica* and *E. dispar*.

One hundred twenty stool samples positive for *E. histolytica/E. dispar* have been analyzed by this PCR assay. The results show that this PCR assay can be used for detection of *E. histolytica* infection in stool specimen. The correlation of this PCR assay with isoenzyme analysis (which is considered to be the gold standard for differentiation of *E. histolytica* from *E. dispar*) is about 93%.

Field Trial on Beta-carotene and Anti-helminthic Therapy to Improve Micronutrient Nutriture among Pre-school Children in Bangladesh

PIs: Rashidul Haque, M.A. Wahed, and M.J. Albert

Funded by: Thrasher Research Fund

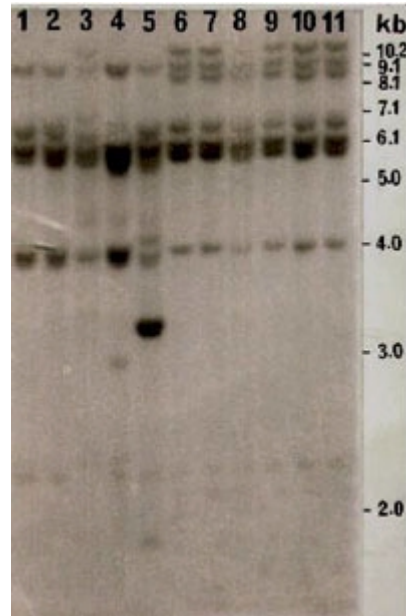
The major objective of the study is to examine the separate and combined effects of low-dose beta-carotene supplementation and anti-helminthic therapy on the vitamin A status and physical growth of pre-school children in Bangladesh.

In total, 244 children have been studied in four treatment groups. The groups were: albendazole only, daily beta-carotene only, albendazole with daily beta-carotene, and a placebo-control. The study is continuing, and the final blood sample collection for measurement of serum retinol and beta-carotene levels and the final anthropometric measurements are due in early 1998.

Molecular Genetics Laboratory

Head: Shah M. Faruque

The Molecular Genetics Laboratory with 12 personnel is involved in the development and application of molecular techniques to identify and characterize diarrhoeagenic organisms. Besides performing research within protocols developed in this laboratory, members of the staff also provide support to other protocols which involve molecular techniques. This laboratory also actively collaborates with the Public Health Sciences Division and Clinical Sciences Division in carrying out their research protocols. The facilities available in this laboratory include: gel electrophoresis, nucleic acid preparation, hybridizations using both radio-labelled and non-radioactive probes, DNA sequencing and DNA amplification by polymerase chain reaction (PCR). The techniques that are routinely used include: DNA probe assays of diarrhoeal pathogens, ribosomal RNA fingerprinting (ribotyping) for differentiating strains as an aid to epidemiological studies, and PCR assays for rapid identification and characterization of diarrhoeal pathogens.



Emergence of a new clone of V.cholerae O1 biotype E1 Tor after the epidemic caused by V.cholerae O139. Lanes 1-5 show RNA gene restriction patterns of E1 Tor strains isolated before the 0139 epidemic, whereas lanes 6-11 show those of the new clone of E1 Tor vibrios

Development and Application of Multiplex Diagnostic PCR Assays As an Aid to Clinical and Environmental Studies

PIs: S.M. Faruque, A.R.M.A. Alim, and M.J. Albert

Funded by: USAID

This study employs the polymerase chain reaction (PCR) to amplify specific segments of genes encoding virulence factors for identifying enteric pathogens. The aim is to develop and standardize rapid and sensitive diagnostic techniques for different enteric pathogens and to test the applicability of these techniques in clinical and epidemiological studies. PCR assays have been standardized for various enteric pathogens, including *Shigella*, different categories of diarrhoeagenic *E. coli*, and toxigenic *V. cholerae* O1 and O139 strains. PCR assay based on the amplification of intergenic spacer region of rRNA genes has provided a rapid technique for differentiating the strains of enteric pathogens. Development and evaluation of multiplex PCR assays are in progress. This includes the detection of enterotoxigenic (ETEC) and enteropathogenic *E. coli* (EPEC) from a single PCR assay.

Characterization of Epidemic Strains of *Vibrio cholerae* O1 and Non-O1 Based on Genetic and Phenotypic Traits

PIs: S.M. Faruque, A.K. Siddique, and M.J. Albert

Funded by: USAID

The aim of the study is to characterize epidemic strains of *Vibrio cholerae* in Bangladesh and other countries based on genetic and phenotypic characteristics. Toxigenic *V. cholerae* strains have been collected from various regions of the world during epidemic or inter-epidemic periods. The strains are being analyzed to study their genetic relatedness and their contribution to cholera

epidemics. Recent data confirmed the emergence of new epidemic clones of *V. cholerae* O1 and O139.

Epidemiology and Ecology of *Vibrio cholerae* Infections in Bangladesh

PIs: S.M. Faruque, A.R.M.A. Alim, K.M. Ahmed, and M.J. Albert; and R.B. Sack (Johns Hopkins University, Baltimore, MD, USA)

Funded by: National Institutes of Health (NIH)

Toxigenic *V. cholerae* strains isolated from various components of the aquatic ecosystem, and from cholera patients are being analyzed to study their genetic characteristics and their contribution to cholera epidemics. The aim of the study is to build a model to explain the general epidemiologic behaviour of cholera and to develop criteria to be able to predict epidemics. Strains of *V. cholerae* O1 analyzed so far belong to the recently emerged new clone of El Tor vibrios. Further studies are underway.

Acute Respiratory Infections Laboratory

Head: Mahbubur Rahman

Acute respiratory infections (ARIs) are an important cause of morbidity and mortality in children throughout the world and accounts for an estimated 6.5 million deaths per year. Most ARI-related deaths occur in developing countries. To address this important problem, research on ARIs was initiated recently.

Surveillance and Associated Studies on Antimicrobial Resistance in *Streptococcus pneumoniae* and *Haemophilus influenzae* in Children

PIs: M. Rahman; and S.K. Saha (Dhaka Shishu Hospital)

Funded by: Government of Bangladesh and World Bank

The objectives of the study are to determine the prevalence and patterns of antimicrobial resistance among invasive and non-invasive isolates of *S. pneumoniae* and *H. influenzae* obtained from children aged less than 5 years and to develop WHO-recommended methods for surveillance of drug-resistance in Bangladesh. The preliminary data showed that 15% of the non-invasive *H. influenzae* are resistant to ampicillin and 78% to cotrimoxazole. Penicillin resistance was detected among 2% of the non-invasive *S. pneumoniae* isolates by disc diffusion method.

REPRODUCTIVE TRACT INFECTIONS PROGRAMME

Head: J. Bogaerts

The laboratory of the Reproductive Tract Infections Programme, with a total manpower of 4, continued to work on the diagnosis and epidemiology of reproductive tract infections (RTIs). In 1977, technical support was given to CARE Bangladesh for isolation of *Neisseria gonorrhoeae* from sex workers attending the Shakti Project. A short pilot study, in collaboration with the Marie Stopes Clinic Society (MSCS), was conducted for isolation of *N. gonorrhoeae* from clients visiting the MSCS's Mohakhali clinic. Sufficient number of *N. gonorrhoeae* isolates were obtained at the end of the year to start typing and antimicrobial susceptibility testing.

A new agreement between BADC and ICDDR,B is in progress for extending the laboratory-based activities in the field of RTI/STI and other emerging infectious diseases.

Prevalence and Aetiology of Reproductive Tract Infections among Women Attending the Bangladesh Women's Health Coalition (BWHC) Clinic in Mirpur

Pls: J. Bogaerts, J. Ahmed, N. Akhter, and N. Begum

Funded by: Belgian Administration for Development Cooperation (BADC)

The study started in June 1996 with a representative group of women attending the BWHC's Mirpur clinic and is planned to last till April 1998. The aim of the study is to better understand the epidemiology of reproductive tract infections (RTIs), to provide more appropriate treatment to patients and to strengthen the BWHC's management of RTIs. All women undergo a standard interview, including questions on risk factors for RTI/STI, clinical examinations and laboratory tests for infection with *N. gonorrhoeae*, *C. trachomatis*, *T. vaginalis*, *T. pallidum*, yeasts, and bacterial vaginosis. Unlinked anonymous HIV-testing is performed. From June 1996 to September 1997, 1575 women were examined. Laboratory data showed a 0.5% and 2.2% prevalence of gonococcal and chlamydial infections respectively. The prevalence of a reactive syphilis serology was 2% (RPR \geq 1:2 with TPHA+). The prevalence of *Trichomonas* and yeast infections was 1% and 11% respectively. Bacterial vaginosis was diagnosed among 20% of the women. All women, except two, had a negative ELISA for HIV infection. The reactive ELISAs were not confirmed by a Western blot technique.

Prevalence of Selected Sexually Transmitted Diseases and Associated Risk Factors in Urban Slum Dwellers in Dhaka

Pls: K. Sabin and Mahbubur Rahman

Funded by: The Royal Netherlands Government

Reproductive tract infections (RTIs) are thought to be an important health problem among adults in Dhaka, Bangladesh. However, little is known about the prevalence and aetiology of these infections. The results of the study among 1504 adult slum dwellers in Dhaka city showed that 7% had syphilis, 4% had hepatitis B, 1.4% had gonorrhoea, and 0.5% had chlamydial infections. *Trichomonas vaginalis* was detected in 2% of the study population. A multiplex PCR was used for detection of *Neisseria gonorrhoeae* and *Chlamydia trachomatis*.

NUTRITIONAL BIOCHEMISTRY PROGRAMME

Head: M.A. Wahed

The major goals of the programme are to support research projects in the area of Nutritional Biochemistry, conduct research and undertake development and training activities. The programme is run by 7 personnel in total.

Major Activities Performed and Services Offered

- ❑ As many as 24 research projects of the Centre received services and a total of 17606 assays from the laboratory. Number of assays done was almost double of the number done last year.
- ❑ Collaborative research support to a multi-centre vitamin A study by the All India Institute of Medical Sciences, Delhi, was also continued this year. A total of 300 MRDR tests (vitamin A1 and A2), 570 retinol analysis on breastmilk and 319 zinc on serum samples were done. Serum β -carotene levels on 180 serum samples from Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine & Metabolic Disorders (BIRDEM) were also assayed.
- ❑ Collaboration with the University of Alabama at Birmingham (UAB), USA, has continued. A PhD student's research project "Effect of simultaneous supplementation of zinc and vitamin A in children" is progressing. Blood samples are being collected for zinc, retinol, retinol-binding protein and C-reactive protein tests. One student was hosted for a 3-month training under Minority International Research Training Programme funded by the National Institutes of Health (NIH), USA, and administered by UAB.
- ❑ On a request from Helen Keller International, training to their field staff was provided on how to carry out haemoglobin assay in the field. Two physicians from the Clinical Sciences Division were also trained on how to conduct iron assessment under field settings. Laboratory facilities were extended to Dr. L. Rossi, a Swiss Research Fellow attached to BIRDEM.
- ❑ The laboratory continued to participate in the quality assurance programme run by the National Institute of Standards and Technology (NIST), Washington, USA. Performance in retinol analysis was rated good for this year also.

Major Achievements, Reorganization, Improvement and New Developments

- ❑ A project proposal for "Development of Food composition database" has been submitted to the Bangladesh Integrated Nutrition Project for funding.
- ❑ New laboratory tests to assess iron status, transferrin receptor and ferritin tests were established.
- ❑ For saponification of breastmilk for retinol analysis, use of a suitable internal standard (IS) was needed. Didehydroretinyl acetate as an internal standard to monitor extraction efficiency was introduced.
- ❑ Within the laboratory, a reorganization has been made, and accordingly individuals were assigned for:
 - quality control
 - micronutrient analysis
 - macronutrient analysis

CLINICAL LABORATORY SERVICES PROGRAMME

Head (Acting): Md. Anowar Hossain

The Clinical Laboratory Services Programme includes Dhaka Clinical Laboratories (Clinical Microbiology, Pathology, Biochemistry, Histopathology and Outpatient Service Project) and rural Matlab Diagnostic Laboratory.

The Programme provides laboratory support to clinical, community and field studies undertaken by the Centre's scientists and diagnostic laboratory services to diarrhoeal patients attending the Clinical Research and Service Centre (CRSC) at Dhaka, the Matlab Diarrhoea Treatment Centre (DTC), and to private patients on payment. In addition to carrying out methodological and applied (clinical) research, this programme also trains national and international fellows, graduate and postgraduate students in laboratory research and laboratory diagnostic procedures.

The Clinical Laboratory Services Programme has 50 personnel who include scientific and support staff.

Clinical Microbiology Laboratory

Head (Acting): Md. Anowar Hossain

The Clinical Microbiology Laboratory in Dhaka provides diagnostic support to patients of the Clinical Research and Service Centre (CRSC), staff clinic, travellers' clinic of ICDDR,B, and outside patients on payment. It also supports the research work, trains national and international fellows and in-house staff, carries out methodological and applied (clinical) research, and undertakes quality assurance programme.

In total, 37,109 clinical samples were processed by the Clinical Microbiology Laboratory during 1997. The samples included blood, stool, rectal swab, urine, throat swab, sputum, etc. The common diarrhoeal pathogens isolated from 18,386 faecal samples included 1,237 (6.73%) *Shigella* spp., 2,351 (12.79%) *Vibrio cholerae* O1, 133 (0.72%) *Vibrio cholerae* O139, 1,526 (8.30%) *Aeromonas* sp., 562 (3.06%) *Salmonella* spp., and 441 (2.4%) *Plesiomonas*. From a faecal sample of 2,301, *Campylobacter* was detected in 267 (11.60%). The commonest blood isolate was *S. typhi*: 1.69% (110 of 6,522), and urine isolate was *E. coli*: 18.34% (1,391 of 7,586).



Participants in the International Training Course on Laboratory Diagnosis of Diarrhoeal Disease Pathogens at work

The major accomplishment of the Clinical Microbiology Laboratory during 1997 was the adaptation of a rapid antigen-detection test from CSF samples and also from culture plates. An analysis of microbiological data was performed on clinical isolates (pathogens) for the past five years. Antimicrobial resistance patterns among *Salmonella* and *Shigella* isolates were analyzed.

The Laboratory has been continuing its participation in External Quality Assurance Scheme (EQAS) with the University of Leuven, Belgium, sponsored by WHO. The performances of the batches evaluated were within 95% confidence interval.

In 1997, the Clinical Microbiology Laboratory supported 20 research protocols and collaborated with the University of Dhaka (Prof. Saleh Mahmood, Department of Biochemistry, and Prof. Joseph de Silva, Department of Zoology) for the research works of graduate students on *Salmonella*, *Staphylococcus* and intestinal Protozoa. Field support was also given to the Epidemic Control Preparedness Programme (ECPP) team investigators to contain cholera outbreaks in different parts of the country. Among 915 rectal swabs collected by the ECPP team, 232 (25.30%) were positive for *V. cholerae* O1 and 30 (3.27%) for *V. cholerae* O139.

The laboratory has 14 personnel, including 9 technical and 2 medically qualified professional staff. The total workload in Clinical Microbiology Laboratory and workload units per hour for 1997 were calculated to evaluate the performance and efficiency according to the procedure of the College of American Pathologists. Workload units were 55 minutes per man-hour (indicative of overload). The laboratory participated in the International Training Course on Laboratory Diagnosis of Common Diarrhoeal Disease Agents in 1997. It also provided training to two medical microbiologists from Vietnam on laboratory diagnosis of diarrhoeal pathogens and to another from a private pharmaceutical industry on microbial quality control. The laboratory provided orientation to 5 members of the Armed Forces Institute of Pathology (Govt. of Bangladesh), one lecturer from the University of Dhaka, and 5 clinical fellows from CRSC, Dhaka.

Clinical Pathology Laboratory

Head: Md. Anowar Hossain

The Clinical Pathology Laboratory (1) provides diagnostic support for patient care to the Clinical Research and Service Centre (CRSC), Staff Clinic, Travellers' Clinic and referred cases from national hospitals and paying users from private clinics; (2) supports research protocols; (3) conducts and provides support for research on diarrhoeal and other infectious disease agents; (4) carries out studies for methodology development; (5) gives technical support to the specimen reception area; (6) gives training to in-house staff, and national and international fellows; and (7) undertakes quality assurance programme.

The laboratory has 11 personnel, including 8 technical and 1 medically qualified staff.

The Clinical Pathology Laboratory performed 158,645 tests of various kinds on 63,641 specimens of blood, serum, plasma, stool, urine, CSF, etc., producing 13,38,600 workload units (WLUs) in 23,000 working hours with a general index of 58.20 WLUs per person-hour. The total number of specimens decreased by 1.5% in 1997 compared to 1996. On the contrary, the number of tests increased by 31.69% in the same period which represents a gross increase in paying cases (74.88% vs. 25.12%) due to availability of increased number of tests introduced in the laboratory in 1997.

The major accomplishment, among others, was the introduction of tests for the full panel of hepatitis markers and cancer markers using ELISA.

The Clinical Pathology Laboratory continued its participation with inter-laboratory comparison programme in Quality Assurance Scheme (QAS) of the College of American Pathologists (CAP) in routine haematology, limited coagulation and in parasitology. Performance on all parameters has been rated within the acceptable target value (95% of confidence interval) and 100% in parasitology as was in the previous years.

Parasites commonly detected from stool samples were: *G. lamblia*, *E. histolytica*, *Cryptosporidium* spp., *E. nana*, *E. coli*, *B. hominis*, *Clonorchis* spp., *Diphyllobothrium* spp., and *Iodamoeba butschlii* and those from blood were: malarial parasites of both *P. vivax* and *P. falciparum*, *Babesia* spp. and *Trypanosoma gambiense*. The common hepatitis marker HBsAg was positive in 9.46% (221 of 2,335) of the blood specimens.

The Clinical Pathology Laboratory supported one international training course on laboratory diagnosis of common diarrhoeal agents, provided lab-orientation to a medical student from Philadelphia, USA, two medical microbiologists from Vietnam, 5 members of the Armed Forces Institutes of Pathology (Govt. of Bangladesh) and four clinical fellows of CRSC, Dhaka.

Under the staff development programme, Mrs. Mahmuda Khatun, Senior Laboratory Technician, returned from Brussels, Belgium in February 1997 after completing a 3-month training in serology. One senior official attended two workshops on HIV/AIDS education programme for the staff.

The laboratory supported 12 research protocols during the year. As part of collaboration, the laboratory processed 350 serum samples for surveillance of HIV-1 seropositivity in Bangladeshi children with diarrhoea and malnutrition, and hosted one student from the Department of Zoology, University of Dhaka, to work in parasitology unit for M.Sc thesis.

Clinical Biochemistry Laboratory

Head: Ashish Kumar Chowdhury

The Clinical Biochemistry Laboratory rendered diagnostic support to patient care activities of the Clinical Research and Services Centre (CRSC), Staff Clinic, Travellers' Clinic and to referral cases from national hospitals and private clinics (paying users); supported research protocols; trained in-house staff and national and international fellows; conducted research on methodology development; undertook quality assurance programme internally and externally; and provided technical support for specimens reception area in collecting specimens/drawing blood.

The biochemistry laboratory has 11 personnel, including two professionally qualified biochemists.

During the year, the laboratory performed 106,790 tests of various kinds on 29,539 specimens of blood, serum, plasma, stool, urine, cerebrospinal fluid, intravenous fluid (IVF), ORS, etc, producing 1,190,195 workload units (WLUs) in 21,864 working hours with a general index of 54.4 WLUs per person-hour. The number of specimens from paying cases was 17,271 which was about 58.5% of the total specimens tested. The laboratory continued its support to Institute of Public Health (IPH) for quality control of IVF for electrolytes, glucose, and pH. The lab also supported the Nephrology Department, IPGM&R, to set up a clinical biochemistry lab and to establish quality control procedures. Tests for glycosylated haemoglobin (HbA1c) and seven different reproductive hormones were introduced during the period.

Twenty-four research protocols were supported during 1997. Ten national and international fellows were given training/orientation for periods ranging from two days to two weeks.

The Clinical Biochemistry Laboratory continued to participate in the External Quality Assessment Scheme (EQAS) sponsored by WHO Collaborating Centre, Wolfson EQA Laboratory, Birmingham, UK. The Overall Mean Running Variance Index Scores (OMRVIS) of this laboratory varied from 45 to 61, which indicated a grade 1 standard. Internal quality assurance procedures continued as before.

Matlab Field Laboratory

Head (Acting): Md. Anowar Hossain

The Matlab Field Laboratory renders diagnostic laboratory support to the Matlab Diarrhoea Treatment Centre (DTC), Matlab Staff Clinic and field-based research protocols.

The laboratory operates through two units, namely Microbiology and Pathology. The laboratory has 7 personnel, of whom 5 are technical. The position of supervisor fell vacant in July 1997.

During 1997, the laboratory processed a total of 14,199 specimens which included blood, faeces, urine, CSF, and other biological samples collected mainly from the Matlab DTC and field-based research protocols. The Microbiology unit processed 7,328 specimens for culture, antimicrobial susceptibility for various isolates and dark-field microscopy for *Vibrio cholerae*. The Pathology unit processed 6,871 specimens and performed 9,897 individual tests for routine haematological, biochemical parameters (electrolytes, renal function and blood glucose), urine and stool microscopy.

The most common bacterial isolates from faecal samples were: 649 (52.0%) *Vibrio cholerae* O1, 122 (9.8%) *Vibrio cholerae* O139 Bengal, 283 (22.7%) *Shigella* and 39 (3.1%) *Salmonella*, including 5 (0.4%) *Salmonella typhi* in blood specimens (details in Table 1).

In 1997, attempts were made to improve the quality of services of the Matlab field laboratory, and steps were taken to streamline the Matlab laboratory operation. Internal quality control had been geared up on a monthly basis through Dhaka clinical laboratories. The activities of the laboratory were reviewed by discussing with senior staff of Matlab health services to suggest further improvement and development.

Table 1: Total number of organisms isolated from 6200 faecal samples and 1128 other specimens in the Matlab Field Laboratory

Organism	Serotype	Number	Percentage
From stool samples			
<i>V. cholerae</i> (classical)	Inaba	0	0
	ogawa	0	0
<i>V. cholerae</i> (El Tor)	Inaba	69	5.5
	Ogawa	580	46.4
<i>V. cholerae</i> O139	-	122	9.8
<i>Vibrio</i> species (Non-O1, O139)	-	78	6.2
<i>S. dysenteriae</i>	-	98	7.8
<i>S. flexneri</i>	-	145	11.6
Other <i>Shigella</i> species	-	40	3.2
<i>Salmonella typhi</i>	-	5	0.4
Other <i>Salmonella</i> species	-	34	2.7
From other specimens			
Blood, urine, throat swab, etc.	-	78	6.2
Total	-	1,249	(100%)

Outpatient Service Project

Head: Md. Anowar Hossain

The Outpatient Service Project is involved in handling specimens from Clinical Research and Services Centre (CRSC), Dhaka, Travellers' Clinic, Staff Clinic, and paying users. To the laboratory users it provides support services, such as registration of patients, preparation of appropriate laboratory forms by computer, blood drawing, cash handling, and report delivery. Total manpower was 8 of whom two are technical.

The unit handled a total of 130,540 specimens, including collection of 21,189 blood samples in 1997. There was a decrease of specimens by 5.75% in 1997 compared to 1996. On the contrary, the cash payment has increased by 10.87% in the same period. The decrease of specimens resulted from a reduction in specimen collection by CRSC of Dhaka for cost-containment.

The major accomplishments in the area of infrastructural development were the replacement of two air-coolers for specimen and cash reception area and blood-drawing room; an additional printer was purchased; two new wall cabinets and a table with shelves were fitted in the blood-drawing room. Material for a brochure was prepared and an estimate for airconditioning of the waiting area was obtained. An ice machine was purchased for use in the clinical and research laboratories.

Safe Blood Transfusion in Dhaka and Matlab Hospitals

PI: Md. Anowar Hossain

Funded by: Ford Foundation

The objective of this project is to prevent transmission of HIV, hepatitis B and other agents of STDs and malaria, and to determine the prevalence of these diseases among commercial blood donors.

The blood-bags purchased from commercial sources were subjected to group confirmation, screening for above agents by rapid screening test and confirmed by ELISA and other tests. Blood samples, positive for any of the above markers, were discarded and those negative for the above markers were cross-matched with patients' blood and then transfused.

In total, 213 blood-bags (positive for blood groups: A=54, B=83, AB=17 and O=59) were purchased from commercial sources, of which 51 (23.94%) were found positive either for HBsAg, VDRL and/or TPHA. None of the 51 blood-bags was found positive either for HIV or malarial parasite. Among the positive samples, 21 were positive for HBsAg (9.86%), 44 for VDRL (20.66%), and 37 for TPHA (17.37%). Twenty-nine blood-bags (13.62%) were discarded after expiry of recommended storage days from the date of collection of blood from the donors. The remaining 133 bags were found fit for transfusion, of which 97 bags (72.93%) were used in the CRSC, Dhaka and 36 (27.07%) in Matlab DTC.

Histopathology Laboratory

Acting Head: A.K. Azad

The Histopathology Laboratory, with a total manpower of only two, examined host-pathogen interaction and related pathology either in the gut mucosal biopsies or in postmortem material. Data were analyzed from fatal cases of chronic diarrhoeal illness in adults to understand the cause and pathogenesis of the illness. The laboratory also supported protocols examining the gut mucosal immune response to vaccines and natural infections.

The major achievement was the finding of features of shock lung in fatal cases of typhoid fever with altered mental status during the early stage of the disease.

Logistics Support Branch

Head: Q. Shafi Ahmed

The Logistics Support Branch is being run with 12 personnel who are distributed in two sections, namely Media Preparation-Decontamination, and Bacterial Stock Culture Collection.

Summary of Major Activities

Logistics Support Branch has provided technical support to the clinical laboratories at Dhaka and Matlab by supplying various kinds of culture media needed for isolation and identification of bacterial pathogens. The media were supplied to 39 different users which include research projects also. In 1977, the media section has prepared 198,100 culture plates and 990 litre of different kinds of culture broth. All important primary media were passed through sterility and quality control checks.

The bacterial stock culture collection continued its routine activity by supporting 10 research projects. Clinical strains of *V. cholerae*, *Shigella*, and *Salmonella* as well as various biological specimens from different research projects were lyophilized.

Table 2 and 3 reflect the activities of the Logistics Support Branch during 1997.

Table 2: Production of media in 1997

Item	Production (in litre)
Culture media (semi-solid) of different kinds	3,962
Culture broth	831
Carbohydrate fermentation tube (different kinds)	124
Amino acid tubes	35
Total	4,952

Table 3: Lyophilization of samples in 1977

Particulars	Project sample (ampule/flask)	Routine sample (ampule/flask)	Total
Lyophilization of samples in ampules containing:	0.2 mL	2,433	2,998
	3.0 mL	0	0
Lyophilization of samples in flasks ranging from 5 mL-700 mL	31	0	31
Lyophilization in flask/tube	804	0	804
Number of freeze-dried stocks supplied	270	0	270
Stock culture retrieval	155	0	155
Grand Total			4,258

Biomedical Engineering Cell

Head: Syed Saiful Huq

Bioengineering Cell (BEC), with a total manpower of 3, is responsible for installation of new equipment, routine maintenance of all analytical and biomedical equipment, calibration of the equipment, etc. It also assists the operators and users to overcome the daily minor problems encountered by them. The Cell looks for replacement with indigenous parts in case of non-availability of spareparts from overseas sources. It also provides assistance to other divisions of the Centre whenever needed.

The BEC, during 1997, installed 21 pieces of new equipment, and these are working satisfactorily. The BEC also acquired 5 pieces of new measuring and diagnostic equipment which will greatly enhance the trouble-shooting capacity in terms of speed and accuracy.

As part of assistance for national institutions, BEC helped various institutions, such as IPH, IEDCR, CRP, BIRDEM, DU, etc. to solve their technical problems and also imparted training to their staff.

Archives Unit

Head: M.A. Malek

The Archives Unit, with 4 personnel, plays a vital role in archiving and retrieval of data for the Centre's research work. The Unit acts as a data bank for the Centre and provides routine support to the scientists and researchers both at home and abroad. The Unit computerizes data for the Dhaka hospital and Matlab Treatment Centre and laboratories and performs data entry/verification, coding, editing, data cleaning and data processing.

The Unit produces monthly financial recovery reports for the Clinical Laboratory, Dhaka Treatment Centre, Travellers' Clinic, Staff Clinic, private patients (paying

cases) and media preparation. It also provides monthly blood culture reports, *Shigella* sensitivity reports and reports on isolation of organisms.

The Unit produces a weekly surveillance report on major diarrhoeal pathogens isolated from the stool/rectal swab samples collected from a systematic 2% subsample of all patients attending the Dhaka hospital. This unit also provides support for data analysis, data management activities and research support to the scientists/researchers for different ongoing protocols.

To ensure better management and quick service, a database has been developed for the specimen reception area: (1) to register and deliver reports for the outside paying cases; (2) for day-to-day financial recovery report; and (3) for daily performance report (number of tests, costs, etc.). Programme modification, adding new tests and costing have been done when required. A database for specimens stored in the cold room has been developed for easy retrieval.

In 1997, the Unit processed 53,368 records mainly for the Microbiology, Pathology, and Clinical Biochemistry laboratories of Dhaka and Matlab as shown in Table 4. About 6,000 records were added each month to the existing database of 11,460,340 records.

Table 4: Data entry/verification and data processing status in the Archives Unit in 1997

Form	Dhaka	Matlab	Total
Microbiology	14746	3381	18127
Pathology (Stool)	5524	1571	7095
Clinical Biochemistry	9534	1214	10748
Pathology (Urine)	1966	1120	3086
Haematology (Blood)	6117	2522	8639
Serology	1297	136	1433
Miscellaneous	511	62	573
Media Preparation	3667*	-	3667
Total	43362	10006	53368

*For both Dhaka and Matlab

Besides routine activities, the Unit produced verification reports; performed data analyses for scientists and researchers in different ongoing protocols; supervised the cold chain activities of

the Division; provided technical and software support for the Division; and produced 52 weekly surveillance reports (with graphical representation) on diarrhoeal pathogens to assist the Government of Bangladesh.

