ICDDR,B: Centre for Health and Population Research (the Centre) is a large, non-profit international health research organization with headquarters in Dhaka, Bangladesh. It conducts research and provides service and training in a variety of the most important health problems, which the developing countries face. Initially focused on cholera and diarrhoeal diseases, the mandate of the Centre has broadened considerably, and the Centre is a world leader in studies of and solutions for common conditions prevalent in the developing nations and associated with poverty, including infectious diseases, malnutrition, high fertility, microbial and chemical contamination of the environment and need for better health services.

- ICDDR,B recruits international staff, including public health scientists, laboratory scientists, clinicians, nutritionists, epidemiologists, demographers, social and behavioural scientists, from academic and research institutions, and the United Nations (UN) organizations. Approximately, 95% of the staff, including scientific researchers, medical officers, health workers, and administrators, are Bangladeshi nationals.

- ICDDR,B provides training to health professionals attending courses funded by USAID, the Government of Japan, and other donor organizations. Trainees are invited through their governments, academic institutions, and donor agencies.

- The Centre's activities are supported by donors, including governments, UN specialized agencies, non-government organizations, foundations, research institutions, and private sector organizations and companies, and governed by an international Board of Trustees.

The Centre is expanding its mandate to address some of the most critical global health needs facing humanity as we enter into the 21st century, and is composed of four scientific divisions and the Director's Division.

The Clinical Sciences Division (CSD) undertakes clinical and community research and provides clinical services in diarrhoeal diseases, respiratory tract infections, and nutrition. The CSD also provides preventive strategies, such as immunizations for mothers and children, education for mothers on the management of diarrhoeal diseases, nutrition, and other childhood illnesses, with special emphasis on children aged less than five years. The Clinical Research and Service Centre provides treatment to more than 100,000 patients annually, of whom 80% are children, aged less than five years, suffering from diarrhoea, malnutrition, and pneumonia.

The Health and Population Extension Division (HPED) conducts operations research in rural and urban areas in collaboration with the Government of Bangladesh and NGOs. The scientific work of the Division aims at enhancing efficiency, effectiveness, cost-effectiveness, and sustainability of the health and population sector programmes through the design, field-testing and replication of appropriate strategies and technologies. A major focus is on advocacy and the application of research findings in policy formulation as well as the provision of technical assistance in scaling-up results from successful interventions. The Division has four 'experiment sites' in Abhoynagar (Jessore), Mirsarai and Patiya (Chittagong), and Dhaka city. Its surveillance system covers 23,624 households at these sites with a population of 126,747.

The Laboratory Sciences Division (LSD) conducts laboratory-based research in diarrhoeal diseases, acute respiratory infections, reproductive tract infections, HIV, other infectious diseases, environmental health, and nutrition. It has seven state-of-the-art laboratories for bacteriology, virology, immunology, nutritional biochemistry, parasitology, environmental microbiology, and pathology research. A state-of-the-art tuberculosis laboratory is a recent addition.

The Public Health Sciences Division (PHSD) brings the population perspective to the Centre's mission. It searches for cost-effective approaches that could be widely applied and could increase the absolute level as well as an equitable distribution of health between groups. The Division has a strong research infrastructure, including provision of primary healthcare services in rural Matlab where about 220,000 people are under the Matlab Health and Demographic Surveillance System. Besides the Matlab Health Research Programme and the Health and Demographic Surveillance System, the Division has research programmes for Reproductive Health, Child Health, Social and Behavioural Sciences, Epidemic Control Preparedness, Infectious Diseases and Vaccine Sciences, and Health Economics. Projects address epidemiological patterns of ill health, transmission of infections, public health nutrition, delivery of healthcare, prevention of illness through education, modification of risk behaviours, vaccine trials, and community development.

The Director's Division provides support to the scientific divisions and interfaces with the donor community. The Division is composed of the Director's Office, Policy and Planning, External Relations and Institutional Development Office, Finance Department, Human Resources Department, Training and Education Department, Staff Development, Dissemination and Information Services Centre (Library, Publications, and Audiovisuals), Computer Information Services, Administrative Services, and Committee Affairs Secretariat.

Training: The Centre has two training facilities: the Sasakawa Training Centre on the Dhaka campus of ICDDR,B and the International Training Centre at Matlab. Courses are conducted on epidemiology, family planning and reproductive health, child
Annual Report
2000

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.

Available online
http://www.icddrb.org
Our cover depicts Ali and Ranu of Matlab with their seven-year-old son. Ali is an agricultural labourer and Ranu is a housewife. At the time the photo was taken, Ranu was seven months' pregnant. The couple has been participating in a family-planning programme since 1987.
Preface

This twenty-second Annual Report of the Centre documents many aspects of the activities during 2000, 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 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 2000 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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ICDDR,B
Centre for Health and Population Research

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- Board of Trustees
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- Director
- Clinical Sciences Division
- Health and Population Extension Division
- Laboratory Sciences Division
- Public Health Sciences Division
- Director's Division
Director’s Report

The ICDDR, B: Centre for Health and Population Research continues to grow and mature. A noticeable evolution has been taking place at the Centre that can be summed up with the statement that “we are no longer just a diarrhoeal disease centre.” While this evolution has been underway for many years, it is perhaps more noticeable in this annual report and from the work in each of the Centre’s divisions.

All scientific divisions have expanded their views to discern which of the critical health issues they are best suited to address in a meaningful way. Globally, pneumonia is now a more frequent killer than diarrhoea. Malnutrition underlies nearly every condition in Bangladesh. The importance of tuberculosis is now becoming better understood. Many vaccines are being developed and require evaluation to determine if these will be useful for implementation here. The spectra of issues surrounding reproductive health are now appreciated more fully and demand active research and solutions. HIV/AIDS is a major health threat to all nations, including Bangladesh. Arsenic contamination in shallow tubewell water threatens millions of people in Bangladesh, but tubewell water continues to be used because surface water often carries cholera germs. On each of these topics, the Centre is conducting research and collaborating with experts at the local and international levels. In addressing these challenges, the Centre remains guided by our mission... “to develop and disseminate solutions to major health problems facing the world, with emphasis on simple and cost-effective methods of prevention and management.”

Leadership at the Centre

Some changes in key scientific leadership took place in 2000. Mr. Jacques O. Martin, a Swiss national, retired from the Board of Trustees after serving six years, including three years as Chairperson. Beginning July 2000, Dr. Marian Jacobs, a South African national, became the Chairperson. Professor V.I. Mathan, Head of the Laboratory Sciences Division (LSD), left the Centre in December after serving three years. He had also previously served for six years as a member of the Board of Trustees. Dr. G. Balakrish Nair, an Indian national, has assumed the role of Acting Head of the Division pending a permanent replacement. Prof. Barkat-e-Khuda moved from the position of Head, Health and Population Extension Division (HPED) to become Associate Director, Policy and Planning, and I myself assumed the role of Acting Head of the Division. Dr. Abdullah H. Baqui, Head of the Child Health Programme in the Public Health Sciences Division (PHSD) left the Centre to join the faculty at the Johns Hopkins University. Dr. Chris Tunon left to take up a position with the World Health Organization in Vietnam.

There were several additions to the international professional staff, primarily within the Public Health Sciences Division (PHSD). These included Dr. Yukiko Wagatsuma, an epidemiologist and Japanese national, Dr. Lauren Blum, a medical anthropologist and an American national, and Dr. Carel van Mels, a demographer and a Dutch national. Dr. Rob Breiman, an epidemiologist from the Centers for Disease Control and Prevention, USA, joined the Centre as Head of the newly-created centrewide programme on Infectious Diseases and Vaccine Sciences. Dr. Shams El Arifeen, a scientist in the PHSD, was selected to head the centrewide programme on Child Health.

Financial Support

The Centre’s financial situation stabilized somewhat during the year. For the second year in a row, the Centre balanced its budget. However, the accumulated deficit that occurred when donors shifted their funding away from institutional donations (core) to project funding during the middle of the last decade continues to burden the Centre. At the beginning of the decade, about 50% of the income to the Centre was in the form of core support; now core funding has decreased to about 13%. Making the adjustments to this change was difficult to accomplish in a short time, especially when a major responsibility of the Centre—providing healthcare to
more than 100,000 patients coming for treatment of life-threatening illnesses—depends on core contributions. The Centre has responded to the deficit by ‘right-sizing’ its staff and becoming more efficient and streamlined in its operations. Some donors, expressing their confidence in the Centre, increased their annual contributions. Thus, the deficit has decreased by about $600,000 from its peak in 1998, and the Centre anticipates reducing this cumulative deficit substantially during the coming years.

As we expand our research agenda to address additional health and population priorities, we are faced with limited resources in our efforts to address the cumulative deficit. Increasingly, the Centre is identifying projects that are of high priority both for the Centre and for the donors. However, until the accumulated deficit of more than three million dollars is gone, this will continue to be a drag on the Centre’s creativity and flexibility. Once the deficit is fully gone, the Centre can become more creative and deal with the urgent healthcare issues in a more timely manner.

How can one acknowledge the donors who continue to contribute to the core expenses of the Centre and how can one show the importance that their contributions have made to the Centre’s long-term productivity and sustainability? Annual reports and publications always highlight the fact that a specific project was supported by a particular donor, and we do appreciate these partnerships. However, these project-funded activities could never have been accomplished without the support to the overall infrastructure of the Centre, indeed the Centre would not even be here without the core funding.

As a strategy for long-term stability, the Centre is building an Endowment and continues to seek additional contributions to the Endowment. During the year, the Government of Japan made a remarkable gift of one million dollars to the Hospital Endowment Fund (HEF), raising the total value of this Endowment to about 5.2 million dollars. Additionally, the Centre has also stressed local contributions to this Endowment (especially the Annual Hospital Charity Ball), and these local efforts have contributed significantly during the year. The yields from the Hospital Endowment are able to provide about 15% of the costs of operating the Hospital, but we must continue to seek other sources for supporting the Hospital, a resource that treats more than 100,000 patients yearly, saving the lives of about 15,000 patients who would have died had they not come for treatment. Amazingly, this is done for an average cost of about $10 per patient treated (very few hospitals in the world could calculate these numbers let alone count the cost per death averted). Additionally, the Centre Endowment that is used for any of the Centre’s programmes is valued at about 4.5 million dollars.

Ethics in Research

The ethical conduct of medical research is an issue that has come under scrutiny during recent years, especially as this relates to research in developing countries. Fortunately, the Centre has had an independent and well-functioning Ethical Review Committee (ERC) since 1978. The Committee scrutinizes each protocol and may return protocols to the investigator to improve some aspects of the protocol. Increasingly, ethical standards of medical research are likely to become even stricter. As noted in a recent issue of the Journal of Health, Population and Nutrition (JHPN), most of the discourse on medical ethics is coming from industrialized countries, but the experience with the ethical conduct of research at the ICDDR,B can do much to assist developing countries in formulating rational approaches to ethical research.

Publication and Dissemination

In this electronic age, the Centre has had to keep up with the pace of computers and the Internet. From early 2000, the Centre has had its own V-SAT, and later in the year, has upgraded this to a higher-bandwidth V-SAT. Now scientists are able to use the World Wide Web on a regular basis. Similarly, the Centre’s website is now accessible around the world. The news of the Centre as well as its publications are available at http://www.icddrb.org. Soon, Matlab will also be connected via a microwave link with Dhaka.
Publications are an important means for our communication in medical research, and in 2000, the Centre's scientists wrote 88 papers published in peer-reviewed journals as well as other chapters and reports. Importantly, many of these articles are high-impact publications describing important findings that will form the basis for policy decisions around the world. Also this year, the Centre relaunched its own journal, the Journal of Diarrhoeal Disease Research (JDDR) as the Journal of Health, Population and Nutrition (JHPN). The journal is indexed by all major international indexing systems and is freely available on our website. Although the first issues still contained articles that were from the JDDR, the JHPN is increasingly becoming a means of communicating the findings of studies that have a wider application to international health.

Publications are certainly not the only means of communication, and the linkages with other institutions, visits of scientists, and attendance at meetings are also important. In this regard, the Centre has done well by sending scientists to meetings to present their findings, by hosting a large number of visitors to the Centre, and by hosting some important meetings, such as one with the International Union for the Scientific Study of Population (IUSSP). We had previously established strong linkages with institutions in North America, Europe, and Australia, but in 2000, we especially encouraged improving collaborations with institutions in the South and Southeast Asia region and in Japan.

Training

Training helps the Centre to communicate its expertise, ideas, and perspectives to a large audience. This year the Centre hosted over 300 trainees from 33 countries. Some courses were specifically designed for national trainees, while others hosted participants from other countries. We anticipate that improvements in the electronic communications could make training increasingly 'virtual'. However, there is no substitute for the real 'hands-on' experience of ICDDR,B training.

Scientific Thematic Programmes

This year the Centre created six thematic and cross-divisional programmes to help define the research agenda of the Centre. These included programmes on child health, reproductive health, nutrition, infectious diseases and vaccine sciences, health and family-planning system, and population. The programmes are intended to help bridge the gap between divisions, and help coordinate the continuity of work between clinical facilities, laboratories, and field areas. The programmes do not replace the divisions which will continue to administer the major resources of the Centre, but the programmes help identify the major opportunities for the Centre's research and will help articulate the priorities across the divisions. In some respects, the creation of the programmes complicates the organization of this annual report since many of the activities could be reported as programmatic activities rather than divisional activities. Both would be correct. However, since the programmes are only just beginning to develop their methods of operation, this annual report retains the divisional approach. Realize however, that the programmes are expected to play an increasing role in defining and integrating the research of the Centre.

Key Initiatives

Some important initiatives for the Centre should be highlighted:

A very large and very complex study on understanding the causes and determining the correct interventions for low birth-weight has started in Matlab. About 5,500 women who become pregnant during the next years will be followed through their pregnancy while monitoring the growth and development of the foetus, the child's birth-weight, and the subsequent health and development of the child. Almost 50% of infants in Bangladesh have a birth-weight less than 2,500 g, and these small infants are usually born to underweight mothers (who were themselves likely to have been born with a low birth-weight). With this
A baby born with low birth-weight

disadvantaged start, they have difficulty in catching up and suffer disproportionately from infant illness and death.

Studies on the role of zinc in the treatment and prevention of diarrhoea and pneumonia have played a prominent role in the Centre's recent scientific agenda. Zinc has been shown to improve the outcome of patients with diarrhoea and has now been shown to prevent hospitalizations for diarrhoea and pneumonia. When given to pregnant mothers, the babies are not bigger, but they are healthier. The results of several studies are still being analyzed, but once we have the data from the zinc studies, the task may be to determine how to make the benefits available to the children of Bangladesh, and by extension, to children of other developing countries. Thus, the Centre's studies, with respect to zinc, may shift from biomedical and efficacy studies to operations research, determining how best to implement zinc programmes.

Malnutrition continues to be the major health issue in Bangladesh. Our nutrition rehabilitation unit has shown how to cut fatality rates among severely-malnourished hospitalized children, but there are so many malnourished children in the cities and villages that methods are needed to help care for these children in clinics and in the community. Thus, the Centre scientists are working with local NGOs to identify ways to accomplish this.

A major study from the Centre published in the *Lancet* showed how peer counselling could improve the practice of exclusive breast-feeding. Although Bangladeshi culture does encourage breast-feeding, exclusive breast-feeding for four to six months is unusual. Haider et al. showed how peer counselling could markedly improve these rates. Like the studies on zinc and severe malnutrition, the Centre's future research programme on breast-feeding will focus an extension of these findings to the community.

Studies continue on improving the case management of diarrhoea. Even 30 years after the start of oral rehydration therapy, there are still questions about the most appropriate formulation for special circumstances and new ideas on how to improve its performance. While these ongoing studies continue to refine ORS, a recent paper in the Bulletin of the World Health Organization now estimates that ORS saves the lives of three million annually (previously, the estimate was one million). Truly, the development of ORS was a remarkable achievement, which the Centre can be proud of. Its continued improvement is also appropriate as long as diarrhoea continues to be a public-health problem.

In the area of child health, major efforts are being directed toward evaluation of the Integrated Management of Childhood Illness (IMCI) programme in cooperation with the World Health Organization, and in investigating and solving the problem of neonatal mortality. As highlighted in the last year's annual report, rates of infant mortality between 1 and 12 month(s) have decreased remarkably, but not those deaths occurring during the first month of life (typically expressed as those deaths occurring during the first 28 days). Following extensive planning during 2000, a major intervention is planned to start in 2001.

Research on infectious diseases and vaccine development has expanded significantly during the past year. Several vaccines are being studied at the Centre, including vaccines for rotavirus, enterotoxigenic *Escherichia coli*, *Shigella*, *Haemophilus influenzae* type b, and *Streptococcus pneumoniae*, and plans are underway for studies of newer cholera vaccines.

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In fact, the World Health Organization is now recommending the cholera vaccine tested in Matlab in 1985. The laboratory facilities for tuberculosis were prepared during the year, and this laboratory will be functional during the coming year. We expect that tuberculosis will be an increasingly important area for the Centre's research.

The city of Dhaka was struck by a serious dengue outbreak during the summer of 2000. Although there had been a few cases in the past years, the situation changed in 2000 with thousands of cases, including dengue haemorrhagic fever. The Centre assisted the Ministry of Health and Family Welfare (MoHFW) and the Dhaka City Corporation by hosting a meeting, organized by the Director General of Health Services, for professors of medicine and paediatrics to develop national guidelines for treating cases, and organizing mosquito surveillance in cooperation with the Dhaka City Corporation, and establishing laboratory facilities for identification of the virus. We were greatly aided by collaboration with scientists from the Armed Forces Research Institute of Medical Sciences (AFRIMS, Bangkok) and clinicians from the Queen Sirikit National Institute of Child Health (Children's Hospital) in Bangkok, Thailand.

In the area of reproductive health, the Centre has embarked on major initiatives to reduce maternal mortality. Already maternity sub-centres serve portions of the Matlab area, and the Operations Research Project (ORP) has been assisting the MoHFW in establishing its safe-motherhood facilities. About 30% of deliveries in the Matlab areas take place in these sub-centres (previously, 90% of deliveries were at home), and the sub-centres act as the first referral centre for complications when mothers deliver at home. The issues of sexually-transmitted diseases, reproductive tract infections, and HIV/AIDS must also be addressed. Bangladesh and the Centre have active programmes in each of these areas in defining the extent of the problem, describing the risk factors and assisting the Government in managing the problem. Especially with respect to HIV/AIDS, the Centre contributes by carrying out the national serosurveillance among high-risk populations.

Population studies continue to define the demographic characteristics for Matlab, Abhoynagar, Mirsarai, and Patiya. In Matlab, as in other parts of Bangladesh, the remarkable increases in the use of contraceptives and steady decreases in fertility have now levelled off at a fertility rate that is well above replacement levels. In the past, it was felt that fertility reduction would occur if family-planning programmes were optimized; however, it is now apparent that factors other than contraceptive use are critical as well. Abhoynagar, one of the extension areas of the Operations Research Project, is an interesting example of an area that has nearly reached replacement fertility, and work is planned to understand how this has been accomplished.

**Strategic Plan 2001-2005**

As the Centre looks toward the future, it is developing its revised Strategic Plan. Strategic planning is a major undertaking and requires much cooperation from scientists, staff, Board
members, and donors. We intend to complete this by the end of 2001. Certainly, the Plan will be based on the Centre's strengths, but it will also point the way toward continued changes that are needed to address the major health, population and nutrition issues of the future.

Thank you for your interest in the Centre. We hope this annual report gives you better insight into the Centre's most recent research, activities and accomplishments, and its potential for the future.

David A. Sack, MD
Director
The Centre Over the Years......

1960  Cholera Research Laboratory established
1963  Matlab field station started
1966  Demographic Surveillance System established
1968  First successful clinical trials of Oral Rehydration Solution (ORS)
1969  Relationship between stopping breast-feeding and resumption of menstruation demonstrated
1971  Independence of Bangladesh
1973  Shift from Classical to El Tor cholera identified
1977  Maternal Child Health and Family-planning interventions began in Matlab
1978  Government of Bangladesh Ordinance establishing ICDDR,B signed
1981  Urban Volunteer Programme initiated
1982  Field-testing of cereal-based Oral Rehydration Solution began; MCH-FP Extension project began
1983  Epidemic Control Preparedness Programme initiated
1984  ICDDR,B received UNICEF's Maurice Pate Award
1985  Full Expanded Programme on Immunization activities tested in Matlab; WC/BS cholera vaccine trial launched
1987  ICDDR,B received USAID's 'Science and Technology for Development' Award
1988  Treatment of, and research on, acute respiratory infection began
1989  The Matlab record-keeping system specially adapted for government use and extended to the national family-planning programme
1993  New Vibrio cholerae O139 Bengal identified and characterized
1994  Twenty-fifth anniversary of ORS celebrated. ICDDR,B; epidemic response team goes to Goma to assist cholera-stricken Rwandan refugees, identifies pathogens, and helps reduce mortality from as high as 48.7% to <1%
1995  Maternal immunization with pneumococcal polysaccharide vaccine shown likely to protect infants up to 22 weeks
1996  Hon'ble Prime Minister Sheikh Hasina terms the Cholera Hospital as the best diarrhoeal disease hospital in the world
1998  ICDDR,B celebrates its 20th year of existence; ICDDR,B initiates national HIV surveillance in cooperation with Ministry of Health and Family Welfare, GoB
1999  Hon'ble Prime Minister Sheikh Hasina opens the week-long festivity to mark the 20th anniversary of internationalization of ICDDR,B and calls upon all to support the Centre; Protocolized management of severely-malnourished child published in Lancet; Construction of the International Training Centre at Matlab completed
2000  ICDDR,B assists GoB with control of major dengue epidemic in Bangladesh; The Centre launches theme-based programmes of six major initiatives; WHO recommended oral cholera vaccine developed at ICDDR,B by Swedish scientists in collaboration with the Centre in the 1980s
Clinical Sciences Division

The Clinical Sciences Division (CSD) continued its research, patient care, and training activities in 2000 with the support of 202 fixed-term employees (133 core and 69 project staff). Another 64 health workers, 129 personnel on contractual service agreement (CSA), 15 trainee doctors, 15 trainee nurses, and an international child survival fellow significantly contributed to fulfill the mandate of the Division. Two paediatricians and a consultant radiologist participated in training of the staff and clinical fellows.

George J. Fuchs
Associate Director

Division Highlights

- Asymptomatic Helicobacter pylori (Hp) infected children had impaired gastric acid secretion (GAS) compared to non-infected children although basal GAS and iron absorption were abnormally low in both groups. GAS of infected children improved with no non-infected controls and haemoglobin increased significantly with Hp treatment while iron absorption using stable isotopes was unaffected. This study documents that Hp infection in Bangladeshi children is pathologic and not a commensal infection. Further, while GAS and iron absorption is lower in Hp-infected children, they are abnormally low in all children indicating an impaired gastric barrier as well as increased risk for iron deficiency and anemia.

- Green banana, pectin, Benetilde, and other types and sources of fibre converted to short-chain fatty acids were evaluated in children with persistent diarrhoea. All the three fibres independently reduced diarrhoea, improved mucosal permeability and nutrient absorption; and significantly enhanced clinical recovery from persistent diarrhoea.

- Amino acid L-histidine was shown to reduce colonic inflammation in a rabbit model of shigellosis. Polyphenol compounds extracted from apples reduced intestinal secretion of fluid and electrolytes induced by cholera toxin (CT) in a rabbit ileal loop model. Clinical trials in human shigellosis and cholera are in progress. Azithromycin was effective in the treatment of severe cholera when given to children in a single dose (20 mg/kg).

- An initiative with Urban Family Health Partnership (UFHP) to franchise the ICDDR,B hospital services began in 2000. The UFHP-designated local NGO Progoti Samay Kallyan Protishodh (PSKP) has been operating a clinic within the ICDDR,B premises since November 2000. This reduced patient load and financial pressure on the Centre’s Dhaka hospital and provided a new infrastructure for operations, research, and surveillance.

- As a follow-up to the clinical validation of a standardized protocol for the management of severe malnutrition, the Division (with assistance of the Training and Education Department of ICDDR,B) organized and hosted the WHO Workshop on Management of Severe Malnutrition in Hospital to field test the WHO training modules for treatment of severe malnutrition prior to global implementation. Health professionals of Bangladesh, Bhutan, India, Indonesia, and Myanmar participated in the workshop. The CSD staff and an expert faculty conducted the course. Other training workshops in the management of severe malnutrition were conducted by the Division, together with the Training and Education Department for healthcare providers in Bangladesh. The Centre is exploring the possibility of becoming the WHO regional training site for the management of severe malnutrition that would include follow-up effectiveness studies and operations research.

- Child Development Group (CDG) and Drug Trials Group (DTG) were formed in 2000. The CDG adds research capacity to measure cognitive and psychomotor development in infants and children as an outcome of interventions, while the DTG is expected to ensure quality in the implementation of trials on pharmaceuticals (antimicrobials, vaccines, antidiarrhoeal agents, etc.).
CASE MANAGEMENT RESEARCH

Nutritional Therapy

Dietary fibres, including amylase-resistant starch (ARS), are known to affect small and large bowel structure and function. The effect is mediated by short-chain fatty acids (SCFA) produced by bacterial fermentation in the colon. Two studies at ICDDR,B—one completed and one in-progress—investigated the therapeutic potential of green banana (a locally-available fruit rich in ARS) and pectin in the treatment of persistent diarrhoea and shigellosis.

Amylase-resistant starch (green banana and pectin) in the management of childhood shigellosis
Pls: G.H. Rabbani and M.I. Hossain
Funded by: USAID

In a double-blind study, 162 children aged 6-59 months with acute Shigella-associated dysentery are being randomly assigned to receive for seven days an isocaloric (54 kcal/L), rice-based diet containing boiled green (unripe) banana (250 g/L) or pectin (4 mg/kg) or isocaloric control diet. Main outcome variables are clinical and bacteriologic cure rates. It is anticipated that the results of this study will lead to improved, simplified treatment of dysentery. So far, 15 patients have been enrolled.

Amylase-resistant starch (green banana and pectin) in the management of childhood persistent diarrhoea
Pls: G.H. Rabbani, T. Tek, B. Zaman, and G.J. Fuchs
Funded by: USAID

Sixty children aged 5-12 months with diarrhoea for ≥14 days were randomly assigned to the isocaloric, rice-based diet containing boiled green (unripe) banana (250 g/L), pectin (4 mg/kg), or isocaloric control diet for seven days. Nutrient intake and energy absorption were measured by 72-hour metabolic balance study. Diets with green banana and pectin significantly (p<0.05) reduced volume of diarrhoeal stool and duration of illness and improved stool consistency. Green banana also enhanced (p<0.05) nutrient (energy, fat, nitrogen) absorption compared to pectin or the control diets and correlated with more rapid recovery and improved intestinal mucosal permeability. It is concluded that green banana given with a rice-diet is useful in the treatment of persistent diarrhoea and has potential for use as home treatment for diarrhoea.

A dietary treatment algorithm as a home management of children with persistent diarrhoea: a clinic-to-community study
Funded by: Swiss Agency for Development and Cooperation (SDC)

A randomized controlled study has been undertaken to evaluate the efficacy and feasibility of a dietary treatment algorithm, using a successful hospital-based regimen for home management of non-severe persistent diarrhoea in children. The treatment involves an initial milk-based diet for seven days. If no improvement is observed, a diet of rice-powder, vegetable oil, egg-white, and sugar is advised. The control group receives the usual home diet. Rates of resolution of diarrhoea and recovery between the two diets are being compared. Of 320 children scheduled to be enrolled, 208 have so far been studied.

Iron bioavailability from a traditional complimentary food in infants: effect of human milk
Pls: S.A. Sarker, L. Davidsson, K.M.A. Jamil, and G.J. Fuchs
Funded by: Swiss Federal Institute of Technology (Switzerland) and Nestle Research Foundation

Infants aged 6-24 months are among the most vulnerable to iron deficiency and iron-deficiency
anaemia. Non-home foods, including grains commonly used in complementary feeding of infants, are poorly absorbed. The aim of the proposed study is to evaluate the potential of human milk to improve iron (Fe) bioavailability from a traditional cereal/legume-based complementary food (khichuri). Infant (<18 months)-mother pairs in which the mother has a breastmilk ascorbic acid level of >20 mg/L are enrolled. Iron bioavailability is assessed using a stable isotope technique in which labelled meal (Fe^{57} and Fe^{59}) is administered via test-meal. Blood specimens at baseline and on the 18th day of administration of labelled meals are analyzed for iron indices (Hgb, ferritin, serum transferrin receptor) and isotopic concentrations. The findings of this study are likely to influence programmes for preventing iron deficiency among infants in developing countries. Of the total sample of 30 infant-mother pairs, 26 have so far been enrolled.

Assessment of carotenoid bioavailability from plant sources
Pis: K.H. Brown, K.M.A. Jamil, and G.J. Fuchs
Funded by: United States Department of Agriculture (USDA) and Micronutrient Initiative (Canada)

More recent studies have shown that the previously-used estimates of the conversion of dietary provitamin A to equivalent amounts of retinol are not correct. This study is designed to assess vitamin A bioavailability from different diets in adult volunteers using the novel deuterated-retinol dilution technique. Vitamin A reserve is assessed before and after a 60-day period of daily supplementation with an equivalent amount of one of the following four forms of vitamin A: pui shak (a green leafy vegetable), sweet potato, retinol, and β-carotene. A control group, not supplemented with any form of vitamin A, is also included. The study will additionally assess vitamin A reserve in these subjects by another abbreviated method using octa-deuterated retinyl acetate (d-8R). The study has been completed with 70 subjects enrolled in three rounds. The blood specimens are being analyzed.

Home-based nutritional rehabilitation of severely-malnourished children recovering from diarrhoea and other acute illnesses
Pis: T. Ahmed, M. Islam, B. Nahar, M.A. Salam, A. Ashworth, and G.J. Fuchs
Funded by: SDC and World Bank

Hospital-based nutritional rehabilitation of severely-malnourished children typically requires long stay of approximately 4-6 weeks and is, therefore, relatively expensive. This study is exploring an inexpensive and sustainable alternative to hospital-based nutritional rehabilitation. Severely-malnourished children (weight-for-length <70% or oedema) aged 6-60 months are treated for acute illnesses, including diarrhoea and pneumonia, and then randomized to receive one of three treatments until achieving a weight-for-length of >80%: home-based nutritional rehabilitation with follow-up at home, home-based nutritional rehabilitation with outpatient follow-up, or hospital-based nutritional rehabilitation (control). Children in either of the home-based treatment groups remain initially in the Nutrition Rehabilitation Unit (NRU) for seven days when their conditions are stabilized, and their mothers learn the preparation of khichuri and halwa, which are low-cost nutritious diets being successfully used in the...
NRU to rehabilitate malnourished children. So far, 248 children have been treated for the initial acute phase. Of them, two children died (case-fatality rate 0.8%). The study is expected to be completed by December 2001.

**Use of a standardized approach with a therapeutic diet of low-cost, locally-available foods to maximize catch-up growth of severely-malnourished children**


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

The World Health Organization currently promotes therapeutic milk formulas to rehabilitate severely-malnourished children. Ideal diets for nutritional rehabilitation should be inexpensive, easy to prepare, and culturally acceptable to mothers and children. The current study aims at assessing the impact of a new dietary management protocol for very severely-malnourished children recovering from diarrhoea. The protocol is based on three types of locally-available, culturally-acceptable and inexpensive foods in which vegetables form the principal source of protein. *Khichuri* and *halwa* are examples of such vegetable-based diets used at the ICDDR,B. Severely-malnourished children (weight-for-age <50% or weight-for-length <70% of reference or with oedema) aged six months to five years who recovered from their acute illness (e.g. diarrhoea, pneumonia, electrolyte imbalance, sepsis) were admitted to the NRU for the catch-up growth phase of treatment and fed according to the standardized diet protocol. Food intake of these children (n=611) was gradually increased in a programmed manner, while children in the comparison group (n=373) were offered conventional food eight times a day in a non-programmed manner. Use of the protocol improved the rate of weight gain by approximately 20% in the protocolized children compared to children fed according to the conventional, non-protocolized method (11.5±6.7 vs 9.6±7.0 g/kg per day, 95% CI 2.8 to 1.0). Nutritional rehabilitation of severely-malnourished children using indigenous diets is an inexpensive and sustainable alternative to expensive and more complex formula-based diets.

**Diagnosis and treatment of tuberculosis in children with severe malnutrition**


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

Malnutrition in children, like other conditions in which the immune system is depressed, is often associated with the progression of latent TB to overt disease. The diagnosis of TB in severely-malnourished children is difficult and usually delayed because these children typically have negative skin tests for TB due to their secondary immune suppression and cannot produce sputum for diagnosis. As part of an ongoing programme, the use of modified Kenneth-Jones criteria to diagnose TB in severely-malnourished children, admitted to the ICDDR,B Dhaka hospital, has been evaluated. These criteria include age and nutritional status, non-response to therapy (absence of weight gain during nutritional rehabilitation and/or pneumonia not responding to conventional treatment), prior BCG vaccination, history of contact, skin-test for TB, radiological evidence of parahilar lymphadenopathy, and others.

**Effect of psychosocial stimulation on mental development of malnourished children in nutrition centres of the Bangladesh Integrated Nutrition Project**

*Pls: J.D. Hamadani, S.N. Huda, G.J. Fuchs, and S.G. McGregor*

Funded by: World Bank

Malnourished children exhibit deficits in psychomotor development despite nutritional rehabilitation. This is a randomized controlled trial, where a group of malnourished children and their mothers attending feeding centres of the Bangladesh Integrated Nutrition Project (BINP) participate in an intervention of child development activities and are compared with a control group of malnourished children attending other feeding centres. In addition to evaluating the efficacy of this approach, the project assesses the feasibility of incorporating an
inexpensive and culturally-appropriate set of child development activities into the BINP with the aim of improving both psychosocial and cognitive development of malnourished children and the child-rearing skills of their mothers. The initial enrollment of cases has been completed, and data collection for the first set of tests is near completion.

