ANNUAL REPORT
2006
This twenty-eighth Annual Report of the Centre documents many aspects of the activities during 2006, including research, support for research, health services, training, dissemination, and administration. Important findings of studies have been presented under the eight research programmes of the Centre. Six separate chapters on six Divisions present infrastructural information, along with the routine activities of each Division.

Scientific papers, abstracts, and other documents produced and published by the Centre staff are also listed in the report. Much of the research included here was initiated in previous years and hence documented in earlier reports. Studies that were completed during 2006 present the final results. Some of the studies initiated earlier are still ongoing, and hence preliminary findings from these studies are reported here.

If you have any comments on this report or would like to have more information about the Centre or the work described here, please write to: Executive Director, ICDDR,B, GPO Box 128, Dhaka 1000, Bangladesh or acravioto@icddrb.org.
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VISION
All people, especially the poor, can become healthier and can reach their full potential through the application of new knowledge.

MISSION
To develop and promote realistic solutions to the major health, population and nutrition problems facing the poor people of Bangladesh and other settings.

GUIDING VALUES
- excellence in research, training and service
- high ethical standards
- gender equality
- responsive to change
- promote partnerships
- prioritize the needs of the poor and vulnerable
- promote equity and diversity
- transparency and accountability
- effective use and development of resources
- fiscal prudence
BOARD OF TRUSTEES 2006

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Over the last decades, the Centre has successfully transitioned from a research laboratory, highly focused on cholera, to a full-fledged comprehensive health centre for research, service, and training. Furthermore, the Centre has shown how an institution with vision, purpose, and principles can thrive through changes in governments, donor priorities, and senior staff. In short, it has matured into a world-class institution. Clearly, the Centre is not in the business of acquiring knowledge just to publish papers, but rather to develop the knowledge that will be useful and practical. This is one international health organization that is based in Dhaka—not in Geneva, London or Washington DC—due to the simple fact that this is where the problems are. This is where health problems can best be understood in all their complexities. This is where science and programmes meet the real world, and this is where programmes are integrated into practical and cost-effective solutions.

The Centre’s New Look

2006 was the year when the Centre updated its logo and standardized the appearance of its publications following a branding exercise. The change in the Centre’s colour from blue to yellow ochre reflects its appropriate grouping with the family of humanitarian organizations, distinct from the family of larger, better-funded organizations that tend to use a blue colour. Though our mission is humanitarian, our methods remain those of the health sciences. This concept of “humanitarian science” led to our new tagline: *Knowledge for Global Lifesaving Solutions.*

The ‘knowledge package’

One way to understand the Centre’s new tagline is to consider a concept of knowledge packages. This concept suggests that a body of knowledge is needed to develop a new product, a new policy or a new programme. A single study or discovery is not sufficient to develop such a knowledge package. The development and wide-scale use of oral rehydration solution (ORS) is one example of such a knowledge package that required the input of basic scientists, clinical scientists, epidemiologists, policy-makers, and operations research projects to develop initiatives that could be used all over the world. The discovery of the benefits of zinc is another such knowledge package that is now being implemented in Bangladesh through the SUZY project (Scaling Up Zinc for Young Children).

The basic research on zinc, along with documentation of its clinical benefits during diarrhoea and the field studies showing the lifesaving properties of zinc led to international recommendations to initiate a 10 to 14-day course of zinc whenever a child is ill with diarrhoea. Facilitated by the SUZY project, Bangladesh became the first country to actually scale up this recommendation. Bringing zinc to scale was possible through a public-private partnership involving the Ministry of Health and Family Welfare, ACMB Laboratories Ltd., and Nutriset, along with many other groups and with the crucial financial support of the Bill and Melinda Gates Foundation. ‘Baby Zinc’, the readily dispersible zinc tablet was launched in November 2006 and families all over Bangladesh are...
now learning to treat their children with both ORS and zinc when their children have diarrhoea. This lifesaving treatment costs just $0.25 for a ten-day course of zinc. In the long term, the project is designed to be self-supporting, not relying on continuous donor support.

A lesson from our experience with ORS and zinc suggests that there are at least five requirements for a successful knowledge package which I call the ‘5 Ps’. These include: policy, product, programme, partnerships, and passion. If any of these Ps is missing, the chances for success are poor. Of course, basic knowledge for the package must be based on excellent research, but this is only the beginning of the process of turning scientific results into a package that becomes a global lifesaving solution.

### The Five Ps for Turning Research Information into a Knowledge Package

- **Policy**
- **Product**
- **Programme**
- **Partnerships**
- **Passion**

The research results must be accepted into governmental or global policies, products (that include training and behaviour change as well as physical products) must be made available, and then programmes must be developed to make these products available in a cost-efficient manner. This process will always involve partnerships since one institute cannot do it alone. Finally, the organizations and people must have a passion to ‘deliver the goods’. We often question why the results of important discoveries are not introduced earlier; it would seem that a major reason for delay relates to a failure to take into account at least one of the 5 Ps.

Several other knowledge packages are being identified and developed at the Centre. These include packages to reduce neonatal mortality, strategies to reduce maternal mortality, new methods for diagnosing patients with tuberculosis before they spread the infection to others, and ways to purify water from both bacterial and chemical contaminants. Developing the knowledge packages for these problems requires the input from all of the Centre’s disciplines, including the basic scientists, the clinical scientists, the epidemiologists, the social scientists, and the training unit, but equally important are the partners with which the Centre works.

### Major events

The year was filled with significant events and developments at the Centre. In February, The Centre hosted the 8th Congress of the Commonwealth Association of Paediatric Gastroenterology and Nutrition (CAPGAN) during which over 400 scientists from Commonwealth countries gathered in Dhaka to review key issues of diarrhoea and malnutrition. We were honoured to have, as keynote speaker for the opening, Professor Mohammed Yunus who, not long after, was awarded the Nobel Peace Prize.

**Professor Mohammed Yunus was the keynote speaker in the 8th Congress of CAPGAN**

The Centre also contributed to the Commonwealth briefing documents for the Commonwealth Minister’s Forum prior to the World Health Assembly.

### External review

During June-July, the Centre underwent a comprehensive external review organized by the Australian Government and led by Dr. Krishna Hort. The report, which was made available to all core donors, was very favourable for the Centre. Some key findings from the reviewers included the concepts that donors should increase the proportion of ‘un-earmarked’ long-term funding (core funds) to ICDDR,B, rather than exclusively funding specific research projects. This is in keeping with The Paris Declaration on Aid Effectiveness. These core funds could then be used as determined by the Centre to accomplish the goals as outlined in the Strategic Plan. The reviewers also felt that the Centre should develop a regional engagement strategy, designed to position ICDDR,B increasingly as a contributor to regional research and research capacity-building. It should also increase its investment in activities to improve the linkage between research and policy and programme development, with a view to increasing the salience of research to policy and programme-makers and practitioners, and increasing the rate of adoption of research findings into policy and programme decisions, and practice.

The Centre is responding to these recommendations from the reviewers in coordination with the group of core donors which currently include the governments of Australia, Bangladesh, Canada, The Netherlands, Sweden, Switzerland, and the United Kingdom. Hopefully, additional countries, agencies, and foundations will be added to this list in the future. We anticipate that a common Monitoring Evaluation Framework (MEF) can
be developed so that the Centre can report to each of these core donors using the same MEF. This common framework should minimize transaction costs (relative to a different MEF for each donor) and should make our activities transparent for all of the donors. Finalizing this MEF will be a major task during 2007 and the Centre looks forward to this encouraging development from our donors.

Withdrawal from certain certifications

Last year, we reported that the Centre had decided to withdraw from certain certifications required by USAID as a condition for their funding. This decision to decertify from the Mexico City Certification and the Trafficking Certification was finalized on 30 June 2006. Thus, the largest project in the Centre, the Family Health Research Project (FHRP), ended on that date, and the Centre no longer receives funds from the USAID mission in Dhaka.

Since USAID was our founding and the most consistent donor since 1971, this interruption in relationship was a remarkable event for the Centre. Fortunately, other core donors have increased funding to help compensate for the loss of USAID funding. A benefit of this action is the ability of Centre scientists to pursue crucial research on issues of abortion and HIV/AIDS that were not possible previously. Some estimates suggest that about 15% of maternal deaths are related to unsafe abortion, but because of previous restrictions on abortion research, these estimates are not well-documented. Now ICDDR,B scientists are concentrating on studies to understand how to reduce risks from unsafe abortion and how to assist the Government of Bangladesh to achieve its goals as stated in their policy documents on availability of safe menstrual regulation (MR). Clearly, the preferable and effective strategy to avoid the need for MR is through family planning (FP) programmes, and the Centre continues to carry out programmes to maximize the FP programme of the country.

Board of Trustees

Under the leadership of Professor Terence H. Hull as Chairperson, the Board of Trustees held two meetings during 2006. At the time of the June meeting, the Board authorized an external review of the Health Systems and Infectious Disease Division, and during the December meeting, the Board confirmed the selection of Professor Alejandro Cravioto as the next Executive Director of the Centre.

Transitions in international staff

There were several changes in international staff during the year. Vanessa Brooks returned to the United States after being the General Counsel for the Centre. She was replaced by Michael Behan. Alexander Mercer, Operations Research Scientist, left the Centre to return to the UK. Additions to the scientific staff with a special emphasis in issues of reproductive health included Dr. Elizabeth Oliveras, Dr. Heidi Johnston, and Dr. Allyson Moran. Dr. Tracey Lynn Perez Koehlmoos was recruited to increase our capacity in Health Systems Research. Henry Richards was recruited to head the newly-formed Communications Unit.

ICDDR,B in the news

ICDDR,B was prominent in the international news during the year with the Centre being featured in a cover story...
in Time Magazine (16 October 2006–European and Asian Editions). The article was devoted to the development and use of oral rehydration solution around the world and was largely based on the story of our ICDDR,B hospital in Dhaka.

Centre’s finances

Financially, the Centre’s budget continued to increase. Previously, the annual budget had been growing at a rate of about one million dollar, but this year it jumped five million dollar, and it appears that the budget will increase by a similar amount in 2007.

Fortunately, the cumulative deficit continues to be paid off slowly, and is now less than two million dollar. The increasing budget reflects mainly increasing project activity by the Centre’s scientists but it also reflects a growing confidence by the core donors. We thank each of these donors for their support of our activities and would like to continue to encourage individuals and organizations to continue to support the Centre through additional donations, especially to the endowments which provide long-term stability and creativity for the science and service to the patients who depend on our care.

Research highlights

Among many research results, some should be especially noted. Several of these represent years of effort while others represent the start of new knowledge packages. The paper by Alam in the Journal of the American Medical Association documented the safety and efficacy of the newly-recommended formula for ORS, and this study represents the latest in a series of studies on the low-osmolar ORS which has now become the ‘standard solution’.

Scientists from the Centre contributed to several of the recent Lancet series related to achieving the Millennium Development Goals, including reducing maternal and neonatal mortality. Currently in progress is another Lancet series on reducing malnutrition being written in coordination with the Mainstreaming Nutrition Initiative (an ICDDR,B project funded by the World Bank). Other breakthrough reports include the stimulation of innate immunity with short-chain fatty acids reported in the Proceedings of the National Academy of Science, and the analysis of the Projahnmo project demonstrating the effectiveness of a community-based intervention to reduce neonatal mortality in a large area of Sylhet district.

Also reported this year were preliminary findings from studies on the toxicity of water contaminated with arsenic consumed during pregnancy. This is the first study showing increased rates of foetal loss and early infant mortality when pregnant mothers drink such contaminated water.

Avian influenza is also becoming a threat to the region and the Centre, in close collaboration with the IEDCR (Institute of Epidemiology, Disease Control and Research) and the Ministry of Livestock and Fisheries, has initiated surveillance for this virus in flocks and people. Bangladesh is considered a country with a very high risk for avian influenza.

Developments in cholera research continue to expand our understanding of these bacteria, and the bacteria seem to be capable of continued evolution. In Africa, case-fatality rates continue to be about 5%, and may be as high as 30% in some areas of Angola as reviewed in a New England Journal of Medicine Perspective in 2006. During the last year, Centre scientists have discovered that the evolution of Vibrio cholerae El Tor has taken a very dangerous turn with these strains now expressing the toxin which was
formerly produced by classical strains. Preliminary results suggest that these newly-evolved strains cause more severe cholera than the earlier 7th pandemic strains. If these strains continue to spread to Africa or other remote areas of Asia, the case-fatality rates will almost certainly rise to unprecedented levels because of the severity of the illness these new organisms cause, and the need for rapid and rigorous rehydration.

Once again, our hospital was able to cope with the increased severity of patients, though, this has required increased resources. We estimated that the Dhaka Hospital saved the lives of more than 35,000 patients who had such severe dehydration and would have died if they had not come for treatment.

In 2006, most of the Centre's scientists contributed to a book on Achieving the Millennium Development Goals for Bangladesh. Each of the scientific programmes identified key issues in their area, tracked its progress over the last few decades, and recommended key strategies which would help achieve the health-related MDGs for Bangladesh. This country is one of only seven which may be on track for reducing child mortality and perhaps for reducing malnutrition, but considerable effort will be needed to actually achieve these goals. The analysis of the Centre's scientists will hopefully assist the country to achieve the goals for health.

Since this is my last Report as the Executive Director, I want to express my thanks to all the staff of the Centre and the Staff Welfare Association who have contributed so much to the Centre, and who have worked with me in such an understanding manner. I also want to thank our Board members for sharing with us so much of their time, effort, and experience. They have all been a joy for me to get to know and are a primary reason that the Centre has been so successful through the years. For our donors, and especially to our core donors, I give a special thank you for your support and encouragement. I trust you have also been able to accomplish your goals by working with our Centre.

Finally, I want to thank the Government of Bangladesh without whose support and cooperation we would have not been able to, and continue to, achieve our goals.

My wife and I will certainly miss living and working in this land of Bangladesh.

David A. Sack, MD
Executive Director
May 2007
What does the Programme do?

The Child Health Programme of ICDDR,B helps develop cost-effective child health and survival programmes. It does this by working to improve our understanding of the causes of childhood illness and death, and by testing public-health interventions designed to improve children’s health and development.

2006 Highlights

Considerable evidence accumulated in 2006 to support a recommendation to extend child health services as close as possible to the family. Since 1999, we have been collaborating with the Government of Bangladesh in the evaluation of Integrated Management of Childhood Illness (IMCI). IMCI is being mainly implemented through the government health services. Community IMCI interventions were introduced in mid-2003 through NGO and ICDDR,B workers to improve child-caring and feeding, and care-seeking practices. The interventions also targeted village doctors to improve referral of severely-ill children and to reduce harmful practices.

The implementation of IMCI was followed by a several-fold increase in the use of health facilities with IMCI-trained workers, with about a fifth of sick children taken for care from a formally-trained worker (up from less than 10% at baseline). However, village doctors continued to account for more than half of care-seeking for the sick child.

As reported last year, in October 2005, we introduced a new cadre of 65 village health workers (VHWs), one for about every 2,400 people, i.e. average of 2 villages. These workers, recruited from the villages, have been trained on community case management of common childhood illness and education and counselling of families. The aim is to address two of the problems identified through intervention monitoring: low exposure to community interventions and low use of trained providers for management of sick children.

The figure shows that, following introduction of VHWs, overall care-seeking from the trained providers increased from the previous steady state of 19-22% to 34%, with VHWs contributing half of the care-seeking. Also, for the first time, the village doctors from whom care was sought reduced from the previous trend of about 45-55% to less than 40%, though they were still the dominant providers.

In the previous annual reports, we have described Projahmo, the neonatal intervention research projects in 24 unions of Beanibazar, Zakiganj and Kanaighat upazilas of Sylhet district (Projahmo 1) and 12 unions of Mirzapur of Tangail district (Projahmo 2). In 2006, end-of-project surveys were conducted. Findings from
Projahanno 1 (Sylhet) showed that the home-care model reduced risk of deaths among all neonates by 33% compared to the comparison arm. The home-care arm involved community health workers (CHW)—one for every 4,000 people—who provided birth and newborn care preparedness counselling and education and identification and management of newborn sepsis. The CHWs were also trained to treat sick newborns with injectable antibiotics (penicillin, gentamicin), if referral failed. In contrast, there was no effect of the community care arm where we provided community mobilization activities and depended on government services for healthcare.

We conclude from the findings of these two studies that provision of community case management of childhood illness, including neonatal illness, is an essential intervention strategy, if we are to achieve a high coverage of case management of childhood illness.

The Multi-Country Evaluation of IMCI study, being implemented in collaboration with the Government of Bangladesh, is part of a global evaluation supported by WHO (with funds from the Bill and Melinda Gates Foundation) and USAID. Investigators from the Johns Hopkins University, London School of Hygiene & Tropical Medicine, and Tulane University are collaborating with ICDDR,B in this project.

The Projahanno studies are supported by USAID, Saving Newborn Lives (SNL) Initiative, the Wellcome Trust, and other donors, and are being implemented in partnership with Johns Hopkins University, Shimanik, Ministry of Health and Family Welfare of the Government of Bangladesh, Dhaka Shishu Hospital, Kumudini Hospital, the Institute of Child and Mother Health, and other partners.

**Child Development**

The Child Development Unit conducts research on issues relating to better development of children in Bangladesh. The Unit attempts to measure the effects of nutritional deficits, poor health, and deprivation on the development of children, and to design and evaluate low-cost and feasible interventions. The following stories illustrate the nature of experiences that contribute to our growing knowledge in this field.

**Story of Nayem**

WPPSI is a psychological test to assess the IQ of young children. Nayem, a 6-year old child and his mother were brought for the test in Matlab where it was being piloted as part of the MINIMat study. Tester Sumi started the verbal tests, but to her utter surprise, Nayem was completely silent and kept looking at his mother. The tester suspected that the child was unable to speak, but on inquiry the mother informed her that he could speak but was shy and mostly speaks only to her. Sumi tried to encourage the child to speak, but not getting any response after asking several questions, she observed that the boy was scared of his mother as she kept scolding him repeatedly. Sumi then asked the mother to leave the room, after which Nayem became responsive and made good progress in the test, but his IQ was poor. Sumi asked the mother if she used to punish Nayem at home, and the mother admitted that she did. Sumi counselled the mother on the importance of encouragement and disadvantages of punishment that may prevent the normal development of the child. After a week, Nayem was brought for a re-test on the same tool, when he made better responses, while the mother too was more cooperative and less inhibiting. This time the boy achieved higher IQ scores than expected.

Unfortunately, most parents in this society believe that punishment, especially of a physical nature, are needed to rear the child and make them an ideal child. Nayem’s status shows how, just in one week, slight changes in the behaviour of his mother changed his IQ. Love, affection, positive rewards and sound psychosocial behaviour all contribute to shaping the child’s character, while punishment, particularly physical punishment, can affect emotional development of a child and cause him/her to become a shy, introverted, less-responsive and less-productive adult.

**Story of Arif**

The Child Development Unit has initiated a programme of psychosocial stimulation at 4 nutrition centres in Dhaka city under a research project that aims at assessing the effects of a community-based stimulation programme for the development of severely-malnourished children.

Arif was a very severely-malnourished boy aged 9 months with weight-for age z-score (WAZ) -4.2. He was admitted to the Dhaka Hospital of ICDDR,B for diarrhoea. He comes from a poor Bihari (non-Bengali) family living in the Mirpur area of Dhaka. His father is a labourer and earns about Tk 600-900 (about US$100-150) per month by weaving Banaresi sharee (item of clothing usually used as a bride’s wedding dress). They live with Arif’s paternal grandmother who provides partial support to their family. Arif, enrolled in the study after the control of his diarrhoea, participated in the stimulation programme which required Arif and his mother visiting the nutrition centre in Mirpur every fortnight. There, the mother received counselling on child rearing, and Arif received toys made of cheap materials, appropriate for his developmental age. At the age of 9 months, his developmental age was that of a 6-month old boy. During the initial visits, he could not understand us, would cry continuously, and did not touch any of the toys or move around from one place to another. During the first three months, it was really difficult to work with the child, who was frequently sick and reluctant to explore his environment and play with the toys. At three-month follow-up, his developmental age had dropped to 5 months. His parents were unable to take proper care of Arif’s frequent illnesses due to their financial state. They did not play with Arif as much as they should have. As a result, Arif’s development was poorer at a 3-month follow-up, and his parents had given up their hopes for improving his physical and mental health at some point. Then his family faced another disaster. Arif’s grandmother who was providing support refused to support them any
longer and asked them to leave her house. This made the situation worse, and it was difficult for them even to manage food for the child. Thus, the mother started work, and together they started earning about Tk 2500 per month, and their financial situation improved. However, as Arif had missed some follow-up visits, we arranged some extra visits for him. At the 6-month follow-up visit, when he was 15 months of age, he was re-tested for psychosocial development, and this time, he had improved a lot reaching a developmental age of 11 months. He grew better physically, and at 15 months of age, his WAZ improved to -2.95. Relentless efforts by his mother to follow our advice and by play leader Kazi Sufia made this miraculous change possible.

This story highlights the importance of stimulation, along with nutrition, on improving both mental and physical development of a child. The caregiver’s willingness, the play leader’s sincerity, and the economic solvency of the family all made the programme a success.
What does the Programme do?

The Reproductive Health Programme works to develop strategies for improving maternal health and also tools to monitor the progress towards achieving the Millennium Development Goals (MDGs). In this way, the Programme aims at making a significant contribution to realizing Goal 5: ‘Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio.’

Other key areas of focus include the promotion of family planning and efforts to find ways of preventing, treating, and managing sexually transmitted infections and HIV/AIDS. This includes work to develop strategies for improving knowledge of adolescents about sexual health and to teach them how to avoid risky behaviour. The Programme undertakes research for reduction of morbidity and mortality due to abortion-related complications.

The researchers of the Programme also work to improve our understanding of violence against women in its social context and to develop public-health strategies that will reduce the incidence of such violence. Ensuring that men play an active role in ensuring their and their partners’ reproductive health is another key area of interest.

2006 Highlights

Trends and causes of pregnancy-related mortality in Matlab during 1976-2005

Over the last few decades, pregnancy-related deaths have fallen in the ICDDR,B’s Health and Demographic Surveillance System (HDSS) area in Matlab (Fig. 1). The HDSS and other special verbal autopsy data were analyzed to determine the trends and causes of pregnancy-related deaths in Matlab during 1976-2005. In the ICDDR,B service area, maternal and child health and family-planning services were introduced in the early eighties, followed by a skilled birth-attendance strategy in 1987. An adjacent area, covered by routine government health services, serves as a useful comparison for understanding how the scaling-up of interventions within the wider health system may affect pregnancy-related mortality.

In the ICDDR,B service area, pregnancy-related mortality due to all causes declined from 445 per 100,000 pregnancies in 1976-1985 to 208 per 100,000 pregnancies in 1996-2005 (Fig. 1). In the government service area, pregnancy-related mortality declined from 517 per 100,000 in 1976-1985 to 304 per 100,000 in 1996-2005. In proportional terms, this represents a 53% and 41% decline in the ICDDR,B and government service area.
In the ICDDR,B service area, overall direct obstetric mortality declined from 251 per 100,000 pregnancies from 1976-1985 to 110 per 100,000 pregnancies from 1996-2005. In the government service area, the corresponding decline was from 304 per 100,000 from 1976-1985 to 177 per 100,000 from 2001-2005. The overall decline in abortion-related mortality in the ICDDR,B and government service areas was 80% and 48% respectively. In both the areas, indirect obstetric mortality declined only in the recent years, and no change in injury/accidental deaths was observed over the past 30 years.

Haemorrhage was the most common direct obstetric cause in both ICDDR,B (45.0%) and government (35.1%) service areas, followed by pregnancy induced hypertension (PIH)—25.0% and 31.1% respectively (Fig. 2). In both the areas, about a quarter of the maternal deaths occurred due to indirect causes.

Pattern of gestational weight gain and birth-weight

Maternal nutrition, before and during pregnancy, can have a significant effect on a number of pregnancy outcomes, including birth-weight (Fig. 3 and 4). Low body-weight is quite common among babies born to rural Bangladeshi women. Gestational weight gain (GWG), a well-established important determinant of birth-weight, is also low and is about half that observed in healthy populations in western countries. Pattern and total amount of GWG, have been reported to be important in predicting birth-weight in some western studies, but little is known about this in populations, such as in Bangladesh where total weight gain is relatively low. Recently, we examined data on GWG from 904 women who participated in Maternal and Infant Nutrition Intervention at Matlab (MINIMat), a food and micronutrient supplementation study, during pregnancy and delivered in the clinics where birth-weight was measured immediately after child birth. Total GWG and that in three intervals (9 to 19 weeks, 20 to 30 weeks, and 30 weeks to delivery) were calculated. GWG above the median for the particular interval was defined as adequate. The mean total GWG was 7.2±3.1 kg (mean±SD) and birth-weight was 2744±376 g. After adjusting for potential confounding factors, adequate GWG in all three intervals was associated with the highest birth-weight, and inadequate GWG in all three intervals was associated with the lowest birth-weight (2886±421 g vs 2565±420 g, p<0.01). Regardless of the adequacy of GWG in earlier periods, adequate GWG in the last interval was associated with higher birth-weight and a lower proportion of low-birth-weight infants than inadequate GWG at this time. These findings suggest that, in circumstances in which total weight gain is relatively low, adequate GWG after 30-week gestational age is not only associated with an increase in birth-weight but also with a substantial reduction in low birth-weight. Thus, intervention for GWG could be prioritized accordingly in situations with resource constraint.

Saving Sheema from obstructed labour: CHRW’s ongoing effort to save women’s lives

Sheema, an 18-year old married woman, was pregnant for the first time. After confirming her pregnancy, a Community Health Research Worker (CHRW) trained by ICDDR,B explained pregnancy-related risks using a pictorial card, and suggesting her to go to the ICDDR,B health sub-centre for regular antenatal care. Her expected date of delivery was 28 October 2006. Since Sheema was from a conservative family, she was not willing to go to the sub-centre as this required passing shops on the way. However, the CHRW’s motivation inspired her family, in spite of concerns about proper social behaviour, to assist her in coming for antenatal care visits. After repeated urge from the CHRW, Sheema finally agreed to go for antenatal care with some conditions. She and a family member would only come to the sub-centre in the evening when shops would be closed. In this way Sheema was able to come to the sub-centre for 3 antenatal visits. Her midwife gave her advice on nutrition, cleanliness, and education, and suggested she deliver at a hospital.

Her labour began on 30 October 2006 at 10:00 pm. It took about 2 hours to bring her to the sub-centre for delivery. When she arrived at the sub-centre with strong labour pain, after a per-vaginal (P/V) examination, her midwife confirmed that the cervix had not dilated prop-
erly. Sheema continued her labour and was in pain for 17 hours, but there was no progress in the dilatation of cervix, despite all her midwife’s efforts. By this time, Sheema had become extremely exhausted and restless. A day had passed.