Animal Resources Branch

Head: K.A. Al-Mahmud

The Animal Resources Branch (ARB) provided support to the scientists of the Centre in performing experiments on animals for 24 research protocols. The Branch arranged breeding of required number of animals of different species and maintained inter-institutional collaboration with the Institute of Public Health, Government of Bangladesh; IPGM&R; BIRDEM; Bangladesh Agricultural University, Mymensingh; American International School; and with some leading national and multinational pharmaceutical companies in Bangladesh. The Branch is run by 13 personnel.

ARB has earned a revenue of around US\$ 3,500 through sale of surplus animals, rabbit blood, and sheep blood.

Organizational Changes

Due to financial constraints of the Centre, the Research and Treatment Section of ARB was abolished.

Training

ARB provided training to one person from Bangladesh Rice Research Institute (BIRRI), Gazipur, on techniques of animal model experiments.

Research Activities and Support

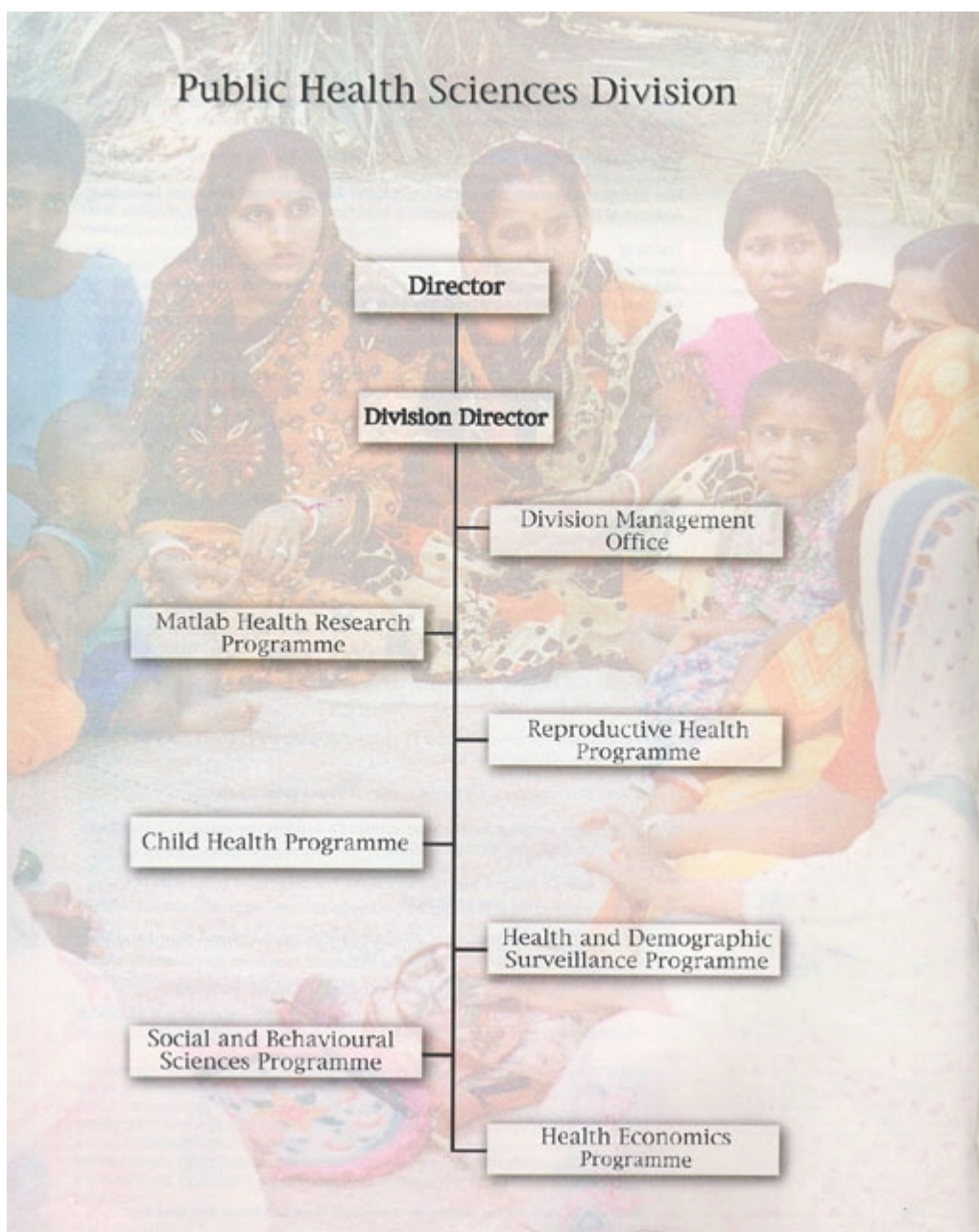
- ❑ *Reversible intestinal tie adult rabbit diarrhoea (RITARD) model:* Experiments were performed on 55 adult rabbits to observe the diarrhoeagenic properties of different enteric pathogens.
- ❑ *Ileal loop assay:* The assay was performed with various enteric bacteria/toxins using 22 adult rabbits.
- ❑ *Colonic loop assay:* To evaluate the effect of plant extracts on experimental shigellosis, 45 rabbits were used.
- ❑ *Support to physiology laboratory of Clinical Sciences Division:* In total, 100 rabbits were supplied to the Physiology Laboratory for performing animal studies there.
- ❑ *Production of hyperimmune sera:* Hyper-immune sera were produced against different antigens using 10 adult New Zealand White rabbits.
- ❑ *Monoclonal antibody production:* Monoclonal antibodies were produced using 252 Balb/c mice by producing ascites tumours.
- ❑ *Lethality test:* To determine the LD50 dose of different bacteria, 285 infant mice (Swiss albino) were used.
- ❑ *ST test:* Ten samples were tested using 30 infant Swiss albino mice.
- ❑ *Competition between V. cholerae strains:* To support the study, 175 suckling mice were orally fed with inoculum.
- ❑ *Sereny test:* To observe and to confirm the enteroinvasive properties of some bacteria, 15 guinea pigs were used.

The number of research animals of different species produced and issued and the quantity of blood supplied are shown in Table 5.

Table 5: Number of animals and quantity of blood supplied

Species/Blood	No. produced	No./Vol. issued
Rabbit	615	508
Guinea pig	415	305
Rat	954	848
Mouse (Swiss albino)	8,520	7,795
Mouse (Balb/c)	495	317
Sheep blood	-	35,420 mL
Rabbit blood	-	675 mL
Guinea pig blood	-	195 mL
Chicken blood	-	55 mL

Sheep and chicken are not bred in the laboratory. These species are procured from the local market.



Public Health Sciences Division

The Public Health Sciences Division (PHSD) focuses on the evaluation of population-based interventions to improve reproductive, sexual and child health. The staff comprises public health professionals, epidemiologists, social scientists, and economists. The Division is responsible for the primary healthcare services in rural Matlab where about 210,000 people are under health and demographic surveillance system. Besides the Matlab Health Research Programme, the Division has research programmes for Reproductive Health, Child Health, Health and Demographic Surveillance, Social and Behavioural Sciences, and Health Economics. The broad range of research interests includes such projects as epidemiologic patterns of ill



*Division Director
Prof. J. Patrick Vaughan*

health, transmission of infectious agents (especially for diarrhoeal and acute respiratory illnesses), community nutrition, delivery of healthcare, prevention of illness through education, modification of risk behaviours, vaccine trials, and community development.

Division Highlights

- ❑ Randomized Clinical trial on Bismuth subsalicylate for the treatment of persistent diarrhoea was completed, and the findings showed no detectable improvement over the control group.
- ❑ study evaluating the compliance of oral cotrimoxazole for moderate ALRI in Matlab indicated that 25% of the children who were under-dosed on the day of the visit did not have higher ALRI relapse rates.
- ❑ The Mirzapur Birth Cohort follow-up study for the epidemiology of diarrhoea and ARI was successfully completed, and the laboratory and statistical analyses are continuing.
- ❑ Household nutrition education in a controlled village-based trial for the promotion of beta-carotene-rich foods as sources of vitamin A in children was shown to substantially improve dietary intake.
- ❑ Introduction of high-quality antenatal and delivery care at the union level successfully attracted women to deliver at the health centre.

Matlab Health Research Programme

Head: Md. Yunus

The Public Health Sciences Division operates a field research centre in rural Matlab which underwent a major reorganization in 1997. The clinical and community activities have been integrated in the new Clinical Research Unit and the Community Health Research Unit respectively. The community health workers (CHWs) now visit households every month, and the community-based maternity care is being extended to cover both intervention and comparison areas, with donor and community support. Further modifications in service delivery and surveillance methods are planned for 1998, including changes from "doorstep" service delivery by CHWs to static community cluster service points. The former DSS, RKS and GIS units are being integrated under the new Health and Demographic Surveillance Programme.

The Matlab clinical services have been reorganized so that these are integrated for both mothers and children, while the community services in the intervention area now have a comprehensive approach to curative and preventive services for primary healthcare. In a similar way, more decentralized control has been given to the senior management team in Matlab.

The Matlab Health Research Programme provides clinical services for diarrhoea, ARI and malnutrition at Matlab and runs three community-operated diarrhoea treatment centres at Nayergaon, Kalirbazar, and Shataki. The Programme also offers health education to all patients on the prevention and treatment of diarrhoea, ARI, immunization, vitamin A supplementation, nutrition, weaning practices, safe motherhood, and family planning.

The Matlab station hosted 269 visitors during 1997, including representatives of donor agencies, visiting scientists and foreign diplomats.



Mr. Muhammed Ali, Secretary, Ministry of Health and Family Welfare, Govt. of Bangladesh, is seen looking at the figures that show attendance of patients at the Matlab Health Research Centre hospital. He was accompanied by Dr. Md. Yunus, Head, Matlab Health Research Programme (extreme left), Dr. A.M. Zakir Hossain, Director PHC, Directorate of Health(2nd from left)

Matlab Clinical Research Unit

Head: Md. Yunus

In total, 13,045 patients with diarrhoea received treatment at Matlab in 1997, which was 30% more than in 1996, but only about one in five (18%) lived in the Demographic Surveillance System (DSS) area. The case fatality rate was 0.7%. Another 3,251 patients were treated at the three community centres run by trained volunteers, and they had a case fatality rate of only 0.1%.

Rectal swabs from the DSS residents were cultured for vibrios, *Shigella*, and *Salmonella*. The culture yielded 19.0% *V. cholerae* O1, 1.2% *V. cholerae* O139, 9.6% *Shigella*, and 3.7% *Salmonella*. Table 1 shows the isolation rates of vibrios and *Shigella* species for 1997. This shows that *V. cholerae* O1 and *V. cholerae* O139 are co-existing and endemic in this area. Isolation rate of *Shigella* spp. remained the same as in the last year, *S. flexneri* (59.6%) and *S. dysenteriae* type 1 (24.8%) being most common.

Table 2 shows the patterns of antibiotic resistance of *Shigella* isolated over the last 6 years. The resistance to mecillinam slightly decreased over last year, whereas *S. flexneri* and other species of *Shigella* were still sensitive to nalidixic acid. No resistance to ciprofloxacin was found in any of the isolates.

Microscopic examination of 1,488 stool samples revealed: *Ascaris lumbricoides* (33.3%), *Trichuris trichiura* (13.4%), *Giardia lamblia* (3.9%), hookworms (1.6%) and *Entamoeba histolytica* (1.5%).

Table 1. Aetiological agents identified in patients from the Matlab DSS area in 1997

Month	Total number of patients	patients in DSS Area	<i>V. cholerae</i> O1	<i>V. cholerae</i> O139	<i>Shigella</i>	<i>Salmonella</i>
Jan.	955	167	17	2	12	3
Feb.	452	99	8	0	7	1
March	646	177	30	0	4	2
April	1391	261	46	1	24	2
May	1903	229	58	3	24	7
June	1327	205	26	4	27	0
July	1095	204	23	5	15	1
August	845	190	41	0	18	6
Sept.	936	209	34	9	21	2
Oct	1091	205	45	26	34	2
Nov.	1222	245	81	23	24	3
Dec.	1182	193	45	16	20	0
Total	13045	2384(18.3)	454(19.0)	89(3.7)	230(9.6)	29(1.2)

Figures in parentheses are percentages of patients in the DSS area

Table 2: Isolation and resistance pattern of *Shigella* species in the Matlab Clinical Research Unit for 1992-1997

Year	<i>Shigella</i> species	No. isolated	Resistance N (%)			
			AM	SXT	NA	MEC
1992	<i>S. dysenteriae</i> type 1	38	37 (97)	38 (100)	34 (89)	7 (18)
	<i>S. flexneri</i>	153	84 (55)	111 (73)	7 (5)	62 (41)
	Others	16	1 (6)	5 (31)	1 (1)	5 (31)
	All	207	-	-	-	-
1993	<i>S. dysenteriae</i> type 1	158	153 (97)	155 (98)	153 (97)	48 (30)
	<i>S. flexneri</i>	153	89 (58)	126 (82)	13 (8)	87 (57)
	Others	24	2 (8)	14 (58)	0 (0)	6 (25)
	All	335	-	-	-	-
1994	<i>S. dysenteriae</i> type 1	162	152 (94)	155 (96)	151 (93)	23 (14)
	<i>S. flexneri</i>	132	79 (60)	88 (67)	6 (5)	46 (35)
	Others	17	1 (6)	9 (53)	0 (0)	3 (18)
	All	311	-	-	-	-
1995	<i>S. dysenteriae</i> type 1	187	182 (97)	187 (100)	185 (99)	19 (10)
	<i>S. flexneri</i>	162	102 (63)	112 (69)	3 (2)	61 (38)
	Others	31	1 (3)	12 (39)	0 (0)	8 (26)
	All	380	-	-	-	-
1996	<i>S. dysenteriae</i> type 1	58	57 (98)	56 (97)	56 (97)	18 (31)
	<i>S. flexneri</i>	131	83 (63)	99 (76)	6 (5)	50 (38)
	Others	18	3 (17)	13 (72)	0 (0)	7 (39)
	All	207	-	-	-	-
1997	<i>S. dysenteriae</i> type 1	57	54 (95)	57 (100)	48 (84)	14 (25)
	<i>S. flexneri</i>	137	94 (69)	107 (78)	12 (9)	46 (34)
	Others	36	4 (11)	13 (36)	1 (3)	3 (8)
	All	230	-	-	-	-

AM= Ampicillin; SXT= Trimethoprim + Sulphamethoxazole; NA= Nalidixic acid; MEC= Mecillinam

Matlab Staff Clinic

Head: Md. Yunus

Funded by: ICDDR,B

The Matlab Staff Clinic continued to provide improved healthcare services to members of the staff and their dependents. Of the 3,884 personnel and their dependents who attended the Staff Clinic, 49 were hospitalized.

Research Activities

Children's Fluid Intake during Diarrhoea: A Comparison of Questionnaire Responses of Caretakers with Data from Observations

PIs: K. Zaman, J. Chakraborty, Md. Yunus, A. de Francisco, D.S. Alam, and K.M.A. Aziz
Funded by: WHO/Geneva

This study aimed at evaluating the use of simple questions to child caretakers to estimate the proportion of young children being offered/receiving increased quantities of fluids during diarrhoeal episodes, by comparing caretakers' responses with data obtained by direct observation. The study also aimed at contributing to the development of guidelines for conducting future surveys on home management of diarrhoea.

Two groups of children/caretakers were recruited for surveillance of active diarrhoea. Children aged 4 to 35 months and having diarrhoea at the time of surveillance were observed for fluid intake at home for 12 hours during diarrhoea and two weeks later when the child was cured (Group A). On the first day after expiry of two weeks, the caretakers were interviewed using a standard questionnaire. The comparison was made with another group of children with diarrhoea in the past two weeks and on the day of surveillance. They were designated as children of Group B and were administered the same questionnaire. In total, 195 children in Group A and 360 in Group B were recruited. The enrolment and field activities were completed by June 1997. Analysis and report writing are in progress.

Does Disease Due to *V. cholerae* O1 Confer Protection against Subsequent Diarrhoea Due to *V. cholerae* O139?

PIs: Md. Yunus, John Clemens, and K. Zaman
Funded by: National Institutes of Health (NIH), USA

A case-control study was carried out to assess whether an initially treated episode of diarrhoea due to *V. cholerae* O1 has a reduced risk of subsequent diarrhoeal attack due to *V. cholerae* O139 during a period up to 10 years following the initial episode. The cases were Matlab residents with diarrhoea due to *V. cholerae* O139 strain detected during 1993-1995, and 943 cases were included for the study. For each case, three controls were selected who did not have diarrhoea during 1993-1995. The controls were matched by age, sex, and residential location. Whether an individual was a resident in the Matlab DSS area was also recorded. The cases and the controls will be compared for incidence of earlier episodes of treated *V. cholerae* O1 diarrhoea during 1983-1992, using odds ratio appropriate for matched data. Data analysis is in progress. The results of this study would have important implications for development of cholera vaccine and cholera control strategies.

Evaluation of a Packaged Rice-ORS in Cholera and Cholera-like Illnesses in Children

PIs: K. Zaman and Md. Yunus
Funded by: Thrasher Research Fund (USA)

In a randomized, controlled clinical trial, the efficacy of a new pre-cooked packaged rice-ORS was compared with that of standard glucose-ORS in the treatment for dehydration and maintenance of rehydration in 5-15 years old patients with cholera and cholera-like illnesses. Patients with moderate or severe dehydration, admitted to Matlab hospital of ICDDR,B were randomized to receive either packaged rice-ORS or packaged glucose-ORS. Diet and antibiotic treatment were given according to standard procedure. During their stay at the hospital, fluid intake and output measurements were recorded 8 hourly. Blood haematocrit and serum electrolytes were estimated at 0, 4, and 24 hours.

In total, 167 patients were enrolled in the study with 85 in the rice-ORS and 82 in the glucose-ORS groups. Analysis showed that there was no significant reduction in stool output between the two groups in the first 8 hours. There was also no significant difference in mean duration of diarrhoea and in ORS failures that required IV fluids. More detailed analyses of the data are underway.

Efficacy of Bismuth subsalicylate in Preventing Acute Diarrhoeal Episodes from Becoming Persistent in Rural Bangladeshi Children

PIs: Hafizur R. Chowdhury, Md. Yunus, K. Zaman, and A. Rahman

Funded by: Proctor & Gamble, USA

The study evaluated the role of 100 mg/kg body wt./day of Bismuth subsalicylate (BSS) administered in 4 divided doses for 5 days in preventing acute diarrhoeal episodes from becoming persistent in Bangladeshi children. This randomized clinical trial planned to include 1240 rural Bangladeshi children aged 4-36 months with acute watery diarrhoea of less than 72 hours duration admitted at the Matlab Hospital. Ultimately, 489 children were recruited for the study. The study children were randomly assigned to receive either BSS or placebo along with standard case management. All children were followed up at home up to 14 days to determine whether the diarrhoea episode had resolved or become persistent.

The study was completed in May 1997. Of the 489 children, 9.1% showed symptoms of persistent diarrhoea. No adverse drug reactions were observed. Because of a slower-than-expected recruitment, an interim analysis on 418 patients found no significant difference in the rate of persistent diarrhoea between the treatment and placebo groups. Extrapolation of these results for the total sample size (1240) also showed no significant difference between the two groups. Detailed data analyses are in progress.

Development of Matlab's Infrastructure

Construction of an International Family Planning Training Centre at Matlab, with financial assistance from the Government of Japan, is progressing satisfactorily, and is expected to be completed by the end of March 1998.

Extension of the community-based safe motherhood facilities at Block D subcentre with an outpatient and a maternity unit is in progress on land donated by the local community and with financial support from the Belgian Administration for Development Cooperation (BADDC). The construction work is expected to be completed by the end of January 1998.

Reproductive Health Programme

Head: Andres de Francisco

This new programme started in 1997 with rural and urban surveys on RTIs/STDs and is developing new studies on adolescent health, safe motherhood, and male involvement in family planning.

Maternal and Child Health and Family Planning (MCH-FP) Programme and Record Keeping System (RKS) in Matlab

PI: A. de Francisco

Funded by: Government of Japan and ICDDR,B

The new initiatives undertaken by the Reproductive Health Programme include the following:

- Adolescent reproductive health
- Women's morbidity and safe motherhood
- Male involvement in family planning
- Reproductive and sexually transmitted infections
- HIV/AIDS
- Infertility

1997 was a year of transition for the MCH-FP Programme as many of its activities were divided to be performed by the new Reproductive Health Programme and the Community Health Research Unit in Matlab. This section reports on the former MCH-FP Programme activities undertaken during 1997.

Prevalence of Reproductive Tract Infections in Rural Bangladesh

PIs: S. Hawkes, A. de Francisco, J. Chakraborty, K. Gausia, N. Alam, L. Williams, and D. Mabey

Funded by: DfID, UK

This study, completed during 1997, determined the prevalence of RTIs, STDs, and associated risk factors in population-based samples of adult men and married women, pregnant women, mothers, and neonates. It also investigated perceived morbidity and healthcare-seeking behaviour, antimicrobial resistance patterns, and the replicability of programmes for the recognition, management and prevention of RTIs. Laboratory diagnostic tests were: ELISA and PCR for chlamydia; culture and PCR for gonorrhoea; RPR and TPHA for syphilis; culture and wet mount for *Trichomonas vaginalis*; ELISA and Western blot (PCR confirmation) for HIV.

The preliminary results showed that the prevalence of both STIs and RTIs in Matlab was lower than anticipated, despite a high level of self-reported morbidity. The study highlighted the need to reconsider the RTI/STI management and prevention strategies in areas of low prevalence; the inclusion of men in sexual health services; screening pregnant women for syphilis; and giving prophylaxis against ophthalmia neonatorum in neonates. Both public and private sector providers need to be involved in ensuring improved quality of care.



A community health worker is administering an injectable contraceptive to a village woman at the latter's home

Safe Motherhood in Matlab: Analysis of Early Studies

PIs: A.M. Vanneste, J. Chakraborty, C. Ronsmans, R. Shaheen, and A. de Francisco
Funded by: DfID, UK

Using data from the DSS and special investigations, the study compared the trends in direct obstetric maternal mortality ratios in the MCH-FP area that received extensive services in health and family planning since 1977 with those in the comparison area that received no such intensive health inputs.

Direct obstetric mortality declined by 3% per year, but there was no difference between the MCH-FP and comparison areas. Mortality reduced by 50% from 1976-1986 and 1987-1989 in the northern MCH-FP area where the maternity care programme was initiated in 1987, while no change was observed in the southern MCH-FP area having no such intervention at that time. After 1990, when the programme was expanded throughout the MCH-FP area, the southern part showed a downward (non-significant) trend in direct obstetric mortality. However, direct obstetric mortality declined between 1987 and 1989 in the southern comparison area even in the absence of an intensive maternity care programme. Caution is required in the interpretation of short-term trends in maternal mortality. A maternal death audit and a reclassification of maternal deaths according to specified guidelines were completed.

Use of Healthcare Services in Rural Bangladesh: Pregnant Women's Choices

PI: R. Shaheen
Funded by: AusAID (through University of Western Australia)

A community-based cross-sectional descriptive survey was conducted to investigate healthcare-seeking behaviour of pregnant, intrapartum and postpartum women in three villages outside ICDDR,B's intervention and comparison areas in Matlab. Qualitative methods were used. One hundred and fifty-seven pregnant and early postpartum women were interviewed for the health problems and symptoms they had encountered.

Eighty percent of the study women reported suffering from at least one health problem or symptom during their pregnancy, intrapartum or postpartum period. The most common ones were: symptoms indicative of anaemia, difficult labour, postpartum haemorrhage, postpartum infection, urinary problems, reproductive tract infection, and genital prolapse. The women used a range of indigenous providers and western-trained specialists, although local allopaths were the most commonly consulted providers. The range of beliefs reported by women as to the aetiology of illnesses varied from highly traditional to those that were more consistent with biomedical notion. The main barriers to women's use of health services included: poverty, minimal education, poor accessibility, lack of transport, inadequate local facilities, and low societal status of women.

Women need encouragement to receive health education, and the existing village doctors need training on prevention and management of maternal and reproductive health problems.

Safe Motherhood in Matlab: The Next Steps

PIs: T. Juncker, A. de Francisco, J. Chakraborty, and R. Shaheen

Funded by: BADC and ICDDR,B

Safe Motherhood Programme started at one health subcentre which provided a comprehensive antenatal service by a nurse/midwife, high-quality delivery, and arranged community-based meetings for the pregnant women. This initiative was successful in attracting women even for normal delivery at the health centre.

There were 644 deliveries in Block C, and 32% of these were subcentre-based deliveries, with 15 women being referred to Matlab. There have been 1,042 antenatal contacts, and 520 postnatal contacts were made by paramedics. This intervention, still under evaluation, indicates that couples are willing to attend a health centre for delivery if there is enough understanding about obstetric complications, and if a high-quality antenatal screening exists.

Future activities include the development of comprehensive essential and emergency obstetric care at the Matlab Thana Complex for Caesarian section and safe blood transfusion.

Family Planning

PIs: A. de Francisco and J. Chakraborty

Funded by: Government of Japan

Out of a total of 19,504 eligible women in the Matlab intervention area, 13,122 (67%) are using contraceptives provided by the MCH-FP Programme. Of all contraceptive users, 51% use injectable contraceptives, 25% use the pill, 2% use IUD, 10.7% are tubectomized, 8% use condom, and 4% use other methods. The total fertility rate as reported by the DSS is now below 3.0.

Activities were initiated to involve men in the family planning with contacts on reproductive intentions and desired family size. Planning for a comprehensive intervention that involves males has been completed and will start in 1998.

Current service-oriented research activities include screening and treatment of women for side-effects, by the Community Health Workers (CHWs). During the year, Matlab hospital and health centres saw 5,696 women using DMPA, 1,970 women using the pill, 349 women using IUD, and 755 men using condoms. These consultations included both reassurance on the method use, counselling, management of side-effects or control.

Adherence to Cotrimoxazole Treatment in Rural Bangladeshi Children with Acute Lower Respiratory Tract Infections (ALRI)

PIs: A. de Francisco and J. Chakraborty

Funded by: ICDDR,B

The study evaluated the compliance of oral cotrimoxazole in an ALRI control programme in Matlab. Health workers administered the first dose to patients with moderate disease and gave the remaining doses to the relatives. Subsequently, a team of medical assistants visited the families of patients 3-5 days after initiation of treatment and counted the remaining tablets. Severe cases were referred to Matlab and excluded from the study.

Medical assistants made 367 visits to families of children under treatment at a mean of 4.4 days after the treatment had begun. All children appeared to have been given the antibiotic, but 25% were under-dosed. This practice did not correlate with the socio-demographic variables studied. Under-dosed children did not seem to have a higher number of subsequent episodes during the study period. There was no indication of increased progression toward severe disease or death from home-managed moderate pneumonia cases in this study. This finding raises a question on the requirement for five days of oral antibiotics for the management of moderate pneumonia.

Nutrition Surveillance System and Rehabilitation Unit

PIs: A. de Francisco and J. Chakraborty

Funded by: Helen Keller International and ICDDR,B

The project is currently collaborating with Helen Keller International (HKI) in a countrywide nutrition surveillance system in disaster-prone areas. Reports on anthropometric measurements: weight, height and mid-upper arm circumference (MUAC) in groups of 500 infants both in the treatment and the comparison areas are produced every three months by HKI.

Measurement of MUAC is recorded every three months for all children aged less than five years in the Matlab MCH-FP intervention area. If the MUAC is between 120 and 110 mm, the child is closely monitored. However, if it is below 110 mm, the child is referred to the Nutrition Rehabilitation Unit (NRU) of the MCH-FP Programme. Management of sick children is ensured there by prompt treatment of complications. Mothers are involved in the preparation of simple and inexpensive food which is given with regular frequency under supervision. In most cases, this improves the nutritional status of their children.

Health Services--Mother and Child

PIs: J. Chakraborty, A. de Francisco, and Md. Yunus

Funded by: ICDDR,B

This component of the programme includes interventions directed toward reduction of mortality and morbidity, and management of morbidity of women of reproductive age and their children aged less than five years through primary healthcare structure. Specific activities target specific conditions that contribute to disease burden. The health services evaluated the Record Keeping System (RKS).

Immunization data for the year showed that 95% of the infants are immunized with BCG, 85% with DPTP III; 94% of the children aged 9-23 months were immunized against measles; and 98% of the women of reproductive age with two doses of tetanus toxoid. In total, 13,959 children over six months of age were given vitamin A capsules with a coverage of 97%. Six hundred and seventy-three cases of acute lower respiratory infections were reported during the year from which 70% were treated at home by CHWs, and 30% were referred to the ALRI Unit at the Matlab hospital. During the year, 149,650 locally-made ORS packets were distributed, and 2,659 safe delivery kits were produced and distributed to pregnant women in the intervention area.

Record Keeping System

PI: A. de Francisco

Funded by: ICDDR,B

The Record Keeping System (RKS) maintains computerized information on the health and family planning services delivered by health workers in the MCH-FP Intervention area. The information is recorded by CHWs in service record books and serves to provide immediate feedback regarding targeting of households and balances of supplies. The computerized information is used for researchers to conduct evaluation of health interventions.

Activities during 1997 concentrated on computerizing all information not entered till date and on cleaning the available database. This required a large investment in terms of time spent by the workers both in the field as well as in Dhaka. The information available at present has been cleaned, and data analysis on the impact of the components of MCH-FP intervention is ongoing. The RKS has recently been linked to the Demographic Surveillance System and the Geographic Information System and will be part of the Health and Demographic Surveillance Programme from 1998 onwards.

Dissemination Activities

Funded by: DfID (UK), Government of Japan, and BADC

One international workshop on Improving Effectiveness and Quality of Care in the MCH-FP Programmes through operations research was organized at the Centre level. A dissemination workshop on the Reproductive Tract Infections was organized which was participated by experts and high-ranking officials from the concerned agencies, including Directorate of Health and AIDS Prevention and Control Programme of the Government of Bangladesh. A dissemination seminar on the findings of the Safe Motherhood Programme in Matlab was also organized during the year, and both Government officials and NGO representatives were present.

Child Health Programme

Acting Head: Nigar S. Shahid

This new programme has concentrated on developing new vaccine trials for conjugate pneumococcal and rhesus rotavirus vaccines, and on the surveillance for ALRI and diarrhoeal pathogens.