Fluid Therapy

Efficacy and safety of reduced-osmolarity ORS with lower sodium concentration in the treatment of neonates and young infants with acute dehydrating diarrhoea

Pis: A.M. Khan and G.J. Fuchs
Funded by: USAID (Targeted Research)

This double-blind, randomized, controlled clinical study compared the efficacy and safety of WHO-ORS and hypotonic oral rehydration solution (ORS) in the treatment of neonates and young infants aged up to two months with acute dehydrating diarrhoea. In total, 144 subjects were enrolled in the study and randomly assigned to standard WHO-ORS or reduced-osmolarity ORS (mmol/L: Na 75, K 20, Cl 65, citrate 10, glucose 75, osmolarity 245). No differences were observed between the groups in stool output, duration of diarrhoea, intake of ORS, need for unscheduled intravenous fluid, or incidence of hyper- or hyponatraemia. These results indicate that reduced-osmolarity ORS has no advantage over WHO-ORS in the treatment of very young infants with acute watery diarrhoea.

Efficacy of rice-based ORS with L-histidine in cholera

Pis: G.H. Rabbani, D.A. Sack, and J.W. Peterson
Funded by: Cytos Pharmaceuticals/CATO Research, USA

L-histidine, an amino acid, has potent antisecretory effects in animal models of experimental cholera. This randomized controlled trial compares L-histidine-containing (2.5 g/L) rice-based ORS with standard rice-based ORS in 130 cholera patients. Both the groups are treated with antibiotics. Stool volume, duration of illness, and requirements for ORS and intravenous fluids are being compared. So far, 80 of the 130 patients have been enrolled.

Reduced-osmolarity oral rehydration solution in the treatment of severe persistent diarrhoea in children

Pis: S.A. Sarker, N.H. Alam, A.M. Khan, and G.J. Fuchs
Funded by: USAID

This study evaluated and compared the efficacy of WHO-ORS and two different formulations of reduced-osmolarity ORS in infants aged 4-24 months with severe persistent diarrhoea. Ninety-three infants with severe persistent diarrhoea were randomized to one of the three ORS treatment groups: WHO-ORS (control, n=32), a glucose-based, reduced-osmolarity ORS (RORS-G, n=30), or a rice-based reduced-osmolarity ORS (RORS-R, n=31). Treatment was given for seven days. Major outcome measures were stool volume and stool frequency, ORS intake, and resolution of diarrhoea. The stool volume was approximately 40% less in
the RORS groups. Consequently, the children in the RORS groups required significantly less ORS (22% for RORS-G and 27% RORS-R group). A higher proportion of children in the RORS-R group also had resolution of diarrhea during the study period. Reduced-osmolality ORS is more effective than WHO-ORS in the management of persistent diarrhea in children.

**Pharmacologic Therapy**

**Parenteral gentamicin in a single dose versus conventional three divided doses in malnourished children with infection**

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

Funded by: USAID

A prospective, open and randomized clinical study evaluated and compared the efficacy of a large daily single dose versus conventional triple dose of gentamicin in malnourished children with infection. This study also sought to determine the effects of malnutrition on the pharmacokinetics of once daily dose of gentamicin. One hundred and fifty-six malnourished and 20 healthy children aged 1-5 year(s) of either gender and with infection requiring an aminoglycoside were randomly assigned to one of the two treatment groups. Efficacy of gentamicin assessed by clinical and laboratory parameters and gentamicin-related toxicity evaluated by renal, auditory and vestibular function tests were compared. Preliminary analysis indicates that the single-dose regimen of gentamicin was equally effective as the conventional multiple-dose regimen and was safe in malnourished children with diarrhea and pneumonia.

**Inhibition of cholera toxin-induced fluid and electrolytes secretion by purified extracts of immature apple (applephenon' and applephenon ACT') in rabbit jejunum in vivo**

Pls: G.H. Rabbani, K. Rahman, M. Akhtar, D.A Sack, and M. Noda

Funded by: Tori-n Corporation, Japan

Natural apple contains polyphenols, flavonoids, and condensed tannins. The apple polyphenol, particularly the condensed tannins (ACT), purified from unripe fruit, inhibits cholera toxin (CT)-induced fluid accumulation in a rabbit ileal assay. This study aims at evaluating the CT-inhibitory actions of applephenon and characterizing the antisecretory effects of applephenon in a rabbit model of secretory diarrheoa by the steady-state perfusion technique in CT-stimulated rabbit small intestine using a non-absorbable marker (PEG 4000). Treatment effects will be evaluated by comparing intestinal transport rates of water, sodium, potassium, chloride, and bicarbonate ions across the mucosa between the treatment and the control groups. After a 24-hour overnight fasting, 15-30 cm jejunal loops were inoculated with 100 mg purified cholera toxin for five hours, and perfused with test solutions. There was an approximately 50% reduction of net secretion of sodium, potassium, and chloride ions by AP and AP-ACT compared to control. There was a 45% and 55% reduction in jejunal fluid secretion by AP and AP-ACT respectively (p<0.05). These preliminary findings indicate that both AP and AP-ACT are able to inhibit secretion of fluid and electrolytes induced by CT and might be useful antidiarrheal agents for cholera in human.

**Anti-inflammatory effects of L-histidine in experimental colitis due to *Shigella flexneri* infection in rabbits**

Pls: G.H. Rabbani, J.W. Peterson, and D.A Sack

Funded by: Cytos Pharmaceuticals/CATO Research

Because of anti-inflammatory and anti-oxidative properties of L-histidine in experimental animals, the effect of L-histidine in a rabbit model of colitis induced by *S. flexneri* 2a infection was evaluated. After 24 hours of *S. flexneri*-induced infection, rabbits (n=62) were given intraperitoneal injection of L-histidine or an L-histidine-free solution (control). L-histidine significantly (p<0.05) reduced mucosal congestion, cellular infiltration, and necrotic changes. Inflammation assessed by histologic grading scores was significantly lower in L-histidine compared to control groups at 24 hours, 48 hours, 72 hours, and 96 hours (p<0.05). Mucosal myeloperoxidase activity and bacterial counts correlated well with resolution of inflam-
L-histidine significantly (p<0.05) reduced faecal blood, mucus and improved diarrhoea, fever, leucocytosis, and weight loss. L-histidine may have potential in the treatment of human shigellosis.

**Single-dose azithromycin suspension in the treatment of severe cholera in children due to V. cholerae O1 or O139**

Pis: W.A. Khan and M.A. Salam
Funded by: New England Medical Center, USA

This randomized, double-blind clinical trial compared the clinical and bacteriologic efficacy of a 20 mg/kg single dose of azithromycin with that of a three-day 12.5 mg/kg 6-hourly dose of erythromycin (control) in the treatment of children with severe cholera. Sixty-three and 60 evaluable patients were enrolled in the azithromycin and erythromycin group respectively. Rates of clinical and bacteriologic success were similar (76% vs 65%, p=0.24; and 71% vs 82%, p=0.26), and median duration of diarrhoea was significantly shorter in azithromycin-treated patients. Single-dose azithromycin therapy is an effective alternative in the treatment of severe cholera in children.

**Efficacy of zinc supplementation in young infants with acute watery diarrhoea**

Pis: W.A. Brooks, S.K. Roy, G.J. Fuchs, M. Santosham, R.E. Black, M. Hashem, and M.A. Wahed
Funded by: USAID (ICDDR,B-Johns Hopkins University Cooperative Agreement)

Previous studies have demonstrated efficacy of zinc in older infants and children with acute watery diarrhoea, while the efficacy in younger infants is uncertain. The aim of this study is to compare efficacy of 5 vs 20 mg zinc in reducing duration and severity of acute watery diarrhoea (AWD) in infants aged less than six months in a double-blind, randomized, placebo-controlled clinical trial. The study has been completed in 265 of the 292 infants.

**A multicentre study to evaluate efficacy of a short-course ciprofloxacin therapy in the treatment of children with dysentery due to S. dysenteriae type 1**

Pis: M.A. Salam and W.A. Khan
Funded by: New England Medical Center

This multinational, randomized, controlled clinical trial compared the efficacy of a 3-day vs conventional 5-day course of ciprofloxacin in the treatment of children with dysentery due to *Shigella dysenteriae* type 1. Children aged 1-12 year(s) with ≤ 72-hour history of diarrhoea and culture-proven *S. dysenteriae* type 1 infection without history of prior antimicrobial therapy and other concomitant illnesses were eligible. Seventy children were randomly assigned to the study. They were hospitalized for six days and followed up for two weeks after discharge. The rates of predefined clinical and bacteriologic efficacies are the primary and major secondary outcome measures respectively. Patient enrollment has been completed, and data are being analyzed.

**Parenteral magnesium in the management of diarrhoea-associated abdominal distension in severely malnourished children**

Pis: T. Ahmed, M.A. Azam, K. Kosar, M.A. Salam, R. Suskind, and G.J. Fuchs
Funded by: USAID, Government of Japan, and ICDDR,B

Abdominal distension, which interferes with feeding, is a frequent complication in severely malnourished children. In this study, severely malnourished children with diarrhoea and abdominal distension are randomized to receive a single-dose intramuscular injection of either 0.3 mL/kg (maximum 2.0 mL) magnesium sulphate or normal saline. Abdominal distension, persisting beyond 24 hours of treatment with failure to tolerate oral feeds, constitutes treatment failure. If magnesium therapy, along with potassium supplementation, is effective in resolving abdominal distension, feeding can be initiated without further compromising nutritional status. This will minimize the need of intravenous infusions and associated risks, such
A clinical scientist is assessing a severely-malnourished child admitted to the Nutrition Rehabilitation Unit of the Dhaka hospital of ICDDR,B.

Soluble fibre (Benefiber)-supplemented diet in the treatment of persistent diarrhoea in children

Pls: N.H. Alam, S.A. Sarker, R. Meier, H. Schneider, and K. Gyr
Funded by: Novartis Nutrition, Switzerland

Among diarrhoeal diseases, persistent diarrhoea is associated with disproportionately greater number of deaths. The cause and the mechanisms of persistent diarrhoea are complex, and its management is directed primarily to nutritional interventions. Certain fibres, including Benefiber (soluble, partially-hydrolyzed guar gum), are fermented in the colon to produce short-chain fatty acids (SCFAs). This double-blind, randomized, controlled clinical trial evaluated Benefiber-supplemented comminuted chicken-based diet (therapeutic diet for persistent diarrhoea) in the treatment of children with persistent diarrhoea. In total, 116 children with persistent diarrhoea were enrolled (57 for comminuted chicken-based diet plus Benefiber and 59 for chicken-based diet without Benefiber). Initial analyses indicate that the duration of diarrhoea was less (p=0.03) and the rate of resolution of persistent diarrhoea within seven days was greater (p<0.01) among children in the Benefiber group compared to the control group. Soluble fibre has great potential in the case management of persistent diarrhoea in children.

Efficacy of an enkephalinase inhibitor—racecadotril (Hidrasec)—in the treatment of cholera in adults

Funded by: Glaxo SmithKline, UK

The foundation for treatment of cholera is rehydration therapy complemented by antibiotics. Several antisecretory agents have been investigated over the past decades. However, none has been shown to be both clinically effective and safe for the treatment of cholera. Initial clinical studies indicate that racecadotril, an enkephalinase inhibitor, may sustain the action of natural opioid (enkephalin) which acts on intestinal delta receptor to inhibit secretion of fluid and electrolyte in the small intestine. A randomized, placebo-controlled clinical trial has been undertaken to evaluate the efficacy and safety of racecadotril in the treatment of male adult cholera patients. Of 110 patients to be enrolled, 85 have so far been studied.

Zinc balance and bioavailability from two different dietary regimes for children with persistent diarrhoea syndrome

Pls: S.K. Roy, S.F. Tait, and A.M. Tomkins
Funded by: USAID

A significant amount of zinc is lost in the stools of patients with persistent diarrhoea. However, absorption efficiency of dietary and supplemental zinc in persistent diarrhoea is not known. To measure the efficiency of intestinal absorption of zinc from chicken-based and
rice-based diet and from supplemental zinc, a metabolic balance study with stable isotope 
($^{65}$Zn and $^{64}$Zn) in children with persistent diarrhoea is being conducted. In total, 52 patients 
have been recruited, and 45 subjects completed the recovery phase of the study. Biochemical 
and microbiological tests have been completed. Stool and urine samples have been sent 
to the UK for isotope estimation. These results will help develop and further define effective 
dietary and micronutrient management of persistent diarrhoea in children.

**Effect of zinc supplementation in children with shigellosis on the immune and 
inflammatory responses, clinical outcome, and growth**

and G.J. Fuchs
Funded by: USAID

This double-blind, placebo-controlled trial aims at determining the effect of zinc 
supplementation (22 mg/d) in moderately-malnourished children aged 1-5 year(s) with 
dysentery due to *S. flexneri* on the inflammatory and immunological response and severity 
of acute illness, and on growth following recovery. Of the 76 subjects, 46 have been recruited. 
Microbiological and immunological tests and rectal biopsies have been completed. Results 
from this study are expected to have implications for the management of shigellosis.

**Clinical trial on zinc supplementation in children with cholera**

PIs: S.K. Roy, G.J. Fuchs, and J. Hossain
Funded by: World Bank

Zinc supplementation has been shown to be efficacious in children with acute watery diarrhoea 
of all causes. This study will investigate the possible efficacy of zinc in addition to standard 
therapy in the treatment of childhood cholera. Clinical course, including stool output, severity 
and duration of diarrhoea as well as a metabolic balance will be assessed in children aged 
3-14 years.

**PATHOPHYSIOLOGY RESEARCH**

**Role of nitric oxide and reactive oxygen species in experimental shigellosis**

PIs: G.H. Rabbani, M. Miller, and G.J. Fuchs
Funded by: USAID

This study investigates the role of nitric oxide (NO), peroxynitrite, and reactive oxygen species 
(ROS) in the pathogenesis of experimental shigellosis in rabbits. Factors determining the 
pathogenic process of the acute mucosal inflammatory response in shigellosis are poorly 
understood. Concentrations of NO, iNOS, ROS, NF-kB, LTC4, LTD4 in body fluids/tissues of 
normal (controls) and *S. flexneri*2a-infected rabbits will be quantified and the effect of specific 
NO inhibitors and antioxidants will be evaluated in controlled studies. Laboratory assays will 
be done at the ICDDR,B and at the Albany Medical College, NY. It is hoped that this study 
will result in new information to be applied to diagnosis or assessment of severity of intestinal 
inflammatory diseases. So far, 50% of the experimental work has been completed.

**Helicobacter pylori infection and iron-deficiency anaemia in children**

PIs: S.A. Sarker, P. Hildebrand, and G.J. Fuchs
Funded by: National Institutes of Health (NIH), USA

Gastric acid is necessary for intestinal uptake of dietary iron. This combined community- and 
facility-based study assesses the role of *H. pylori* (Hp) infection as a cause of impaired iron 
absorption and iron-deficiency anaemia (IDA) through gastritis and reduced gastric acid 
output, and examine if it is a cause for failure of iron therapy among children with IDA. 
Current information is conflicting regarding impaired gastric acid secretion (GAS) with acute 
and chronic Hp infection. Twenty asymptomatic Hp-infected and 20 Hp-negative children (2-5 years) were studied. GAS was measured at baseline and 60 days after anti-Hp therapy 
(omeprazole, clarithromycin, and amoxicillin for two weeks). Basal acid output was one-tenth
of historical controls in both the groups although basal and stimulated acid outputs after pentagastrin stimulation were significantly lower in Hp-infected children compared to the age-matched Hp-negative group. In the Hp-positive children, successful therapy increased acid output to levels seen in Hp-negative children. These findings document an inhibition of acid secretion in Hp-infected children.

In the community-based component of the study, 325 children aged 2-5 years with IDA were assigned to one of five groups (65 in each)—four groups with infection and one group without Hp infection. Three hundred twenty-five children aged 2-5 years with IDA and with and without H. pylori are being enrolled in the study. Hp-infected children with IDA will be assigned to one of the four treatments: anti-Hp therapy alone, anti-Hp therapy plus iron supplementation, iron supplementation alone, or placebo. Children having no Hp infection but with IDA are being treated with iron supplementation only. Haemoglobin, serum ferritin, and transferrin receptor concentrations will be determined before the intervention and after one and three month(s) of starting treatment. In total, 219 children (150 infected and 60 non-infected) have been enrolled to date.

*Helicobacter pylori* infection-associated hypochlorhydria and iron-deficiency anaemia in Bangladeshi women in childbearing age
Pis: S.A. Sarker and G.J. Fuchs
Funded by: SDC/Nutrition Centre of Excellence (World Bank)

This community-based study is assessing the prevalence of low gastric acid secretion (hypochlorhydria) relating to *H. pylori* infection in women and its potential role in causation of iron-deficiency anaemia (IDA). One hundred Hp-infected women aged 18-45 years with IDA, were assigned to one of the four treatment groups (n=25 in each): anti-*H. pylori* therapy alone, anti-*H. pylori* therapy plus iron supplementation, iron supplementation alone, or placebo. A fifth group of *H. pylori*-infected women with hypochlorhydria (stimulated acid output <13 mmol/h) are treated with anti-Hp therapy. Haemoglobin, serum ferritin, and transferrin receptor concentrations are being determined before the intervention and after three months of starting treatment. Gastric acid output is quantified in the fifth group before and three months after intervention to evaluate the role of Hp in causing hypochlorhydria and IDA. Of the 100 women with Hp and IDA, 20 have so far been enrolled. Of the 25 women with Hp infection and hypochlorhydria (fifth group), eight have so far been enrolled.

**Release of toxins from Shigella dysenteriae type 1 in response to different antibiotics**

Pis: K.M.A. Jamil, M. Begum, W.A. Khan, F. Qadri, M.A. Salam, and G.J. Fuchs
Funded by: USAID

*Shigella dysenteriae* type 1 is associated with a severe form of dysentery leading to complications including haemolytic-uremic syndrome (HUS). *S. dysenteriae* type 1 causes extensive injury to the colonic mucosa and surrounding tissues through two types of toxins—various Shiga toxins and endotoxin—that are believed to act synergistically in the development
of HUS. Recently, it has been demonstrated that different antibiotics result in different quantities of endotoxin release from enterohaemorrhagic E. coli (EHEC) even if the same minimum inhibitory concentrations (MIC) of these agents were used. It is hypothesized that S. dysenteriae type 1 may also release different levels of endotoxin relating to the specific antibiotics used in treating this infection.

Endotoxin yields of five strains of S. dysenteriae type 1 have been tested so far in response to various antibiotics, using half-MIC concentrations of the respective antibiotics. At least 15 more clinical isolates will be tested soon.

Prevalence of ALRI and risk factors for ALRI mortality in children aged less than five years admitted to Dhaka hospital of ICDDR,B

Pls: S. Hossain, G.J. Fuchs, M. Rahman, A. Baqui, and A.M. Khan
Funded by: USAID

Of the 10,143 children aged less than five years admitted during April 1999-September 2000 to the Dhaka hospital of ICDDR,B, 2,406 (24%) were admitted for pneumonia documented by clinical signs and chest radiograph. Of the pneumonia cases, 664 (28%) were included in the ALRI surveillance study. 46 (6.9%) of whom died. In a case-control study, independent risk factors for death included chronic malnutrition (OR 8.7, 95% CI 1.2-54.1), history of convulsion before coming to hospital (OR 79, 95% CI 1-8 to 34), duration of cough between 3 and 5 days (OR 4.7, 95% CI 1.1-21.2), irregular wage earning by father (OR 3.5, 95% CI 1.3-9.6), severe anaemia Hct < 20% (OR 274, 95% CI 5-150), hypokalaemia <2.5 mmol/L (OR 3.6, 95% CI 1.3-10.3), and presence of H. influenzae in blood (OR 14.5, 95% CI 1.6-126.9). These findings may help identify children at increased risk of death who need more intensive or specific care and also provide direction for future studies to define causality and management of identified risk factors.

Clinical diagnosis of pneumonia in children with dehydrating diarrhoea

Pls: M.A. Salam, A. Ronan, W.A. Khan, D. Saha, and C.A. Kawser
Funded by: USAID

The objectives of this study are to validate the sensitivity and specificity of the WHO-algorithm in diagnosing pneumonia in children with dehydration, determine the best clinical predictors of pneumonia in children with dehydrating diarrhoea with cough and fever in 200 non-severely-malnourished children, and assess the role of pulse oximetry in diagnosing pneumonia in 100 severely-malnourished children with diarrhoea and cough on admission and 48 hours later. The combination of clinical signs, chest X-ray findings, and pulse oximetry that best predict pneumonia in these populations will be assessed. All of the 115 severely-malnourished children and 200 of the 230 better-nourished children have been enrolled in the study to date.

Identification of risk factors and definition of outcome of Shigella dysenteriae type 1-associated haemolytic-uraemic syndrome

Funded by: Government of Japan and USAID

The objectives of this case-control study are to identify clinical and laboratory risk factors and outcome of S. dysenteriae type 1-associated haemolytic-uraemic syndrome (HUS), including the role of antimicrobial therapy. Children aged six months to one year with S. dysenteriae type 1 infection and HUS, are the cases, and those with S. dysenteriae type 1 but who do not develop HUS are the controls. Children with HUS will be followed for one year. Of the total 125 children with dysentery initially screened, 64 had either S. dysenteriae type 1 or Shiga toxin gene (Stx) identified in their stools. Twenty-one of these children developed HUS, of whom 12 died, 8 improved, and one left hospital in poor general condition against medical advice. It is hoped that the results of this study will provide information that will lead to strategies to prevent development of HUS in children with shigellosis.
Controlled trial of zinc to prevent acute lower respiratory tract infection and diarrhoea in children aged less than two years

Pls: W.A. Brooks, A.S.G. Faruque, R.E. Black, M. Santosham, G.J. Fuchs, and M.A. Wahed
Funded by: SDC, CHR (USAID), and Johns Hopkins University (USAID)

This is a double-blind, placebo-controlled trial to determine the efficacy of 70 mg/wk of zinc vs placebo for one year to reduce pneumonia incidence in over 1,500 children aged less than two years. The crude incidences of pneumonia and acute watery diarrhoea were 2.3 episodes/child per year and 2.2 episodes/child per year respectively. Data analyses are in progress.

Efficacy of zinc in the treatment of severe pneumonia in hospitalized children

Funded by: Johns Hopkins University (USAID)

The aim of this double-blind, placebo-controlled trial is to determine the efficacy of 20 mg zinc in the treatment of pneumonia in hospitalized children aged less than two years. Duration and severity of illness are the main outcomes. Approximately, 75% of the 270 children have been enrolled to date. The results of this study may lead to a new strategy in the management of severe pneumonia.

Dengue surveillance among Dhaka urban slum residents: a prospective study to assess burden of disease and risk factors

Pls: W.A. Brooks, R. Breiman, A. Naheed, A. Hossain, M. Rahman, T. Azim, and D.A. Sack
Funded by: USAID

This surveillance was implemented as part of the Centre's response to the emergent dengue epidemic in Bangladesh that included hospital surveillance, serological and virological detection methods, vector surveillance, and community surveillance. The community surveillance will define the burden of dengue in an urban slum population and identify risk factors for dengue fever and dengue haemorrhagic fever (host, pathogen, and environment). Enumeration and mapping are nearing completion, and data collection is in progress. It is anticipated that this study will provide policy-makers and programme implementers all necessary information to define the magnitude of the problem and design improved vector control, case identification, and case-management strategies in Bangladesh.

Bibliography on community nutrition research in the South East Asian region 1995-2000

Editor: L. Ekstrom
Funded by: WHO/SEARO

In collaboration with the South-East Asia Regional Office (SEARO) of WHO, compilation of a bibliography of community nutrition research in the region has been initiated. The bibliography covers the period from 1995 to 2000 and will include nutrition research done in the SEARO countries (Bangladesh, Bhutan, India, Indonesia, Maldives, Nepal, Sri Lanka, and Thailand) participating in the existing nutrition research-cum-action network. The aim of the bibliography is to describe the progress and identify knowledge gaps of community-based nutrition research focusing on priority research areas identified in the World Declaration and Plan of Action for Nutrition. These include protein-energy malnutrition, adolescent nutrition, low birth-weight, and micronutrient deficiencies (iodine, vitamin A, and iron). Zinc deficiency as an emerging nutritional problem will also be included, as well as diet-related non-communicable diseases be.
PREVENTIVE/MATERNAL AND CHILD HEALTH RESEARCH

Promotion and support of exclusive breast-feeding and lactational amenorrhoea method (LAM) by peer counsellors in rural Bangladesh
Pis: I. Kabir, R. Haider, T. Faruque, and S. Banu
Funded by: SDC and World Bank

Previous studies have documented the efficacy of peer-counselling to improve rates of exclusive breast-feeding. This study assessed the effectiveness of a larger-scale project of peer-counsellors to achieve exclusive breast-feeding and LAM as a contraceptive method for mothers during the first five months postpartum. Three rural unions in Chittagong district were randomized to receive individual counselling at their houses, another cluster to receive counselling at a house in groups, and a third union served as the control without counselling. Local women from two unions were trained as peer-counsellors who provided support and counselling to pregnant mothers during the third trimester to practise exclusive breast-feeding. At the end of six months, the rates of exclusive breast-feeding were 88.5% and 80.6% in the individual and group counselling clusters compared to only 11.8% of mothers in the control group.

Efficacy of fish-oil supplementation to reduce low birth-weight
Pis: I. Kabir, R. Haider, S.M. Akramuzzaman, and G.J. Fuchs
Funded by: World Bank

Limited data from developed countries suggest a possible role of fish-oil rich in omega-3 fatty acid to improve birth-weight. The weight of an infant at birth is a powerful predictor of infant growth and survival. Bangladesh has the highest incidence of low birth-weight (LBW) in the world, with nearly 50% of all infants born with LBW. This randomized, double-blind study is evaluating the efficacy of fish-oil supplementation to pregnant women during their third trimester to increase birth-weight. Four hundred pregnant women of lower socioeconomic status during the 25th week of gestation were randomly assigned to receive 4 g fish-oil capsule or 4 g soybean oil daily for 90 days. Birth-weights were obtained within 48 hours of delivery. So far, 400 mothers have been enrolled, and birth-weights of 325 babies have been obtained. Seventy-five babies were not available due to migration of mothers, stillbirth, or refusal of mothers to continue with the study. Data analyses are going on. A follow-up study will also be implemented to assess growth and development of this cohort.

Single-dose vitamin A to prevent family-contact shigellosis in children
Pis: A.S.G. Faruque and G.J. Fuchs
Funded by: SDC

Shigellosis is associated with childhood malnutrition in developing countries, including Bangladesh. Infection is easily transmitted from one family member to another. In an earlier study, vitamin A was shown to improve clinical outcome of children with acute shigellosis. This randomized, double-blind, placebo-controlled trial aims at determining if a single large dose of vitamin A can reduce the secondary infection rates of shigellosis among family members who have been exposed to index cases of shigellosis. One hundred forty-seven children have so far been enrolled in the study.

Health systems approach to management of severe malnutrition
Funded by: Nutrition Centre of Excellence (World Bank)

In this study, a model has been developed to address malnutrition in urban children by integrating child nutrition services with child health and other essential services package (ESP) interventions. The study uses an existing urban primary healthcare infrastructure to establish and test a replicable system for active identification and appropriate referral and management of severely-malnourished children from among urban low-income and slum
populations. Components of the model are: (1) for severely-malnourished children who do not require hospitalization provision of protocolized community-based management consisting of outpatient medical care for infectious diseases and monitored home-based care and feeding, (2) establishment of a two-way referral system for severely-malnourished children requiring acute-phase care and/or supervised feeding in hospital (Dhaka Shishu Hospital) or at a daycare facility (Radda MCH-FP Centre), and (3) prevention of child malnutrition by using the existing urban primary-care static clinics and satellite clinics (Urban Family Health Partnership/PSKP) for the provision of monthly growth monitoring and promotion, including breast-feeding promotion and nutrition education.

Nutrition services at a pilot intervention clinic in Mirpur became fully operational in June 2000. Staff training for personnel of two additional clinics was conducted in November 2000. A record-keeping system and monitoring procedures for the protocol were developed and were being refined in consultation with clinic personnel, based on implementation experiences. A welfare fund, covering fares to clinic visits and drugs for curative care of children's infectious diseases, was also established as a safety net for the poorest, keeping the UFHP-fee for services policies intact. Initial data from the pilot intervention clinic indicated satisfactory weight gains in two-thirds of the severely-malnourished children enrolled for standardized management. Causes for the absence of satisfactory weight gains among the children were being investigated, but are likely to require provision of a ready-to-eat supplement. Partners with the ICDDR,B on this project include: Urban Family Health Partnership (UFHP), a John Snow Inc. project under the GoB/USAID National Integrated Population and Health Programme (NIPHP); Profoti Samaj Kallyan Protisthan (PSKP); Dhaka Shishu Hospital; and Radda MCH-FP Centre, Mirpur.

Operations research component of the Bangladesh Integrated Nutrition Project
Programme Director: G.J. Fuchs
Funded by: Government of Bangladesh

Fourteen research projects were conducted under the Bangladesh Integrated Nutrition Project-Operations Research Project (BINP-ORP) by scientists from eight different national and international research organizations, NGOs, and the ICDDR,B. By the end of 2000, all projects had completed data collection, and the results had been disseminated to the Research Advisory Committee of the BINP through five dissemination reports. These reports compiled the findings of several BINP operations-research projects and presented overall conclusions and recommendations for the programme. The reports were disseminated widely among various academic, programmatic, and policy-making institutions. Five dissemination workshops were held at the ICDDR,B from December 1999 to October 2000. The Centre is currently assisting the BINP in implementation of the findings.

Two additional proposals have been approved and will be implemented by investigators from the ICDDR,B, and two requests for proposals were disseminated for the remaining two studies to be conducted with the remaining BINP-ORP funds. These proposals address recent research questions as identified by the BINP and its successor—the National Nutrition Programme (NNP): reduction of malnutrition; implementation of nutrition activities in the urban areas; evaluation of the home-gardening and poultry programme within BINP; and an evaluation of the arsenic problem in the BINP areas. Two proposals on "Feasible means to address moderately-malnourished children with BINP communities" and "community-based management of severe malnutrition in the urban areas" will be conducted by the ICDDR,B.

Clinical Research and Service Centre
Chief Physician: M.A. Salam

In total, 107,474 patient-visits took place in 2000. This was 8.4% lower than that in 1999. Of the total patients, 59,605 (55.5%) were admitted to the Short Stay Ward (SSW), 67% of whom were discharged within 24 hours. Another 7,321 (12.3%) patients required admission to the longer stay General Ward (GW) and Special Care Unit (SCU). Six hundred twenty-seven patients were admitted to either the Clinical Study Ward (CSW) or Metabolic Study.
Ward (MSW) under 16 different research protocols conducted by the CSD alone or jointly with the Laboratory Sciences Division. Of the total 7,321 patients admitted in the GW and SCU, 306 (4.2%) died despite all possible efforts. A total of 20 (0.03%) patients admitted in the SSW died, while another 22 patients were dead upon arrival at the CRSC. Thus, the total mortality rate in the hospital in 2000 was 0.3%, which was the same as in 1999.

Nursing Programme
Nurse Manager: Mohammad Ullah

Fifty-two nursing personnel provided nursing care to patients and participated in clinical research studies. Fifteen nurse fellows significantly contributed to the patient-care activities of the CRSC, in addition to learning through didactic lectures and hands-on training on nursing management of diarrhoeal diseases, malnutrition, and associated problems. Nursing officers, in addition to their assigned job of supervision of the nursing staff, facilitated practical sessions of international and national courses on case management of diarrhoeal diseases and severe malnutrition organized by the Training and Education Department of the Centre.

Child Health Programme (CSD component)
Coordinator: Tahmeed Ahmed
Funded by: Nutrition Centre of Excellence (World Bank) and John Snow Inc., USA

This programme provides preventive health-service delivery of the CRSC with medical doctors, paramedics, and health workers. In addition to operation of the NRU, it maintains an outpatient nutritional follow-up unit, an immunization unit, and health education and reproductive health planning and counselling services. Most children and their accompanying mothers attending the CRSC had not received any prior preventive health services. Based on concept of missed opportunities, the CHP has been providing these services since 1988. Training of healthcare providers and operations research in these areas are additional activities of the programme.

During the year, 345 very severely-malnourished children were treated at the NRU, where a standardized feeding protocol has been successfully developed and tested, using inexpensive, locally-available diets. In total, 1,983 severely-malnourished children were treated at the nutrition follow-up unit, and 19,402 focus-group discussions on prevention and home management of diarrhoea, prevention of malnutrition using appropriate complementary diets, immunizations, and water and sanitation were conducted with mothers and female caregivers of children. These covered an estimated 107,459 individuals. Immunization against six vaccine-preventable diseases was provided to 5,147 (100% of the eligible) children, making the CRSC the largest fixed-site immunization centre in Bangladesh. Additionally, tetanus toxoid was administered to 4,432 women of childbearing age. Vitamin A capsules were given to all children who did not receive the vitamin during the previous six months. The programme provided family-planning services to 611 parents of children attending the hospital.

Ongoing research focuses on home management of severe malnutrition; validating standard and testing of new strategies of case management of severe malnutrition, including the efficacy of metronidazole in improving nutritional rehabilitation and magnesium for ileus; and diagnosis and treatment of TB in severely-malnourished children. The success of the CHP as a model for dissemination of knowledge and practice of healthcare in the community has made its activities a part of the training courses for national and international participants. The recently-concluded Workshop on the WHO Protocol for the Management of Severe Malnutrition is an example.

Franchising Hospital Services of ICDDR,B
Coordinators: S. Hossain, H. Ashraf, M.A. Salam, and G.J. Fuchs

The Dhaka hospital of ICDDR,B, established in 1962, supports research activities, provides
excellent care to patients 24 hours per day. The hospital currently provides care for more than 100,000 patients each year. 40-50% of the patients have uncomplicated, mild diarrhoea that could be managed either in their homes or at a primary healthcare clinic. A collaboration with the John Snow Inc. (JSI) was implemented in March 2000 to franchise the hospital services of ICDDR,B by Progoti Samaj Kallyan Protisthan (PSKP), a JSI-supported NGO under the Urban Family Health Partnership (UFHP). Expected outcomes of this initiative include reduced patient load and financial pressure on the Centre's Dhaka hospital, improved healthcare delivery (decentralization, improved case management of diarrhoeal disease and malnutrition within a package of comprehensive healthcare services), and a new infrastructure for ICDDR,B for operations research and surveillance. A registration fee of Tk 10.00 per patient per visit for services was also introduced at the ICDDR,B hospital. By 31 December, the PSKP staff successfully treated 31,693 (38%) of the total patients who attended the ICDDR,B hospital during that period.