The next day at 3:00 pm, the midwife explained Sheema’s situation to her family members and suggested they take the patient to the ICDDR,B Hospital in Matlab. Sheema was suffering from prolonged obstructed labour, and if it continued, her uterus might rupture. Sheema required surgery to resolve her serious condition. Her family agreed but this time Sheema did not. She felt that it was not possible to reveal the private parts of her body to the men (medical personnel) who would need to be present during the surgery.” After repeated urge by the midwife and her family, she finally was convinced to go to the hospital and the midwife accompanied her.

After arriving at ICDDR,B’s Matlab Hospital, Sheema’s family decided to refer the patient to Chandpur for further management at a private clinic. They decided not to waste time since Sheema’s condition was continuing to deteriorate. An ambulance was sent from Chandpur and, at 4:45 pm, reached Chandpur Medical Centre. An ultrasonogram was performed and, after a P/V examination, the nurse told Sheema that her cervix was dilated 5 cm.: she could be observed for some time. At 9:00 pm, a physician examined her again and found that her baby was completely obstructed—she would need to undergo a caesarean section delivery. The operation took place around 10:30 pm. Both mother and the baby were fine. They stayed in Chandpur Medical Centre for 10 days before safely returning home. The mother and the family members were pleased and grateful to the staff of ICDDR,B for their role in making her delivery a safe one.

Moving from research to action: the tale of MotherNewBorNet

MotherNewBorNet, a regional network of organizations working on maternal and newborn health in Asia and the near east region, was established in April 2005 with 76 members from 14 countries. Within one and a half years, the membership spread to 47 countries and increased to 479. From the beginning, the network aimed at moving research into practice to improve maternal and neonatal health at the community level. The MotherNewBorNet conducted an evaluation of its activities to track how successful its activities were to attain the goal of moving from research into action. A member from the Prevention of Postpartum Hemorrhage Initiative (POPHI) said, “the MotherNewBorNet has been very valuable. It introduced POPPHI to groups, previously unknown, working in Asia on the prevention of postpartum hemorrhage (PPH). More importantly, it introduced PPH prevention to many groups that the POPPHI would not have known or had access to. In other words, we have been able to share important messages and information and data in an efficient and effective way.”

A member from the NGO Service Delivery Programme (NSDP), Bangladesh, expressed, “the network activities are valuable for the NSDP. The NSDP improved active management of the third stage of labour, initial stabilization and referral for PPH, and incorporated postpartum care within 72 weeks based on the information provided by the network.”

Another member from Pakistan stated, “the network is like a state-of-the art tool! Specifically, information in the newsletter helped us update our protocol on birth asphyxia. From the annual meeting, we learned about the minimum package of interventions for mothers and newborns. This has now been adapted for Pakistan.”

The MotherNewBorNet has contributed to the development of a set of indicators to monitor the progress towards maternal and newborn survival. In collaboration with the United States Agency for International Development, the network facilitated the development of country-specific work-plans to prioritize community-based early postpartum care and implementation of minimum activities for mother and newborn in 9 countries: Afghanistan, Bangladesh, Egypt, India, Indonesia, Iraq, Nepal, and The Philippines. The MotherNewBorNet actively promoted the idea of considering mothers and newborns as inseparable. Inclusion of MotherNewBorNet representatives in the National Postpartum Haemorrhage Task Force of Bangladesh has provided the opportunity to interact with the policy-makers in Bangladesh and share the evidence-based interventions for PPH and the importance of early community-based postpartum care.
Malnutrition retards children’s growth and mental development. It also makes people more susceptible to diseases and leads to mothers with poor diets giving birth to underweight babies. In fact, it is the root cause of many health problems in developing countries like Bangladesh. Without improvement in nutritional status of the population, it is doubtful whether the health-related United Nations Millennium Development Goals (MDGs) can be achieved. With only seven years to go to the MDG deadline of 2015, many countries are unfortunately lagging behind the target of MDG 1, particularly its hunger and nutrition component. ICDDR,B’s Nutrition Programme, therefore, works to have a wide-ranging impact on the health of population by reducing the burden of protein-energy and micronutrient-related malnutrition.

2006 Highlights

2006 was an eventful year for the Programme. Researchers have initiated a number of new studies. The Programme has also established a number of collaborative initiatives with different partners—both in Bangladesh and abroad.

Floods in Bangladesh: impact on nutritional status of children

Situated in the Gangetic delta, Bangladesh often experiences floods. The country was devastated by floods
in 2004—more than three-fourths of the country went under water, first due to overflow of the rivers in July-August and then due to incessant rains in September. An analysis done in 2006 on the 2004 flood revealed that it largely affected the health and nutrition of children. The child nutrition part of the baseline survey of the National Nutrition Programme was completed just before the floods started, which offered an opportunity to assess the impact of floods on the nutritional status of children and coping mechanisms of their parents. Children studied during the baseline survey were randomly selected for re-assessing their nutritional status. The re-assessment was done 4-5 months after the baseline survey, which gave an estimate of the impact of the 2004 floods on the nutritional status of children. In total, 815 children aged 6 months to 6 years, were selected from the flood-affected and non-affected areas in different regions of the country. Their baseline anthropometry was done before flooding. Before the floods, 15% of children in the flood-affected areas suffered from severe stunting, a condition which indicates chronic malnutrition. This rate in the same group of children increased to 22% after the floods. The rates of severe underweight and wasting—indicating acute malnutrition—also increased in this group after the floods. However, the rates of severe underweight and wasting after the floods in the areas not affected were less than those in the flood-affected areas, which provides evidence that the floods adversely affect the nutritional status of children.

Some responses from the flood victims revealed a few of the post-flood problems among people in the affected community:

*The river washed away our house. We are staying in a neighbour’s kitchen, which is a roofed shelter with two walls. We’ll have to stay there until we can find a new place to live, but first we need to find work. Normally, we’d have work in the paddy fields, bringing in the harvest, but the flood came early this year and washed the fields away.*

What people needed was help to rebuild or repair their houses and employment as one person said, “We don’t want relief, we want work.”

### Need to integrate nutrition: Mainstreaming Nutrition Initiative

Malnutrition remains the world’s most serious health problem and the single largest contributor to child mortality. Half of all childhood mortality could be averted by eliminating malnutrition. Nearly one-third of children in the developing world are either under-weight or stunted, and more than 30% of people in the developing world suffer from micronutrient deficiencies. This serious problem of malnutrition is often dealt with in isolation by different sectors of the Government and other organizations. Nutrition programmes are often undertaken as stand-alone initiatives that cease to function properly soon after government or donor support is withdrawn. Again, lack of communication and collaboration across sectors to address problems in a unified manner has also contributed to poor nutritional outcomes. Many countries and their development partners need to work towards improving nutrition not only...
through health interventions but also agriculture, rural development, water supply and sanitation, social protection, education, and community-driven development initiatives. In order for this to occur, countries need to make nutrition a priority agenda and adopt clearly-defined nutrition policies. Nutrition education, food distribution and security, nutritional rehabilitation, micronutrient programmes, and immunization must be integrated in a holistic and sustainable way.

With support from the World Bank, the Nutrition Programme last year formed the Mainstreaming Nutrition Initiative (MNI), a global partnership for catalyzing the integration of priority nutrition action into health sector policies and programmes worldwide. By building on a network of the existing programmes in different countries, the MNI, led by ICDDR,B, has formed a learning network to build local capacity and leadership, share knowledge about successful programmes, and help selected countries to develop long-term programmes on nutrition. Collaborating institutions include, among others, Cornell University, Aga Khan University, Partnership for Maternal, Newborn and Child Health (PMNCH), and the United Nations Sub-Committee on Nutrition.

The first international workshop of the MNI, held in Dhaka in October 2006, was the first step to communicating the need to mainstream nutrition to key health leaders around the globe. Participants of the workshop included researchers from ICDDR,B and Cornell University, officials from the Ministry of Health and Family Welfare (Bangladesh), representatives from the World Bank, and delegates from Bolivia, Guatemala, Ethiopia, India, Tanzania, Viet Nam, and Bangladesh. The workshop focused on a newly-developed conceptual framework and assessment tools for mainstreaming nutrition into maternal and child health programmes (Fig. 2). Important aspects of the workshop included country presentations and an exercise using the framework and tools to identify country opportunities for mainstreaming nutrition.

The country delegates worked on developing proposals on how to mainstream nutrition in their region or country and begin to arrange in-country workshops with local stakeholders for advocating the need to mainstream some aspects of nutrition (e.g. expanding coverage of vitamin A supplementation, exclusive breastfeeding, essential nutrition actions, and zinc supplementation) at the local, provincial, national and global policy levels. The MNI core team will provide technical assistance to the in-country teams to help realize the envisioned goal.

### Global nutrition review and the Lancet nutrition series

As a component of the MNI, a global review of nutrition was done with the following objectives:

- Review the available evidence in the scientific and programme literature of various nutrition interventions
- Assess the evidence base and impact of large-scale nutrition and health programmes on maternal and child health and nutrition outcomes
- Synthesize the evidence to recommend integrated sets of maternal and child nutrition interventions that may work in various health system settings
- Recommend a process for monitoring outcomes and assessment of impact of such interventions in health system and programmatic settings

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Coefficient</th>
<th>Adjusted odds ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (6-60 months)</td>
<td>0.59 (0.56, 0.62)**</td>
<td>0.13 (0.12, 0.13)**</td>
</tr>
<tr>
<td>Sex (0=female, 1=male)</td>
<td>1.40 (0.59, 2.22)**</td>
<td>0.49 (0.24, 0.74)**</td>
</tr>
<tr>
<td>Education of mother (0=no, 1=yes)</td>
<td>1.79 (0.88, 2.71)**</td>
<td>0.44 (0.25, 0.69)**</td>
</tr>
<tr>
<td>Diarrhoea (0=no, 1=yes)</td>
<td>-0.99 (-2.29, -0.30)***</td>
<td>-0.48 (-0.78, -0.17)***</td>
</tr>
<tr>
<td>Dysentery (0=no, 1=yes)</td>
<td>0.55 (-0.55, 1.65)</td>
<td>0.17 (-0.17, 0.51)</td>
</tr>
<tr>
<td>Fever (0=no, 1=yes)</td>
<td>-0.49 (-1.36, 0.38)</td>
<td>-0.17 (-0.39, 0.06)</td>
</tr>
<tr>
<td>Flood (0=not affected, 1=affected)</td>
<td>-0.99 (-1.94, -0.05)***</td>
<td>-0.29 (-0.55, -0.02)***</td>
</tr>
</tbody>
</table>

*p <0.05; **p<0.01; CI=Confidence interval; HAZ=Height-for-age z-score; WAZ=Weight-for-age z-score; WHZ=Weight-for-height z-score; SD=Standard deviation

### Table 1. Coefficients and odds ratio (95% confidence intervals) of children’s malnutrition indices adjusted for different background characteristics (children aged 6-60 months, n=815)
Provide information on evidence gaps and the requisite research needed to address maternal and childhood malnutrition in the context of the MDG 1 and 4.

The synthesis of interventions that work at scale will form the basis for recommendations for action in the upcoming *Lancet* series on nutrition. This publication will focus on what may work in an integrated approach to maternal and childhood malnutrition in various settings and will specifically suggest an approach relevant to health systems and the MDGs for eliminating hunger and reducing maternal and child mortality.

Additionally, the MNI has commissioned analytical reviews by world-renowned experts on specific issues relating to mainstreaming nutrition. These include the following:

**Barriers to seeking services from existing MCH programmes:** Currently, only 50% of women in Bangladesh have antenatal check-ups, regarded as the first step in MCH programmes. Treatment is sought from public MCH programmes for ailments of children in less than 10% cases. It is, therefore, essential to know why people refrain from seeking services from public MCH providers.

**Scaling up of exclusive breastfeeding:** The recent *Lancet* child-survival series has pointed out that breastfeeding can prevent 13% of all deaths of children aged less than 5 years in the world. Rates of exclusive breastfeeding are appallingly poor in Bangladesh—around 12% as revealed in the Baseline Survey of the National Nutrition Programme. This analysis will look at different ways of improving exclusive breastfeeding on a global scale, with particular emphasis on developing countries. The study will also cover breastfeeding in the context of HIV infection of the mother.

**Growth monitoring and promotion:** Growth monitoring and promotion (GMP) is widely regarded as a powerful tool for promoting child nutrition. There are concerns, however, regarding its effectiveness. This review has analyzed global literature on GMP and suggested recommendations.

**Improving micronutrient status of complementary food:** Existing national programmes on nutrition in developing countries, including Bangladesh, provide supplementary food that lack essential micronutrients. Even complementary food given at home does not have the appropriate quality or quantity of micronutrients. This study has investigated ways of improving complementary and supplementary food both at household and community levels through appropriate strategies, including micronutrient sprinkles and food-fortification at the community level.

**Meta-analysis of the efficacy of deworming in improving nutritional status of children and adolescents:** Intestinal worm infestation is common in Bangladesh and in other less-developed countries: This meta-analysis of the effects of deworming on nutritional status will tell us whether anti-helminthics should routinely be given to target populations.

**Better targeting of supplementary food in national programmes:** There is concern about mistargeting children, pregnant and lactating women for food supplementation. This has huge implications on the budget of large-scale nutrition programmes. This work will collate information on targeting population groups

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**Fig. 2. Biological, implementation, and sociopolitical processes of mainstreaming nutrition**

- **Locus of Mainstreaming**
  - Donor
  - Partnerships
  - National Governments
  - Ministries of Health
  - NGOs
  - District Health Teams
  - Private Sector

- **Dimensions of Mainstreaming Process**
  - Biological considerations
  - Implementability
    - How can the delivery of nutrition interventions be integrated with other MCH programmes/services/initiatives?
    - Who can deliver interventions?
    - What are the economic considerations?
  - Sociopolitical considerations
    - How is the nutrition problem perceived?
    - Who are the values and interests of people and organizations who will need to take action to move the nutrition agenda?
    - Why will organizations buy into the nutrition agenda?

- **Policy decisions can be made via:**
  - Full consensus among players, with all stakeholders on board
  - Well-informed decisions by policymakers with input from all the right people

- **Source:** Frongillo E, et al. 2006
for supplementary feeding, collect evidence for options that are more likely to work, and suggest appropriate recommendations.

Management of Severe Malnutrition

Severe malnutrition in childhood is a serious condition that results from a combination of causes, including lack of food, repeated infections, and familial and social deprivation. If not managed properly, the risks of death are as high as 40%. It was believed until recently that severe malnutrition is just the tip of the iceberg and resources should rather focus more on its prevention. However, it is now known that severe malnutrition contributes to more than 15% of all deaths among children aged less than 5 years in the developing world. Therefore, if the MDG 4, i.e. to reduce child mortality by two-thirds is to be achieved by 2015, the huge problem of severe malnutrition should be addressed appropriately.

The case-fatality rate (CFR) in children with severe malnutrition has decreased in centres where the WHO guidelines for the management of severe malnutrition have been implemented. These generic guidelines focus on immediate start of feeding, supplementation with essential micronutrients, broad-spectrum antibiotic treatment, judicious use of rehydration fluids, and expeditious identification and management of complications. ICDDR,B was the first institution to test the efficacy of the guidelines tailored for severely-malnourished children with diarrhoea using local diets (results published in *The Lancet*, 1999). More recently, a meta-analysis done by researchers of the Centre’s Nutrition Programme revealed that the WHO guidelines are efficient in reducing the CFR. They analyzed the results of studies from different centres and showed that if the WHO guidelines are followed, the CFR is likely to be reduced by 61% (odds ratio of 0.39, Table 2).

National guidelines on management of severe malnutrition for Sudan

Just having good guidelines is not enough. These have to be adapted for use in different geographical settings and incorporated in national guidelines. Last year, the Nutrition Programme assisted the Government of Sudan in developing a national guideline for the management of severe malnutrition and a plan of action. The current CFR is around 20% among severely-malnourished children in Sudan. The national guideline, developed through a consultative approach involving various stakeholders, including government and non-government representatives, academics, and international agencies, will be instrumental in reducing the high CFR. The following are the key issues in the guidelines:

- Human resources and equipment needs
- Initial management of severe malnutrition
- Choice of antibiotics in relation to current antimicrobial resistance patterns
- Use of local diets during management of severe acute malnutrition
- Nutritional rehabilitation
- Treatment of pneumonia among severely-malnourished children
- Management of infants aged less than 6 months with severe malnutrition
- Management of severe malnutrition in disaster settings

### Table 2. Meta-analysis of studies reporting use of WHO guidelines for management of severe malnutrition and impact on case-fatality

<table>
<thead>
<tr>
<th>Study</th>
<th>Odds ratio (random)</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amin et al. 1999</td>
<td>0.49 [0.38, 0.64]</td>
<td></td>
</tr>
<tr>
<td>Amin et al. 2001</td>
<td>0.51 [0.39, 0.67]</td>
<td></td>
</tr>
<tr>
<td>Amin et al. 2004</td>
<td>0.46 [0.30, 0.67]</td>
<td></td>
</tr>
<tr>
<td>Dean 2003</td>
<td>0.45 [0.33, 0.62]</td>
<td></td>
</tr>
<tr>
<td>Dean 2004</td>
<td>0.41 [0.29, 0.58]</td>
<td></td>
</tr>
<tr>
<td>Faiz 2004</td>
<td>0.55 [0.41, 0.75]</td>
<td></td>
</tr>
<tr>
<td>Noor Shaha 2003</td>
<td>0.32 [0.20, 0.51]</td>
<td></td>
</tr>
</tbody>
</table>

Test for overall effect: Z=5.93 (p<0.0001)

### Table 3. Outcome of management of severe malnutrition in different hospitals in Bangladesh

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Addin Hospital</th>
<th>CMCH</th>
<th>KMCH</th>
<th>ICDDR,B</th>
<th>DMCH</th>
<th>DSH</th>
<th>ICMH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight gain (g/kg/d)</td>
<td>11.1</td>
<td>7.7</td>
<td>7.7</td>
<td>11.9</td>
<td>13.5</td>
<td>7</td>
<td>11.1</td>
</tr>
<tr>
<td>Days to meet exit criteria</td>
<td>28</td>
<td>14.8</td>
<td>11.9</td>
<td>14</td>
<td>15</td>
<td>11</td>
<td>28</td>
</tr>
<tr>
<td>Recovery rate (%)</td>
<td>72.4</td>
<td>88.4</td>
<td>63.5</td>
<td>81</td>
<td>38</td>
<td>73.1</td>
<td>83.3</td>
</tr>
<tr>
<td>Death rate (%)</td>
<td>6.7</td>
<td>10.8</td>
<td>5.7</td>
<td>5.3</td>
<td>15.3</td>
<td>6.8</td>
<td>6.7</td>
</tr>
</tbody>
</table>

CMCH=Chittagong Medical College Hospital; KMCH=Khulna Medical College Hospital; DMCH=Dhaka Medical College Hospital; DSH=Dhaka Shishu Hospital; ICMH=Institute of Child and Mother Health
National guidelines on management of severe malnutrition for Bangladesh

An estimated one-quarter of a million severely-wasted children currently living in Bangladesh are at risk of dying. The Nutrition Programme helped the Directorate General of Health Services (Bangladesh) in developing the national guidelines for the management of severe malnutrition at healthcare facility and community levels. In a keynote lecture in a seminar on national guidelines for senior health professionals held in 2006, Head of the Nutrition Programme shared the experience of ICDDR,B and also the work being done in other institutions. The WHO guidelines, with some modifications, are being implemented in some hospitals. CFR is typically around 10% (Table 3).

Establishment of nutrition services at Chittagong Medical College Hospital

Although severe malnutrition in childhood is a major problem in Bangladesh, the national medical college hospitals hardly have any services for children. The Nutrition Programme, in collaboration with Concern Worldwide and with support from the Centre’s Improved Health for the Poor project, established a nutrition block in the Children’s Ward of the Chittagong Medical College Hospital. The major objectives of setting up this block were manifold—to allow medical and nursing students to have hands-on training in the assessment and management of severe malnutrition, to provide services to children with severe malnutrition, and to demonstrate that such services can be established in other public teaching hospitals. Over a one-year period, 171 severely malnourished children were treated in the block, with 88% recovery rate, which is greater than the internationally-acknowledged Sphere Standard of more than 75% (Table 4). Eighty-two medical students, 12 nurses, and 103 doctors have so far received hands-on training in the nutrition block.

Vitamin A status during pregnancy

Vitamin A deficiency is one of the most common micronutrient deficiency disorders, especially among children and pregnant women in Bangladesh and other developing countries. In many regions of the developing world, night-blindness is frequently observed among pregnant women. Pregnant women with vitamin A deficiency have a high risk of morbidity, especially from infectious causes. Moreover, vitamin A deficiency can also affect the vitamin A status of the foetus and also the newborn infant. Severe vitamin A deficiency during pregnancy may increase the risk of infant death in the first few months of life.

Vanessa Lee and Shoko Wada—two students from the School of Public Health, University of Queensland—studied the magnitude of vitamin A deficiency in pregnant women and their dietary intakes of the vitamin. They studied 200 pregnant women in their second (14-28 weeks) or third trimester (29+weeks) in villages in Gazipur district.

More than 50% of the women had poor vitamin A status with low serum vitamin A levels (<30 µg/dL). About 16% of women had sub-clinical vitamin A deficiency (<20 µg/dL). Only one-third of them actually consumed the recommended dietary allowance (RDA) of vitamin A. The prevalence of sub-clinical vitamin A deficiency was almost two times higher among women who did not satisfy the RDA compared to those who satisfied the RDA. The pregnant women in the third trimester had significantly lower serum vitamin A levels compared to those in their second trimester. Those who were malnourished, with mid-upper arm circumference <22.5 cm, had significantly lower serum vitamin A levels compared to well-nourished women. However, the women with low per-capita income and poor sanitation/latrine had a relatively higher prevalence of sub-clinical vitamin A deficiency than those with a higher per-capita income and good sanitation. It was also observed that women's exclusion from purchasing family food from the market and lack of control over food distribution in the household could influence their dietary vitamin A intake. Furthermore, cultural beliefs and taboos placed on foods can restrict consumption of nutritious foods during pregnancy. It is, therefore, very important to change behaviour for improving dietary vitamin A intake during pregnancy. Supplementation of a large dose (200,000 units) of vitamin A to the mother within 6 weeks of delivery is part of the national strategy for combating vitamin A deficiency and should be scaled up.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>CMCH</th>
<th>Sphere Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recovery rate (%)</td>
<td>88</td>
<td>&gt;75</td>
</tr>
<tr>
<td>Case-fatality rate (%)</td>
<td>10.8</td>
<td>&lt;10</td>
</tr>
<tr>
<td>Length of stay (%)</td>
<td>15</td>
<td>3-4 weeks</td>
</tr>
</tbody>
</table>

Non-communicable diseases among adults born to mothers exposed to famine during pregnancy

Bangladesh and other developing countries are going through important demographic changes in recent decades primarily for reduction in fertility and mortality due to communicable diseases. However, chronic non-communicable diseases, including diabetes mellitus
of all deaths are attributable to non-communicable diseases. In a recent study in Matlab, the nutritional status and selected adult health outcomes were examined on two randomly-selected groups of adults—one relatively younger (aged 27-32 years) and the other older (aged 38-49 years). The younger group consisted of individuals who were either exposed to the famine of 1974-1975 during their foetal life or born before or after the famine and were not exposed to famine in foetal life.

Overall, the study subjects were non-obese but had over-weight (body mass index 25-29), with prevalence of 7% in males and 12% in females. Abdominal obesity (defined as waist-circumference >90 cm for male, and >80 cm for female), which is considered a stronger risk factor for cardiometabolic disorders, was prevalent among 7% of males and 20% of females. The differences between males and females were statistically significant (Fig. 3). The study also revealed that 8% of older males and 11% of older females were hypertensive (Fig. 4). Impaired glucose tolerance (IGT), a pre-diabetic condition, was prevalent among 7% of males and 10% of females, but again, older females had a disproportionately higher prevalence (12%) of IGT (Fig. 5).

None of the younger males was detected as diabetic while 2% of older males and 2% of younger and 6% of older females had type 2 diabetes. When compared between the exposed and the non-exposed individuals to famine during prenatal life, the prevalence of IGT was three times higher in exposed than non-exposed groups (IGT: 11.8% vs 3.7/4.3%; p<0.03). Blood lipid profile did not differ significantly between the groups. These findings suggest that exposure to under-nutrition during foetal life is associated with abnormal glucose metabolism and an elevated risk of impaired glucose tolerance and have implications for future development of type 2 diabetes mellitus. An important observation was that very few subjects (less than 2%) were aware that they had abnormal blood pressure and metabolic disorders, which may have implications for long-term health and quality of life. This ignorance might also result in catastrophic health and economic consequences for the family and the community at large.

Training and Teaching

- The Nutrition Programme coordinated the nutrition module of MPH course of James P. Grant School of Public Health, BRAC University.
- It also arranged a training course on nutrition research methods for FCPS/MD students of Dhaka Medical College.
- The Nutrition Programme has been working in a collaborative initiative with Concern Bangladesh to strengthen the capacity of the Khulna Shishu (Children) Hospital, Khulna Medical College Hospital and Chittagong Medical College Hospital to implement institutional management of severe malnutrition among children aged less than 5 years.
- The Programme is providing the technical support to develop staff capacity in the appropriate clinical care required for severely-malnourished children.
- A training course on the management of severely-malnourished children was conducted for 22 doctors, nurses, and other health professionals of BRAC, Chittagong Medical College Hospital, Khulna Medical College Hospital, and Khulna Shishu (Children) Hospital.
What does the Programme do?

ICDDR,B is a vibrant institution with various experts actively engaged in research on infectious diseases. Microbiologists conduct fundamental research on the characteristics of pathogens. Immunologists study host defences, including potential vaccine candidates. Clinical scientists study the diseases caused by these infectious agents and evaluate optimum therapy in infected patients. Epidemiologists study the magnitude, distribution, risk factors, and effectiveness of preventive interventions for these infections. Anthropologists study the understanding of these diseases in communities and their impact on daily life. Health economists consider the burden caused by these diseases and the coping strategies used for addressing them. Health systems experts evaluate the health-system response to infectious diseases.

One advantage of the research environment at ICDDR,B is that there are a critical mass of scientists from a number of disciplines working on infectious diseases. The Programme on Infectious Diseases and Vaccine Sciences supports and encourages collaboration across all the scientific divisions within ICDDR,B on infectious disease research. The Programme’s research priorities include understanding the causes, distribution, and control of key infectious diseases, responding to disease outbreaks, and evaluating promising vaccines. This collaboration allows multi-disciplinary teams to address problems with greater synergy and productivity than single disciplinary work allows.