Epidemiology of Diarrhoea and ARI in a Cohort of Newborn in Rural Bangladesh

PIs: Kh. Z. Hasan, R.B. Sack (Johns Hopkins University), A.K. Siddique, K.M.A. Aziz, J. Albert, L. Unicomb, R. Huq, and B.P. Pati

Funded by: USAID

A cohort of 288 newborn children was recruited and longitudinally followed up at Mirzapur in Tangail district for 24 months to determine the aetiological agents of diarrhoeal disease and the incidence and causes of acute lower respiratory tract infections, particularly pneumonia. A 500-bed general hospital (Kumudini Hospital) located close to the study villages collaborated in the investigation. All ALRI patients, particularly those with pneumonia and acute dehydrating diarrhoea and persistent diarrhoea, were hospitalized for detailed investigation and proper management. The routine laboratory investigations of enteric bacteria, virus, and parasites were continued till the first quarter of 1997. The laboratory investigations of putative enteric organisms and some serological tests started during the first and the second quarter of 1997.

The morbidity surveillance was completed in December 1996. However, some activities that included verification of information continued in the field during the first three months of 1997. Out of the 288 newborns recruited at birth, 53 (18.4%) were dropped out from the study due to out-migration (3.8%), very low birth weight, i.e. less than 2000 g (3.12%), congenital abnormalities (1.7%), and deaths (9.7%). The incidence of diarrhoea was 3.84 per child per year and ALRI was 0.59 per child per year. In total, 73 pneumonia cases were diagnosed clinically in the cohort during the study period. RSV was the predominant viral agent in 23 (27.4%). Blood culture was positive for bacterial aetiology in 7 (11.3%) of the 54 pneumonia cases.

Immunogenicity of Conjugate Pneumococcal Vaccine in Infants of Mothers Vaccinated with the Pneumococcal polysaccharide Vaccine

PIs: Nigar S. Shahid; and Mark Steinhoff (Johns Hopkins University)

Funded by: Thrasher Research Fund and USAID

Study of the immunogenicity of the 9-valent conjugate pneumococcal vaccine in infants of mothers vaccinated with the polysaccharide pneumococcal vaccine could not be commenced due to some questions raised by WHO on unintended effects of the vaccines. The study vaccines have been received from the manufacturer.



Health and Demographic Surveillance Programme

Head: Jeroen K. van Ginneken

This programme is now responsible for the Demographic Surveillance System (DSS), MCH-FP Record Keeping System (RKS), and Geographic Information System (GIS) that cover Matlab. Methods for data collection, handling, and linkages are now being updated and modernized.

Population dynamics in the Matlab Intervention Area (served by the Centre's MCH-FP Programme) and the Matlab Comparison Area (served by the government health services)

Vital rate (per 1000)	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996
Crude birth rate												
MCH-FP area	34.6	33.6	33.6	30.9	28.4	28.3	25.4	25.4	24.7	25.9	25.2	22.4
Comparison area	42.6	39.6	39.2	40.4	36.6	37.8	32.7	31.1	29.4	29.4	27.8	26.7
Both areas	38.5	36.5	36.4	35.5	32.4	32.9	29.0	28.2	27.0	27.6	26.5	24.5
Total fertility rate^a												
MCH-FP area	4.5	4.3	4.2	3.8	3.4	3.4	3.0	3.0	2.9	3.0	2.9	2.7
Comparison area	6.0	5.5	5.4	5.4	4.9	5.0	4.3	4.0	3.8	3.8	3.6	3.5
Both areas	5.2	4.9	4.8	4.5	4.1	4.1	3.6	3.5	3.3	3.4	3.2	3.0
Crude death rate												
MCH-FP area	10.2	9.9	9.3	8.7	8.0	7.6	8.1	8.3	7.7	8.0	7.3	7.6
Comparison area	14.2	12.2	11.2	11.0	9.5	9.4	10.2	9.8	10.2	9.2	8.4	7.9
Both areas	12.2	11.0	10.2	9.9	8.7	8.5	9.1	9.0	8.9	8.6	7.9	7.7
Neonatal mortality^b												
MCH-FP area	52.5	45.4	43.8	42.8	46.0	47.8	47.7	49.6	42.8	36.4	30.6	39.5
Comparison area	69.4	53.0	54.9	57.7	52.7	53.3	63.2	53.3	64.5	56.4	50.3	42.1
Both areas	61.7	49.4	49.7	51.1	49.7	50.9	56.3	51.6	54.4	46.9	40.8	40.9
Post-neonatal mortality^b												
MCH-FP area	33.8	36.4	34.6	38.0	28.3	27.4	32.3	30.8	20.3	27.3	20.6	26.6
Comparison area	49.1	39.7	39.5	39.0	38.0	34.1	51.7	37.0	34.8	30.8	28.3	24.8
Both areas	42.1	38.2	37.2	38.6	33.6	31.2	43.0	34.1	28.0	29.2	24.6	25.7
Infant mortality^b												
MCH-FP area	86.4	81.8	78.4	80.8	74.3	75.2	80.0	80.5	63.1	63.7	51.1	66.2
Comparison area	118.4	92.7	94.4	96.6	90.7	87.5	114.9	90.2	99.3	87.2	78.6	67.0
Both areas	103.8	87.6	86.9	89.6	83.3	82.1	99.2	85.7	82.4	76.0	65.3	66.6
Child mortality (1-4 yrs)												
MCH-FP area	16.4	13.4	9.9	7.6	6.4	5.3	7.0	5.9	5.9	5.3	6.7	6.0
Comparison area	24.6	20.7	15.0	14.4	11.5	9.3	9.1	10.4	10.0	7.0	8.4	8.0
Both areas	20.7	17.2	12.6	11.1	9.0	7.4	8.1	8.3	8.1	6.2	7.6	7.1
Rate of natural increase												
MCH-FP area	24.4	23.7	24.3	22.1	20.4	20.7	17.3	17.1	17.0	17.9	17.9	14.8
Comparison area	28.4	27.4	28.0	29.4	27.1	28.4	22.5	21.2	19.2	20.2	19.4	18.8
Both areas	26.3	25.5	26.1	25.7	23.6	24.4	19.9	19.1	18.1	19.1	18.6	16.8

^aPer woman
^bPer 1,000 live-births

Demographic Surveillance System (DSS)

PI: J.K. van Ginneken

Funded by: DfID (UK), Government of the Netherlands, and ICDDR,B

DSS is a component of the Matlab Project and has been in operation continuously since 1966, collecting data on vital events from a population of 210,000. As one of the very few projects in the developing world with continuous surveillance at the subnational level for a period of nearly 30 years, it is a unique global resource.

Data collection was done by female community health workers (CHWs) who visited each household every fortnight, but this frequency of visit was reduced to monthly in late 1997. In the intervention, the CHWs are also responsible for family planning and maternal and child health services. In the comparison area, CHWs do not provide any services. The data collection activities of CHWs are verified by male workers, but this system was modified in late 1997. The workers maintain the population registers and fill in the demographic event forms.



A community health worker is discussing health issues and collecting information on the health of the mother and her child in a cordial environment

Vital event data are transferred to the ICDDR,B headquarters and subjected to further checking before entry into the large database. At this stage, these data give the key vital rates that are published in the Early Indicators series and the ICDDR,B Annual Report. Additional data collected by the DSS also include the socio-economic censuses conducted in 1974, 1982, 1993, and 1996.

Publication of the Demographic Surveillance System (DSS) Report

PI: G. Mostafa

Funded by: DfID (UK) and ICDDR,B

Since 1966, DSS has been producing annual reports detailing the demographic situation in Matlab. By the end of 1997, DSS Annual Report for 1996 has been ready for publication.

Publication of the Socio-economic Census Report 1996

PIs: A. Razzaque and L. Nahar

Funded by: DfID, UK

In November 1996, a socio-economic population census was held in Matlab. During 1997, much time was spent on cleaning, processing and analysis of the data, and the report was nearly completed. Publication is expected in early 1998.

Matlab Health and Socio-economic Survey (MHSS)

PIs: N. Khan; and O. Rahman (Harvard University and RAND), and J. Menken (University of Pennsylvania and Colorado)

Funded by: National Institutes of Health (NIH), USA

Adults in 2,700 *baris* and 5,000 households in the DSS area were interviewed in May through August 1997. Data were collected on household composition and economy, labour force, fertility and contraception, adult health status, use of health services, migration, and transfers of income, goods and services to DSS households. The interviews were carried out by Mitra and Associates, who are also in charge of data cleaning, entry, and editing. The information from the survey will be linked to already-existing information for the respondents of the survey, derived from the DSS database. The whole dataset will be assembled at the RAND Corporation, and with proper documentation, will be released jointly by ICDDR,B and RAND as a database for public use in the middle of 1998.

Recent Changes in Marriage Patterns in Rural Bangladesh

PI: K. Shaikh

Funded by ICDDR,B

This study examined the crude marriage rates by age and sex, the proportions of never-married individuals and the average age at marriage of grooms and brides, using marital status registration data from the DSS for 1975-1992. Socio-economic information collected in 1982 was also used for investigating the impact of socio-economic status and age at first marriage, and age differences between husband and wife. A regression analysis used age of the female at marriage as the dependent variable and selected explanatory variables, such as wife's education on age at marriage. The results suggest that among women with 6 to 10 years of schooling, age at marriage is significantly higher compared to the illiterates. It was almost 3 years higher among the women who have higher secondary level of education and above compared to the illiterate women. The results also showed that the average age of the female at marriage increased significantly (1.6 and 3 years respectively) during the periods 1981-1986 and 1987-1992 compared to 1975-1980.

Impact of Age at Marriage on Fertility

PI: K. Shaikh

Funded by: ICDDR,B

Two specific aspects were investigated, including influence of age at first marriage and divorce, and dissolution of marriage on the levels of fertility, using marital status registration data from the DSS for 1975-1992. Socio-economic information collected in 1982 census is also used for investigating the impact of socio-economic status on fertility. Multiple regression analysis with children ever born as the dependent variable showed that age at marriage has a significant effect on fertility. The lower the age at first marriage, the higher is the number of children ever born. The result showed that the fertility of more-than-once married women is higher compared to the once-married women.

Childlessness as a Risk Factor of Divorce among Young Married Women in Bangladesh

PI: L. Nahar

Funded by: ICDDR,B

This study examined whether delay in producing a child leads to a higher risk of marital dissolution after 3 years of marriage. The data on marital status of 1405 girls in the DSS area, who were married for the first time during 1982-1985, were analyzed. First birth after marriage, migration, marital dissolution (due to death or divorce), and socio-economic information were obtained from the DSS files. The likelihood of divorce was modelled in discrete-time hazard models where having a child is the single most important variable, taking into account other demographic and socio-economic variables.

Childbearing significantly reduced the risk of divorce of the women. Other important findings were that the couple's socio-economic characteristics, such as education of both partners, male partners' previous marital status, parents' characteristics, like possession of land, occupation, and education, influence the chance of divorce.

Induced Abortion in Matlab: Trends and Determinants

PI: M.K. Ahmed

Funded by: ICDDR,B

Trends and risk factors associated with induced abortion, miscarriage, and stillbirth were examined in Matlab, using DSS datasets. About 75,000 pregnancy terminations during 1982-1991 were analyzed using logistic and proportional hazards regression models. Induced abortion

has significantly increased between 1982 and 1991. It was higher among women who had a large number of children or had short birth intervals. Induced abortion was higher among users of pill, condom, or traditional methods than among injectables users or non-users. It was lower in a population that has access to an intensive maternal and child health and family planning (MCH-FP) programme than in an otherwise comparable neighbouring population under less intensive government services. A high-quality reproductive health programme relying on effective contraceptive methods could, therefore, probably reduce the burden of induced abortion in Bangladesh and other comparable countries.

Epidemiology of Child Deaths Due to Drowning in Matlab, Bangladesh

PI: M.K. Ahmed

Funded by: ICDDR,B

Deaths of children aged 1-4 year(s) due to drowning were examined in a longitudinal population-based case-control study undertaken in Matlab for the risk factors. Deaths due to drowning ranged from about 10 to 25 percent of all child deaths during 1983-1995. The absolute risk of dying from drowning remained almost the same over the study period but the proportion of drowning to all causes of death has increased. Drowning is specially common in the second year of life. The risk of dying from drowning increases with age of the mother and much more sharply with higher number of living children in the family.

Risk Factors of Death Due to Violence among Women of Reproductive Age in Rural Bangladesh

PI: M.K. Ahmed

Funded by: ICDDR,B

Risk factors of death from violence (accidents, suicide and homicide) among women of reproductive age during 1988-1995 were studied in Matlab, with data from the DSS. A case-control study was designed to examine the risk factors of death due to violence, and a logistic analysis model was used for assessing some factors and the risk of death from violence and other causes. The preliminary results suggest that women outside marital union have a much higher risk of dying regardless of causes of death. Childlessness seems to be a risk factor for both violence and accidents.

Abortion Dynamics in Rural Bangladesh: Does an MCH-FP Programme Bring About Any Changes?

PI: R. Bairagi

Funded by: WHO

The objectives of this project are to examine the impact of a family planning programme on the quantity, quality, and health consequences of abortions and to find the reasons in rural Bangladesh. Existing data for the 1974-1996 period from the DSS, Record Keeping System (RKS), and Socio-economic and KAP Surveys of ICDDR,B in Matlab during 1974-1996 will be used. Some additional data on health consequences of abortion will also be collected by survey from Matlab for the study.

Household Visitation Cycle

PIs: N. Alam, R. Bairagi, and A. Razzaque

Funded by: DfID, UK

In Matlab, the DSS data on births, deaths, marriages and migrations were collected by household visits at an interval of two weeks till the middle of 1997 when the frequency of visits was changed to a monthly cycle. To determine the effect of change in frequency of visits, an experiment was started in the middle of 1997 to examine its effects on supervision of the completeness and

accuracy of demographic events. In two areas, each with a population of about 35,000, Community Health Workers (CHW) visited at two weeks interval, and supervision by Health Assistants was being done at about six weeks intervals. In one of these two areas, visits by two teams, each with a CHW and an HA, took place at three months interval, and in the other area, by the CHWs each alone at an interval of two months. The completeness of the reporting will be assessed for the same events.

Abortion: An Emerging Issue to Meet Son Preference and Limit Family Size in Bangladesh

PI: R. Bairagi

Funded by: ICDDR,B

Son preference is common in most countries in South and East Asia. Some experts argue that this preference would be an obstacle to fertility decline. However, the effect of son preference on fertility does not seem to be consistent. In this study, longitudinal data on contraceptive use, abortion and fertility from the Matlab Demographic Surveillance System (DSS) were used in understanding the issue. The Arnold Index was used for measuring the effects of gender preference on contraceptive use, abortion and fertility. This index provides an estimate of the absolute as well as relative change that may be termed Sex Preference Effect Measure (SPEM) in a variable.

Diagnosis of the Inconsistencies in the Bangladesh Child Nutrition Survey Findings

PI: R. Bairagi

Funded by: Bangladesh Bureau of Statistics (BBS) and ICDDR,B

The objective of this study was to investigate the reasons for the inconsistencies in the findings based on anthropometric indices in the Bangladesh Child Nutrition Surveys. Anthropometric and age data collected from 95 children independently by two groups of workers were used for the study. Bias was found to be about 1.8 months in age and 0.13 cm in mid-upper arm circumference (MUAC). Biases in weight and height were negligible. However, random error was found to be substantial in data on height. Bias in age was thought to be mainly responsible for the inconsistencies in malnutrition in different nutrition surveys in Bangladesh. There is a need for development of a tool for collecting age data accurately, on the basis of an experiment in a demographic surveillance area, where accurate age data are available. It is also suggested that MUAC be routinely collected in any nutrition survey until such a tool is fully developed. The importance of accuracy in weight and height data is emphasized.

Preference for Children and Subsequent Birth: Evidence from Matlab, Bangladesh

PI: A. Razzaque

Funded by: ICDDR,B

The study investigated the validity of preference for children in predicting birth in the MCH-FP and the comparison areas of Matlab, Bangladesh. The two datasets used were: KAP Survey (1990) and the Demographic Surveillance System (1990-1995). After controlling for all variables in the hazard model, likelihood of birth was 0.37 times in the MCH-FP area and 0.58 times in the comparison area for those who wanted no more children than those who wanted more. As the success of these family planning programmes depend largely on reduction of birth among those who wanted no more children, family planning service providers should give utmost importance to reduce these unwanted births to accelerate fertility decline.

Health Behaviour, Perceptions, Practices, and Decision Making: Subnational and Socio-demographic Differentials in Bangladesh

PI: A. Razzaque

Funded by: Bangladesh Bureau of Statistics (BBS) and ICDDR,B

The study examined health behaviour, perceptions, practices, and decision-making patterns using data from the 1995 Health and Demographic Survey conducted by the Bangladesh Bureau of Statistics. Respondents' knowledge about causes of diarrhoea (90%) and food contamination (92%) was higher than knowledge about night-blindness (60%) and worm infestation (62%), but this knowledge was found to be inadequate. Reports of multiple causes about these issues were very low (6-12%).

Infant and Child Mortality in Bangladesh: Age-specific Effects of Previous Child's Death

PI: N. Alam

Funded by: ICDDR,B

This study examined whether mortality of two adjacent siblings in families is age-specific and is modified by the MCH-FP programme and fertility and mortality declines in Matlab, Bangladesh. Analyses included singleton births during 1977-1978, 1985-1986, and 1989-1990 in the Matlab treatment (MCH-FP) and comparison areas. Logistic regression was used in estimating the net effects of survival status of elder siblings on mortality of younger siblings in the neonatal, post-neonatal and toddler (ages 12-35 months) stages controlling for birth order, previous birth interval, maternal age, education and religion, household possession of valuable items, and sex of the child in each area.

Repeated Deaths in Families: What Causes the Repetition and When?

PI: N. Alam

Funded by: ICDDR,B

Longitudinal data from Matlab were used for examining which causes of death repeat at what ages in families. Primary causes of neonatal and post-neonatal deaths of 18,827 births in 1989-1992 and their immediate elder siblings were categorized into infectious and non-infectious diseases. Multinomial logistic regression was used for estimating the risk of younger siblings' dying of infectious and non-infectious diseases, given the age and cause of deaths of older siblings, preceding birth interval, birth order, maternal age, education and religion, sex of the child, household possessions of valuable items, and exposure to MCH-FP programmes. Analysis is continuing.

Divorce in Teknaf, Bangladesh: Its Predisposing Factors and Consequence for Child Survival

PI: N. Alam

Funded by: ICDDR,B

Levels and determinants of marital disruption are hardly known in Bangladesh. The demographic surveillance system in Teknaf recorded 1319 marriages and 568 remarriages of Muslim brides during 1982-1983. These marriages were followed up for five years. Probabilities of divorce were inversely related to duration of marriage. Controlling for the effects of other socio-demographic factors, the probabilities of divorce were 21% for first marriages and 37% for remarriages during the first five-year period. Probabilities were the highest for brides' first marriage with polygynous men and for their remarriage with single grooms. Groom's low economic status, illiteracy, and lower age at marriage were also related to high divorce risk in the first three years of marital life. High divorce rate soon after marriage in this community may reveal that divorce was used, particularly by male partners as a solution to unhappy unions. Children of divorced parents experienced higher mortality than those whose parents did not have divorce.

How Did the Grameen Bank Affect Fertility in Bangladesh?

PI: Mizanur Rahman

Funded by: Rockefeller Foundation

The Grameen Bank (GB) is a highly innovative credit programme for the rural land-less. It has provided collateral-free loans to over two million members, 95% of whom are women. The study examined how the proximate determinants of fertility, investment in daughters vis-a-vis son, and son-preference-related fertility behaviour have been affected by joining GB. It also examined the conceptual changes of the GB members about desired fertility, changes in the economic role, bargaining and decision-making power after joining GB, changes of son-preference, perceptions about the economic and social roles of daughters, and their role in old-age security, and diffusion of ideas regarding participation in GB and income-earning.

The study observed three kinds of effects: participation effect, diffusion effect, and selectivity effect. Contraceptive use is higher and thus fertility is lower among GB members than others. GB members' innovative ideas are diffused among non-members. However, GB members are selective of characteristics that are favourable to low fertility. The findings suggest that cross-sectional survey data provide biased estimates of the effect of GB on contraceptive use and thus on fertility.

Social and Behavioural Sciences Programme

Head: Carol L. Jenkins

Since its establishment, the Social and Behavioural Sciences Programme (SBSP) has been working under the conviction that there is significant need of both qualitative and quantitative research on public health issues in sexual and reproductive health. The programme is funded by Ford Foundation. Although staff training and capacity building continue, an increasing emphasis is being placed on developing new research protocols on male sexuality, commercial sex workers, risk behaviours for HIV/AIDS transmission and drug abuse in Bangladesh. The new head of the programme joined in June 1997.

Explanatory Models of Reproductive Tract Infections and Sexual Diseases in the Culture of Rural Bangladesh

This research aimed at understanding the explanatory models used by men and women in rural Bangladesh regarding sexually transmitted diseases and reproductive tract infections. Other objectives included documenting associated treatment-seeking behaviour, attitudes and perceptions about condom use. The research was carried out in conjunction with a clinical investigation of RTI/STD conducted by Sarah Hawkes and colleagues. Sixty male and sixty female cases with a similar number of non-cases were selected for in-depth interviews.

In collaboration with other units of the Centre, SBSP researchers provided technical assistance in qualitative methods of social science research. Those collaborative projects included:

- ❑ socio-cultural and behavioural factors in STD/RTI prevalence in an urban slum population. Investigator: Keith Sabin, MCH-FP Extension Project (Urban)
- ❑ use of shared needles by drug users in Bangladesh: risk of rapid spread of HIV. Investigator: Albert Felsenstein, BADC
- ❑ assessing the health service use in the catchment area of Gonoshasthya Kendra, Savar and Gazipur thana. Investigator: M. Desmet, Health Economics Programme, PHSD
- ❑ improving care-seeking behaviours in ARI illness in Dhaka slum area. Investigator: Anjali Sharma, MCH-FP Extension Project (Urban).

Current and Future Research on Sexual Health

- ❑ Formative and evaluation research for a one-year pilot project using peer education for youth sexual health, with the Red Crescent Society in Maghbazar, Dhaka. PI: Carol L. Jenkins; Funded by Ford Foundation.
- ❑ Pilot study on male sexuality and HIV risk behaviour in Dhaka. PI: Carol L. Jenkins (protocol is being developed).
- ❑ A situational assessment of the HIV-related risk factors in the maritime industry at Chittagong Port. PI: Carol L. Jenkins; Funded by FHI/USAID.
- ❑ The national HIV serological and behavioural surveillance in collaboration with staff from the Laboratory Sciences Division and on behalf of the Government of Bangladesh. PI: Carol L. Jenkins; Funded by UNAIDS.
- ❑ A national study on violence against women in families, to be conducted as part of a multi-country trial initiated by WHO, in cooperation with Naripokkho, and other NGOs. PI: Carol L. Jenkins (protocol is being developed).
- ❑ A national study on male sexualities in Bangladesh among men of different occupations, sexual orientations, and geographical areas. PI: Carol L. Jenkins; funding source being sought.

Impact of Social and Economic Development Programmes on Human Health and Well-being: The BRAC-ICDDR,B Collaborative Matlab Joint Project

PIs: Abbas Bhuiya; and Mushtaque R. Chowdhury (BRAC)

Funded by: Aga Khan Foundation, Ford Foundation, and International Center for Research on Women

Data analysis has been the major recent activity of the Project. Preliminary findings suggest that household income has increased due to income generated from BRAC-assisted activities. There are also indications that the level of household food consumption is higher among BRAC members than comparable non-members. The burden of illness, as measured by illness during the 15 preceding days, remained the same. Contacts with qualified healthcare providers are more frequent and prompt among the BRAC members than the non-members, and among the males than the females. It also appears that BRAC members have a tendency to defer pregnancies. Exploratory studies on sexual and reproductive health issues using anthropological methods were also carried out during the year. Preliminary findings suggest that high-risk sexual behaviours in the community are common. Progress has been made in developing the training materials for communicating sexual and reproductive health matters.

Improvement of Health through a Community Development-oriented Programme in Rural Bangladesh: Chakaria Community Health Project

PI: Abbas Bhuiya; Technical Adviser: Peter Eppler

Funded by: Swiss Red Cross and Dutch and German Red Cross Societies

The Project started in 1994 and aims at improving community health through promotion of preventive measures and other health initiatives by indigenous village-based self-help organizations.

In 1997, the project activities were extended to three more new unions, and training continued with the self-help organizations on hygiene, nutrition, malaria, ARI, mother and child health, and reproductive health problems. Trained representatives also continued their dissemination activities, and an HIV/AIDS awareness campaign was launched. Traditional birth attendants were also trained. A camp on ear, nose and throat diseases was also organized during the year. Emergency medical services were provided to the cyclone victims during the first half of the year. Village health posts run by the self-help organizations continued providing growth monitoring, nutrition counselling, health education and consultation services for sickness management during the year. Government service providers started to use these facilities in five places to provide EPI and MCH-FP services. A system of quantitative impact monitoring was introduced, and the findings are being regularly shared with the self-help organizations to facilitate corrective measures.

Health Economics Programme

Head : M. Mahmud Khan

The Health Economics Programme (HEP) of ICDDR,B was established in December 1996 with financial support from the Department for International Development, DfID (UK), Belgian Administration for Development Cooperation (BADC), and ICDDR,B.

The overall goal of the programme is to establish and strengthen a resource unit at ICDDR,B for organizing and conducting practical policy-oriented research and training with emphasis on application of state-of-the-art technical tools and methodology.

The main objectives of the programme are: to develop expertise in health economics/systems research and training in Bangladesh, identify policy-relevant health economics/systems research projects, demonstrate economic costs and benefits of alternative health interventions, estimate the impacts of health and nutrition programmes on economic and social development activities and vice versa, collaborate with the Government of Bangladesh in policy review and analysis, develop links with other institutions in both developed and developing countries for health economics teaching. HEP activities can be categorized into three broad headings: Research, Training, and Policy Dialogue. In December 1997, total number of ICDDR,B staff involved with the HEP was 14, including the health systems research component.

Research Initiatives

Development of Private Healthcare Sector of Bangladesh: Effects on Costs and Quality of Care

PI: M. Mahmud Khan

Funded by: DfID, UK

This research examined the development of private clinics and hospitals in major urban areas of the country. The analysis focuses on the rate of growth of private sector and its impact on medical care price escalation and quality of service provided.

Development of private sector has been very rapid in Bangladesh since the early 1980s. Despite the rapid growth, number of hospital beds per capita remained almost stagnant in urban areas over the last 15 years. Private health sector of Bangladesh is still highly segmented, and competition for prices and quality of services is not seen. However, with the increase in the number and size of the private facilities, market competitiveness will improve in the future.

Salt Marketing Structure in Bangladesh: Implications for Iodine Deficiency Disorders

PI: M. Mahmud Khan

Funded by: DfID (UK) and SDC

This research examined the marketing structure of common salt to determine whether the price difference between the iodized and non-iodized salt in the market justifies additional expenditure incurred by salt factories in iodizing.

The research identified layers of intermediaries between the cultivators and the final consumers. At every step, cost of salt went up to allow for traders' margin. Finally, at the retail level, price difference between iodized and non-iodized salts was about Tk 3 to 4 per kg.

Optimal Distribution of Emergency Obstetric Care (EOC) Facilities in Bangladesh: An Economic Analysis

PI: M. Mahmud Khan

Funded by: DfID (UK)

The purpose of this study is to determine the size and geographic density of the EOC facilities based on total social benefit maximization principle. Using the 20 former districts as the unit of geographic analysis, the research identified the catchment area of each of the EOC units to minimize the total social costs. The

defined optimal catchment area also determined the size of each unit and the investment required to upgrade the Thana Health Complexes to serve as EOC facilities. The analysis suggests that the social cost per case will be the lowest if the EOC facilities are located within 20 to 24 km from one another. Therefore, Bangladesh should have about 330 EOC facilities. The number of facilities currently providing EOC services is less than 100. If the Thana Health Complexes (THCs) are upgraded to provide EOC facilities, new investments in equipment and physical facilities will be required. Total fixed cost of upgrading the THCs will be about US\$ 240 million and the recurrent costs will also increase by about US\$ 11 million per year.

Revenue and Expenditure Pattern of a Tertiary Hospital in Bangladesh: A Case Study Based on BIRDEM Hospital

*PI: M. Mahmud Khan
Funded by: DfID (UK)*

This research illustrates the use of routinely collected hospital expenditure and revenue data in understanding the longer term financial viability of hospital activities. Monthly time series of revenue and expenditures were used in understanding month-to-month variability and the long-term trend. The relationship between capital expenditure, hospital occupancy rate and revenue earned was also analyzed. This research is being conducted in cooperation with the BIRDEM Hospital.

Macro-economics of the Health Sector of Bangladesh

*PIs: M. Mahmud Khan and M. Kamrul Islam
Funded by: DfID, UK*

The purpose of this research is to examine the macro-economic aspects of the health sector of Bangladesh, including the size of the health sector, resource mobilization strategies followed, sources of funding, and possibility of resource re-allocation within the sector to improve the availability and delivery of essential health services. Future trends in the growth of the health sector will also be analyzed, using standard time series analysis techniques. This research is carried out in collaboration with a faculty member of the Department of Economics, Jahangirnagar University.

Costing of Integrated Management of Childhood Illnesses (IMCI)

*PI: M. Mahmud Khan
Funded by: ABT Associates, DfID*

The purpose of this research is to estimate the cost of IMCI, if implemented in a well-functioning health centre in rural Bangladesh. This research would be able to indicate the impact of introducing IMCI on recurrent healthcare costs. An indirect approach of estimating the cost of IMCI has been developed with technical assistance from the Child Health Programme of WHO. The data collection for costing will be initiated in early 1998.

Evaluation of Home Gardening Programme of Helen Keller International (HKI)

*PIs: George Fuchs and M. Mahmud Khan
Funded by: USAID*

The Health Economics Programme is examining the economic, social and anthropological components of the HKI home gardening project. The biomedical component is being studied by the Clinical Sciences Division. The objective of the study is to evaluate the impact of home gardening on household income, health and nutritional status of children and women, and to examine the potential of using home gardening as an alternative sustainable mechanism of delivering vitamin A.

Survey of rural households participating in the programme started in November 1997. In-depth surveys and qualitative data collection will continue till August 1998.