Physiology Laboratory
Head: G.H. Rabbani

The Physiology Laboratory, established in 1995, is equipped for clinical and animal experimentation and provides opportunities to the CSD and LSD scientists to conduct pathophysiologic studies on intestinal and metabolic disorders in selected fields with direct relevance to clinical research. Seven scientific investigators, including doctoral students and trainees, conducted research in the following areas:

- Intestinal infection in animal models of shigellosis and malnutrition
- Studies on intestinal ion transport involving Ussing chamber and perfusion techniques
- Evaluation of nitric oxide and oxidative stress in intestinal infections
- Evaluation of antidiarrhoeal agents in experimental cholera (plant polyphenols) and shigellosis (L-histidine)
- Role of trace elements (copper) in the pathogenesis of experimental diarrhoea
- Studies on body composition using bioelectric impedance analysis technique

Research collaboration has been continuing with the Albany Medical College, NY, Pasteur Inst, Paris, University of Dhaka, INSERM, Paris, McGill University, Canada, University of Alabama, Chiba University, Japan, Tokushima University, Japan, and the University of Texas at Galveston.

The current donors for the laboratory studies are: USAID, Cytos Pharmaceuticals, USA, CATO Research, USA, Government of France, Government of Bangladesh, and Tomen Corporation, Japan.
Nutrition Centre of Excellence
Programme Head: G.J. Fuchs
Funded by: World Bank

The Nutrition Centre of Excellence (NCOE) was established in 1998 as a Centrewide, cross-divisional activity and is housed in the CSD. The NCOE continued to strengthen the Centre's activities during 2000 in nutrition research and enabled the Centre to expand its existing nutrition agenda. Twelve scientific projects were awarded funds through an internal competition by the NCOE partners through funds earmarked for research. Other initiatives enhanced by the NCOE included: work conducted under BINP-ORP; standardized management of severely malnourished children in a hospital setting; maintenance of the NRU and Nutrition Follow-up Clinic of the Dhaka hospital of ICDDR,B; and development of a training programme on the treatment of severely-malnourished children in hospital setting. The Nutritional Biochemistry section added or upgraded existing equipment and facilities with NCOE support. The proceedings of the International Symposium and Workshop on Low Birth Weight hosted by the ICDDR,B, convening a group of international experts and co-sponsored by ICDDR,B (NCOE), UNICEF, CHR Project of USAID, and the BINP were published as a monograph in 2000.

Hospital Surveillance Programme

Diarrhoeal Disease and Enteric Infection Surveillance
Pls: G.J. Fuchs and A.S.G. Faruque
Funded by: USAID

Each year, thousands of patients attend the CRSC, Dhaka and Matlab hospitals for treatment of diarrhoeal illness and associated problems. The objective of the Hospital Surveillance Programme is to collect information on clinical, epidemiological, and demographic characteristics of patients attending these facilities. The Programme provides key information to the Government for development of health policies; enables the Centre to monitor the emergence of new enteric pathogens and changes in the population and disease patterns and drug-sensitivity. It provides a database for conducting epidemiological studies, assists in the identification and development of new research areas, and helps in defining improved patient care strategies as well as in introducing preventive programmes.

A systematic 2% subsample of patients attending the CRSC, Dhaka, is enrolled in this surveillance, while all patients attending the Matlab hospital is included. Trained personnel interview the patients and/or their attendants to obtain information on patients' socioeconomic 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. Extensive microbiological assessments of faecal samples (microscopy, culture, and ELISA) of patients are performed to identify diarrhoeal pathogens and to determine antimicrobial susceptibility of bacterial pathogens. The figure presents the diarrhoeal pathogens isolated in 2000.

Not shown in the figure are the results of the testing for enterotoxigenic E. coli since results of these assays are delayed in being reported. During 1999, however, among 2,300 patients in the sample, there were a total of 278 (12%) ETEC patients identified. These cases occurred primarily during the months of April and May.

Acute Lower Respiratory Infection Surveillance
Pls: S. Hossain and G.J. Fuchs
Funded by: USAID

The Dhaka hospital of ICDDR,B receives more than 100,000 patients a year for treatment of diarrhoea, malnutrition, and associated problems. About 70% of the patients are children aged less than five years. Using clinical definition, acute lower respiratory tract infection (ALRI) appears to be common among children with diarrhoea in this hospital. The ICDDR,B
Estimated number of patients according to aetiologic agents detected by ICDDR,B Surveillance Programme, Dhaka, 2000

recently established a surveillance system that collects information on socioeconomic and nutritional status, clinical features, microbiology, and the outcomes of children with ALRI as well as patterns of resistance of S. pneumoniae (Spn) and H. influenzae (Hib) to commonly-used antibiotics. The surveillance enrolls children with ARI aged less than five years admitted to the hospital during 9.00 a.m. - 4.00 p.m. A dedicated research team collects selected information using a comprehensive questionnaire, and a research physician records symptoms and physical and clinical findings on arrival. Blood specimens are sent to the ARI laboratory of ICDDR,B for culture and other tests; stool samples are sent for culture.

The prevalence and antimicrobial resistance patterns of Hib and Spn among children aged less than five years hospitalized with meningitis and/or pneumonia were investigated (Table). During 2000, 33 (3.5%) Spn and 49 (6%) Hib were isolated from 937 samples (blood 813; CSF 124); the predominant age group was 2-12 months. Rates of resistance of Hib isolates to ampicillin were high, and most Spn and Hib isolates were resistant to TMP-SMX.

Other Developments in 2000

Child Development Group

Psychomotor development in children is highly responsive to the in utero and external environment. The cost of nutritional and other insults to cognitive and psychomotor development in children resulting in poorer school performance, reduced individual productivity, and ultimately compromised productivity and development at the national level is estimated to be enormous. Cognitive and psychomotor development in children is, therefore, an important outcome of nutritional and other interventions and is essential to ensure that a child reaches his/her maximum potential. The CSD has created a Child Development Group consisting of three scientists at its core. Psychologists and other health researchers are also part of the group. Linkages with the Institute of Child Health (ICH), London University and the Institute of Food Sciences, Dhaka University, played key roles in the development of the Group. Studies to date on psychomotor development in infants and children related to micronutrient supplementation, rehabilitation of malnourished children, and low birth-weight. These studies have also established collaboration with the ICH and the Johns Hopkins University.
Table. Antimicrobial resistance patterns of S. pneumoniae and H. influenzae (blood and CSF isolates)

<table>
<thead>
<tr>
<th></th>
<th>Amp</th>
<th>Chloro</th>
<th>TMP-SMX</th>
<th>Ctx</th>
<th>PCN</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CSF</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S. pneumoniae (n=20)</td>
<td>ND</td>
<td>35%</td>
<td>55%</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>H. influenzae type b (n=14)</td>
<td>50%</td>
<td>36%</td>
<td>54%</td>
<td>0</td>
<td>ND</td>
</tr>
<tr>
<td>H. influenzae (other spp.) (n=15)</td>
<td>40%</td>
<td>40%</td>
<td>73%</td>
<td>0</td>
<td>ND</td>
</tr>
<tr>
<td><strong>Blood</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S. pneumoniae (n=26)</td>
<td>ND</td>
<td>19%</td>
<td>73%</td>
<td>0</td>
<td>8%</td>
</tr>
<tr>
<td>H. influenzae type b (n=11)</td>
<td>64%</td>
<td>45%</td>
<td>91%</td>
<td>0</td>
<td>ND</td>
</tr>
<tr>
<td>H. influenzae (other spp.) (n=28)</td>
<td>32%</td>
<td>43%</td>
<td>61%</td>
<td>0</td>
<td>ND</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S. pneumoniae (n=46)</td>
<td>ND</td>
<td>17%</td>
<td>65%</td>
<td>0</td>
<td>4%</td>
</tr>
<tr>
<td>H. influenzae type b (n=25)</td>
<td>56%</td>
<td>46%</td>
<td>80%</td>
<td>0</td>
<td>ND</td>
</tr>
<tr>
<td>H. influenzae (other spp.) (n=43)</td>
<td>35%</td>
<td>42%</td>
<td>65%</td>
<td>0</td>
<td>ND</td>
</tr>
</tbody>
</table>

AMP=Ampicillin, Chloro=Chloramphenicol, TMP-SMX=Trimethoprim-sulphamethoxazole, Ctx=Ceftriaxone, PCN=Penicillin, ND=Not done

**Drug Trials Group**

Evaluation of pharmacological agents (antibiotics, antidiarrhoeal agents, vaccines, etc.) is a major activity of the CSD, and there is a growing number of experienced scientists undertaking such work in the Division. With globally-recognized and stringent requirements known as the GCP (Good Clinical Practice) of licensing authorities for approval of pharmaceutical products, it is essential that these studies done at the ICDDR,B meet this set of international standards. The standardization of certain personnel and procedures and centralized management of certain key support staff will also facilitate performance of studies according to GCP guidelines. The CSD recently formed a Drug Trial Group (DTG), with Dr. Wasif Khan as the coordinator, and with input by a DTG Committee formed by members from the CSD and LSD who use the Study Ward facilities of the CSD. The DTG will have a facilitating role in the implementation of studies as well as institute and monitor quality-assurance measures. It is expected that the DTG will strengthen clinical trials for evaluation of pharmacological agents and will increase industry support for such trials.
Health and Population Extension Division

Director

Associate Director

Operations Research Project

Integrated Family Health Services Team

Field Support and Surveillance Team

Management Support Systems and Innovative Programmes Team

Administrative Support and Dissemination Team

Sustainable Service Delivery Systems and Health Financing Team
Health and Population Extension Division

The mandate of the Health and Population Extension Division (HPED) is to enhance the efficiency, effectiveness, cost-effectiveness, and sustainability of the national health and population programme through operations research. The activities of the Division focus on the design and replication of simple, appropriate and accessible strategies and technologies, making optimal use of the available resources.

The Division conducts operations research on health and family-planning systems; evaluates ongoing health and family-planning programmes and provides assistance in improving their performance and effectiveness; and disseminates research findings, nationally and internationally, through seminars, conferences, and publications. The Division also facilitates translation of research findings into policy and actions by replicating the successful interventions field-tested in the Division's research sites and through advocacy for the necessary policy and programmatic changes; and provides technical assistance to the related government agencies and NGOs in the application and replication of the successful health and population interventions.

Division Highlights

- The Division continued to provide research support and technical assistance to the Ministry of Health and Family Welfare (MoHFW), Government of Bangladesh (GOB), in operationalizing the Essential Services Package (ESP) delivery systems, including the Community Clinics and Unified Management Information System (UMIS).

- The Division designed and initiated field-testing of strategies within the government and NGO programmes to improve reproductive health services for adolescents. A special strategy for adolescents working in garment factories is being tested as well. The ORP is also participating with the Population Council and the Urban Family Health Partnership (UFHP), in the Global Youth Study being conducted in Bangladesh, Senegal, Kenya, and Mexico.

- One of the field areas under surveillance (Abhaynagar) has reached fertility rates that are nearing replacement levels.


- Research findings have been published in 16 peer-reviewed articles, 12 working papers, one special publication, and two technical reports. Also, 64 presentations were made at the national and international meetings. A special publication provides the demographic data for the field areas under surveillance.

- A new method for examining the combined benefits of family-planning and child-survival programmes was developed. The new method shows that an integrated programme is more effective than either programme alone and provides a model for estimating this combined benefit.

- Dr. Cees Tuncer and Dr. Subrata Routh played an important role in organizing the Centre's 9th Annual Scientific Conference (ASCON) on 'Health Systems Research: Meeting the Needs of Populations in Transition' as Convener of the Conference and Member of the Scientific Committee respectively.
The scientific activities of the Division, thus, entail a multidisciplinary field of inquiry on the related research issues addressed through both quantitative and qualitative methods.

By the end of 2000, the Division had a staff of 243 personnel (2 international, 42 national, and 199 general services and field-level staff).

The Division had been undergoing some major reorganization during the year. The scientific review of the Board of Trustees (November 1998) suggested a change in the name of the Division to better reflect the mission. Another change was the move of the Epidemic Control Preparedness Programme (ECPP) away from the Division to the Public Health Sciences Division (PHSD) in view of the need to encourage closer collaboration with the epidemiologists in the PHSD.

Head of the Division Prof. Barkat-e-Khuda was transferred to be the Associate Director, Policy and Planning, and Prof. David A. Sack, Director of the Centre, assumed the responsibilities as Acting Associate Director since July 2000. An external review of the Division's key programme, namely the Operations Research Project (ORP) in August 2000, considered ways to redirect ORP funds toward research activities conducted in other scientific divisions of the Centre. The reorganization is expected to be completed during 2001.

Operations Research Project
Chief of Party: Prof. Barkat-e-Khuda (till 30 June); Prof. David A. Sack (interim)
Funded by: USAID

The ORP, which started in July 1997 as a follow-on project to the former MCH-FP Extension Projects (Urban and Rural), represents the Centre in its principal contribution to a broad partnership, involving the MoHFW of GoB and other service-delivery organizations under the USAID-funded National Integrated Population and Health Programme (NIPHP).

The focus of the ORP reflects the Centre's emphasis on finding solutions to problems in reproductive health and child survival and on promoting the wider availability and use of services included in the nationally-adopted ESP. The key indicators of the project effectiveness directly relate to programmatic and policy improvements in the health and population sector. These include the number of operations-research studies conducted to support the service-delivery activities of the GoB and the NIPHP partners, and the application of research findings for the required programmatic and policy changes. Within these contexts, the ORP designs and field-tests interventions jointly with the government agencies and NGOs in both rural and urban areas.

The Project maintains four fieldsites located in Abhoynagar upazila (subdistrict) of Jessore district, Mirsarai and Patiya upazilas of Chittagong district, and in Dhaka city. In addition, the ORP conducted research and technical assistance activities during 2000 in 34 upazilas of 17 districts and in three city corporations of the country.

The Project has been organized into three scientific teams, covering the areas of Integrated Family-health Services; Management Support Systems and Innovative Programmes; and Sustainable Service-delivery Systems and Health Financing. A Field Support and Surveillance Team and an Administrative and Dissemination Team assist the scientific teams in implementing the operations-research protocols.
Research Highlights

In 2000, the ORP had continued to offer its research support to the efforts of the GoB to implement the Health and Population Sector Programme (HPSP) and thereby delivery of the ESP. In addition, research support was provided to the USAID-funded NGOs to strengthen the provision of high-impact ESP elements further. The major research activities pursued by the ORP scientists included the following:

1. Operationalizing a cost-effective tiered system for delivering the ESP in the rural and urban areas
2. Strengthening management support systems for effective delivery of the ESP
3. Improving prevention and management of reproductive tract infections and sexually transmitted diseases
4. Testing modified strategies for ensuring referral and linkage for essential obstetric care
5. Improving the quality of performance of the clinical contraceptive services
6. Improving reproductive health services for adolescents
7. Cost-recovery of ESP delivery through systematic pricing and revenue management

The ORP scientists continued to participate in a number of national policy advisory bodies. These are: (a) National Technical Committee on Cost-recovery and Financial Sustainability in the Health and Population Sector, (b) National Essential Obstetric Care Core Group, (c) National Committee for Development of an Integrated Behaviour Change Communication Programme.
Strategy, (d) National Unified MIS Implementation Task Force, (e) Technical Group on Adaptation of National Guidelines for IMCI, and (f) Task Force on ESP Training Curriculum Development. The Project extended substantial assistance in organizing the 8th International Workshop on Improving Effectiveness, Quality of Services and Sustainability in Reproductive Health Programmes through Operations Research held at the Centre on 4-15 December.

Scientists of the Project actively participated in the development of training curricula on ESP delivery for the clinical and non-clinical service providers of GoB and facilitated the Training of Trainers (TOT) workshops. Also, technical support was offered to the government project on Local-level Planning (LLP) and Social Marketing Company's pilot-marketing scheme on the provision of injectable contraceptives by private practitioners.

Integrated Family Health Services Team
Team Leader: M.A. Quaiyum

Improving reproductive health services for adolescents
Research Team: Q. Nahar, M.A. Quaiyum, N.L. Huq, and F. Haseen
Funded by: USAID

Based on the findings of the needs assessment study conducted in 1999, the ORP has been testing different strategies to improve reproductive health services for adolescents. These strategies are being tested in Abhayangar, Mirasrai, Dhaka and Jahanpur (Naogaon) fieldsites in collaboration with the MoHFW of GoB, Urban Family Health Partnership (UFHP), Concerned Women for Family Development (CWFD), and Bangladesh Centre for Communication Programs (BCCP).

As part of the intervention activities, the ORP has developed a database on frequently-asked questions (FAQ) on issues relating to reproductive and sexual health of adolescents. The purpose of creating the FAQ document is to establish a database which would enable service-delivery organizations to develop materials for their own programmes. The database was developed through focus-group discussions, in-depth interviews, and analysis of secondary data. The responses to these questions were developed based on information available in the literature and through consultations with 20 national experts, including educators, psychologists, religious leaders, social workers, programme managers from the government agencies, NGOs, and distinguished academic institutions. Validation of the responses was also done with a group of rural and urban adolescents.

Using information from the database, 'easy-to-read' information material on reproductive health is being developed. The main focus of the intervention is to assess the feasibility of distribution of these materials through schools, community, and workplaces to improve reproductive health knowledge, attitude and behaviour of adolescents. The ORP has also been testing the effects of a strategy of comprehensive adolescent development programme compared to a reproductive-health-only programme. This deemed necessary to improve the reproductive health status of adolescents. For adolescents working at the garment factories, a peer-educator strategy is being tested.

The ORP has also been participating, with the Population Council and the UFHP, in the Global Youth Study. The countries where this study is being done are: Bangladesh, Senegal, Kenya, and Mexico.

Strategies for improving quality and performance of clinical contraceptive services
Research Team: A.I. Khan, A. Islam, S. Khan, and S. Rahman
Funded by: USAID

The intervention strategies are aimed at reducing barriers to clinical methods, reducing contraceptives discontinuation, and strengthening referral and linkages. The intervention is taking place at both GoB and Rural Service Delivery Partnership (RSDP) sites. Baseline
surveys at both the sites have been completed and reports published. The baseline findings revealed that misconceptions regarding the disadvantages of clinical methods, particularly male sterilization, IUD, and injectables, are high among women and their husbands. Social and religious barriers to clinical contraception are also widely persistent. Use of contraception was higher in the GoB areas than in the RSDP areas. A wide gap was found between husband’s and wife’s reporting of contraceptive use.

As part of the intervention, different behaviour change communication (BCC) materials (posters, job-aids) were developed and introduced at the fieldsites with the aim of reducing misconceptions about clinical contraceptives. Various organized groups and formal/informal social leaders have been oriented on clinical contraception for promotion of clinical methods and strengthening of the referral system. Village medical practitioners also have been oriented on related BCC materials.

In Mirsarai, Norplant implantation has surprisingly increased from 5 cases in January to 200 cases on an average per month since June 2000. The Norplant recipients are being followed up to trace any dissatisfaction or side-effects.

**Strategies to improve prevention and management of reproductive tract infections and sexually transmitted infections**


Funded by: USAID

Prevention and management of reproductive tract infections (RTIs) and sexually transmitted infections (STIs) is one of the important reproductive health components of both HPSP and NIPHP. The study is assessing two approaches: syndromic approach in the management of RTIs/STIs and screening of pregnant women for syphilis as part of antenatal care at the primary healthcare (PHC) level. Within the syndromic approach, the study is assessing the operational feasibility of the syndromic management recommended in the technical standard and service-delivery protocol developed by the RTI/STI and HIV/AIDS Task Force of NIPHP and validation of the modified flow-charts on vaginal discharge. The study is being done in the government and non-government clinics in urban and rural areas in collaboration with the GoB, UFHP, RSDP, and the Centre’s Laboratory Sciences Division (LSD). The intervention clinics are: Sher-e-Bangla Nagar Government Outdoor Dispensary (Model ESP Clinic), Progoti.
Samaj Kallyan Protishan (PSKP)-affiliated Paribarik Shasthya Clinic at Mirpur, Badda, Tejgaon, Manikdi; and Concerned Women for Family Development (CWFD)-affiliated Paribarik Shasthya Clinic at Lalbagh and Rayer Bazaar in Dhaka city. Assessment of operational feasibility of the syndromic approach has been completed. The findings indicate that health facilities at the PHC level do have the required logistic and technical skills to implement syndromic management. The approach has been well-accepted by the paramedics. However, there is a trend of over-diagnosis of cervicitis, but this trend could be minimized through periodic monitoring, need-based refresher training, and further modification of the approach.

Within the other approach—antenatal screening for syphilis—787 of 1,118 blood samples have been tested. Of these, 14 samples were positive for both rapid plasma reagin (RPR) and Treponema pallidum haemagglutination assay (TPHA)

Modified strategy for ensuring referral and linkage for essential obstetric care
Funded by: USAID

Within the intervention activities, village practitioners and traditional birth attendants (TBAs) were included in the referral mechanism along with the GoB service providers. In addition, various formal and informal community leaders were involved in awareness-raising activities for the use of essential obstetric care. A pictorial card, containing the signs of obstetric complications, is being used as a tool for raising community awareness, which has also been adopted by the GoB for nationwide implementation. The intervention activities have been extended to an RSDP working area in Chandina upazila since April 2000.

The baseline report on the GoB sites has been published and that of RSDP working area is in press. The findings from the RSDP baseline showed that nearly three-fourths of both women and their husbands had knowledge about prolonged labour as a complication of childbirth. Two-fifths of the women knew about malpresentation, and 30% of the husbands knew about it. Knowledge of severe bleeding during postpartum period was higher among husbands compared to their wives. However, knowledge on bleeding during pregnancy and/or after delivery, premature rupture of membrane, convulsion, retained placenta, and postpartum infection was poor both among women and their husbands (Figure).

Knowledge of women and husbands about complications relating to pregnancy, delivery, and after delivery

With regard to antenatal care (ANC), 58% of the women reported to have received such care from trained service providers, like paramedics, nurses, MBBS doctors, and/or institutional facilities. Slightly higher than 27% of them made three or more ANC visits.

The findings also showed that 14% of all deliveries were attended by trained service providers. Both women and their husbands had knowledge about the existence of Upazila Health Complex (UHC) and availability of services, but a very small percentage of women used the facility for management of complications.

In the GoB areas, maternal admission to the UHC for management of obstetric complications increased. The number of deliveries attended by trained personnel also registered an increase.

Maternity admission at the UHC has almost doubled since the involvement of village practitioners and TBAs in the referral process and the involvement of formal and informal leaders in the awareness-raising activities within the community.
It may, therefore, be concluded that both in the GoB and RSDP areas, women's and their husbands' knowledge on symptoms of obstetric complications needs to be improved further. Use of emergency obstetric care services is likely to increase if the women and the family members have adequate knowledge on the signs of complications when medical attention is required.

**Management Support Systems and Innovative Programmes Team**

Team Leader: Cris Tunon (till November 2000); Ali Ashraf (since December 2000)

**Strengthening management support systems for effective delivery of ESP**

Research Team: C. Tunon, J. Uddin, N. Uddin, Barkat-e-Khuda, and A. Ashraf

Funded by: USAID

The operations research activities are primarily focused on offering technical support to the National Task Force for Implementation of the Unified Management Information System (UMIS) in finalizing the design of the new UMIS and in its nationwide implementation and monitoring. Accordingly, monitoring of the UMIS implementation is ongoing since February 2000 in all the upazilas of Jessore and Chittagong districts. Also, a GoB-ORP joint team visited selected upazilas under other administrative divisions of the country to assess the status of implementation of the new UMIS and performance monitoring at the field levels. Meetings to review the UMIS-related issues and identify future activities to be pursued were held with the upazila health managers and staff on a monthly basis, the district managers on a quarterly basis, and the national-level officials once every four months. Two workshops—one in Chittagong and another in Jessore—were organized involving upazila-, district-, and national-level officials to review the implementation status of UMIS. It has been found that the new UMIS has helped family planning and health staff in working jointly. However, collection and updating of information on disease profiles were not done in all observed upazilas during the Geographic Reconnaissance (GR) 2000 because of time constraints. A methodology for rapid GR was needed. The UMIS field-testing also indicated the necessity of the following: checklist for improvement of supervision, a workplan for improvement of performance, a regular review mechanism, and a separate section to address the Logistics Management Information System (LMIS) issues.

A strategy for the use of UMIS data to strengthen programme performance at the local level was designed and field-testing initiated. In addition, new interventions to reduce missed opportunities at the service-delivery facilities with appropriate use of information from the Family Health Cards, improve the effect of targeted home visits on service use, and reduce drop-outs have been planned. Also, MIS of the rural and urban service-delivery partners of NIPHP was reviewed and suggestions made on their further improvements.
Met and unmet health needs in UFHP clinic areas
Funded by: USAID

A study on the met and unmet health needs of the catchment population in six urban areas served by the UFHP clinics was completed. It has been found that more than 80% of the clients visited the UFHP clinics with single complaint and 17% with multiple complaints. Over 60% of the clients in the areas received their last services from the UFHP clinics, and 15% from the government and other outlets. Almost a fifth of the households did not receive any service at all. In all, 21% of the clients had unmet need for RTI/STI services.

Trafficking of women and children
Funded by: USAID

To help understand the nature of trafficking of women and children and undertake appropriate interventions to combat the problem, an overview of the trafficking of women and children in Bangladesh has been completed. Gender discrimination, poverty, unemployment, cultural norms about marriage, social attitude toward women, well-organized national and international networks of the traffickers, and the weak law-enforcing systems are all critical factors relating to the trafficking of women and children in Bangladesh. There is a further need to pursue more studies to identify the trafficking antecedents, and properly assess the social, economic, political and health implications of trafficking. It is also critical to identify and understand the current and prospective role of the GoB and NGOs in combating the problem.

Sustainable Service Delivery Systems and Health Financing Team
Team Leader: Subrata Routh

Operationalization of ESP delivery and Community Clinics
Funded by: USAID

As part of the ongoing operations research, the ORP facilitated and documented the site selection process for 116 Community Clinics (CCs) in 46 unions of the three ORP fieldsites. Research findings on the orientation of stakeholders on HPSP/ESP and site selection of CCs were disseminated to policy-makers and programme managers through workshops and publications. Operational guidelines on the management of CCs by community groups have been finalized, based on a series of focus-group discussions with the stakeholders. ESP delivery from CCs has been initiated at Abhoynagar and Mirsarai. A study of the behaviour change communication (BCC) needs for promotion of CCs in rural areas has been completed and the report published. A draft report on the transition plan from the doorstep service-delivery strategy to the CC-based ESP delivery has been completed, based on workshops with the stakeholders.

A qualitative study of the healthcare-seeking behaviour and BCC needs of the urban poor has been completed and the findings published. A report of the baseline survey of ESP coverage in the urban intervention area has also been completed and published. ESP delivery in the Sher-e-Bangla Nagar Model ESP Clinic has been strengthened with the introduction of counselling and health education, service-delivery job-aids and training of service providers, algorithm-based screening of clients for addressing the missed opportunities, syndromic management of RTIs/STIs and antenatal screening for syphilis, and appropriate supervisory mechanisms.
The findings from the above research activities suggest that proper orientation of the stakeholders (local managers, service providers, supervisors, and community leaders) on HPSP/ESP and CCs contributes to their better understanding about the new programme and their active participation in the process of establishing CCs. A well-defined manual on the operational guidelines for management of the CCs by the community is necessary for smooth operation of the CCs with community support.

Development of an integrated BCC programme with interpersonal communication, print, demonstration and BCC media, as well as advocacy workshops, is essential for effective operationalization of the CCs. The plan for transition from the doorstep to CC-based service-delivery should be done locally, with involvement of the stakeholders, and be done gradually in a phased-in manner over a period of six months to one year, depending on the local sociocultural, geographic and programmatic factors.

There are notable differentiations among the slum/non-slum populations in terms of use and effects of ESP within Dhaka city: Fertility rate for the slum area is 4.8 and for the non-slum area 2.1; CPR 46% vs 61%; and EPI coverage 57% vs 84%. The Sher-e-Bangla Nagar Model ESP Clinic is well-known in the community but is considered a women's clinic providing basically EPI and FP services, which implies the necessity for proper BCC activities. Client attendance at the Sher-e-Bangla Nagar Model ESP Clinic increased from 6,000 in October-December 1999 to 7,050 in June-September 2000. Clients tapped for missed opportunities ranged between 20% and 45% of the detected cases.

The GoB guidelines on the establishment of CCs have been modified, based on the key findings of the ORP research on site selection of CCs. The operational manual developed by the ORP in collaboration with the government has laid out in detail the modalities of community involvement in organization and management of the CCs. This manual has been incorporated into the GoB guidelines on operation, management, and functioning of the CCs. Lessons learnt from the urban intervention have been fed into the Urban Primary Healthcare Project funded by the Asian Development Bank (ADB).

Cost-recovery of ESP delivery through systematic pricing and revenue management  
Research Team: S. Routh, Z. Islam, S.A. Jahan, and M.A. Mazumder  
Funded by: USAID  

Two reports—each on demand and household healthcare expenditure in rural and urban areas—have been completed. Tools for costing of ESP services have been designed, pretested and finalized. It has been found that an urban household, on an average, spends only 2% (Tk 120.00) of monthly income on healthcare. A rural household, on an average, spends Tk 100.00 and Tk. 6700 per illness episode for children and women respectively. The
expenditure varies with change in income, type of disease, and type of service provided. Household income, duration of disease, number of workdays lost due to illness, and education are significant determinants of demand for healthcare among the urban households.

Elasticity of demand is highest with respect to duration of disease, followed by the number of working days lost and household income among the urban population. Price elasticity of demand is quite low, while income elasticity is considerably higher among the rural households.

Monitoring of customer satisfaction at UFHP clinics
Research Team: S. Routh, S.A. Jahan, Z. Islam, S. Sarker, and M.A. Mazumder
Funded by: USAID

This study was conducted during May-October 2000, in collaboration with the UFHP, aiming at assessing the existing satisfaction level among the UFHP clinic clients and development of simple monitoring tools and process that could be administered from time to time by the UFHP clinic managers and service providers to assess how the clients rate their services. The final report of the study has been prepared. Tools for monitoring client satisfaction have been developed and handed over to the UFHP for implementation by their clinic managers at the programme levels.

The overall level of client satisfaction toward the services provided from the static and satellite clinics of UFHP is pretty high. Nine of every 10 UFHP clients consider the UFHP services as good. Good behavior of the clinic staff, location of the clinics within reasonable proximity, cleanliness, less waiting time, good waiting arrangements, a well-organized service-delivery system, availability of female doctors, availability of all essential family-health services, adequate information given to clients by the service providers, and proper physical examination facilities are all key factors of client satisfaction.

Field Support and Surveillance Team
Team Leader: A.B.M. Khorshed Alam Mozumder

The ORP has continued to maintain a routine demographic and programmatic surveillance system at three rural fieldsites at Abhoynagar, Mirsarai, and Patiya of Chittagong district and one urban site in Dhaka city. It included a population of 144,076 in 27,302 households.
Programmatic modules have been modified since April 2000. It now includes information on the incidence of acute respiratory infections and diarrhoeal diseases within a week preceding the interviews. The surveillance system collected additional information to help in the monitoring of strategies to improve quality and performance of clinical contraceptive services and referral and linkage for emergency obstetric care since July 2000.


Immunization, contraception, fertility and mortality rates for the year 2000 appear in the following table:

<table>
<thead>
<tr>
<th>Type of area</th>
<th>Upazilla</th>
<th>CPR</th>
<th>Fertility</th>
<th>Mortality</th>
<th>Morbidity</th>
<th>FIC**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural intervention</td>
<td>Mirsarai</td>
<td>43.8</td>
<td>92.2</td>
<td>2.9</td>
<td>62.9</td>
<td>1.4</td>
</tr>
<tr>
<td>Rural comparison</td>
<td>Satkania</td>
<td>30.2</td>
<td>119.8</td>
<td>3.9</td>
<td>48.2</td>
<td>4.8</td>
</tr>
<tr>
<td>Rural intervention</td>
<td>Abhirnagar</td>
<td>58.8</td>
<td>85.1</td>
<td>2.5</td>
<td>49.3</td>
<td>0.6</td>
</tr>
<tr>
<td>Rural comparison</td>
<td>Keshobpur</td>
<td>54.2</td>
<td>80.7</td>
<td>2.3</td>
<td>63.7</td>
<td>2.5</td>
</tr>
<tr>
<td>Rural intervention</td>
<td>Patiya</td>
<td>49.3</td>
<td>94.8</td>
<td>3.0</td>
<td>44.8</td>
<td>4.4</td>
</tr>
<tr>
<td>Rural comparison</td>
<td>Lohagara</td>
<td>34.1</td>
<td>143.3</td>
<td>4.6</td>
<td>66.4</td>
<td>2.2</td>
</tr>
<tr>
<td>Urban intervention</td>
<td>S.B. Nagar</td>
<td>52.3</td>
<td>99.9</td>
<td>2.8</td>
<td>76.9</td>
<td>3.7</td>
</tr>
<tr>
<td>Urban comparison</td>
<td>Lalbagh</td>
<td>49.8</td>
<td>100.1</td>
<td>2.9</td>
<td>65.5</td>
<td>1.9</td>
</tr>
</tbody>
</table>

* Acute respiratory infection in less than 5 years old children for October-December quarter is defined as: Illness with fever, cough, and difficult breathing at anytime within the last seven days preceding the date of interview and during illness of breathing faster than usual with short and rapid breaths.

* Diarrhoea in less than 5 years old children for October-December quarter is defined as: Loose motion three or more times a day within the last seven days preceding the date of interview or watery stool irrespective of number of defaecations.

* Dysentery in less than 5 years old children for October-December quarter is defined as: Stool with blood irrespective of number of defaecations.

** FIC: Full-immunization coverage includes BCG, measles, and three doses of DPT and polio received by children aged 12-23 months.

During the reporting period, the Field Support and Surveillance Team also provided support for computerization, data analysis, and field work to the following studies/activities:

a. Met and unmet health needs in the UFHP clinic areas

b. Antenatal screening for syphilis
Operations Research Project Fieldsites 2000

Legend
- Intensive areas*
- Less intensive areas#
- Comparison areas!