2006 Highlights

ICDDR,B research on rotavirus

In 2006, the work on rotavirus by various researchers throughout the Centre illustrates the type of cross-disciplinary work that is central to the Programme on Infectious Diseases and Vaccine Sciences.

One of the most exciting achievements in global public health in 2006 was the publication of results of two large trials of two different vaccines against rotavirus. Rotavirus is estimated to cause 600,000 childhood deaths each year. The live rotavirus vaccine—RotaRix—developed by GlaxoSmithKline, was 85% effective in preventing severe disease due to rotavirus. The RotaTeq vaccine, developed by Merck & Company, was 98% effective in preventing severe disease due to rotavirus in the first year and 88% in the second year. These two papers were selected by *The Lancet* as the “Paper of the Year.” The Lancet editors opined that these two vaccines “one day are likely to stand alongside smallpox, measles, and poliomyelitis vaccines in their global public health benefit” [Butcher J. Paper of the Year 2006. *Lancet* 2007;369:91-2].

These studies represent important advances, although a number of questions remained unanswered regarding rotavirus vaccine in Bangladesh and in other high-need countries. The vast majority of children enrolled in two rotavirus studies were residents of the United States, Western Europe, and Latin America. Numerous previous rotavirus vaccine candidates have shown good efficacy in some countries and poor efficacy in others. Live enteric virus vaccines have characteristically performed much worse in South Asia and other settings with high prevalence of malnutrition, diarrhoeal diseases, and poor sanitation.

To determine the appropriateness of rotavirus vaccine for Bangladesh, two questions are central. First, how much disease from rotavirus is present in Bangladesh? Second, when introduced into the local population, how effective will the new vaccines be against the strains of rotavirus circulating in Bangladesh in preventing severe disease due to rotavirus?

Burden of rotavirus-associated disease in Bangladesh

ICDDR,B scientists made substantial progress in addressing both of the above questions in 2006. Since 1993,
ICDDR,B has maintained a surveillance for determining the causes of diarrhoea among patients visiting the Dhaka and Matlab hospitals. Epidemiologists in the Health Systems and Infections Diseases Division collaborated with clinical scientists in the Clinical Sciences Division, along with collaborators from the Centers for Disease Control and Prevention and Emory University, USA.

They reviewed the surveillance data and extracted the proportion of children aged below 5 years hospitalized for diarrhoea with rotavirus identified in their stools at the two ICDDR,B hospitals. They used this proportion as an estimate of the proportion of children, with severe diarrhoea, who have rotavirus, throughout the country. Next, they reviewed the data from the most recent Bangladesh Demographic and Health Survey to estimate the rate of death from diarrhoea among children in Bangladesh. They applied the proportion of cases attributed to rotavirus in the hospital to diarrhoeal death rates in Bangladesh and concluded that rotavirus is responsible for 5,600-9,400 child deaths in Bangladesh each year. This provides a useful figure to estimate the health benefit of an effective vaccine.

**Characterizing rotavirus strains in Bangladesh**

There are different strains of rotavirus. Immune protection against one strain does not guarantee protection against another. In the ICDDR,B’s Virology Laboratory, rotavirus strains identified from stools of patients participating in the hospital surveillance in Dhaka and Matlab have been monitored and characterized. Since 1992, rotavirus has been detected in stools of one-fourth of all tested patients in the two hospitals. They applied the proportion of cases attributed to rotavirus in the hospital to diarrhoeal death rates in Bangladesh and concluded that rotavirus is responsible for 5,600-9,400 child deaths in Bangladesh each year. This provides a useful figure to estimate the health benefit of an effective vaccine.

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**Rotavirus vaccine studies in Bangladesh**

As a first step to evaluate the efficacy of the new rotavirus vaccines in Bangladesh, The ICDDR,B scientists conducted a study in urban Dhaka to evaluate the safety, the immune response, and the impact of co-administration of RotaRix vaccine at the same time as oral polio vaccine, another live virus vaccine that is active in the infant gut. Two hundred ninety-four healthy infants were randomly assigned to 4 groups to receive either: RotaRix with oral polio virus vaccine, RotaRix without oral polio vaccine, placebo with oral polio vaccine, and placebo without oral polio vaccine. The antibody response of rotavirus was assessed by measuring the seroconversion rate for anti-rotavirus IgA antibodies and seroprotection rates for anti-polio type 1,2,3 antibodies using a virus neutralization assay.

There were no clinical differences in tolerability between the groups. Anti-rotavirus IgA seroconversion rate in the RotaRix group where oral polio vaccine was administered concomitantly was 57% compared to 67% where RotaRix was administered alone. The seroconversion rate in the pooled placebo group was 19%. No significant difference was observed in oral polio virus seroprotection rates between the groups. The ICDDR,B scientists concluded that the RotaRix vaccine was well-tolerated with a good safety and immunogenicity profile in this setting. No significant difference was noted in the immune response...
when two doses of the RotaRix vaccine were co-administered with oral polio vaccine compared to two RotaRix doses when oral polio vaccine was given apart.

Defining incidence of intussusception in Bangladesh in preparation for a Phase III Trial of a new rotavirus vaccine

An earlier rotavirus vaccine—RotaShield—was removed from the market because of an increased incidence in intussusception following the administration of the vaccine. Intussusception is a severe medical problem in infancy where one portion of the bowel slides into the next, much like the pieces of a telescope. Although the new vaccines have not demonstrated any increased risk of intussusception, any evaluation of live rotavirus vaccine needs to include the capacity to recognize, rapidly diagnose, and appropriately treat intussusception. In 2004, scientists at ICDDR,B established an ongoing population-based surveillance for intussusception in the ICDDR,B's Matlab field site in anticipation of conducting a large vaccine trial of a new rotavirus vaccine. In addition, the scientists reviewed data on previous hospital admissions to identify possible cases of intussusception. As part of their routine monthly visit, the community health research workers visited households of all children aged less than 2 years in the Matlab surveillance area and asked if they had experienced any symptoms consistent with intussusception. Suspected cases were referred to the Matlab hospital for further evaluation by the medical officers for clinical examination and ultrasound. Overall, there were 2 probable cases of intussusception detected. The intussusception surveillance system has been fully established to diagnose and treat and the referral of potential cases.

Phase 3 RotaTeq vaccine trial

Late in 2006, ICDDR,B reached an agreement with PATH to conduct a phase III randomized placebo-controlled trial of the RotaTeq vaccine in the Matlab field site. This study will enroll up to 1,780 children who live in the Matlab surveillance area and who routinely get care for their diarrhoeal illness at the ICDDR,B’s Matlab Hospital. Data from Bangladesh will represent the primary evaluation of the effectiveness of the vaccine in low-income countries in Asia. We expect the results to inform vaccine policy for Bangladesh and for tens of millions of children in the region.

The diverse work on rotavirus in 2006 illustrates the benefits of cross-divisional collaboration. The epidemiologists in the Public Health Sciences Division oversee the population-based surveillance in Matlab and collaborate with the clinical scientists at the Matlab Hospital to identify appropriate patients for stool testing. These provide pathogen-specific population-based estimates and also provide remarkably unbiased population-based samples for detailed laboratory analysis and genotyping in the Laboratory Sciences Division. All of this provides a productive environment to support globally-important vaccine trials. The Programme on Infectious Diseases and Vaccine Sciences will continue to support productive collaborations on rotavirus and across the broad range of ICDDR,B’s work on infectious diseases.
What does the Programme do?

The Health and Family Planning Systems Programme (HFPSP) is broadly concerned with improving access of people to healthcare in Bangladesh. It also seeks to boost the effectiveness of the country’s health services (both preventative and curative) and to improve service coverage. The Programme uses the best available evidence to do this, addressing key considerations, such as health policy, service organization, funding and costs, and interactions of public-private sector. Several other research programmes within the Centre also work to improve health systems. The HFPSP, thus, works closely with these programmes and also with the Health Systems and Economics (HSE) Unit of HSID.

The HFPSP scientists have been engaged in a wide range of research activities addressing many of the most important health problems facing Bangladesh. This includes prevention of HIV/AIDS, the scaling-up of zinc for the treatment of childhood diarrhoea, the testing of integrated reproductive health strategies, the costing of vaccines and diarrhoeal diseases, a situation analysis of induced safe and unsafe abortions, tools to assess community readiness and then work with communities to participate in disease prevention efforts, new strategies for the delivery of immunization services to urban slum populations, and an ongoing effort to better delineate essential laboratory services at the primary healthcare level. The following two stories illustrate the work we do.

2006 Highlights

Renewed tuberculosis control agenda

Tuberculosis (TB) continues to be an important contributor to the overall burden of disease and preventable deaths in nearly all developing countries, including Bangladesh. This country ranks sixth in the world in terms of total TB burden. Control of TB depends upon coordinated, effective implementation of programmes that combine strategies to prevent TB, but also among those who become infected, to diagnose and treat it early. It is early diagnosis and treatment that will prevent its spread within households and among those coming into contact with active cases. Early diagnosis is often hampered by the fact that adults may have only mild symptoms of a relatively non-specific nature at the initial stage of infection. This includes a persistent cough—these ‘chronic coughers’ being a primary source of transmission. If the individual infected or his primary healthcare provider is aware that this is an important sign of early TB, it is hoped they will then refer themselves to a ‘directly observed treatment, short-course’—DOTS centre. It is at these DOTS facilities that one will find the required resources and trained health professionals able to diagnose and properly treat and follow up cases of tuberculosis. In Bangladesh, it is estimated that 80% of TB cases seen at a DOTS centre are cured. On the other hand, less than 40% of adults with TB are ever seen in a DOTS facility. At present, the primary strategy used to identify potential cases of TB is to refer any adult with a cough of three-or-more weeks duration to a DOTS centre.

The National Tuberculosis Programme (NTP) of Bangladesh is well aware of the shortcomings of early detection of recently-infected adults and its chronic cough referral strategy. In consultation with a team of HFPSP researchers, important gaps in knowledge were identified that required urgent attention in the hope of guiding future NTP strategies and health policy. The knowledge gaps, or unanswered questions, included the following:

- How common is a chronic cough among adults?
- What are the healthcare-seeking practices of those with a chronic cough?
- If a ‘chronic cougher’ seeks help from a healthcare provider, what happens?
• Are providers aware that they should suspect TB in an adult with chronic cough and do they refer such cases to a DOTS facility?

To answer these questions, the research team carried out surveys to identify chronic coughers in two lower-income urban communities in Dhaka. They also interviewed licensed and unlicensed providers in two large cities: Dhaka and Chittagong.

Door-to-door household surveys eventually reached over 60,000 adults, of whom 1,138 (1.9%) were identified to have a cough of more than 3 weeks duration. The prevalence of chronic cough was significantly higher in males than in females (2.3% vs 1.7%). This is not a very high prevalence of chronic cough, especially if one considers over 90% of these individuals will not have TB. Even if every chronic cougher was referred to a DOTS centre, only about 2 early diagnoses per 2,000 people would be made—a rate much lower than the current estimates of TB prevalence in Dhaka.

We found that about two-thirds of those with chronic cough had sought help from a health provider. Over 80% of these individuals sought help from private-sector care providers, of whom more than three-quarters were unlicensed. Unlicensed providers primarily practise allopathic medicine, copying the treatment practices of licensed providers, but in an unregulated environment. These include what are locally referred to as ‘village doctors’ or less frequently it might be a drug vendor or a traditional healer. This means, for early detection to be successful, there is a need to work closely with the private sector, especially those who are unregulated. This does not mean they are unorganized. On the contrary, they have their local and national associations that are capable of representing them and influencing practices.

Those with chronic cough were asked what measures had been taken by the private provider from whom care was sought. Table 1 summarizes what were reported by those interviewed. As can be seen, all providers frequently prescribe a drug. Unregulated providers infrequently order investigations. Most strikingly, we could find only one chronic cougher who was referred to a DOTS centre. In contrast to what symptomatic adults are reporting, the private care providers who were interviewed presented a very different picture. Less than one-half of the providers were aware that they should suspect TB in an adult with chronic cough. Unlicensed care providers were the most out-of-line with what their patients were telling us. As can be seen, only 5% reported prescribing a drug, and 75% claimed they referred chronic coughers to a DOTS centre.

The chronic coughers and care providers who were interviewed often gave us anecdotal accounts of their experiences that shed light on the reasons for some shortfalls in the detection of TB.

Chronic cougher: I am not interested in being sent for tests or referred to another doctor, I just want some medicine to cure my cough.
Provider: I used to refer to the DOTS centre, but I stopped. I would send my patients there, then never hear what happened. The patients would come back to me complaining that the centre did nothing—just told them they did not have TB, but offered no help for their chronic cough.

These results tell us many important things. First, there are wide disparities between self-reported services received and what providers tell us they are practising. Second, the DOTS centres are not receiving referrals from the private sector in adequate frequency to have a substantial impact on the detection of TB in Dhaka or Chittagong. The situation may be different in rural Bangladesh and, therefore, there is a need to carry out similar surveys in these areas. Finally, the National TB Programme needs to consider new strategies and policies that will encourage greater public-private collaboration.

Launching of ‘Baby Zinc’ in Bangladesh

In November of 2006 ‘Baby Zinc’, a dispersible zinc tablet formulation, was launched in Bangladesh, and thus the first national scale up anywhere in the world of zinc treatment for diarrhoea and prevention programme was begun. This event represents the culmination of over a decade of research completed at the Centre that included the work of basic laboratory, clinical, public-health and health-systems scientists. For the children of Bangladesh, this event also represents the beginning of an intervention that could annually save the lives of up to 50,000 children aged less than 5 years.

The research on zinc as a treatment for childhood diarrhoea has been described by the Centre’s Executive Direc-
To implement production, marketing, and delivery strategies in the public, private and NGO sectors that will set us on the path to reaching all children of Bangladesh, regardless of gender, income, or where they live in providing zinc as a treatment for any diarrhoeal disease episode. A dispersible zinc tablet preparation was chosen because of its ease of distribution and administration, stability over long periods of time in hot, humid weather, and reduced cost. A 10-tablet blister pack (one tablet to be taken per day) costs Tk 17 or about 25 US cents. The technology behind the preparation of this dispersible tablet formulation was developed by a French pharmaceutical laboratory, Rodael Ltd. In June of 2006, a technology transfer was made between Rodael and the Bangladeshi pharmaceutical company, ACME Laboratories Ltd.

Previous annual reports have presented many of the research projects carried out in support of the SUZY Project. This includes safety and side-effect studies, confirmation of product acceptability among parents and children, adherence to treatment instructions, caretakers’ and providers’ knowledge of zinc, and diarrhoea management practices.

A critical gap in knowledge needed to prepare for the launching of Baby Zinc was what to include in mass-media messages and how to introduce this new product to care providers. To prepare for this, a formative research team was created, as was a communications team made up of scientists and experts in marketing. This latter team was unique in the sense that it brought together staff from ICDDR,B, a private pharmaceutical company ACME Laboratories Ltd., and an advertising firm Dhansiri Productions, that together developed all the promotional materials, including TV and radio commercials, billboards, village courtyard meetings, provider promotion materials, and provider orientation workshops.

To help prepare for the provider promotion materials, members of the research team travelled with medical representatives and observed their interactions with licensed and unlicensed care providers. Medical representatives are hired by drug companies to promote their drugs among licensed MBBS doctors and unlicensed, usually unregulated village doctors or drug vendors. The larger drug companies will have as many as 60,000 provider contacts, and medical representatives will visit most of them every 1-2 week(s). The busier care providers might be visited 3 or 4 times a week. This means the medical representatives are kept very busy, working 12 hours per day, with each covering about 150 care providers.

The important differences in how medical representatives interact with licensed and unlicensed care providers were observed. The following is a brief description of a typical visit to a licensed care providers and unlicensed care providers.

**Licensed providers:** The visits were formal with the medical representative behaving in a subservient, almost apologetic manner, avoiding eye contact, and waiting for the appropriate time to introduce their products. It
was standard for the doctor to continue to treat patients throughout a visit, with minimal verbal response. Initial interactions involved conveying personal interest in the physician, such as: *Sir er bashar shobai bhalo achen?* (Is everybody in sir’s residence doing well?), *Sirke ai shirt e chomotkar lagche* (sir is looking great in this shirt.)

The medical representative waits until the physician signals permission to introduce products. While treating patients, the physician listens passively. The medical representative uses biomedical terms to explain the function of a drug and cites medical literature. Information is transferred in a concise manner, and free samples are offered. The session ends with the medical representative leaving a small gift, such as a pen.

**Unlicensed providers:** These visits are informal beginning with greetings and an offer to sit down. If seeing a patient, the care provider finishes and then meets separately with the medical representative. Often this included a cup of tea. The conversation starts with personal introductions and might begin as follows:

> “Mojid Bhai, bhabi bachchara kemon ache?” (Brother Mojid, how is my sister-in-law [this indicates affection towards the provider's wife] and the children?)

The medical representative presents drug products one at a time, reminding the care provider why the product is important, how it works and its indications. Care providers typically ask questions and use the session to educate themselves. Brochures and notepads containing information on specific drugs are commonly given, as are posters, stickers, and danglers promoting drug products. Books in Bangla with detailed descriptions of drug products, including composition, dosage, side-effects, and effectiveness are, also offered.

At the time of these observations, Baby Zinc was not on the market, but several zinc syrups were. Messages relating to zinc typically covered the following:

> “Bhai [Brother], zinc is very effective for treatment of all types of diarrhoeal illness. This has been shown through various scientific studies. It also treats long-term fever and protects young children from having future diarrhoeal episodes. When a child refuses to eat, zinc can be used for treating loss of appetite. It is also beneficial for growth and development, such as skeletal growth or strengthening bones or gonad development.”

Strikingly, there was no mention of including ORS with zinc therapy.

Among the many things learnt from these observations is the tremendous potential medical representatives have for promoting a new product, such as Baby Zinc. They function within an extremely well-organized system and represent an important—sometimes only—source of information providers receive about drugs and new treatments. The challenge will be to continue promotion of ORS products, discourage unnecessary drugs, such as anti-diarrhoeals and most antibiotics, and not to exaggerate the therapeutic properties of zinc. Over the coming year, we will be constantly monitoring the uptake of Baby Zinc—whom it is reaching and what impact it is having on ORS use and other medications.
What does the Programme do?

The Population Sciences Programme works to understand a wide range of issues relating to changes in the population of Bangladesh. Foci of the programme include work to identify why the decline in fertility rates has levelled off in Bangladesh and efforts to understand the health problems of adults and the elderly—and how best to provide support to them. The Programme also studies rural-to-urban migration and changes in health equity and aims at developing and monitoring interventions to better manage health and population challenges in Bangladesh and other areas of the world.

2006 Highlights

Review of population challenges for Bangladesh in the coming decades

The current population of around 142 million in Bangladesh is still likely to double before stopping the growth. This will result in a major shift from a young population to a much-older population with consequent implications for healthcare especially for non-communicable diseases.

The other major demographic phenomenon is the cessation of rural population growth in the near future, accompanied with continued urban growth driven by rural-to-urban migration. The majority of this future urban growth will be in slums, with predicted serious health and social consequences.

What forces are driving this rural-to-urban migration? First, Bangladesh is extremely densely-populated. The current population density (1,000 per sq. km) is 50% higher than that would be in the United States if the entire world population were squeezed into it. Agriculture is reaching saturation. The agricultural workforce has remained numerically stagnant for more than a decade. Landlessness appears to be decreasing (to 50% in 1996), although the landless are selectively migrating to the cities, producing a misleading decline. Among those farmers with land, the average farm sizes and agricultural production provide just enough for family consumption, leaving nothing additional to sell, or to feed other non-agricultural families.

Agricultural production is expected to peak in the next decade or so unless substantial changes occur in production techniques and water supply. While major increases in production are possible, irrigation is a limiting factor, even when sufficient water enters Bangladesh annually to cover the entire country to a depth of 10 metres. Due to an absence of dams and minimal canal construction linked to the widespread flood-control embankments, input requirements for irrigated rice production are increasing every year. Depletion of the deeper aquifer (which, unlike the shallow aquifer, does not replenish every monsoon) is contributing to drought in the dry season, especially in the north. The expanding use of motorized pump deep tubewells is part of the explanation for this.

There is a little possibility of increasing land available for agriculture (88,000 sq. km at present), and already widespread double and triple cropping allows for little further intensification. Agricultural land has been decreasing annually by 1% for expansion of new residence and commercial enterprises. Simultaneously, river erosion is consuming 10,000 hectares of land annually and driving rural residents to relocate in other rural or urban areas. In the south, depletion of the shallow aquifer for irrigation and drinking-water is resulting in salination and reducing usable water for crop production. Finally, recent estimates of the extent of the threat of potential sea-level rise resulting from global warming varies from 0.4 m by 2080 (Hadley Centre, UK) to 6 m by 2100 (Scandanavian group reporting in *Science* in 2006). Even the more modest predictions imply a threat to some 30 million Bangladeshis living in coastal areas who would have to move north, many probably to the cities of Chittagong and Dhaka.
The interventions or socioeconomic changes that might make some impact on this scenario involve greater efforts to generate employment in rural areas, restrictions on rural-to-urban migration through residence registration, and greater efforts to increase agricultural production.

Assuming whatever policy and programmatic changes occur, urbanization will continue at a high rate—hopefully lower than the current 3.5% p.a. overall (20-year doubling time) and 7% for slums p.a. (10-year doubling time. This implies a need for urban planning for low-income populations involving slum-improvement programmes, possibly along the lines of those in neighbouring Asian countries. Infrastructure requirements are great for such large and rapidly-growing slum populations—for example, in Dhaka, an additional 6 million litres of water are required annually, in addition to the 2.1 billion litres currently consumed. Sanitation (currently only 30% of the population in Dhaka has piped sanitation) must be expanded, if only to protect surface-water resources.

A final comment on ageing will illustrate the health impact of changing age-structure. Over the next 3 decades, the number of cases of diabetes can be expected to increase almost three-fold, from 2.7 million to 7.1 million, but only one-quarter of that increase will be due to increasing population size, and three-quarters of the increase will be due to ageing of the population. This applies particularly to chronic non-communicable diseases that affect older people, but it also applies to communicable diseases that affect adults, such as tuberculosis (TB), where the number of cases will almost double. This is in a context where, during this century, the young population (aged below 15 years) will remain constant at 47 million, but the elderly population (aged 60 years and over) will increase about 9-fold.

Infant mortality among twins and triplets in Matlab, Bangladesh in 1975-2002

Few data are available in low-income countries on the incidence of multiple births (defined here as twins and triplets) and on levels, trends, and determinants of neonatal, postneonatal and infant mortality among children born as twins or triplets. The Health and Demographic Surveillance System, maintained in Matlab, Bangladesh, is a unique source of population-based, longitudinal data on multiple births in a developing country. Multiple births constitute only 2% of all livebirths, but contributed 10% to all infant deaths in 1975-2002. The rate of multiple births was much higher among older and multiparous women, and for twins and triplets born after a long previous birth interval. The decline in infant mortality varied by type of pregnancy. Mortality among multiple births declined 25% in 1975-2002, which is considerably lower than the 50% decrease in mortality among singletons in the same period. Various demographic and socioeconomic factors explain this higher mortality in twins and triplets. Infant mortality was particularly high among women who were born to mothers without schooling. It was also higher in the government service area than in the ICDDR,B area where the availability of accessible high-quality maternity care and care for newborns and infants is greater.

Father’s migration and children’s education in Matlab, Bangladesh

Migration is a strategy for livelihood. Men migrate leaving behind their spouses, children, and aging parents for more earnings. The HDSS records type of place (rural, urban, and abroad), where and when migrants went out or returned from. Men’s migration can affect education of children by increasing material well-being or bringing an attitudinal change or both. The HDSS recorded education of children and household possessions of durable articles, including land owned in 2005. Household durables are used for calculating household asset quintiles. The higher the asset quintile the better is the household economic condition. Population-based longitudinal data from the HDSS on migration in 1996-2004 are used for estimating effects of father’s migration on children’s school enrollment and retention, controlling simultaneously for age and sex of the child, education of parents, and household asset quintile in Matlab, Bangladesh. School enrollment among children aged 4-10 years in 2005 was found to be near universal (90%). Enrollment of girls—primary and secondary—exceeds enrollment of boys. Among school-enrolled children aged 12-15 years, 64% passed grade 5, 49% among children aged 14-17 years passed grade 7, and 13% among children aged 16-19 years passed grade 10. During 1996-2004, 60% of children aged 6-19 years lived with both the parents, and the rest missed their fathers at least for some time. Fathers’ emigration to urban areas accounts for 6%, abroad (mostly oil-rich middle-east countries) accounts for 7%, and away from the family most of the time accounts for 27%. Both school enrollment rates and pass rates in grade 5, 7, and 10 were higher among children whose fathers were abroad or were away from family for a long time than among children whose fathers did not migrate at all. Father’s migration abroad and long-stay away from family also contributed to education of children by improving household economic condition. Other important factors associated with higher school enrollment and pass rates were higher education of parents and higher household asset quintiles. Their influences on education of children are much larger than the effects of father’s migration.

Selected maternal health indicators obtained by the geographical reconnaissance

We calculated maternal mortality ratio estimates and proportion of facility-based deliveries using large-scale population-based data collected by the fieldworkers of the Ministry of Health and Family Welfare, Government of Bangladesh under an activity termed ‘geographical reconnaissance’. We then compared these estimates with those from the Bangladesh Maternal Health Services and Mortality Survey and the results obtained through the sample vital registration system of the Bangladesh Bureau of Statistics. The national estimate of the maternal mortality ratio using the geographical reconnaissance was 50% lower than the other estimates, but divisional estimates varied greatly, and the number of facility-based deliveries was increasing in some areas. We also assessed
whether annual changes in maternal mortality could be monitored at the sub-district level. A substantial yearly variation in the number of maternal deaths and large confidence intervals characterizes sub-district maternal mortality ratio estimates. The Government commits substantial resources for the geographical reconnaissance, and the quality of the mortality data it collects deserves critical examination that will support important decision-making about the future of the geographical reconnaissance.

Demographic, programmatic, and socioeconomic correlates of maternal mortality in Matlab, Bangladesh

Although declining, maternal mortality in Bangladesh is high by any standard. A better understanding of the factors associated with maternal mortality will help health and family-planning programmes to develop strategies to make pregnancy and childbirth safer for women. Data from the Matlab Demographic Surveillance System on nearly 143,000 pregnancy outcomes examined correlates of maternal mortality during 1982-2002. The study assessed the effects of the four ‘too’s that are commonly believed to increase the risk of livebirth mortality—too young, too short a birth interval, too many children, and too old. Of these, only ‘too old’ was a risk factor for maternal mortality. Controlling for gravidity, women aged below 25 years had the lowest risk of mortality, and then it increased sharply with age. We found evidence of one additional ‘too’: too long birth interval. Inter-pregnancy intervals of 5 years or longer had nearly double the risk of maternal mortality compared to intervals of 2-5 years. First pregnancies, those ending in non-livebirths, and those with a history of previous child deaths and pregnancy losses also carry high risks of maternal mortality, as do low levels of women’s learning, poor household socioeconomic conditions and living in the comparison area of Matlab. The analyses identified higher-risk pregnancies that should be monitored and implied that increased provision of maternity care could help maintain and perhaps accelerate the pace of maternal mortality decline in Bangladesh and similar countries.