Healthcare Use Patterns of Slum Residents in Dhaka, Bangladesh

PIs: M. Desmet, S. Zeitlyn, and J. Myaux

Funded by: IDRC and BADC

This study, conducted in the field in 1993, provided a comprehensive analysis of the healthcare-seeking behaviour of the slum population. It identified components of healthcare decision-making, investigated the variables contributing to healthcare choice-making and utilization, and healthcare expenditure. There were 3 consecutive data collection phases: key informant interviews with slum residents and practitioners working in the slums on the components of healthcare decision-making, a 6-month longitudinal survey through fortnightly visits for illness episodes in 1,050 households, and case studies on specific healthcare-seeking behaviour. A comprehensive report was completed in December 1997.

Healthcare Use Patterns of Non-slum Residents in Dhaka City

PIs: M. Desmet and M. Siddiqi

Funded by: IDRC, BADC, UNICEF, and Dhaka Urban Community Health Programme

The preceding study described above was replicated in the non-slum population of Dhaka city. Comparison of findings from these two studies will provide valuable information on health needs, healthcare use, and healthcare costs among differing populations in a large city of a developing country. Qualitative data collection, entry and analysis of the cognitive study were completed in 1996 and the longitudinal survey and case studies in 1997.

Healthcare Use Patterns in the Catchment Area of the Gonoshasthya Kendra Healthcare System in Savar and Gazipur Thanas in Bangladesh

PIs: M. Desmet and A. Qasem Chowdhury

Funded by: IDRC, BADC, and Gonoshasthya Kendra

The activities of the Gonoshasthya Kendra (GK) healthcare system cover a semi-rural area of about 165,000 inhabitants in Savar and Gazipur thanas. This study used the same methodology as the two preceding ones and will enable to investigate rural-urban differentials in healthcare-seeking and specifically to address questions on willingness and ability-to-pay in the GK healthcare system, which has been gradually established over the past 25 years and includes a health insurance scheme. Qualitative data collection, entry, and analysis of the cognitive study were completed in May 1997, and the longitudinal survey will be completed in January 1998. Case studies are expected to be completed in June 1998.

A Meta-analysis of the Organization and Functioning on Two Health Insurance Schemes in Bangladesh

PIs: M. Desmet, A.Q. Chowdhury, and Md. K. Islam

Funded by: BADC

This study was based on existing data of the Gonoshasthya Kendra healthcare programme in Savar and of the Grameen Health Programme, both of which have a health insurance scheme. The purpose was to describe technical performance of the scheme and the level of community involvement in management, and to discuss these achievements in the light of the scheme's potential role as a mechanism in management of healthcare.

Training Activities

Clinical Health Economics Workshop/Training Course

A one-week course was conducted to introduce economic evaluation methods for decision making in clinical practice, i.e., whether a particular medical intervention, procedure or service is worth doing compared to other things that can be done with the economic resources. Cost-minimization, cost-effectiveness, cost-utility and cost-benefit analyses are used for presenting a number of practical case studies. The course was specially designed for physicians, and the first session was held at the University

of Science and Technology, Chittagong (USTC) in April 1997. Sixteen participants successfully completed the course.

Health Economics for Developing Countries

A two-week course was initiated for introducing health economics concepts, issues and methodology to health planners, policy analysts and health sector administrators. The topics covered by the course included: health production function, measuring health status, demand for and delivery of medical services, health insurance issues, health insurance and medical care price escalation, supplier-induced demand, payment mechanisms for physicians and hospitals, economic evaluation of health interventions and political economy of regulations. The course was offered at ICDDR,B in September 1997. Fifteen participants completed the course. This course was jointly organized with the Health Economics Unit of the Ministry of Health and Family Welfare.

Health Economics Course at Jahangir-nagar University

This course has been introduced at the Department of Economics, Jahangirnagar University during 1997-1998 academic year. Health Economics course outline with reading list was prepared,

and the University Curriculum Committee adopted the outline as one of the options to be offered to masters-level students. Out of 80 M.Sc. students, 25 have opted for the class. The classes started in December 1997 and will continue till July 1998. The Centre will provide assistance in running the course during the 1998-1999 academic year.



Participants in a training course on "Applied Health Economics for Developing Countries" organized by the Health Economics Programme of PHSD during 28 September-9 October 1997

Future Research and Plan of Actions of the Division

A proposal was submitted to WHO for funding trials on maternal and infant pneumococcal immunization, but the proposal was rejected. However, WHO approved US\$ 15,000 for a randomized, placebo-controlled trial on Tetravalent Rhesus Rotavirus Vaccine to evaluate immunogenicity, reactogenicity, and acceptability in infants of Matlab, Bangladesh. Additional funds have been requested from USAID.

Three research protocols—one each on Adolescent Health, Safe Motherhood, and Male Involvement in FP were initiated. Funding for the first one is expected from DfID (UK), and for the second and third from EU in 1998.

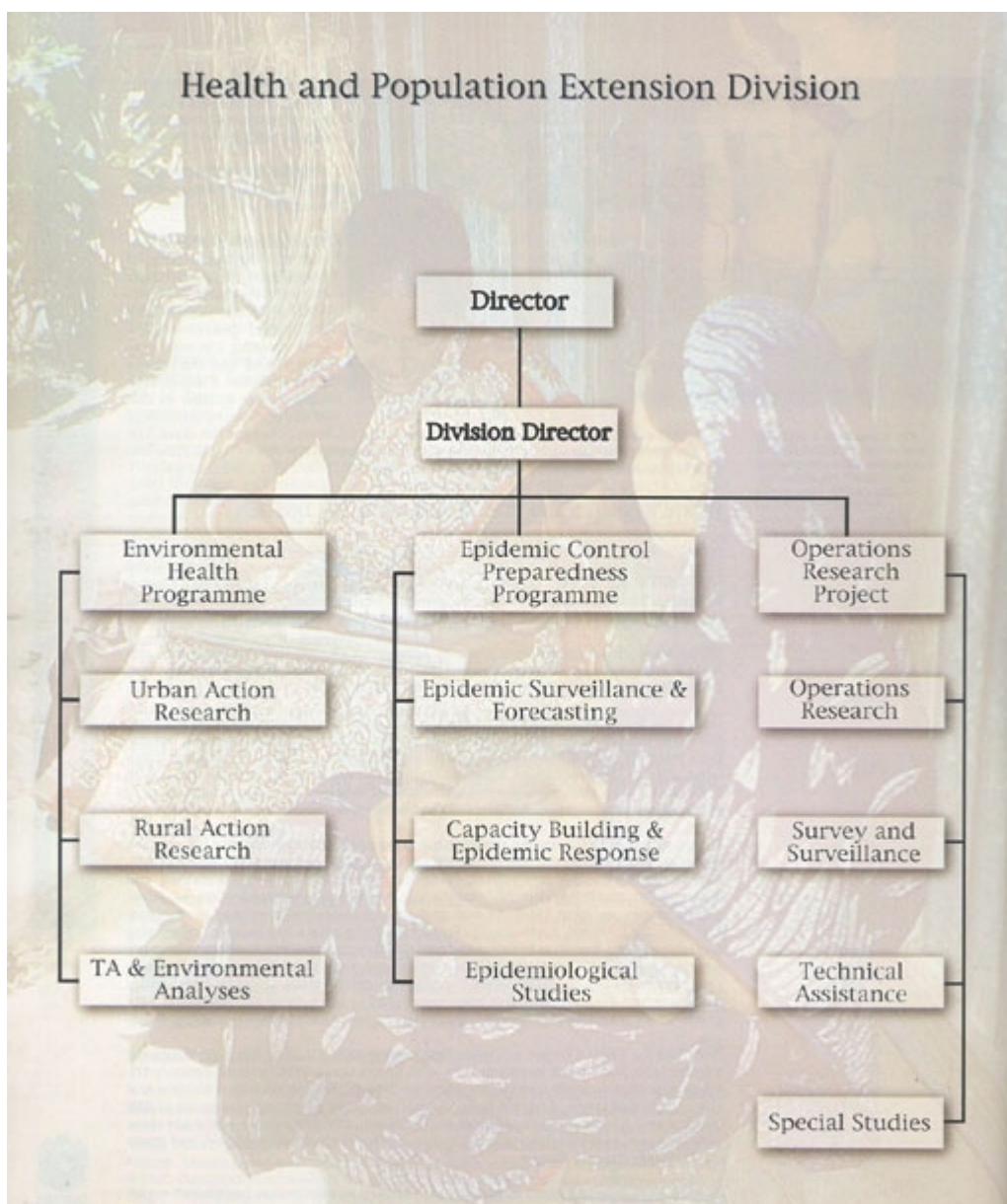
Under the Matlab Health Research Programme, planning is completed to integrate the management of all health services in Matlab and to establish linkages, for patient referrals, with the district and thana health service facilities of the Bangladesh Government. The programme activities include: surveillance of reproductive health indicators, integrated management of childhood illnesses (IMCI), strengthening of safe motherhood and EOC facilities at the thana level,

Future activities to strengthen the Health and Demographic Surveillance Programme include: modernization of household data collection procedure by CHWs, introduction of quality control procedures, computerization of data entry, handling and presentation, and integration of demographic, health and geographic systems. These will be implemented in 1998. As part of the implementation of plans for reorganization of the Division, a new Health Economics Programme has been initiated with recruitment of a health economist to head this programme. Incorporation of more health systems

research (HSR) will be emphasized. Social and Behavioural Sciences Programme (SBSP) has been strengthened with recruitment of a new head and a demographer. Planning has also been completed to strengthen the divisional programmes by transferring two epidemiologists to join PHSD from 01 January 1998.

Priorities for PHSD's future activities that were planned during the reporting year also include: adolescent health in rural and urban areas; WHO's multi-country trials on growth standards and violence against women; Rhesus rotavirus vaccine and zinc supplementation; Cholera Peru-15 Vaccine Phase 2 trial; effectiveness of Hib vaccine and zinc in the management of diarrhoea; risk-behaviours and male sexuality in regard to HIV/AIDS; community approaches for Safe Motherhood, and study on contraceptive use dynamics.

BRAC-ICDDR,B Joint Project in Matlab has planned to implement health and socio-economic impact survey and to complete analytical studies and draw conclusions next year.



The Health and Population Extension Division (HPED) is one of the four scientific divisions of the Centre with the largest collaborative project with the host government. The Division has a long history of accomplishments in applied research which focuses on the application of simple, effective and appropriate technologies and strategies to improve health and family welfare of the population.



*Division Director
Syed Shamim Ahsan*

Division Highlights

- The long-standing USAID-funded MCH-FP Extension Projects (Rural and Urban) ended successfully in July 1997. Achievements and results were documented in two monographs; and a two-day national seminar was conducted with participation of senior GoB policy makers, programme managers, and representatives from the NGO and donor community. Many of the

strategies and innovative approaches developed from the MCH-FP Extension Projects were incorporated into the national health and family planning programme.

- ❑ A new 5-year Cooperative Agreement with sole source for the entire operations research portfolio of the National Integrated Population and Health Project (NIPHP) was finalized with an obligation of US\$ 21 million for 1997-2002 with possible extension for two additional years up to 2004 with a total obligation of US\$ 29 million.
- ❑ Dissemination of the Division's research output through global Internet system was initiated. The information is being updated on a quarterly basis.
- ❑ The concept of essential services package (ESP) developed by the Extension Projects has been accepted as the basis for the Government's Health and Population sector. ESP is being field-tested by ORP under the NIPHP. The ESP is an integral part of the NIPHP and the 5th Health and Population Project, which is anticipated to be initiated in June 1998 by the Government and the World Bank.
- ❑ EHP has responded swiftly to recent reports of widespread arsenic contamination in groundwater of Bangladesh. EHP is in the process of developing a field-kit for detecting arsenic in water.
- ❑ A handbook for planning and operating temporary makeshift treatment centre that can provide rapid access to treatment during cholera epidemics was prepared by the Epidemic Control Preparedness Programme. The book, published under the Internal Publication Series of the Centre, is now widely used by the government health care providers of Bangladesh.

The primary focus of the Division is on:

- ❑ conducting operations research (OR) in health and family planning, including environmental health and epidemic control.
- ❑ scaling up the lessons learned from successful operations research interventions.
- ❑ disseminating research findings, nationally and globally, through seminars, conferences, and publications.
- ❑ providing technical assistance to the Government of Bangladesh (GoB) and the non-governmental organizations (NGOs) to strengthen the national health and family planning programme.

The Division went through several significant developments during 1997. The MCH-FP Extension Projects (Urban and Rural), funded by USAID for a period of five years, were concluded successfully in July 1997. A new five-year Operations Research Project (ORP) was initiated in August 1997 which resulted in the merger of the erstwhile Extension Projects. This new five-year project, with possible extension for two years, is entrusted with the entire operations research portfolio of the National Integrated Population and Health Programme of the Ministry of Health and Family Welfare (MOHFW) and the United States Agency for International Development (USAID). With the merger of the previous two Extension Projects effective August 1997, HPED is now composed of three projects: the Operations Research Project (ORP), the Environmental Health Programme (EHP), and the Epidemic Control Preparedness Programme (ECPD).

The ORP's mandate is to improve the national health and population programme by effecting appropriate programmatic and policy changes. In partnership with the Government, USAID, NGOs and commercial sector, some of the key research issues to be addressed in the next five years of the project period are to:

- ❑ increase use of high-impact family health services;
- ❑ improve quality of information, services and products, and customer satisfaction;

- ❑ strengthen local service delivery organizations and improve support systems for high-impact family health services; and
- ❑ improve sustainability of family health services and support systems.

The EHP's purpose is to study the environmental issues relating to health. EHP collaborates with the Ministry of Local Government, Rural Development & Cooperatives (MLGRD&C) and MOHFW for its activities in the urban and rural sites. The major activities and the accomplishments of EHP revolve around hygiene education, community involvement in water and sanitation-related activities, interventions on safe water and sanitation, and examination of arsenic contamination in tubewell water of Bangladesh. The basic task of the Epidemic Control Preparedness Programme (ECP) is to develop a system which provides early warning of impending cholera epidemics in the country. ECP works in collaboration with MOHFW. It maintains surveillance sentinel points in seven locations across the country. ECP also conducts epidemiological and ecological studies on cholera.

The Division's total staff strength in 1997 was 433 which included 9 personnel of international level, 68 national officers, and 356 general services and other field-level staff. ORP maintains six field offices located at Abhoynagar thana in Jessore district; Mirsarai, Patiya, and Sitakundu thanas in Chittagong district; less intensively in other ten rural thanas of Chittagong district; and Lalbagh thana in the Dhaka city. These field offices are coordinating the operations research (OR) activities in the respective 'laboratory areas' of the Project.

Operations Research Project

Project Director: Barkat-e-Khuda

Funded by: USAID

The Operations Research Project is the outcome of merging the resources and lessons learned from the two previous MCH-FP Extension Projects in rural and urban areas of Bangladesh. The ORP represents the Centre's contribution to a broad partnership involving the Ministry of Health and Family Welfare and other service-delivery organizations under the USAID-funded National Integrated Population and Health Programme. The focus is on the improvement of management capability, enhancing quality of care and promoting sustainability through application of the lessons learned from operations research. The ORP interventions are designed and field-tested with the government agencies and NGOs delivering health and family planning services in rural and urban Bangladesh.

Within the Project, four teams conduct applied research and provide technical assistance to government and local service-delivery organizations on: the use of the high-impact family health services; quality of information and services; strengthening local service-delivery organizations; and sustainability of family health services.

These teams are supported by a Survey, Surveillance and Field Research Support Team, a Policy Analysis Unit, and the Project's Administrative Unit.

Current Activities of ORP

During the first five months of the Project, the four teams formulated their respective workplans for 1 August 1997-31 September 1998 period, and completed staff recruitment and orientation, defining the scope of work for each member of the staff, formation of working groups for interventions, visits to the field sites, conducting needs assessments and developing concept papers for specific interventions.

The ESP Interventions

In addition to the continued monitoring and technical support for the Essential Services Package (ESP) interventions at Patiya, Abhoynagar, and Dhaka, the Project has established a partnership with the Dhaka City Corporation and the Directorate of Health Services and of Family Planning to establish model

ESP clinic(s) in the Dhaka city. A coordination mechanism involving these agencies has been formalized with senior officers representing the service-delivery agencies. The first clinic was inaugurated on 23 December at Sher-e-Bangla Nagar Government Outdoor Dispensary by Mayor of the Dhaka city, Secretary of the Ministry of Health and Family Welfare, Director General for Health Services, and the Director General for Family Planning. The team working on the design of these ESP interventions has begun to develop alternative strategies to facilitate tiered approach for the delivery of ESP (e.g., Clusters, Satellite Clinics combined with immunization sessions, Health and Family Welfare Centres, etc.).



In December, Mr. Md. Hanif, Mayor of the Dhaka City inaugurated the first urban model ESP clinic in the Sher-e-Bangla Nagar Dispensary of the Ministry of Health and Family Welfare. The photo shows the Mayor, Mr. Muhammed Ali, Secretary of the Ministry of Health and Family Welfare, Ms Margaret Neuse and Dr. Zareen Khair from USAID, and local community leaders at the opening ceremony

Reviews of existing information and strategies for low-performing areas in Chittagong district have also been done. These reviews have included assessments of the current use of GIS and aerial planning by other projects and agencies at the national and international level, and how to apply this methodology to improve the health performance in low-performing areas.

Design of the Cost-effective Tiered System for Delivering an ESP, Including Referral Mechanisms

The project staff reviewed the current and past interventions, documents, draft protocols, evaluation reports, and related materials and information on ESP. They also conducted qualitative research at Patiya and Abhoynagar to obtain providers' and clients' feedback on communication material designed to promote ESP in the community. Service-delivery personnel at Patiya were trained on the use of an IEC ESP Flip Chart, and plans are underway to develop a training video to facilitate the wider use of this instrument.

During the reporting period, the adapted version of the ESP protocols in English was finalized and printed. A Bangla translation and a training manual are ready for final editing and printing.

Project staff linked to this activity (in conjunction with those working on sustainability issues) played the leading role in the provision of technical assistance to NGOs in the development and finalization of the Needs Assessment Instruments to be used as part of the initial activities of service providers working within the NIPHP. They also contributed to the development of revolving drug fund instruments, in collaboration with BRAC and other NIPHP partners. This team assists a multi-agency task force in developing plans for assessing the impact of NIPHP-funded NGOs. As part of this job, the team is working in the design of methodologies to estimate the catchment area for NGOs working in the urban areas.

Design and Testing of Strategies to Meet the Needs of Under-served Demographic Groups (e.g., adolescents, working women, men, floating population, and commercial sex workers)

Of the five demographic groups mentioned, males and adolescents are being addressed currently. Needs assessment studies conducted on males and adolescents included the review of existing information, project reports, data, and literature on reproductive health knowledge, behaviour, needs, and health-seeking practices. The needs assessments included visits to NGOs, GoB, and ORP sites where interventions dealing with adolescent reproductive health and the promotion of male involvement in family health will be tested.

Design and Testing of Strategies to Improve RTI/STD Prevention and Management

The team dealing with this intervention has undertaken fact-finding visits to NGO clinics and GoB facilities and held meetings with the government officials and researchers with experience in the area as part of the needs assessments on the RTI/STD situation in the country. Work is underway on the design of the interventions which include improving clinical management of RTI/STD clients, testing the feasibility of introducing syphilis screening during antenatal contacts and establishing effective strategies to increase community awareness on RTI/STD.

Quality Improvement Interventions

These interventions seek to improve the quality of information, services and products, and customer satisfaction. During the first phase of the Project, the emphasis has been on improving the technical quality of essential services, in compliance with technical standards and protocols; testing strategies for improving the quality and performance of clinical contraceptive services; and adapting technical standards, protocols and input standards for essential obstetric care at different tiers of service delivery. Interventions in this area will include testing strategies for removal of barriers to clinical contraception and reducing contraceptive discontinuation. It will also include testing strategies for ensuring referral and linkages for clinical contraceptives.

The personnel linked to these quality improvement interventions have continued their work toward strengthening referral and linkages for emergency obstetric care (EOC). As part of a review of current strategies for EOC referral and linkage, the team working on this intervention has completed a working paper which documents findings from the intervention and lessons learned to date. A pictorial card on danger signs during pregnancy has also been produced.



The team is actively supporting the efforts of the GoB to establish comprehensive EOC

Construction of maternity Unit at Mithapukur Thana Health Complex, Rangpur, where the project is providing technical assistance as part of the national effort to scale up our EOC intervention

services at the sub-district level by providing technical assistance in the process of scaling up of the model developed by the previous MCH-FP Extension Project (Rural) site at Mirsarai Thana Health Complex in Abhoynagar, Dumuria, Narsingdi, Shahrasti, and Mithapukur. The technical assistance provided by the Project during this time included assistance in the design and supervision of the construction work of the five maternity units at these Thana Health Complexes and facilitating both procurement of equipment and training of personnel in anesthesiology and obstetrics.

Thus far, 18 Caesarean sections have been performed at the Mirsarai Thana Health Complex (THC). The number of THC maternity admissions is increasing and has risen from 15 clients per month in 1994 to 54 per month at present in Mirsarai.

As part of designing the interventions to improve quality and performance of clinical contraceptive services, the Project has established a Core Committee for Clinical Contraceptives under the leadership of the Project Director, Family Planning Clinical Services Project of the Directorate of Family Planning. This committee has started to work on the identification of key areas of concern in the clinical contraceptive service-delivery programme infrastructure in order to develop a comprehensive operations research proposal.

Strengthening Management Support Systems

The Project has completed a review of existing systems used by service-delivery organizations in the delivery of the high-impact family health services included in the ESP. The systems studied include the record-keeping and recording tools and procedures utilized by the Government and NGOs to monitor performance on health and family planning. The aim is to identify needs and draw lessons to assist in the development of proposals for a generic system that is congruent with the plans outlined in the new Health and Population Sector Strategy (HPSS). The system includes: tools, procedures and formats for an integrated record-keeping and reporting system on essential services, including promotion of information use for management purposes and supportive supervision. Drafts of the new MIS tools and procedures have been produced with active involvement of the staff from the Directorate of Health Services and of Family Planning at the central level and in the intervention site at Patiya.

The Project staff completed the design of the record-keeping and reporting tools, formats and procedures to be used by clinic and outreach staff of NGOs in the NIPHP. The Project also provided technical assistance to BRAC and other national NGOs supported by Pathfinder International and John Snow Inc. to pilot-test the design in their respective working areas. The findings from the pilot-testing exercise will be used in the final design of a system to be adopted in 1998 by all NGOs working as partners in the NIPHP.

The Project continued the intervention in four zones of the Dhaka City Corporation to promote local-level planning and coordination among service providers. The respective Zonal Coordination Committees met

and helped organize the recent National Immunization Day and other health promotion activities at zone and ward levels.

Increasing Sustainability of Family Health Services

A report which reviews the existing systems of cost recovery through pricing at the GoB/NGO programmes was completed. This review is a preparatory phase for an intervention to develop

mechanisms for cost recovery in the context of delivering ESP. A draft concept paper outlining the modified intervention on systematic pricing of services and revenue management at the GoB and NGO settings was completed during the reporting period. The literature review on cost analysis studies of the health and family planning programmes in Bangladesh was completed. As part of the costing activities, a methodology for cost-effectiveness analyses of health and family planning programmes is being developed.



The focus of the project has shifted from designing tools to help deliver domiciliary services toward strengthening the capacity of clinics to provide convenient and comprehensive quality essential services

The Project plans to continue, in a modified form, the intervention to promote networking at the local level. A draft of the concept paper on the modified intervention has been completed.

Dissemination Activities

A key element in the work of ORP is to continue regular dissemination of results and findings from research activities among the government agencies, NGOs, and donors through meetings, workshops, seminars, conferences, and publications. During the reporting period, two volumes of Intervention Updates on current interventions were published. Other publications include: 35 working papers, 4 articles in international journals, 4 monographs, and 4 special publications. National and international representatives from the government agencies, donors, academic institutions and international development organizations visited the project field sites.

The project staff provided technical assistance (TA) to various government and non-governmental agencies in the field of health and MCH-FP activities. Such TA was largely provided through participation of the project staff in various committees, working groups, and task forces. For example, during the reporting period, the ORP staff actively participated in the design of the Operations Research component of the NIPHP. The project staff also contributed to the process of developing the National Health and Population Sector Strategy of the Government of Bangladesh; the forthcoming Fifth Health and Population Programme (HAPP-5), funded by the World Bank; and the Urban Primary Health Care Project, funded by the Asian Development Bank.

In November, the Project organized a seminar participated by senior officials from the Ministry of Health and Family Welfare and the Directorate of Health Services and of Family Planning to discuss national priorities for health and family planning. The seminar also involved NGOs and representatives from donor agencies. Jointly with the NIPHP partner--Access to Voluntary and Safe Contraception (AVSC)- the Project organized an orientation seminar on ESP for managers of NIPHP partner agencies. During this event, the participants learned about experiences from the Centre's intervention sites and were briefed on the national policy by senior officials from the MOHFW.

The project staff directed and participated in the International Workshop on Improving the Effectiveness, Quality and Sustainability of Reproductive Health Programmes through Operations Research held at the Centre in November. In addition, the project staff participated at several international conferences, including the IUSSP meeting in Beijing.

MCH-FP Extension Projects

From January to July 1997, the staff of the two former MCH-FP Extension Projects worked for the evaluation of their ongoing interventions, for documentation of the lessons learned and for organization of the dissemination events. The interventions were conceptualized, designed, implemented, and evaluated in collaboration with various government and non-governmental agencies providing services in the respective testing sites. Within the health and population sector, the government agencies included in the interventions were: Directorate of Health Services (DHS) and the Directorate of Family Planning (DFP) under MOHFW. The Local Government Division (LGD) of the Ministry of Local Government, Rural Development and Cooperatives and the Health Department of Dhaka City Corporation (DCC) were involved in the interventions with their policy and service-delivery roles in urban areas. From the NGO sector, the main partner was Concerned Women for Family Planning. In addition, 60 other NGOs were involved in the activities to strengthen planning and coordination in the Dhaka city.

The MCH-FP Extension Projects monitored and evaluated the following operations research interventions to improve management, quality of services, and financial sustainability:

Interventions to Improve Management	Testing Site
Cluster Visitation	Mirsarai and Abhoynagar
Essential Services Package (ESP)	Patiya and Abhoynagar
Management Information Systems for Urban NGOs	Zone 1 and 3 of the Dhaka city
Record-keeping System for Field Workers	Abhoynagar and Mirsarai
Reorganization of Health Service Delivery System	Zone 3 and 8 of the Dhaka city
Satellite Clinics Combined with EPI	Mirsarai, Abhoynagar, and other eleven thanas of Chittagong district
Strengthening Local Planning and Coordination	Rural Project field sites and all ten zones of the Dhaka city

Interventions to Improve Quality	Testing Site
Emergency Obstetric Care at the Thana Level	Mirsarai and Abhoynagar
Institutionalizing Quality Improvement Approaches	Zone 3 of the Dhaka city
Referral and Linkages to Improve Maternal and Neonatal Health	Mirsarai and Abhoynagar
Standardized Service Delivery Protocols for the PHC Clinics	Zone 1, 2 and 4 of the Dhaka city

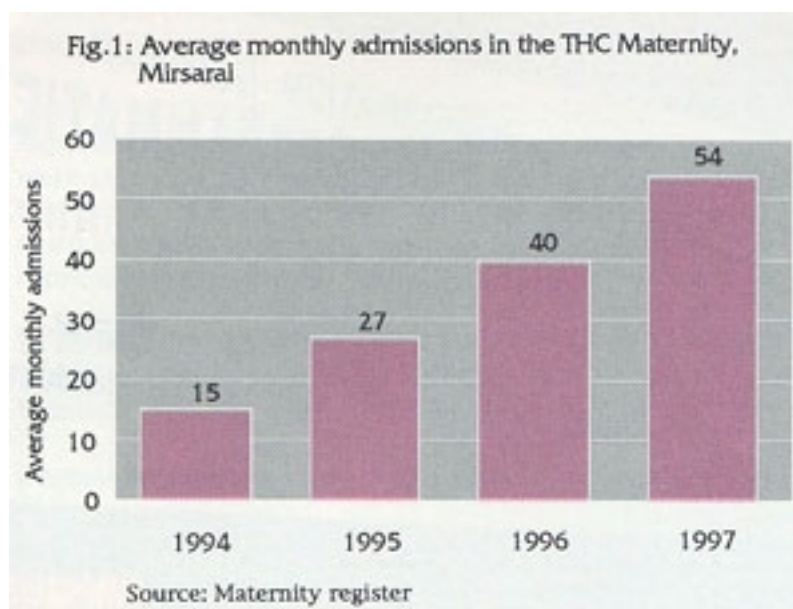
Interventions to Improve Financial Sustainability	Testing Site
Alternative Service Delivery Strategies	Zone 1 and 3 of the Dhaka city
Charging for MCH-FP Commodities and Services	Mirsarai and Abhoynagar
Cost Management	CWFP branches in Wari of the Dhaka city, and Khulna, Magura, Tangail, Chittagong and Rajshahi
Pricing Mechanisms for MCH-FP Services	CWFP branches in Wari of the Dhaka city, and Chittagong and Rajshahi

Major Achievements of the Extension Projects

The Projects concentrated their activities on addressing the need to develop more efficient structures for organizing the services and more sustainable strategies for delivering quality care. Lessons learned from the experiences of the projects were instrumental in the national decision to adopt alternative service-delivery approaches to the existing costly strategy of providing doorstep services. The Projects showed the implications of delivering services from fixed sites and demonstrated that there could be increases in the use of clinics and no reduction in the contraceptive prevalence rate.

The Projects adapted, developed and field-tested a set of protocols for the delivery of essential services based on current national and international guidelines. The introduction of this set of standards and protocols in urban and rural clinics showed how diagnostic and treatment practices could be improved in the government and NGO settings. The interventions also contributed to a reduction in the inappropriate use of antibiotics. There might be savings to the system with more rational use of drugs. The evaluation also revealed a number of organizational issues that need to be addressed as part of any attempts to make essential services more widely available. Thus, although protocols were easy to use and resulted in improved diagnosis and treatment procedures, full implementation will require further interventions to improve record-keeping systems, community education, availability of medicines in the government clinics, and appropriate space and facilities for counselling and physical examinations. Together with the handbook of protocols, the projects produced training modules that can be adapted in the scaling up of these activities.