* ORP intensive areas include interventions/activities, field office and surveillance at 3 rural upazilas (sub-districts) in 2 districts and 1 selected area within Dhaka City Corporation (DCC)

# ORP less intensive areas include interventions/activities, but no field office and surveillance at 34 upazilas in 17 districts and 3 city corporations

! ORP comparison areas include no interventions/activities, but field office and surveillance at rural upazilas in 2 districts and 1 area within DCC
c. Exit interviews for the ESP clinic users

d. Strategies to improve effectiveness of the National Immunization Days

e. Frequently-asked questions on the reproductive health of adolescents

f. Documentation of the CFWD adolescent programme

Apart from providing field support to the ongoing interventions and research, the Field Support and Surveillance Team facilitated 69 field visits of over 180 national and international dignitaries at the rural and urban field sites of ORP during 2000.
Laboratory Sciences Division

Director

Associate Director

- Division Administration
- Division Office
- Logistics Support
- Biomedical Engineering
- Animal Resources
- Radiation Safety

- Enteric and Respiratory Microbiology
- Environmental Microbiology
- Immunology
- Molecular Genetics
- Nutritional Biochemistry
- Parasitology
- Reproductive Tract Microbiology
- Tuberculosis Laboratory
- Virology

- Clinical Laboratory Services
- Clinical Microbiology
- Clinical Pathology
- Clinical Biochemistry
- Matlab Laboratory
Laboratory Sciences Division

The mission of the Laboratory Sciences Division (LSD) is to adopt, develop and use the best scientific technology to address infectious diseases and related health problems of disadvantaged populations in partnership with other divisions of the Centre and with national, regional and international institutions that share our commitment to maintain healthy populations. The mandate of the Division is to apply science to alleviate diseases.

In 2000, the Division had 24 scientists, 54 technologists, and 75 support staff. In April, Dr. G. Balakrish Nair joined the LSD as Senior Research Microbiologist. Prof. V.I. Mathan left the

Division Highlights

- A killed whole cell vaccine for enterotoxigenic E. coli based on colonization factor antigens has been found safe and immunogenic in children.
- Zinc supplements increase the immune response to a killed oral cholera vaccine.
- The use of eight-fold saree material as a filtering device for drinking water has reduced the cholera attack rate substantially in the post-intervention period compared to that of the pre-intervention period. A carefully-designed protocol and comparison with results for nylon net filtration provided a basis for optimism that this method can eventually be widely adopted.
- Culturable Vibrio cholerae O1 was isolated from environmental samples at Matlab, Bangladesh.
- Appearance of cholera in a region correlates with certain environmental conditions.
- A pandemic strain of V. parahaemolyticus has spread in Bangladesh.
- Children with shigellosis showed reduced and delayed antigen-specific immune responses compared to adults.
- Bacterial DNA causes reduction of non-specific immune factors in shigellosis.
- Increase of mucosal mast cells, eosinophils, neutrophils and argentaffin cells is seen at the local site in cholera which has long been considered a paradigm of a non-inflammatory diarrhoeal disease.
- There is a genetic diversity within Entamoeba histolytica isolates from Bangladesh as reflected in serine-rich E. histolytica protein (SREHP) gene polymorphism, and this polymorphism may be immunologically or biologically mediated.
- Antibiotic resistance monitoring of enteric, respiratory and sexually transmitted bacteria continue to show increasing trends toward resistance.
- The second round of surveillance for human immunodeficiency virus (HIV) and syphilis showed the overall prevalence of HIV to be 0.2% (95% CI, 0.0-0.3), and that of syphilis was 18.4% (95% CI, 17.3-19.6) in the high-risk group. The highest prevalence was among injectable drug-users (IDUs) from a needle exchange programme in central Bangladesh (1.4%, 95% CI, 0.5-3.1).
Centre on 31 December after three-years of invaluable service to the Centre, and Dr. G. Balakrish Nair became the Acting Associate Director of LSD.

**Division Highlights**

- Rectal mucosal morphology in children with *Shigella dysenteriae* 1 infection, with and without haemolytic-uraemic syndrome (HUS), showed that more children with HUS have increased epithelial cell and vascular damage than children with uncomplicated shigellosis. However, children with HUS have a decreased cellular response compared to children with uncomplicated shigellosis.

- An extended period of incubation up to 48 hours has increased the isolation rate of *Shigella* by more than 3%.

- Sunlight can induce lysogenic bacteriophage-encoding cholera toxin in *V. cholerae* which may have important ecological and epidemiological implications.

- Dengue serological test panels were introduced to support hospital-based serosurveillance. Testing of accumulated sera of 250 febrile patients of 1997-1998 showed that dengue was prevalent in Dhaka earlier than the epidemic of July 2000.

- Dr. Rashidul Haque was given the International Research Scholar Award of the Howard Hughes Medical Institute of USA through its Infectious Disease and Parasitology Program for a five-year term from September 2000 to August 2005.

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**Major infrastructural changes**

In tune with the expanding mandate of the ICDDR,B, the LSD is in the process of establishing a modern air-flow-controlled tuberculosis laboratory. This laboratory will have the necessary equipment for the culture and detailed molecular studies of *Mycobacterium tuberculosis*. The Parasitology Laboratory has received a small grant from the Ministry of Science and Technology, Government of Bangladesh, this year to establish a facility for in vitro culture for studying drug-sensitivity of the malarial parasites. This project will be linked to a larger project that the ICDDR,B is planning to establish and monitor in vitro drug-sensitivity of malarial parasites. As in the previous years, Dr. Kaiser A. Talukder has prepared and supplied primers within and outside the Centre, using an Oligo 1000 DNA synthesizer. The Animal Resources building was renovated for better housing of research animals and to facilitate increase in production and supplies of animals, sheep blood, and other requirements for research purposes.

**ENTERIC AND RESPIRATORY MICROBIOLOGY**

**Head:** G. Balakrish Nair

*Molecular epidemiology of pandemic clones of Vibrio para-haemolyticus in Bangladesh*

*PIs:* G.B. Nair, Y. Takeda, D.A. Sack, S.M. Faruque, A. Hossain, R. Nandy, K. Alam, and N.A. Bhuiyan

*Funded by:* Japanese Collaborative Study Grant

In total, 21 strains were isolated during the study period, all of which were positive for *toxR* gene by PCR and, therefore, their identity was confirmed as *V. para-haemolyticus*. Of the 21 strains, six belonged to the O3:K6 serogroup, four to the O1:KUT serogroup, three to the O1:K56 serogroup, one each to the O3:K29, O3:KUT, O1:K25, O4:K68, O4:K11, and O4:K55.
serogroups. Two strains could not be typed. Examination of these strains for virulence genes revealed that 18 strains carried the \textit{tdh} gene only. Nine of the 21 strains were positive by GS-PCR indicating that these strains belonged to the pandemic genotype. Of the nine pandemic genotype strains, five belonged to the O3:K6 serogroup, two to the O1:KUT serogroup, and one each to the O3:KUT, O1:K25, and O4:K68 serogroups. All the pandemic genotype strains carried only the \textit{tdh} gene. Representative strains of \textit{V. parahaemolyticus} from Dhaka were analyzed by random amplified polymorphic DNA PCR using two sets of primers. RAPD fingerprinting carried out on the representative isolates from different pandemic serogroups generated identical arrays of DNA fragments with one primer (1281). The study is continuing.

\textbf{Surveillance of invasive \textit{Streptococcus pneumoniae} (Spn) and \textit{Haemophilus influenzae} (Hi) diseases in Bangladeshi children and the antimicrobial resistance and serotype patterns of \textit{H. influenzae} and \textit{S. pneumoniae} isolates in Bangladesh [laboratory component]}

Pis: M. Rahman, A.H. Baqui, and S. Hossain
Funded by: USAID

The main objectives of the study are to: (i) conduct a hospital-based surveillance in urban Dhaka and a population-based surveillance in rural Matlab for investigating the aetiology and epidemiology of invasive \textit{H. influenzae} and \textit{S. pneumoniae} infections in children aged less than five years; (ii) determine the prevalence and patterns of, and trends in, antimicrobial resistance among Hi and Spn isolates; (iii) disseminate relevant information, and (iv) improve the use of such data for policy-decisions, particularly by the acute respiratory infection (ARI) control programmes of the Government of Bangladesh.

A bacterial pathogen was detected in 86 of 946 (9.1%) pneumonia cases by blood culture. \textit{S. pneumoniae} and \textit{H. influenzae} were detected in 16 and 18 pneumonia cases respectively. \textit{Acinetobacter} and \textit{Moraxella} were also detected in 21 and 7 cases respectively. Most (75%) \textit{S. pneumoniae} isolates were resistant to co-trimoxazole. One (6.3%) isolate was resistant to penicillin, and another (6.3%) was resistant to chloramphenicol. The prevalence of resistance to antibiotics among \textit{H. influenzae} was: co-trimoxazole 72%, ampicillin 33%, chloramphenicol 44%, and erythromycin 11%.
A bacterial pathogen was isolated in 74 of 171 (43.3%) meningitis cases. *H. influenzae* type b, *S. pneumoniae*, and *N. meningitidis* were detected in 25, 16, and 2 meningitis cases respectively. Of the 25 Hib isolates from cerebrospinal fluid (CSF), 52% were multidrug-resistant, being simultaneously resistant to ampicillin, co-trimoxazole, chloramphenicol, and erythromycin. All isolates were susceptible to ceftriaxone. All 16 *S. pneumoniae* isolates from CSF were susceptible to penicillin. Overall, only one of 34 (3%) invasive *S. pneumoniae* isolates was resistant to penicillin, indicating the low penicillin resistance rate in Bangladesh. In contrast, high resistance rates (range 33% to 72%) to first-line antimicrobial agents (ampicillin, co-trimoxazole, and chloramphenicol) among invasive *H. influenzae* isolates is a disturbing trend.

**Studies on virulence of *V. cholerae* O139 Bengal**  
**Pis:** M. Ansaruzzaman, A. Weintraub, F. Qadri, M. Rahman, M. Mathan, and G.B. Nair  
**Funded by:** SIDA-SAREC

Wild capsulated serum-resistant strains of *V. cholerae* O139 were consistently translocated across polarized CaCo-2 monolayers of transwell filter units. This invasion is now being examined by transmission electron microscopy (TEM). None of the supernatants of CaCo-2 cell monolayers produced by capsular polysaccharide (CPS), lipopolysaccharide (LPS) or live cells elicited TNF-α or IL-1β. The mechanism of serum resistance, either by inability of capsulated bacteria to activate complement or after activating complement system, is being evaluated.

**Clonal analysis of ETEC strains isolated from childhood diarrhoea in Bangladesh**  
**Pis:** M. Ansaruzzaman, F. Qadri, K.A. Talukder, N.A. Bhuiyan, and I. Kühn  
**Funded by:** USAID

In total, 94 enterotoxigenic *Escherichia coli* (ETEC) strains possessing different colonization factor antigens (CFAs) isolated during 1996-1998 were characterized by serogrouping, biochemical fingerprinting, and PCR typing. The ETEC strains belonged to eight O serogroups,
including two major serogroups O25 (n=27 strains) and O6 (n=21 strains). Biochemical fingerprinting indicated that each phenotype comprised several CFAs with different O serogroups. Most strains of O6 (n=17) possessed CFAI, and most strains of O25 (n=13) possessed CFAII/CFAV. Other serogroups O142 (n=12, CFAI) and O115 (n=6, CS6) produced two distinct PhP types.

Serological and molecular epidemiology of *Shigella flexneri* isolated in Bangladesh
Pls: K.A. Talukder, G.B. Nair, V.I. Mathan, and D.A. Sack
Funded by: ICDDR,B

Between January 1997 and June 2000, 23% of 469 clinical isolates of *S. flexneri* were untypable by using a panel of commercially available antisera-specific for all types- and group-factor antigens. Serotype 2a, the dominant serotype from 1978 to 1984, is no longer the major one and has been replaced by 2b. These strains were subsequently typed, using monoclonal antibody raised to *S. flexneri* (MASF). About 4% of untypable strains failed to react with monoclonal antibodies to *S. flexneri* (MASF B), and 4% of these strains were serotype 4. Of the remaining untypable strains, 79% were 1c (a provisional serotype first detected in two strains only in a study carried out 12 years ago), and 8.3% isolates reacted only with a monoclonal antibody, specific for a new antigenic determinant (E1037) but did not react with any type- or group-antigen-specific monoclonal antisera, suggesting that this is a sub-serotype which has not been previously identified elsewhere. It was also noted that serotype 1c and a new serotype designated 4X (E1037) are emerging. Previously-identified four serotypes of *S. flexneri* 3b, 3c, 4a were not detected, while 1a, 5a, and X are also disappearing. This study also showed a significant correlation between *S. flexneri* serotypes and severity of clinical manifestation. Phenotypic and genotypic characterization of emerging and re-emerging serotypes of *S. flexneri* is being done.

ENVIRONMENTAL MICROBIOLOGY
Head: Md. Sirajul Islam

Epidemiology and ecology of *V. cholerae* in Bangladesh
Funded by: National Institute of Allergy and Infectious Diseases, NIH

Environmental samples, including water, zooplankton, aquatic plants, phytoplankton, and sediment, were collected from four districts of Bangladesh at 15-day intervals. All samples were processed to culture and detect *V. cholerae* O1 and O139, using enrichment culture, direct fluorescent antibody (DFA), colony blot hybridization, and PCR techniques. *V. cholerae* O1 was isolated in culturable form as well as detected by DFA and PCR techniques from various environmental samples.

Are waste stabilization ponds barriers to, or reservoirs of, cholera? How much *V. cholerae* is there in wastewater?
Pls: M.S. Islam, T. Curtis, and M. Barer
Funded by: Department for International Development (DfID), UK

The objective of this project is to determine the density of *V. cholerae* in wastewater. Various microbiological techniques, such as most probable number (MPN), fluorescent antibody (FA), and PCR, were used in determining the *V. cholerae* load in wastewater from Pagla (the major sewage outflow point of Dhaka). Both *V. cholerae* O1 and O139 were isolated and detected by MPN and PCR techniques throughout the year from raw and settled sewage. The FA counts of non-culturable *V. cholerae* O1 and O139 in wastewater of Pagla were always ≥104 cells/mL. Several physicochemical parameters were also monitored.
A simple water filtration for cholera intervention
Funded by: National Institute of Nursing Research, NIH

The first phase of the project has been successfully completed. A field trial of the feasibility, acceptability, and efficacy of filtration of surface water for various household and personal uses with eight folds of old sari cloth and nylon material was undertaken, aiming at reducing the incidence of cholera cases. Significant reduction of cholera cases in both sari and nylon intervention groups was observed in the first phase. In the intervention group, the households receiving filtration devices showed lower incidence of cholera than households without the intervention during the first phase of the study. Higher percentage of respondents showed interest in using filtration devices in the follow-up survey than in the baseline survey. The baseline survey, targeted for the second phase, will be conducted in a population of 60,000.

IMMUNOLOGY
Head: Firdausi Qadri

Role of the specific and innate mechanisms of the immune response in acute watery diarrhoea due to Vibrio cholerae and enterotoxigenic Escherichia coli: studies in patients and vaccinees
Pis: F. Qadri, A-M. Svennerholm, D. Islam, R. Raqib, N.H. Alam, and M.A. Salam
Funded by: SIDA-SAREC

The involvement of different types of inflammatory cells at the mucosal surface in acute watery diarrhoea caused by V. cholerae O1 and O139 is being investigated. Infection with V. cholerae O1 and O139 results in up-regulation of mucosal mast cells in both duodenal and rectal tissues. It also results in the up-regulation of eosinophils, which persist till late convalescence. Increases are also seen at the local site only at the acute stage of infection in the numbers of polymorphonuclear neutrophils and up-regulation of specific bactericidal proteins. Ultrastructural studies are also being carried out to support the immunohistochemical studies. The study is ongoing.

Enterotoxigenic E. coli (ETEC) may express a large number of colonization factors (CFs). About 22 CFs have been described to date. It has been proposed that a multivalent ETEC vaccine containing these components, together with toxin antigen, could provide protection against a large proportion of ETEC strains all over the world. Although all CFs are separate antigens, it has been shown that there is partial antigenic homology among the sub-units of certain CFs. Since the CFs share epitopes, protection to disease can be afforded by immune response to homologous as well as cross-reacting antigens. To understand what happens during natural infection, the mucosal and systemic IgA antibody responses are being studied in children and adult patients infected with ETEC expressing CFAI, CS1-CS7, CS14, or CS17. Results so far show that patients respond not only with antibody-secreting cell responses to homologous CFs but also to cross-reacting CFs. Similarly, plasma and intestinal antibodies were detected to the CF of the infecting strain as well as to cross-reacting CFs. This suggests that the coverage of a multivalent ETEC vaccine presently undergoing extensive field-testing may elicit immune responses against a wider range of CFs than those included in the vaccine.

Phase II studies of safety and immunogenicity of the enterotoxigenic Escherichia coli (ETEC) vaccine in Bangladeshi children
Pis: F. Qadri, T. Ahmed, A-M. Svennerholm, M. Yunus, R.B. Sack, and D.A. Sack
Funded by: USAID

A double-blind, randomized, placebo-controlled Phase II study of the ETEC vaccine has been initiated in the Mirpur slum area in Dhaka. Two doses of the vaccine or placebo will be administered 14 days apart to 316 children. For this purpose, children in the study area have
been stratified into two age-groups (6-17 months and 18-36 months). The safety of the vaccine will be monitored in all 316 children, while the immunogenicity will be studied in a subgroup of 120 children. One thousand five hundred households have been visited and 800 children enrolled in the study. The vaccine has been administered to 200 children. In about 81 of these children, the immune response has been assessed, using antibody-secreting cell responses as well as plasma and intestinal antibody responses to the CF components of the ETEC vaccine.

Epidemiology and ecology of *Vibrio cholerae* infection in Bangladesh
Pis: F. Qadri, A.K. Siddique, R.B. Sack, G.B. Nair, M.S. Islam, and A. Weintraub
Funded by: NIH

Procedures involving monoclonal antibody-based immunomagnetic cell separation, together with PCR (IMS-PCR), are being used for the rapid detection of *V. cholerae* O1 and O139 from clinical samples. Using this procedure, about $10^3$ cfu of *V. cholerae* O1 and 10 cfu of *V. cholerae* O139 can be detected from fresh or frozen stools. Attempts are being made to optimize this technique to detect bacteria from contaminated water samples. Surveillance for ETEC is being carried out in stools obtained from diarrhoeal patients of three monitoring sites of the project. The prevalence of toxin types as well as different CFs on ETEC is being studied. Three hundred and eighty diarrhoeal stool samples have been tested for CFs.

Immune responses to *V. cholerae* in Bangladesh
Pis: F. Qadri, M. Akramuzzaman, M.A. Salem, S. Calderwood, and E. Ryan
Funded by: NIH

A prospective five-year study on the immune response in patients with cholera has been initiated. This study will evaluate the immune responses in patients and household family contacts, with particular emphasis on the mucosal immune responses. The plan is to enroll 400 index cases and 1,600 household contacts over the course of the study period.

Effect of vitamin A and zinc supplementation on immune response to oral cholera vaccination
Funded by: Thrasher Research Fund, USA

Two hundred fifty-seven children, aged 2-5 years, were enrolled from a fieldsite in Mirpur to determine whether vitamin A, zinc, or both together result in improved immune response to the killed oral O1 cholera vaccine. One group received 200,000 IU of vitamin A orally one week prior to administration of the vaccine; a second group received daily oral supplementation of 20 mg of zinc acetate for the duration of the study. The third group received both the micronutrients, whereas the fourth group received placebo only. All volunteers were given two doses of cholera vaccine with a two-week interval between doses.

The study has been completed, and analysis shows that the group supplemented with both vitamin A and zinc resulted in a significantly higher number of responders with four-fold or higher vibriocidal antibody titres compared to the placebo group.

Significant differences in the cholera toxin-specific antibody responses in serum were also seen between the study groups. There appeared to be a decrease in the magnitude and the
responder frequency in the group that had been supplemented with both vitamin A and zinc compared to those who had been supplemented with vitamin A only or the group given placebo. Thus, the preliminary analysis suggests that supplementation with both vitamin A and zinc results in a higher magnitude of antibacterial antibody response, measured using the vibriocidal assay but a decreased response to cholera toxin (CT). More data analyses are being carried out to further evaluate the results of the study.

Identification of risk factors and study of the outcome of Shigella-associated haemolytic-uraemic syndrome (HUS)

Pis: T. Azim, M.A. Salam, T. Ahmed, N.H. Alam, R. Raqib, M. Hanif, S. Yamasaki, and Y. Takeda
Funded by: Government of Japan through UNOPS and USAID

The study aims at comparing the history of antibiotics intake, clinical features, and immune responses between children with and without HUS associated with S. dysenteriae type 1 infection. For this purpose, 7-60 months old children, with confirmed S. dysenteriae type 1 infection, were enrolled. Of 95 children who were initially screened with dysentery, 47 had either S. dysenteriae type 1 or stx in their stools, of whom 21 developed HUS. Preliminary analysis was conducted to determine the rectal mucosal morphology, using rectal biopsy specimens from 29 children with S. dysenteriae type 1 infection, 18 without complications, and 11 with HUS. Initial results have shown that more children with HUS have increased epithelial cell and vascular damage than children with uncomplicated shigellosis. However, children with HUS have a decreased cellular response compared to children with uncomplicated shigellosis.

Influence of innate immune mechanisms on T-cells stimulation in shigellosis

Pis: D. Islam, B. Christensson, and N.H. Alam
Funded by: SIDA-SAREC

The study was undertaken to comprehend the interplay between immune effector cells and molecules of the innate and adaptive systems in shigellosis. During 1999-2000, thirty-two male adult patients with shigellosis and 22 male adult patients with acute diarrhoea (diarrhoeal control) were enrolled in the study. Assessment of Shigella antigen-specific antibody-secreting cells (ASC) in peripheral blood and rectal biopsies is continuing. Assessment of the expression of C-X-C and C-C chemokine families in the rectal biopsy samples is also ongoing. Analysis of the expression of antibacterial peptides shows that, in early Shigella infection, expression of the antibacterial peptides LL-37 and β-defensin-1 (HBD-1) is reduced or turned off. The down-regulation is detected in biopsies from patients with shigellosis and in Shigella-infected cell cultures of epithelial and monocyte origin. This down-regulation of immediate defense effectors might promote bacterial adherence and invasion into host epithelium and could be an important virulence parameter for Shigella. The gene expression of these immediate effectors is also affected by other enteric pathogens, indicating that down-regulation of antibacterial peptides represents a novel immune escape strategy used by enteropathogens. Analyses of bacterial molecules causing the down-regulation indicate DNA as a possible mediator.

Immune responses in children with both acute lower respiratory tract infection and diarrhoea

Pis: D. Islam, A. Brooks, R. Raqib, M.A. Salam, and Nazmunnahar
Funded by: USAID

The study was undertaken to identify immunological risk factors in children with both pneumonia and diarrhoea by defining the immune response mechanisms in these children compared to children with only pneumonia or only diarrhoea. Recruitment of children (aged 2-36 months) with clinical pneumonia and diarrhoea, with only pneumonia, with only diarrhoea, and apparently healthy children has been completed. It is evident from the preliminary analysis of data that, in about 50% of the children, pneumonia did not resolve within one month.
few children, the active disease continued for two months. Preliminary data indicate a different immune response in children with both pneumonia and diarrhoea.

Further studies of immunoprotective and immunopathogenic mechanisms in shigellosis
Funded by: SIDA-SAREC

The overall objective of the protocol is to study the development of specific and innate immune defense mechanisms in children during the course of natural Shigella infection and to compare with those in adults and in age-matched healthy controls. Earlier, extensive production of innate mediators was seen to take place during acute shigellosis at the local site, and increased concentrations of the mediators correlated with disease severity. Differences were found between adult and paediatric patients. To ascertain the role of cells of the innate immune system against Shigella infection, neutrophils, mast cells, eosinophils, argentaffin cells, and the chemottractants for these cells were studied during the acute and convalescent stages in the rectal mucosa. Increased numbers of neutrophils were evident in the rectum during the acute stage, as expected, in both adult and paediatric patients. Migration of mast cells and eosinophils occurred from the deeper regions to the superficial layer of the lamina propria. Differences were found among paediatric and adult patients in the kinetics of mast cell and eosinophil expression pattern as well as the factors released by these cells.

Detailed study of the humoral and cellular immune responses in children with primary infection due to Shigella species
Funded by: WHO

Antigen-specific ASC responses in paediatric patients (2-10 years), infected with Shigella species, ranged between 2% and 5% of the total ASC responses, while in adults, these were 8% and 15% of the total ASC responses. The predominant component of the anti-Shigella LPS antibody subclass response in paediatric patients was IgA1, while in adult patients, IgG2 was the major IgG subclass in the serum. A rapid induction of LPS-specific-IgA1 and IgA2 responses occurred in adults, reaching peak levels already within 3-5 days after onset of the disease, while in children, peak responses were delayed and occurred 8-10 days later. The capacity to produce IFN-γ in response to mitogens gradually increased during convalescence in comparison with the acute stage in both adult and paediatric patients. Adaptive immune responses in paediatric patients with shigellosis were delayed and reduced compared to adults.

Effect of zinc supplementation on the immune and inflammatory responses of children to Shigella flexneri infection and correlation with clinical severity of illness and growth following recovery
Funded by: USAID

In a randomized, double-blind, placebo-controlled trial, investigations are being carried out to study the effect of zinc supplementation on the immune response, inflammatory responses, outcome of clinical illness, and growth following recovery from acute illness with S. flexneri infection in preschool children. Forty-four patients have been recruited. Blood, stool, and rectal biopsies are being collected. Clinical outcome and anthropometric measurements are being recorded and immune and inflammatory responses studied in the sub-groups.

MOLECULAR GENETICS
Head: Shah M. Faruque

Characterization of environmental and clinical strains of toxigenic and non-toxigenic Vibrio cholerae as an aid to predict emergence of new epidemic strains
Pl: S.M. Faruque
Funded by: USAID

The aim of this study is to conduct environmental and clinical surveillance and characterization of non-toxigenic progenitor strains and toxigenic strains of V. cholerae. It
is also designed to perform comparative molecular analysis of *V. cholerae* strains to
determine the origination of new toxigenic strains and their relation to epidemics of cholera.
The long-term goal is to understand the epidemiology and evolution of toxigenic *V. cholerae*
and develop feasible means to predict the emergence of new toxigenic *V. cholerae* strains
with epidemic potential. Genetic fingerprinting, based on restriction fragment length
polymorphisms of rRNA genes (ribotype) and genes involved in virulence, has been used
in differentiating among clones. Molecular epidemiological surveillance has shown a
continual emergence of new clones characterized by change in ribotypes, CTX genotypes,
and antimicrobial susceptibility, particularly among the recently-emerged O139 serogroup
of *V. cholerae*. At least seven different ribotypes have been recognized during the short
span of the emergence of this serogroup, suggesting that the O139 serogroup is undergoing
rapid genetic reassortment. The study also investigated induction of the bacteriophage-
encoding cholera toxin (CTXΦ) in naturally-occurring strains of toxigenic *V. cholerae*
and demonstrated that certain environmental non-toxigenic strains can acquire the phage
leading to the origination of new toxigenic strains.

**Epidemiology and ecology of Vibrio cholerae infections in Bangladesh**

PI: S.M. Faruque

Funded by: NIH

Toxigenic *V. cholerae* strains isolated from various components of the aquatic ecosystem
and from cholera patients are being analyzed to study their genetic relatedness 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 for predicting
epidemics. Genetic fingerprinting has been used for studying the molecular epidemiology
of *V. cholerae* strains and the distribution of different toxigenic clones. A standardized
typing scheme for *V. cholerae* O139 has been developed in collaboration with the National
Institute of Cholera and Enteric Diseases in Calcutta. Comparative analysis of toxigenic
O139 vibrios from epidemic outbreaks in Bangladesh and non-toxigenic O139 strains
from the environment in Bangladesh and India showed that these non-toxigenic O139 strains
are derived from environmental strains of *V. cholerae* non-O1. Thus, the O139 antigen is
present in several different lineage and does not identify a unique cluster. Furthermore, this
serogroup comprises epidemic and non-epidemic strains which have emerged separately from multiple *V. cholerae* O1 and non-O1 progenitors.

**Molecular epidemiology and evolution of clinically significant Shigella species in Bangladesh**

PIs: S.M. Faruque, S. Yamasaki, and G.B. Nair

Funded by: Japanese Collaborative Study Grant

This project proposes to study the emergence of virulent *Shigella* strains from possible non-
virulent progenitors by acquisition of virulence and serotype-specific genes, and their relation
to outbreaks of shigellosis. The study is being carried out in active collaboration with Japanese
scientists. This year-round effort monitors the presence of *Shigella*-specific virulence genes
and *Shigella*-specific bacteriophages in environmental waters in two surveillance sites in
areas of endemic *Shigella* infection in Bangladesh; conducts clinical and environmental
surveillance for the presence of *Shigella* species and closely-related bacteria of the
Enterobacteriaceae family; and performs comparative genetic fingerprinting of the strains. Methods to determine the presence of Shigella and related organisms in stools of patients and in environmental samples were standardized. These assays employ PCR technique to detect genes specific for Shigella and hence the bacterium. A multiplex PCR assay targeted to detect genes involved in invasiveness of Shigella (ipa) and in the production of Shiga toxin (stx1 and stx2) were standardized. This test will allow identification of Shigella rapidly as well as any other organisms carrying the invasive or Shiga toxin genes. The long-term goal of this work is to devise ways to predict epidemics of shigellosis through environmental and clinical monitoring and, thus, suggest means to abort or control a predicted epidemic.

NUTRITIONAL BIOCHEMISTRY
Head: M.A. Wahed

Deficiencies of both macro and micronutrients have tremendous impact on health in many countries, including Bangladesh. It has also been recognized that diarrhoea and malnutrition is a vicious cycle. The Nutritional Biochemistry Laboratory has been rendering research support, conducting independent and collaborative research, and continuously bringing out new tests to suit the research needs of students in both Masters and PhD programmes in laboratory methods.

This laboratory conducts sophisticated assays requiring expensive equipment, needing regular skilled maintenance. As many as 21 research projects received services from this laboratory. It continues to participate in the quality-assurance programme run by the National Institute of Standards and Technology (NIST), Washington, D.C., USA. A new ELISA reader with an auto-washer was acquired. With this machine, serum transferrin receptor and ferritin are being done to assess nutritional anaemia. Techniques for determination of mannitol, lactulose, and creatinine in urine samples was successfully developed with the new Hitachi autoanalyzer. A pilot phase of collaborative research project titled "Effect of small fish rich in vitamin A to improve vitamin A status of school-going children in Bangladesh" has been completed. The study is being done in collaboration with the Human Nutrition Department of the Royal University of Veterinary and Agricultural Sciences, Copenhagen. Miniclean space has been designed to protect dust-flow in the laboratory.

PARASITOLOGY
Head: Rashidul Haque

Field studies of human immunity to amoebiasis in Bangladesh
Pls: R. Haque and W.A. Petri, Jr.
Funded by: NIH

It is not known if humans acquire immunity against colonization or invasion by E. histolytica. This ongoing study in Mirpur, an urban slum of Dhaka, is investigating that possibility. In total, 1,164 children, aged 2-5 years, have been examined for E. histolytica infection by testing stool and blood. Two hundred eighty-nine children have been enrolled in the study and will be followed for three years. There are two cohorts among the 289 children, matched for age and sex. One cohort is composed of 145 children with serologic evidence of prior E. histolytica infection with or without E. histolytica infection in stool; the other is composed of 144 children without serologic evidence of prior E. histolytica infection and without any

Scientists working in the Parasitology Laboratory
Senior technologists of Clinical Laboratory are interpreting MAC ELISA for dengue antibody.

E. histolytica infection detected in stool. Stool samples are collected every month and blood samples every 4 months from these children for analysis of E. histolytica. Preliminary analysis of the first year's data has shown that new E. histolytica infections occurred more frequently in the children with serum IgG anti-lectin antibodies, while children with stool anti-lectin IgA at the beginning of the study had significantly lowered E. histolytica infections during the 12-month observation period.

Intraspecies variation in Entamoeba histolytica and protective immunity with E. histolytica infection
Pls: R. Haque and W.A. Petri, Jr.
Funded by: University of Virginia and USAID

The aim of this study is to analyze the genetic heterogeneity of E. histolytica isolates by isoenzyme classification, by analysis of DNA polymorphism of two single-copy genes, and/or PCR ribotyping, and to determine if any association exists between the clinical manifestations of amoebiasis and protective immunity. Size and restriction site polymorphism in the repetitive regions in two E. histolytica genes, the 'serine-rich antigen' gene and the 'strain-specific gene' are being studied. Distinct differences among the local isolates of E. histolytica have been found. This is an important finding in relation to the immunity to E. histolytica infection.

REPRODUCTIVE TRACT MICROBIOLOGY
Head: J. Bogaerts

Aetiology of reproductive tract infections among women attending the clinics of Bangladesh Women's Health Coalition and Marie Stopes Clinic Society in Taan Bazar and Dhaka, Bangladesh
Pls: J. Bogaerts, T. Azim, Y. Ahmed, M. Van Ranst, and J. Verhaegen
Funded by: Directorate General for International Cooperation (DGIC), Belgium

The activities in the Taan Bazar clinic of the Bangladesh Women's Health Coalition (BWHC) stopped prematurely in 1999 after eviction of the brothel in that area. Collection of clinical samples at the Elephant Road Clinic of the Marie Stopes Clinic Society (MSCS) in Dhaka ended on 15 December 2000. In total, 1,808 women were examined; only 11 (0.6%) had a culture positive for Neisseria gonorrhoeae. Further analysis for other pathogens (Chlamydia trachomatis, Treponema pallidum, human papillomavirus, herpes simplex virus, etc.) is underway. Activities at the Dhaka clinic of the MSCS will continue till June 2001.