Lower maternal mortality in the Matlab MCH-FP area in Bangladesh: role of non-livebirth pregnancies

The Matlab MCH-FP project is known for its impact on fertility and child mortality in Bangladesh. However, it also provides maternity-care as a part of its reproductive health services. The study examined whether the project has had any impact on maternal mortality and, if so, the extent to which differences in pregnancy outcomes and their case-fatality rates between the areas explain the maternal mortality difference. We analyzed data from the Matlab Demographic Surveillance System on 142,952 pregnancies that resulted in a maternal death during pregnancy, a non-livebirth, or a singleton livebirth during 1982-2002 to compare maternal mortality between the MCH-FP area and the government-served comparison area. The study documented that women in the MCH-FP area who were pregnant or recently delivered experienced 23% lower mortality than those in the comparison area. Rates of maternal mortality for women whose pregnancies resulted in livebirths did not differ significantly between the two areas (1.21/1,000 livebirths in the MCH-FP area and 1.24/1,000 in the comparison area). In both the areas, the risk of maternal mortality was considerably higher for pregnancies that resulted in non-livebirths (induced abortion, miscarriage, and stillbirth) compared to those that resulted in livebirths, and this was especially the case in the comparison area. The incidence of non-livebirth pregnancy outcomes was 21% lower in the MCH-FP area than in the comparison area, and the likelihood of maternal death following a non-livebirth pregnancy was 32% lower in the MCH-FP area (5.42 deaths/1,000 pregnancies) than in the comparison area (8.01 deaths/1,000 pregnancies).

Levels and sociodemographic differentials of non-communicable disease risk factors among adults in Matlab, Bangladesh: findings from the WHO STEPS survey

Non-communicable diseases (NCDs) are prevalent in all countries of the world, regardless of the level of their economic development or demographic and epidemiological transition. Although the burden of common NCDs is increasing, the risk factors, such as smoking, alcohol-use, blood pressure, physical activity, and obesity, are highly preventable. From the public-health perspective, the major risk factors of today will be the diseases of tomorrow. The study examined NCD risk factors among adults in Matlab using the WHO STEPS methodology. The study selected randomly 1,000 males and 1,000 females, aged 25-64 years, from two blocks of the ICDDR,B service area. Results showed that slightly over 50% of the males were smoking but it was less than 1% for females, while tobacco-use (smoking/chewing) was about 70% for males and 30% for females. Alcohol consumption was very low—about 4% for males and nil for females. Eating fruits (weekly 3 or more days) was low and lower for females than males (16.3% vs 33.6%), while eating vegetables (weekly 5 or more days) was also low and lower for females than males (38.1% vs 48%). Vigorous physical activities relating to work were low for both males and females (8% vs 5%), while walking/biking was more common among males than among females (75% vs 27%). Both high blood pressure and overweight were more for females than males (3.4% vs 2.7%), while 4% of males had both blood pressure and smoking habit, and it was 0.2% for females. After controlling all the variables in the model, risk factors of non-communicable diseases for both males and females usually varied significantly by age, education, occupation, and religion.

Life-cycle stories from the Matlab Demographic Surveillance System

Chronic illness deepens poverty

Kuddus, born in February 1960, resides with his family in Fatehpur, a village in the southwest of Matlab, Chandpur. He and his family have lived there since the Demographic Surveillance System (DSS) started in 1966.

Kuddus, educated in maktab, is a landless farmer and day-labourer. He married Marzina (then aged 19 years) in July 1993 at the age of 33 years. Marzina had studied in a secular school up to class IV. Currently, they have three sons and one daughter (Halima) who was born in May 2004, and the eldest son Jalil studies in class VII.
For 15 years, Kuddus has suffered from asthma. His asthma, which becomes more serious in winter, hampers his ability to carry out daily activities. As a result of this illness, Kuddus is unable to maintain his earnings. He is the only income-earning person among his 6 family members. He has been forced to sell his inherited land to bear medical expenses and the costs of raising a family. Furthermore, in 1998, Kuddus separated from his brother’s family because of a family quarrel.

Analysis of data from three consecutive census periods (1982, 1996, and 2005) demonstrated the effect of Kuddus’s illness on his socioeconomic status. Once a member of the middle socioeconomic quintile in 1982, Kuddus and his family had risen to the richest quintile by 1996. However, by 2005, probably due to sickness and an inability to earn an income—coupled with a large family size, they became one of the poorest.

Shamsuddin: From Poor to Rich

Shamsuddin, born in December 1955 with congenital abnormality in one foot, has been residing with his family in Gazipur village since the Matlab Demographic Surveillance System started in 1966. He married Johora in November 1978. After studying in maktab and later being an agricultural day-labourer, he started paddy/rice business around 9 years back and suffered a serious loss. He is now engaged in match-making for a small fee. His wife Johora is a housewife, and their family consists of 8 members, including 4 sons, one daughter, and a grandson.

Johora’s first child Suruz was born in September 1980 and her last child Mohon in February 1993. Suruz married Nasrin in September 2003 and got divorced after 11 days, and re-married Salma in December 2003. In March 2005, Shamsuddin’s first grandson was born, and he was named Sujon. Suruz is a farmer and next two sons Babu and Abul are employed in a shop in Dhaka city. The youngest son Mohan studies in the BRAC school.

Despite lameness, Shamsuddin performs his daily chores properly. He borrowed some money from ASA, a microcredit NGO, to repair their house. Now Shamsuddin’s family possesses cows and doves and earn about Tk 40 per day by selling cow-milk. Since all the family members still live together in the same household and have regular sources of income, the socioeconomic status of the family gradually improved over the last few years. The interview also showed that employment of Shamsuddin and his 3 sons, with the use of loan from a microcredit organization, have changed the socioeconomic status of his family and reached from the poorest to the richest asset quintile during 1996-2005.
Migration to abroad brings economic well-being

Mariomer’s husband died around 15 years ago, leaving 4 sons and 3 daughters in a dilapidated condition. In the dream of a secure source of income, she sold her agricultural land and sent her eldest son Faruk, born in 1967, to Saudi Arabia (KSA). Mariomer’s brothers, already living in KSA, helped Faruk by providing visa assistance and other monetary support. In KSA, Faruk got the job of a driver in a carton factory.

After settling down in KSA, Faruk started sending money to his family on regular intervals—usually in the range of 60,000 to 90,000 per year. Over time, Mariomer was able to payback her loans and recover mortgaged properties. Faruk also helped in bringing his younger brother Alamgir to KSA as a driver in a poultry farm. After working there for 4 years, Alamgir returned home due to injury in an accident. By that time, all of Mariomer’s daughters got married, and younger sons got involved in farming and poultry business.
Now Mariomer maintains a bank deposit and is paying installments on one plot in Dhaka city. She believes that hard work and remittance from abroad are the keys of economic progress of her family.

**Story of a polygamous husband**

Gani Mia, born in Machhuakhal village on 1 February 1944, has been residing in the surveillance area since the inception of the Matlab DSS. According to the DSS records, he married 8 women in his lifetime, and all of them are still alive. The DSS personnel interviewed Gani to collect more information on his lifestyle and reasons for multiple marriages.

Gani is the eldest son of his family and has been educated in maktab for couple of years. He is a Kabiraz (practising exorcism and occult method) and worked as agricultural labourer for many years. He used to lease in agricultural land and cultivate different crops with the help of his family members. Nowadays, he cannot work in the fields and depends on the income of his family members—his remaining wives, sons, and daughter work as agricultural wage-labourer, rickshaw-puller (5 sons), and engine-boat driver (one son). According to Gani Mia, he married 6 women—his first wife, along with her 3 children, left him when he brought his second wife about 5 years after his first marriage. However, the other 5 wives are living in the same bari, where only the youngest wife with a son aged 10 years live with him in the same household, and the other 4 live with their respective son’s family in separate households. He has two big sheds (tin-sheds with bamboo fence wall and earthen floor) with 5 small rooms, and each room has become a separate household due to the splitting of Gani’s family.

Gani Mia stated that none of his marriages was registered anywhere and, from his second wife, all of his wives knew about the presence of other wives before marriage. About the reasons of multiple marriages, he said that he was physically well-built and very good-looking and women felt attracted and fell in love with him easily. He also mentioned that he had had 2 marriages due to social pressure, against his willingness, in which cases his good relation with those 2 women as his Kabirazi clients, and some villagers forced him to marry both of them. He feels proud to having many marriages without any match-maker and for the fact that his wives never quarrel among themselves. He is satisfied with the existing status as his wives and sons still take care of him during illness, and they all share curries with him, especially when something special is cooked.

According to Gani’s remaining wives, they are satisfied with what they get from him. They all work in the field for their survival, and they consider their marriage and present status as their fate accepted likewise—they do not blame either their parents or Gani Mia for their lives.

Despite Gani’s claim of having 6 marriages, the HDSS record showed that he married 8 women, among which 3 wives are recorded as divorced and other 5 are recorded as married.

**Story of three generations**

**Grandfather Bacchu Mia** (CID: V21001701, RID: IV2100901, DoB: 1 April 1935)

Bacchu Mia is an honourable person of their bari named Chairman bari. Many people of this bari are educated
since the British period, and since then, many people of this bari have been serving as government officials. One Major General who retired very recently is also from this bari. Two UP Chairmen of Khadergaon union were elected from this bari, and both of them are the cousins of Bacchu Mia. Among 4 sons and 3 daughters, Bacchu is the third son of his father and mother.

Bacchu is fully familiar with the activities of ICDDR,B in Matlab. Being satisfied with the activities of ICDDR,B, he and his family donated 12 decimals of land to ICDDR,B where the Centre has constructed a sub-centre named Block B Khadergaon sub-centre. He cannot remember how many times he acted as a respondent to the DSS interviewer, what he said was that ‘thousand times’ (hazarbar). As a subject, he took part in the TB study, and his cough was examined. He is fully aware of the worldwide achievement of ICDDR,B for ORS. He is proud of being a part of ICDDR,B activities.

Son: Joshim Uddin (CID: V21001712, RID: IV21000904, DoB: 1 March 1961)

Joshim Uddin is the second son among the 6 sons and 3 daughters of Bacchu Mia. He is a farmer by profession. He can remember the activities of ICDDR,B, particularly the treatment to cholera patients from his childhood days. Like his father, he also took part as a respondent to the DSS interviewer several times. His wife Surma Begum volunteers as a subject and took part in urine, stool, and ultrasonography tests in the first phase of MINIMat studies. She is also taking part as a subject in the second phase of MINIMat studies. She loves to consult with Community Health Research Worker (CHRW) for any personal and family problems, including health. She greets CHRW and other staff members of ICDDR,B at her house and provides information, particularly health and demographic data, during their visits.


Sumaiya is the second of two daughters of Joshim Uddin. She has not started schooling yet but she knows the CHRW who vaccinates children and comes to their house very often. She was vaccinated in the house of CHRW, which is close to their house. The Khadergaon sub-centre is also very close to their house. The small Sumaiya can show the location of sub-centre and the house of CHRW pointing finger where she visited with her mother during illness.
What does the Programme do?

The mandate of the Poverty and Health programme includes a poverty focus on all research activities throughout the Centre. The Programme places special emphasis on studying the barriers facing the poor in accessing health and other development services. It provides a platform to exchange ideas and generate research studies, within and outside the Centre, on poverty and health. The Programme also contributes to developing the capacity of researchers within and outside the Centre to carry out poverty and health-related research. This is done through organizing training courses and workshops and by establishing collaborations with relevant organizations within and outside Bangladesh. The Social and Behavioural Sciences Unit (SBSU) of the Public Health Sciences Division continues to coordinate the Poverty and Health Programme and its activities.

2006 Highlights

Research

Some research topics that fall under the purview of the Poverty and Health Programme include pre-paid vouchers for the poor to access safe motherhood services from skilled birth attendants, pro-poor monitoring of health systems, violence against women, the Social Exclusion Knowledge Network of the WHO Commission on Social Determinants of Health, and an anthropological assessment of risks and vulnerabilities to STIs/HIV of an indigenous community. Details of research mentioned above and other relevant studies have been reported under the activities of the Social and Behavioural Sciences Unit of the Public Health Sciences Division and in other units and divisions of the Centre. A story on two cases of the voucher system that has been introduced since January 2006 by the Chakaria Community Health Project (CCHP) to provide free maternal health services to poor pregnant women is presented in this report.

Capacity-building and dissemination

Monthly meetings

The Programme has been holding monthly meetings where members from various divisions across the Centre can attend, and ideas are cross-fertilized. The meetings are a forum where research findings can be shared, new directions of research are explored, and capacity for poverty-focused research is developed. Some research topics discussed during the meetings included: “Self-rated health of ultra-poor women: the effect of an inclusive development intervention”, “Mothers’ perception of children’s development and gender differences in play, work, and opportunities—findings from focus-group discussions”, and “Health, nutrition, and poverty in applied anthropology.”

Collaboration with BHEW

Collaborative work with the Bangladesh Health Equity Watch (BHEW) is continuing. BHEW is a collaborative effort of ICDDR,B, Bangladesh Bureau of Statistics, Bangladesh Institute of Development Studies, and BRAC. Collaborative work with the BHEW on the production, publication, and dissemination of working papers and newsletters is continuing. The SBSU hosts the secretariat of the project. More about the BHEW activities has been reported in the SBSU section under the Public Health Sciences Division.

Poverty and health resource centre

The Information Sciences Division maintains a poverty and health resource centre at the ICDDR,B library. This resource unit was built to facilitate...
research on poverty, health, and equity both within and outside the Centre by providing a strong knowledge-base with the most recent books, articles, and papers published on poverty-related issues. The growing collection of books, articles, etc. at the unit covers a wide range of topics, including writings on various methods of poverty measurement, rural-urban poverty status within the country, and the poverty situation in different parts of the world.

Website

Webpages of the Poverty and Health Programme are a part of the Centre’s website. The information in the site made available includes:

- News on ongoing ICDDR,B poverty research projects and collaborative ventures
- Bibliographical data of current articles on related topics from world literature
- Other resource sites on health equity research, such as the BHEW website and online links to various sources of poverty research, such as Eldis and International Society for Equity in Health.

Pre-paid vouchers and safe motherhood services in Chakaria

Champa Rani, aged 26 years, is the mother of 4 daughters. She has been married to a poor fisherman for 11 years. All her deliveries, except the last one, were assisted by the untrained traditional birth attendants (TBAs), whose services are comparatively cheaper than the skilled attendants and with whom her past experiences were not good. In contrast, her youngest daughter—26 days old—was delivered with the assistance of a skilled birth attendant (SBA), which was made possible by the voucher system that has been introduced since January 2006 by the Chakaria Community Health project of ICDDR,B in her area. The voucher system provides free maternal health services to poor pregnant women. During her last 3 pregnancies, Champa had no choice but to go to the untrained midwives though the SBA services were available at the village health posts, which were established and are now managed by villagers. She knew about the health post and its services but nobody approached her with more information or an invitation to visit these facilities. In contrast, for her last delivery, vouchers were delivered to her in
her home, and encouraged and assured her of access to the quality maternal health services provided by SBA.

Early in her pregnancy, Champa had complications and, thus, the visits to the SBA at the health post were critical to her and her child’s health. Had it not been for the voucher system, the private hospital/clinic would have been her only option for dealing with her pregnancy-related complications. The private hospital/clinic is expensive, and she and her family would have had to sell their land, or seek help from other villagers to meet these expenses. The voucher system saved her from desperate measures and the possibility of not receiving the required care at all. With the voucher, Champa received 3 antenatal check-ups during her pregnancy period and several postnatal check-ups. The SBA also provided her with information regarding proper diet during pregnancy, restrictions concerning heavy physical labour, etc. She also learned from the SBA how to care for her newborn child and about the importance of feeding colostrums to the baby. Because of the SBA she now also knows the importance of immunization and is determined to complete the immunization doses for her baby. In short, the voucher system has helped her to gain back her right to safe delivery and the health of her newborn.

Rahima Begum started her work as an SBA in 2000 after receiving midwifery training from the CCHP and from the Gonoshasthaya Kendra. Since January 2006, she has been involved in the voucher programme introduced by the CCHP for poor pregnant women. Under the programme, she, as an SBA, provides antenatal check-ups, delivery services, and postnatal services in exchange for vouchers. At the end of each month, she submits the vouchers she has collected, and the CCHP reimburses her costs. The reimbursement rate is different for each type of service she provides, e.g. Tk 60 for 3 antenatal check-ups, Tk 110 for 3 postnatal check-ups, and Tk 250 for...
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delivery. In the beginning, Rahima had to convince skeptical villagers—who otherwise would seek delivery services from untrained midwives—about the quality of services provided by the SBAs. She told them about the voucher programme and explained the benefits of having skilled attendance during delivery as opposed to the often harmful practices of untrained birth attendants. She began by registering the pregnant women in her area, and the CCHP then distributed vouchers to those who were identified as poor. Most poor pregnant women in her area now come to Rahima to get antenatal care, postnatal care, and delivery services during their pregnancies. The voucher programme has helped steer these pregnant women away from untrained birth attendants, who now opt for services provided by the SBAs.

Despite the great success of the programme, for Rahima and the poor pregnant women of her area, she says there are still some challenges remaining. The pregnant women who receive antenatal care services in exchange for vouchers do not always deliver their babies with Rahima’s assistance, or seek postnatal care from her. After working with a woman for several months, Rahima can only claim money for her antenatal care services. The other problem Rahima often faces is related to appropriate referral points. When a delivery gets complicated, she refers the patient to a hospital/clinic where the cost of service is mostly out of reach. This is a loss for both sides, Rahima loses her reimbursement money and the family of the pregnant woman faces great financial hardship or, more dangerously, the woman does not receive the care she needs during delivery. Overall, the voucher system has been a positive development in the lives of women in Bangladesh. A proper solution to the few remaining problems will help the voucher programme to ensure that maternal health needs are met for poor pregnant women.

**Future health systems—making health systems work for the poor**

This project, funded by DFID, is a part of the research programme consortium that seeks to find ways through which future health systems can better serve the disadvantaged people. The fund has been channeled through the Johns Hopkins University Bloomberg School of Public Health, USA, to support the consortium partner countries: Bangladesh, China, India, Nigeria, UK, and Uganda. The project spans the 2005-2010 period and is organized in 3 distinct phases:

*Inception phase:* Reviewing the health systems/policies in the country that will help identify strategies to fill important knowledge gaps regarding the health services of the country.

*Phase I:* Studying healthcare providers and available health services in an upazila (Chakaria) and also healthcare-seeking behaviour of the community people.

*Phase II:* Developing interventions based on findings from phase I and testing their effectiveness in reaching the poor.

The project, now in its Phase I, is conducting surveys among the healthcare providers of Chakaria, the local government representatives, and the community members. Through these surveys, the project is collecting information on the quality of services provided by the healthcare providers and the factors influencing their use, healthcare-seeking behaviour of the community members, and the role that the local government representatives are playing in the health of the people, especially the poor. These, in turn, will help sketch a guideline for developing interventions for Phase II that will aim at improving the health of the people, especially the poor.

The partners meet at regular intervals to better communicate with each other in sharing their own experience and learning to improve their work in the respective countries. During Phase I, the project team met the other consortium partners at a workshop held in Beijing in September 2006. The workshop was organized with the aim at revising the research described in each of the country concept notes to be as innovative, future-looking, and poverty-focused as possible. At the workshop, the countries also set a clear plan for conducting qualitative and quantitative data analyses.

**Pro-poor monitoring of the use of health, nutrition and population services**

The study aims at developing and testing rapid methods to monitor the use of health services by the poor. Three methods have been tested in 2 upazilas. These were benefit incident analysis, sequential sampling plan, and lot quality acceptance sampling (LQAS). All the methods were effective in knowing whether the health services offered by a facility are reaching the poor up to the expected level. The benefit incident analysis gave a broad indication of how much the poor are represented in the facility compared to their proportion in the community. The method did not comprise a formal testing of the proportion of the poor attending the facility against a pre-determined level. It also requires information about the proportion of the poor in the community. The sequential sampling plan requires a small sample, and information to be collected only from the facility. However, using binomial probability, it allowed decision-making about adequacy in serving a pre-determined proportion of poor among attendees by counting the number of poor/non-poor among a sample of less than 50 attendees. The LQAS was in a similar position of sequential analysis in terms of classifying the facility as being pro-poor or not. However, the LQAS was in a better position enabling decision-making using a pre-determined small size not exceeding 50, while in sequential sampling at times, the assessment can continue for long before making a decision-making possible. Although the last two methods are based
on advanced statistical theories, their actual application at the field level can be made very simple, making them feasible to be adopted by the health systems. Application of the above led to the conclusion that the private clinics are more pro-rich, and the government facilities tend to be more pro-poor.
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HIV/AIDS
What does the Programme do?

The HIV/AIDS Programme concentrates on conducting research to monitor the spread of HIV in Bangladesh and to better understand the dynamics of the epidemic and obstacles to its prevention. The Programme provides care and support to HIV-positive people through voluntary counselling and testing (VCT), outdoor clinical facilities, and laboratory monitoring of disease progression.

2006 Highlights

Gathering strategic information on the HIV epidemic

Effective HIV programming must be evidence-based and, therefore, it is essential that a country gather strategic information on a regular basis. With this in mind, Bangladesh has since the late 1990s developed a national HIV and risk-behaviour surveillance system that follows the UNAIDS/WHO guidelines for second-generation surveillance. This system has generated HIV and risk-behaviour data on most-at-risk population groups, including injecting drug users (IDUs), sex workers (female, male) from different venues, transgenders, males having sex with males (MSM), mobile men, and regular sex partners of female sex workers and transgenders. As the surveillance system forms the basis of policy decisions relating to programme development and funding, it is essential that the sampling methodology for the surveillance system be as representative as possible. At present, the serological and behavioural surveillance systems are run in tandem among the selected population groups but the two systems are not conducted among the same individuals, i.e. they are not integrated. Moreover, the two systems follow different methodologies: the behavioural surveillance uses the time-location sampling (TLS) methodology, while for the serological surveillance, convenience sampling is used whereby individuals within interventions are invited to provide blood through the clinics of those programmes. TLS is one of the methods devised for obtaining a random sample from fixed venues at specified times. Therefore, although TLS provides a random sample, it does so for only those people who come to the fixed sites that are previously identified through mapping. “Hidden” populations are populations who, because their behaviours may not be socially sanctioned, are often reluctant to have their identities known and, therefore, difficult to find. Both the systems access individuals who are more visible in public spaces and may be missing the more hidden individuals in the sub-population groups. This is concerning since data from the current surveillance methods, which are used in planning and funding important programmes, may not be representative of the entire sub-population of interest.

Despite the very low HIV prevalence in all population groups sampled (except IDUs in central city A), very risky behaviours continue to be documented. Therefore, the question often asked is whether the surveillance system is missing an epidemic. Employing other sampling methodologies may overcome some of these difficulties. One such system is respondent-driven sampling (RDS), which has been demonstrated to provide better access to a given sub-population compared to other sampling methods. Another advantage of RDS is that, as interviews are conducted in a fixed location (in an office, clinic, or any discreet site) rather than in the field, blood can be collected from the same individuals for HIV and STI prevalence testing. In Bangladesh, the serological surveillance has been restricted, for ethical reasons, to collecting blood from individuals who are members of an intervention programme where clinical services are available, so that individuals can return for the results and for treatment, if required. The RDS method allows provision of clinical services and treatment of STIs for all participants in the study, irrespective of intervention programme membership. In other words, RDS provides an opportunity for integrating the behavioural and serological surveillance systems in a manner that is ethically acceptable to the country.

For RDS to work, it is essential that the population group is networked. The RDS recruitment starts out with
a non-random set of initial recruits, known as seeds, who are provided with a set number of coupons, which they use for recruiting members of their social network. Once the seeds’ recruits complete their participation in the study, thereby producing the first wave of participants, they are also given coupons to use for recruiting members of their social network. This continues for numerous waves, until the sample size is reached. Once data are gathered, the probability of recruitment can be calculated based on a recruitment-probability matrix made up of who recruited whom and each participant’s number of social contacts.

The Government of Bangladesh decided to conduct a pilot study of MSM in Dhaka city to answer the following questions:

(i) Is it feasible to conduct RDS in MSM in Dhaka?
(ii) Can RDS access more diverse and hidden MSM?
(iii) Can RDS be used as a sampling methodology in surveillance?

One of the reasons for selecting MSM as the target population was that they were the most likely group to have the dense social network properties necessary for conducting RDS. MSM were sampled at a fixed site in Dhaka city between 5 March and 15 May 2006. Eligible participants were males who had sex with another male (who had not sold sex) in the past one year, were 18 years or older, and were living in urban Dhaka. Recruitment began with 8 non-randomly selected MSM seeds who, after completing a face-to-face interview and providing blood for HIV and syphilis screening, were given three coupons for use in recruiting their peers. Seeds were identified through local NGOs and ICDDR,B’s voluntary counselling and testing unit (Jagori), and were selected based on their ability to recruit other MSM (large social network sizes) and their differences in age, occupation, NGO involvement, and self-categorization (how they labelled themselves in relation to their MSM identity). Male-to-male sexual activity in Bangladesh is constructed across a number of gender-specific and performative dimensions, which can be defined as follows: ‘Kothi’ are feminized males who play the part of the ‘female’ in their emotional, physical and social interactions with other males. Kothis prefer to be penetrated, some cross-dress, or use feminine make-up. ‘Panthi’ (a name given by kothis), are the sex partners of kothi and are usually insertive partners. ‘Male’ refers to MSM who do not have a self-perceived MSM identity (for example, most panthi will identify themselves as male, rather than panthi). ‘Parik’ is the male lover of kothi, and all parik are panthi, but not all panthi are parik. ‘Do-parata’ are men who practise both active (insertive) and passive (receptive) sex roles. ‘Gays’ identify themselves as westernized
homosexuals, engaging in emotional and sexual relationships with other men, and ‘bisexuals’ have sex with both men and women.

Beginning with 8 seeds, the RDS was successful at recruiting a sample of 531 MSM in Dhaka over a period of 11 weeks. Each seed was effective at recruiting other MSM, and regardless of the type of seed, all but one of the recruitment chains were diverse, with respect to the 7 types of MSM self-identification (male, kothi, panthi, parik, gay, do-parata and bisexual). In Figure 1, the recruitment chain consisted of 105 recruits; beginning with a ‘gay’ seed, this chain comprised up to 9 waves of each identified type of MSM. This was a clear indication that MSM in Dhaka do form dense social networks and not only socially interact with MSM within their own self-identified type but also with various MSM who self-identify as other types.