The projects successfully explored the feasibility and implications of strengthening maternal care systems at all levels. In particular, a blueprint was prepared for upgrading Thana Health Complexes to provide Comprehensive Emergency Obstetric Care. The emerging findings from Mirsarai were accepted by the Government, and steps are being taken nationwide for scaling up this intervention in a phased manner. As shown in Figure 1, the number of maternity admissions to the Thana Health Complex in Mirsarai has increased dramatically over the intervention period.



At the community level, the projects introduced tools to increase knowledge about complications of pregnancy and childbirth. In a country with a low literacy rate, as in Bangladesh, the pictorial card is a potentially important tool for raising awareness and to establish linkages among different service providers and facilities, leading to increased use of pregnancy-related services by women.

Evaluation of the effects of information systems and supervisory tools developed by the projects indicate that these instruments facilitated the use of information at local level and contributed to better management of clinic and field operations. Field staff felt that the registers for Health Assistants (HA) and Family Welfare Assistants (FWA) helped improve workplans and arrange visits to those most in need. The register also assisted in the performance monitoring by field supervisors and thana managers. The bound registers, however, had to be adapted in urban areas where client mobility is high. Although Health Assistants and managers found the HA register user-friendly and useful, the full implementation appeared to require major changes in the duties and work routines of the field staff.

The introduction of a clinic information system (CIS) in urban NGO clinics led to an increased number of customers receiving complete screening for family planning, pregnancy care and other conditions, such as reproductive tract infections and management of diarrhoeal diseases. Managers also used the CIS to identify problems and design solutions. Despite the contribution of CIS to quality improvement and customer-centred services, further work is needed to reduce the costs involved.

The field supervisors and thana health and family planning managers concurred that the supervisory diaries, developed by the Project, facilitated their supervision and monitoring activities. The checklists for clinical supervisors were found to be useful in monitoring the activities of the paramedics and improving quality of services. The lessons learned from the interventions on management information systems were applied in the development of a management information system for all organizations delivering the high-impact family health services in the context of the NIPHP.

The projects developed interventions to create multi-sectoral networks to promote reproductive health services and to develop local-level planning and coordination for health and family planning. The intervention provided important lessons for future work and concrete recommendations for policy makers. The response of local agencies to the networking intervention was positive. However, all concerned agencies are not equally involved with the initiative. Some progress was attained in the involvement of local agricultural sector and social welfare services staff as well as organizations providing credit. An area that deserves particular attention is the development of strategies to include the commercial sector (e.g., pharmacies and traditional practitioners) in the local-level planning and coordination of activities at the primary healthcare level.

At the local level, the establishment of a periodic and systematic performance review process involving union staff proved to be feasible and helped improve services.



The Extension Projects maintained a dialogue with national policy makers in a effort to make research relevant to the national needs and priorities in reproductive health and child survival

In Dhaka, the proposals to reorganize the Health Department of the Dhaka City Corporation, prepared by the former urban project, were accepted by the city authorities. An intervention that established health and family planning coordination committees in all zones of the Dhaka City Corporation managed to bring together all NGOs working in health and family planning, community representatives and officials from the Health, Population and Local Government sectors. In some zones, the committees changed the geographical distribution of services to improve access of the slum dwellers to services. This experience with zonal committees prompted the Local Government Division to issue instructions for the establishment of similar committees in other urban areas of the country.

At the national level, the former urban project helped create an inter-ministerial coordination committee for urban health, which was instrumental in the recruitment of medical officers to organize health departments in municipalities and for dissemination of lessons learned from the project activities in Dhaka to other municipalities of the country.

The growing concern over the cost and sustainability of the programmes led to the inclusion of interventions to identify ways of increasing financial and programmatic sustainability through cost recovery. The Project found that there was no apparent effect of pricing on contraceptive prevalence but that there were some behavioural changes in contraceptive-seeking behaviour and in the use of alternative sources of contraceptives. Other interventions led to the development of costing instruments which used available routine data to enable programme managers to analyze cost of services and to identify areas where cost reduction or cost recovery could be implemented.

The assessment of time allocation to personnel in service delivery and support activities was critical in the cost estimations. The methodology for time estimation was adapted, and efforts were made to assess whether it could be conducted independently by service-delivery managers. Besides developing practical tools for assessing the cost of service delivery, the Project also adapted methodologies to measure consumers' willingness to pay for health and family planning services.

Two major dissemination seminars were held in June and July to disseminate the experience of the former rural and urban MCH-FP Extension Projects. The seminars were attended by senior managers and policy makers from the Ministry of Health and Family Welfare, the Ministry of Local Government, Rural Development, Cooperatives, Planning Commission, NIPORT, national and international researchers, and representatives from NGOs and international development agencies.

Epidemic Control Preparedness Programme (ECP)

Programme Head: A.K. Siddique

Funded by: Norwegian Agency for Development Corporation (NORAD)

Investigations and Interventions of Cholera Epidemics by ECP in 1997

A total of 586,685 cases and 983 deaths from acute watery diarrhoea were reported in 1997 during suspected epidemics of cholera from different regions of the country. Between April and May 1997, epidemics affected the southern coastal regions. The onset of post-monsoon outbreaks of cholera was not marked till late October and continued through early December 1997. The north-central and north-eastern regions were mostly affected during this period. The significant observation was the resurgence of *V. cholerae* O139 during the post-monsoon outbreaks in the north-central and north-eastern districts where the strain disappeared during the last two years. However, O139-prevalent pockets continue to exist in the southern coastal areas since its first detection in Bangladesh in 1993.

Between January and December 1997, ECP investigated outbreaks in 15 epidemic-affected districts in different regions of the country, from where over 270,000 cases and nearly 600 deaths were reported. Nearly two-thirds (181,709) of the cases and over 200 deaths were reported from the eight northern districts (Naogaon, Mymensingh, Kishoreganj, Narshingdi, Sunamganj, Sylhet, Moulvibazar and Habiganj). Over 90,000 cases and 140 deaths were reported from seven southern and coastal districts (Barisal, Patuakhali, Pirojpur, Jhalokhati, Noakhali, Chittagong, and Cox's Bazar).

A systematic sample of 464 specimens was cultured at the ICDDR,B laboratory. *V. cholerae* was isolated from 54% of the samples. The overall isolation rate of *V. cholerae* O1 was higher (88%). However, the proportion of O139 in Kishoreganj and Mymensingh districts in the north-central region were 67% and 50% respectively.

Monitoring Cholera in Sentinel Sites

ECP is continuing the sentinel surveillance for cholera at four sites located in different geographic areas in Bangladesh. The objective of the surveillance is to assist the government health services to improve capabilities for early detection of cholera epidemics, monitor antibiotic sensitivity patterns of *V. cholerae* O1 and *V. cholerae* O139. The surveillance has contributed to better preparedness and to formulate uniform drug use for cholera in the government health facilities.

In total, 437 rectal swabs were collected from patients with watery diarrhoea during 36 surveillance days of the year from each of these sentinel posts. *Vibrio cholerae* was isolated from nearly 19% of the samples. Of the vibrios identified, 95% were El Tor, and *V. cholerae* O139 accounted for the rest. All the vibrios were sensitive to tetracycline and erythromycin.

Epidemic Management Training for Mid-level Health Managers of GoB

ECP, in collaboration with the government diarrhoeal disease project, conducted 11 training sessions for the mid-level health managers on Epidemic Management of Diarrhoeal diseases. A total of 238 participants (178 Thana Health and Family Planning Officers, 42 Medical Officers, Disease Control and Surveillance, 18 Deputy Civil Surgeons and others) attended the sessions from all administrative divisions of the country.

A manual for planning and operating temporary treatment centres during cholera epidemics in rural areas has been developed and published by ECP for use by the government health personnel.

Clinical Surveillance for Ecology and Epidemiology of Cholera

PI: A.K. Siddique

Funded by: National Institutes of Health (NIH), USA

The objective of this five-year study is to assess correlation between incidence of cholera and specific environmental parameters (survey being conducted simultaneously by LSD) of aquatic ecosystem at different geographical locations in Bangladesh. The study hopes to improve the global prediction capabilities of cholera epidemic and facilitate intervention and prevention.

Environmental Health Programme (EHP)

Head: Bilqis Amin Hoque

Funded By: SDC, USAID, Ministry of Health and Family Welfare GoB), World Bank, Johns Hopkins University, and ICDDR,B

The impetus that led to the creation of the Environmental Health Programme has not waned. It continues with a multi-faceted programme incorporating environmental engineering, sociology, public health, laboratory sciences, and management. The overall objective of the programme is to conduct and support environmental health research focusing on the control of diarrhoeal and infectious diseases both in rural and urban areas. EHP conducts both basic and actions research and also responds to requests for technical assistance from government and non-governmental agencies. Several NGOs have been included as partners in EHP's actions research projects. EHP operates a sophisticated environmental laboratory to carry out various tests on samples from its own research projects as well as from external agencies. Other activities include: providing training to students and personnel from home and abroad. Research findings are shared through regular seminars/workshops and through networking.

Actions Research and Studies on Community Water, Sanitation and Hygiene Education Interventions in Rural Areas

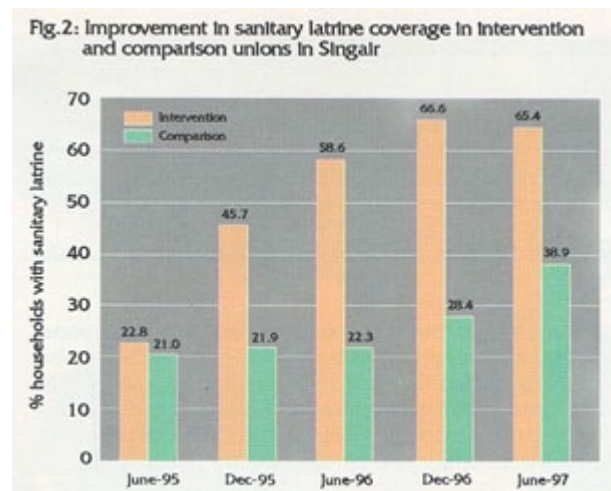
The Project, in collaboration with the Department of Public Health Engineering and the Directorate of Primary Health Care and selected NGOs, has been conducting applied research on further development of the Government's Social Mobilization for Sanitation (SOC-MOB) Programme since 1995. The programme is being implemented in Singair thana, Manikganj district, in collaboration with the Department of Public Health Engineering (DPHE). This project is approved by the Ministry of Local Government, Rural Development and Cooperatives (MLGRD&C). The project is now working in all 11 unions of Singair.

Follow-up surveys were conducted in June 1997 on 3,600 households, and in December 1997 on 2,000 households. Interviews, focus group discussions, observations and laboratory analyses of environmental samples were also carried out.

Preliminary findings show that the sanitary latrine coverage in five early intervention unions improved from 66% households in December 1996 to about 80% in December 1997. The same coverage in the six unions included in the intervention activities in 1997 (which were earlier comparison unions) showed improvement from 28% to 40% households. Figure 2 shows the results of the intervention on sanitary latrine coverage.

Political and local leaders played a major role in the promotion of sanitation. Women's participation was very encouraging. Some women's groups started to operate latrine production centres as business ventures. The role of the Thana Nirbahi Officers (TNOs) was found important in intra-union coordination of activities.

A two-day national-level dissemination workshop was held. This workshop was attended by the Minister for Local Government, Rural Development and Cooperatives, the Minister for Health and Family Welfare, secretaries of these two ministries, and senior officials from the government, NGO and UN agencies. The workshop recommended that at least one latrine production centre should be established in every union; national mass media (radio and TV) should be involved in WSH promotion; and workers of all partners should be given orientation on WSH topic.



Applied Research on Replicable Environmental Health Interventions in Primary Health Care Perception

The pilot phase of this project has been initiated in June 1997, in collaboration with the Directorate General of Health Services, Ansar and Village Defense Party, Family Planning Association of Bangladesh, and PLAN International. The long-term objective of this project is to provide technical assistance to improve water supply, sanitation, hygiene and solid waste (WSHS) component of the primary healthcare programmes based on applied research. Immediate objectives include: development of replicable WSHS information, education and communication package for normal and flood situations; studying ways for social mobilization and community participation to improve WSHS conditions using local resources as considered appropriate; studying appropriate incorporation of gender issues at all levels; development of appropriate WSHS technologies and techniques; studying appropriate cost sharing and operations and maintenance by community; and dissemination of findings at policy and programme levels, nationally and internationally.

The rural component of the project is located in Patuakhali district. Four unions of Patuakhali Sadar thana have been randomly selected as intervention sites, and four similar unions have been selected as comparison unions. Baseline survey of 1,600 randomly selected households has been completed. The urban component of the project includes slums in Ward 5, 41, 59 and 85 of the Dhaka city. Baseline survey of 750 randomly selected urban households has been completed.

Impact of the Bangladesh Rural Electrification Programme on Groundwater Quality

This study was jointly conducted with the National Rural Electrification Cooperative Association and the Johnson Company of USA. The objectives of the study were: (i) preliminary evaluation of present groundwater for arsenic contamination and (ii) studying the potential effect of the rural electrification infrastructure upon groundwater quality. Approximately, 600 water samples were collected from tubewells for domestic water supply throughout the country.

Scientific evidence from the tests demonstrates that the arsenic-treated wooden power poles are not the source of widespread arsenic contamination of groundwater observed in Bangladesh. About 61% of the water samples were found with arsenic concentration higher than the WHO-recommended value. This concentration in tubewell water appeared to be extremely variable, even over a short distance such as 15 m. Only 4% of the respondents among the arsenic-contaminated tubewell users were aware that their tubewell water posed a health hazard.

Special Research on Arsenic Problem in Groundwater

To address the problem of arsenic in drinking water, EHP has embarked on several activities using its own funds and resources. These activities include: (1) development of a field-kit for detection of arsenic, (2) development of technique to remove arsenic from water, (3) finding acceptable alternative sources of safe water, and (4) community involvement in addressing this problem.

Environmental Health Interventions in Selected Poor Areas of the Dhaka City

Dhaka is one of the fastest growing megacities in the world. With the growing population, the problem of sanitation and supplying safe water to city dwellers is becoming increasingly acute. It is estimated that less than half (about 48%) of the households in the Dhaka city dispose of faecal matter in a sanitary manner. The problems are more acute in the city's numerous slums. Among the slum dwellers, only 30% have access to piped water supply and 20% to sanitary latrines.

This research project tested two educational packages—one for the permanent slums and another for the temporary slums. A pre- and post-intervention cross-sectional design was adopted. Baseline and final surveys were conducted on 2,400 randomly selected households to measure WSHS knowledge, attitude and practice as well as the status of related provisions.

Data analysis of this study was completed during the early part of 1997. The results show that project interventions improved WSHS-related knowledge significantly among the target population. The related practices, however, did not improve significantly. The people claimed that they cannot change their practices due to lack of necessary provisions and/or related operational and maintenance services. The findings indicate that policy makers and

programme managers should make efforts to improve WSHS knowledge and related provisions and services simultaneously.

Impact of Exogenous Technology on Traditional Resources Management and the Environment in Rural Bangladesh

The objective of this study is to determine how pond management responds to environmental change, mainly due to technological influence and ecological impacts. This is being conducted in collaboration with the University of Basel, Switzerland.

Permanent and Temporary Settlements with a Focus on the Perception and Infiltration of Development Agencies in the Communities

The purpose of this study will be to critique the policies, programmes, and methods of intervention that particular international and non-governmental organizations use in their work in the permanent poor settlement of Bauniabad and the temporary slum of Agargaon. It will also assess the extent of their impact in the lives of the residents, and in the community as a whole. Underpinning the research is the concept of 'good governance.' This is what decision making powers, access to resources and political influence, low-income people should have to allow them to ensure that their needs are met, their rights respected, and their priorities addressed.

Source of Pollution of Groundwater Aquifer in Slum Areas of the Dhaka City

The main objective of the study is to identify the source of contaminants for the shallow aquifer which supply drinking water for the slum inhabitants. The study gives special attention to transmission of pathogen from pit latrine to groundwater. Other sources of pathogen, including surface water, are also being taken into account. The study is being conducted in collaboration with the University of Dhaka.



EHP's intervention, in collaboration with the Government of Bangladesh, helped women in producing, marketing and managing sanitary latrines by themselves

Environmental Laboratory

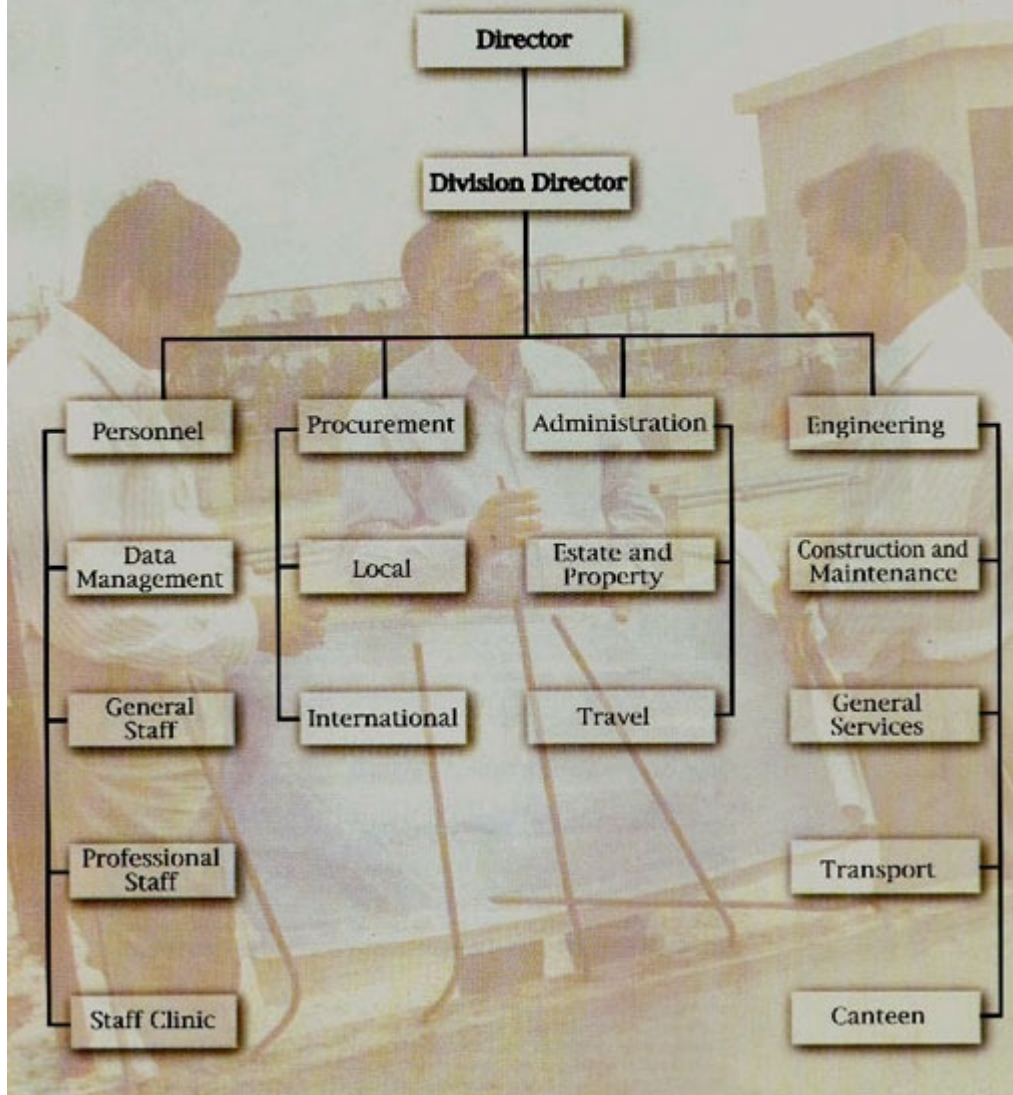
EHP maintains a full-fledged, in-house environmental laboratory to conduct various biochemical, physical, chemical and microbiological tests on environmental samples from research projects and external agencies. The laboratory is also capable of conducting tests to detect arsenic in water samples and can perform speciation of arsenic. Information on water quality in the Dhaka city is being shared with the Ministry of Local Government, Rural

Development and Cooperatives, Dhaka Water Supply and Sewerage Authority (DWASA), and the Department of Environment, Government of Bangladesh.

Global Applied Research Network (GARNET)

EHP coordinates the Bangladesh chapter of the Global Applied Research Network popularly known as GARNET. Recently, the GARNET headquarters has declared EHP as the Local Network Centre (LNC) for South Asia region. About 200 government, UN, NGO and donor agencies from Bangladesh and other countries are members of the LNC for South Asia. Bangladeshi members meet more or less quarterly. Three meetings were held in 1997 on prioritization of applied research needs, arsenic in drinking water, and writing proposals. An Internet web site on the LNC for South Asia was launched. Two issues of a quarterly newsletter were also published.

Administration and Personnel Division



Division Highlights

- ❑ New construction of 20,000 sft on the second floor of the northern and southern wings of the existing hospital building in Dhaka is in progress to accommodate the Director's office, Finance and Personnel offices, and research wings of CSD.
- ❑ New construction of 12,000 sft of three-storey International Family Planning Training Centre at Matlab is in progress.
- ❑ Equipment and materials worth US\$ 2.80 million were procured, of which US\$ 0.72 million was spent for local purchase, and US\$ 1.34 million for overseas purchase. Under an agreement, equipment and materials worth US\$ 0.74 million were also procured for IPH.

Personnel Branch

Chief Personnel Officer: Wahabuzzaman Ahmed

Personnel Manager: M.A. Jabbar

At the end of 1997, the Centre had 1,026 members of the staff (26 international, 164 national officers, and 836 general services staff). In addition, there were 159 Community Health Workers and 64 Health Workers.

New Professional Staff

Prof. Robert M. Suskind (USA), Chairman of the Department of Pediatrics of the Louisiana State University, USA, joined the Centre on 22 September as Director. Dr. Mahmud Khan (Bangladesh) was appointed Health Economist under PHSD on 1 January. Dr. Carol L. Jenkins (USA) joined the Centre on 1 June as Head/Social Scientist, SBSP, PHSD. Dr. Bilqis A. Hoque (Bangladesh) was appointed Environment Specialist, ORP, HPED on 1 June. Dr. Thomas T. Kane (USA) joined the Centre on 1 August as Operations Research Scientist, ORP, HPED. Mr. John F. Winkleman (Canada) joined the Centre on 1 December as Chief Finance Officer.

Prof. V.I. Mathan (India), from the Department of Gastrointestinal Sciences, Christian Medical College Hospital, has been appointed Director of the Laboratory Sciences Division. He will join the Centre on 1 January 1998.

Consultants

During the year, the following consultants provided their expertise to different projects/programmes:

Ms Anjali Sharma, International Fellow, HPED, was appointed from 1 June to 31 July and again from 1 August to 31 December. Ms Saskia Osendrap, International Fellow and Coordinator, BINP, CSD, was recruited for 6 months from 1 August to 31 December 1997. Ms Vanessa Brooks, Fundraising Consultant, ERID, Director's Bureau, was recruited for 6 months from 1 October 1997. Ms Jackie Reeves (DfID, UK), Human Resources Consultant, provided services in November and December. Ms Diane Rutter (UK) was appointed Nurse Consultant, CRSC, CSD, for 11 months. She resigned from her services of the Centre effective 31 December 1997.

Those who provided short-term consultancy for different projects, studies and other activities were: Dr. Sally Grantham McGregor, Institute of Child Health, London, UK; Anura Kurpad, Associate Professor of Physiology & Nutrition, St. John Medical College, Bangalore, India; and M.A. Khaled, Associate Professor of Nutrition & Biochemistry, University of Alabama at Birmingham, USA.

Departure

Prof. Demissie Habte, Director of the Centre since 1989, completed his service on 22 September 1997 to take up his new assignment in the World Bank, Washington, D.C., USA.

Others who left the Centre in 1997 include: Dr. A.M. Vanneste, Visiting Scientist, BADC (on 17 January); Dr. Jacques Myaux, Visiting Scientist, BADC (on 20 April); Ms Leanne Unicomb, Research Virologist, LSD (on 30 April); Mr. Albert Felsenstein, Head, BADC (on 23 May); Dr. Henry Perry, MCH-FP Programme Specialist, HPED (on 31 May); Dr. Therese Juncker, Scientist, BADC (on 26 August); Mr. K.J.J. Tipping, Division Director, Finance (on 15 October); and Dr. M.A. Khaled, Senior Adviser, CSD (on 30 November).

Retirement

Nine personnel retired from the Centre during the year. They were:

Dr. Md. Motaher Hossain, Veterinary Officer, ARB, LSD; Mr. A.K.M. Mozibul Hoque, Administrative Assistant, HDSS, Matlab, PHSD; Mr. Md. Alam Ali Mollah, Speedboat Driver, Matlab Administration, PHSD; Mr. Nuruzzaman, Foreman (Plumbing and Maintenance), A&P; Mr. Md. Jalal Ahmed, Despatcher, Matlab Administration, PHSD; Mr. Abdur Rahman, Security Guard, GSU, A&P; Mr. Sekander Hayet, Administrative Assistant, Matlab Administration, PHSD; Mr. Z.B.M. Bakht, Committee Coordination Manager, Director's Bureau; and Mr. Sadu Miah Mirdha, Speedboat Driver, Matlab Administration, PHSD.

Separation by Mutual Agreement

The following 28 personnel and 15 Community Health Workers, who sought separation by mutual agreement, were released during the year:

Dr. Ziauddin Ahmed, Senior Scientist, LSD; Mr. Md. Osiur Rahman, Speedboat Driver, MH&RC; Mr. Shahabuddin, Security Guard, GSU, A&P; Mr. Rezaur Rahman, Supervisor, Matlab Laboratory, LSD; Mr. Akbar Ali, Laboratory Manager, LSD; Mr. Helal Uddin Ahmed, Administrative Assistant, Procurement Office, A&P; Mr. Md. Anisur Rahman, Senior Laboratory Attendant, LSD; Mr. Golam Mohammad, Driver, Transport Branch, A&P; Mr. Azizul Hoque, Maintenance Supervisor, Maintenance & Engineering, A&P; Mr. Md. Abdul Khaleque, Administrative Assistant, Procurement Branch, A&P; Mr. Md. Abdul Haque, Driver, Transport Branch, A&P; Mr. Md. Abu Taher, Driver, Transport Branch, A&P; Mr. Mir Motasem Ali, Serials Librarian, DISC, Director's Bureau; Mr. Alauddin Ahmed, Cleaner, CRSC, CSD; Dr. K.M.A Aziz, Senior Scientist, PHSD; Mr. Amir Ali Khan, Ward Attendant, CHRU, PHSD; Mr. Dinesh Chandra Shaha, Senior Health Assistant, MHSP, PHSD; Mr. Abu Taher, Senior Health Assistant, CHRU, PHSD; Mr. Md. Delwar Hossain, Senior Health Assistant, MHRP, PHSD; Mr. Chitta R. Das, Senior Health Assistant, CHRU, PHSD; Mr. Md. Abdur Rashid Mia, Senior Health Assistant, HDSS-Matlab, PHSD; Mr. Md. F.M. Aminul Islam Khan, HDSS-Matlab, PHSD; Mr. Md. Abul Latif Patwary, Senior Health Assistant, HDSS-Matlab, PHSD; Ms Jahanara Khayer, Nursing Attendant, CHRU, PHSD; Mr. Md. Jainal Abedin, Security Guard, Matlab Administration, PHSD; Mrs. Husneara Salma, Health Assistant, CHRU, PHSD; Mrs. Monowara Akhter, Health Assistant, CHRU, PHSD; Ms Kamrun Nessa, Senior Health Assistant, CHRU, PHSD; Mrs. Jahanara Begum, CHW, HDSS-Matlab; Mrs. Shamsun Nahar, CHW, HDSS-Matlab; Mrs. Begum Easmin, CHW, Matlab CHS, MHSP; Mrs. Momtaz Begum, CHW, HDSS-Matlab; Mrs. Prodhan Mahmuda Akhter, CHW, CHRU; Ms Monowara Begum, CHW, CHRU; Ms Jahanara Begum, CHW, CHRU; Ms Begum Amena Khanam, CHW, CHRU; Ms Sanjali Rani Saha, CHW, CHRU; Mrs. Delwara Begum, CHW, CHRU; Ms Momtaz Begum, CHW, CHRU; Ms Kamrun Nahar, CHW, CHRU; Ms Shahzadi Hossain, CHW, CHRU; Ms Shamsun Nahar, CHW, CHRU; Ms Rahima Akhter, CHW, Matlab CHS, MHSP; Mrs. Rahima Begum, CHW, HDSS-Matlab; and Ms Hosne Ara Begum, CHW, CHRU.

Long Service Award

During 1997, the following 11 personnel, after completion of their 30 years of service in the Centre, were awarded within-grade step increase in pay:

Mr. Abdul Mannan, Cleaner, GSU, A&P; Mr. Md. Fazlur Rahman, Health Assistant, DSS, MHSP; Mr. A.F.M. Aminul Islam Khan, Senior Health Assistant, DSS, MHSP; Mr. Md. Golam Mustafa, Laboratory Technician, Clinical Microbiology, LSD; Mr. Md. Abul Hashem, Senior Accounts Officer, Finance; Dr. M.A. Kashem Shaikh, Associate Scientist/Manager, DSS-Dhaka; Mr. Mokshed Ali Khan, Senior Health Assistant, CRSC, CSD; Mr. M.A. Mannan Bakaul, Senior Health Assistant, DSS-Matlab; Mr. Mohammad Abu Taher, Mechanic, Maintenance & Engineering, A&P; Mr. Abdur Razzak, Speedboat Driver, MHSP; and Mr. Md. Fazlul Haque, Senior Laboratory Attendant, LSD.

Obituary

With deep sorrow we record the deaths of the following personnel:

Mr. R. Robin Rozario, Secretarial Assistant, Travellers' Clinic, CSD, who served the Centre for more than 12 years.

Mr. Mohammad Ali, Senior Laboratory Attendant, Media & Wash-up, LSD, who served the Centre for 32 years.

Procurement Branch

Procurement Manager: Mahbulul Alam

The Branch arranged to procure scientific and other materials worth US\$ 2.80 million, of which 0.72 million was spent for local purchase, and US\$ 1.34 million for overseas purchase. Under an agreement, US\$ 0.74 million was spent for procuring materials for the Institute of Public Health, Dhaka. The Branch completed the periodical Rate Running Contract minimizing cost and reducing lead time and selection of vendors. It disposed of 18 unserviceable vehicles.