Studies on genital ulcer diseases in males: a hospital-based study in Dhaka, Bangladesh
Pls: J. Bogaerts, T. Azim, M. Rahman, M. Hoque, M. Van Ranst, and J. Verhaegen
Funded by: DGIC, Belgium

A prospective study on the aetiology and healing of genital ulcers started in collaboration with the Skin/Venereal Disease Department of Dhaka Medical College Hospital and Sir Salimullah Medical College Hospital of Bangladesh. In total, 352 patients were included in the study till December 2000. The main causes of genital ulcer disease are chancroid, syphilis, and genital herpes. The study is still continuing.
Prevalence of bacterial vaginosis among pregnant women in Bangladesh
Pis: M. Rahman, A. Begum, and N. Yasmin
Funded by: ICDDR,B

The prevalence of bacterial vaginosis and syphilis among 256 pregnant women attending an urban maternity centre was studied during June-December 2000. Of them, 17.5% were positive for bacterial vaginosis, and 3% for syphilis by both rapid plasma reagin (RPR) and Treponema pallidum haemagglutination assay (TPHA). The rate of prevalence of positive tests for syphilis suggests that routine screening for syphilis will be cost-effective.

Treatment failure due to ciprofloxacin and ceftriaxone in gonorrhoea among Bangladeshi female sex workers
P: M. Rahman
Funded by: Swiss Agency for Development and Cooperation (SDC)

Treatment failure due to ciprofloxacin is being compared with ceftriaxone in gonorrhoea among female sex workers. One hundred fifty-seven culture-positive cases of gonorrhoea were randomly treated with either ciprofloxacin or ceftriaxone. Of the patients treated with ciprofloxacin, 32% were cured compared to 96% treated with ceftriaxone.

TUBERCULOSIS LABORATORY
Head: M. Ziaur Rahim

The new Tuberculosis Laboratory is equipped with biohazard safety cabinet, negative air pressure, and other equipment required to meet the standard of a safe and modern tuberculosis laboratory. Necessary arrangements are being made to set up conventional culture and sensitivity tests. For rapid diagnosis of tuberculosis, molecular techniques, including line probe assay and PCR, will also be set up. In addition, rapid diagnostic tests, including micro-plate alamar blue assay and microscopic observation broth drug-susceptibility, will be established. Mycobacteria growth indicator tube and other tests will be evaluated and validated for rapid detection of M. tuberculosis.

Immunological studies of PE-PGRS proteins of Mycobacterium tuberculosis
Pis: N. Honore, B. Saint-Joanis, and S.T. Cole
Funded by: Institut Pasteur, Government of France

Studies are being carried out to investigate the immunological role of some of the polymorphoglycine-rich sequence (PGRS) proteins. The PGRS genes were selected randomly, and RT-PCR showed the expression at the transcriptional level. DNA vaccination technique was used for producing antibodies against the PGRS proteins in mice. To test the specificity of the antibodies produced in mice, the same plasmids were used for expressing proteins in eukaryotic cells and probed with the corresponding antibody. The antibodies reacted with the corresponding proteins, indicating that these were specific for the particular PGRS protein. On Western blot analysis, the antibodies recognized multiple proteins from different mycobacterial species as well as clinical isolates of M. tuberculosis. Results obtained so far show that antibody against one PGRS protein can recognize several PGRS proteins of different sizes, which indicates that PGRS proteins might be responsible for antigenic variation.

VIROLOGY
Head: Tasnim Azim

Cellular and humoral immune responses to rotavirus infection in Bangladeshi infants and relevance to rotavirus vaccine studies
Pis: T. Azim, M.A. Salam, G. Podder, M.A. Wahed, and S.M. Faruque
Funded by: USAID

This study aims at describing the immune response of Bangladeshi children with natural rotavirus infection and the relationship between malnutrition, clinical progress, rotavirus
excretion, and specific immune responses. For this purpose, children with rotavirus infection are being enrolled and followed for three weeks. One hundred twenty-four children with complete follow-up for three weeks have been recruited (92 and 32 children with >75% and <75% weight-for-age respectively). Some children are being followed up for 3 months.

Investigation of the importance of Norwalk-like viruses in childhood diarrhoea in Bangladesh

Funded by: USAID

The cause of diarrhoea in a proportion of children in the Clinical Research and Service Centre surveillance system is not known. Diarrhoea in these children may be due to pathogens not tested for, such as caliciviruses. This study will determine the association of caliciviruses with diarrhoea by testing samples of stool and blood for antigens and antibodies. One hundred thirty-one children with complete follow-up have been enrolled.

National sentinel surveillance for HIV and syphilis

PIs: T. Azim and J. Bogaerts
Funded by: DFID

The second round of surveillance, in collaboration with the GoB workers, was successfully completed with 4,634 samples from female sex workers in brothels and streets, male sex workers, men who have sex with men, injectable drug-users (IDUs), and men with sexually transmitted diseases attending clinics. The overall prevalence of HIV was 0.2% (95% CI, 0-0.3) and that of syphilis was 18.4% (95% CI, 17.3-19.6). The highest prevalence was among IDU from a needle exchange programme in central Bangladesh (1.4%, 95% CI, 0.5-3.1). The results for both HIV and syphilis are similar to those for the first round. The third round of the surveillance has commenced.

Outbreak of dengue haemorrhagic fever in Bangladesh

Funded by: USAID

Since June 2000, an outbreak of dengue fever (DF) and dengue haemorrhagic fever (DHF) is ongoing for the first time in Bangladesh. Surveillance for DF and DHF among in-patients at a general hospital in Dhaka has begun. Clinical details were recorded prospectively, and DF, DHF, and dengue shock syndrome (DSS) were defined according to WHO-criteria. Sera were tested for anti-dengue and anti-Japanese encephalitis IgM and IgG by ELISA, and also for dengue viral RNA by reverse transcriptase-polymerase chain reaction (RT-PCR). Significant anti-dengue antibodies (>40 units) were detected in 174 of 238 patients tested; adults (>18 years) were predominantly (62%) affected. The disease patterns were: DF (44%), dengue fever with bleeding (16%), DHF (39%), and DSS (0.6%). Important clinical features were: fever (100%), headache (91%), myalgia/arthralgia (85%), vomiting (64%), macular rash (55%), bleeding (45%), thrombocytopenia (≤100,000/cm²), pleural effusion (12%), ascites (9%) and hepatomegaly (75%). Single serum ELISA after five days of illness detected infection in 97% of the cases. Paired sera increased case detection by 7% (2/30). Secondary infection occurred in 72% of all cases, and 22% of DHF occurred in cases having primary infection. Dengue serotype 3 (Den 3) was detected in 5 of 20 (25%) patients by RT-PCR; 4 (80%) had DHF. All patients except two (case-fatality rate=1.15%) recovered with supportive treatment (paracetamol, intravenous fluid, transfusion when necessary). Thus, Den 3 appears to have caused the first documented outbreak of DHF in Bangladesh. Rational therapeutic strategies proposed by WHO have been widely circulated as physicians gain experience in proper management and prevention of dengue infections.
OTHER PROTOCOLS

Molecular characterization of *Helicobacter pylori* strains isolated from patients with duodenal ulcer and gastric cancer and from asymptomatic carriers
PIs: M. Rahman, M.J. Albert, S. Sarker, F. Qadri, S. Normark, and L. Engstrand
Funded by: SIDA-SAREC

*Helicobacter pylori* strains were isolated from patients with duodenal ulcer, gastric cancer, and non-ulcer dyspepsia. The strains were characterized for the expression of virulence factors by studying cagA and genotyping of vacA gene. In total, 18 isolates were analyzed. Of the isolates, 7 (38%) were cagA-positive, 10 (55%) were found to have s1 signal sequence of vacA compared to 6 (33%) with s2. Similarly, 11 (61%) of the isolates expressed m1 middle region of vacA compared to 6 of 18 (33%) with m2. Further analysis of the isolates is being done.

Safe blood transfusion in Dhaka and Matlab hospitals of ICDDR,B
PI: M. Anowar Hossain
Funded by: ICDDR,B

The objective of the safe blood transfusion project is to prevent transmission of HIV, hepatitis B, other sexually transmitted diseases, and malaria and to determine the prevalence of these diseases among commercial blood donors. The blood-bags purchased from commercial sources were tested for group confirmation, screened for above infectious agents and confirmed by ELISA and other tests. Blood samples positive for any diseases were discarded, and others were cross-matched with patients’ blood for transfusion.

In total, 235 blood-bags (A=57, B=64, AB=28, and O=86) were purchased from commercial sources, of which 78 (33.2%) were discarded, since these were positive either for HBsAg, VDRL, or TPHA. None of the 78 blood-bags was positive either for HIV or malarial parasite. Of the total blood-bags, 12 were positive for HBsAg (5.1%), 53 for VDRL (22.6%), 60 for TPHA (25.5%). Thirty-six blood-bags (15.3%) were discarded after expiry of recommended storage days from the date of collection of blood from the donors. The remaining 121 blood-bags were fit for transfusion, of which 108 bags (89.3%) were used in the Clinical Research and Service Centre (Dhaka) and 13 bags (10.7%) in the Matlab hospital of ICDDR,B.

Surveillance on antimicrobial resistance of selected pathogens in Nepal: a technical cooperation project
PIs: VI. Mathan, G.B. Nair, A. Hossain, and M. Rahman
Funded by: USAID

The main objective of this project was to help strengthen the capacity for determination of antimicrobial resistance of *V. cholerae*, *Shigella*, *S. pneumoniae*, *H. influenzae*, and *N. gonorrhoeae* and to develop an external quality control system for participating laboratories in Nepal. Three routine technical visits were made to observe the performance of each laboratory, discuss technical problems, and suggest measures to overcome the problem. Critical laboratory supplies, such as diagnostic antisera, antibiotic disks, diagnostic disks, gonococcal agar base with antibiotic supplement, bacterial strain preservation, and empty storage vials, were provided to each laboratory to strengthen the programme further.
storage-capacity of the National Public Health Laboratory was also helped by repairing the 
−70 °C deep-freezer. Following each visit, a detailed report was prepared and submitted to 
the Environmental Health Programme (EHP) of Nepal and to USAID. A coordination meeting
was organized in July between the supervisors of the participating laboratories, staff of 
EHP, USAID, and ICDDR,B scientists. A detailed presentation was made on the activities,
including some results on validation of 483 isolates and their antimicrobial susceptibility
pattern. Two scientists attended the mid-term review meeting of the Infectious Disease Pro-
gram of USAID, Nepal, held in December where, again, a detailed presentation was made on 
ICDDR,B's activities and impacts on the project. Four batches of external quality control 
strains were distributed. A summary report on their evaluation is under preparation for sub-
mission to USAID and the Ministry of Health of His Majesty's Royal Government of Nepal.

Elimination of coccidial infection from laboratory rabbits by medicated chow: an eco-
nomic device
Pis: A.S.M.H. Rahman, K.M.N. Islam, K.M. Shafiullah, and A.C. Das
Funded by: ICDDR,B

For elimination of coccidia, sulphaquinoxaline (when administered in drinking water) took
6-8 weeks but when mixed with rabbit pellet required only three weeks. So, use of the medi-
cated chow proves to be an economic and cost-effective measure.

CLINICAL LABORATORY SERVICES
Head: Md. Anowar Hossain

The Clinical Pathology, Clinical Biochemistry, Clinical Microbiology, and Out-patient Services
Project in Dhaka and the Matlab Clinical Laboratory provided laboratory diagnostic support
to the patients attending the Dhaka and Matlab hospitals and paying patients, including
those from the British Embassy medical unit, Japan International Co-
operation Agency (JICA) medical unit, and US Peace Corps and also
provided support to the research protocols and training to the national
and international fellows, graduate and postgradu-
ate students in labora-
tory research and labo-
ratory diagnostic proce-
dures. A short summary
of activities in the Dhaka
clinical laboratories is
shown in Table 1. There
was an 8% increase of
paying patients over
1999. Safe blood trans-
fusion service in the
Dhaka and Matlab hos-
pitals is a major contribu-
tion of this programme. The major achievements were the introduction of dengue serologic
markers, serum complement fractions C<sub>3</sub> and C<sub>4</sub>, an increase of Shigella isolation by 3.5%
following an extended period of incubation up to 48 hours, increase of H. influenzae follow-
ing addition of haemoglobin supplement to chocolate agar.
Clinical Pathology Laboratory
Head: Md. Anowar Hossain

The Clinical Pathology Laboratory comprises haematology, serology and microscopic units. The Laboratory performed 148,958 tests/assays on 69,515 specimens of blood, serum, stool, urine and other body fluids. In 2000, the specimens and tests increased by 11% and 14% respectively. The Laboratory continued to be assessed as 'excellent' by the external quality-assurance programme with College of American Pathologists (CAP).

Clinical Biochemistry Laboratory
Head: Ashish K. Chowdhury

In total, 124,962 tests/assays were done on 33,926 specimens. To reduce costs, reagents for autoanalyzer were prepared indigenously. The performance of the Laboratory was assessed as Grade 1 standard by the WHO's external quality-assurance scheme.

Clinical Microbiology Laboratory
Head: Md. Khorshed Alam

This laboratory processed 35,321 specimens for culture and antimicrobial susceptibility testing. Common diarrhoeal pathogens were *Shigella* (11.3%), *V. cholerae O1* (10.3%), and *V. cholerae O139* (1.3%). *Salmonella typhi* continued to be the most common blood-isolate (2.7%), whereas *E. coli* (10.9%) as urine-isolate. The performance of this laboratory was assessed as being within 95% confidence interval by the WHO's external quality-assurance scheme.

### Table 1. Activities in Dhaka clinical laboratories in 2000

<table>
<thead>
<tr>
<th>Activity</th>
<th>Clinical Pathology</th>
<th>Clinical Biochemistry</th>
<th>Clinical Microbiology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total specimens processed</td>
<td>69,515</td>
<td>33,926</td>
<td>35,320</td>
</tr>
<tr>
<td>Specimens from paying cases</td>
<td>44,666</td>
<td>19,506</td>
<td>18,069</td>
</tr>
<tr>
<td>Specimens from internal cases</td>
<td>24,849</td>
<td>14,420</td>
<td>17,251</td>
</tr>
<tr>
<td>Total number of tests</td>
<td>1,48,958</td>
<td>1,24,962</td>
<td>-</td>
</tr>
<tr>
<td>Total workload units (WLUs)</td>
<td>11,15,171</td>
<td>10,46,002</td>
<td>12,85,850</td>
</tr>
<tr>
<td>Total work-hours</td>
<td>19,014</td>
<td>17,988</td>
<td>23,559</td>
</tr>
<tr>
<td>WLUs per person-hour</td>
<td>58.65</td>
<td>58.15</td>
<td>54.58</td>
</tr>
</tbody>
</table>

Matlab Laboratory
Head: Md. Anowar Hossain

In total, 14,386 tests were performed on 11,168 specimens, of which 4,010 were processed for microbial culture and 7,158 for haematological and biochemical tests and microscopy. *V. cholerae* continued to be the most common diarrhoeal isolates.
DIVISION OFFICE
Manager: Shipan K. Sarker

The Division Office provided managerial, secretarial and technical support to the Associate Director and Head, Laboratory Sciences Division and to the research laboratories. The Office maintained liaison with the Procurement, Maintenance, Budget, Finance, Personnel, Travel and Estate and other administrative branches in the Centre and with various GoB offices and collaborative institutions at home and abroad. It coordinated activities of the Logistics Support, Bioengineering Cell, Animal Resources Branch, and the Radiation Safety Cell.

Managerial, Cold Chain and Archival Support
Head: Md. Bodrul A. Prodhan

This unit is responsible for procurement and maintenance of equipment, data management, and preservation of uninterrupted cold chain activities for the Division. The Unit circulated a weekly surveillance report on major diarrhoeal pathogens isolated from the stool/rectal swab samples collected from a systematic 2% sub-sample of patients attending the Dhaka hospital; acted as a databank for the Centre’s scientists; and produced monthly financial recovery for the clinical laboratories, Traveler’s Clinic, Staff Clinic, and Media Preparation Unit. In 2000, the unit processed 65,500 records and added these to the existing database of 1,320,025 records on microbiology, pathology, biochemistry tests and media preparation requests. The unit has developed a useful database for Oral Cholera Vaccine Trial Specimens (Blood=48,000, BM=10,000) stored in the cold room for easy retrieval.

Logistics Support Branch
Head: Qazi Shafi Ahmed

Media preparation, decontamination, and bacterial stock culture collection are the primary responsibilities of the Branch. In 2000, the media section provided technical support to 43 research projects by supplying 5,505 litre of bacteriological media for growth and identification of bacterial pathogens. These include: culture media (semi-solid) 4,510 litre, culture broth 845 litre, carbohydrate fermentation broth 115 litre, and amino-acid broth 35 litre. The bacterial stock culture collection has supported nine research projects, lyophilizing 3,382 samples. Decontamination and proper disposal of various infected materials are done following standard biosafety rules. Regular quality control of media and lyophilization is ensured before delivery to the users.

Biomedical Engineering Cell
Head: Syed Saiful Haque

The Biomedical Engineering Cell (BMEC) is responsible for the installation, repair, and maintenance of equipment and hardware in the LSD and other divisions of the Centre. To cope with the continued problem of low voltage, the BMEC undertook special measures to connect several stabilizers to various critical points. During the year, the BMEC helped several national institutions, including Bangladesh Council for Scientific and Industrial Research (BCSIR), National TB Control Programme, Bangabandhu Sheikh Mujib Medical University, and Institute of Public Health, in solving their technical problems.

Animal Resources Branch
Head: A.S.M. Hamidur Rahman

The animal house provided support for research protocols and to a number of national institutions and was used for training-related visits by various other institutions. The number of
Table 2. Production and issuance of items in Animal Resources Branch

<table>
<thead>
<tr>
<th>Species/blood</th>
<th>No. produced</th>
<th>No./vol. issued</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rabbit</td>
<td>596</td>
<td>498</td>
</tr>
<tr>
<td>Guineapig</td>
<td>378</td>
<td>308</td>
</tr>
<tr>
<td>Rat</td>
<td>326</td>
<td>234</td>
</tr>
<tr>
<td>Mouse (Swiss albino)</td>
<td>9401</td>
<td>7035</td>
</tr>
<tr>
<td>Mouse (Balb/c)</td>
<td>416</td>
<td>306</td>
</tr>
<tr>
<td>Sheep blood</td>
<td>-</td>
<td>36,281 mL</td>
</tr>
<tr>
<td>Rabbit blood</td>
<td>-</td>
<td>1916 mL</td>
</tr>
<tr>
<td>Guineapig blood</td>
<td>-</td>
<td>65 mL</td>
</tr>
<tr>
<td>Chicken blood</td>
<td>-</td>
<td>65 mL</td>
</tr>
</tbody>
</table>

Research animals of different species and volume of animal blood issued to different research protocols and collaborative institutions during the year are shown in Table 2.
Public Health Sciences Division

Director

Associate Director

Division Management Office

Matlab Health Research Programme

Health and Demographic Surveillance Programme

Reproductive Health Programme

Social and Behavioural Sciences Programme

Child Health Programme

Health Economics Programme

Epidemic Control Preparedness Programme
Public Health Sciences Division

The Public Health Sciences Division (PHSD) brings the population perspective to the Centre's mission and focuses on the development and evaluation of population-based interventions to address major health problems.

The Division provides a variety of scientific skills and methods. Its research programme contributes to understanding how health and diseases are generated in the community, with a focus on vulnerable or disadvantaged groups. It searches for simple and cost-effective approaches that could be widely applied and could increase the absolute level as well as an equitable distribution of health among groups. The Division has a strong research infrastructure, including provision of primary healthcare services in rural Matlab under Chandpur district and in Chakaria under Cox's Bazar district. In Matlab, the Health and Demographic Surveillance System (HDSS) regularly updates demographic information on about 215,000 people. Besides the Matlab Health Research Programme and the HDSS, the Division has research programmes for reproductive health, child health, social and behavioural sciences, and health economics.

The broad range of research interests includes projects addressing epidemiological patterns of ill health, transmission of infectious agents (especially for diarrhoeal and acute respiratory illnesses), effects of micronutrients, public health nutrition, delivery of healthcare, prevention of illness through education, modification of risk-behaviours, vaccine trials, and community development.

The scientific staff comprises public health professionals, epidemiologists, social scientists, population specialists, and health economists. Twelve personnel of international level, 58
national officers, and 531 personnel of other categories, including 131 Community Health Workers, worked for the Division in 2000.

Matlab Health Research Programme
Head: Md. Yunus

The Matlab Health Research Programme consists of a clinical research unit, a community health research unit, and an administrative services unit. The Programme maintains a research infrastructure, including a team of well-trained village-based Community Health Workers (CHWs), four sub-centre clinics (each covering a population of 27,000) run by paramedics and a primary care hospital at Matlab. The Programme conducts clinical and epidemiological research and provides health services for diarrhoea, child health and reproductive health problems, including basic maternity care. The services are provided at the community, sub-centre clinic and hospital levels. The lessons learnt in Matlab have the potential of being formulated into policy and action not only for Bangladesh but also for other developing countries.

In the reporting year, 7,310 patients with diarrhoea received treatment at the Matlab health facility. Four of five patients came from outside the Matlab Health and Demographic Surveillance System area. Of the 7,310 patients, 1,170 (16%) required admission as in-patients in the central health facility. The overall case-fatality rate was 0.3%, compared to 0.5% in the previous year. Of 1,471 patients from the surveillance area, *Vibrio cholerae* O1 and *V. cholerae* O139 were isolated from 73 (5%) and 41 (2.8%) individuals respectively, which were less than half of what were isolated in 1999. *Shigella* spp. were isolated from 86 (11.7%) of 734 patients in the surveillance area, based on laboratory testing since July 2000. Of the *Shigellae*, 56% were *Shigella flexneri*, while no *S. dysenteriae* type 1 was isolated.

Another 11,645 patients (6,182 women of childbearing age and 5,463 children aged less than five years) were receiving services at the central MCH-FP clinic in Matlab. Thereof, 86% were treated as out-patients and 14% as in-patients. Of 385 women admitted with complications of pregnancy, 356 (92.5%) delivered at Matlab, and the remaining 29 (7.5%) were referred to the government district hospital at Chandpur. A total of 960 children, aged less than five years, were admitted as in-patients. Of them, 599 (63%) were treated for acute lower respiratory tract infections (ALRI). The case-fatality rate for ALRI was 0.67%, compared to 0.7% in the previous year. In addition, 88 malnourished patients, mostly referred from diarrhoea treatment centres, were managed in the Nutrition Rehabilitation Unit (NRU).

The Matlab Staff Clinic provided improved healthcare to members of the staff and their dependants. During the year, 4,662 patients (61% staff, 39% dependants) received treatment from the clinic, including 73 hospitalized patients. Of the 4,662 patients, 369 were referred either to Chandpur hospital or Dhaka Staff Clinic for specialized consultations. The Matlab Staff Clinic also provided periodic health examinations to 62 fixed-term employees.

Maternal child health and family-planning (MCH-FP) services, supported by the Government of Japan, were provided following
the concept of service-oriented research in the intervention area. In half of the intervention area, the CHWs provided services at the household level as before, and in the other half, at fixed-site clinics at the residence of the CHWs. In spite of the change in service-delivery strategy, more than 70% of the eligible couples continued to use family-planning methods in 2000. Men were encouraged to attend male clinics established in all four sub-centres staffed with male paramedics for sexual health problems and to learn about family planning. Condom use was 8.4% in 2000, while it was 74% in 1999. A total of 1,041 men attended the male clinics, and 85 underwent vasectomy. Support by the CHWs continued for high contraceptive use, screening and treatment of women for side-effects, and other health problems of mothers and children, with referral to sub-centre clinics and Matlab hospital for further management. A total of 11,972 women visited the four sub-centre clinics for various health problems.

Essential delivery facilities (with trained nurse-midwife) were established at the fourth sub-centre (Block A). With this addition, facilities for safe delivery were made available at all the four sub-centres. This also implied improved possibilities for safe motherhood-oriented research. A study of combined interventions in pregnant women for improved maternal health and intraterine growth using these facilities will start in early 2001. Promotional activities were carried out by the CHWs through behaviour change communication. A pictorial card was given to each pregnant woman to promote attendance at the sub-centre clinics for antenatal, delivery and postnatal care. Antenatal and postnatal care was provided at all the sub-centre clinics. During the year, 366 deliveries were conducted in the three sub-centres (Blocks B, C, and D), covering 22% of the total number of births in these three blocks. In addition, 2,426 pregnant women made 3,352 antenatal and 981 postnatal visits to the four sub-centre clinics. The services were recorded and assessed by the pictorial cards and the newly-introduced Health Cards. Ninety-seven percent of infants were immunized with BCG, 88% with three doses of DPT and polio each, 95% of children aged 9-23 months against measles, and 96% of women of reproductive age with at least two doses of tetanus toxoid. In total, 14,165 doses of vitamin A capsules were given to children aged six months to five years in two six-monthly rounds.

Three thousand five hundred eighty-nine cases of ALRI were detected (active and passive detection) by both CHWs in the community and paramedics at the sub-centre clinics. In Block A and B, the CHWs continued home management of non-severe ALRI cases with co-trimoxazole as before, and referred severe cases without giving co-trimoxazole to Matlab hospital. In Block C and D, the CHWs referred all non-severe cases to the sub-centre clinics and severe cases to Matlab hospital without giving co-trimoxazole. This strategy was monitored as part of a community-based ARI surveillance. The CHWs treated 1,435 ALRI cases and referred another 785 cases either to sub-centre clinics or to Matlab hospital. During the year, 221,501 ORS packets were distributed for management of diarrhoea at home by 'bari-mothers' (bari is a compound of houses), and 2,303 safe-delivery kits were produced and distributed to pregnant women in the area where ICDDR,B is a service provider. In the four sub-centre clinics, 4,365 infants and 7,073 children aged 1-5 year(s) were given care for various illnesses.

The International Training Centre in Matlab hosted a number of local and international courses and seminars. The training centre is also available for rent by other organizations for conferences, workshops, and retreats.

Research Highlights

Tetravalent rhesus rotavirus vaccine (RRV-TV): a randomized, placebo-controlled trial to evaluate safety and immunogenicity in infants of Matlab, Bangladesh
Pl: M. Yunus and J. Bresee
Funded By: WHO, Geneva (Vaccine donated by Wyeth-Ayerst International)

The study evaluated the safety and immunogenicity of three doses of oral RRV-TV (4x10⁵ pfu/dose) in Bangladeshi infants in Matlab. The subjects received three doses of vaccine or
placebo at 6-8, 10-12, and 14-16 weeks of age. The vaccine was found to be safe; there were no significant differences between the groups in rates of fever, diarrhea, or any other signs or symptoms. Overall, 87% of the vaccine recipients demonstrated seroconversion (4-fold rise in antibodies) based on either anti-RRV IgA using an ELISA or neutralizing antibody to RRV test. This study supports continued evaluation of this and other rotavirus vaccines. The need for a safe and effective vaccine continues, particularly for children in the poorest countries.

Evaluation of sustainability of education aimed at increased consumption of green-leafy vegetables by young children and mothers in selected poor rural communities at Matlab, Bangladesh

Pl: M. Yunus
Funded by: Swiss Agency for Development and Cooperation (SDC)

This study conducted in Matlab evaluated whether the earlier positive impact of a nutrition-education intervention had been sustained for four years after the termination of the intervention. It included households with very poor socioeconomic conditions having one child aged 6-59 months. These households had previously been given intensive nutrition education for one year. Households with similar criteria, but without intervention, served as control. Both quantitative and qualitative methods were used in the study. The earlier results showed that a significant increase was achieved in the proportion of children fed with β-carotene-rich vegetables and in the mean frequency of consumption of the relevant vegetables at the end of the intervention. After four years, no significant differences were shown, although the numerical values differed between the groups in the same direction as before. The lack of evident effect after four years may indicate that repeated nutrition education is required for a sustained effect.

Reproductive Health Programme

Head: Japhet Killewo

The Reproductive Health Programme (RHP) is mandated to address issues relating to reproductive health research in line with the Centre's mission. The goal of the RHP is to contribute to the improvement of reproductive health in Bangladesh and other developing countries through research and evidence-based policy recommendations for linking reproductive health research activities with health delivery and care. To that end, the Programme conducts research in critical and priority areas of reproductive health in various parts of Bangladesh. The Programme continued the mandated research activities and developed new research ideas in an attempt to fill the knowledge gaps in reproductive health. The Programme has also been a major beneficiary to the Centre's initiative of forming inter-divisional themes.

Research Highlights

Safe motherhood: essential obstetric care

Pl: J. Killewo
Funded by: European Union

The main objective of the project, jointly undertaken by the Government of Bangladesh (GoB) and ICDDR,B, is to develop and evaluate the impact of essential obstetric care (EOC) interventions in a rural area of Bangladesh. These interventions include establishing a comprehensive EOC facility for conducting caesarean sections at the Matlab Upazila Health Complex, and for providing basic EOC at the Union Health and Family Welfare Centres. The process and various outcomes of the interventions are monitored. All project activities are designed to take place within the GoB healthcare system. Physical renovation was completed in seven of the eight centres. Most recruitments were completed and training of essential staff initiated. Data collection was started for qualitative as well as costing studies.
Male involvement in reproductive health
Pt: J. Killewo
Co-investigators: J. Chakraborty, N. Alam, M. Yunus, K. Gausia, L. Blum, P. Nahar,
and L.A. Persson
Funded by: European Union

The objective of this project is to involve men in reproductive health issues, particularly in family planning. This intervention is testing the hypothesis that male involvement in reproductive health and family planning is dependent upon an active programme targeting adult male populations in rural Bangladesh. The intervention is being tested in Matlab, and elements of success will be propagated in other areas of Bangladesh. Collection of quantitative data was completed, and the four male clinics became fully functional during the year. Preliminary data analysis for the quantitative study has been started. In-depth qualitative studies for examining spousal communication and healthcare-related decision-making were carried out.

Prevalence and risk factors for STDs among residents at the Tejgaon truck-stand in Dhaka
Pt: N. Alam
Co-investigators: M. Rahman, M. Yunus, R. Shaheen, K. Gausia, and J. Killewo
Funded by: SDC

The objective of this project is to estimate the prevalence and risk factors for sexually transmitted diseases (STDs) and reproductive tract infections (RTIs) among residents/workers at the Tejgaon truck-stand, a crowded and high-risk area for STDs and RTIs in Dhaka. The study will also determine the healthcare-seeking practices for RTIs and STDs of the study population and the antimicrobial susceptibility of bacterial pathogens. The study population will be the adults working at the truck-stand, excluding the truck drivers and their helpers. This cross-sectional study with its three components, including a qualitative part, quantitative surveys (clinic and laboratory-based), and a case-referent approach, has completed its fieldwork phase. Data processing has been started, and the final project report is being written.

Menstrual regulation project
Pt: R. Shaheen
Co-investigators: J. Killewo, J. Chakraborty, and M. Yunus
Funded by: SDC

The project is testing the hypothesis that provision of high-quality menstrual regulation (MR) services in rural Bangladesh would increase their use and consequently decrease abortion-related complications, particularly those due to induced abortions. Baseline information was collected in 2000. Existing MR services at two Union Health and Family Welfare Centres (UH&FWCs) in Matlab was improved by providing supplies and training to Family Welfare
Visitors (FWVs) on high-quality MR services. In addition, Family Welfare Assistants (FWAs) were trained on how to recognize the safe period for seeking MR services so that they can advise their clients accordingly.

The study will compare use rates of MR services in the two intervention centres with those in four centres not provided with the services. Abortion rates in the two comparison areas will also be assessed. Care is being taken to ensure that MR is not perceived as a contraceptive method. Until the end of 2000, the facility-based records show that use rates have increased in the two centres.

Unmet Need for major obstetric interventions
PI: I. Bashir
Funded by: Belgian Technical Cooperation

The purpose of this project is to develop an appropriate tool for measuring unmet need for major obstetric interventions in Bangladesh. This tool may assist health planners in identifying the deficits in the performance of obstetric interventions and may improve maternal health policies and services, thereby reducing maternal morbidity and mortality. The study is a collaborative effort with the Unmet Obstetric Needs Network, based in Antwerp, Belgium. All formalities for project implementation, such as external review, approval by RRC and ERC, and recruitment of technical advisor, have been completed.

Combined intervention against maternal depletion and low birth-weight: issues of cost-effectiveness, compliance, and equity
PI: R. Shaheen
Funded by: Global Forum for Health Research and SIDA

Nested under the umbrella project of combined interventions against low birth-weight, this project will conduct a comprehensive economic evaluation of the umbrella project. Objectives are to conduct incremental and marginal analyses to examine the effects of adding different components to the intervention and the influence of the inclusion of different target groups on the cost-effectiveness ratios. The project also intends to explore the levels, patterns, and determinants of compliance as well as examine the broader issues of equity in achieving gains from the intervention among different groups.

Child Health Programme
Head: Shams El Arifeen

The mission of the Child Health Programme (CHP) is to contribute to the development of cost-effective child health and survival programmes by enhancing the understanding of causes of childhood morbidity and mortality and by testing cost-effective public health interventions. The objectives of CHP are to develop in-house expertise to conduct programmatically relevant child health research; collaborate with other programmes and divisions within the Centre and with national and international institutions in conducting multidisciplinary research; disseminate research findings; and assist the GoB and other partners in programme development, and policy review and analysis.

The Programme has identified these four broad areas of priority research in the child health: (a) childhood illness, including surveillance and management of common illnesses, perinatal and neonatal health, and prevention and management of low birth-weight; (b) strengthening and expansion of immunization programmes; (c) childhood growth and development, including caring, care-seeking practices, and nutritional interventions; (d) strengthening health systems for delivery of child health services.
Research Highlights

A community-based, randomized controlled trial to assess the effect of zinc supplementation in Bangladeshi children aged less than five years during diarrhoea on the clinical course of diarrhoea, subsequent diarrhoea, and acute respiratory infections morbidity and growth

Pis: S.E. Arifeen, A.H. Baqui, and R.E. Black
Funded by: USAID/CHR (JHU and ICDDR,B)

This is a community-based, prospective, randomized controlled trial to assess the effect of two weeks of zinc therapy for all episodes of diarrhoea in 3-59 months old children on the clinical course of diarrhoea, subsequent diarrhoea, and ALRI morbidity and growth. This study is based on the premise that if all episodes of diarrhoea were treated with zinc, the severity and duration in the subsequent episodes will be reduced. In addition, a positive zinc balance will be maintained in most children which, in turn, will reduce morbidity and improve growth and survival of children. Thirty areas covered by CHWs in Matlab were randomized to serve as intervention and control areas with diarrhoeal episodes among children aged less than five years. In the intervention area, the patients had access to a 14-day zinc therapy in addition to ORT through established depot holders of ICDDR,B. A morbidity and growth surveillance was instituted to measure outcomes. Data collection for the second year was completed in November 2000. Analysis of the two-year data is ongoing to assess impact on all the outcome measures, especially on child mortality. Analysis of the first 10 months' data had revealed a marked but statistically non-significant reduction in child mortality in the zinc intervention area.