To assess whether a more hidden and diverse population of males having sex with males could be accessed using RDS, data obtained from MSM with the previously conducted behavioural surveillance (in 2003-2004) using TLS were compared with the RDS data. It was obvious that the RDS was able to recruit a more diverse group of MSM (Fig. 2).

Through the TLS methodology none of the MSM recruited categorized themselves as being ‘gay’. The RDS was also successful in reaching a more hidden population of MSM, as a large proportion reported meeting their sex partners at home and communicating for sex from home or via telephone (Fig. 3 and 4). In the methodology used previously, MSM were communicating through cruising spots only. Moreover, 58.2% of the MSM recruited through TLS reported exposure to an intervention NGO in the last year compared to only 14% in the RDS sample.

Overall, the RDS pilot in MSM showed that it is feasible to conduct RDS and that it may be a better methodology for accessing a more representative sample. What remains to be shown is whether this methodology can be used for other marginalized most-at-risk population groups.

### Barriers to condom-use

Condoms can prevent sexual transmission of HIV. It is also well known that in Bangladesh, reported condom-use by female sex workers is among the lowest in South and southeast Asia. Low condom-use has also been documented in studies on male clients of sex workers. Condoms were introduced in Bangladesh as a contraceptive method and are mainly used in pregnancy prevention in non-commercial sex. The role of condoms in the prevention of HIV and STIs is being emphasized to increase their use in commercial sex, however despite this awareness, usage remains low.

Qualitative and quantitative studies at ICDRR,B have attempted to understand the barriers to condom use. In a recently-conducted study on 1,395 female sex workers in brothels, streets, and hotels, 13.5% reported condom-use in all vaginal sex acts in the last week, whereas 72.8% used condoms sometimes, and 5.5% never used them. The reasons cited for not using condoms were:

- Clients’ pleasure--97.1%
- Delayed ejaculation--47.7%
- Clients objected without providing a clear reason--36.3%
- Sex workers complained of pain during sex when condoms are used--7.6%
- Lack of condom availability --10.9%.

A qualitative study on men conducted in 2004, showed that men feel inhibited using condoms in the non-commercial setting as well, because it creates distrust in a relationship, takes away intimacy, and in Bangla-
HIV/AIDS
desh’s cultural and religious stigma a young man may be labelled as a ‘bad boy’ when purchasing condoms. However, data from different surveys have shown that young men and, to a lesser extent, women are having pre- and extra-marital sex, and engaging in unprotected sexual encounters. Strong barriers to the accessibility of condoms, particularly for unmarried youths, must be removed in order to prevent HIV infection in young people, and to avert a generalized epidemic in Bangladesh. This will require strong public-sector support but is the community ready?

Communities can have a profound, positive influence on the prevention outcomes, but only if they are ready. Given its relatively conservative religious and cultural norms, the Bangladesh society is expected to resist the introduction of HIV/AIDS prevention messages addressing sexual behaviour and the use of condoms. A nationally-representative baseline survey in 2005 showed that knowledge on HIV/AIDS transmission and prevention is low among gate-keepers in the community, and more urgently, the survey found that although more than 90% of gate-keepers agree that condoms should be used for prevention of HIV/AIDS and STIs, only 25% of them support condom sales to unmarried youths.

A study was completed to measure the readiness of various community groups in Bangladesh to adopt HIV-prevention activities for young people. The groups surveyed included teachers, religious leaders, union parishad members, businessmen, and drug vendors who act as gate-keepers of religious, cultural and social norms and wield a strong influence on societal behaviour. Stages of readiness measured included awareness of the country’s vulnerability, knowledge on transmission and prevention, planning to act, preparation to act, and initiation of activities. To elicit information about how each community group understood and was acting on information about the imminent HIV epidemic as it affected the youths, members and key informants of these groups were interviewed and rated for their activities at each stage.

The study found that the community readiness among different groups was remarkably similar overall, with some small variations by type. With the exception of imams, the community groups were quite supportive of awareness campaign on HIV/AIDS by mass media. The attitudes of the groups were much more uniformly intolerant of pre-marital sexuality or condom availability. Nearly all groups recognized that condoms could prevent HIV infection and save lives. Nonetheless, acceptance of condom availability for unmarried youths was uniformly low: making condoms available was viewed as encouraging pre-marital sex. Drug sellers, who have a pivotal role in HIV prevention, were particularly not ready to accept prevention messages. None of the organizations interviewed had begun serious preparation for HIV prevention by taking decisions or identifying resources, and no activities had been initiated.

Levels of knowledge about HIV/AIDS in the Bangladesh community are high, as is agreement on the existence of the problem, but preparation for prevention programming is absent. Tacit agreement supports these positions, but the groups have not yet organized meetings or formed any kind of coalition or cohesive approach with one another to discuss their knowledge or opinions openly. Strategies to overcoming barriers to community-wide communication and preparing for preventive activities are now needed: parent and community resistance must be addressed in programme planning, and it is time to think about intervention programmes which may help increase their knowledge and participation in HIV/AIDS prevention. Building community cohesion among groups for a mass media strategy could be the first step. Stronger communication needs to be fostered between these groups, leadership initiatives need to be encouraged, and input should be provided for groups to start planning and participating in HIV prevention activities.

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A knowledge package is a body of knowledge needed to develop a new product, a new policy or a new programme. Our experience with ORS and zinc suggests that there are at least 5 requirements for a successful knowledge package, which I call the 5 Ps:

POLICY
PRODUCT
PROGRAMME
PARTNERSHIP
PASSION

David A. Sack
Why should Bangladesh spend money on medical research when the needs for providing practical help for people are so urgent? Isn’t research the kind of thing that only rich countries can afford? If we carry out research in Bangladesh, will we ever see the benefits for our people, and how long will it take to see the benefits?

Rich countries can afford to waste money and resources, but poor countries must be more careful with theirs. Only by conducting the research, can the money we have be guaranteed to be well spent. Too often, money for development could be much better used if the knowledge existed how best to use it.

David A. Sack
Recent studies have explained that 10.5 million children under the age of 5 years die each year. About 7 million of these deaths could be avoided by applying the results of the research investments made in the recent past. These 7 million could be saved with simple things like measles vaccine, zinc, ORS, handwashing, delivery of babies by skilled birth attendants. Each of these strategies required research to understand their scientific basis and more research will be needed to understand how best to apply them.

David A. Sack
CLINICAL SCIENCES DIVISION

What does the Division do?

Working both in hospitals and in the community, ICDDR,B’s Clinical Sciences Division (CSD) conducts clinical studies on diarrhoeal illnesses, respiratory infections, nutrition, and child development. The Division also operates ICDDR,B’s Dhaka Hospital. It provides a wide variety of clinical services—ranging from the treatment of diarrhoeal illnesses and associated health problems to preventative strategies, such as immunization and health and nutrition education.

Training efforts aim to build capacity, by teaching researchers how to correctly apply research methods and by teaching health practitioners how to properly manage diarrhoea-related health problems.

How are we organized?

The Division has three main areas of activity: Research, Services, and Training. The staff includes 3 international professionals and 209 fixed-term employees, in addition to 78 health workers, 54 staff members on contractual service agreements, 15 trainee doctors, and 10 trainee nurses. An international research fellow—Dr. Lars Henning—from the Swiss Tropical Institute, an adjunct scientist—Prof. Frances Aboud—from McGill University, Canada, and Prof. M.R. Khan, a consultant paediatrician also continued to facilitate training to the Division’s staff and clinical fellows.

Staff Development

To improve the skills of the team leaders and senior CSD staff, including the Director of the CSD, three advanced management training workshops: (a) Essential skills for managers course; (b) Advanced team leader workshop; and (c) Interpersonal communication skills workshop were organized with the assistance of British Council, Dhaka.

In 2006, Dr. Md. Shafiqul Alam Sarker has obtained a doctoral degree, Dr. Md. Iqbal Hossain and Dr. M. Munirul Islam are completing their doctoral theses, Dr. Sayeeda Huq is enrolled in MIPH degree, and Dr. Baitun Nahar has initiated doctoral studies all at various universities abroad in 2006.

Dhaka Hospital activities

Restructuring of the CSD: Following the external review of CSD in 2003 and its recommendations, the Centre decided to implement ‘Participatory Management’ at the Dhaka Hospital and the required changes in its structure. An organogram was finalized in consultation with the CSD staff of all categories and Director, HR, and was approved by the Executive Director of ICDDR,B.

Renaming the Centre’s hospital in Dhaka: Of the two hospitals operated by the Centre, the one in Dhaka was popularly known as ‘Cholera Hospital’. The other names that had been used for describing this hospital since its inception include: (a) Dhaka Station Hospital, (b) Clinical Research Centre (CRC), and (c) Clinical Research and Service Centre (CRSC). This has resulted in confusions for using different names in scientific articles published by the Centre staff and in its other publications and communications. After receiving inputs from the CSD staff and the Centre Directorate, a consensus was reached to name the hospital as ‘Dhaka Hospital, ICDDR,B’. All concerned have been advised to use this name consistently in future publications and correspondence.

Establishment of three new units in Dhaka Hospital: In the line of restructuring, 3 new units were established in the Dhaka Hospital: (a) Short Stay Unit (SSU) that combines former Triage, Oral Rehydration Pavilion, Immunization, Health Education, and Breastfeeding Counselling; (b) Longer Stay Unit (LSU) that combines former General Ward, Nutrition Rehabilitation Unit (NRU), and Nutrition Follow Up (NFU); and (c) Special Care Unit (SCU) that combines former Special Care Ward and recently-established Isolation Room with negative-pressure system.
Dr. Pradip Kumar Bardhan, Dr. Md. Shahadat Hossain, and Dr. Ahzarul Islam Khan were appointed Head of the SCU, LSU, and SSU respectively on 1 July 2006.

Following recommendations of the external reviewers and approved by the Board of Trustees, a position of Hospital Administrator was also created.
Patient-care: Comparative monthly patient-visits to the Dhaka Hospital in 2003, 2004, 2005 and 2006 are shown in Figure 1. In total, 106,531 patients attended the Dhaka Hospital for treatment of their diarrhoeal diseases alone, or in association with other health problems, of whom 194 (0.18%) died. In total, 29,180 patients with mild diarrhoea were referred to the PSKP clinic that franchises the diarrhoeal disease case management of the Dhaka Hospital, and 1,934 (6.6%) of them were referred back to ICDDR,B for hospitalized management.

Of the 106,531 patients, 78,810 (74%) were admitted to the Short Stay Ward (SSW) and 14 died. Another 5,659 (7.2%) patients required admission to the longer-stay General Ward (GW), Special Care Unit (SCU), Research Ward (RW), and Nutrition Rehabilitation Unit (NRU), of whom 144 (2.5%) were admitted to the Research Ward under 6 different research projects conducted by the CSD alone or jointly with the Laboratory Sciences Division, while 147 volunteers were studied at the Advanced Biomedical Research Unit (ABRU), and 225 patients were studied in the LSU under different research protocols. Of the remainder 5,659 patients, 1,200 (21.2%) were admitted to the SCU with very severe disease, and another 576 patients were transferred from the General Ward (total=1,815); of them, 173 (9.5%) died. Of the 4,315 patients treated solely in the GW, 4 (0.09%) died compared to none in 2005. Of the 5,659 patients admitted to the longer-stay wards, 220 (3.9%) absconded; 269 (4.8%) took discharge against medical advice, and 96 (1.7%) were referred to other hospitals for the management of complications. In total, 147,924 litres of intravenous fluids (1.4 L per patient) and 506,174 L of ORS solutions (4.8 L per patient) were used at the Dhaka Hospital in 2006.

Research: The Dhaka Hospital included the Mother and Health Services Unit as the hub of the Centre’s research on diarrhoeal diseases and associated health problems, and severe malnutrition. Research during 2006 included studies on: (a) assessment of efficacy of community-based follow-up, food supplementation, and psychosocial stimulation in home-management of young severely-malnourished Bangladeshi children in a randomized intervention trial and (b) assessing effects of 2.00,000 IU of vitamin A followed by 5,000 IU versus 5,000 IU daily doses of vitamin A on recovery from diarrhoea and acute lower respiratory infections in severely-malnourished hospitalized children.

Franchising of hospital services of ICDDR,B
Coordinators: Md. Shahadat Hossain, Meer Ramzan Ali, and Mohammed Abdus Salam

In March 2000, collaboration was reached between a local health-related NGO called Progati Samaj Kallyan Protishan (PKSP) and ICDDR,B to franchise ICDDR,B’s clinical services to the community, which resulted in the establishment of an outpatient clinic within the Centre premises to treat uncomplicated mild diarrhoeal patients, along with providing other services of the Essential Services Package of the Government of Bangladesh. In 2006, the clinic provided treatment to 27,229 patients and referred back 6.6% of them to the Dhaka Hospital for further management. Discussions are ongoing for addition of family planning and enhancement of treatment programmes for childhood tuberculosis, along with their ongoing directly observed therapy (DOT) programme.

Longer Stay Unit
Head: Md. Shahadat Hossain

The Longer Stay Unit (LSU) has 77 fixed beds, including 12 beds in the Nutrition Rehabilitation Unit. Of the 5,659 patients admitted to the LSU, 82% were aged ≤5 years (male : female ratio 1:0.68), and 10% of them required transfer to the Special Care Unit (SCU) for closer observation, of whom 46 (8%) died. In total, 266 (4.7%) infants and young children with a weight-for-age of ≤50% or weight-for-height of ≤70% of the NCHS reference, or frank kwashiorkor were admitted to the NRU. Their average stay at the LSU was 4.8 days.

The LSU manages its activities and services with 67 staff members. Five trainee physicians (Clinical Fellows), an international research fellow, and 4 trainee nurses (Nurse...
Fellows) actively participated in the provision of care as part of their hands-on training.

**Mother and Child Health Services**
Coordinator: Md. Iqbal Hossain

The Mother and Child Health Services (MCHS) is a formal and comprehensive healthcare-delivery system blending curative and preventive health activities. Following the restructuring of the Dhaka Hospital and formation of three functional units in the second half of 2006, the nutrition rehabilitation and follow-up unit of the previous MCHS were merged with the Longer Stay Unit (LSU), and its Health Education and Immunization Units were merged with the Short Stay Unit (SSU) of the Hospital.

**Nutritional Rehabilitation Unit (NRU):** Nutritional rehabilitation of severely-malnourished children following resolution of their acute illness before discharge from healthcare facilities and their growth monitoring and management of their medical problems are important in reducing subsequent morbidity and deaths. In 2006, 513 severely malnourished children, after control of their acute illnesses, were admitted to the Nutrition Rehabilitation Unit, and their rapid catch-up growth was achieved by following a standardized diet protocol using low-cost, culturally-appropriate, nutritious food based on locally-available ingredients and provision of essential micronutrients.

**Nutrition Follow-up Unit (NFU):** In 2006, the growth of 984 severely malnourished children, including those graduated from the NRU, was monitored. Any medical problems were addressed, and health and nutrition education were re-enforced at the NFU.

**Health and nutrition education:** Trained Health Workers conduct group discussions for 5-6 mothers at specified times and places on specific topics in all areas of the hospital, except the Special Care Unit. The topics include prevention of diarrhoea and its home management; prevention of malnutrition using low-cost, locally-available, and culturally-acceptable nutritious foods; promotion of immunization for young children, and girls and women in the reproductive age, and birth-spacing; and demonstration of correct and hygienic preparation of home-made rehydration solutions using locally-available ingredients. In total, 14,125 health-education sessions were conducted, covering 141,256 mothers or caregivers of children admitted to the hospital.

**Immunization:** The MCHS runs the largest, fixed-site immunization centre in the country to provide 6 EPI vaccines and hepatitis B vaccine to children aged less than 2 years and tetanus toxoid to girls/women aged 15–45 years. In 2006, this unit administered 3,151 dose(s) of EPI vaccines, 1,894 dose(s) of hepatitis B, and 15,820 doses of tetanus toxoid.
**Vitamin A supplementation:** The health workers identified children, aged less than 5 years, who did not receive high-potency vitamin A in the last 6 months but were administered to 5,137 such children in 2006.

**Promotion of oral rehydration therapy:** The health workers educated mothers/caregivers of young children on the technique and assisted them in administering oral rehydration solution to children.

**Childhood tuberculosis programme:** Diagnosis and management of TB in children attending the hospital and their close contacts (e.g. parents) is a regular activity of the MCHS. In total, 36 new patients were diagnosed, and anti-TB medicines were provided free of charge to them in 2006.

**Birth-spacing counselling and services:** Trained Health Assistants provided birth-spacing counselling to 244 parents of children attending the hospital in 2006.

**Training of health professionals:** The success of the NRU/NFU as a model for dissemination of knowledge and practice of healthcare in the community has made its activities and role a part of the training courses for national and international health professionals. Practical demonstrations on the assessment and management of severe malnutrition in the NRU and NFU were given to 5 doctors and nurses from BRAC in February; several international health personnel in April; several doctors from the Government of Bangladesh in March and May-June; 15 health personnel, including doctors, nurses, and nutrition-manager from Khulna Shishu (Children’s) Hospital, Khulna Medical College, Chittagong Medical College Hospitals, and Concern Bangladesh in August; 26 MPH students from the James P. Grant School of Public Health, BRAC University in September; and several DCH, FCPS and MD students from Dhaka Children’s (Shishu) Hospital in December 2006.

**Breastfeeding counselling**
Coordinator: A.K.M. Iqbal Kabir/A.A.Khan

The Dhaka Hospital provides counselling for the promotion and support of exclusive breastfeeding in infants younger than six months and continued breastfeeding along with appropriate complementary feeding by trained breastfeeding counsellors. It also provides training to physicians, nurses and other paramedics to promote and support correct breastfeeding and complementary feeding practices of young infants at the Dhaka Hospital of ICDDR,B.

In total, 4,935 mother-infant pairs were counselled on breastfeeding in 2006, of whom 1,324 mothers of infants aged less than 6 months were counselled to re-establish exclusive breastfeeding, and the remaining 3,168 mothers of children aged 7-24 months were counselled to continue breastfeeding until the completion of 24 months of age along with initiation of appropriate complementary feeding after 6 months of age of the infants. At admission, all the children were partially breastfed, and at discharge, 70.5% of the mothers of infants aged less than 6 months were exclusively breastfeeding their babies (WHO definition of exclusive breastfeeding included ORS and medicine), indicating that the breastfeeding counselling at the Dhaka Hospital was a highly-effective programme over the last few years.

**Emergence of Multidrug-resistant V. cholerae O1 (El Tor)**

Beginning in November 2004, multidrug-resistant strains of *V. cholerae* were being increasingly isolated from patients attending the Dhaka Hospital (n=37), and by March 2005, nearly all the isolates became additionally resistant to erythromycin, doxycycline, and azithromycin, leaving chloramphenicol and ciprofloxacin as the only drugs, effective in vitro and known to be effective in controlled clinical trials for the management of patients with cholera. We have, for the first time, encountered this unique, multiple antibiotic resistance pattern, including resistance to erythromycin, among *V. cholerae* O1 (Fig. 2).

The emergence of these strains of *V. cholerae* had resulted in longer stay of cholera patients in the hospital, overcrowding the facility, necessitating expansion of the hospital in temporary tents, recruitment of additional doctors, nurses, health workers, and other categories of staff, and procurement and stocking of enough intravenous fluids and ORS that required considerable additional resources. Patients infected with such strains had (a) 27% excess stool output in the first 24 hours, (b) 58% excess total stool volume, (c) 69% excess requirement of intravenous fluid volume, and (d) 25% excess duration of illness compared to patients receiving an appropriate drug.

Based on results of the carefully-conducted trials, the routine antimicrobial therapy for severe cholera was changed to ciprofloxacin as follows: a single 1 g dose administered only once for adults (except pregnant and lactating women) and patients with a body-weight of ≥30 kg; and a single 20 mg/kg dose for children aged over 2 years. This form of therapy is more expensive than doxycycline but cheaper than erythromycin. For pregnant and lactating women with cholera, management was confined to prevention of dehydration using ORS and correction of dehydration using ORS or intravenous polyelectrolyte solution as appropriate, and continued feeding. However, the clinicians soon observed that diarrhoea was not expectedly responding; examination of the results of the studies evaluating single-dose therapy for cholera in adults and children revealed gradually decreasing clinical and bacteriological responses of the patients, which were related to increasing MICs of *V. cholerae*.
cholerae isolates to this drug from 0.003 to 38-0.5 µg/mL) between 1994 and 2005. The lack of such information would result in the use of ineffective drugs.

Due to the great clinical and epidemiological importance of these findings, continued monitoring of the susceptibility of V. cholerae strains is essential in cholera-endemic countries, along with effective and rapid dissemination of information to the policy planners and healthcare providers. It would also be important to institute other public-health measures, including provision of safe drinking-water, promotion of personal hygiene, and consumption of safe food. Provision should also be made for increased production of intravenous fluids and oral rehydration salts, availability of effective drugs throughout the country, and training and re-training of healthcare providers in preparation for efficient management and control of large outbreaks and epidemics due to such multidrug-resistant V. cholerae O1.

**Special Procedure Clinic**
Coordinator: P.K. Bardhan

This clinic manages and processes specimens submitted by various individuals and clinics within Dhaka city for clinical microbiological, pathological and biochemical tests, and conducts gastrointestinal endoscopic examinations. The clinic also offers vaccinations against poliomyelitis, diphtheria, whooping cough, tetanus, measles, mumps, rubella, varicella, hepatitis A, hepatitis B, H influenzae type b, and typhoid and BCG vaccines. In 2006, 2,099 persons used the services, and the clinic generated over Tk. 1.6 million. The options for modifications and potential expansion of the services of the clinic are being considered and explored.

**Nursing Programme**
Nurse Manager: Mohammad Ullah

The nursing programme of the Dhaka Hospital consists of 1 nurse manager, 4 nursing officers, 36 senior staff nurses, 3 aid nurses, and 4 assistant staff nurses. Thirteen trainee nurses received hands-on training on nursing management of diarrhoeal diseases and contributed significantly to the patient-care services. The nursing programme assists nurses working in 3 functional units of the hospital in planning, organizing, directing, coordinating, supervising, and monitoring nursing care, including staff motivation, guidance, and performance appraisal.

The nursing programme participates actively in facilitating international and local training activities of the Centre. It conducts in-service training for nurses and facilitates bedside training activities arranged by the Centre’s Technical Training Unit (TTU). The nursing programme developed collaboration with the State University of Bangladesh to teach their undergraduate nursing students. Institutional collaboration was also extended to the College of Nursing, University of Dhaka, and the Open University of Bangladesh to explore the possibility of placement of nursing students at the Dhaka Hospital as a part of their training.

In the implementation of the participatory management of patient-care services (Proyas), all nurses participated in behavior change communication training and team building workshop organized by the PRIP Trust, a local consulting farm, and gender awareness workshop organized by the Centre’s Human Resources Department. One Senior Staff Nurse, one Nursing Officer, and the Nurse Manager took part in workshops on advanced team leader, essential skills for managers and on interpersonal communication skills organized by British Council, Dhaka. Furthermore, 10 nurses received training on infection-control policy and guidelines.

**Infection Control Activities**
Chairman: Ali Miraj Khan

In 2006, manuals on hospital infection-control measures, such as hand-washing and use of hand-rub, universal precautions, environmental cleaning and disinfection, sanitary food service in the hospital, hospital waste management and safe disposal of sharps, IV therapy surveillance system, and nosocomial infection surveillance system, were updated.

Using available resources, several mini-posters on hand-washing techniques, use of hand-rub solution, and hospital waste-disposal system; and hygiene messages for patients and attendants have been developed for display at different strategic locations in the hospital.

Hand-washing facilities for staff and patients in the hospital have been substantially increased, and arrangements for local procurement of portable hand-rub solution containers has been accomplished. Facilities for safe drinking-water have also been established through installation of filter machines, along with periodic testing of water quality in the Centre’s laboratories.

The use of disposable gloves by doctors and nurses in performing invasive procedures, such as intravenous infusions and venepunctures, has increased during 2006; observational studies indicated around 90-95% compliance in the longer-stay General Ward and Special Care Unit.

In 2006, the rates of nosocomial infections among patients admitted to the longer-stay wards varied from 6.8% to 8.4%. During 2006, the Hospital Infection Control Committee (HICC) initiated periodic medical inspections (by hospital physicians) for hospital kitchen staff members to improve hygienic hospital-food services. The baseline survey results of hospital-acquired infection rate (around 7%) during 2004 and 2005 was presented at the 7th Commonwealth Congress on Diarrhoea and Malnutrition of the CAPGAN, 6-8 February 2006, Dhaka, and a manuscript has been submitted to the Indian Journal of Medical Research for publication.

During 2006, the HICC conducted one-hour educational sessions for dietitians, nurses, health workers, attendants, cooks, clerks, laundry workers, pharmacists, x-ray technicians, and house-keeping personnel, with 15-16 participants in each batch. The key topics of the sessions were: problems and risks of hospital-acquired infections, general measures to prevent nosocomial infections, practice of universal precautions, including promo-
tion of hand-hygiene through hand-washing and using hand-rub, barrier precautions, management of sharps, decontamination and disinfections, hospital waste management, etc. Pre- and post-tests were carried out using a structured questionnaire for assessing the impact of educational session. Also, follow-up compliance was evaluated at the Special Care Unit using an anonymous self-evaluation checklist for nursing staff and by spot-observations. In total, 204 hospital staff members participated. Evaluation of a 10% sample of the total participants revealed a mean increase of knowledge by 29%, from the pre-test level of 55.5% to the post-test level of 84.5%.

The self-evaluation of a checklist by staff for compliance at the Special Care Unit showed that approximately 70% of staff members were practising correct hand-washing and using hand-rub; however, our observational studies and qualitative data showed the figure to be 60% that indicated some progress.

Medical Audit (Dhaka Hospital)
Chairman: Ramendra Nath Mazumder

Medical auditing has been introduced at the Dhaka Hospital since the early nineties with the objectives to: (a) evaluate the quality of care provided by the doctors, nurses, health workers, hospital attendants (sanitary and food); (b) make recommendations to improve care/service provided to the patients; (c) advocate modifications of patient-care policies/practices to improve services; and (d) observe unusual events in relation to provision of healthcare to patients.