Engineering Branch

Chief Engineer: Taqsem A. Khan

The Branch continued to provide technological, engineering and logistics support to the Centre, and supervised and coordinated security and cleaning services, transport and logistics support management, vehicle maintenance, and the Staff Canteen. The Department maintained liaison with DESA, WASA, Titas Gas Co., Bangladesh Road Transport Authority, and many consulting firms. The activities of the Branch were carried out through the following sections:

Civil Engineering

Senior Assistant Engineer: Rabindra Das

The Section was involved in the new construction of 20,000 sft of northern and southern wings of the second floor of the existing hospital building in Dhaka and 12,000 sft of three-storey International Family Planning Training Centre at Matlab.

Electrical Engineering

Assistant Engineer: N. Sayem Uddin Ahmmed

The Section installed an additional PFI (Power Factor Improvement) unit in the sub-station to reduce the electricity bill of the Centre. A 500-KVA standby generator was purchased for the Matlab sub-station to reduce the power problem substantially.

Vehicle Maintenance Section

Senior Assistant Engineer: M.A.H. Talukder

The Section provided maintenance support to the Centre's fleet of 76 vehicles.

General Services Unit

General Services Officer: Mujibur Rahman

The Unit provided usual security services to the Centre, and offered catering services during seminars, courses, workshops, conferences, and meetings. The Unit handled about 65,000 pieces of mail through local and international courier services, express mail service, and post office.

Transport Management Unit

Senior Transport Officer: Md. Hamidullah

The Unit provided logistics and transport support by coordinating the use of the Centre's 76 vehicles (and leased 16) and 31 motorcycles. It maintained the radio communication system between Dhaka and Matlab.

Estate Office

Estate Officer: A.M. Alamgir

The Estate Office maintained the telecommunication system, assisted in hiring/leasing of offices for projects and houses for the expatriates, arranged payment of bills and taxes, provided mimeography and photocopy services, and maintained constant liaison with the T&T Board, WASA, DESA, and gas department for ensuring uninterrupted services for the Centre. The unit installed 10 new telephones, and as usual, published an internal telephone directory for use by the Centre's staff, embassies, and donor agencies located in Dhaka.

Staff Clinic

Physician Manager: Md. Matiur Rahman

The Staff Clinic continued to provide healthcare to the members of the staff and their dependents. During the year, 22,268 patients were seen, 453 were vaccinated, and 584 were provided family planning services. The Clinic conducted 3 health education seminars to create health awareness among members of the staff and their dependents.



In addition to providing healthcare to the Centre staff and their dependents, the staff Clinic organized health awareness seminars on different diseases. The photo shows Dr. Rashid Hyder giving a seminar on eye care

Staff Canteen

Supervisor: M. Abdullah

The Canteen continued to prepare and serve wholesome food to about 400 personnel, 200-400 patients and their attendants daily. It also catered for various seminars, conferences, and meetings of the Centre.

Travel Services Office

Manager: Kh. Shafiqul Hossain

The Travel Services Office continued to provide all travel-related services to the staff and visitors to the Centre, including members of the Board of Trustees. The Office also maintained liaison with the concerned government authorities for issuance of visa, landing permits, and customs passbook wherever applicable. The Centre's Guest House was maintained and run by the Office.

INTER-DIVISION SCIENTIFIC FORUM LIST

Clinical Sciences Division

Tahmeed Ahmed. Standardized management reduces mortality among severely malnourished children with diarrhoea.

Nur Haque Alam and Ramendra Nath Mazumder. Multi-centre study to evaluate the efficacy/safety of a reduced osmolarity ORS solution in adults with cholera and in children with acute watery diarrhoea.

Rukhsana Haider. Neonatal diarrhoea in a diarrhoea treatment centre in Bangladesh.

Shahadat Hossain. Therapeutic efficacy of vitamin A in acute shigellosis in children: a randomized double-blind controlled trial.

Sufia Islam. Multi-frequency bioelectrical impedance analysis (BIA) to assess human body composition.

Wasif Ali Khan. Neurologic manifestations of childhood shigellosis.

M. Mujibur Rahman. Acute respiratory infections prevent improvement of vitamin A status in young infants supplemented with vitamin A.

David Rush (Department of Community Health and Pediatrics, Tufts University, USA). New thoughts on the relationship between maternal nutrition and mortality.

Edward T. Ryan. Use of attenuated *Vibrio cholerae* as a multi-valent mucosal vaccine vector.

Mohammed Abdus Salam. The efficacy and safety of ciprofloxacin in the treatment of childhood shigellosis.

Health and Population Extension Division

Selina Amin. Strengthening urban clinic-based basic health services through standardized service-delivery protocols: preliminary findings from an intervention.

Bruce Caldwell. The determinants and consequences of pregnancy termination in rural Bangladesh: a client's perspective.

Yousuf Hasan. Essential services package (ESP) experiences from interventions in rural and urban areas.

Bilqis Amin Hoque. Sustainability of a water, sanitation and hygiene education project in rural Bangladesh.

Irene Kranzlin. The influence of tubewells on traditional pond management in a village in Bangladesh: some selected findings.

Ann Levin. Cost-effectiveness of alternative strategies for delivery of FP-MCH services: evidence from rural and urban areas.

Mizanur Rahman. Factors associated with reported side-effects of oral pills and injectables in rural Bangladesh.

Aye Aye Thwin. Making strategic decisions for delivery of MCH-FP services based on cost analysis.

Laboratory Sciences Division

Tasnim Azim. Effect of nutritional status on lymphocyte responses in children with shigellosis.

Joseph Bogaerts. Auxotypes, serovars and *in vitro* susceptibility of *Neisseria gonorrhoeae* from Rwanda.

Birger Christensson (Department of Pathology, Karolinska Institute at Huddinge University Hospital, Sweden). The scid mouse as a tool in experimental medicine.

Firdausi Qadri. Immune response in enterotoxigenic *Escherichia coli* patients and vaccines.

A.S.M. Hamidur Rahman. Cryptosporidiosis and its zoonotic aspects.

Mahbubur Rahman. Antimicrobial resistance and its implication among diarrhoeal pathogens.

Motiur Rahman. Modulation of pilus-mediated attachment of pathogenic *Neisseriae* to host cells by pilc.

Rubhana Raqib. *In vivo* apoptosis in shigellosis.

Samir Kumar Saha (Department of Microbiology, Bangladesh Institute of Child Health, Dhaka Shishu Hospital, Bangladesh). Burden of diseases in Bangladeshi children due to *Haemophilus influenzae* and *Streptococcus pneumoniae*.

M.A. Wahed. Evaluation of vitamin A status during acute illness.

Public Health Sciences Division

Dewan Shamsul Alam. Birth weight and its association with maternal nutrition and socioeconomic variables in rural Bangladesh.

Mohammad Ali and Jacques Myaux. Spatial dynamics in Matlab population: an exploration of the data over the past decade.

K.M.A. Aziz and M. Yunus. The impact of a community-based nutrition education intervention on green vegetable consumption and vitamin A status of children.

Abbas Bhuiya. Marital disruption in rural Bangladesh: predisposing factors and consequences on women's lives.

Andres de Francisco. Studies on measles control in rural Bangladesh.

Martinus Desmet. The potential for social mobilization in Bangladesh: the organization and functioning of two health insurance schemes.

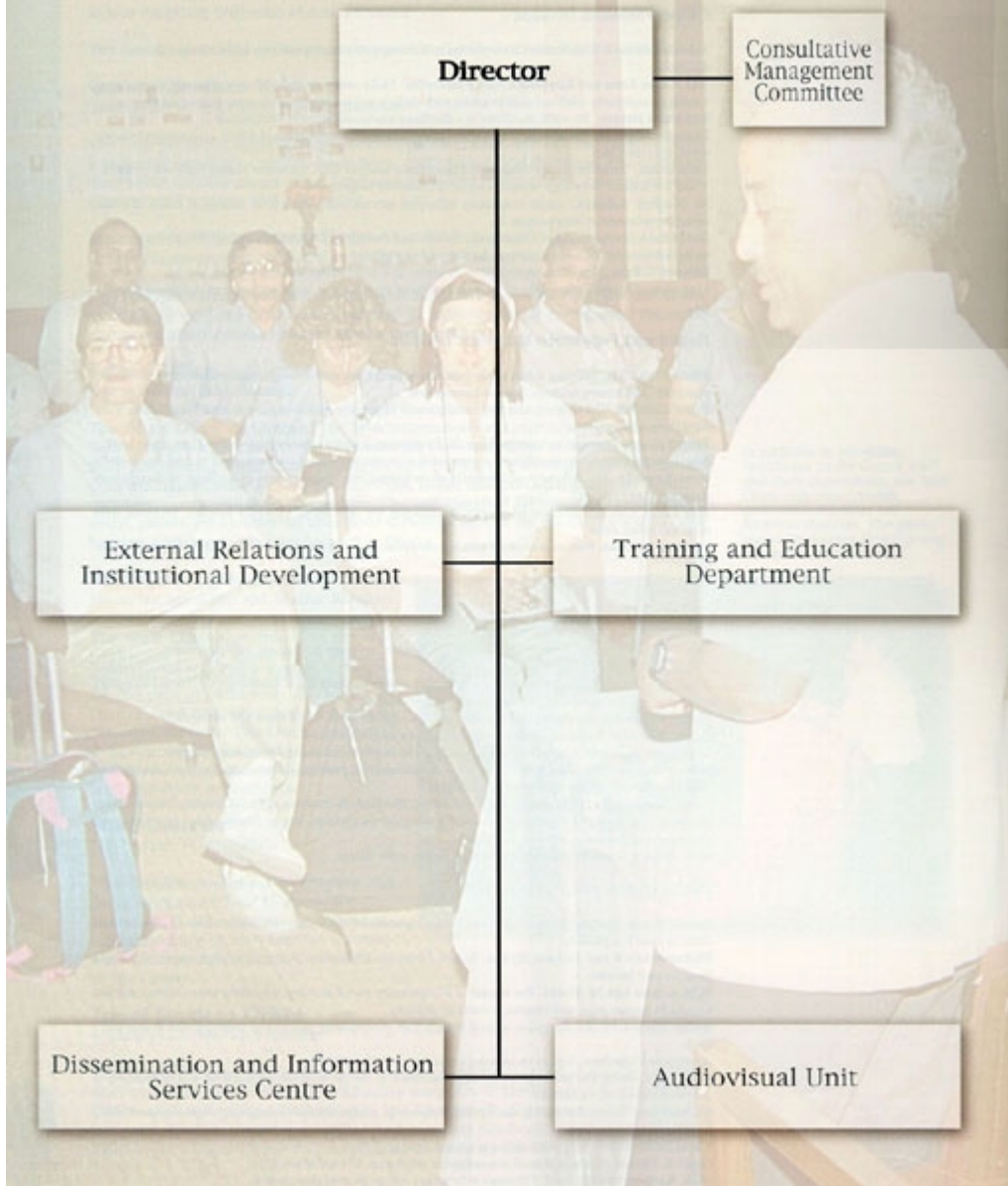
M. Mahmud Khan. Estimating the optimal number of comprehensive emergency obstetric care (EOC) facilities for Bangladesh.

Carol Jenkins. Sexuality research for behaviour change.

Nigar S. Shahid. Global maternal immunization studies on ARI and meningitis.

M.A. Kashem Shaikh. Recent changes in marriage pattern in rural Bangladesh.

Director's Bureau



External Relations and Institutional Development Office

TCO: Ishtiaque A. Zaman



Director
Dr. Demissie Habte
(Till 22 September)

The External Relations and Institutional Development (ERID) Office continued to implement the planned activities during the reporting period.



Director
Dr. Robert M. Suskind
(From 23 September)

Activities in Bangladesh

In October 1997, Ms Vanessa Brooks, a lawyer from the USA, was recruited as a consultant for new fundraising initiatives.

Preparation of Proposals for Funds

The ERID Office prepared the institutional components of proposals to AusAID (1997 and 1998), BADC (1998-2001), CIDA (1998-2000), Government of Japan (1997), Kingdom of Saudi Arabia (1996-2000), SDC (1998-2000), The Netherlands government (1997-1999), NORAD (1997), and UNDP (1997-2001).

In an effort to raise funds for specific projects and programmes, the ERID Office sent proposals to NORAD (1997-1998) for funding ECPP and ORT Corner of the hospital; to UNICEF (1997-1999) for funding the Child Health Programme; to AusAID (1997) for additional funds for Short-Stay Ward of the Dhaka hospital. The ERID Office collaborated with CARE International for a bid proposal that led to OFDA's award to CARE of the Indefinite Quantity Contract enabling the Centre to intervene in disaster situation at the global level.

The ERID Office continued to assist in the finalization of ICDDR,B's proposal to the European Union for the Bangladesh Health and Family Welfare Action Research Project (BHARP). Three project proposals were thoroughly discussed and selected for consideration of funding. The Asian & Latin American (ALA) Committee of the European Union has approved three projects to provide 3 million ECU to BHARP for a five-year period. Since the preparatory work on this project has already begun, the ERID Office sent a request to the EU Headquarters for approval of an early starting date of the contract. If signed, the project will cover over 66% salary support to the PIs, and much of the core costs of the unfunded programmes in Matlab will be covered from this funding. This alone will substantially reduce the Centre's projected deficit in 1998. BHARP focuses on actions research in the fields directly involved with the present and possible future EU interventions in the key areas of reproductive health.

AGFUND will provide the Centre US\$ 100,000 under Phase VI and VII of its programmes. AGFUND also provided support for child survival activities during epidemics in 1995. With the assistance of Dr. Tawfiq A.M. Khoja, additional effort was made to liaise with UNDP and the Arab Gulf Fund to try to overcome the backlog of proposals pending in Riyadh, Saudi Arabia.

The ERID Office continued efforts to diversify the Centre's funding base, and to liaise with SAARC and ASEAN countries, and with countries that signed agreements during the

internationalization of the Centre in Geneva in 1979. Save the Children Fund-USA became a new donor to the Centre in 1997 to join the other 35 who are supporting the Centre's work.

Hospital Endowment Fund (HEF)

To continue efforts to strengthen the Hospital Endowment Fund, a series of committees have been organized. The terms of reference of these committees have been set. The Hospital Endowment Committee (HEC) is the engine for the HEF campaign and is chaired by Maj. Gen. (Retd) M.R. Choudhury.

The ERID Office implemented the decision to honour the donors contributing to the Hospital Endowment Fund by setting up Honour Boards. These Honour Boards, under six different categories, are placed in the lobby of the Dhaka hospital for permanent display.

In addition, the ERID Office sent letters of appeal to all members of the Centre staff. Many employees of the Centre responded generously. Still more have expressed their willingness to contribute in installments. Even patients and their attendants have contributed to HEF. To date, the Hospital Endowment Fund has raised US\$ 4.6 million. The target is to raise US\$ 10 million by the year 2000.

Rhône-Poulenc Rorer, the French-American pharmaceutical company, made a contribution of US\$ 50,000 to the Hospital Endowment Fund during the BOT Meeting held in London in June 1997. This was the first ever corporate donation to this fund.

Similar proposals for contribution to the Fund were prepared and submitted, among others, to the Scobie and Claire Mackinnon Trust of Australia, and the Trust has made its annual contribution to the Endowment Fund.

In 1994, the Hospital Endowment Fund received a one-time contribution of US\$ 3 million from the Swiss Development Cooperation (SDC). In the new three-year agreement signed recently, SDC pledged 1.5 million SFR to the Centre's Endowment Fund.

The American International School in Dhaka organized a concert on 2 June 1997 at the school premises in Baridhara. This was their second concert to raise funds for the Hospital Endowment Fund.

The International Health Solutions Trust has been registered in the UK. This was initiated by Mr. Tony Shillingford as a consultant from the British Executive Services Overseas (BESO). The Trust can raise funds in the UK on behalf of the Centre. Mr. Peter McLean was appointed Chairman of the Trust, and it received support from the Bangladesh High Commissioner in London and from the British Bangladesh Chamber of Commerce.

Grants Administration

The Technical Cooperation Office of ERID ensured that the terms and conditions of grants are acceptable to the Centre and are in line with the Centre's interests. These para-legal reviews of each grant are made before agreements are signed. A special seminar on the USAID regulations was organized for the Centre's scientists to promote compliance with the donor requirements.

The database generated by grants administration is running successfully. Status reports of financial and technical matters are produced every month and are distributed to the Centre's management personnel for review. This has resulted in a much improved reporting system and donor compliance.

Communication

The ERID Office continued to prepare, update and distribute certain publications, such as strategic plans, work plans, brochure on the Centre's information, Centre Fund, HEF, and Partnership in Progress, etc. The Office initiated a media blitz where all the leading national dailies, radio, and television, were routinely fed with news on the endowment campaign. It produced information kits for visitors to the Centre and put together special folders to introduce the campaign to potential Goodwill Ambassadors. The HEF Committee is exploring other areas of fundraising.

The ERID Office was closely involved in the preparation and production of the 1997-1998 Biennial Work Plan and the Proceedings of the Donors Support Group Meeting held in November 1996. The ERID Office assisted in the dissemination of the Centre's research findings through media coverage during the Sixth Annual Scientific Conference (ASCON VI).

Activities in North America

The Centre's US Office in Baltimore was involved in both endowment campaign and

Hospital Endowment Fund Contributions

1997

Individuals (in alphabetical order of the last name)

Foundations, trusts, business firms, and others

Mr. Al-Mamoon
 Mr. Peter Amachep
 Ms. Fahana Amin
 Mr. M. Ahsanul Amin
 Dr. R. Bairagi
 Mr. Z. B. M. Bakht
 Dr. P.V. Barret
 Mr. J.T. Bout
 Mr. Abu Yusuf Chowdhury
 Dr. A.J. Collee and Mrs. A.J. Collee
 Brigadier Nicholas OBE Cottam
 Dr. Mercedes de-Onis
 Dr. Ruth Frischer
 Dr. George Fuchs and Mrs. Fuchs
 Dr. Demissie Habte and Mrs. Sablewongel Yeshewalul
 Mr. Abdul Haque
 Dr. Ralph H. Henderson
 Mr. Imtiaz Hussain
 Dr. Thomas Kane
 Mr. A.B.M. Masud Karim
 Dr. Derek Lobo
 Prof. J.P. Vaughan and Mrs. Pauline Macaulay
 Mr. Jacques O. Martin
 Prof. V.I. Mathan and Mrs. Minnie M. Mathan
 Mr. Cranter Arden Mairay
 Mrs. Charmaine Mendes
 Ms. Minu and D. Johnson
 Mr. Khondoker Moniruddin
 Mr. Henry Baker Perry
 Mr. Zeaur Rahim
 Mrs. Turah Rahiman
 Dr. Jon E. Rohde
 Prof. R.B. Saak
 Haji Mohammad Shahabuddin
 Prof. Robert M. Suskind and Mrs. Leslie Suskind
 Ms. Carole Swayne
 Mr. Kishore Thadani
 Dr. Cris Tuñón
 Mr. Y.U. Lal Udagewara
 Dr. Jeroen van Ginnikzen
 Mr. M. A. Wahed
 Mr. Graham A.N. Wright
 Dr. Ishtiaque Zaman

Ali Automobiles
 Family Planning Association of Bangladesh
 Ganges Travel Service
 Matlab Health and Research Centre
 Nepal View Travels
 Population Council
 Rhône-Poulenc Rorer
 SABINCO
 Sheraton Hotel, Dhaka
 Shing On International Ltd.
 Singapore Airlines
 United Insurance Company Ltd.
 Vantage Tours & Travels
 Zonta Club of Dhaka



general development activities. The priorities included helping organize the Donors Support Group Meeting in June aiming at building a strong financial base for the future years of the Centre by obtaining support from governmental, corporate and individual sources.

Forum on the Future of the Centre



Representatives of the Rhone-Poulenc Rorer (RPR) with the Centre Director and BOT Chairperson during the June Meeting in London

The US Office assisted in the coordination of the Donors Support Group Meeting held in conjunction with the Board of Trustees Meeting in London in June 1997. The Office has been entrusted with the responsibility of acting as the Secretariat for planning and execution of the Global Forum on the future of the Centre.

The Office developed a case statement and other material for the Global Forum.

Canada

The US Office has developed a proposal and a strategy for approaching the Canadian International Development Agency (CIDA) for an endowment contribution.

Corporate Affiliates Programme

A strategy for corporate participation in the endowment campaign was developed by the US Office. The purpose of the Corporate Affiliates Programme is to facilitate collaboration between the global health and nutrition industries and the Centre.

Corporate Cultivation

Building a relationship between the Centre and Pasteur Merieux Connaught represents an important accomplishment of the US Office in 1997. The Office has also been researching corporations that have their programmes in Asia and may be interested in supporting the Centre. The most promising ones are: American Express Bank, Citibank, Levi Strauss & Company, Novartis, Wyeth-Ayerst, Chase Manhattan Bank, and Baxter International. Several contacts have been made, and relevant activities for each of these prospects have been undertaken.

USAID

The Office is in regular contact with USAID on a weekly basis, facilitating communications, providing background material and generally keeping the Centre's profile before the Agency. The benefits of having a North American Office in close proximity to USAID and other donor agencies are realized frequently.

Levi-Strauss

The Office provided information to Levi-Strauss on the Centre's AIDS/HIV education and prevention programme. Follow-up is ongoing.

Administration of Endowment Funds Managed by Morgan Stanley

The North American Office has been maintaining the central liaison with Morgan Stanley, the New York-based managers of a portion of the Centre's endowment fund.

Johns Hopkins University

The North American Office has been serving as a link between the Centre and a science writer at the Johns Hopkins University on communications for the Child Health Research Project.

Bangladeshi American Campaign

The Office has developed a strategy to obtain contributions from the Americans of Bangladesh origin. The campaign is called Renewing the Promise, and it approaches the Bangladeshi community in North America as well as business firms and community leaders in Bangladesh for financial support to the Centre.

The World Bank

The US Office has made it a priority to develop a strong relationship with the key personnel of the World Bank. Its goal is to be in a position to identify opportunities for the Bank's funding in the areas of health research.

Fundraisers

The US Office, in late 1997, worked closely with the fundraisers: Jay Hoffman and Osman Yousuf in developing the logical framework and the strategic plan for their worldwide activities.

VISITORS

American Refugee Committee, USA

Ms Sandra Krause, International Health Adviser

AusAID, Australia

Ms Sung-Lee, Director for South Asia and Middle East Affairs



U.S. Ambassador to Bangladesh H.E. Mr. John Holzman (2nd from left) during his visit to the Centre



Mr. Chuck Robb, the U.S. Senator from Virginia and member of the Senate Foreign Relations Committee of the South Asian Subcommittee, Paid a visit to the Centre. Acting Director Dr. George Fuchs (3rd from right) and the U.S. Ambassador to Bangladesh H.E. Mr. John Holzman (extreme right) are also seen

Australian High Commission, Dhaka

Mr. Jason Reynolds, First Secretary (DA)

Bangladesh Medical Association

Prof. M.A. Majed, President

Better Life Options, Center for Development & Population Activities, USA

Ms Seema S. Chauha, Director

British High Commission, Dhaka

H.E. Mr. David C. Walker, High Commissioner, Mr. Kevin Sparkhall, Counsellor and Head, Aid Management Office, and Mrs. Mary McCowan, Deputy Head of DfID Health



Mr. Kelly Krammerer, Acting Assistant Administrator of USAID for Asia and the Middle East (4th from right), during his visit to the Centre. He was accompanied by USAID Mission Director Mr. Richard M. Brown (2nd from right), Deputy Mission Director Ms Anne Aarnes (3rd from right), Director of Population and Health Ms Margaret Neuse (2nd from left)



Ms Carol Bellamy, Executive Director of UNICEF (3rd from left), listens to a Centre's scientist on the breast-feeding initiative undertaken at the Dhaka hospital

Canadian High Commission, Dhaka

H.E. Mr. Nicholas Etheridge, High Commissioner, Mr. Thomas Schatzky, First Secretary, Development, and Ms Annick Amyot, Second Secretary

Canadian International Development Agency (CIDA)

Dr. Nancy Gerein, Director

CARE

USA: Mr. Paul J. Giannone, Director, Emergency Preparedness, Mitigation & Planning;

Bangladesh: Mr. Douglas Steinberg, Assistant Country Director

Catholic Relief Services, USA

Ms Mary S. Lung'aho, Senior Technical Adviser, Emergency Health & Nutrition, Program Quality and Support Department

Embassy of the Federal Republic of Germany

Dhaka: Mr. Dieter Ebser, Second Secretary and Head of Chancery; **Jakarta:** Dr. Wolfgang Wehnert



H.E. Mr. Eugeniy P. Ivanov, Ambassador of the Russian Federation in Bangladesh (2nd from right), visiting the research laboratories



Delegates from the American Programme lessons without Borders, comprising professionals from Boston and Baltimore, are listening to the Head of the Centre's Dhaka hospital

Embassy of France, Dhaka

H.E. Ms Renee Veyret, Ambassador

Embassy of Japan, Dhaka

H.E. Mr. Yoshikazu Kaneko, Ambassador

Embassy of the Russian Federation, Dhaka

H.E. Mr. Eugeniy P. Ivanov, Ambassador, and Mr. I. Trotsenky, Counsellor

Embassy of Sweden, Dhaka

H.E. Mr. Anders Johnson, Ambassador, Ms Britt Hagstrom, Counsellor and Head of Development Cooperation, and Mr. Karl Hagstrom, First Secretary, Health

Embassy of the United States of America, Dhaka

H.E. Mr. John Holzman, Ambassador, and Mrs. Kim Holzman

Government of Australia

H.E. Mr. Tim Fischer, Honourable Deputy Prime Minister

Government of Bangladesh

Prof. M. Amanullah, Honourable State Minister, Ministry of Health and Family Welfare, Mr. Engineer Mosharaf Hossain, Honourable Member of Parliament, Mirsarai, Mr. Shah Hadiuzzaman, Honourable Member of Parliament, Abhoynagar-Bagherpara Constituency, Dr. A.K.M. Nurul Anwar, Director General, Health Services, and Mr. Md. Shirajul Islam, Director General, Family Planning

Government of Nepal

Mr. Chhabi Prasad Devkota, Honourable Minister of State for Population & Environment, Mr. Ramesh Rizal, Honourable Member of Parliament, and Mr. Kamlesh Kumar Sharma, Honourable Member of Parliament

Harvard School of Public Health, USA

Dr. Jonathan Simon, Department of Population Sciences and International Health

INSERM, Pasteur Institute, France

Prof. Philippe J. Sansonetti, Microbial Pathogenesis Unit

International Medical Center of Japan

Dr. Satoshi Nakamura, Epidemiologist and Chief, Project Assessment Division, Department of Appropriate Technology, Dr. Shuzo Kanagawa, Paediatrician and Chief, Section of MCH & Program Management, Bureau of International Cooperation, and Ms Hatsuko Ubara, Medical Coordinator of JOCV

John Snow, Inc., USA

Dr. Sydney R. Schuler, Project Director, and Mr. Peter Conell, USDP

Johns Hopkins University/Center for Communication Programs, Dhaka

Mr. Edson E. Whitney, Country Representative

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

Dr. Robert E. Black, Professor and Chairman, Department of International Health, and Prof. R. Bradley Sack

London School of Hygiene & Tropical Medicine, UK

Prof. David Mabey, Department of Communicable Diseases

The Nippon Foundation, Japan

Dr. Kenji Ikeuchi, Department of International Affairs

Norwegian Agency for International Development (NORAD)

Ms Maren Brennesvik, Second Secretary

Pasteur Merieux Connaught, Berges du Rhone

France: Dr. Didier Leboulleux, Medical Director for Asia; **South and Southeast Asia Regional Office, Thailand:** Mr. Vincent Hamelin, Managing Director

Population Council

Dhaka: Dr. Kim Streatfield, Country Representative; **New Delhi:** Dr. Saroj Pachauri, Regional Director; **New York:** Dr. George F. Brown, Vice President; **Board of Trustees:** Dr. Jorge Balan, Dr. John Caldwell, Mr. Werner Holzer, and Mr. Rodney Wagner

Rhône-Poulenc Rorer

Paris: Ms Lisa Palme, Vice President, Dr. Gilles Roche, Director of Scientific Affairs and Business Development, EMA Region, Dr. Meena Dave, Medical Director, South-West Asia Region, and Mr. Benoit Girette, Vice President, Middle East and South West Asia Region; **Bangladesh:** Mr. A.K.M. Shamsuddin, Managing Director; **Hong Kong:** Mr. Michael R. Lienard, Vice President, South East Asia

The Rockefeller Foundation, USA

Mr. Peter C. Goldmark, Jr., President, and Ms Angela Blackwell, Vice President

The Royal Netherlands Embassy, Dhaka

Mr. Weert Mostert, Counsellor and Deputy Chief of Mission, and Ms Mary Kroon, Sector Specialist

Sanitation and Anti-epidemic Station, Shaanxi Province, People's Republic of China

Dr. Zhou Shi Pin, Director, Epidemiology Department

Swiss Red Cross, Switzerland

Mr. Claude A. Ribaux, Programme Manager, International Cooperation

TFIPP

Dr. Azam Ali, Mr. Kees Groenendijk, and Mr. Gabriel Mairesse

Thrasher Research Fund, USA

Dr. Robert Briem, Associate Director

UNFPA, Dhaka

Mr. Alain P. Mouchiroud, Representative

UNICEF, USA

Ms Carol Bellamy, Executive Director

University of Pretoria, South Africa

Prof. Kobus Oosthuizen, Centre for Population Studies

University of Rochester Medical Center, USA

Prof. Stephen J. Kunitz, Department of Community and Preventive Medicine

University of Western Australia Fremantle Hospital, Australia

Dr. Peter Underwood, Director, Community Health Research & Training Unit, Department of General Practice

USA

Mr. Chuck Robb, U.S. Senator

USAID

Dhaka: Mr. Richard M. Brown, Mission Director, and Ms Anne Aarnes, Deputy Mission Director, Mr. David Piet, Director, Office of Population & Health, Ms Margaret Neuse, Director, Population & Health Team, and Ms Nancy Powell; **Washington:** Mr. Kelly Krammerer, Acting Assistant Administrator for Asia & Middle East Bureau, Dr. Ruth Frischer, Health Science Specialist, Office of Health & Nutrition, Bureau for Global Programme,



Mr. Benoit Girette, Vice President for Middle East and South West Asia of the Rhone Poulenc-Rorer, Paris and Mr. Michael Lienard, Vice President, South East Asia Zone of RPR Hong Kong, being briefed on the patient care at the ICDDR,B's Dhaka hospital

Ms Carol Kiranbay, Congressional Liaison Officer, Dr. Tim Meinke, Technical Adviser to the Common Agenda, and Mr. Koichi Takagi, Director of International Affairs, Population Leadership Program.