Surveillance of invasive Haemophilus influenzae and Streptococcus pneumoniae diseases in Bangladeshi children and the antimicrobial resistance and serotype patterns of Hi and Spn isolates in Bangladesh [community component]

Pis: K. Zaman and A.H. Baqui
Funded by: USAID

The objectives of this ongoing surveillance are to study the epidemiology of invasive Haemophilus influenzae (Hi) and Streptococcus pneumoniae (Spn) infections to determine the prevalence and patterns of the pathogens and trends in antimicrobial resistance, and to disseminate relevant information for policy decisions. A surveillance system has been set up with 12,500 children aged less than five years in the Matlab treatment area to identify all ALRI and meningitis cases. Relevant clinical and epidemiological information is being collected from all patients attending the Matlab hospital and adjoining four sub-centres. Blood samples are obtained and cultured for Spn and Hi from all patients admitted at the Matlab hospital. Between July 1999 and November 2000, more than 9,000 patients attended the centres with symptoms of respiratory infections. Of them, 1,000 patients had pneumonia.

Safety and immunogenicity of 4x10^8 pfu tetravalent rhesus rotavirus vaccine, with or without zinc supplementation in Matlab, Bangladesh

Pis: S.E. Arifeen, M. Yunus, and J. Bresee
Funded by: USAID/CHR (JHU) and WHO (Vaccines donated by Wyeth-Ayerst International)

The study was designed to assess the safety and serological response of three doses of oral tetravalent rhesus rotavirus vaccine (4x10^8 pfu/dose) in Bangladeshi infants, given with or without zinc supplementation and to test the hypothesis that simultaneous daily zinc supplementation will significantly improve the immunogenicity of the RRV-TV rotavirus vaccine in infants. The final report has been prepared and will be published shortly. Two-thirds of the six-week old infants who did not receive zinc supplement had serum zinc levels less than <9.18 μmol/L compared to only 10% of those who were started on daily supplementation two weeks prior to testing. Daily zinc supplementation appeared to have a marginally significant positive effect on seroconversion to the rotavirus vaccine among those with weight-for-age z-score of <-1.0.
A community-based, randomized controlled trial to assess the efficacy of iron and/or zinc or a micronutrient mix supplementation to reduce anaemia and morbidity and to improve growth and development in Bangladeshi infants

Pls: K. Zaman and A.H. Baqui
Funded by: USAID/CHR (ICDDR,B) and Nutricia Foundation, The Netherlands

This is a community-based, prospective, double-blind, randomized controlled trial to evaluate the efficacy of weekly supplementation of iron and/or zinc or a micronutrient mix in infants for six months, beginning at six months of age. Five groups: (1) 20 mg iron with 1 mg riboflavin, (2) 20 mg zinc with 1 mg riboflavin, (3) both iron and zinc with riboflavin, (4) a micronutrient mix, and (5) riboflavin only (placebo) are being studied. The study is being carried out in the Matlab surveillance area of ICDDR,B. The following outcome variables are being measured: (a) iron status, (b) zinc status, (c) copper status, (d) diarrhoeal morbidity, (e) growth, and (f) cognitive, psychomotor, and behavioural development. Eight hundred children have been enrolled in the study. Trained Community Health Workers have been conducting weekly morbidity surveillance. A trained psychologist has been assessing mental and psychomotor development in a 50% sample of infants at the start and the end of the follow-up period (6 months). Blood samples are being collected for measurement of haemoglobin, serum transferrin receptor (sTfR), ferritin, zinc, and copper.

An evaluation of the health and economic impact of Integrated Management of Childhood Illness (IMCI), Matlab, Bangladesh

Pl: S.E. Arifeen
Funded by: WHO

This five-year study is part of WHO's Multi-country Evaluation of Integrated Management of Childhood Illness (IMCI). The study is being implemented in Matlab in collaboration with the GoB. It was designed to evaluate the impact and cost-effectiveness of IMCI. Selected first-level facilities of the Government and ICDDR,B at the upazila, along with their catchment areas, will be stratified and randomly selected for IMCI intervention or as control. In the intervention facilities, IMCI services will be made available. Local community-based field staff will be used in implementing an intensive community-education intervention for improved care-seeking in the catchment areas of the intervention facilities. In the control facilities and their catchment areas, existing government and ICDDR,B services will continue. The impact of IMCI will be evaluated in terms of changes in health status, including mortality and outcomes of nutrition status. Baseline household and facility surveys were completed in 2000.

An effectiveness study of *Haemophilus influenzae* type b vaccine

Pls: S.E. Arifeen and A.H. Baqui
Funded by: Urban Primary Health Care Project of the Government of Bangladesh (financed by Asian Development Bank) and Aventis Pasteur International

The study aims at providing data to facilitate the introduction of the *Haemophilus influenzae* type b (Hib) conjugate vaccine in Bangladesh by showing that the vaccine will substantially reduce the burden of pneumonia and meningitis in less than two-year old children as well as providing estimates of cost-effectiveness of the vaccine. As part of the study, a combination of Hib conjugate and adsorbed DPT vaccine (TetractHib) manufactured by Aventis Pasteur International is being provided through selected clinics in Zone 6, 7, and 8 of Dhaka City Corporation, covering approximately 50% of the study area. Clinical and laboratory-based surveillance has been set up in five clinics and hospitals in the study area, and the mothers are being motivated to bring children with signs of severe pneumonia or meningitis to these clinics. Two hospital-based and four matched community controls are being selected for each confirmed case of Hib pneumonia, radiologic pneumonia, or Hib meningitis.
Epidemiology and surveillance of multi-drug resistant Mycobacterium tuberculosis and assessment of directly observed therapy short course programme in selected areas of Bangladesh

PI: K. Zaman
Funded by: USAID

The objectives of the study are to: estimate disease burden due to tuberculosis; determine transmission patterns and risk factors; determine the prevalence and patterns of, and trends in, antimicrobial resistance; undertake an assessment of directly observed therapy short course (DOTS); and provide technical assistance to build the capacity of national institutions.

The study is being conducted in rural Matlab and urban Dhaka. A tuberculosis surveillance system is being set up within the HDSS area of Matlab. Data on suspected cases of tuberculosis (cough for >3 weeks) will be collected by the CHWs through home visits. Sputum samples from Matlab will be transported to Shyamoli TB Clinic in Dhaka for determining drug-susceptibility patterns. To estimate and monitor antimicrobial resistance, a surveillance system is being set up in the Shyamoli TB Clinic. Both new tests and conventional methods will be used for culture and for determining drug-susceptibility patterns against TB. In addition, family and case-control studies will be conducted both in Dhaka and Matlab to determine transmission patterns and risk factors. One consultant from the Government and a microbiologist from the Centre have recently completed training on TB culture techniques from the Madras TB Reference Laboratory. Setting up of a laboratory in Shyamoli TB Clinic has been initiated.

Impact of food and micronutrient supplementation in rural Bangladeshi pregnant women on the birth-weight of their newborns

PIs: L.A. Persson, G.J. Fuchs, and S.E. Arifeen
Funded by: UNICEF and NIH (USA)

This study will assess the effectiveness and impact of combined food and micronutrient supplementation in Chowddagram and Kapasia upazillas included in the last phase of the Bangladesh Integrated Nutrition Project (BINP) of the Government. The study is being conducted in collaboration with BRAC and the BINP. Some unions of each upazilla will be randomly selected for early or late initiation of the project activities. Pregnant women in these unions, identified in their first trimester during the first three months of the study, will be enrolled. Thus, pregnant women in the early-starting unions will receive supplementation for most of the pregnancy period, while those living the late-starting unions will not. The women will be followed throughout pregnancy and delivery. The outcome variables to be measured include: weight in early pregnancy, weight after pregnancy, and birth-weight of the newborn. An intent-to treat analysis will be performed and expressed as impact of the programme (comparing birth-weights in supplemented and non-supplemented women) and effectiveness of the programme (comparing weights of participating women with weights of non-supplemented women). In 2000, preparatory work for the project was done.
Combined interventions to promote maternal and infant health: a study in Matlab

PIs: L.A. Persson, G.J. Fuchs, and S.E. Arifeen
Funded by: UNICEF

Preparatory activities of this study started in 2000. The study is designed to evaluate combinations of four types of interventions among a single group of approximately 5,000 under-nourished women who live in Matlab upazila of Bangladesh. An ongoing surveillance programme identifies pregnant women within 6-8 week of conception and an ongoing government programme (BINP) provides a daily food supplement to pregnant and lactating women.

The four interventions are: (1) Food Supplementation—where pregnant women will be randomly assigned to receive advice to enroll in the food supplementation programme (a) immediately after diagnosis of pregnancy or (b) at the time of their choosing; (2) Micronutrient Supplementation—where all pregnant women will be randomly assigned to receive a pill that contains (a) 30 mg iron and 400 mg folic acid or (b) 60 mg iron and 400 mg folic acid, or (c) 30 mg iron, 400 mg folic acid, and 13 additional micronutrients; (3) Treatment for Bacterial Vaginosis—where all women will be screened for Bacterial Vaginosis (BV). Asymptomatic BV-positive women will be randomly assigned to (a) 250 mg metronidazole orally thrice daily for seven days or (b) lactose tablets given with the same dose frequency; and (4) Exclusive Breast-feeding Counselling—where the women will be randomly assigned to receive either (a) counselling for exclusive breast-feeding or (b) a different health education message of equivalent intensity. Monitoring of compliance and combination of the interventions makes it possible to analyze doses, effects, and interactions among the interventions.

Health and Demographic Surveillance Programme
Head: Peter Kim Streatfield

The Programme, designed to evaluate the impact of different health and socioeconomic interventions, has two functional units: (1) Health and Demographic Surveillance System (HDSS) and (2) Geographic Information System (GIS). The demographic surveillance in Matlab started in 1966; surveillance of health conditions (record-keeping system) was added in 1978 in half of Matlab; and the GIS started in 1994. The system for collecting demographic data on more than 200,000 people for over 30 years is the longest-running demographic surveillance system in the developing world.

In 2000, the major activity of the Programme was the modernization of the Matlab Health and Demographic Surveillance System (1998-2001) Project, funded by the Department for International Development (DFID), UK, which is integrating the collection and management of all demographic, health and GIS data. The scientists of the Programme have also undertaken other studies on population, reproductive health, including family planning and maternal and child health.

Since January 2000, female CHWs have been collecting all health and demographic data directly throughout the entire Matlab area. The working unit areas of the CHWs have been reorganized, consistent with the change in their working conditions and upgraded status. The data-collection instruments (record-keeping books and census volumes) have been modified so as to facilitate direct data entry into computers and to ease the burden for the CHWs in the field.

A number of significant changes have been made in field management to maximize data quality, including the creation of an independent quality control team. There has been an increase in the number of routine group visits to households by the CHWs and supervising field research assistants and field research officers. The integration of the RKS data into the DSS database has been completed so that all data are now merged and more easily accessible. Documentation on the entire HDSS database is now complete and is being installed online as well as in hard copy.
In place of the previous 'physical' periodic door-to-door censuses, an electronic census is currently being conducted for the first time, following an updating of all baris. It is expected that in future the periodic censuses will be conducted in more efficient manner. Additional information (e.g. on socioeconomic factors) will be gathered through periodic modular surveys.

**Development versus family-planning argument for fertility decline in Bangladesh**

*PI: R. Bairagi*

*Funded by: WHO and Commission of the European Communities*

During the last two decades, the decline in fertility in Bangladesh has been remarkable. Many people believe that the national family-planning programme of the country made this decline possible, but others do not agree with this view. This study investigated these two opinions critically, using data from the Matlab DSS and RKS. It concludes that an effective family-planning programme can lower abortion substantially and bring down fertility to a certain level. However, without a change in fertility preference, further emphasis on family planning might be countered by other proximate determinants of fertility, such as abortion. To expedite the completion of the demographic transition in a developing country, both development and reproductive health services are essential.

**A comparison of house-to-house visit versus fixed site for family-planning service delivery**

*PIs: M.A. Khan, M. Begum, M.K. Barua, M. Islam, and R. Bairagi*

*Funded by: Commission of the European Communities*

Bangladesh has a very successful family-planning programme, and is considered to be a model for other developing countries. However, the door-to-door service-delivery system of this programme has been found to be expensive and may not be sustainable in the future. The Government of Bangladesh decided to withdraw the system and introduced a new service-delivery system operating from fixed-site centres called Community Clinics (CCs). Clients will have to come to these clinics for services. This study investigated the effects of the CCs on the contraceptive prevalence rate and contraceptive method-mix in Matlab. The initial results of the study suggest that this change in the family-planning service-delivery system from house-to-house to the CCs will not have significant effect on the contraceptive prevalence rate and method-mix in the country.

**Contraceptive use in Bangladesh with special focus on condom: socioeconomic correlates and future implications**

*PIs: M. Islam and R. Bairagi*

*Funded by: Commission of the European Communities*

The use of condom is surprisingly low in developing countries, including Bangladesh. This study investigated the socioeconomic correlates of contraceptive use with special reference to condom use in rural Bangladesh. Data for this study were obtained from the Matlab MCH-
Some PHSD scientists in a tea garden at Srimangal, Sylhet, during a retreat to discuss future research. The field workers deliver MCH-FP services and collect data on health and family planning through monthly home visits. The results of this study suggest that development, particularly women's education and higher socioeconomic status, seem significant in increasing the use of condoms, and thus, also for preventing AIDS.

FP area where ICDDR,B has been providing a comprehensive MCH-FP services for approximately 100,000 people since 1977. Data for this study came from the Matlab MCH-FP area. A case-control study (where pill-failure was considered a case, and no-failure was considered a control) was used for quantitative data collection. The following appear from both quantitative and qualitative data as risk factors for pill failure: limited mobility of women, poor knowledge about the effectiveness of both pill and drop-out of pill, gap between the use of the subsequent packets of pills, delay in starting pill after menstruation, not taking any measures consistently for missing pills, and not following the arrow sign given on the packet of pills. It is concluded that proper training to the service providers and to the users will bring down the adverse effects of the variables identified as risk factors of pill failure in this study.

Pill-failure vs no-failure: do knowledge and practice differ?
Funded by: Commission of the European Communities

Pill is the most popular method in Bangladesh, but its failure is very high. Data for this study came from the Matlab MCH-FP area. A case-control study (where pill-failure was considered a case, and no-failure was considered a control) was used for quantitative data collection. The following appear from both quantitative and qualitative data as risk factors for pill failure: limited mobility of women, poor knowledge about the effectiveness of both pill and drop-out of pill, gap between the use of the subsequent packets of pills, delay in starting pill after menstruation, not taking any measures consistently for missing pills, and not following the arrow sign given on the packet of pills. It is concluded that proper training to the service providers and to the users will bring down the adverse effects of the variables identified as risk factors of pill failure in this study.

Effects of quality characteristics of field workers upon contraceptive-use dynamics in rural Bangladesh
Pls: M. Islam, M.K. Barua, and R. Bairagi
Funded by: Commission of the European Communities

The study focuses on a new dimension of quality of care: quality characteristics of family-planning workers and their effects on contraceptive prevalence rate, continuation, and failure. Data for this study came from the Matlab MCH-FP area. The results suggest that quality characteristics of workers have significant effects on each of the components of contraceptive-use dynamics. Among the eight characteristics, innovative technique in communication, regularity of work, accuracy of record-keeping and conformity to social norm are the most effective quality characteristics of family-planning field workers. The programme managers, policy-planners, and training specialists should consider these characteristics in designing the family-planning programme and relevant training courses.

Use of periodic abstinence method of contraception in Bangladesh: do the users really understand?
Pls: N. Kamal, M.A. Khan, U.R. Saha, and R. Bairagi
Funded by: Commission of the European Communities

Data from a national representative study (BDHS 1996-1997) were used for identifying significant predictors of the use of periodic abstinence for contraception in comparison with other modern methods, including terminal methods. The study finds that the women in Bangladesh use modern methods mostly during their peak reproductive years and that some
switch to periodic abstinence after reaching menopause. These women tend to be more from educated and higher socioeconomic background and having at least one living son. Another set of data from the Matlab DSS area was analyzed with similar results, indicating that higher field worker coverage did not dramatically change the characteristics of the users of periodic abstinence method. Data revealed that 75% of women in the Matlab comparison area and 18% in the MCH-FP area were incorrectly using the periodic abstinence method. The study emphasized that the periodic abstinence method be used correctly.

Dynamics of induced abortion in rural Bangladesh
Funded by: Fogarty Fellowship (USA) and ICDDR,B

The study aims at understanding the dynamics of induced abortion through quantitative and qualitative approaches and examining the health and other consequences of induced abortion. Three DSS datasets have been used for this study, including an in-depth qualitative case study during 1992-1997. The results indicate that induced abortion is very widely practised and is acceptable to the people of rural Bangladesh. The relatively lower level of reliance on induced abortion in the Matlab treatment area suggests that a well-designed and well-implemented reproductive health services programme may help reduce the need for induced abortion. Bangladeshi policy-makers should design appropriate and realistic programmes to focus on the use of long-term and permanent methods of fertility control to reduce reliance on induced abortion. Intensive advocacy is required at all levels to strengthen MR services and achieve the reproductive health goals.

Mortality due to violence against women of reproductive age in rural Bangladesh
Pls: M.K. Ahmed, A. Razzaque, and N. Alam
Funded by: ICDDR,B

The objective of this study is to investigate the risk factors and circumstances of deaths from violence against women of reproductive age in rural Bangladesh. Data are presented on deaths of women due to violence and other causes derived from a longitudinal, population-based surveillance system in operation in a rural area of Bangladesh during 1982-1998. Risk of death from other causes decreased while that from violence remained unchanged during the study period. Death from violence was more frequent among both men and women of reproductive age. However, lower parity, never-married women, and a shorter age difference between spouses were associated with violence causing deaths. The underlying causes of suicidal and homicidal deaths among women of reproductive age are mostly social. Change of social context is an absolute necessity as violence and its painful consequences are becoming more prominent in the society.

Abortion among adolescents: a view from rural Bangladesh
Pls: M.K. Ahmed and A. Razzaque
Funded by: ICDDR,B

The study examines the levels of, and trends in, abortion among adolescent girls and to identify risk-groups of adolescents who are prone to abortion. Data for this study were obtained from the Matlab DSS for the period covering 1982-1998 when there were approximately 125,000 pregnancy outcomes, of which 319 were abortions among adolescents. Young married adolescent girls who had a higher abortion rate also had a higher incidence of post-abortion marital dissolution than that of their counterparts. The abortion rate increased sharply for adults and moderately for adolescents. Practice of abortion was higher among young women (both adults and adolescents) who have had some formal education and increased with pregnancy order. The incidence of abortion was higher among users of contraception than non-users, and users of less effective methods had higher abortion rates than among users of more effective methods. Sex education for adolescents, increase in age at marriage, and counselling for married adolescents are likely to reduce abortions and improve the reproductive health of adolescents.
Correlates of timing of induced abortion in rural Bangladesh
PI: M.K. Ahmed
Funded by: ICDDR,B

The timing of abortion can minimize morbidity and mortality. Factors regarding the timing of induced abortion were investigated. Data for this study were obtained from DSS covering the 1991-1998 period. The difference in the timing of induced abortion is an outcome of the interactions of a variety of factors. Procedures used for abortion were significantly related to the timing of induced abortion. Again, women living in the comparison area, who sought abortion by a traditional method, were at greater risk of having an induced abortion in the third or late months of pregnancy. Findings of the study suggest that the MCH-FP services should be ensured, and facilities for modern methods for abortion should be made available so as to have abortion performed in proper time, thus lowering abortion-related morbidity and mortality.

Women, households, communities and care of sick children in rural Bangladesh
Funded by: ICDDR,B and Fogarty Fellowship (USA)

The study examines the relationship between women’s position in the household, in the community and the care of children with acute illnesses in Matlab, Bangladesh, using data of the Matlab Health and Socioeconomic Survey (MHSS) conducted in 1996. Women's position is indicated by education, domestic autonomy, inter-dependence among women folk in the family, and prestige in compliance with traditions of seclusion, membership in credit schemes, social organizations, and household structure. The results show that children are more likely to be treated by healthcare providers as opposed to home-care if their mothers have some education and a comparatively high social position. Treatment for illnesses by healthcare providers varies among villages, and inter-village variation in women's social position accounts for this. Membership in micro-credit programmes benefits some aspects of women's status but does not lead to better healthcare for their children. Household socioeconomic status is the strongest predictor of use of medical doctors as opposed to village quacks. Inter-village variation in the use of well-trained healthcare providers is explained by access to such providers. A higher level of schooling of women in a village raises their use even further. The results suggest that mass improvements in women's education and social position and upgrading the quality of healthcare would increase health-service use in rural areas of Bangladesh.

Levels and determinants of, and trends in, adult mortality in Matlab, Bangladesh
PIs: A. Razzaque and P.K. Streetfield
Funded by: ICDDR,B

An analysis of the Matlab DSS data shows that the level of mortality for both young (20-44 years) and elderly (45-59 years) adult groups has declined in both the groups over the study period (1982 to 1998). For young adults, the mortality rate (per 1,000 population) declined from 2.7 to 2.1 in the treatment area compared to 3.4 to 2.1 in the comparison area. For elderly adults, the mortality rate declined from 18.2 to 9.1 in the treatment area, compared to 14.1 to 9.1 in the comparison area. After controlling for a number of variables in the regression model, mortality of young adults was higher among those who owned no household items and those who had no education. For elderly adults, mortality was higher for those who owned no household items, those who had no education, and for males, Hindus, and those in the comparison area.

Supply and demand factors in fertility decline in Matlab, Bangladesh during 1977-1998
PIs: J.K. van Ginneken and A. Razzaque
Funded by: Netherlands Integrated Demographic Institute (NIDI) and ICDDR,B

The supply factor (family-planning programme) contributed to a considerable decline in fertility.
in Matlab but the demand factors (socioeconomic), with the exception of attitude toward family size, had only a limited impact. An important factor in the fertility decline was the change in attitude toward the feasibility and acceptability of family planning, which has taken place in the past 25 years. An implication of this finding for the future is that fertility will decline further only when there are simultaneous improvements in both supply and demand factors.

**Do better family-planning services reduce abortion? Evidence from Bangladesh**

Pls: M. Rahman, J. DaVanzo, and A. Razzaque
Funded by: Futures Group International

Higher levels of contraceptive use in the intervention area have led to lower levels of unintended pregnancy and hence to lower levels of abortion than in the comparison area. The likelihood that an unintended pregnancy will be aborted has increased in both areas but reduction in the incidence of unintended pregnancies in the intervention area offsets this increase.

**Social and Behavioural Sciences Programme**

Head: Abbas Bhuiya

The Social and Behavioural Sciences Programme continued to fulfil its mandate by carrying out relevant research, providing support to other studies, developing staff capacity, and participating in national and international activities. During 2000, two of six studies were completed. A new study on monitoring health equity in Bangladesh was designed and fund received from the Rockefeller Foundation. The Programme also made a special effort to collaborate with other programmes within the Centre.

**Impact of social and economic development programmes on health and human well-being: BRAC-ICDDR,B Joint Project at Matlab**

Pls: A. Bhuiya and A.M.R. Chowdhury
Funded by: Ford Foundation and Rockefeller Foundation

Data on 12,000 households obtained from the impact-evaluation survey of the poverty-alleviation programme carried out last year are being analyzed. Information on economic conditions, morbidity, reproductive and healthcare-seeking behaviour, and nutrition status was collected. Findings from this survey will provide opportunities to assess the impact of poverty-alleviation programmes on different aspects of human well-being. The Rockefeller Foundation has funded the third phase of this project for two years.

**Use of direct recording scale to involve mothers in monitoring the growth of their own children**

Pls: A. Bhuiya and S. Rasheed
Funded by: World Bank

The objective of the study was to use direct recording scale (DRS) to involve mothers in monitoring the growth of their children. Children aged less than two years and their mothers were the study subjects. The project inputs included supply of one DRS to each group of 10-15 mothers who were trained to use DRS and interpret the growth curve. Both qualitative and quantitative data were collected. The result indicates that most mothers were willing and able to monitor growth by themselves. Data are being analyzed.

**Improvement of health through a community development-oriented programme in rural Bangladesh: Chakaria Community Health Project**

Pl: A. Bhuiya
Technical Adviser: A. Beerling
Funded by: Swiss Red Cross

The Chakaria Community Health Project continued its effort to improve community health
through promotion of health initiatives by indigenous village-based self-help organizations. The major activities included provision of support to the community initiatives on curative and preventive services and strengthening of the self-help organizations. The Swiss Red Cross extended its support to the Project for another three years.

**Qualitative research for community-based management of malnutrition**  
Pls: L. Blum and P. Nahar  
Funded by: World Bank

The study delineates sociocultural factors contributing to child malnutrition in low-income neighbourhoods in Dhaka and assesses the feasibility of home management of severe malnutrition. In-depth interviews were carried out in households with caretakers of both better-nourished and severely-malnourished children. Based on the results, intervention strategies designed to facilitate the home management of malnourished children will be developed and tested during the second phase of the Project.

**Women's health and domestic violence against women**  
Pls: R.T. Naved and S. Azim  
Co-investigators: L.A. Persson and A. Bhuiya  
Funded by: Urban Primary Health Care Programme

This two-year project, jointly undertaken by ICDDR, B and Naripokkho, a women's activist organization, explores: forms of domestic violence against women; risk and protective factors; women's coping strategies; and physical and mental health consequences of domestic violence against women. The study uses both qualitative and quantitative research methods and covers both urban and rural areas. Collection of qualitative data is almost completed; data analysis is underway; and preparations for survey are being made.

**An action research into positive and negative deviance in child nutrition in rural Bangladesh**  
Pls: R.T. Naved and S. Rasheed  
Funded by: World Bank

The study explores caring practices contributing to child nutrition over a period of 26 months. The exploratory phase of the study has been completed and a specific programme developed. Training has been conducted for programme implementation, and work has begun in seven villages of Saturia upazila under Manikgonj district.

**Situation assessment of male-to-male sex in Chittagong for STD/HIV intervention**  
Pls: S. I. Khan and A. Bhuiya  
Funded by: SDC

The project explored the situation of male-to-male sex, especially in terms of the male sex trade in Chittagong city, with an ultimate objective of designing an intervention in the context of STD/HIV transmission in Bangladesh. Both qualitative and quantitative research methods were employed. Data are being analyzed. In contrast to the western script of globalized gay culture, male-to-male sex in Bangladesh has its own local patterns and ways of operation. It is expected that findings of this project would help government organizations and local NGOs to design and implement a culture-sensitive STD/HIV intervention for gays in Bangladesh.

**Sexuality, risk and HIV/AIDS: adolescents in Bangladesh**  
Pi: L. Muna  
Funded by: SDC

The aim of the study is to examine adolescent sexuality in the cultural context of Bangladesh with a specific attention to risk-behaviour in relation to HIV/AIDS. Eighty in-depth interviews were conducted with unmarried, school-going adolescents in Dhaka and information obtained on places where adolescents most frequently meet. The data are being analyzed.
Health Economics Programme
Acting Head: Abbas Bhuiya

The overall goal of the Health Economics Programme is to establish a resource base at the ICDDR,B for conducting policy-oriented research and training on application of state-of-the-art technical tools and methodology in the field of health economics. In addition to costing of different health interventions, the Programme carries out economic evaluation of child health, nutrition and reproductive health interventions in collaboration with other programmes of the Centre. It also looks into equity issues regarding access to healthcare services and analyses fairness in healthcare financing.

Cost-effectiveness of nutritional intervention activities in rural Bangladesh
PIs: S. Ahmed, M.M. Khan, Z. Quayyum, and S.K. Roy
Funded by: World Bank

The main purpose of the study is to examine the cost-effectiveness of Bangladesh Integrated Nutrition Programme (BINP) activities. The project aims at formulating policy regarding resource allocation and strengthening the interventions. A baseline survey was conducted, and collection of longitudinal data on health outcomes is ongoing.

Healthcare-seeking behaviour and willingness and ability to pay for health services and costing of ESP components delivered through NGO-run facilities of Rural Service Delivery Partnership
PIs: S. Ahmed, M.M. Khan, and Z. Quayyum
Funded by: USAID

The main objective of the study is to contribute to pricing policy of the Rural Service Delivery Partnership (RSDP) for various components of ESP, considering unit cost of services and clients' willingness and ability to pay. Ingredient-based costing technique was used for estimating total recurrent and capital costs, and time allocation methods were used for calculating unit cost of each component.

Epidemic Control Preparedness Programme
Head: A.K. Siddique

The overall objectives of the Epidemic Control Preparedness Programme (ECPP) are to: (a) improve the understanding of the epidemiology of cholera; (b) understand the factors that determine the seasonality of cholera in endemic areas; (c) develop models for the prediction of outbreaks; and (d) improve methods of intervention to slash epidemics. To achieve these objectives, the ECPP conducts: (1) surveillance to study epidemiology and ecology of cholera at sentinel sites in Bangladesh in collaboration with environmental microbiologists; (2) epidemiological investigations of cholera outbreaks in collaboration with GoB health services to monitor occurrence, distribution of epidemic strains of V. cholerae O1 and O139 and related drug-sensitivity patterns.
During January-November 2000, a total of 381,835 cases and 208 deaths from acute watery diarrhoea were reported in the country by the GoB health services. The total number of cases reported during the year was significantly lower than that reported for the previous year (Fig. 1).

The ECPP conducted rapid assessment in 41 upazilas of eight southern districts (Pirojpur, Jhalokathi, Barisal, Patuakhali, Borguna, Noakhali, Bhola, and Bagerhat). Cholera epidemic was confirmed in 24 upazilas (59%). In total, 222 acute watery diarrhoea patients were identified and treated by the ECPP team during the field investigations. Specimens of 145 patients were cultured at the ICDDR,B laboratory at Dhaka. *V. cholerae* was isolated from 41% of the specimens. *V. cholerae* O1 accounted for 92% of the isolates, and the remaining 8% were *V. cholerae* O139. Earlier, re-emergence of biotype El Tor Inaba in the northern areas was noted. This trend was also observed in the southern districts where nearly half of the O1 isolates were Inaba. Epidemic strains of *V. cholerae*...
O139 were isolated from five southern upazilas. In the last 24 months, the ECPP identified epidemic strain of V. cholerae O139 in 13 (5 coastal and 8 non-coastal) upazilas. This observation suggests that V. cholerae O139 is spreading in Bangladesh. All V. cholerae isolates were sensitive to tetracycline and erythromycin, but were resistant to co-trimoxazole.

**Surveillance for cholera in Bangladesh at sentinel sites**

_Pi_: A.K. Siddique  
_Funded by_: National Institutes of Health (NIH) and UNOCAL

The ECPP is continuing the cholera surveillance at six sentinel sites all over the country (Map). Both clinical surveillance and environmental surveillance are being conducted at Chattak, Bakerganj, Chaughacha, and Matlab. The cholera study in these sites is supported by grants from the NIH. In Iswarganj and Begumganj, the ECPP conducts clinical surveillance only, which is supported by UNOCAL. In total, 1,214 diarrhoea patients were identified (93% were acute watery diarrhoea) during 333 days of surveillance during January-November 2000. Specimens of 951 patients were cultured for V. cholerae O1 and O139. Over 8% of the specimens cultured were positive for V. cholerae. V. cholerae O1 accounted for 86% of the isolates. V. cholerae O139 was isolated from three sites. During the past three years, a difference in seasonality of cholera was observed among different geographical locations. This was also noted during 2000 (Fig. 2). In the north-eastern and north-central areas, cholera was isolated during monsoon and post-monsoon months (August-November). However, in the south-central and southern areas, cholera was present nearly throughout the year. A preliminary finding from the environmental and clinical studies suggests that certain environmental parameters would be useful in predicting cholera outbreaks in various areas of Bangladesh.

**Entomological assessment during the dengue outbreak in Dhaka city**

_Pis_: Y. Wagatsuma and M. Ashraf Uddin  
_Funded by_: USAID and Duncan Brothers Ltd.

In response to the outbreak of dengue fever and dengue haemorrhagic fever, a larval survey was conducted from 19 August to 11 October in all administrative wards of Dhaka City Corporation (DCC) and in Kamrangir Char to generate information on breeding habitats and density of Aedes mosquitoes. In total, 9,462 houses were inspected to record the number and types of wet containers where Aedes mosquito may breed. Larvae from positive containers were collected and brought to the laboratory for identification of species. In total, 40,786 wet containers (with water) were checked, of which 2,259 were positive with _Aedes aegypti_ and/or _Aedes albopictus_ larvae, yielding a Container Index of 5.5. Of the 9,462 houses inspected, 1,311 were positive for _Aedes aegypti_ and/or _Aedes albopictus_, resulting in a House Index of 13.9. The overall Breteau index was 22.6 (range 0-94 by ward; 11 wards showed very high index of more than 50). The results indicate that high density of _Aedes_ mosquito is a significant risk factor of dengue transmission in the Dhaka city.

**Surveillance for dengue viral disease in Bangladesh**

_Pis_: A.K. Siddique and M. Rahman  
_Funded by_: USAID

The ECPP has planned to initiate a surveillance of dengue and dengue haemorrhagic fever which emerged as epidemic disease in Bangladesh. The objective is to study the epidemiology (clinical and serological) of dengue in Bangladesh, thus contributing to the efforts of the GoB health services to improve preparedness and to develop intervention strategies.
Fig. 2: Watery diarrhoea (WD) cases and detection of *V. cholerae* at sentinel sites: Bangladesh, 2000 (333 days of surveillance)
Programme on Infectious Diseases and Vaccine Sciences
Head: Robert F Breiman

The Programme on Infectious Diseases and Vaccine Sciences (PIDVS) was established in the summer of 2000. It is a Centrewide cross-cutting activity to facilitate and focus the Centre's expanding role in the prevention and control of infectious diseases in Bangladesh and other developing countries. Particular emphasis is placed on epidemiology, clinical and laboratory research, and vaccine evaluation. The PIDVS is setting priorities and identifying resources. Further use of existing resources will enhance the Centre's capacity to reduce suffering and mortality from key infectious diseases through investigations relevant to prevention.