Medical Audit Committee (MAC) consists of 8 members from different categories of the hospital staff, including doctors, nurses, dietitians, and general services supervisor. On the third Wednesday of each month, the members meet to audit records of patients admitted to different wards of the Hospital (Short Stay, Longer Stay, and Special Care). The members review appropriateness of initial assessment, management, and referral to doctors by triage nurses; the quality of medical history and assessment, work-ups, and therapy of patients; and appropriateness of laboratory work-ups and therapy with particular emphasis on antimicrobial therapy. Additionally, the members meet patients and/or their attendants to assess and record attitudes and behaviour of the caregivers, their opinions on physical facilities, whether they have encountered any problems, and the overall quality of care. Finally, the MAC invites suggestions from patients and attendants of their patients for further improvement of the care to patients and physical facilities/auxiliary services.

From July 2005, pre-tested audit forms have been computerized, and all data are now stored in PC using SPSSPC+. Data are analyzed to evaluate change/improvement in care and results reported to the Division head.

In January 2006, when the prevalence of cholera in young children was very low, a special, rapid audit was conducted in the Short Stay Ward to determine the use-rate of azithromycin in children with acute watery diarrhoea. Review of records of 77 children revealed that only 3 were receiving on clinical suspicion of cholera. This indicated excellent adherence to the hospital guidelines that required frequent modifications due to rapid changes in the susceptibility pattern of *V. cholerae* O1—the pathogen that causes cholera.

**Physiology Laboratory**
Coordinator: G.H. Rabbani

Established in 1995, the Physiology Laboratory is equipped for clinical and animal experiments, and it provides opportunities to the CSD and LSD scientists to conduct basic pathophysiological studies on intestinal and metabolic disorders in selected fields with direct relevance to clinical research. The Laboratory currently supports animal experiments and studies in humans to understand the pathophysiological mechanisms of enteric infections, intestinal electrolyte transport, development of anti-secretory agents, and environmental toxicities.

**Effect of black and green tea extracts (polyphenols) on arsenic-induced toxicity in rabbits**
Principal Investigator: G.H. Rabbani

Arsenic-induced cellular oxidative stress is important in the pathogenesis of arsenicosis. The objectives of the study were to assess the oxidative injuries by arsenic toxicity in rabbits and evaluate the effects of black and green tea extracts (polyphenols) in detoxifying arsenic-induced toxicity. Twenty rabbits, included into the study, were divided into 4 groups. Three groups of rabbits—black tea (BT), green tea (GT), and placebo (PL)—received arsenic for 14 days, and the fourth group received arsenic and black tea extract (As+BT) concomitantly. Arsenic trioxide (3 mg/kg/day) was administered to rabbits through an orogastric tube. The whole blood glutathione (GSH), thiobarbituric acid reactive substances (TBARS), and index of nitrite/nitrate (NOx) levels were determined at baseline (before arsenic administration), post-arsenic (after arsenic trioxide administration), and post-treatment of tea extracts (at the 7th and 14th day of initiation of treatment).

The results showed that treatment with extracts (polyphenols) of both BT and GT teas significantly recovered the depleted GSH level and reduced the elevated TBARS and NOx levels. The elevated values of GSH in the BT, GT, PL, and As+BT groups were 30.31±4.20, 32.17±2.18, 26.37±3.36, and 43.05±4.46 mg/dL respectively. The reduction of the TBARS levels in the BT, GT, PL, and As+BT groups were 2.37±0.23, 1.90±0.22, 3.25±0.33, and 1.49±0.41 µM respectively. The decreased value of the NOx levels in the BT, GT, PL, and As+BT groups were 88.17±17.90, 77.83±5.61, 89.50±21.76, and 135.0±17.0 µM respectively. The elevations of the GSH level were 53.12%, 57.47% and 26.59% in the BT, GT, and PL groups respectively compared to the post-arsenic values. Both the tea groups recovered the GSH levels compared to the placebo group. However, between the two tea groups, the GT group showed greater recovery. The reductions of the elevated TBARS levels were 43.27%, 62.59%, and 21.24% in the BT, GT, and PL groups respectively compared to the post-arsenic values. Similarly, the reductions of the increased NOx levels were reduced.
to 63.62%, 67.67%, and 58.94% in the BT, GT and PL groups respectively. Here, again the reductions of the TBARS and NOx levels were also significant in the tea groups than in the placebo groups, and between the tea groups, GT showed greater reduction of oxidative stress. The quantitative analysis of black and green tea extracts showed that the polyphenols were 27.69% and 29.71% respectively against gallic standards. These results indicate arsenic-induced toxicity in rabbits, which is manifested by decrease in the whole blood GSH level, elevation of the TBARS and NOx levels that could be significantly reversed with black and green tea extract (polyphenols) treatment, and the greater activity of green tea compared to that of black tea correlates with slightly higher content of polyphenols in green tea.

**Nandipara Clinic**  
**Coordinator:** Shafique A. Sarker

The Nandipara Clinic, situated in peri-urban Dhaka, about 12 km east to the Centre, was established in 1985 to provide opportunities for conducting community-based research by the CSD scientists. Over the last several years, the study area has been expanded to the adjacent localities of Trimohoni, Madertyek, and Dakhingaon. A prospective study has recently been completed in this community to examine the usefulness of ferrous fumarate and ferric pyrophosphate as food-fortificants in preventing anaemia and iron deficiency in infants and young children. Biological samples of this study have been shipped to ETH, Zurich, Switzerland, for required assays. A community-based study is being conducted in this clinic to assess the genetic diversity of H. pylori in colonization and infection, along with its role in disease outcome and transmission among family contacts. The partnership established with this community also helps identify human volunteers for important studies; the community people are currently participating in a study to examine transfer of zinc through mothers’ breast milk to adequate- and small-for-gestational-age Bangladeshi infants.

In addition to supporting research studies, the clinic provided outpatient services to 13,025 women and children living in the community for their common medical problems.

**Hospital Surveillance for Diarrhoea**

**Diarrhoeal disease and enteric infection surveillance at Dhaka and Matlab hospitals**  
**Principal Investigator:** A.S.G. Faruque

Around 110,000 patients attend the Dhaka Hospital and over 10,000 patients attend the Matlab Hospital for their diarrhoea and/or other health problems. The Diarrhoeal Disease Surveillance System was established at the Dhaka Hospital in 1979, which was extended to the Matlab Hospital in 1999 to collect information on demographic, epidemiological and clinical characteristics of patients. A systematic 2% sample of patients attending the Dhaka Hospital and all patients attending the Matlab Hospital from the Health and Demographic Surveillance System (HDSS) area are enrolled into the surveillance programme. Using structured questions, trained personnel interview patients and/or their attendants to collect relevant information on socioeconomic and demographic characteristics, housing and environmental conditions, feeding practices, particularly of infants and young children, and use of drugs and fluid therapy at home. Information on clinical characteristics, anthropometric measurements, and treatments received at the facilities and outcomes of patients are also recorded. Extensive microbiological assessments of faecal samples (microscopy, culture, and ELISA) are performed to identify diarrhoeal pathogens and to determine antimicrobial susceptibility of bacterial pathogens.

The activity provides valuable information to hospital clinicians in their clinical decision-making processes and enables the Centre to detect the emergence of new pathogens and in early identification of outbreaks and their locations, thereby alerting the host government to take appropriate preventive and control measures. The system also monitors changes in patients’ characteristics and antimicrobial susceptibility of bacterial pathogens. These population-based surveillance data constitute an important database for conducting epidemiological studies, validation of results of clinical studies, developing new research ideas and study designs, and improving patient-care strategies and introducing preventive programmes. The isolation of various enteric pathogens from patients enrolled in the surveillance system at both Dhaka and Matlab Hospitals are shown in Figure 3, which shows diarrhoeal pathogens isolated in 2006.

**Biophysics Laboratory**  
**Coordinator:** A.K.M. Iqbal Kabir

The Biophysics Laboratory is equipped with a Delta-Trac machine for measuring energy expenditure and a multi-frequency BIA machine for determination of body composition. The scientists of the Centre uses the facility, which is also open to students for their thesis-related work.

**Child Development Unit**  
**Head:** Jena D. Hamadani

The Child Development Unit (CDU) continued its collaboration with other divisions at ICDDR,B and external agencies and organizations. The Unit is an active member of the early childhood development (ECD) network in Bangladesh.

The Unit started piloting of new tests to be conducted for the 5-year follow-up of the MINIMat/arsenic project. Four members of the Unit received training on the
Wechsler Preschool and Primary Scale of Intelligence (WPPSI) and Movement Assessment Battery for Children (ABC) at the Institute of Child Health (ICH) in London, and the piloting of WPPSI was completed. We also conducted piloting, translation, cognitive testing, and test-re-test of the ‘Strengths and Difficulties Questionnaire’ and piloting, translation, and cognitive testing of the ‘Middle childhood HOME’ that are to be used in the project.

Data collection of the project titled “The efficacy of a community-based follow-up programme comparing follow-up services with food supplementation, psychosocial stimulation, and both” is in progress, and so far, more than 300 children (60% of the sample required) have been enrolled.

The follow-up of the project titled “Neurologic and functional outcomes of Nipah virus infection” and data-collection of another project titled “Neurologic and functional outcomes of Japanese encephalitis virus infection” were done in May-July 2006; and data entry and cleaning was completed.

The project titled “Epidemiology of postnatal depression in rural Bangladesh” was completed in February 2006, and a manuscript, based on the findings of the project, was submitted for publication.

Preparations for another project titled “Determining the burden of maternal ill health and death and its programmatic implications in rural Bangladesh: understanding the incidence of moderate/severe obstetric complications and maternal death, their physical consequences; psychological, economic and social impact; and determinants in rural Bangladesh” were started, and a new questionnaire on care-giving practices was developed, piloted, cognitively tested, and re-tested in Matlab. The Unit imparted training to staff on interviewing women at 6-weeks postpartum on their self-esteem and postnatal depression.

A project titled “Evaluating SUCCEED preschool quality and primary students’ performance”, undertaken by Prof. Frances Aboud, was ongoing, and the Unit was helping with staff training and supervision. The project, started in April 2005, will continue for 4 years.

Preliminary work of the project on the effects of psychosocial stimulation on mental development and behaviour of iron-deficient anaemic children, funded by Nestlé Foundation, was started in late 2006.

One of the Unit members, Ms Sakila Yesmin successfully completed her Masters programme in International Child Health which was supported by the Erasmus Mundus scholarship. Dr. Fahmida Tofail successfully completed her PhD in January 2006. She attended the ‘Workshop on Child Language Development’ conducted by the Early Childhood Development Resource Centre, BRAC University Institute of Educational Development in May 2006, made an oral presentation as a guest speaker in “Rotary Club of Ramna” on 10 October 2006 about “Untold story of childhood development”, and attended the Workshop on Problem Analysis and Basic Strategic Framework for Preventing Anaemia/Iron deficiency organized by Interspeed Advertising Limited, Gulshan, Dhaka in November 2006.

Another member of the Unit Ms Afroz Hilaly trained the staff of BRAC for the project to be conducted by a PhD student from BRAC in Cornell University on UNICEF’s Family Psychosocial Care Indicators. The Unit had earlier conducted studies on its cognitive testing and validation.

The results of the study on the effects of psychosocial stimulation and parental counselling on mental development of malnourished children in the hospital were presented at the 2006 Commonwealth Congress on Diarrhoea and Malnutrition of CAPGAN.

**Clinical Fellowship Programme of CSD**

The CSD has established case-management training programmes for medical doctors and nurses over a decade and a half ago. The aim of the Clinical Fellowship programme is to provide further training to young medical graduates with demonstrated initiatives for postgraduate studies in paediatrics and internal medicine. Fifteen fellows receive hands-on training for 1-2 year(s) on case management of diarrhoeal diseases and associated problems. The University of Dhaka and the Bangladesh College of Physicians and Surgeons (BCPS) recognize the training programme for higher studies in paediatrics and internal medicine. Recently the BCPS has also recognized training at the Dhaka Hospital for its infectious disease fellowship. The Hospital has also a programme for imparting hands-on training to 10 nurses. In 2006, the Fellowship Programme continued as usual.

**Ongoing Protocols of CSD**

Aboud F. Effectiveness of a community-based responsive feeding programme
Funded by: Plan International Bangladesh and Department for International Development (DFID), UK

Aboud F. Evaluating SUCCEED pre-school quality and primary student performance
Funded by: Save the Children-USA

Ahmed T. Efficacy of lysine supplementation in reducing attack rates of diarrhoea in adults: a community-based randomized trial in urban Bangladesh
Funded by: International Nutrition Foundation (INF), Japan

Alam NH. Efficacy of benefibre added, reduced-osmolarity WHO-ORS in the treatment of cholera in adults
Funded by: Novartis, Switzerland

Alam NH. Efficacy of salovam egg powder containing antisecretory factor in the treatment of severe cholera in adults
Funded by: Novartis, Switzerland

Alam NH. Optimization of oral rehydration solution and evaluation of the efficacy of benefibre containing modified oral rehydration solution in the treatment of...
severely-malnourished children with watery diarrhoea
Funded by: Novartis Consumer Health, Switzerland

Alam NH, Raqib R. Efficacy of L-isoleucine-supplemented oral rehydration solution in the management of acute diarrhoea in children and in inducing innate immunity
Funded by: Australian Agency for International Development (AusAID), Australia

Ashraf H. Prevalence of hepatitis B and hepatitis C virus-associated infections in selected community of Dhaka city, Bangladesh and identification of risk factors for acquiring the infection
Funded by: University of Basel, Switzerland

Ashraf H. Randomized, controlled clinical trial of day-care-based and hospitalized management of severe pneumonia in children
Funded by: University of Basel, Switzerland

Bardhan PK. Assessment of the profile of C-reactive protein, procalcitonin, interleukin-6, and viral serology values in under-five Bangladeshi children with acute lower respiratory infection: an exploratory descriptive study
Funded by: ICDDR,B

Bardhan PK. A double-blind, randomized, placebo-controlled, parallel group study to assess the efficacy, safety, and tolerability of crofelemer (SP 303) in the treatment of cholera in adults
Funded by: NOPO India Pvt. Ltd., India

Chisti J. Risk factors for sclerema in infants with diarrhoeal disease
Funded by: ICDDR,B

Faruque ASG. Diarrhoeal disease in infants and young children in developing countries
Funded by: United States Agency for International Development (USAID)/Dhaka

Faruque ASG. Time series study of relationship between rainfall and diarrhoea
Funded by: Foundation for Advance Studies on International Development (FASID), London School of Hygiene & Tropical Medicine (LSHTM), UK

Hossain J. Epidemiology and etiology of encephalitis and other arboviral diseases in Bangladesh
Funded by: Centers for Disease Control and Prevention (CDC), USA

Hossain J. Long-term neurologic and functional outcome in persons surviving acute Japanese encephalitis virus infection
Funded by: CDC

Hossain J. Long-term neurologic and functional outcome in patients with Nipah virus infection
Funded by: CDC

Hossain J. Understanding the ecology of Nipah virus in Bangladesh
Funded by: National Institutes of Health (NIH), USA

Hossain MI. Effectiveness of community-based follow-up and food supplementation and psychological stimulation in the home-management of young severely-malnourished Bangladeshi children: a randomized intervention trial
Funded by: Government of Bangladesh (GoB)

Islam M. Breast-milk zinc transfer to appropriate number and small-for-gestational-age Bangladeshi infants: longitudinal studies of milk volume, using deuterium-to-mother, and milk zinc concentration
Funded by: International Atomic Energy Agency (IAEA), USA

Islam M. Effects of frequency of feeding and energy density of complementary foods on total energy intakes and consumption of breast milk by healthy, breastfed children in Bangladesh
Funded by: United States Department of Agriculture (USDA), USA

Jamil KMA. Efficacy of daily consumption of orange-fleshed sweet potatoes for increasing total body vitamin A pool size in Bangladeshi women of reproductive age
Funded by: IAEA and Harvest Plus, USA

Jamil KMA. Independent effects of vitamin A intake and vitamin A status on iron and zinc absorption from meals containing sweet potatoes with low and high beta-carotene content
Funded by: IAEA and Harvest Plus, USA

Khan WA. Evaluation of bioscale’s ultra-rapid test for the diagnosis of Salmonella
Funded by: IAEA and Harvest Plus, USA

Mazumder RN. Effects of L-histadine on sodium and chloride transport across isolated intestinal mucosa of rabbits in experimental shigellosis and to determine the role of reactive oxygen species and nitric oxide
Funded by: NIH, USA

Roy SK. Comparison of determinants of clinical recovery from acute watery diarrhoea of well-nourished and malnourished children in an urban hospital
Funded by: Bangladesh Medical Research Council (BMRC), GoB

Roy SK. The effect of socioeconomic status and care-seeking behaviour by the caretakers of children hospitalized with diarrhoea complicated by pneumonia
Funded by: DFID, UK

Roy SK. Follow up of rural <2 children of the 2004 NNP Baseline Survey, Bangladesh, and assess changes in their nutritional status since survey and examine its association with risk of mortality
Funded by: World Bank Group, Bangladesh

Sattar S. The effect of 2,00,000 IU of vitamin A followed by 5,000 IU daily doses versus daily 5,000 IU of vitamin A on recovery from diarrhoea and acute lower respiratory infections in severely-malnourished hospitalized children
Funded by: Government of Bangladesh and ICDDR,B
Sarker SA. Randomized, double-blind, placebo-controlled studies to evaluate the safety and tolerability (Part I) of a novel Llama-derived anti-rotavirus VHH fragment in human volunteers and its effect on the severity and duration of rotavirus diarrhoea in children (Part II)
Funded by: Unilever Nederland Holdings B.V., The Netherlands

Sarker SA. Randomized, double-blind placebo-controlled studies to evaluate the safety and tolerability of an orally-fed *Escherichia coli* phage in human volunteers (Part-I)
Funded by: National Oceanic and Atmospheric Administration (NOAA), USA

Sarker SA. The usefulness of ferrous fumarate and ferric pyrophosphate as food fortificants in developing countries
Funded by: Micronutrient Initiative, USA
What does the Division do?

The Health Systems and Infectious Diseases Division (HSID) conducts research to strengthen health systems and services and to reduce the burden of infectious diseases in less-advantaged populations. Health systems researchers design, test, and facilitate the replication of cost-effective and sustainable interventions that are applicable to people of developing countries, particularly those living in poverty. These include investigations in support of health policies, more effective delivery of primary healthcare services, scaling up proven life-saving technologies, and the cost and financing of health services. The HSID researchers work in close collaboration with decision-makers to ensure that the knowledge acquired will be applied to priority health problems in real-world settings. Infectious disease researchers are engaged in studies on emerging and re-emerging communicable diseases, the testing of new vaccines, investigations of outbreaks, and prevention of the spread of infectious diseases of highest priority to the people of Bangladesh and other developing countries.

Recognizing the need for timely dissemination of research findings to healthcare providers and decision-makers throughout Bangladesh, HSID coordinates the publication of the quarterly Health and Science Bulletin (HSB). In 2006, more than 7,500 health professionals at home and abroad regularly received the Bulletin. This publication is now in its third year, with issues sent out on a quarterly basis. The topics covered by the HSB in 2006 included a wide range of priority health issues, such as population-based influenza surveillance, risk factors for neonatal mortality in rural areas of Bangladesh, domestic violence against women, surveillance for pneumococcal disease, new strategies for treating falciparum malaria, the nutritional status of unmarried adolescent girls, and the re-emergence of Inaba serotype of V. cholerae O1 El Tor with increased susceptibility to tetracycline. Articles in the HSB are frequently reported in the local media, thus reaching not only health professionals, but the general public as well. The HSB is available on the Centre’s website at www.icddrb.org/hsb.

How are we organized?

HSID currently has 53 national (Bangladeshi) officers and 159 support staff. These figures include those working at the Centre in Dhaka and in three field sites. An important change in the rural field sites was the transition from general service to local community workers for the routine collection of demographic and health surveillance data. Changes in international staffing included the arrival of Dr. Elizabeth Oliveras, (Operations Research Scientist) and Dr. Tracey Lynn Perez Koehlmoos (Health Systems Researcher) who joined the Health Systems and Economics Unit during 2006. Alexander John Mercer (Operations Research Scientist) left the Division.

HSID staff are grouped under 4 administrative units: Health Systems and Economics, Infectious Diseases, Surveillance and Data Resources, and Field Sites. The Division houses two of the Centre’s 8 scientific programmes: the Infectious Diseases and Vaccine Sciences Programme and the Health and Family Planning Systems Programme. In addition, the Division administers several, multi-investigator, inter-divisional research projects. These include: Family Health Research Project (FHRP) funded by USAID and terminated in 2006; Scaling Up Zinc for Young Children with Diarrhoea (SUZY) Project funded by the Bill and Melinda Gates Foundation; and HIV/AIDS Youth Prevention Project funded by the Global Fund to Fight AIDS, Tuberculosis and Malaria.

The Division maintains three field sites (Fig. 1) that are used for demographic surveillance and for supporting investigations carried out by researchers from all divisions of the Centre. The field sites include two rural field stations—one in Mirsarai (a sub-district in southern Chittagong division) and the other one Abhoynagar (a sub-district in western Khulna division bordering
India) and an urban slum field station in the Kamalapur zone of Dhaka city. In all these three settings, people benefit from the government and NGO health services; however, the primary source of curative health services remains the private sector.

**HSID Fellowship Programme**

The Division initiated, in 2006, a fellowship programme aiming at attracting promising young Bangladeshi scientists. The first intake included 3 fellows—2 concentrating on infectious diseases and 1 on health systems.

**Surveillance and Data Resources Unit**

Head: Carel van Mels

This Unit is responsible for the content, processing, and analysis of health and demographic surveillance data. It also provides data-management services to the other units of the Division.

**Surveillance**

A major restructuring of the surveillance in the two rural sites—Abhoynagar and Mirsarai—and in the Unit itself in Dhaka has resulted in an important reduction of the surveillance costs. The restructuring included rebranding of the sites under individual site names. The common name—HSID Surveillance Sites—will no longer be used, instead the sites will use the name of the area in which they are located: Abhoynagar (which includes neighbouring Keshobpur), Mirsarai, and Kamalapur. The demographic surveillance of the urban Kamalapur area of Dhaka will, in future, be separated from the infectious diseases surveillance in that area and be organized similar to that of the rural sites. The Unit continued the regular processing of health and demographic surveillance data. Processing includes coding, data entry, editing, verifying, archiving, and printing of the household books for the rural sites—Abhoynagar and Mirsarai surveillance—and for the bi-annual census of Kamalapur.

Analysis of the surveillance data showed that the government vaccination programme has been very successful in rural areas of Bangladesh: both Abhoynagar and Mirsarai have vaccination rates well above 95% for DTP, polio, and BCG (Fig. 2). Only measles vaccinations lagged slightly behind, although these rates are still rising. Vitamin A supplementation showed room for improvement, as only two-thirds of children had received this in the last half year.

The contraceptive prevalence in the rural sites continues its mostly upward trend, with the oral pill winning ground compared to the other methods (Fig. 3). The contraceptive prevalence in Mirsarai remains lower than in Abhoynagar, but this can partly be explained by the absence of a large proportion of husbands who work outside the country, mostly in the Gulf States. Pharmacies and shops continue to be the most important source of modern contraceptive methods, rising to almost a third
in 2005 in both the rural areas (Fig. 4). The Community Clinics and Health Assistants continue to become less used as a source.

The Unit created a regularly-updated version of its surveillance database in an SQL-compatible format, which includes all demographic variables and should facilitate the direct access of users to the database. Once a divisional data server has been installed, this will allow authorised researchers to import surveillance data directly into packages, like SPSS and SAS. In the meantime, the Unit continues to provide sub-sets of its surveillance data to interested researchers within and outside the Division.

Data-management Services

The Unit provides data-management assistance to various protocols in the Division. This varies from provision of computers and their maintenance to a full package, including screen design, data entry, editing, tabulation, and statistical analysis. A major milestone in 2006 is the establishment of inter-departmental service rates for these activities by the Centre’s Finance Department, so these services can now be charged accordingly. In addition, the Unit’s engineer provides hardware and software installation services to the Division, including setting up of new computers and connecting those to the network. This service is free of charge as is the archiving by the Unit. According to the Centre’s policy, all research data and their documentation should be archived in multiple sets for back-up. The Unit is responsible for this in HSID.

Rural field sites

Head: Ali Ashraf

HSID personnel conduct demographic and health surveillance and support research in two field sites. The oldest field site—Abhoynagar, located on the industrial belt of the Dhaka-Khulna highway in southwestern Bangladesh—has been in operation since 1982. The surveillance activities cover a population of 34,000 individuals living in about 7,500 households. The second site—Mirsarai—has been in operation since 1994. The surveillance population is about 40,000 living in 7,500 households. Coinciding with the termination of funding support in 2006 by USAID, the rural field sites undertook a major reorganization. This included streamlining of the data-collection system and household-visit schedule without a change in the frequency of visits. This provided an opportunity to harmonize data collected with that in Matlab, but also to add several questions of relevance to our research activities and the Centre’s strategic plan. This reorganization resulted in nearly a 50% reduction in operational costs.

Demographic surveillance in Mirsarai and Abhoynagar

All fertility indicators have shown a clear downward trend during the last 3 years. The overall total fertility rate has declined from 2.6 in 2003 to 2.3 in 2005 (Fig. 5). This rate is well below the national total fertility rate of 3.0 in both the rural sites. Data collected in our rural sites assist Bangladesh in monitoring its progress towards the Millennium Development Goals (MDGs). As shown in Figure 6, little progress has been made in the proportion of women receiving a facility-based delivery.

The Abhoynagar and Mirsarai field sites are members of the international INDEPTH network. In 2005, the Network sponsored a multi-site survey of the burden of non-communicable diseases among adults aged over 60 years. It was found that 32% of males and 48% of females in Mirsarai and 26% of males and 33% of females in Abhoynagar reported having been diagnosed with at least one active disease. The commonest diagnoses were arthritis (37%), hypertention (27%), and respiratory illnesses (8%). Other conditions included cancer, heart disease or stroke, and diabetes.
Urban Field Site (Kamalapur)
Head: W. Abdullah Brooks

The Kamalapur field site is located in the southeast of Dhaka city and approximately a 40 to 60-minute drive from ICDDR,B. According to the demographic surveillance conducted in 2005-2006, Kamalapur has an estimated population of 200,000 living in around 45,000 households, of which 5,000 are selected by cluster randomization and kept under active surveillance for the current pneumonia disease-burden surveillance among children aged less than 5 years. The surveillance site covers an area of approximately 4 sq. km and is located between a train terminal and a bus station, thus serving as a major point of population ingress and egress. Although a survey had been conducted in a part of the site some years ago, Kamalapur was established as a surveillance site with its current infrastructure and territory only in 1998. The present infrastructure includes demographic surveillance, active morbidity surveillance, clinical services, clinical and research training, and, finally, monitoring and evaluation. Additionally, features, such as population density, low education and family-income levels, high rates of immigration, and high rates of communicable diseases, make this a high-risk community in a number of areas and a valuable place to understand the challenges facing similar high-risk, impoverished urban communities.