Training and Education Department

Head: A.N. Alam

Training is a key component of the Centre's strategy to disseminate its research findings to help develop increased capacity for research, management of the control of diarrhoeal diseases (CDD) programmes, and family planning services. National and international training courses and workshops offered by the Centre are designed to provide participants with skills and knowledge applicable to their needs.

During the reporting year, 529 scientists, physicians, health administrators, health personnel and trainers from 27 countries received training at the Centre.

The Government of Japan and the Swedish International Development Cooperation Agency (SIDA) provided support to the Centre to conduct most of the training programmes; USAID and WHO also provided support to organize specific workshop/training courses, and the Belgian Administration for Development Cooperation (BADC) sponsored fellows from Vietnam, Cambodia, and Laos for training at the Centre.

Health Research Training

The major components of health research training are: (a) Health Research Training Fellowships, (b) Research Methodology Workshop, and (c) National Course on Epidemiology and Biostatistics. The Centre organized these programmes, and also (d) supervised research work of Bangladeshi nationals through its ongoing research projects.



Participants in the Research Methodology workshop, receiving training on analysis and management of data

In total, 64 researchers from 6 countries participated in these programmes.

Health Research Training Fellowships: In 1997, no fellowships were offered under the Health Research Training programme due to financial constraints.

Research Methodology Workshop: Six participants from Bangladesh, Pakistan, Myanmar, Nigeria, and Ghana and five members of the ICDDR,B staff attended the two-week workshop. The participants acquired skills necessary to develop and implement clinical and epidemiological research protocols, and to analyze and interpret data.

Introductory Course on Epidemiology and Biostatistics: Two four-week courses, attended by 44 participants, were organized, in collaboration with national institutions and NGOs. The participants learnt how to plan, design, analyze, and conduct epidemiological studies.

Training of Bangladeshi University Students: Seven MSc, one MPhil, and one PhD students from the University of Dhaka, and the Institute of Postgraduate Medicine & Research carried out research work for their dissertations at the Centre's research laboratories under direct supervision of the Centre's concerned scientists.

Training of Trainers

Training and Education Department of the Centre organized three national and international training courses to update knowledge and skills of trainers in prevention, case management and laboratory diagnosis of diarrhoeal diseases and in HIV/AIDS, aiming at creating efficient

manpower in these areas so that they are able to organize appropriate training programmes in their own countries or place of work.

International Course on Clinical Management of Diarrhoeal Diseases: Eleven physicians, nurses, and diarrhoeal disease control programme managers from Bangladesh, Nepal, Myanmar, the Maldives, Kenya, and Zimbabwe attended the course. In addition, two BADC fellows from Vietnam, while undergoing a three-month training at the hospital, also attended the course.

Laboratory Diagnosis of Common Diarrhoeal Disease Agents: A two-week course was attended by 11 participants: two each from Bangladesh, Bhutan, China, Myanmar, and Zimbabwe, and one from Iran. The participants learnt the principles of laboratory procedures of isolating and identifying diarrhoea pathogens and preparation of culture media.

Training on Sexual Health, Counselling and Communication Skills: Under the Centre's HIV/AIDS Staff Education Programme, a five-day training course on "Sexual Health, Counselling and Communication Skills" was organized in January to create a core group of trainers who would train peer educators for dissemination of HIV/AIDS information across the Centre. The objective of the course, attended by 23 members of the Centre staff and one person from CARE Bangladesh, was to improve the knowledge and communication skills of the participants on sexuality, transmission and prevention of HIV.

Training Workshop on Emergency Response to Cholera and Shigella Epidemics

The Centre organized a workshop to train health care professionals of international NGOs and other agencies that respond to disaster situations. The workshop was attended by 12 participants from 8 countries, representing the American Refugee Committee, Canadian Red Cross, Catholic Relief Services, CARE, International Committee for Red Cross, International Medical Corps, International Rescue Committee, Medicines Sans Frontiers, Holland and Spain, Save the Children Fund, USA, WHO, and UNICEF.

The objectives were to strengthen the capacity of the international NGOs in managing epidemic of cholera and shigellosis effectively to reduce morbidity and mortality. The Workshop also emphasized on preparedness to handle disaster situations, prevention of diarrhoea, ensuring safe water supply and addressing sanitation hazards. The participants received hands-on training at the patient care facility in Dhaka and in the makeshift treatment centres in the field, and prepared an action plan to be used by their organizations during disasters and epidemics.



Participants of the training workshop on Emergency Response to Cholera and Shigella Epidemics are seen receiving training at the patients' bedside

Family Planning Training Programme

In 1997, the Centre organized an International Workshop on "Improving Effectiveness, Quality of Services and Sustainability in Reproductive Health Programmes" based on its experiences and lessons learnt from Matlab and the ORP field sites. The objectives were to: (a) familiarize participants with the operations research activities and lessons learnt in the field of reproductive health by the Centre's scientists, (b) acquaint the participants with innovative interventions of service delivery agencies working in reproductive health in Bangladesh, and (c) disseminate the experiences of linking operations research with the process of policy formulation to improve reproductive health programmes. Seven participants from Bangladesh, Ghana, India, Pakistan,

and UK attended the Workshop. The participants were highly benefited because of a good balance between practical training in the field and theoretical lectures. The participants felt that such workshops can really contribute toward strengthening the MCH-FP programmes in developing countries.

Clinical Training Programme

The Centre offered fellowships to 54 persons for providing training in diarrhoeal diseases. The main objective of this programme was to provide the fellows with clinical skills in diagnosis and treatment of patients with diarrhoea and malnutrition with some insight into research methods. The different fellowship programmes in 1997 are as follows:

Fellowship for SAARC Countries: The Centre offered a 6-week training for fellows from member countries of the South Asian Association for Regional Cooperation (SAARC). The aim of this programme was to provide hands-on training to health professionals on different aspects of diarrhoeal diseases, laboratory diagnosis of common diarrhoeal disease agents, and community health to help strengthen the diarrhoeal disease control programmes in their countries. Seven fellows—two each from Bangladesh, Bhutan, and the Maldives and one from Pakistan—received training during the year.

Clinical Fellowships: The programme provided intensive training on different aspects of diarrhoeal diseases to physicians from Bangladesh, who have completed at least one year's training either on paediatrics or on internal medicine and are interested to pursue postgraduate studies. Fellows are selected on a competitive basis. Training at the Centre is recognized by the University of Dhaka and the Bangladesh College of Physicians & Surgeons for postgraduate diploma/degree in paediatrics or in medicine. In total, 12 fellows received training in 1997.

BADC Fellowships: The Belgian Administration for Development Cooperation (BADC) offered 6 fellowships for 3 months to participants from Vietnam, Laos, and Cambodia for training at the Centre in the field of clinical management or laboratory diagnosis of diarrhoeal diseases. Four of them have completed their training, and the remaining two are still undergoing training.

Fellowship for Nurses: The programme aimed at training nurses in the management of patients with diarrhoeal diseases. The Centre offered 15 fellowships in 1997 on a competitive basis.

Other Fellowships: Health professionals from Australia, Canada, India, the Philippines, UK, and USA received training on different aspects of diarrhoeal diseases. The large majority came for elective clinical attachment in the hospital or the community, and in some cases, assisted the Principal Investigators of the ongoing research protocols.

National Training Courses on Clinical Management of Diarrhoeal Disease

Two national training courses were organized in 1997. Eight DCH students from Bangladesh Institute of Child Health, and 14 physicians from the College of General Practitioners of Bangladesh attended these courses.

Training at the Dissemination and Information Services Centre (DISC)

Twenty-two persons from various institutions received hands-on training at the Centre's library to gain experience in the management and dissemination of information. The durations of their training varied from 15 days to 3 months.



Participants in the Laboratory Diagnosis of Common Diarrhoeal Diseases Agent Course, receiving training at the Laboratory and Animal experimentation

Short-term Courses

During the year, series of one- and two-day sessions were organized on the management of diarrhoeal diseases for 308 medical students and health professionals from national institutions.

National Workshops

Workshop on Safe Motherhood: A one-day workshop on "Safe Motherhood" was organized with financial assistance from the Department for International Development (DfID), UK, to disseminate the results of the Centre's research on the trends in maternal mortality in Matlab over the last decades. The Safe Motherhood Programme introduced in Matlab in 1987 also created a unique opportunity to assess the impact of an outreach attempt in the Safe Motherhood Programme, based on midwives stationed at the peripheral health centres backed by a referral/linking system at the thana and district levels. The participants included representatives from the Government of Bangladesh, NGOs, and midwives and supervisors from the Matlab Programme.

Workshop on Reproductive Tract Infections in Rural Bangladesh: A one-day dissemination workshop on "Reproductive Tract Infections in Rural Bangladesh: Findings and Policy Implications" was organized in 1997. Eighty participants included representatives from the Government of Bangladesh, NGOs, donor agencies, and some concerned personnel of the Centre. The results of the Centre's three-year study on reproductive tract infections (RTI) and sexually transmitted infections (STI) were presented at the Workshop. Implications for the development of a national plan to control these infections was discussed. The workshop highlighted the need for reconsidering RTI/STI management and prevention strategies in the area of low prevalence in Bangladesh.

Seminars

To provide opportunities for exchange of information and views, 7 seminars were organized during the year, in addition to 37 inter-division scientific forums, 7 weekly seminars, and 4 clinical seminars at the Clinical Research and Service Centre. Both resident and visiting scientists presented seminars on various topics.

Staff Development

Manager: Bejoy R. Saha

To achieve its mission, the Centre is mandated to undertake a systematic staff development programme to improve skills of its personnel. The Centre received financial support from the Swiss Development Cooperation and fellowships from several other agencies for the programme.

Overseas Training

At the beginning of the year, 17 personnel were on overseas training in various universities. During the year, an additional 25 left to begin study and training, and 28 returned. Of them, 25 completed their study and training, while three, after completing their course work/enrolment formalities, were back to the Centre to undertake research work for their dissertations for PhD degree from the London School of Hygiene & Tropical Medicine (LSH&TM), UK, University of Alabama at Birmingham, USA, and the Wageningen Agricultural University (WAU) in the Netherlands. Of the 25 personnel who completed their study and training, one received PhD degree, seven obtained Master's degree, and 17 attended non-degree programmes of various lengths. The fields of study and training included: community nutrition, public health, health promotion, health policy, planning and financing, primary health care, epidemiology, clinical epidemiology, microbiology, immunology, virology, phage display technology, sexual health counselling, computer and geographic information systems, testing and certification of biological safety, hospital management, and office management.

Those who had left the Centre to begin study and training abroad were:

Dr. Dewan Shamsul Alam, Senior Medical Officer, Matlab Health Research Programme (MHRP), PHSD, to complete the initial phase and enrolment formalities for a PhD degree in nutrition from the Department of Human Nutrition, WAU, the Netherlands. On return, he started conducting research for his doctoral dissertation.

Dr. Shams El Arifen, Epidemiologist, PHSD, to complete analysis of data, writing and defence of dissertation for DrPH degree from the Johns Hopkins University, USA.

Dr. Mahbubur Rahman, Associate Scientist, LSD, to attend a course on clinical microbiology (HIV) at the University College of London Hospital, NHS Trust, UK.

Mr. Md. Haroun-Ar-Rashid, Medical Assistant, MHRP, PHSD, to attend training on sexual health counselling at the British Council, Calcutta, India.

Dr. Syed Mohd. Akramuzzaman, Senior Medical Officer, CSD, to complete analysis, writing and defence of dissertation for a PhD degree from LSH&TM, UK.

Mrs. Saleha Begum, Analyst Programmer, CIS, Finance Division, **Mrs. Zaeda Khanam**, Data Management Officer, Personnel Office, A&P, **Mr. Sajal Kumar Saha**, Programmer, Health and Demographic Surveillance Programme (HDSP), PHSD, **Mr. Birendra Nath Adhikary**, Database Officer, HPSD, PHSD, **Mr. Sk. Firoj Ahmed**, Senior Programmer, and **Mr. K.M. Lutfur Rahman**, Data Processing Coordinator, Finance Division, to attend short courses on computer software at the Asian Institute of Technology, Thailand.

Mr. Syed Saiful Huq, Bio-medical Engineer, Bio-medical Engineering Cell, LSD, attended a course on testing and certification of biological safety cabinets at the Harvard School of Public Health, Boston, USA and made an orientation visit to the CDC Laboratory at Atlanta, USA.

Mr. Meer Md. Ramzan Ali, Manager, Hospital Administration, CSD, to begin training in UK on hospital management.

Dr. Rukhsana Haider, Associate Scientist, CSD, to fulfill the requirement for her PhD degree from LSH&TM, UK as an external student.

Mr. Aminur Rahman, Manager, Administrative Services, MHRP, PHSD, to begin a middle management programme at the Institute of Management, Ahmedabad, India.

Mr. Khorshed Alam, Assistant Scientist, Enteric Bacteriology, LSD, to undergo training on tissue culture assay at the Center for Vaccine Development, University of Maryland, Baltimore, USA.

Dr. Md. Khalequzzaman, Manager, Clinical Services, MHRP, PHSD, to begin study for his DrPH degree from the Department of International Health, the Johns Hopkins University, Baltimore, USA.

Mr. Nizam Uddin Khan, Research Officer, Population Studies Centre, HDSP, PHSD, to begin study for a PhD degree from the University of Colorado at Boulder, USA.

Mrs. Shamim Ara Jahan, Senior Investigator, Operations Research Project, HPED, to begin study for her MPH degree from the University of California, Los Angeles, USA.

Ms. Shamim Sufia Islam, Coding Assistant, Reproductive and Sexual Health Programme, PHSD, to attend a course on tropical epidemiology at the Ruprecht-Karls-Universität, Heidelberg, Germany.

Mrs. Ashrafuzzaman Chowdhury, Research Officer, Virology, LSD, to attend a course on phage display technology and applications at the Gesellschaft für Biochemologische Forschung mbH (GBF), Germany.

Mr. Mohammad Ali, Head, Geographic Information Services (GIS) Unit, HDSP, PHSD, to begin his postgraduate study in cartography and satellite imagery at the University of Liege, Belgium.

Mr. Md. Zahirul Haq, Data Management Assistant, GIS Unit, HDSP, PHSD, to undergo training on spatial data creation, editing, mapping and image processing at the Laboratory Surfaces, University of Leige, the Belgium.

Dr. Kaniz Gausia, Medical Officer, Reproductive and Sexual Health Programme, PHSD, to begin her Master's programme in sexually transmitted diseases at LSH&TM, UK.

Dr. Goutam Podder, Senior Scientific Officer, Virology, LSD, to begin training on viral gastroenteritis at the Centers for Disease Control and Prevention (CDC), Atlanta, USA.

Seventy-four personnel attended 31 scientific conferences outside Bangladesh. A number of personnel presented papers on the findings of their results at scientific conferences held in the country.

In-country Training

During the year, 40 personnel were trained in the areas of: computer programming, gynaecology, midwifery, English language, STD/HIV counselling, and high-performance liquid chromatography. One person attended a full-time course for a PhD degree in microbiology at the University of Dhaka and another for Diploma in Child Health at the Bangladesh Institute of Child Health.

In-house Training

Ten personnel participated in a short course on Windows 95; five attended a research methodology workshop; and 18 attended an introductory course on epidemiology and biostatistics.

Dissemination and Information Services Centre

Head: M. Shamsul Islam Khan

The Dissemination and Information Services Centre (DISC) is the central gateway of ICDDR,B for both 'input information' and 'output information.' DISC maintains a modern library equipped with the most advanced tools of New Information Technology (NIT) and paraphernalia for storage, retrieval, and dissemination of information. DISC disseminates the Centre's research findings and other outputs through print and electronic media. The Centre's internal publications include: the quarterly Journal of Diarrhoeal Diseases Research; one quarterly English newsletter Glimpse; a 4-monthly Bangla newsletter Shasthya Sanglap; one bilingual staff news bulletin ICDDR,B News, annual report, working papers, scientific reports, and special publications. The Library Advisory Committee and the editorial boards for the journal and newsletters have continued guidance in the improvement of information service and quality of publications. Activities and services of DISC were managed and maintained with a total regular staff of 11 personnel. However, one senior personnel left at the end of the year. Keeping pace with the overall growth of the Centre, activities of DISC proliferated during 1997 at a rapid rate.

Information Services

As in the previous years, the library services in 1997 included extensive collection of books, journals and other periodicals through purchase and inter-library loan, provision of computerized literature search through MEDLINE, AIDS, AHEAD, Nutrition, and POPLINE in CD-ROMs, referral services, current awareness services, bibliographic and photocopying services.

A total of 12,728 reader-visits took place during the year. Users of the library facilities ranged from the Centre's staff to the health professionals and researchers of other organizations, university teachers and students, trainees, and visitors.

Some 635 new books (81 purchased), 701 volumes of bound journals, and 364 current journals (227 titles on subscription) and other periodicals, and 5 databases on CD-ROM diskettes were added during the year, thus raising the total book and journal collection to 30,087, in addition to over 12,870 reprints and documents on diarrhoeal disease-related subjects. The library continued to add, update, and maintain four in-house databases, using the CDS/ISIS software. Of the 358 computerized literature searches, 141 were done for external users.

In a weeding out programme, the library permanently withdrew 940 old, unused, and less-used books, of these, 588 have been donated to the National Library of Bangladesh, and 301 to the Institute of Public Health.

The library, under the inter-library loan relationship, continued to extend borrowing facilities to the National Health Library and Documentation Centre, Bangladesh Institute of Development Studies, and the Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine & Metabolic Disorders (BIRDEM). Seventy-three duplicate journal issues and books were offered to health libraries in the country.

Information Dissemination and Publication Services

During the reporting period, members of the scientific staff of the Centre published a total of 394 documents, papers and abstracts (with 21 of 1996 and 13 of 1995 not listed before) which include: 55 working papers, scientific reports, special publications, and monographs; 81 original articles and short communications; 85 review articles, book chapters, papers in conference proceedings and research reports; 173 letters and abstracts in journals and conference proceedings.

DISC published 4 issues of the Journal of Diarrhoeal Diseases Research with Bibliography on Diarrhoeal Diseases in each issue; four issues of the English newsletter Glimpse, two issues of the 4-monthly Bangla newsletter Shasthya Sanglap, and four issues of the ICDDR,B News. Centre's Annual Report for 1996 was micro-edited at DISC. DISC assisted other branches in the publication of 37 working papers, 2 scientific reports, 12 special publications, and 3 monographs, and one specialized bibliography. Several of these were published directly by DISC.

A publication titled "Scientific Achievements of ICDDR,B: 1991-1995" highlighted the achievements made by the Centre through research during 1991-1995. It contains a list of 722 publications and dissertations published and produced during 1991-1995. Another 60-page publication titled "Bibliography of Nutrition Research at ICDDR,B" contains a list of 512 publications.

DISC disseminated information on incoming learning resources through the DISC Bulletin which included information on articles of relevance to the Centre's scientists, availability of new books, as well as information on conferences and training opportunities. Twenty-four issues of the DISC Bulletin were produced in 1997.

In total, 128,112 copies of different publications were distributed/mailed during the year, and 1,985 addresses were updated (added, deleted, or modified) in database on the mailing lists of Glimpse, Annual Report, Shasthya Sanglap, and the Journal.

DISC continued to participate in the PAN Asia Network by maintaining a Web site for the Centre (www.icddrb.org.sg) and in the AHEAD (Asian Health, Environmental & Allied Databases) project by submitting the Centre's publications for CD-ROM format. The Internet connection was installed in the middle of the year.



During important meetings, workshops, symposia, and conferences, DISC arranges display of the Centre's internal publications

Under the national collaboration programme, 22 undergraduate students of library and information science of the University of Dhaka received training on information management under a 15-day internship programme at the library. Four master's degree students of library and information science of the same university also received 3 months' training on information management. Besides, one Librarian of the Department of Public Libraries underwent a 3-week training on the CDS/ISIS software. In addition to these, DISC accepted five students (one master's degree and 4 diploma) of library and information science for a 3-month training at the end of the year. Considering the demand, the Centre approved a fee-based training programme on information management, beginning January 1998.

DISC earned a revenue of US\$ 20,485.00 from the sale of services, and of publications, subscriptions, and memberships and from the editorial advisory services. DISC rendered editorial advisory service for 64 papers and publications (2,378 pages) published from various divisions of the Centre.

Audiovisual Unit

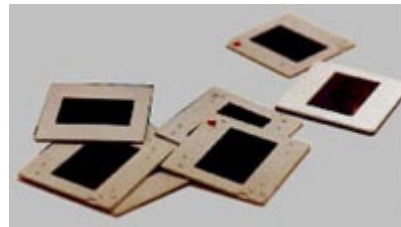
Head: Asem Ansari

The Audiovisual Unit (AVU) had a busy year providing support to the Centre's scientists and others (on payment) for preparing graphics material for their research papers, scientific reports, brochures, and other display materials, including slides; snapping and developing photographs of important events in the Centre, including visits of distinguished persons; audio and video-recording of scientific presentations and deliberations during meetings, seminars, workshops, and conferences; preparing photo albums and plaques for the outgoing personnel.



Head of the Audiovisual Unit Mr. Asem Ansari, instructing his assistant Mr. Fakrul Alam

In addition to regular page-making and lay-out of the Centre's periodicals, such as Glimpse, ICDDR,B News and preparing illustrations for the Bangla newsletter Shasthya Sanglap, the Unit designed covers and illustrations for almost all important publications of the Centre during 1997.



The Head of the Unit sometimes produces cartoons to portrait the major events, including Centre-donor relationship and financial crises, and these provide a source of humor amidst the busy schedule of work at the Centre. AVU plays the major role in producing documentary films intended to create mass awareness of the Centre or any of its activities.

The Unit contributed to the Hospital Endowment Fund campaign by producing a brochure on the campaign, preparing T-shirts and decorating coffee mugs for sale to strengthen the Hospital Endowment Fund.

AVU earned a total revenue of US\$ 13000.00 during 1997.



Committees

Coordination Manager: Z.B.M. Bakht (Till November)

Coordination Manager (Acting): Sirajul Islam Mollah

Board of Trustees

The multinational Board of Trustees, as the supreme policy maker of the Centre provides general direction to run its activities. The Board comprising 17 members include: the Director of the Centre, three persons nominated by the Government of Bangladesh, one by the World Health Organization (WHO), one by the United Nations Children's Fund (UNICEF), and 11 members from different countries and organizations, of whom at least half must come from developing countries. Each June, about 33% of the members complete their three-year term unless re-elected for another, after which they must retire. The Board meets twice a year in June and in November, and considers matters relating to scientific research, finances, and management. The Director of the Centre acts as Member-Secretary of the Board. The Board of Trustees in 1997 was constituted with the following persons:

Chairperson

Dr. Maureen Law (Canada) till June

Mr. Jacques O. Martin (Switzerland) from July

Member-Secretary

Dr. Demissie Habte (Ethiopia) till 22 September

Dr. Robert M. Suskind (USA) from 23 September

Members: Prof. Peter F. McDonald (Australia); Mr. Muhammed Ali (Bangladesh); Dr. Jon E. Rohde (UNICEF) up to June, Mr. Rolf C. Carriere (UNICEF) from July; Dr. A.K.M. Masihur Rahman (Bangladesh); Maj. Gen. (Retd) M.R. Choudhury (Bangladesh); Prof. Cesar G. Victora (Brazil); Prof. Chen Chunming (China); Prof. P. Helena Makela (Finland); Prof. Yoshifumi Takeda (Japan); Prof. Fehmida Jalil (Pakistan); Dr. Tawfik A.M. Khoja (Saudi Arabia); Prof. Marian E. Jacobs (South Africa); Dr. Ralph H. Henderson (WHO, Switzerland); Prof. Rita R. Colwell (USA).

Programme Coordination Committee (PCC)

PCC is established by the Board of Trustees with the prime objective of coordinating the Centre's research activities with national health institutions, and developing mechanisms to strengthen research capabilities through collaborative research.

PCC comprises 53 members: five from the Centre, three nominated by the Board of Trustees, three nominated by the Ministry of Health and Family Welfare of the host government, and the remaining from the government health departments or institutions, universities and non-governmental organizations involved in health, nutrition, education, population studies, and development programmes.

In 1997, the Chairperson was Prof. M.A. Matin, the Vice Chairperson was Prof. Kamaluddin Ahmad, and the Member-Secretary was Dr. Demissie Habte till 22 September and Prof. Robert M. Suskind from 23 September.

In 1997, PCC members included Director of ICDDR,B and Division Director of the Clinical Sciences Division (CSD), Public Health Sciences Division (PHSD), Laboratory Sciences Division

(LSD), and Health and Population Sciences Division (HPED) of the Centre; three representatives from BOT.

Representatives from the Government of Bangladesh were: Director General of Health Services, Director General of Family Planning, and Director General of National Institute of Population Research and Training; Joint Secretary (Health), Ministry of Health and Family Welfare; Director of: Institute of Epidemiology, Disease Control and Research, Institute of Postgraduate Medicine & Research, Institute of Public Health, Institute of Public Health Nutrition, National Institute of Preventive and Social Medicine, Management Information System (MIS) Unit of the Directorate of Family Planning, Cancer Hospital and Research Institute; and Project Director, CDD Programme.

Representatives from the academic institutions included Vice Chancellor of: Bangladesh Agricultural University, Bangladesh University of Engineering and Technology, Chittagong University, University of Dhaka, Islamic University, Jahangirnagar University, Khulna University, Rajshahi University, and Shahjalal University of Science and Technology.

Representatives from other organizations included Chairman of: Bangladesh Agricultural Research Council, and Bangladesh Council of Scientific and Industrial Research; Research Director, Bangladesh Institute of Development Studies; Medical Director, Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine & Metabolic Disorders (BIRDEM); Director of: Bangladesh Institute of Research for Promotion of Essential and Reproductive Health & Technologies (BIRPERHT), Institute of Bangladesh Studies (Rajshahi University), Institute of Nutrition and Food Science (University of Dhaka), Underprivileged Children's Education Programme, and Bangladesh Medical Research Council; Programme Director, Bangladesh Rural Advancement Committee (BRAC); Dr. M.S. Akbar, Professor of Paediatrics, Dhaka Shishu Hospital, and Prof. S.M. Nurul Alam, Department of Anthropology, Jahangirnagar University.

Individuals who were included as members of PCC in 1997 were: Prof. Nurul Islam, and Prof. T.A. Choudhury, Maj. Gen. (Retd) M.R. Choudhury, Dr. Humayun K.M.A. Hye, Dr. Zafrullah Chowdhury, Brig. M. Hedayetullah, Dr. A.K. Khan, Dr. Mobarak Hossain, and Dr. Sultana Khanum.

In its meeting held on 29 July 1997, PCC reviewed the Director's report on collaborative activities undertaken between the Centre and national institutions during May 1996-June 1997 in the fields of training, research and other areas. The members particularly appreciated the efforts of the Centre in organizing different training courses for the benefit of national institutions.

PCC also noted that 19 research protocols were undertaken by the researchers of national institutions during the past seven years with funding support from the Centre.

The Centre's scientists provided technical assistance and guidance to the scientists of national institutions in developing research proposals, undertaking research in their institutions, and in writing their scientific papers. Investigators from those institutions also participated in the ongoing research protocols at the Centre.

Research Review Committee (RRC)

Research Review Committee (RRC) reviews and evaluates the scientific merit of all research proposals, originating from the Centre's four scientific divisions, competence of the principal investigators, and relevance of the research protocols to the Centre's objectives and priorities. PCC is composed of clinicians, epidemiologists, social scientists, laboratory scientists, and demographers from both within and outside the Centre. In 1997, RRC met 9 times and considered 22 protocols. The members of RRC in 1997 were: Dr. Demissie Habte, Chairman till 22 September, Prof. Patrick Vaughan, Acting Chairman from October; Prof. Kamaluddin Ahmad

(external); Dr. M.J. Albert; Dr. Abdullah H. Baqui; Prof. T.A. Choudhury (external); Dr. George Fuchs; Prof. Md. Nazrul Islam (external); Prof. Farida Huq (external); and Dr. Carol Jenkins.

Ethical Review Committee (ERC)

The Ethical Review Committee (ERC), a mandatory committee of the Centre, meets regularly to examine and consider the ethical issues of research protocols involving human subjects. Its 5-member subcommittee undertakes periodic inspection and audit of research projects on behalf of the Committee and ensures that studies are being conducted ethically and according to the approved proposal.

The Committee is composed of 15 members: four from the Centre, one each from PCC, Bangladesh Medical Research Council, and WHO in Bangladesh. The remaining eight represent individuals from varying disciplines. In 1997, ERC met 14 times and considered 16 research protocols. The Chairperson of the Committee was Prof. Farida Huq.

The members of ERC in 1997 were: Dr. Halida Hanum Akhter, Population Science (external); Ms. Nafiza Anwar, Nursing (till September) and Mr. Mr. Mohammad Ullah (from December); Prof. S.A.R. Chowdhury, Pharmacology (external); Prof. A.B.M. Habibur Rahman Choudhury, Religion (external); Brig. Q.M.S. Hafiz, WHO, Dhaka (external); Prof. Farida Huq, Microbiology (external); Dr. Mahmuda Islam, Social science (external); Prof. Khursheed Jahan, Nutrition (external); Prof. Barkat-e-Khuda, Population Science; Prof. M.A. Majid, General Surgery (external); Dr. Sayeda Rowshan Qadir, Women's affairs (external); Dr. Rafiqur Rahman, Legal Practice (external); Dr. M.A. Salam, Dr. Rukhsana Haider, Clinical Science; and Prof Mahmudur Rahman.

Animal Experimentation Ethics Committee (AEEC)

The Animal Experimentation Ethics Committee (AEEC) was established by the Centre's Board of Trustees to ensure compliance of the standard procedures for protection of research animals at the Centre. The Committee reviews protocols, involving research with animals, and gives clearance to those protocols.