The Programme coordinates the ongoing investigations addressing key emerging infectious diseases in Bangladesh and surrounding region. These investigations include: epidemiology of ALRI, including studies to assess the magnitude and impact of drug-resistant respiratory pathogens; magnitude of tuberculosis prevalence, drug-resistant Mycobacterium tuberculosis, and the effectiveness of control programmes using directly observed therapy; surveillance for novel and emerging strains of diarrhoeal pathogens; optimal therapy and strategies for prevention of drug-resistant STDs; epidemiology of malaria, including drug-resistant strains; and impact of dengue and dengue haemorrhagic fever. The Programme is implementing a multi-faceted emergency project to address the recent outbreak of dengue fever and dengue haemorrhagic fever in Bangladesh, calling upon expertise throughout the Centre. The dengue projects involve cross-divisional efforts focused on assessing the incidence and risk factors for the disease, vector surveillance and investigations focused on reducing the density of Aedes mosquitoes.

The Programme also directs the ongoing or recently-completed studies of a live Shigella vaccine (SC602) and an enterotoxigenic E. coli vaccine. The PIDVS is working with the International Vaccine Institute in Seoul, Korea, to facilitate investigation of vaccines to prevent diseases of the most impoverished nations (OMNI). The diseases include cholera, typhoid, and dysentery due to Shigella. The PIDVS provides support to the proposed or ongoing studies for evaluating vaccines against respiratory infections, including Streptococcus pneumoniae, H. influenzae type b (Hib), respiratory syncytial virus (RSV), diarrhoeal pathogens (including rotavirus), and dengue. An evaluation of safety and immunogenicity of a new live rotavirus vaccine, originally isolated from a human, will begin soon. The PIDVS will also lead an evaluation of the safety and effectiveness of vaccines currently administered to children in WHO's Expanded Programme on Immunization (EPI), using the existing surveillance data from Matlab and will work with the GoB and WHO to evaluate the acceptability and impact of vaccines that are newly introduced into EPI, i.e. hepatitis B vaccine, proposed for introduction during 2001.

The PIDVS is preparing the Centre to be able to evaluate new vaccines important for Bangladesh when these become available. These include vaccines for TB and malaria and new-generation pneumococcal and dengue vaccines. Many of the efforts of the PIDVS will be directed toward operations research programmes consistent with the ICDDR,B's new operations research workplan.

The PIDVS, in collaboration with the Centre's training staff, will develop programmes for conducting seminars, forums, and training relevant to infectious disease and vaccine research. The PIDVS also maintains scientific working groups on infectious diseases and vaccines to nurture collaborative efforts and to ensure that all available resources are ideally focused and be made effective.
The strong infrastructure at ICDDR,B provides opportunity for the Centre to be a global leader in addressing priority research questions regarding a wide array of key infectious diseases in developing countries.

Research Highlights

Efficacy of zinc supplementation in young infants with acute watery diarrhoea
PI: W. Abdullah Brooks
Funded by: USAID/JHU

The efficacy of 5 vs 20 mg zinc in reducing duration and severity of acute watery diarrhoea in infants aged less than six months is being assessed. This is a double-blind, randomized placebo-controlled clinical trial. Data collection for this study ended on 31 December. As of 30 November, 265 of 292 infants had been included. The withdrawal rate remained at 10%. The mean duration of stay was 5.9 days, and there had been no deaths.

Controlled trial to prevent acute lower respiratory tract infection and diarrhoea with zinc supplementation in children of less than two years
PI: W. Abdullah Brooks
Funded by: SDC, CHR (USAID), and JHU (USAID)

This community-based, double-blind, placebo-controlled trial employing weekly home surveillance is aimed at determining the efficacy of 70 mg/week of zinc vs placebo to prevent/reduce the incidence of pneumonia in 1,614 children aged less than two years, supplemented for one year. The study has enrolled 1,979 children. There were 384 (19%) outmigrations and 268 (15%) withdrawals from the study. Thirty-nine (2%) children dropped from the study after enrollment because of severe baseline illness (mainly tuberculosis), and there were 25 (1%) deaths. The crude incidence of pneumonia was 2.3 episodes/child per year; that of acute watery diarrhoea was 2.2 episodes/child per year. Data collection has been completed, and analysis is underway.

Emergency dengue surveillance among urban slum residents in Kamalapur, Dhaka:
assessing disease burden and risk factors
PI: W. Abdullah Brooks
Funded by: USAID

This ongoing study aims at determining the burden of disease (incidence and prevalence) in the urban slum population in Kamalapur, Dhaka and identifying risk factors associated with dengue fever and dengue haemorrhagic fever (host, pathogen, and environment). This is a part of the Centre’s multi-faceted dengue emergency response that includes hospital surveillance, serological and virological detection methods, vector surveillance, and community surveillance. This portion of the response involves: (1) active surveillance for disease burden; (2) nested case-control study for risk factor identification; (3) cross-sectional survey to determine accuracy of case identification and disease burden assessment at the end of the
study. Re-enumeration of the area was first done for the entire community. All population
data were entered into an electronic database. The area was remapped to include all of
Kamalapur. Sub-samples of clusters were then randomly selected by cluster number
(approximately 20% of the population) for active surveillance.
Director's Division

Director

Director's Office

Policy and Planning

External Relations and Institutional Development Office

Training and Education Department

Human Resources Department

Dissemination and Information Services Centre

Finance Department

Computer Information Services

Administrative Services

Staff Development Office

Procurement Branch

Travels and Estate Office
Director’s Division

The Director’s Division (DD) provides logistics support to the four scientific divisions of the Centre. The Division comprises the Director’s Office, Policy and Planning, Human Resources Department, External Relations and Institutional Development Office (ERID), Finance Department, Training and Education Department (TED), Dissemination and Information Services Centre (DISC), Computer Information Services (CIS), Administrative Services, Procurement Branch, Travels and Estate Office, and Staff Development Office.

Division Highlights

- At the end of 2000, the Centre had a total staff of 977 personnel, in addition to 130 Community Health Workers and 67 Health Workers. Seven personnel joined senior positions, three key personnel left the Centre, six personnel retired, 18 personnel received long-service awards, and four personnel died. At the June BOT Meeting, the post of Associate Director and Head, Policy and Planning, was created.

- Revenue contributions increased by US$299,000 over 1999. Contributions to projects increased by US$676,000, and contributions for central activities decreased by US$377,000. All these resulted in an operating surplus of US$63,000 (US$202,000 in 1999). US$2.8 million was spent to procure scientific and other materials from home and abroad.

- The Government of Japan contributed US$1 million to Hospital Endowment Fund. The Centre’s Annual Dinner also contributed significantly to the Fund.

- Sixteen training courses and workshops were organized. Three hundred twenty-three scientists, physicians, health administrators, health personnel, and trainers from 33 countries participated in these courses. Skills of 143 personnel of various levels were enhanced under the staff development programme.

- Steps have been taken to develop the Strategic Plan of the Centre for the 2001-2005 period.

- Installation of a new V-SAT satellite system was completed, and the bandwidth was upgraded to 256 kbps.

- About 350 biomedical and social science researchers, health professionals, policy-makers, and health administrators from national, regional and international institutions attended the 9th Annual Scientific Conference.

- The Centre’s library added 751 new books, bound journals and reprints, and 300 current journals. 15,509 readers availed of the library facilities.

- The Centre’s scientists published 142 original papers, review articles, book chapters, letters, etc., in addition to 15 working papers, scientific reports, and special publications published internally.

- Over 112,000 copies of the Centre’s publications were distributed and/or mailed all over the world.
Policy and Planning
Associate Director and Head: Barkat-e-Khuda

At the June 2000 Meeting of the Board of Trustees (BoT), the post of Associate Director and Head, Policy and Planning (P&P), was created to take effect from July 2000. The major responsibilities of the post include: (1) working with the Director and others concerned in the development of the Centre's Strategic Plan; (2) monitoring implementation of the Strategic Plan following its adoption; (3) working with the Associate Directors and the scientists in translating the research findings into policy and action; (4) assisting the Director in preparing materials for the BoT meetings; (5) representing the Centre at various national and international meetings; (6) monitoring the overall socioeconomic and demographic trends in Bangladesh to help the Centre understand their implications for the Centre; and (7) assisting the Director by contributing to the Centre's human resources and the external resources agenda.

Strategic Plan

The major focus of Policy and Planning, thus far, has been on the development of the Centre's Strategic Plan. A Strategic Plan Core Group (SPCG) was formed with the Associate Director, P&P as its head, and comprised two representatives from each of the four scientific divisions and four representatives from the Director's Division.

The basic approach adopted for the development of the Strategic Plan includes three stages: (1) situation analysis, (2) formulation of vision statement and future priorities, and (3) formulation of Strategic Plan/proposed actions. Also, an Activity Plan, with timelines necessary to accomplish the activities needed for development of the Strategic Plan, has been outlined. The basic approach and the Activity Plan were shared at the November 2000 BoT Meeting.

An admirable feature of the Strategic Plan is its participatory nature, based on the inputs of the Centre staff at different levels and those of the stakeholders, Government of Bangladesh (GoB), BoT, and donors. At the November 2000 BoT Meeting, a Working Group comprising Prof. Marian Jacobs, Prof. Carol Vlassoff, Prof. Jane Kusin, Prof. Ricardo Uauy Dagach, and Prof. Peter McDonald was formed to provide guidance to the SPCG in the process of developing the Strategic Plan. The draft Strategic Plan will be presented at the June 2001 BoT Meeting, and the final plan is scheduled for adoption at the November 2001 BoT Meeting. As decided by the Board, the existing Strategic Plan will continue till final approval of the new Plan.

Human Resources Department
Head: Diann M. Hill

To support the expanding activities of ICDDR,B and improve the internal ability to operate, a
comprehensive human resources (HR) agendum has been adopted. The reorganization of
the Department began in the last quarter of 2000, moving the focus away from administrative
duties toward a strategic partnership that aligns with the Centre's mission and strategic
goals. The Human Resources Department has the overall responsibility for the areas of
employment, compensation and benefits, employee relations, training, and staff development.

Personnel
Chief Personnel Officer: Wahabuzzaman Ahmed

At the end of 2000, the Centre had 977 personnel in addition to 130 Community Health
Workers and 67 Health Workers. The Centre also had 18 personnel of international level, 6
of whom were on secondment. One hundred eighty were national officers, and 779 were in
the general services category.

Arrival, Departure, and Retirement

Dr. Lauren S. Blum, Anthropologist, PHSD; Dr. G. Balakrish Nair, Research Microbiologist,
LSD; Ms Diann M. Hill, Head, Human Resources, DD, joined the Centre in 2000. Dr. Shams
El Arifeen joined in his new international position as Epidemiologist/Head, Child Health
Programme, PHSD.

Those who joined the Centre on secondment are: Dr. Yukiko Wagatsuma, Scientist, ECPP,
PHSD from the Johns Hopkins University; Mr. Carel van Mels, Demographic Researcher,
PHSD from Government of the Netherlands; and Dr. Robert Breiman, Medical Epidemiologist,
PHSD from CDC-Atlanta.

Key personnel who left the Centre in 2000 included: Dr. A.H. Baqui, Senior Epidemiologist/
Head, Child Health Programme, PHSD; Dr. Cristobal Tunon, Management Scientist, ORP,
HPED; and Prof. V.I. Mathan, Associate Director, LSD.

Six personnel retired from the Centre in 2000. They are: Mr. Dhan Miah, Field Attendant,
CSD; Mr. Md. Abul Hosein, Assistant Staff Nurse, CSD; Mr. Waseque Uddin Ahmed, Senior
Research Officer, LSD; Ms Bernadette Barman, Aid Nurse, CSD; Mr. S.M. Abdus Sattar, Senior
Accounts Officer, Matlab Administration, PHSD; and Mr. K.M. Rafique, Secretary, Gr. II, CRSC,
CSD.

Long-service Award

Seven personnel completed their 30 years of meritorious service in the Centre and were
awarded a special pay increase. Eleven personnel who completed their 25 years of meritorious
service in the Centre were also awarded a special pay increase.

Obituary

With deep sorrow, we record the deaths of four personnel who served the Centre for many
years. They were: Mr. Md. Abdullah (49), Canteen Supervisor, Staff Canteen, DD; Md.
Shahjahan (49), Driver, Transport Management Branch, DD; Md. Habibur Rahman (42),
Security Guard, Matlab Administration, PHSD; and Md. Abul Kashem (52), Health Assistant,
HDSS, PHSD.

Staff Clinic

The Staff Clinic provided improved healthcare services to the NO- and GS-level staff and
their dependents. A total of 19,581 patient visits took place. Of them, 18,935 were treated
successfully in the Staff Clinic; 640 required referral to outside clinics/hospitals/consultants;
468 were vaccinated; 128 were hospitalized; 81 were emergency cases; 280 required minor
surgery; and 118 had ECGs done. Pre-employment medical examinations were done for 107
employees. Periodical medical examination was carried out for 91 existing employees. Another 407 were provided family-planning services. Health-education seminars were arranged on two serious health problems: stroke and diabetes mellitus.

**Administrative Services**
Consultant: Colonel Tajul Islam Ghani psc (Retd.)

The Department, with 206 fixed-term and outsourced staff, provided administrative, engineering, and logistics support for the construction and maintenance of the Centre's physical facilities. It coordinated security and cleaning services, management logistics for conferences, training activities, and transport operations.

**Engineering Branch**
Senior Assistant Engineer: Rabindra Das (Civil)
Assistant Engineer: M. Sayem Uddin Ahammed (Electrical)

The Branch routinely maintained utility services and all electrical and telecommunication equipment and facilities. Installation of a tubewell in 2000 has been providing a back-up resource to the existing water supply from the city sources. The Branch also coordinated the planning and construction of four male clinics and 30 low-cost toilets in the Matlab area.

**Transport Management Branch**
Senior Transport Officer: M. Hamidullah

The Branch directed and coordinated transport operations, using the Centre's vehicles and those hired from outside. It provided pick-up and drop services for approximately 350 personnel per day. The vehicle maintenance workshop provided general preventive maintenance for all vehicles.

**General Services Branch**
General Services Officer: M. Mujibur Rahman

The General Services Branch provided security services for the grounds and property of the Centre, coordinating the Centre's guards and those hired from outside. The Branch also provided services for cleaning, mail receipt and dispatch, logistics management of conferences and training activities of the Centre.

**Staff Cafeteria**
General Services Officer: M. Mujibur Rahman

The Staff Cafeteria provided catering services to the staff for lunch and the morning and evening tea. An average of about 375 members of the staff made use of the canteen facilities every working day.

**Travels and Estate Office**
Manager: Kh. Shafiqul Hossain

The Travels and Estate Office provided all travel-related services to expatriate personnel, local staff, members of the Board of Trustees, visitors, and trainees. The Office assisted in arranging meetings, workshops, and parties. The Office also maintained the Centre's telecommunication system and assisted in hiring/leasing offices for projects and houses for international staff.

**Procurement Branch**
Procurement Manager: Md. Mahbubul Alam

The Procurement Branch procured scientific and other materials worth US$2.802 million through local and overseas purchase. I.V. fluids and equipment worth US$0.263 million were
procured for use by the Institute of Public Health and the Government of Bangladesh (GoB) following an agreement between ICDDR, B and GoB.

**Finance Department**

Chief Finance Officer: John F. Winkelmann

The Finance Department has the overall responsibility for financial operations, central stores, and fixed-asset management of the Centre, and has a staff of 31. The financial operations include: custodianship of all funds, preparation of the annual budget, recording of all financial transactions and commitments to prepare accurate and timely financial reports for the Board of Trustees and donors, in addition to preparing monthly and annual financial reports. The Department is also responsible for facilitating the annual audit and assuring that audits for all necessary donors’ contributions are completed in time.

During the year, improvements were made in the accounting and payroll system to provide improved financial information to managers and more accurately accrue the cost of employee benefits.

**Financial highlights for 2000**

- Contributions from donors increased by US$299,000 over 1999. Contributions to projects increased by US$676,000, and contributions for central activities decreased by US$377,000.

- ICDDR, B Hospital Endowment Fund contributed US$200,000 (US$200,000 in 1999) to help defray the costs of patient care in the Dhaka and Matlab hospitals.

- Contributions from donors increased by 2.2% from US$13,265,000 to US$13,564,000.

- Net expenditure after deducting miscellaneous receipt of US$833,000 (US$778,000 in 1999), not including depreciation, increased by 3.8% from US$13,263,000 to US$13,767,000.

- Operating surplus for the year was US$63,000 (US$202,000 in 1999), which, after charging depreciation of US$20,000 (US$899,000 in 1999), resulted in a net deficit of US$857,000 (US$697,000 in 1999).

- Net current assets increased by US$1,510,000 over 1999 due to an increase in cash and deposits of US$233,000 and an increase of US$1,277,000 in other net current assets.

- The Government of Japan contributed one million US dollar to the Hospital Endowment Fund raising the value of the endowment at the end of 2000 to US$5,246,000.

- Capital expenditure of US$659,000 (US$1,271,000 in 1999) comprised US$612,000 (US$1,210,000 in 1999) from project funds and US$47,000 (US$61,000 in 1999) from central funds.
DONORS' CONTRIBUTION 2000
US$13,564,444

- European Union: 7%
- Swiss Red Cross: 2%
- UK-DFID: 6%
- Sweden-Sida: 3%
- AusAID: 3%
- Bangladesh: 4%
- Canada-CIDA: 2%
- Switzerland-SDC: 6%
- Netherlands: 2%
- World Bank: 7%
- Japan: 5%
- Belgium-BADC/BTC: 1%
- Others: 10%
- USA: 42%
- Others: 10%

TOTAL EXPENDITURES BY CATEGORIES 1996-2000
EXCLUDING CAPITAL

- Local Salary
- International Salary
- Others

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<td>13.44</td>
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<td>12.80</td>
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<td>12.77</td>
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<td>13.94</td>
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<td>58%</td>
<td>66%</td>
<td>78%</td>
<td>98%</td>
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Hospital Endowment Fund Contributions 2000

Individuals (in alphabetical order)

Prof. Barkat-e-Khuda
Mr. J.Y. Choi
Dr. Rita R. Colwell
Dr. O. Fontaine
Mr. Kamrul Hasan
Mr. Gaziul Haque
Mrs. Judith B. Henry
Mr. Tareque Hossain
Prof. Ingela Krantz
Mr. Alphonsus Marcelis
Mr. J.O. Martin
Rev. Silas M. Nath
Dr. Peter John North
Dr. Petra Osinski
Dr. R. Sarwar and Afroza
Dr. Carol Vlassoff
Mr. and Mrs. Winkelmann
Mr. Graham A.N. Wright

Institutions (in alphabetical order)

ANZ Grindlays Bank Ltd.
Asian Textile Mills
British Women’s Association
Eastland Insurance Co. Limited
Ganges Travel Services
Hoda Vasi Chowdhury & Co.
Hong Kong Shanghai Banking Corp.
ICDDR, B Employees’ Cooperative Society
ICDDR, B Hospital Employees Society
International Office Equipment
Japan
JICWELS
Johnson’s Place
Radda MCH-FP Centre
Reliance Insurance Limited
Singapore Airlines
Tradeworth Ltd.
United Insurance Company Ltd.
Unique Business System
UNOCAL Bangladesh Ltd.
World Vision
Zonta Club, Dhaka
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, 2000, from which these abridged financial statements were derived. In our report of same date we expressed an opinion that the financial statements from which these abridged financial statements were derived, present fairly the financial position of the Centre in all material respects, except for non-recognition of "ICDDR,B Employees Separation Payment Fund" balance as at December 31, 2000 of US$9,280,189 and corresponding investments with Generali Worldwide Insurance Company Limited of Guernsey, Channel Islands, in these accounts.

In our opinion, the attached abridged financial statements are consistent, in all material respects, with the aforesaid financial statements from which they were derived and on which we issued a qualified report as indicated above.

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 these abridged financial statements were derived and our report thereon.

Hoda Vasi Chowdhury & Co
Chartered Accountants

Dhaka, March 22, 2001
**Statement of Financial Position as of December 31, 2000 (US$ 000) - Abridged**

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<th>Asset Category</th>
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<th>1999</th>
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<td><strong>Assets</strong></td>
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<td>Cash and deposits</td>
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<td>4,176</td>
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<td>Hospital Endowment Fund Investments</td>
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<td>Centre Endowment Fund Investments</td>
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<td>Inventories</td>
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<td>Property, plant and equipment</td>
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<td><strong>deferred revenue expenditure</strong></td>
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<td><strong>Total Liabilities and Fund Balances</strong></td>
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<td><strong>Current Liabilities</strong></td>
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<td><strong>Fund Balances</strong></td>
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<td>Hospital Endowment Fund</td>
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<td>Centre Endowment Fund</td>
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<td>Operating Fund</td>
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<td><strong>(3,356)</strong></td>
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<td><strong>Statement of Activities (US$ 000) - Abridged</strong></td>
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<td><strong>Income</strong></td>
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<td>Donors' contributions</td>
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<td>Contribution from ICDDR,B Hospital Endowment Fund</td>
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<td>Contribution from Centre Endowment Fund</td>
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<td>Other items</td>
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<td><strong>Expenditure</strong></td>
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<td>14,041</td>
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<td>Personnel</td>
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<td>Voluntary Severance Package</td>
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<td>Capital expenditure</td>
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<td>Other items</td>
<td>5,036</td>
<td>4,559</td>
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<td><strong>Surplus for the year before depreciation</strong></td>
<td>63</td>
<td>202</td>
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<tr>
<td><strong>Depreciation (without effect on Operating Fund)</strong></td>
<td>920</td>
<td>899</td>
</tr>
<tr>
<td><strong>Deficit for the year after depreciation</strong></td>
<td>857</td>
<td>697</td>
</tr>
</tbody>
</table>

**Statement of Cash Flows (US$ 000) - Abridged**

| Cash Flows from operating activities                | 136    | 1,255  |
| Cash Flows from investment activities               | (552)  | (1,234) |
| Cash Flows from financing activities                | 659    | 694    |
| **Net Increase in Cash and Equivalents**            | 233    | 715    |
| **Cash and Equivalents beginning of year**          | 3,582  | 2,867  |
| **Cash and Equivalents end of year**                | 3,815  | 3,582  |

*This is the abridged form of the Financial Statements referred to in our report of same date.*

**Director**

**Member, Board of Trustees**

**Price Waterhouse**
Chartered Accountants

Dhaka, March 22, 2001
## INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH, BANGLADESH

### DONORS' CONTRIBUTIONS (US$ 000)

<table>
<thead>
<tr>
<th>Contributions</th>
<th>2000</th>
<th>1999</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia-AusAID</td>
<td>357</td>
<td>209</td>
</tr>
<tr>
<td>Bangladesh-World Bank and BINP</td>
<td>497</td>
<td>677</td>
</tr>
<tr>
<td>Belgium—BADC/BTC</td>
<td>158</td>
<td>210</td>
</tr>
<tr>
<td>Canada-CIDA</td>
<td>204</td>
<td>205</td>
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<td>European Union</td>
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<td>573</td>
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<td>Ford Foundation</td>
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<td>256</td>
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<td>Japan</td>
<td>614</td>
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<td>Johns Hopkins University</td>
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<tr>
<td>Netherlands</td>
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<td>Norway-NORAD</td>
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<tr>
<td>Sweden-SIDA/SAREC</td>
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<td>Switzerland-SDC</td>
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<tr>
<td>Swiss Red Cross</td>
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<tr>
<td>United Kingdom-DfID</td>
<td>809</td>
<td>594</td>
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<tr>
<td>United States-AID etc.</td>
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<td>5,946</td>
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<td>United Nations-(UNAIDS)</td>
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<tr>
<td>UNDP-Japan</td>
<td>44</td>
<td>78</td>
</tr>
<tr>
<td>UNICEF</td>
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<td>WHO</td>
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<td>128</td>
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<tr>
<td>World Bank</td>
<td>973</td>
<td>885</td>
</tr>
<tr>
<td>Disaster/Epidemic</td>
<td>92</td>
<td>257</td>
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<tr>
<td>Others</td>
<td>636</td>
<td>581</td>
</tr>
</tbody>
</table>


Director

Member, Board of Trustees
External Relations and Institutional Development Office
Technical Cooperation Officer: Ishthaque A. Zaman
Grants Administrator: Vanessa Brooks

The External Relations and Institutional Development (ERID) Office is the primary line of communication between the Centre and the donor community. It is the repository for all of the grants, contracts, and other agreements entered into by the Centre, that are directly related to the Centre's research, service and training mission. The Office serves as the Secretariat for the Centre's Donor Support Group (DSG) and assists the Centre Director in the preparation for the Board of Trustees meetings.

The functions in 2000 included: preparing the agenda for special visitors to ICDDR,B and accompanying them on tour of the Centre's hospitals, laboratories, training facilities, and fieldsites. The Office assisted the Centre's scientists by: identifying sources of fund for new activities; identifying new donors; working with the scientific divisions and the Finance Department in ensuring budgetary support for core activities; drafting and submitting proposals to the donors; and providing a final review of contracts between donors and the Centre's scientists to assure agreement among the parties and adequate budgetary support for its scientific endeavour.

Other external relations activities included: coordinating press conferences and press briefings; presenting and publicising the Centre's achievements in scientific forums; organizing special events; developing fundraising initiatives and sponsorship for programmes and special events.

During 2000, the Office undertook special assignments relating to institutional strengthening and Board development. The Office spearheaded the efforts for the growth of the Centre Endowment Fund and the Hospital Endowment Fund.

Submission of Proposals: The ERID Office prepared the institutional components of proposals seeking annual contributions for both core and project activities. Funds for the core activities were sought from AusAID, Japan, the Kingdom of Saudi Arabia, and the Netherlands Government. The Office coordinated the activities relating to the proposal submitted to USAID/Washington to extend the USAID/W-ICDDR,B Cooperative Agreement for another three years for core and project funding (US$4.75 million) under the umbrella protocol Child Health Research. Other submissions for core funding included proposals to: European Union, DFID, and AusAID.
One of the highlights of generating core funding from donors was the support of the Government of the Netherlands, which returned as a core donor in 1999 and again provided crucial core support in 2000. The Netherlands Government has indicated willingness to provide increased core support in future years.

The ERID Office also drafted project proposals seeking financial support for purchase of hospital supplies and for a one-off core contribution from the Government of Bangladesh; and for a similar one-off contribution from the USAID’s Dhaka Mission.

The Office assisted in the submission of various concept papers and/or project proposals to: European Union, Arab Gulf Fund (AGFUND), Swiss Red Cross, Government of Japan, SmithKline & Beecham International (SB), Rockefeller Foundation, UNICEF, WHO, Howard Hughes Medical Institute, and GoB/Asian Development Bank. The Office also submitted proposals for institutional collaborations with: Africa-based In-depth Network for a Gates Foundation Global Health Program grant; Johns Hopkins School of Hygiene and Public Health for a Path Foundation grant; and Harvard Medical School for an International Vaccine Institute grant from its Disease of Most Impoverished (DOMI) Program.

The Office submitted the collaborative research proposals between ICDDR,B and Japanese scientists to the Government of Japan.

Grants and Contracts Administration: The ERID Office reviewed the Centre’s contracts to ensure that the agreements were acceptable to the Centre and that the interests of the Centre were protected. The terms and conditions of agreements entered into by the Centre were reviewed to ensure that standards of scientific and ethical review as well as rights to publish research findings were consistent and the work of the Centre’s scientists was protected. The Office worked with the Finance Department to ensure that the full cost of each project was realized, and the appropriate overhead rate was included in the budget component of the projects.

The Office also administered the ongoing multi-year umbrella grants from USAID/Washington and Swiss Agency for Development and Cooperation and ensured allocation of funds as well as compliances by the recipient scientists. The Office put together the technical and financial reports as well as the annual workplans of three EU-funded protocols for release of fund for the third year. It also coordinated the preparation of progress reports of several ongoing projects funded by the Ford Foundation.

Fundraising Initiatives: For strengthening the Hospital Endowment Fund, the ERID Office participated as part of the Centre’s Events Committee in organizing the Annual Fundraising
Dinner at the Sonargaon Hotel resulting in an earning of US$50,000 from ticket sales, raffles, and generous contributions. The American Express Bank sponsored the Annual Dinner. The ERID Office initiated discussions with local and international business firms interested in expanding their support to the ICDDR,B's Dhaka hospital.

The ERID Office will focus much of its fundraising efforts in the upcoming year on an initiative 'Circle Around the Centre' campaign launched in October 2000. The initial appeal is directed to recent visitors, collaborators from academic or research institutions, and alumni and former international staff or Trustees of the Centre, many of whom had begun their careers at the Matlab research facility. Resources from the campaign will be directed toward funding new research and supporting the Centre's unfunded initiatives as well as assisting in launching the scientific careers of Bangladeshi scientists. Such funds will be targeted toward research designed to address those health problems that are most closely associated with developing countries and prevalent in Bangladesh. The campaign is initially directing its appeal to potential contributors in North America and Europe with the support of the Child Health Foundation in the United States and the International Health Solutions Trust, based in the UK.

Communication: To expand awareness of the Centre's role in international health research, the ERID Office developed presentations for international audience at several key international forums. In October, the Office projected the Centre at the International Conference on Health Research for Development in Bangkok and also presented a profile of the Centre and its commitment to nutrition research as part of a team presentation at the World Bank Human Development Week in Washington, D.C. in February. Among the newly-produced display materials, a brochure highlighted scientific themes, and a pamphlet described the Centre's training programmes.

The ERID Office organized press conferences and arranged media coverage, including special radio and TV programmes during the Ninth Annual Scientific Conference (9th ASCON). The Office produced a new video for promotion of the Centre and its activities. The Office liaised closely with the Bangladesh Ministry of Health and Family Welfare (MoHFW), UNAIDS, UNDP, and other agencies in organizing a dissemination workshop in June on HIV in Bangladesh. The Office continued production of the bi-monthly newsletter 'The Grants News' and kept all concerned abreast of the activities undertaken by the Centre.

Special Events: After an outbreak of dengue fever in late 2000, the Centre quickly responded to the national effort for informing people of what steps needed to be taken. The ERID Office was closely involved in bringing a number of Thai experts and in organizing training programmes for the GoB health professionals and disseminating the Centre's work on dengue to the donors and the media.

The Office put together a special report—Portfolio Review on the Child Health Research (CHR) Project funded by USAID/Washington—by liaising with the scientific divisions of the Centre.

Visitors in 2000

The Centre's reputation and achievements attracted a number of visitors and dignitaries from around the globe during 2000. The ERID Office played the key role in arranging their tours of the Centre's hospital and laboratory facilities in Dhaka and the fieldsites, including...
Matlab. During their visits, they expressed keen interest in the Centre's research, service and training activities. Following is a list of the distinguished visitors to the Centre in 2000, presented in alphabetical order of the names of their organizations/countries:

**Armed Forces Research Institute of Medical Science, Japan**: Dr. L.W. Pang, Scientist.

**Australian High Commission to Bangladesh/AusAID**: His Excellency Mr. Robert Flynn, High Commissioner; Ms Juliette Iftene, Deputy High Commissioner; Mr. Mark Collins, First Secretary (Development Assistance); and Mr. Peter Mahomet, AusAID, Canberra.

**Australia**: Professor John Caldwell, Australian Parliament; Dr. Andrew Southcott, Mr. Bernie Ripoll, and Ms Kelly Hore, Hon'ble Members of the House of Representatives; Mr. Ross Lightfoot, Senator; Mr. Greg McIntosh, Delegation Secretary. **BASICS, New York, USA**: Dr. Indira Narayanan.

**British High Commission to Bangladesh**: H.E. Mr. David Carter, High Commissioner; and Dr. Frank Atherton, Health and Population Adviser. **British Women's Association**: Ms Anita Bell, Chairperson.

**Canadian High Commission to Bangladesh/CIDA**: H.E. Mr. David Preston, High Commissioner; and Ms Sophia Robineault, First Secretary. **Cornell University, USA**: Dr. Indira Narayanan.

**Centers for Disease Control and Prevention, Atlanta, USA**: Dr. Jeff Koplan, Director; Dr. Roger I. Glass; and Dr. Barbara Stoll. **DFID, UK**: Mr. Stephen White. **Embassy of Japan, Dhaka, Bangladesh**: H.E. Mr. Kazuyoshi Urabe, Ambassador; Mr. Kiyokazu Ota, Minister; Mr. Koij Tomita, First Secretary; and Mr. Yutaka Nakamura, First Secretary. **Embassy of France, Dhaka, Bangladesh**: Mr. Andre Raynouard, Cultural Counsellor. **Institute of Child Health, UK**: Dr. Sally Grantham McGregor, Professor of Centre for International Child Health. **Institut Pasteur, France**: Prof. Stewart Cole, Head, Molecular Genetic Bacteriology. **Institute of Public Health of Cuernavaca, Mexico**: Dr. Lynnette Neufeld, Head, Department of Child Nutrition and Health. **International Vaccine Institute, Seoul, Korea**: Dr. Mossadeque Hossain, Senior Scientist and Coordinator.