The following disease-burden studies and clinical trials are ongoing at Kamalapur. Nearly all of these are being done in collaboration with other divisions of the Centre and international institutions:

1. Pneumonia surveillance to determine the burden of disease, including bacterial (PneumoADIP) and viral (Centers for Disease Control and Prevention, Health and Human Services) aetiologies

2. A clinical trial on zinc as adjuvant therapy in the management of outpatient pneumonia in children aged less than 2 years (Bill and Melinda Gates Foundation/Thrasher Research Fund)

3. Surveillance for typhoid fever and other febrile diseases (PneumoADIP/others)

4. Tuberculosis studies (WHO)

5. Hepatitis B and C burden of disease study (Basel University)

6. A clinical trial on zinc as adjuvant therapy in the management of outpatient bronchiolitis in children aged less than 2 years (USAID)

The physical facilities include a ground-level clinic and two upper levels for staff. Nine physician-nurse teams provide clinical services, each supported by health workers. All clinical personnel are trained in each of the ongoing studies so as to serve as multi-disciplinary project staff. In 2006, 29,208 patients aged less than 5 years were seen in the clinic, of whom 11,445 had acute respiratory infections, including 2,216 cases of pneumonia, and another 1,038 had acute wheezing episodes. There were also 3,239 cases of diarrhoea, including 1,462 cases of dysentery. Another 483 were diagnosed with enteric fever. Additionally, 164 cases of clinical measles were also detected, showing a sign that measles immunization has not achieved herd immunity. Three Field Research Officers, 40 Field Research Assistants, and 15 Health Workers, support the clinic. They conduct both demographic and active morbidity surveillance, and refer patients with illness to the onsite clinic. The work in Kamalapur has an immediate relevance to the community, but also to other urban poor settings.

Health Systems and Economics Unit
Head: Rukhsana Gazi

During 2006, the Health Systems and Economics Unit was further strengthened in line with the recommendations of the Board of Trustees after an external review of the Division. Two new international staff with expertise in health systems and health economics joined the Unit. Necessary steps have been taken to consider other recommendations of the external review relevant to the area of health economics.

Professional development

Several staff members of the Unit undertook short training courses on health systems, epidemiology, and biostatistics in Bangladesh (at the National Institute of Preventive and Social Medicine) and India. One staff member of the Unit was admitted into the master's programme in health economics under an AusAID scholarship. To strengthen writing and critical appraisal skills of staff, an HSID writing group was formed headed by an international staff. This group used to meet every Thursday afternoon to review and finalize manuscripts developed by the staff members.

Research activities

The research topics covered by the Unit scientists currently include the testing of alternative strategies for improving immunization coverage in hard-to-reach and urban slum areas of Bangladesh, a situation analysis of primary-care level laboratory facilities, evaluation and monitoring of demand-based reproductive health-care delivery, prevention of postpartum haemorrhage in rural Bangladesh, management of chronic coughers by private practitioners, willingness to pay for cholera vaccine, cost-effectiveness of nets impregnated with insecticide for the prevention of kala-azar, and the cost of acute respiratory infection illnesses. These studies are described briefly in the report of the Health and Family Planning Systems Programme.

Menstrual regulation and abortion: back on the agenda

In July 2006, unsafe abortion and menstrual regulation (MR) returned to the research agenda at ICDDR,B. After years of restrictions due to the Mexico City Policy of the United States Government, which limits work on abortion by organizations receiving money through the USAID Population Programme, the Centre’s researchers, for the first time in July 2006, could pursue such research without fear of repercussion. The Centre staff
immediately set out to determine the key questions that need to be answered using the wealth of data available within the Centre.

To lay the groundwork for future studies, a situation analysis was conducted through a collaboration of Health Systems and Infectious Diseases Division, Public Health Sciences Division and Laboratory Sciences Division. Using available data from ICDDR,B, they showed that abortion remains a leading cause of maternal mortality in Bangladesh and that both total abortion rates (average number of abortions a woman would have over her life-time assuming age-specific abortion rates remain constant) and abortion ratios (the number of abortions per 1,000 livebirths) appear to be increasing in some areas of Bangladesh, and wide variation exists (Fig. 7 and 8).

Although the situation analysis represents only an initial investigation of current data on abortion and MR in Bangladesh, it highlighted a number of research questions that need to be addressed. For example, little is known about which women are most vulnerable to unsafe abortion, the role of MR in fertility decline in Bangladesh has not been documented, and the quality of MR service-delivery requires careful documentation. The answers to these questions are important to Bangladesh, but also internationally. This is particularly so because the Bangladesh Menstrual Regulation Programme is unique in providing decentralized MR services to women through female paramedics at the primary-care level. If this programme has been successful in reducing the number of unsafe abortions, adapting a similar approach may help save lives of women around the world.

**Infectious Diseases Unit**

Head: W. Abdullah Brooks

The Unit is involved in the work on infectious diseases with the assistance of 6 fixed-term employees and 7 trainee fellows. The research activities of the Unit cover a range of topics, including respiratory infections, tuberculosis, population and hospital-based surveillance, Nipah virus, typhoid fever, dengue, leptospirosis, and clinical trials. The 2006 highlights include findings from the population-based pneumonia surveillance in Kamalapur that show not only continued high rates of pneumonia (0.52 episodes/child/year for children aged less than <5 years), but also high rates of both bacterial and non-bacterial causes.

The activities of the Unit are mainly based in the Kamalapur field site. During the reporting period, the Unit was involved in conducting a number of studies mostly on emerging and re-emerging infectious diseases. Some of the important results are mentioned below.

**Communicable diseases surveillance in Kamalapur**

**Influenza**

During January–December 2006, of 29,208 clinic visits among children aged less than 5 years, 3,422 (11.7%) met the case definition of acute respiratory or febrile illness and were eligible for sample collection (blood culture, nasopharyngeal wash, serology). Pursuant to the 20% sample frame for the influenza surveillance, 710 (20.8%) of these children had a nasopharyngeal wash and serology collected. For the period, 509 nasopharyngeal wash samples (71.6%) were processed, of which 59 (11.6%) were positive for influenza. Since April 2004, 98 (55.4)% of the isolates were influenza A (H3N2, H1N1) and 79 (44.6%) were influenza B—Shanghai/Malaysia and Hong Kong (Fig. 9 and 10).

During April 2004–December 2006, there have been 11,444.4 child-years of observation. The overall influenza incidence was 74.4 cases per 1,000 child-years. Among the epidemiological findings, influenza was isolated year-round, has 2 distinct influenza A seasonal peaks (H3N2 in the pre-monsoon April–May period, H1N1 in the July–September period) and showed that influenza B is available for a prolonged period of time (Hong Kong in...
March–September) or practically year-round (Shanghai). The spring-summer seasonality may have implications for the northern hemisphere, for which influenza is primarily a winter pathogen. Clinically, 28% of influenza infections were associated with pneumonia, including severe pneumonia. These findings indicate that influenza is a major public-health concern in this urban population, among whom respiratory illness is the leading cause of death. Year-round circulation increases the probability of reassortment among human and also non-human influenza viruses.

**Pneumococcal (Streptococcus pneumoniae) surveillance in Kamalapur**

In 2006, of the 3,422 eligible children, blood samples were drawn from 3,257 (95.2%) and cultures done, of which 158 (4.9%) were positive for a bacterial isolate. Eighteen (11.4%) of these isolates were Streptococcus pneumoniae. This brings the total number of eligible children since surveillance began in April 2004 to 8,806, and the number of collected cultures to 8,164 (92.7%), and an overall pneumococcal isolation fraction of 10.0% (43 isolates). This continues to demonstrate a high incidence of invasive pneumococcal disease of approximately 4 episodes/1,000 child-years of observation, which is comparable with rates in other high-endemic areas (Fig. 11).

**Fig. 11. Seasonality of invasive pneumococcal infection: Kamalapur, April 2004-December 2006**

Most importantly, the serotypes most common in the community are represented in protein-conjugate vaccines currently in use in other countries, suggesting that they could reduce the burden of pneumonia and other invasive pneumococcal disease in this community.

**Typhoid fever surveillance in Kamalapur**

Typhoid has been associated with an increasing rate of both hospitalization and mortality among febrile children aged less than 5 years, while antimicrobial resistance rates to beta-lactams and fluoroquinolones continue to rise. Salmonella Typhi remains the number one bacterial isolate (Fig. 12). From January through December 2006, there were 110 isolates from febrile children aged less than 5 years, accounting for an isolation fraction of 69.6% for an overall rate of 54.7% since April 2004. This continues to confirm an incidence of S. Typhi among children aged less than 5 years over 20 episodes/1,000 child-years (>2%).

**Fig. 12. Seasonality of Salmonella Typhi: Kamalapur, April 2004-December 2006**

**Family Health Research Project**

**PI:** David A. Sack  
**Manager:** Ahsam-ul Hoque Helal

The Family Health Research Project (FHRP), which began in July 2001, ended its operations in 2006. The mandate of the FHRP, within the context of the overall vision and mission of ICDDR,B, was to improve the health of the people of Bangladesh, primarily through improving the effectiveness of the essential services package (ESP) of the Ministry of Health and Family Welfare that provides basic medical services to families, especially the most vulnerable poor.

**FHRP-funded research**

The research activities funded through the FHRP covered a wide range of topics, but all addressed priority health issues for developing-country populations and had application to health policy or programming. This included reproductive and population health, child health, health systems, nutrition, HIV/AIDS, and illnesses with high disease-burden. During its tenure, the FHRP supported 27 research protocols.

Some significant contributions that the research has made are highlighted below:

- Introduction of nationwide record-keeping and reporting systems
- Development and implementation of pictorial cards for raising community awareness on pregnancy related complications and decision-making
- Introduction of a comprehensive essential obstetrical care model in sub-district hospitals
- Development of educational booklets on ‘Puberty’, ‘Marriage and family life’ and ‘Sexually transmitted disease’ and a toolkit
- Confirmation of safety of hypo-osmolar ORS
- Development of primary-care checklists to minimize missed opportunities

The Family Health Research Project was officially declared closed in a ceremony

- Testing of alternative IMCI strategies and strengthening of community participation
- Cost-effective, community-based neonatal survival packages
- Validating rapid tests for screening of STI
- Identification of system barriers to completing immunization schedules

The results of the research funded through the FHRP were shared with policy-makers, programmers, providers, and other health professionals in the public and private sectors. This was done through creation of protocol-specific technical interest groups, holding workshops, and presentations at seminars and conferences.

**Closure of FHRP**

The closure of the FHRP was effective from 1 July 2006. This closure had a major impact on Centre staff, with over 75 at risk of losing employment. Through careful planning and with the support of the Human Resources Department, the Centre was able to absorb all staff requesting continued employment at the Centre. This has had a noteworthy impact on the staff morale and reassured them of the commitment the Centre has made to the welfare of its staff.

**Scaling Up Zinc for Young Children (SUZY) Project**

PI: Charles P. Larson
Manager: Abdul Wazed

**Dispersible zinc tablets: technology transfer and production**

In June 2006, a team from France-based Nutriset Ltd. and Rodael Pharmaceutical Laboratories carried out the technology transfer to a Bangladeshi pharmaceutical laboratory—ACME Pharmaceuticals Ltd.—for the production of dispersible zinc tablets. At the conclusion of their visit, ACME produced a test batch that was then submitted for accelerated stability testing. These tests were suc-
cessfully completed in September. In early November, the tablets were produced and packaged, with 500,000 blister packs exclusively for consumption at the Ministry of Health and Family Welfare (MoHFW) facilities and approximately 3 million to be distributed in the private sector under the brand name ‘Baby Zinc’.

National launching of ‘Baby Zinc’

In November 2006, ‘Baby Zinc’ was formally launched through a mass-media event at the China-Bangladesh Friendship Conference Centre in Dhaka. To coincide with this launching, in collaboration with Dhansiri Productions, a mass-media package was prepared which includes TV and radio commercials, cartoon characters, posters and billboards, and village dramas. In addition, ACME has initiated a provider-introduction strategy for health professionals, which will reach approximately 90,000 providers.

Provider orientation

The SUZY training team works with the private sector-regulated/licensed and unregulated service providers throughout Bangladesh. Within the public sector, the team has trained professional staff of the Ministry of Health and Family Welfare in over 100 sub-districts and in Dhaka City Corporation. Following this orientation, Baby Zinc blister packs are delivered to sub-district health centres for free distribution among clients. We have also prepared two videos (in Bangla and English), the first targets unlicensed providers, and the second is to be shown to parents in waiting rooms/clinic settings.

Impact monitoring of the scaling up

In 2004-2005 a diarrhoeal management survey was carried out throughout Bangladesh. This included populations representative of rural/small town settings, and large cities. The latter also included urban slum populations. This survey provides baseline information on diarrhoeal management practices, particularly the use of ORS, antibiotics, and zinc. Immediately prior to the launching of Baby Zinc, a repeat national survey was conducted, and this will be repeated twice in 2007. The purpose of the survey is to document the uptake of zinc and also to monitor potential changes in the use of ORS and antibiotics. The survey also monitors the use patterns of health services, household expenditure on the treatment of childhood diarrhoea, and whether zinc is reaching the poorest of the poor.

Project networking

The SUZY Project continues to sponsor an annual conference that covers recent scientific and programmatic advances in support of zinc treatment throughout the world. In 2006, the presentations included a description of the prophylactic administration of zinc to children, aged less than 5 years, in Indonesia, following the Tsunami in December 2004 and its use in refugee camps in Chad. This year, participants from 18 countries attended...
Ongoing protocols of HSID

Akhter S. Cost-effectiveness of long-lasting insecticidal nets in the prevention of kala-azar project acronym: KALANET
Funded by: European Union (EU)

Brooks WA. Efficacy of zinc in the treatment of outpatient pneumonia in an urban slum among children less than 2 years old
Funded by: United States Agency for International Development (USAID), USA

Brooks WA. Efficacy of zinc in the treatment of bronchiolitis and prevention of wheezing respiratory illness in children less than two years old
Funded by: USAID/Dhaka

Brooks WA. Surveillance for influenza and the viral aetiologies of influenza-like febrile illnesses in an urban slum in Dhaka, Bangladesh
Funded by: Centers for Disease Control and Prevention (CDC), USA

Gazi R. Demand-based reproductive health commodity project
Funded by: Canadian International Development Agency (CIDA), Canada and United Nations Population Fund (UNFPA), Bangladesh

Haseen F. An analysis of social, behavioural and biomedical risk factors of adolescents and youth clients of sex workers: implications for STI/HIV interventions in Bangladesh
Funded by: Global Funds to Fight AIDS, Tuberculosis (TB) and Malaria (GFATM)

Haseen F. Impact of an HIV/AIDS prevention entertainment education programme and the effect of post-viewing inter-personal discussion
Funded by: Global Funds to Fight AIDS, Tuberculosis (TB) and Malaria (GFATM)

Larson C. Assessment of a peer education project for HIV prevention among hotel-based sex workers in Dhaka
Funded by: Family Health International (FHI), USA

Larson C. Baseline HIV/AIDS survey among youth in Bangladesh
Funded by: Save the Children-USA

Larson C. Monitoring the impact of the SUZY project role-out of zinc as a treatment for childhood diarrhoea
Funded by: USAID

Larson C. Rapid assessment of youth perspectives on health services: modification of World Health Organization guidelines for youth-friendly services in Bangladesh
Funded by: Save the Children-USA

Larson C. Scaling up zinc as a treatment for childhood diarrhoea in Bangladesh: monitoring the impact of public, private and NGO delivery strategies
Funded by: Bill and Melinda Gates Foundation, USA

Larson C. Understanding community dynamics influencing sexuality and high-risk behaviors for STIs/HIV/AIDS among rural youth in Bangladesh
Funded by: Save the Children-USA

Luby S, Sack DA. Burden of pneumococcal disease in children in Bangladesh: a project to enhance laboratory capacity and create awareness and to prepare for introduction of a pneumococcal vaccine
Funded by: Johns Hopkins Bloomberg School of Public Health (JHSPH), USA

Luby S. Nipah virus transmission in Bangladesh
Funded by: NIH, USA

Luby S. Surveillance for hospitalization and death due to pneumonia and meningitis in Dhaka, Bangladesh
Funded by: Johns Hopkins University (JHU), USA and GoB

van Mels CT. The effects of crowding and indoor air pollution on acute/lower respiratory infections in children <5 years of age
Funded by: CDC, USA

Naheed A. Establishment of laboratory-based community surveillance for typhoid fever to define incidence of typhoid fever and to identify modifiable risk factors which may be useful in subsequent interventions to reduce the burden of disease
Funded by: CDC, USA, and International Vaccine Institute (IVI), South Korea

Oliveras E. Johnston H. Situation analysis on unsafe abortion in Bangladesh: magnitude, populations at risk, resources, and consequences
Funded by: DFID, UK

Quaiyum MA. Feasibility, acceptability and programme effectiveness of misoprostol in preventing postpartum haemorrhage in rural Bangladesh
Funded by: USAID/Dhaka
What does the Division do?

The large and modern laboratories of the Laboratory Sciences Division (LSD) provide research facilities for basic and applied research and extend laboratory services to both the rest of the Centre and the public at large. The Division’s researchers also collaborate with national and international research and educational institutions and participate in conferences, workshops, symposia, and training programmes worldwide.

The Division houses a range of laboratories, the activities of which are explained below. It also houses the HIV/AIDS Programme, which is considered alongside the Centre’s other research programmes at the appropriate point in this Annual Report.

How are we organized?

The Division is divided into three areas: Research (encompassing all research laboratories), Services (under which the laboratories and units of the Clinical Laboratories Services fall), and the HIV/AIDS Programme. In 2006, the Division had 364 staff members, including 30 scientists.

Activites in 2006

In 2006, the LSD scientists published 75 papers in peer-reviewed international journals, successfully completed 21 projects, initiated 12 new studies, and continued 40 research and service projects.

The scientists of the Division guided 40 fellow students from different national and overseas universities to complete their MPhil or PhD degrees. As part of the staff-development programme, 6 scientific personnel are working towards their doctoral degrees in different countries, and 48 travelled overseas to attend seminars, workshops, and short-term training programmes during the year.

Ms Shamsun Nahar of the RTI/STI Laboratory was awarded a PhD degree from the University of Dhaka, and Mohammed Bakhtiar completed his PhD under the University of California-Davis Fellowship Program and joined the Nutritional Biochemistry Laboratory. Dr. Firdausi Qadri, Senior Scientist and Head of the Immunology Laboratory, was elected Fellow of Infectious Diseases Society of America for her professional excellence in infectious diseases and related fields.

The Clinical Laboratory Services not only provided laboratory diagnostic support for patient-care activities but also played a significant role in research and support for research. A significant achievement is collaboration with the Center for Vaccine Development (CVD), University of Maryland, Baltimore, USA, for a multi-centre study on comprehensive aetiology of diarrhoeal diseases in children aged less than 5 years to be conducted in Mirzapur of Tangail district. In addition to the conventional bacteriological isolation and identification technique, its molecular and serodiagnostic unit will support the detection and identification of diarrhoeagenic Escherichia coli, viruses (rotavirus, adenovirus, norovirus, sapovirus, and astrovirus), and parasites (E. histolytica, Giardia, and Cryptosporidium) using polymerase chain reaction (PCR) technology (multiplex-PCR and RT-PCR). Dr. M. Anowar Hossain and Dr. G.B. Nair attended the coordination meeting of this project held at CVD in August 2006.

To maintain regional cooperation and to exchange high-quality technical know-how, the LSD scientists rendered consultancy in Mozambique, Nepal, Bhutan, and Family Health International (India). They also maintained productive collaborations with the research institutions of Belgium, The Netherlands, France, Japan, India, Peru, Sweden, USA, and UK. The Division actively participated in the PulseNet Asia Pacific programme to strengthen the electronic molecular networking for controlling bacterial enteric infections prevailing in these countries.
Enteric Microbiology Laboratory  
Head: G. Balakrish Nair

The Enteric Microbiology Laboratory works to develop and apply techniques of identifying and characterizing diarrhoea-causing organisms. These techniques involve both phenotypic studies (which consider the appearance of a pathogen) and molecular studies, including genetic fingerprinting. For these, the Laboratory uses a wide range of techniques, from gel electrophoresis and DNA amplification via PCR to enzyme-linked immunosorbent assay (ELISA). It also uses animals to study the mechanism of disease and to produce antisera, which are used for identifying bacteria.

The Laboratory has recently standardized the PulseNet Protocol—known as PFGE—to allow it to be used for characterizing Shigella, Salmonella, E. coli, Vibrio and Campylobacter strains from different sources. Researchers in this laboratory started some work on basic research to understand the molecular pathogenesis of enteric pathogens using different cell-lines. Different techniques have been set up in this laboratory to monitor the DNA damage-signaling pathway.

Extensive studies are being carried out by the investigators of the Laboratory on the phenotypic and molecular epidemiology of Shigella, Salmonella, Vibrio cholerae, V. parahaemolyticus, Campylobacter, enterotoxigenic E. coli (ETEC), enteropathogenic E. coli (EPEC), and specially on Shiga-toxin-producing E. coli, Aeromonas, and Helicobacter pylori. Studies on the mechanisms of antibiotic resistance of Shigella and Salmonella Typhi are also ongoing.

To build capacity, national and international fellows are frequently imparted training on various molecular aspects. MSc, MPhil and PhD students are doing their theses routinely under the supervision of scientists in collaboration with various universities of Bangladesh and other parts of the world.

Immunology Laboratory  
Head: Firdausi Qadri

The Laboratory is a thriving area of activity where the current trends in the field of microbiology and immunology are continuously upgraded. Nutritional aspects of work involve studies in infants, children, and pregnant women. The negative effects of environmental pollution, especially that of arsenic in modulating the immune system are an important addition to the activities of the Laboratory. The overall burden due to the vicious cycle of malnutrition, immune deficiency, and infection is being studied with an aim to translate information into strategies for preventing disease using vaccines and immunotherapeutics. The aim is also to understand the correlates of protection in different diseases so as to be able to use these measures in vaccine-efficacy studies. These activities involve human studies and pre-clinical work: experimental models.

Areas of research include infectious diseases relating to Shigella spp., V. cholerae, V. parahaemolyticus, ETEC, S. Typhi, Mycobacterium tuberculosis, and H. pylori. The Laboratory continues to introduce state-of-the-art techniques, including gene and protein microarray, by keeping up with the latest developments in immunology and achieves this partly by active collaboration with scientists in the international community.

As part of training programmes, 7 students at PhD level, 6 at Master’s level, and 2 Fogarty International Clinical Research Scholars have been working in the Laboratory, while trainees from the unit are working at different laboratories in the USA and Sweden.

Acute Respiratory Infection Laboratory  
Head: Mahbubur Rahman

The Acute Respiratory Infection Laboratory is involved in studying the epidemiology and clinical characteristics of respiratory pathogens for better diagnosis, case management, and prevention of diseases; in disseminating relevant information to stakeholders; and improving the use of such data for policy decisions, particularly for ARI-control programmes of the Bangladesh Government. Acute lower respiratory infection, primarily pneumonia, is a leading cause of morbidity and mortality in children aged less than 5 years in Bangladesh. About 25% of all deaths among under-five children and about 40% of deaths among infants in Bangladesh are associated with pneumonia. Streptococcus pneumoniae, H. influenzae and Moraxella catarrhalis frequently cause pneumonia and other invasive infections. Research done at the Laboratory aims primarily at reducing morbidity and mortality due to ARI in infants and children.

RTI/STI Laboratory  
Head: Motiur Rahman (Up to January)  
Acting Head: G. Balakrish Nair (From February)

The RTI/STI Laboratory is conducting epidemiological studies on reproductive tract infection and sexually transmitted infection (RTI/STI) among different population groups in Bangladesh, validating rapid diagnostic tests for syphilis and monitoring antimicrobial susceptibility of Neisseria gonorrhoeae in Bangladesh. Recently, the Laboratory completed a cohort study among female sex workers to (a) compare the effectiveness of enhanced syndromic management and periodic presumptive management and (b) study the incidence of gonococcal and chlamydial infections among female sex workers. It has recently started a study on epidemiology of human papillomavirus (HPV)-associated infection among females in Bangladesh and completed a study on youth male clients of female sex workers in Bangladesh. The Laboratory provides diagnostic services to national and international projects, including national HIV surveillance. During 2006, it was actively involved in developing the national STI guidelines for Bangladesh. It contributes significantly to the Centre's efforts to release data of public-health importance by routinely publishing those on antimicrobial resistance of N. gonorrhoeae in the Health and Science Bulletin of the Centre. The Laboratory works as a representative for Bangladesh in the Global Network for Perinatal and Reproductive Health and Gonococcal Antimicrobial Susceptibility programme of WHO.
Molecular Genetics Laboratory
Head: Shah M. Faruque

The Molecular Genetics Laboratory is involved in the development and application of molecular techniques to identify and characterize diarrhoeagenic organisms. The major areas of research involve microbial evolution, molecular epidemiology and vaccine development, and environmental microbiology. This laboratory collaborates with various international institutions, including Harvard Medical School, Massachusetts General Hospital, Tufts University, and Johns Hopkins University, and Osaka Prefecture University. In addition to applied research, the investigators of the Laboratory are involved in addressing basic research questions regarding emergence and evolution of pathogens.

Research in this laboratory has made considerable progress in understanding the emergence and evolution of pathogenic *V. cholerae* strains and factors controlling epidemics of cholera. Creation of attenuated mutants of *toxigenic V. cholerae, Shigella*, and diarrhoeagenic *E. coli* as probable vaccine candidates are also important priorities of the Laboratory. Among other research activities, environmental occurrence and biology of diarrhoeal pathogens, including *V. cholerae, Shigella*, and diarrhoeagenic *E. coli*, is also being investigated.

Environmental Microbiology Laboratory
Head: M. Sirajul Islam

The Environmental Microbiology Laboratory focuses its research mainly on water microbiology and water chemistry relating to the ecology and epidemiology of diarrhoea-causing organisms.

Presently, the Laboratory investigates alternative strategies to purify surface water for all kinds of household purposes, including drinking. Recently, the Laboratory has initiated a pilot study to assess the climate change and its impact on transmission dynamics of cholera in Bangladesh. In 2006, the Laboratory conducted 5 different studies. The Laboratory also provides inter-departmental services for testing environmental samples supplied by the Clinical Sciences Division, Public Health Sciences Division, Health Systems and Infectious Diseases Division, and Information Sciences Division. In 2006, the Laboratory carried out 2,332 tests of environmental samples.
samples, including water, juice, and other beverages, prawn, etc., supplied by different national and international institutions and non-governmental organizations of Bangladesh.