AEEC met once in 1997 and approved one protocol. The members of AEEC in 1997 were: Dr. M.A. Jalil, Veterinary and Animal Husbandry (external), Chairperson of the Committee; Prof. A.N.M. Abdul Qadir, Parasitology (external); Prof. Abu Tweb Abu Ahmed, Zoology (external); Dr. Md. Afzal Hossain Miah, Virology (external); Dr. Mohammad Hossain, Veterinary Science (external); Dr. Kh.A. Al-Mahmud, Veterinary Science; and Dr. Firdausi Qadri, Immunology.

Staff Welfare Association

President: Dr. K.A. Al-Mahmud

The Staff Welfare Association (SWA) plays a vital role in maintaining a good working relationship between the Centre's administration and the employees. SWA is the means of conveying suggestions and requests from the members of the staff to the management. SWA organizes a number of social and cultural events. Membership is open to all Bangladeshi staff.



The new Director of the Centre and Chief Patron of SWA Prof. Robert M. Suskind, conducting the oath-taking ceremony of the newly-elected office-bearers of SWA for 1998-1999

1997 was an eventful year for SWA. SWA had the opportunity to welcome the Centre's new Director Prof. Robert M. Suskind and the new Chairperson of the Board of Trustees Mr. Jacques O. Martin. The Chairman of the Selection Committee Dr. Henderson consulted the President of SWA to get feedback in the selection of the Centre's Director.

The SWA Executive Council met with both outgoing and the new Directors and the new Chairperson of the Board of Trustees, and interacted with them to solve various problems of the Centre and of the employees, especially regarding salary raise.

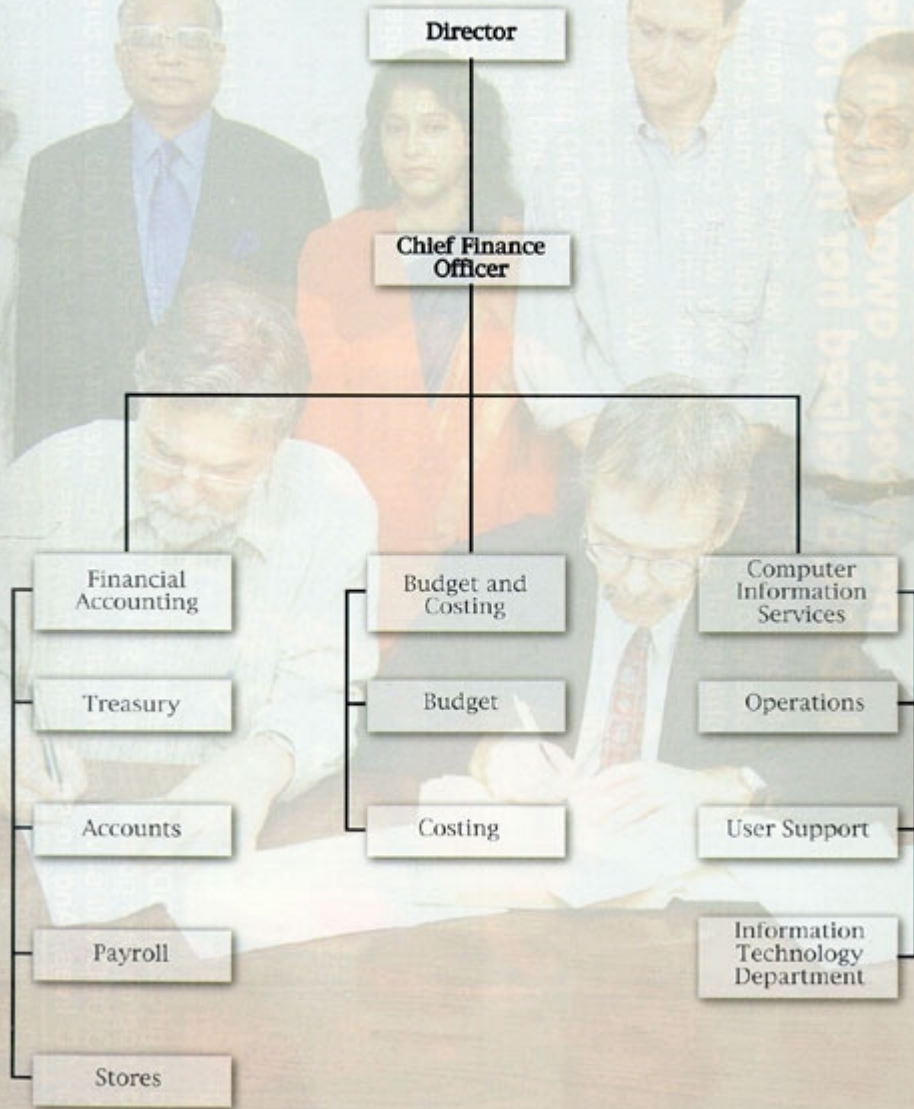
SWA organized annual general meetings in Dhaka and Matlab, and also convened two extraordinary general meetings. It donated the entire amount of money collected as SWA's annual membership fees and the Centre's contribution to the Prime Minister's Relief Fund, forgoing the usual annual dinner, sports and other cultural activities. The Trustees appreciated the concerns of SWA.

Election of the SWA Executive Committee for the 1998-1999 term was held in December 1997; the newly-elected office-bearers are:

President: Dr. Md. Shahadat Hossain (for both Dhaka and Matlab)

	Dhaka	Matlab
Vice President:	Mr. Md. Nazrul Islam	Mr. M.A. Mazid Sarder
General Secretary:	Mr. K. M. Rafique	Mr. Md. Mokbul Hossain
Joint-Secretary:	Mr. Mokshed Ali Khan	Mr. Md. Afteharuzzaman
Treasurer:	Mr. M. Kazi Shafiullah	Mr. Khalilur Rahman
Athletic Secretary:	Mr. M. Delwar Hossain	Mr. M. Mahabubul Haque
Social & Entertainment Secretary:	Mr. S.M. Ruhul Amin Bhuiyan	Mr. Khandaker Ahsan Kabir
Literary & Cultural Secretary:	Mr. Nazmul Ahsan	Ms Manisha Chakraborty
Members:	Mr. Md. Abul Hossain Mr. Md. Osman Ali Mr. M. Kabir Ahmed Bhuiyan Mr. M. Nurul Hoque Sikder Mr. Abdus Sobhan II Mr. Abdul Khaleque Mr. S.M. Akramul Haque	Mr. Ruhul Amin Mr. Shah Mustafa Kamal Mr. Nasir Ahmed Ms Sultana Razia Ms Shahanara Begum Mr. Rehan Uddin Mr. Mohammad Ismail

Finance Division



Finance Division

The Finance Division has the overall responsibility for financial operations, computer information services, central stores, and fixed asset management of the Centre and has a staff size of 44. The financial operations include: custodianship of all funds, preparation of the annual budget, recording of financial transactions, and commitments to prepare accurate and timely financial reports for the Board of Trustees and donors, in addition to preparing the monthly and annual reports.



*Division Director
Kenneth J.J. Tipping
(Till 15 October 1997)*

Computer Information Services has the responsibility for providing LAN-based computer services through several servers and centrewide backbone providing on-line Internet services, personal computer laboratory services, personal computer repair and maintenance, and development of information technology.



*Chief Finance Officer
John F. Winkelmann
(From 1 December 1997)*

Division Highlights

- ❑ In 1997, the Computer Upgrade Project (Phase I), funded by DfID of the U.K., was completed, which resulted in decommissioning of the IBM 4361 mainframe and in the implementation of two mid-range hosts, AS/400 and SUN UNIX along with a campuswide backbone, connecting departmental LANs.
- ❑ An on-line Internet system was introduced in the campus during 1997 that allows scientists and researchers to send/receive e-mails and browse web pages. The Centre's Web page (www.icddrb.org) was initiated during the year on its own server for the Internet.
- ❑ During 1998, a centrewide fibre backbone will be implemented under Phase-II of the plan and will be funded by DfID. Several new departmental LANs will be installed. The Centre's field station at Matlab will also be equipped with a LAN for remote data connectivity with the headquarters in Dhaka.

In 1997, the Centre was affected by a significant reduction in revenue contributions. Contributions to central activities reduced by US\$ 1,052,825 and to projects by US\$ 613,866, resulting in a total reduction of US\$ 1,666,691.

- ❑ Contributions from donors after deducting the expenditure for fixed assets of US\$ 184,931 (US\$ 459,295 in 1996) decreased by 11.7% from US\$ 11,880,737 to US\$ 10,488,410.
- ❑ Net expenditure after deducting miscellaneous receipts of US\$ 1,120,800 (US\$ 906,955 in 1996), but excluding depreciation, decreased by 1.9% from US\$ 12,536,807 to US\$ 12,298,126.

- ❑ In 1997, there was no contribution from the Hospital Endowment Fund whereas in 1996, US\$ 326,207 was contributed towards the operating costs of the hospital.
- ❑ The operating deficit was US\$ 1,809,716 (US\$ 329,863 in 1996) which, after charging depreciation of US\$ 899,838 (US\$ 902,953 in 1996), resulted in a net deficit of US\$ 2,709,554 (US\$ 1,232,816 in 1996).
- ❑ Net current assets decreased by US\$ 1,386,280 due to a decrease of US\$ 103,180 in cash and cash equivalents and a decrease of US\$ 1,283,100 in other net current assets.
- ❑ Receipts on account of Capital contribution decreased by US\$ 521,265 from US\$ 876,430 to US\$ 355,165.
- ❑ In 1997, the Centre received, with no cost, all assets of the Ford Foundation when they closed their Bangladesh Office. This included some 1,400 individual assets, including furniture, equipment, and motor vehicles. These assets are being used for the benefit of the Centre.

With a significant decline in revenue, the Centre's situation regarding financial deficit has become serious. While further cost containment measures will be pursued in 1998, the high-quality research and necessary support services will be in jeopardy without additional revenue.



Dr. A.K.M. Masihur Rahman, Secretary (ERID), Ministry of Finance and member of the Board of Trustees is seen signing the 1997 Annual Financial Statements, Together with the Acting Director, Chief Finance Officer, and the Auditors

Auditors' Report

TO THE BOARD OF TRUSTEES OF
INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH, BANGLADESH

We have audited the financial statements of INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH, BANGLADESH (ICDDR,B) for the year ended December 31, 1997, from which the abridged financial statements were derived. In our report of same date we expressed an opinion that the financial statements from which the abridged financial statements were derived, present fairly, in all material respects, except that "ICDDR,B Employees Separation Payment Fund" balance as at December 31, 1997 for US\$ 9,805,565 and corresponding investments with Generali Worldwide Insurance Company Limited of Guernsey, Channel Islands, has not been recognised in these accounts and income (net) recognition of unspent balance US\$115,514 as at December 31, 1997 at centre's North American office based on statement furnished by them unlike in earlier years.

In our opinion, the following abridged financial statements, except for the above, are consistent, in all material respects, with the financial statements from which they were derived and on which we issued a qualified report.

For a better understanding of the Centre's financial position and the results of its operations for the year and of the scope of our audit, the abridged financial statements should be read in conjunction with the financial statements from which the abridged financial statements were derived and our report thereon.

ACNABIN & Co.
Chartered Accountants

Price Waterhouse
Chartered Accountants

Dhaka, March 18, 1998

INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH, BANGLADESH

Statement of Financial Position as of December 31, 1997 (US\$ 000) - Abridged

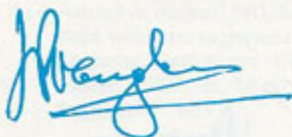
	<u>1997</u>	<u>1996</u>
Assets	14,175	13,290
Cash and deposits	3,626	3,729
Accounts receivable	2,294	2,678
Centre Endowment Fund Investments	3,180	2,150
Inventories	568	479
Property, plant and equipment	4,507	4,254
Total liabilities and fund balances	14,175	13,290
Accounts payable and other	6,807	4,789
Fund balances	7,368	8,501
Fixed assets	4,508	4,254
Fixed asset acquisition and replacement	279	893
Centre Endowment	3,180	2,150
Reserve	2,155	2,148
Operating	(2,754)	(944)

Statement of Activities (US\$ 000) - Abridged

Income	11,609	13,114
Donors' contributions	10,673	12,340
Other items - net	936	774
Expenditure	14,319	14,347
Personnel	9,228	8,771
Depreciation	900	903
Other items	4,191	4,673
Operating deficit	2,710	1,233

Statement of Cash Flows (US\$ 000) - Abridged

Cash flows from operating activities	504	2,021
Cash flows from investment activities	607	560
Net Increase/(Decrease) in cash and equivalents	(103)	1,461
Cash and equivalents beginning of year	3,729	5,190
Cash and equivalents end of year	3,626	3,729



Director



Member, Board of Trustees

These are the abridged form of the financial statements referred to in our report of same date.


ACNABIN & Co.
Chartered Accountants

Price Waterhouse
Chartered Accountants

Dhaka, March 18, 1998

DONORS' CONTRIBUTIONS (US\$ 000)

	<u>1997</u>	<u>1996</u>
Revenue Contributions	10,673	12,340
Aga Khan Foundation	15	103
Arab Gulf Fund	-	100
Australia - AusAID	340	322
Bangladesh	464	663
Belgium - BADC	298	444
Canada - CIDA	216	219
European Union	90	157
Ford Foundation	361	460
IDRC	55	30
Japan	680	680
Netherlands	157	908
Norway - NORAD	162	125
Rockefeller Foundation	57	26
Saudi Arabia	58	58
Sweden - SIDA	501	498
Switzerland - SDC	806	1,063
- Red Cross	212	220
Thrasher Foundation	73	39
United Kingdom - DFID	664	709
United States - USAID etc.	4,817	4,306
UNDP/WHO	-	350
UNICEF	214	167
WHO	67	94
Others	366	599
Capital Contributions	355	876
Bangladesh	210	-
Japan	-	710
United Kingdom - ODA	145	166

Contributions in 1997 from Others for project funds were received from Bangladesh-DGHS, George Mason Foundation, Helen Keller International, International Atomic Energy Centre, Lederle Praxis, Social Development Research Centre, North Field Laboratories, Proctor & Gamble, New England Medical Centre, American Express Foundation, Child Health Foundation, Rand Corporation, Wander Ag., SDC, Japan, Canadian High Commission, Population Council and Universities of Alabama, Pennsylvania and Loughbourg.

During 1997 contributions in kind, for specific and general activities were received from Bangladesh, Belgium, British Executive Service Overseas, Child Health Foundation and Ford Foundation.

Director

Member, Board of Trustees

ICDDR,B Publications 1997

A. Internal Publication Series

A1 ICDDR,B Annual report 1996. April 1997. 120 p.

Working Papers

A2 Ahmed MU, Mirza T, Khanum PA, Khan MA, Ahmed S, Khan MH. Management of reproductive tract infections in rural Bangladesh. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. iv, 21 p. (ICDDR,B working paper, 70) (MCH-FP Extension Project (Rural) working paper, 125)

A3 Ahmed S, Parveen SD, Islam A, Khanum PA. Induced abortion: results from two rural areas of Bangladesh. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. 18 p. (ICDDR,B working paper, 102) (Operations Research Project working paper, 142)

A4 Ahmed S, Khanum PA, Islam A, Parveen SD, Sobhan F, Nessa F. Strengthening maternal and neonatal health: results from two rural areas of Bangladesh. Edited by M. Shamsul Islam Khan and Toni Rahman. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. vii, 52 p. (ICDDR,B working paper, 86) (MCH-FP Extension Project (Rural) working paper, 137)

A5 Alamgir S, Tunon C, Arifeen SE, Baqui AH, Bhuiyan MA, Uddin MJ. Improving availability of and access to an essential services package (ESP) in urban Dhaka, Bangladesh. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. ix, 35 p. (ICDDR,B working paper, 96) (Urban FP/MCH working paper, 34)

A6 Alamgir S, Tunon C, Baqui AH, Bhuiyan MA, Uddin MJ. Improving the effectiveness of the health department of Dhaka City Corporation: summary of the needs assessment studies. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. viii, 34 p. (ICDDR,B working paper, 98) (Urban FP/MCH working paper, 36)

A7 Amin MA, Barkat-e-Khuda, Islam A, Levin A. Do female education and mobility lead to less intra-family abuse? Edited by M.A. Rahim and Toni Rahman. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. iii, 26 p. (ICDDR,B working paper, 81) (MCH-FP Extension Project (Rural) working paper, 133)

A8 Amin S, Tunon C, Arifeen SE, Baqui AH, Khanam R, Manaf S. Implementation of the essential services package (ESP) in urban clinics through standardized service delivery protocols: preliminary findings from an intervention in Dhaka. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. x, 61 p. (ICDDR,B working paper, 97) (Urban FP/MCH working paper, 35)

A9 Ashraf A, Barkat-e-Khuda, Rahman M, Reza M. The delivery of maternal and child health and family planning services through cluster visitation. Edited by M. Shamsul Islam Khan and Toni Rahman. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. iv, 22 p. (ICDDR,B working paper, 89) (Operations Research Project working paper, 140)

A10 Ashraf A, Ahmed MU, Barkat-e-Khuda. Refreshers' training of MCH-FP paramedics and field workers: experience from a low-performing rural area of Bangladesh. Edited by M. Shamsul Islam

Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. iii, 14 p. (ICDDR,B working paper, 103) (Operations Research Project working paper, 143)

A11 Azim SMT, Mookherji S, Tunon C, Begum A, Rasul R, Baqui AH. Information systems for urban health: findings from the clinic information system intervention. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. viii, 68 p. (ICDDR,B working paper, 78) (Urban FP/MCH working paper, 26)

A12 Azim SMT, Tunon C, Quaiyum MA, Begum A, Rasul R, Sirajuddin AKM. Improving the management of field operations: evaluation of an urban field information system (UFI) intervention. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. viii, 36 p. (ICDDR,B working paper, 95) (Urban FP/MCH working paper, 33)

A13 Barb N, Thwin AA, Routh S, Levin A, Mookherji S, Yousuf A, Begum A. Practical experiences from developing cost management skills of CWFP programme managers. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. viii, 45 p. (ICDDR,B working paper, 90) (Urban FP/MCH working paper, 29)

A14 Bhuiyan MA, Uddin MA, Baqui AH, Tuñón C, Alamgir S, Uddin J. Strengthening planning and coordination of urban health and family planning services in Bangladesh: findings from an intervention with government and non-government organizations in Dhaka city. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. viii, 38 p. (ICDDR,B working paper, 91) (Urban FP/MCH working paper, 30)

A15 Caldwell B, Barkat-e-Khuda, Ahmed S, Nessa F, Haque I. The determinants and consequences of pregnancy termination in rural Bangladesh: the wider context. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. iv, 24 p. (ICDDR,B working paper, 77) (MCH-FP Extension Project (Rural) working paper, 131)

A16 Caldwell B, Barkat-e-Khuda. The first generation to control family size: understanding Bangladesh's fertility decline from the perspective of the participants. Edited by M. Shamsul Islam Khan and Toni Rahman. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. iv, 22 p. (ICDDR,B working paper, 73) (MCH-FP Extension Project (Rural) working paper, 128)

A17 Haque I, Kane TT, Roy NC, Mozumder KA, Barkat-e-Khuda. Contraceptive switching patterns in rural Bangladesh. Edited by M. Shamsul Islam Khan and Toni Rahman. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. v, 31 p. (ICDDR,B working paper, 85) (MCH-FP Extension Project (Rural) working paper, 136)

A18 Hasan Y, Barkat-e-Khuda, Levin A. Strengthening outreach sites through an approach combining satellite clinics with Extended Programme on Immunization (EPI). Edited by M. Shamsul Islam Khan and Toni Rahman. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. vii, 27 p. (ICDDR,B working paper, 87) (MCH-FP Extension Project (Rural) working paper, 138)

A19 Juncker T, Khanum PA. Obstetric complications: the health care-seeking process before admission at the hospital in rural Bangladesh. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. iv, 18 p. (ICDDR,B working paper, 79) (MCH-FP Extension Project (Rural) working paper, 132)

A20 Levin A, Amin MA, Rahman MA, Mozumder KA, Barkat-e-Khuda. Charging for FP-MCH commodities and services: mid-term evaluation. Edited by M. Shamsul Islam Khan. Dhaka:

International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. viii, 38 p. (ICDDR,B working paper, 93) (MCH-FP Extension Project (Rural) working paper, 141)

A21 Levin A, Amin A, Saifi RA, Rahman MA, Barkat-e-Khuda, Mozumder KA. Cost-effectiveness of family planning and maternal and child health alternative service-delivery strategies in rural Bangladesh. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. vi, 35 p. (ICDDR,B working paper, 82) (MCH-FP Extension Project (Rural) working paper, 134)

A22 Levin A, Caldwell B, Barkat-e-Khuda. Demand for family planning services in rural Bangladesh: effect of cash prices and access. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. viii, 46 p. (ICDDR,B working paper, 75) (MCH-FP Extension Project (Rural) working paper, 130)

A23 Mozumder ABMKA, Barkat-e-Khuda, Kane TT, Levin A, Ahmed S. The effect of birth interval on malnutrition in infants and young children. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. iv, 16 p. (ICDDR,B working paper, 74) (MCH-FP Extension Project (Rural) working paper, 129)

A24 Perry H, Weierbach R, Hossain I, Islam R. Immunization coverage in zone 3 of Dhaka city, Bangladesh. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. x, 24 p. (ICDDR,B working paper, 76) (Urban FP/MCH working paper, 25)

A25 Perry HB, Begum S, Hussain JB, Baqui AH. Levels and correlates of mortality in zone 3 of Dhaka city, 1995. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. vii, 47 p. (ICDDR,B working paper, 80) (Urban FP/MCH working paper, 27)

A26 Quayyum Z, Thwin AA, Baqui AH, Mazumder MA, Begum A, Sobhani J. Establishing a systematic pricing mechanism for MCH-FP services of NGOs in urban Bangladesh: a preliminary assessment. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. ix, 44 p. (ICDDR,B working paper, 94) (Urban FP/MCH working paper, 32)

A27 Rahman M, Khan MA, Caldwell BK, Kane TT. Factors associated with reported side-effects of oral pills and injectables in rural Bangladesh. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. iv, 30 p. (ICDDR,B working paper, 84) (MCH-FP Extension Project (Rural) working paper, 135)

A28 Rahman M, Barkat-e-Khuda. A rapid procedure to assess awareness of, accessibility to, and utilization of health and family planning services. Edited by M. Shamsul Islam Khan and Toni Rahman. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. vi, 23 p. (ICDDR,B working paper, 72) (MCH-FP Extension Project (Rural) working paper, 127)

A29 Rahman MM, Barkat-e-Khuda, Kane TT, Mazumder KA, Reza MM. Determinants of antenatal care-seeking behaviour in rural Bangladesh. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. iv, 23 p. (ICDDR,B working paper, 71) (MCH-FP Extension Project (Rural) working paper, 126)

A30 Rahman MM, Khan MA, Kabir H. Health Assistant Register: a record-keeping system for the field workers of the national primary health care programme. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. vi, 106 p. (ICDDR,B working paper, 88) (Operations Research Project working paper, 139)

A31 Routh S, Thwin AA, Baqui AH. Cost-effectiveness and sustainability aspects of MCH-FP programmes in Bangladesh: a review of the past and present programmes. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. ix, 69 p. (ICDDR,B working paper, 100) (Urban FP/MCH working paper, 38)

A32 Routh S, Arifeen SE, Jahan SA, Begum A, Thwin AA, Baqui AH. Developing alternative service delivery strategies for MCH-FP services in urban areas: findings from an experiment. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. x, 58+x p. (ICDDR,B working paper, 106) (MCH-FP Extension Project (Urban) working paper, 41)

A33 Routh S, Thwin AA, Kane TT, Baqui AH. Socioeconomic and demographic factors associated with payment for different contraceptive methods in Dhaka city: implications for pricing strategies. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. vi, 34 p. (ICDDR,B working paper, 107) (MCH-FP Extension Project (Urban) working paper, 42)

A34 Salway S, Nurani S. The contraceptive potential of breastfeeding in Bangladesh. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. viii, 53 p. (ICDDR,B working paper, 83) (Urban FP/MCH working paper, 28)

A35 Salway S, Nurani S, Nahar Q, Jamil K. Continued confusion and neglected issues: postpartum family planning services in Bangladesh. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. vi, 47+i p. (ICDDR,B working paper, 105) (Urban FP/MCH working paper, 40)

A36 Tuñón C, Mazumder MA, Baqui AH, Bhuiyan MA, Arifeen SE. The distribution of selected health and family planning services in Dhaka city. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. viii, 26 p. (ICDDR,B working paper, 101) (Urban FP/MCH working paper, 39)

A37 Uddin MJ, Bhuiyan MA, Alamgir S, Nasreen S, Tunon C. Mobilizing for urban health: perceptions and involvement of the members of zonal health and family planning coordination committees in Dhaka city. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. x, 28 p. (ICDDR,B working paper, 92) (Urban FP/MCH working paper, 31)

A38 Zinc and health in South Asia; book of abstracts & programme; Regional Zinc Symposium & Workshop, Dhaka, 15-16 May 1997. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. 24 p.

Scientific Reports

A39 Baqui AH, Islam R, Begum N, Nurani S, Quaiyum MA, Husain JB, Yousuf A, Arifeen SE. Urban panel survey—Dhaka: characteristics of sampled population, demographic events, fertility regulation, and sources of MCH-FP services, 1995. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. vii, 65 p. (ICDDR,B scientific report, 81)

A40 Bhuiya A, Aziz A, Hanif SMA. Reproductive and sexual health problems as perceived by women and men in a rural area of Bangladesh. Edited by M.A. Rahim. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. 24 p. (ICDDR,B scientific report, 80)

Special Publications

A41 Ahsan SS, Barkat-e-Khuda, Kane T, Ahmed S, Chowdhury Z, Sobhan F, Mozumder K, Hassan Y, Vaguerie K. Improving mother and child health in rural Bangladesh; towards better quality of life. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. 48 p.

A42 Baqui AH, Black RE, Arifeen SE, Hill K, Mitra SN, Al Sabir A. Causes of childhood deaths in Bangladesh: results of a nation-wide verbal autopsy study. Edited by M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. vii, 43 p. (ICDDR,B special publication, 60) (MCH-FP Extension Project (Urban) special re- search report)

A43 Arifeen SE, Amin S, Begum S, Ahmed S, Ahmed MU, Khanam R, Tunon C, Manaf S, Parveen SD, Sobhan F, Baqui AH, Barkat-e-Khuda. The essential services package (ESP): protocols for primary health care. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. 46 p. (ICDDR,B special publication, 67)

A44 Bhuiya A, Yasmin F, Begum F, Rob U. Community participation in health, family planning and development programmes: international experiences. Editor: M.A. Rahim. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. 53 p. (ICDDR,B special publication, 59)

A45 Bhuiya A, Ribaux CA. Rethinking community participation: prospects of health initiatives by indigenous self-help organizations in rural Bangladesh. Editor: M.A. Rahim. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. 31 p. (ICDDR,B special publication, 65)

A46 Mazumder MA, Bhuiyan MA, Tunon C, Baqui AH, Chowdhury AI, Khan SA, Arifeen SE, Islam R. An inventory of health and family planning facilities in Dhaka city. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. vii, 121 p.

A47 Piet-Pelon N, editor. Lessons learned and programmatic implications; Dissemination Seminar proceedings. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. viii, 98 p. (ICDDR,B special publication, 66)

A48 Proceedings of the Donors' Support Group Meeting of the International Centre for Diarrhoeal Disease Research, Bangladesh, Dhaka, 4 November 1996. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. 18 p. (ICDDR,B special publication, 63)

A49 Programme and abstracts of the Sixth Annual Scientific Conference (ASCON VI) of the International Centre for Diarrhoeal Disease Research, Bangladesh, Dhaka, 8-9 March 1997. 111 p. (ICDDR,B special publication, 57)

A50 Safe motherhood research and new challenges in the maternity care programme; proceedings of a Workshop for Dissemination of Findings, Dhaka, 28 May 1997. Editors: M.A. Rahim and M. Shamsul Islam Khan. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. 38 p. (ICDDR,B special publication, 69)

A51 Scientific achievements of ICDDR,B, 1991-1995. Editor: Gillian Duffy. Compilers: M. Shamsul Islam Khan, M. Motasem Ali, and Md. Nazimuddin. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. 102 p. (ICDDR,B special publication, 55)

A52 Siddique AK, Nasim SMA. Guidelines for operating makeshift treatment centres in cholera epidemics. Editor: M.A. Rahim. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. 23 p. (ICDDR,B special publication, 61)

Monographs

A53 Barkat-e-Khuda, Stoeckel, Piet-Pelon N. Bangladesh family planning programme: lessons learned and directions for the future. Edited by Toni Rahman. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. xv, 80 p. (ICDDR,B monograph, 6)

A54 Barkat-e-Khuda, Kane TT, Phillips JF, editors. Improving the Bangladesh health and family planning programme: lessons learned through operations research. Edited by Kathryn E. Viguerie. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. xix, 169 p. (ICDDR,B monograph, 5)

A55 Kane TT, Barkat-e-Khuda, Phillips JF, editors. Reproductive health in rural Bangladesh: policy and programmatic implications. Edited by Toni Rahman and Kathryn E. Viguerie. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. 2 v. (ICDDR,B monograph, 7)

Specialized Bibliography Series

A56 Bibliography of nutrition research at ICDDR,B, 1960-1996. Compilers: M. Shamsul Islam Khan, M Motasem Ali, and Md. Nazimuddin. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1997. iv, 60 p. [ICDDR,B specialized bibliography series, 17]

Journal and Newsletters

A57 Journal of Diarrhoeal Diseases Research (also includes: Bibliography on Diarrhoeal Diseases). v. 14, no. 4, 1996* and v. 15, no. 1-3, 1997

A58 Glimpse. v. 18, no. 4, 1996* and v. 19, no. 1-3, 1997

A59 Shasthya Sanglap. v. 6, no. 1-2, 1997

A60 DISC Bulletin. v. 21, no.1-24, 1997.

A61 ICDDR,B News. v. 7, no. 5-6 (combined), 1996* and v. 8, no. 1-3, 1997

B. Original Scientific Papers (Including Short Reports)

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C. Review Articles, Book Chapters, Papers in Conference Proceedings, and Monographs

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