**Johns Hopkins University, USA**: Dr. W. Henry Mosley; Prof. Robert E. Black; and Prof. R.B. Sack, Department of International Health. **Kuwait University, Kuwait**: Prof. M. John Albert. **London School of Hygiene & Tropical Medicine, UK**: Dr. Sophie Moore, MRC International Nutrition Group; Public Health Nutrition Unit; Professor Anne Mills, and Dr. Carine Ronsmans, Maternal & Child Epidemiology Unit, Department of Epidemiology and Population Science. **Mahidol University, Thailand**: Dr. Nitaya Thammapalard, Associate Professor, Department of Microbiology and Immunology. **Massachusetts General Hospital, USA**: Dr. Stephen B. Calderwood, Chief, Division of Infectious Diseases; and Dr. Edward T. Ryan, Division of Infectious Diseases. **Ministry of Health and Family Welfare, Bangladesh**: Prof. M. Amanullah, Hon'ble State Minister; Mr. Mohammed Ali, Chief Adviser and Head, MCG; Mr. D.K. Nath, Additional Secretary; and Mr. Shafuddin Ahamad, Director General, Directorate of Family Planning. **Ministry of Foreign Affairs, Japan**: Mr. Hikihara, Director of the South Asia Division.
Dr. Gregorio Perez-Palacios, Director General, Reproductive Health. NASA, USA: Dr. Byron Wood. National Institute of Cholera and Enteric Diseases, India: Dr. S.K. Bhattacharya, Director. National Institute of Health and Family Welfare, India: Dr. M.C. Kapilashrami, Director; NEC Corporation, Japan: Mr. Kunihiro Hashimoto, Assistant Manager, Asia and Oceania Sales Division. Netherlands Interdisciplinary Demographic Institute: Dr. Jeroen van Ginneken. Partners in Population and Development, New York, USA: Mr. Hernando Clayvio, Senior Advisor. Pathfinder International, New York, USA: Dr. Muzanur Rahman, Director, Research. Quintiles South Asia Pte Ltd., Singapore: Mrs. Sumitra Sachidanandan, Clinical Research Associate. Rockefeller Foundation/California Endowment, USA: A 14-member team of the Trustees led by Dr. Lincoln Chen, Senior Executive Vice-President. The Royal University of Veterinary and Agriculture, Denmark: Dr. Shakuntala H. Thilsted, Faculty Member, Research Department of Human Nutrition. The Royal Netherlands Embassy in Bangladesh: Mr. Jan Mass, Counsellor and Head of Development Section; and Mr. Jan Waltmans, First Secretary. SmithKline & Beecham, UK: Ms Sally Coulten, Dr. Palma Seljan, Mr. Henry Ho, Dr. Edmund, and Ms Namitha.

Sri Lankan High Commission to Bangladesh: H.E. Mr. E.G. Dayananda, High Commissioner. South-South Centre, Dhaka, Bangladesh: Mr. Mahidul Islam, Population and Health Specialist. Swedish Bacteriological Laboratories, Sweden: Dr. Anders Karnell, Head of Medical Department; and Ms Berit Stenzellius, Clinical Research Manager. Swiss Agency for Development and Cooperation: Mr. Markus Waldvogel, Resident Coordinator. Swiss Federal Institute of Technology, Switzerland: Dr. Lena Davidson of Laboratory for Human Nutrition. Thailand: Dr. Siripen Pattamaporn Ananda, Maj Gladys Aleman, and Dr. Khun Panor, dengue experts; and Dr. John Stoeckel, Health and Population Consultant. Tokushima University, Japan: Prof. Akira Takahashi, Department of Nutrition, School of Medicine. Tomen Corporation, Japan: Dr. Yasuyuki Takahashi; and Mr. Kozaburo Maeda, Life Science Group. Tufts University, USA: Professor James Levinson. Tulane University Medical Center, New Orleans, USA: Dr. Jane T. Bertrand, Professor and Chair, School of Public Health and Tropical Medicine.

UCB Osmotics Ltd., UK: Mr. Andrew Hamer, Business Director; Mr. Brian J. Christy, Business Development Manager, Asia Pacific; Mr. David R. Strickland, Sales & Marketing Manager; and Mr. Corinne Straub, Executive, Humanitarian & Emergency Response. Umea University, Sweden: Dr. Lars Lindholm, Health Economist, Epidemiology. UNFPA, USA: Ms Vegeshen, Program Officer. University Hospital, Switzerland: Dr. Klaus Gyr, Professor of Medicine, Department of Internal Medicine. University of Edinburgh, UK: Dr. D. Yirrell, Senior Research Fellow. University of California-Berkeley, USA: Dr. Alan H. Smith, Professor of Epidemiology, School of Public Health. University of California-Davis, USA: Ms Marjorie Haskell, Researcher. University of Dhaka, Bangladesh: Prof. A.K. Azad Chowdhury, Vice-Chancellor. University of Goteborg, Sweden: Professor Ann-Marie Svennerholm, Department of Microbiology and Immunology. University of Illinois at Urbana-Champaign, USA: Ms. Mary Arends.
The Training and Education Department (TED) regularly conducts training courses with the objectives of: 
(a) increasing capacity to conduct research in developing countries, 
(b) increasing capabilities to manage programmes for the control of diarrhoeal diseases and for family-planning services, 
(c) improving skills of health personnel through hands-on training on specific aspects of diarrhoeal diseases and of nutritional problems; and 
(d) improving response to new and emerging issues in health and population. The training courses and workshops, organized in collaboration with the scientific divisions of the Centre, and at times, with national and international organizations, are designed to provide participants with the knowledge and skills applicable to their needs.

In 2000, sixteen training courses and workshops were organized (Table). Participants in these courses and workshops included 323 scientists, physicians, health administrators, health personnel, and trainers from 33 countries (Asia 15, Africa 10, North America 3, and Europe 5). Another 363 persons received orientation training.

The Government of Japan, Swedish International Development Cooperation Agency (SIDA), Office of the Foreign Disaster Assistance (OFDA), USAID, and the Directorate General for International Cooperation (DGIC), Belgium, provided support to conduct most training programmes.
### Table: Training courses conducted during 2000

<table>
<thead>
<tr>
<th>Course</th>
<th>No. of sessions (n=16)</th>
<th>No. of participants (n=323)</th>
<th>Countries represented (n=33)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Health Research Training</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Introductory Course on Epidemiology and Biostatistics</td>
<td>2</td>
<td>40</td>
<td>Bangladesh</td>
</tr>
<tr>
<td>International Workshop on Research Methodology</td>
<td>1</td>
<td>13</td>
<td>Bangladesh, India, Kenya, Malaysia, Pakistan, and Tanzania</td>
</tr>
<tr>
<td>Postgraduate Fellowship for students of Bangladesh universities</td>
<td>1</td>
<td>10</td>
<td>Bangladesh</td>
</tr>
<tr>
<td><strong>International Training Workshops/Courses</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course on Emerging and Re-emerging Pathogens</td>
<td>1</td>
<td>10</td>
<td>Japan, Malaysia, and Vietnam</td>
</tr>
<tr>
<td>Workshop on Emergency Response to Cholera and <em>Shigella</em> Epidemics</td>
<td>1</td>
<td>14</td>
<td>Afghanistan, France, Holland, Laos, Norway, Sierra Leone, Somalia, Sudan, Tanzania, Thailand, and USA</td>
</tr>
<tr>
<td><strong>Course on Clinical Management of Diarrhoeal Diseases</strong></td>
<td>1</td>
<td>10</td>
<td>Bangladesh, Myanmar, Mozambique, Philippines, Tanzania, and Thailand</td>
</tr>
<tr>
<td><strong>Course on Laboratory Diagnosis of Common Diarrhoeal Disease Agents</strong></td>
<td>1</td>
<td>10</td>
<td>Bangladesh, Bhutan, Maldives, Nigeria, and Philippines</td>
</tr>
<tr>
<td><strong>Workshop on Improving Effectiveness, Quality of Services, and Sustainability in Reproductive Health Programmes through Operations Research</strong></td>
<td>1</td>
<td>10</td>
<td>Bangladesh, Ethiopia, Kenya, Mexico, Philippines, Senegal, Tanzania, Uganda, and Vietnam</td>
</tr>
<tr>
<td><strong>National Training Courses/Workshops</strong></td>
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<tr>
<td>Clinical Management of Diarrhoeal Diseases for DCH/MD students</td>
<td>2</td>
<td>29</td>
<td>Bangladesh</td>
</tr>
<tr>
<td>Clinical Management of Diarrhoeal Diseases for FCGP students</td>
<td>1</td>
<td>17</td>
<td>Bangladesh</td>
</tr>
<tr>
<td>Management of Severely-malnourished Children</td>
<td>1</td>
<td>12</td>
<td>Bangladesh</td>
</tr>
<tr>
<td>10th Training Programme of NITUB on Use, Maintenance, and Trouble-shooting of AAS</td>
<td>1</td>
<td>10</td>
<td>Bangladesh</td>
</tr>
<tr>
<td>Community-based Protocolized Management of Severely-malnourished Children</td>
<td>2</td>
<td>47</td>
<td>Bangladesh</td>
</tr>
<tr>
<td>Malnutrition, Diarrhoeal Diseases and ARI</td>
<td>1</td>
<td>21</td>
<td>Bangladesh</td>
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<tr>
<td><strong>Fellowship Programme</strong></td>
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<td></td>
</tr>
<tr>
<td>International Fellowship (elective training and training for postgraduate degree and diploma)</td>
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<td>29</td>
<td>Bangladesh, Canada, India, Japan, Netherlands, Sweden, UK, and USA</td>
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<tr>
<td>Training of Fellows from SAARC countries</td>
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<td>Bangladesh, Bhutan, Maldives, Pakistan, and Sri Lanka</td>
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<td>BADC Fellowship Programme</td>
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<td>Vietnam, Cambodia, and Laos</td>
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<tr>
<td>Clinical Fellowship</td>
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<td>Bangladesh</td>
</tr>
<tr>
<td>Nurse Fellowship</td>
<td>-</td>
<td>12</td>
<td>Bangladesh</td>
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</tbody>
</table>
Some of the major training programmes are described below:

Community-based Protocolized Management of Severely-malnourished Children: As part of the research protocol 'Community-based protocolized management of severe malnutrition' two courses were organized for 47 physicians and paramedics from different clinics of Progoti Samaj Kallyan Protisthan O Poribar Porikalpana Sangtha, an NGO supported by the Urban Family Health Partnership.

The course was developed from detailed analyses of the successful tasks performed in the Nutrition Rehabilitation Unit of the Child Health Programme (CHP) at the Clinical Research and Service Centre of ICDDR,B in Dhaka. It was designed to upgrade the knowledge and skills of the participants needed to identify and manage children with malnutrition at the community level. The course emphasized the preparation of indigenous low-cost diets for use in community-based nutritional rehabilitation.

The participants also received hands-on training at the Centre's hospital in Dhaka.

Emerging and Re-emerging Pathogens: Ten participants from different hospitals and medical schools of Japan, Malaysia, and Vietnam attended a four-week course sponsored by the Japan International Corporation of Welfare Services. The course included a module on hands-on training at the Centre's Dhaka hospital in the management of patients with cholera and shigellosis, and another on laboratory training for diagnosis of diarrhoeal pathogens and identification of their sensitivity patterns. Management of severely-malnourished children and a visit to the Matlab Health Research Programme site for practical experience in community management of diarrhoeal diseases were additional components of the course.

Reproductive Health Programme through Operations Research: International Workshop on Improving Effectiveness, Quality of Service and Sustainability in Reproductive Health Programme through Operations Research was held on 1-12 October. 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 in the field of reproductive health in Bangladesh, and (c) disseminate experiences of linking operations research with policy formulation to improve reproductive health programmes. Ten participants from Bangladesh, Ethiopia, Kenya, Mexico, the Philippines, Vietnam, Senegal, Tanzania, and Uganda attended the workshop. The participants felt that such workshops can greatly contribute to strengthening reproductive health programmes in developing countries.
Training Workshop on Emergency Response to Cholera and Shigella Epidemics: The Centre organized a workshop on 9-20 April to train the healthcare professionals of international NGOs and other agencies that respond to diarrhoea epidemics. The workshop was attended by 14 participants from 11 countries, representing OXFAM, ACF, Medicines Sans Frontiers, Medecins du Monde, Norwegian People’s Aid, American Refugee Committee, International Rescue Committee, International Medical Corps, Catholic Relief Services, and OFDA. The aim of the workshop was to strengthen the capacity of the international NGOs in effective management of epidemics of cholera and shigellosis. The workshop emphasized preparedness to handle disaster situations, prevention of diarrhoea, assurance of safe water supply, and attention to sanitation hazards. The participants received hands-on training at the Centre’s facility in Dhaka and in makeshift treatment centres.

Future Strategy

The future strategy of the Department is to: (a) make training programmes self-supportive; (b) strengthen collaboration with universities both within and outside Bangladesh and offer facilities leading to postgraduate diplomas/degrees; (c) collaborate with institutions of medical education to develop and offer new courses, thus eventually developing TED of ICDRR,B into a regional training centre; and (d) identify new donors for additional funds to implement future plans.

Staff Development Office

Manager: Bejoy R. Saha

Under the staff development programme, the Centre regularly organizes internal workshops and training courses and sends personnel to local and overseas institutions for higher studies and focused training aiming at improving its manpower to sustain the ongoing research, training, and clinical services and to develop well-trained staff to meet the future needs.

One hundred and forty-four personnel were benefited in 2000 with financial support from the Swiss Agency for Development and Cooperation, fellowships from several agencies, and from various projects of the Centre.

Foreign Training: Forty-six personnel attended training courses in Belgium, France, Germany, India, New Zealand, the Netherlands, the Philippines, Switzerland, Sweden, Thailand, UK, and USA. Twenty-three personnel completed their study and training. Five of them received PhD degree, six obtained masters degree, and 12 completed non-degree programmes in various disciplines. During the year, 29 personnel left to begin their higher studies or training abroad. At the end of the year, 10 were studying abroad for PhD degree and eight for masters degree.

In-country and In-house Training: Ninety-seven personnel received in-country training in various disciplines during 2000. Under the in-house training programme, several workshops and training courses were organized. Fifteen personnel attended a training course on PC-based software; four attended a workshop on Clinical Economics; 11 attended an introductory course on Epidemiology and Biostatistics; one each participated in the courses: Laboratory
Diagnosis of Common Diarrhoeal Agents; Management of Severely-malnourished Children; Use, Maintenance and Trouble-shooting of Atomic Absorption Spectrophotometer; and four attended an international workshop on Research Methodology organized at the Centre.

**Dissemination and Information Services Centre**

**Head: M. Shamsul Islam Khan**

The Dissemination and Information Services Centre (DISC) is an arm of ICDDR,B to provide information services and disseminate relevant information through publications and website. As the Centre's paraphernalia for storage and retrieval of global information and for diffusion of its research findings, DISC is the combination of three components: (1) Information Services Branch, (2) Publications Services Branch, and (3) Audiovisuals Unit. The mission of DISC is to diffuse results of global health, nutrition and population research for solving the common health, nutrition and population problems, especially in the context of developing world.

DISC organizes information resources on health, population, nutrition, and environment research and related programmes and encourages their use and application. Within its mission and objectives, DISC has actively been pursuing to offer efficient information services and disseminate the Centre’s research findings.

Thirteen personnel managed the activities and services of DISC in 2000. Several changes took place in the staffing pattern. Mr. M.A. Rahim, the former Senior Publications Officer, joined DISC as Editor, Mr. Md. Al Mamun as Secretary, Gr-I, and Mrs. Syeda Ayesha Parveen as Serials Librarian.

One library advisory committee and 3 editorial boards provided continued guidance in the improvement of information services, dissemination of information, and quality of publications.

**Information Services Branch**

**Librarian: Md. Nazim Uddin**

The Information Services Branch, equipped with the modern tools of information technology, including online literature search facility, has now a total collection of over 33,100 books and bound journals, and 13,000 reprints and other documents.

Collection of books, journals and other periodicals, and CD-ROMs through purchase and under gift and exchange programmes continued in 2000. Referral services, bibliographic and photocopying services, online dissemination of information, and Internet services were strengthened during the year.

During 2000, the total number of reader-visits was 15,609. The Centre’s scientists and health professionals and researchers of other organizations, university teachers and students, trainees, and visitors equally used the library facilities. The library staff met 1,913 formal and informal queries of library patrons.

The library collection was enriched by adding 751 new books (63 purchased) and bound journals, 300 current journals and other periodicals (201 titles on subscription), and one CD-ROM database. The library staff processed 1,047 books, journals, and reprints. The 4 in-house databases were updated, using the CDS/ISIS software. Computerized literature search was sought by and provided to 128 Centre’s staff and 279 external users. The total number of pages of photocopies done and supplied to the users was 1,00,945; of these, 49,514 pages were supplied to the outside library users.

The Centre’s staff borrowed 12,016 books and journals from the library. The library maintained inter-library loan relationship with several libraries of Dhaka city, including National Health Library and Documentation Centre, and libraries of the Bangladesh Institute of Development Studies and Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine &
Metabolic Disorders (BIRDEM). Five hundred thirty-five books and bound journals were lent to these organizations. Under the corporate membership, the library borrowed books and videos from the British Council Library in Dhaka. As usual, the Nuffield Library of the British Medical Association provided photocopies of journal articles, free of charge. The library also received photocopying service, on payment, from the London School of Hygiene & Tropical Medicine Library.

The Centre's scientists were kept informed of the incoming learning resources through the weekly Electronic DISC Bulletin under Current Awareness Service. The bulletin disseminated information on articles of relevance to the Centre's scientists, new books, and training and conference opportunities. Sixty-three issues of the Electronic DISC Bulletin, highlighting 4,745 important articles and publications, were produced in 2000. Beginning January 2000, the Bulletin is available online at the Centre's intranet.

With the assistance of two experts, the library organized a training programme on Popline and Medline searching for the Centre's scientific staff in two phases. They were trained on how best to use the Popline and Medline through the Internet and the Popline CD. Under the national collaboration programme, one employee of the National Health Library and Documentation Centre successfully completed two months' training on information management and micro-CDS/ISIS at the Centre's library.

Publications Services Branch
Senior Publications Officer (Acting): M. Shamsul Islam Khan

During 2000, the Publications Services Branch edited, published, and disseminated the Centre's research findings and other output information through its internal publication series. The publication staff prepared and edited materials for the English and Bangla newsletters of the Centre. The Branch produced one full and another abridged version the Annual Report for 1999, four issues of the Journal (1 issue of JDDR and three issues of JHPN); three issues of the English newsletter Glimpse; two issues of the Bangla newsletter Shasthya Sanglap. The Branch assisted in the production of 16 internal publications by other units of the Centre, and performed all printing-related work for the 9th Annual Scientific Conference (ASCON), including editing and publication of the Programme and Abstracts.

Publication of the new peer-reviewed Journal of Health, Population and Nutrition (JHPN), incorporating the Journal of Diarrhoeal Diseases Research (JDDR), started in 2000. The Editorial Board selected two Deputy Editors-in-Chief, two Associate Editors, six Section Editors, one Assistant Editor, and 44 members of the Editorial Advisory Board formed for the new Journal, which is headed by Prof. David A. Sack as the Editor-in-Chief. The journal has a new emphasis on speedy publication and on publishing original research of relevance to developing countries. It is indexed by all the major international indexing systems.

Mrs. Judith Bennett Henry, Executive Assistant to the Director of the Centre, took over the charge of Glimpse as the Editor-in-Chief. There was a major change in 2000 in the format and presentation of materials in the newsletter aiming at making it more attractive and useful to its readers.

Under the Editorial Advisory Service, different departments and individual scientists of the Centre were given assistance. To ensure the quality of publications, DISC rendered services to the scientists by editing 34 papers and publications (1,225 pages).
Coordination Committee, one from the Bangladesh Medical Research Council, one from the WHO-Bangladesh, and eight others representing various disciplines.

In 2000, the ERC met 13 times to consider 37 research protocols: 36 were approved and only one proposal was disapproved. In addition, the ERC considered and approved addendum proposals for a number of already approved protocols. The ERC and the Board of Trustees had a joint session during the November BoT Meeting to review the activities of the ERC.

Animal Experimentation Ethics Committee
Chairperson: Dr. Mirza A. Jalil

The Animal Experimentation Ethics Committee (AEEC), established by the Board of Trustees to ensure compliance of the standard procedures for protection of animals used in the Centre's research, reviews protocols involving research with animals and gives clearance of the protocols.

Staff Welfare Association
President: G.H. Rabbani

The ICDDR,B Staff Welfare Association (SWA) is a body of elected representatives of staff with the purpose of promoting welfare activities among the employees of the Centre with regard to administrative, socioeconomic and cultural activities.

In 2000, the SWA continued its efforts in helping members of the staff to resolve their job-related issues and to improve working conditions by holding fruitful dialogues with the Management and the Board of Trustees. Several accomplishments were made in 2000. Some of these are: enhancement of staff salary, Annual General Meetings held in Dhaka and Matlab, cultural functions, medical assistance provided to sick personnel, educational stipends provided to children of staff, and condolence meetings for the deceased members of the staff. A sum of taka one lakh ten thousand was donated for construction of the mosque at Matlab substation. Financial support was provided to the workers of the daycare centre.

INSTITUTIONAL LINKAGES

The Centre and its scientific divisions maintained institutional linkages with various international and national organizations in 2000. Some major ones are listed below (in alphabetical order):

International Level

Abt. Associates, USA; AMP/France; Armed Forces Research Institute of Medical Science, Thailand; All India Institute of Medical Sciences; Children Nutrition Center, USA; Centers for Disease Control and Prevention, USA; Cornell University, USA; Aichi Medical University, Japan; Emory University, USA; FOCUS Project on Young Adolescents, USA; Harvard University,
USA; Hasan Sadekin Hospital, Indonesia; Indian Institute of Population Sciences; Netherlands Interdisciplinary Demographic Institute; International Vaccine Institute, Korea; Institute of Child Health, UK; Institut Pasteur, France; Institute of Food Research, 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; Mahidol University, Thailand; Massachusetts General Hospital, USA; Ministry of Health, His Majesty’s Government of Nepal; NASA, USA; National Institute of Immunology, India; National Institutes of Health, USA; National Institute of Cholera and Enteric Diseases, India; National Institute of Infectious Diseases, Japan; New England Medical Center, USA; Oxford University, UK; Partnership for Health Reforms, USA; Partners in Population and Development (an international organization of 17 countries to promote South-to-South Collaboration); Population Council, India; Quintiles South Asia Pte Ltd., Singapore; RAND Corporation, USA; The Royal Veterinary and Agricultural University, Denmark; SmithKline & Beecham, UK; University of Pennsylvania, USA; Southampton University, USA; Swiss Federal Institute of Technology, Switzerland; Tokushima University, Japan; Tomen Corporation, Japan; Tuberculosis Research Centre, India; Tufts University, USA; UCB Osmotics Ltd., UK; UNICEF; University Hospital, Basel, Switzerland; University of Alabama at Birmingham, USA; University of Basel, Switzerland; University of California-Berkeley, USA; University of California-Davis, USA; University of Edinburgh, UK; University of Goteborg, Sweden; University of Liege, Belgium; University of Leuven, Belgium; University of Maryland, USA; University of Newcastle upon Tyne, UK; University of Pennsylvania; University of Umea, Sweden; University of Virginia, USA; Wageningen Agricultural University, The Netherlands; USAID; Walter Reed Army Institute of Research, USA; World Health Organization; World Bank; and Wyeth-Lederle-Praxis.

National Level

American International School; ARI Control Programme, Government of Bangladesh; Bandhu Social Welfare Society; Bangabandhu Sheikh Mujib Medical University; Bangladesh Agricultural Research Council; Bangladesh Agricultural University; Bangladesh Atomic Energy Commission; Bangladesh Breastfeeding Foundation; Bangladesh Bureau of Statistics; Bangladesh Center for Communication Programs; Bangladesh Integrated Nutrition Project; Bangladesh Livestock Research Institute; Bangladesh National Nutrition Council; Bangladesh Institute of Development Studies; BRAC; Bangladesh Women Health Coalition; Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine & Metabolic Disorders (BIRDEM); Bangladesh Institute of Research for Promotion of Essential and Reproductive Health & Technologies (BIFPERHT); CARE Bangladesh; Chittagong Medical Central Drug Treatment and Rehabilitation Centre; Central Skin and Social Hygiene Centre, Chittagong; College of Home Economics; Concerned Women for Family Health; Concerned Women for Family Development; Dhaka City Corporation; Dhaka Medical College Hospital; Dhaka Shishu (Children's) Hospital; Directorate General of Health Services; Directorate of Family Planning; Expanded Programme on Immunization; Field Laboratory at Refugee Camp in Chittagong Hill Tracts; Grameen Bank; Holy Family Hospital; Immunization and Other Child Health Partnership of NIPHP; Institute of Epidemiology, Disease Control and Research; Institute of Public Health; Jahangirnagar University; Jatiya Jubo Sangha; Kumudini Welfare Trust (Kumudini Hospital); Lamb Hospital; Marie Stopes Clinic Society; Miki Lawrence Foundation; Ministry of Health and Family Welfare; Ministry of Science and Technology; Nari Motree; Nari Mukti Sangha; Nari Pakhi; National Institute of Population Research and Training; National Institute of Preventive and Social Medicine; NOVA Medical Centre; Popular Diagnostics; Population Council; Programme Coordination Cell; Progoti Samaj Kallyan Protishoda; Quality Improvement Partnership of NIPHP; Radda MCH-FP Centre; Rajshahi Medical College Hospital; Rangpur Medical College Hospital; Rural Service Delivery Partnership of the NIPHP (Pathfinder International); Shishuk Bangladesh; Sir Salimullah Medical College Hospital; Social Marketing Company; Sylhet M.A.G. Osmani Medical College Hospital; National TB Control Programme; University of Dhaka; Urban Family Health Partnership of NIPHP (John Snow Inc.); and World Vision, Bangladesh.
INTER-DIVISION SCIENTIFIC FORUM LIST

Holding inter-divisional scientific forum is a regular activity of the Centre. These fora are intended to generate ideas to undertake collaborative research work involving multidisciplinary approach. In total, 37 inter-division scientific fora were organized for scientific divisions of the Centre in 2000. A division-wise list of these fora is presented below:

Clinical Sciences Division

N.H. Alam. Efficacy and safety of a modified ORS (Resomal) in the treatment of severely-malnourished children

Jena D. Hamadani. Effect of zinc supplementation during pregnancy or infancy on mental development of infants

Ali Miraj Khan. Reduced-osmolarity ORS in neonates and young infants with acute watery diarrhoea

Wasif Ali Khan. Single-dose antimicrobial therapy in childhood cholera

G.H. Rabbani. Anti-inflammatory effects of L-histidine in experimental shigellosis in rabbits

S.K. Roy. Effective means to address moderately-malnourished children within BINP communities

Shafiqui Alam Sarker. Helicobacter pylori infection and gastric acid secretion in peri-urban community children

Health and Population Extension Division

Shamsuddin Alamgir and Rasheda Khanam. Operationalizing ESP delivery in the public sector in Dhaka city

Ali Ashraf and Masud Reza. Safe motherhood, family planning, fertility and fatherhood: role of married men

S.M. Nurul Alam and Rasheda Khanam. Healthcare-seeking behaviour of an urban population: a qualitative study

Jahanara Khatun. Improving planning and coordination of services among providers of ESP in urban Dhaka: findings from an operations research study

A.B.M. Khorshed A Mozumder. Design of Operations Research Project surveillance system: selected programmatic and demographic indicators

Nikhil Chandra Roy. Socioeconomic and health implications of adult deaths in families of rural Bangladesh

Rumana Akhter Saifi. Effects of rapid population growth and development interventions on environment: emerging issues in the context of Bangladesh

Farzana Sobhan. Misconceptions regarding longer-acting and permanent contraceptives in rural Bangladesh

Md. Jasim Uddin. Capacity-building of health managers for local-level planning: lessons from rural Bangladesh
Laboratory Sciences Division

Sayera Banu. Immunogenicity of the PGRS proteins of Mycobacterium tuberculosis
Joseph Bogaerts. The aetiology of genital ulceration in Bangladesh
V.I. Mathan. Prediction and prevention of the next epidemic due to Shigella shiga
G. Balakrish Nair. Vibrio parahaemolyticus infections on a fast-forward: origin of a new pandemic
Christine M. Pfeiffer (USA). Global micronutrient malnutrition: the CDC initiatives
Motur Rahman. Gonococcal infection in Bangladesh: epidemiology and antimicrobial resistance
Rubhana Raqib. Adaptive immune responses in children with shigellosis
Kaisar Ali Talukder. Serology and molecular epidemiology of Shigella flexneri isolated in Bangladesh

Public Health Sciences Division

Dewan Shamsul Alam. Maternal fat supplementation during pregnancy and lactation: effects on vitamin A status of mother
M Kapil Ahmed. Abortion in Matlab, Bangladesh: knowledge, attitude, and practices
Shams EI Arifeen. Does zinc supplementation enhance the response to rotavirus vaccine?
Abbas Bhuiya. Socioeconomic and gender inequity in health: evidence for Matlab
Zahid Hasan. Risk factors associated with acute lower respiratory infections in a cohort of newborns from birth to 24 months of age in a rural community of Bangladesh
Japhet Killewo. HIV/AIDS/STD surveillance in Tanzania: lessons from Kagera
Lazeena Muna. Sexuality, risk and HIV/AIDS: adolescents in Dhaka
Pertti J. Pelto. Qualitative methods in reproductive health: state of the art
Zahidul Quayyum. Health Care Expenditure, Willingness and ability to pay for selected health services: implications for setting user-fees
Mahfuzar Rahman. Arsenic exposure and health effects
Rubina Shaheen. Impact of dietary supplementation during pregnancy on birth-weight
Peter Kim Streatfield. The health and population sector programme at mid-term: a selective review
ICDDR,B PUBLICATIONS 2000

A. Internal Publication Series

Working Papers

Scientific Report

Special Publication

Journal and Newsletters
1. Journal of Diarrhoeal Diseases Research (also includes: Bibliography on Diarrhoeal Diseases). V. 17, no.2, 1999*
B. Original Scientific Papers (Including Short Reports)


41. Hoque SS, Ghosh S, Poxton IR. Differences in intestinal humoral immunity between healthy volunteers from UK and Bangladesh. Eur J Gastroenterol Hepatol 2000 Nov;12(11):1185-93


53. Klitsch M. Two approaches to managing vaginal discharge lead to overtreatment, missed infections and wasted funds. Int Fam Plann Perspect 2000 Jun;26(2):89-90 (Matlab data used)


C. Review Articles, Book Chapters, Papers In Conference Proceedings, and Monographs
D. Letters, Editorials, and Abstracts in Journals


with persistent diarrhea [abstract]. Gastroenterology 2000 Apr;118(Suppl 2, part 1&2):AGA A179

*Not listed in earlier annual reports*
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health and survival strategies, research methodology, health and demographic surveillance system and advanced longitudinal data analysis, clinical management, laboratory diagnosis, emerging and re-emerging pathogens, and nutrition. These courses have attracted more than 18,000 participants from 77 countries in both developing and industrialized nations.

In the 40 years of its existence, ICDDR,B has evolved into a multidisciplinary research centre whose scientists have wide-ranging expertise. Future research will be directed toward developing cost-effective and sustainable solutions to health and population problems for Bangladesh and for other developing countries. While the divisions will continue to operate as key administrative units, the Centre is undertaking a reorganization and restructuring of its research, service and training activities along the lines of its scientific themes which include: Child Health, Nutrition Research, Emerging and Re-emerging Infectious Diseases, Vaccine Evaluation and Development, Reproductive Health, and Health Systems Research.

Child Health: Although the health of children cannot be separated from health of the rest of the family, especially of their mothers, children do have a special priority for the Centre’s research. Their vulnerability and their high risk from disease and injury enforces the need for special programmes to help them during this critical stage. The research in child health has interlinks with nutrition, infectious diseases, vaccines, reproductive health, and health services, and in this way the child health agenda are truly an interdisciplinary effort. Only by incorporating the benefits of other areas does the health of children improve. We have seen it happen in our field areas, and it does not have to wait for overall economic improvement, it can be accomplished with available resources.

Nutrition Research: In Bangladesh, over 80% of children, aged less then five years, suffer from malnutrition, including many whose malnutrition is severe. Malnutrition is a factor addressed in the Centre’s research in child-survival strategies and maternal health and in the treatment of most medical problems with which the Centre deals, including care management of diarrhoea, efficacy of vaccines, micronutrient interventions, hospital-based clinical trials, and community-based operations research. By itself, malnutrition is a major cause of mortality in Bangladesh. The Centre will continue to conduct research, service and training activities aimed at reducing the level of malnutrition, addressing the problems of low birth-weight, adolescent nutrition, and implementing life-cycle approaches to nutrition interventions.

Emerging and Re-emerging Infectious Diseases: Studies on emerging infections began long before the current name ‘emerging diseases’ became popular, and the Centre was among the first to describe many of the agents that have ‘emerged’ over the last 30 years. The world faces a major problem with antimicrobial resistance among common infectious diseases. The Centre is now undertaking surveillance for the identification of and resistance among respiratory pathogens, tuberculosis, and agents of reproductive tract infections, and sexually transmitted diseases. The Centre has also become a regional resource for strengthening laboratories through training and collaboration with regard to antimicrobial-resistant pathogens. As a research environment, the Centre offers opportunities for scientists, and plans to conduct new clinical and field trials on prevention and treatment of infectious diseases.

Vaccine Evaluation and Development: The Matlab fieldsite was established in the 1960s as an area to evaluate vaccines for cholera. Since then, the goals and capabilities of the Centre have greatly expanded. In addition to Matlab—our primary vaccine-testing area—other geographic areas are now being developed to increase the capability for carrying out vaccine evaluations for both diarrhoeal and non-diarrhoeal diseases. Further, the Centre has an infrastructure to facilitate high-quality and ethical research on vaccines, and will continue to expand its capabilities to carry out vaccine research.

Reproductive Health: As part of its mission since its internationalization in 1978, the Centre has developed a reputation as a fieldsite and an operations-research centre for family planning and reproductive health activities. The reproductive health portfolio has unique attributes, including rural family-planning interventions in Matlab which provides a model for maternal and child health-family planning programmes worldwide; the Matlab International Training Centre which frequently hosts visitors and conferences and conducts courses on family planning and reproductive health and maternal-child health; the Operations Research Project of the HPED that works in collaboration with the Government of Bangladesh. The Centre plans to continue its activities that include: implementing strategies developed at the Centre to improve family planning, reduce population growth, and promote safe motherhood; integrating family planning and child health programmes that improve child-survival outcomes as well as lower fertility rates; and incorporating male contraceptive use and safe-motherhood strategies as new components into the overall Matlab-based family-planning strategy.

Health Systems Research: Research findings need to be translated into programmes and policies which can be used by the government and NGO programmes. Health systems research is ultimately concerned with improving the health of a community by enhancing the efficiency and effectiveness of the health system as an integral part of the overall process of socioeconomic development. Thus, the ICDDR,B works closely with the national programme to identify priority problems and to design, implement and evaluate health and population sector strategies and policies, making optimal use of the available resources. The Centre is also a part of the national and international networks of institutions dedicated to health systems research.