**Parasitology Laboratory**  
**Head: Rashidul Haque**

The Parasitology Laboratory conducts research on parasitic diseases with special emphasis on intestinal protozoan parasites. Recently, the Laboratory has also initiated studies on vector-borne parasitic diseases, such as malaria and leishmaniasis. The research is primarily focused on human immunity to amoebiasis, the relationship of parasite and host genetics with amoebic diseases, and the burden of amoebic diseases in children and molecular diagnostic tests for these intestinal parasites.

The Laboratory is collaborating closely with the University of Virginia and Techlab, Inc, USA, to develop quick and easy methods for the diagnosis of intestinal protozoan parasites, such as *E. histolytica*, *Giardia intestinalis*, and *Cryptosporidium* spp. Rapid tests (Quick Check) for the detection of *E. histolytica* antigen in stool and liver abscess pus specimens have been evaluated. Rapid test for the detection of anti-amoebic antibody in blood specimens has also been evaluated for the diagnosis of amoebic diseases.

Studies are ongoing to understand the disease burden due to *E. histolytica* in a cohort of school-age children in Mirpur, Dhaka, in collaboration with investigators from the University of Virginia, USA. Researchers in the Laboratory are working with researchers from the University of Virginia to understand acquired and innate immunity to *E. histolytica*-associated infection and disease, a third leading parasitic cause of morbidity and mortality worldwide. This research has already shown that IFN-gamma production by peripheral blood mononuclear cells correlates with childhood malnutrition and susceptibility to *E. histolytica*-associated diarrhoea.

It has also been shown that cognitive scores were negatively associated with the incidence of diarrhoea of all aetiologies and, in particular, *E. histolytica*-associated dysentery.

Working with patients in the Dhaka Hospital of ICDDR,B and patients attending the Bangabandhu Sheikh Mujib Medical University, Dhaka, the Laboratory is also attempting to discover which of these intestinal protozoan parasites and their genotypes are associated with diarrhoeal diseases. A case-control study is being conducted to understand the association of intestinal protozoan parasites with diarrhoea. The Laboratory is also doing a field study to compare the efficacy of different anti-helmintic treatment regimens with support from the Thrasher Research Fund, USA.

Work on malaria is limited to a small-scale clinical trial of a new drug regimen for the treatment of falciparum malaria and *in-vitro* drug resistance. A field laboratory has been established in Bandaran District Hospital to work on malaria. Plans are underway to expand this as a reference laboratory for research on malaria in the malaria-endemic districts. Malaria-related research is being undertaken in collaboration with the Medical University, Vienna, Austria, Armed Forces Research Institute of Medical Sciences, Bangkok, and Bandaran District Hospital. The Laboratory is also continuing to work on visceral leishmaniasis (kala-azar). Research on kala-azar is being undertaken in collaboration with the Tropical Disease Research-WHO and the University of Tsukuba, Japan. Besides these research activities, the Laboratory also provides diagnostic support to different projects and imparts training to undergraduate and postgraduate students from both home and abroad.

**Nutritional Biochemistry Laboratory**  
**Head: M.A. Wahed**

During 2006, the Nutritional Biochemistry Laboratory performed 5,798 various tests in biological, food and water samples from different research projects of the Centre. Participation in external quality control with National Institute of Standards and Technology, Washington, DC, and the Centers for Disease Control and Prevention, Atlanta, USA, has been continuing. Research and development is an ongoing labour of the Laboratory; analyses of more metals—both toxic and essential, and beta-carotene content of sweet potatoes are now in progress. A PhD student from The Royal Veterinary and Agricultural University, Copenhagen, Denmark, has completed her thesis titled “Micronutrient deficiencies persist in developing countries: factors associated with prevalence of deficiencies in children living in an urban slum in Bangladesh.” MSc students from the National College of Home Economics completed their theses on (a) Complementary feeding and hygiene practices in infants admitted to the diarrhoeal disease hospital and (b) Perception of mothers living in urban slum about the nutrition of their children” under the supervision of Head of the Laboratory.

**Tuberculosis Laboratory**  
**Head: Md. Zeaur Rahman**

The Tuberculosis Laboratory routinely performs Lowenstein-Jansen-based solid and MGIT-based liquid culture and IS6110-based PCR for the detection of *Mycobacterium* from pulmonary and extra-pulmonary clinical specimens from tuberculosis-suspected patients. Resistance to primary anti-TB drugs is being tested by both conventional and molecular techniques. In addition, genotyping techniques, such as mycobacterial interspersed repetitive unit (MIRU), variable number tandem repeats (VNTR), and spoligotyping techniques are routinely being practised in this laboratory to study the epidemiology of tuberculosis in Bangladesh. Recently-developed highly-sensitive tests, such as Quantiferon Gold and Loop Mediated Isothermal Amplification (LAMP), have been set up in this laboratory as modern tools for rapid diagnosis of TB. In 2006, the Laboratory performed cultures of 4,755 clinical specimens. To study the disease burden of TB in Bangladesh, this laboratory is actively collaborating with the National TB Control Programme of Bangladesh, National Chest Diseases Institute and Hospital, Dhaka, and the Damien Foundation.
**Virology Laboratory**  
Head: Tasnim Azim

The Virology Laboratory is working with different infectious viruses. It focuses on detection and characterization of viruses and standardization of cutting-edge laboratory techniques.

The research areas include rotaviruses and caliciviruses (noroviruses and astroviruses), which are responsible for about half of diarrhoeal diseases in children attending the ICDDR,B hospitals. Identification and genetic characterization of these viruses have been the routine work of the Laboratory. Understanding how these viruses evolve and change over time lays the foundation for vaccine-development programmes.

The Laboratory has been conducting HIV surveillance in the country in collaboration with other partners. Data from surveillance have been used in monitoring the progress of the epidemic and changes in risk behaviour over time and have also been used effectively to mobilize and direct resources appropriately. Molecular typing of circulating HIV strains is an ongoing activity of the Laboratory which also is participating in External Quality Assurance Schemes (EQAS) of Australia and the United Kingdom for HIV serology and absolute CD4 count respectively.

For care and support, voluntary counselling and testing (VCT) units (Jagori) are available in three cities in Bangladesh. Through VCT, the services of physicians are available, and referrals are provided to more specialist physicians, clinics, and hospitals. Laboratory support, such as measurement of absolute CD4 counts using the FACSCalibur, is provided through Jagori. To better understand the risks and vulnerability to HIV of injecting drug users, a number of cohort studies have been initiated.

The Laboratory works with human influenza viruses, using serology and molecular techniques, which is very important for the preparedness to prevent possible outbreak of the highly-pathogenic avian influenza.

The Virology Laboratory has been working with different research institutions and universities at home and abroad, including United Kingdom, Belgium, Switzerland, and the USA. The researchers routinely train and supervise undergraduate and graduate students from various academic institutions.

**Clinical Laboratory Services**  
Head: M. Anowar Hossain

Clinical Laboratory Services is a multi-disciplinary laboratory comprising Clinical Haematology, Biochemistry, Microbiology, Molecular and Serodiagnostics, and Outpatient Service units in Dhaka and the Clinical Laboratory at Matlab and Chakaria. It provides diagnostic support to patient-care activities in the Dhaka Hospital, Matlab Hospital, and to ICDDR,B’s research projects. It also provides support to all paying-users, medical units of the British High Commission, US Embassy, Canadian High Commission, Japan International Cooperation Agency, Pan Pacific Sonargaon Hotel, Ontario Centre for Environmental Technology Advancement, Chevron, and Asia Energy Corporation in Bangladesh. In addition to services, the clinical laboratories are also engaged in supporting the clinical, community and field-based studies of the Centre. The scientists of this laboratory carry out research and train national and international fellows, and graduate and postgraduate students on laboratory research and diagnostic techniques.

In 2006, all laboratory units processed 164,890 specimens and 453,703 tests and assays in total. The outpatient unit handled 97,082 patients, and 52,721 were paying-users; blood samples were collected from 39,545 users. The demand for diagnostic services has steadily increased over the years due to its high-standard and quality services (Fig. 1).

![Fig. 1. Increasing demand for diagnostic services due to the sustainable quality from 1993 onward](image)

All laboratory units participated in the external quality-assessment scheme with the College of American Pathologists, Queen Elizabeth Medical Centre, Birmingham, UK, and National Serology Reference Laboratory, Australia, and each laboratory acquired an excellent score. Safe blood was made available for transfusion to patients in the Dhaka Hospital and Matlab Hospital. The cost of blood-bags, testing, and documentation was borne by the Clinical Laboratory Services. The laboratories supported 15 research protocols in 2006. Senior scientific staff contributed to 7 papers and 4 abstracts as authors and co-authors. The laboratory trained 70 national and 6 international students and fellows. An orientation was given to MPH students of the James P. Grant School of Public Health, BRAC University, and one student from the University of Sheffield, UK was mentored.

Laboratory Information and Management System (LIMS) Phase 1 software has been running smoothly for the management of specimens of paying-users, patients of the Dhaka Hospital and Staff Clinic, and research protocols. The phase 2 of the software is under development and will enable live preview of test reports from hospital wards for patient care and data management. Application of this software in the Matlab laboratory is also anticipated.

Each year, new tests and assays are adopted in the laboratories and, in 2006, HBV DNA viral load and ICT for malaria were added. A new blood gas analyzer and a water distillation plant were added as back-up and, addi-
titionally, an RNA/DNA analyzer and a chlourocounter were purchased.

**Clinical Haematology Laboratory**  
*Head: M. Anowar Hossain*

The Clinical Haematology Laboratory performs routine blood tests and assays, coagulation and haemostasis, safe blood transfusion services, detection of blood and faecal parasites. The unit performed 139,274 tests and assays on 58,356 specimens of blood, serum, plasma, stool, urine, and cerebrospinal fluid; 68% of the tests were done for paying-users. Of 5,536 blood specimens from the Dhaka Hospital of ICDDR,B, 65% were collected by finger-prick. Malarial parasites (*P. vivax* and *falciparum*) were detected from 0.86% of 1,689 cases submitted to the Laboratory; while 40.92% of 403 cases were positive from the specimens submitted by Médecins Sans Frontières, Holland, for a quality check from its field site in the Chittagong Hill Tracts. The laboratory supported 12 research protocols and trained 12 national and 6 international fellows. It collaborated with scientists of other divisions on dengue, typhoid, asthma, and encephalitis studies.

The Laboratory participated in the External Quality Assurance Scheme on routine haematology, coagulation, and parasitology and was rated ‘excellent’ by the College of American Pathologists. Scientists of the Laboratory also conducted research and disseminated findings through publications in peer-reviewed journals and other media.

**Molecular and Serodiagnostic Laboratory**  
*Head: Khairun Nessa*

The Molecular and Serodiagnostic Laboratory rendered diagnostic services for markers of infections, autoimmune diseases, and tumours that included typhoid, rheumatic fever, rheumatoid arthritis, dengue, syphilis, hepatitis, brucellosis, HIV, and breast and gastrointestinal tract cancer. The PCR technology, gel electrophoresis, and immuno-chemiluminescence are available for infectious disease markers. In total, 10,774 specimens were processed for 15,122 tests and assays; 79.48% of these were done for paying-users.

Viral load for hepatitis B was estimated in 38 cases, for hepatitis C in 130 cases, and the genotyping was done for 57 cases, with 3b as the predominant genotype. The hepatitis profile showed antibody to HAV 21.82% of 110, HBsAg 14.61% of 2,663, HCV 9.35% of 663, and HEV 45.05% of 222. Dengue was positive in 34.72% of 504 paying-patients and staff. Antibody (IgG) to *H. pylori* was positive for 88% of 125 cases. The Laboratory participated in the quality-control programme with the National Serology Reference Laboratory, Australia and scored 100%.

**Clinical Biochemistry Laboratory**  
*Head: Ashish Kumar Chowdhury*

The Clinical Biochemistry Laboratory processed blood, serum, plasma, stool, urine, cerebrospinal fluid, intravenous fluid, and ORS and performed 174,404 tests
and assays on 46,624 specimens. The overall workload increased by 4.77%, and the paying-cases constituted 68.9% of the workload with an increase of 5.92% over 2005. New tests and assays were introduced for income-generating potential and research support that included serum insulin and highly-sensitive C-reacting protein. New equipment, such as a centrifuge machine, chlouro-counter, and a top-load electronic balance were added to the Laboratory.

The Laboratory participated in the External Quality Assurance Scheme sponsored by WHO through Wolfson EQA Laboratory, Birmingham, UK. The scores indicated its performance as grade 1 standard. Scientists of the Laboratory assisted the Kidney Foundation in the development of its laboratory and imparted training to maintain a quality control in the laboratory, followed by periodical performance monitoring. The Laboratory supported 12 research protocols, participated in the orientation of 70 national fellows from the University of Dhaka and American International School, Dhaka, and trained 1 international fellow from the University of Sheffield, UK.

**Clinical Microbiology Laboratory**

**Head:** Khorshed Alam (January to September)  
M. Anowar Hossain (October to November)

The Clinical Microbiology Laboratory processed 34,456 specimens for culture, isolation, identification, and testing for antimicrobial susceptibility of various clinical samples (blood, stool, rectal swab, urine, throat swab, sputum, cerebrospinal fluid, pus, and other body-fluids). The specimens from paying-cases contributed mostly (52.23%) to the overall workload. The Laboratory continued its participation in the External Quality Assurance Scheme with the College of American Pathologists; the overall score was 99%.

Common diarrhoeal pathogens were isolated (28.21%) from 13,231 faecal samples. The isolates were 1,562 *V. cholerae* O1 (11.73%), 3 *V. cholerae* O139 (0.02%), 828 *Shigella* (6.23%), 71 *S. Typhi* and *S. Paratyphi A* (0.53%), 274 non-typhi *Salmonella* spp. (2.06%), 450 *Aeromonas* spp. (3.39%), 178 *Plesiomonas* (1.34%), and 377 *C. jejuni* (7.48%) from 5,031 faecal samples. Of the *V. cholerae* O1 isolates, 72 (45%) were El Tor Ogawa and 860 (55%) were El Tor Inaba. The changing pattern of resistant strains of *V. cholerae* O1 for 6 years is shown in Figure 2. Different species of *Shigella* showed varied levels of resistance (Fig. 3).

The overall bacterial isolation rate of positive blood culture was 12.82%, and the isolates were *S. Typhi* (6.28%, 588 of 9,896), *S. Paratyphi A* (1.43%), *S. pneumoniae* (0.53%), *H. influenzae* type b (0.11%), *N. menengitidis* (0.03%), *Shigella* spp. (0.09%), *Stenotrophomonas maltophilia* (0.30%), and *Serratia* species (0.53%). The overall resistant pattern of blood isolates of *S Typhi* increased in 2006 against ampicillin, chloramphenicol, co-trimoxazole, and nalidixic acid, while it reduced against ciprofloxacin compared to 2005 (Fig. 4), and 91.16% of the strains showed reduced susceptibility to ciprofloxacin compared to 2005 (Fig. 4), and 91.16% of the strains showed reduced susceptibility to ciprofloxacin and other fluoroquinolones. However, all strains were susceptible to third-generation cephalosporin and azithromycin. Overall, urine isolates were 25.8%, and *E. coli* was the predominant isolate (14.45%).
Matlab Clinical Laboratory
Head: Md. Golam Yeahia Khan

The Matlab Clinical Laboratory processed 11,455 clinical specimens of stool, urine, blood, cerebrospinal fluid, and other body-fluids from patients attending the Matlab Hospital, field site, and staff. In total, 17,454 tests and assays were performed, and 1,813 (16%) specimens were cultured for isolation, identification, antimicrobial susceptibility test, and dark-field microscopy. Of 1,510 stool or rectal swab specimens, 7.28% were *V. cholerae* O1, 7.41% *Shigella* spp., 9.27% *S. Typhi*, and *S. Paratyphi*. No *V. cholerae* O139 Bengal and *S. dysenteriae* type 1 were found. Of 303 other clinical specimens, 16% yielded various pathogens.

In total, 14,131 haematological, parasitological and biochemical tests and assays were performed on 9,642 specimens. The test and assays included electrolytes, renal function, and blood glucose, routine haematological tests, urinanalysis, and stool microscopy for parasites. Microscopy of 2,250 stool specimens detected *E. histolytica* (1%), *G. intestinalis* (3%), *Ankylostoma duodenale* (1.60%), *A. lumbricoides* (16%), *T. trichiura* (10%), and *S. stercolaris* (1%). The Matlab Staff Clinic provided services to 255 patients. A semi-automated biochemistry analyzer was added to improve the quality of biochemical tests and assays and has increased the scope for possible expansion of tests and assays in this area.

Chakaria Diagnostic Laboratory
Pt: M. Anowar Hussain

The Chakaria Diagnostic Laboratory has been operating in collaboration with the Public Health Sciences Division to support research protocols conducted at the field site and also provides quality diagnostic support to the local community at a low cost. In 2006, diagnostic support was obtained by 1,641 patients who provided 2,984 specimens of blood, urine, stool, etc. In total, 4,081 haematological, biochemical and serological tests and assays were performed. A built-in system and identifying or analyzing unknown specimens supplied from Dhaka laboratories are a measure of quality control, and the score was within 95%.

Safe Blood Transfusion
Pt: M. Anowar Hussain

Safe blood transfusion was made available for hospitalized patients in Dhaka and Matlab by purchasing 241 bags of blood. Blood was screened for syphilis, hepatitis B and C, HIV, and malaria. Seventy-five bags were discarded due to positive test results and 51 bags due to expiry of date after collection. Ninety blood-bags were used in the Dhaka Hospital and 25 in the Matlab Hospital of ICDDR,B. The screening cost was borne by the Clinical Laboratory Services unit. During 2000-2006, an amount of US$29,843 was spent by the Clinical Laboratory Services for this purpose.

Animal Resources Branch
Head: K.M. Nasirul Islam

In 2006, the Animal Resources Branch performed different animal experiments to support the ongoing research activities of the Centre.

The Branch bred the required number of different laboratory animals and maintained inter-institutional collaboration with the Institute of Public Health, Government of Bangladesh, BIRDEM, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh Agricultural University, University of Dhaka, Dhaka, Jahangirnagar University, Savar, American International School, Dhaka, Bangladesh Livestock Research Institute, different diagnostic centres and hospitals of Dhaka, and some leading national and multinational pharmaceutical companies in Bangladesh.

Forty-five internee doctors of the Chittagong Government Veterinary College received training from the Branch this year.

The number of research animals of different species produced, volume of blood issued, and quantity of waste materials incinerated are shown in Table 1.
LABORATORY SCIENCES DIVISION

Media and Lyophilization
Head: Qazi Shafi Ahmad

The activity of this section is divided into three units: Media preparation, Decontamination, and Lyophilization. The Section is primarily responsible for preparing bacteriological culture media, preservation of bacterial stock cultures, and decontaminating infectious laboratory wastes. The prepared culture media are supplied to different projects for research purposes and to the clinical laboratories at Dhaka and Matlab for growth, isolation, and identification of bacterial pathogens from stool, urine, blood, etc. During 2006, the Section supplied different kinds of culture plates and culture broths to 35 projects (Table 2).

This section, equipped with 5 autoclaves and a dry heat sterilizer, carries out the function of sterilizing media and decontaminating different kinds of contagious laboratory wastes generated every day in different laboratories. The wastes are disposed of according to the standard biosafety rules for the material risk level.

The bacterial stock culture unit has facilities to freeze-dry (lyophilize) bacterial cultures and other biological specimens ranging in volume from 0.2-mol ampoules to a maximum of 100-mL bottles. It preserves cultures of the representative strains isolated every year by the ICDDR,B clinical laboratories. During 2006, it supported 13 research projects and processed 5048 samples of enteric pathogens and other research specimens.

The Section also provided support to the Institute of Public Health (Government of Bangladesh), University of Dhaka, and Dhaka Shishu (Children's) Hospital by supplying media and lyophilizing bacterial strains.

Biomedical Engineering Unit
Head: A.K.M. Rahmat Ullah

The Biomedical Engineering Unit is responsible for repairing, calibrating, routine maintenance and installing analytical and biomedical equipment, and ensuring safe, smooth and reliable operation.

To fulfill the requirements of Rule 54 of the Nuclear Safety and Radiation Control (NSRC) Ordinance 1997 of the Government of Bangladesh, the head of the Unit is carrying out the responsibility of Radiation Control Officer of the Centre. The Unit is responsible for fulfilling all legal and regulatory requirements of the NSRC Ordinance with regard to radioactive material and obtaining licenses for Centre’s x-ray units and radioactive material used for research at the LSD. It maintains liaison with NSRC personnel for radiation monitoring and to fulfill all legal requirements. In 2006, the Radiation Control Officer of ICDDR,B developed guidelines for the use of radioactive materials, as well as electric and fire safety standards for the Centre.

<table>
<thead>
<tr>
<th>Item</th>
<th>No. produced</th>
<th>No./volume issued</th>
<th>Percent used</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rabbit</td>
<td>389</td>
<td>328</td>
<td>84</td>
<td>Sheep and chicken are not bred in the facility. These species are procured from local market</td>
</tr>
<tr>
<td>Guinea pig</td>
<td>353</td>
<td>286</td>
<td>81</td>
<td></td>
</tr>
<tr>
<td>Rat</td>
<td>644</td>
<td>424</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>Mice</td>
<td>7669</td>
<td>6825</td>
<td>88</td>
<td></td>
</tr>
<tr>
<td>Mice balb/C (inbred strain)</td>
<td>380</td>
<td>225</td>
<td>59</td>
<td></td>
</tr>
<tr>
<td>Sheep blood (mL)</td>
<td>-</td>
<td>39314</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Rabbit blood (mL)</td>
<td>-</td>
<td>650</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Guinea pig blood (mL)</td>
<td>-</td>
<td>180</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Chicken blood (mL)</td>
<td>-</td>
<td>60</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Incineration of waste materials (kg)</td>
<td>-</td>
<td>20,290</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Number of research animals produced, volume of blood issued, and quantity of waste materials incinerated

<table>
<thead>
<tr>
<th>Media</th>
<th>Production (litre) (n=3,665)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Culture media (solid)</td>
<td>3,062</td>
</tr>
<tr>
<td>Culture broth</td>
<td>536</td>
</tr>
<tr>
<td>Carbohydrate broth</td>
<td>51</td>
</tr>
<tr>
<td>Amino acid broth</td>
<td>16</td>
</tr>
</tbody>
</table>

Table 2. Bacteriological media produced in 2006 for use in ICDDR,B research projects and clinical laboratories
The Unit also maintains other control systems to ensure safety of the laboratories, maintains a weather station, and repairs audio-video equipment and other electronic appliances of the Centre, including hospital equipment. It undertook an inventory of equipment and updated the asset list of the Centre.

The Unit has been maintaining approximately 1,400 pieces of equipment and ensuring their safe, smooth and reliable operation.

**Ongoing Protocols of LSD**

Alam A. comparison of two methods (enhanced syndromic management and periodic presumptive treatment) of systematic prevention and control of STIs among hotel-based female sex workers in Dhaka, Bangladesh
Funded by: Family Health International (FHI), Bangladesh

Alam M. Relative efficacy of two regimens of anti-helminthic treatment to reduce soil-transmitted helminthic infections among selected urban poor pre-school children in Mirpur, Dhaka, Bangladesh
Funded by: National Institutes of Health (NIH), USA

Alam S. Neem oil and insecticide-treated bednet to control visceral leishmaniasis in an endemic area of Bangladesh
Funded by: USAID/Dhaka

Azim T. Enhancing access of female injecting drug users in Dhaka to HIV intervention programmes
Funded by: DFID/Dhaka

Azim T. IDU cohort study in Dhaka, Phase II: Determination of risk factors for HIV and hepatitis C and enhancing interventions
Funded by: AusAID

Azim T. Piloting of respondent-driven sampling for integrated and surveillance among males who have sex with males (MSM) in Dhaka
Funded by: Government of Bangladesh, DFID-UK, and International Development Agency (IDA), Bangladesh

Azim T. A prospective study on the HIV risk behaviour and incidence of HIV and hepatitis C in a cohort of injecting drug users in Chandpur
Funded by: DFID-Bangladesh

Azim T. A study on the risk behaviour and disease progression in a cohort of HIV-positive injecting drug users
Funded by: DFID-Bangladesh

Banu S. Initiative for diagnostic and epidemiological assays for leprosy
Funded by: London School of Hygiene & Tropical Medicine (LSHTM), UK

Banu S. Pulmonary tuberculosis among inmates of the largest prison in Bangladesh: magnitude of problem, multi-drug resistance, and transmission
Funded by: Government of Bangladesh

Banu S. Towards an immunodiagnostic kit for leprosy
Funded by: World Health Organization- Special Programme for Research and Training in Tropical Diseases (WHO-TDR), Geneva

Faruque SM. Analysis and genetic modification of *Vibrio cholerae* strains carrying atypical combination of virulence genes and phenotypes to develop potential vaccine candidates
Funded by: Gates and Government of Bangladesh Award

Faruque SM. Characterization of environmental and clinical strains of toxigenic and non-toxigenic *Vibrio cholerae* as an aid to predict the emergence of new epidemic strains
Funded by: USAID/W

Faruque SM. Genetic variants of *Vibrio cholerae* O139 and development of a vaccine against O139 cholera
Funded by: Swedish International Development Agency (Sida)/SAREC, Sweden

Faruque SM. Phage and genomic variation in *Vibrio cholerae* evolution
Funded by: Harvard Medical School, USA (NIH)
Haque R. Antimalarial drug resistance in Bangladesh
Funded by: US Army Medical Component-Armed Forces Research Institute of Medical Sciences (USAMC-AFRIMS), Thailand

Haque R. Azithromycin combination therapy for the treatment of uncomplicated falciparum malaria in Bangladesh: an open label, randomized controlled trial
Funded by: United Nation Children's Fund (UNICEF)

Haque R. Community-based epidemiologic study of visceral leishmaniasis in Bangladesh
Funded by: Centers for Disease Control and Prevention (CDC), USA

Haque R. Field studies of human immunity to amoebiasis in Bangladesh
Funded by: NIH, USA

Haque R. Gamma delta T cells and the innate immune response to cryptosporidiosis
Funded by: University of Vermont, USA

Haque R. Mechanism of acquired immunity to *E. histolytica*-associated infection and disease in Bangladeshi children
Funded by: University of Virginia, USA

Haque R. New diagnostics for amoebiasis
Funded by: TechLab/NIH, USA

Haque R. New rapid diagnostics for amoebiasis
Funded by: NIH, USA

Haque R. PCR-based micro-titre plate-hybridization technique for the identification for malaria parasite-associated infections in *Anopheles* mosquitoes
Funded by: Government of Japan

Haque R. Validation of diagnostic tests of some category B enteric pathogens and correlation of some protozoal genotype with virulence
Funded by: University of Virginia, USA

Islam S. Cholera risk management in Mozambique and Bangladesh, Phase I
Funded by: Northumbria University, UK

Mitra DK. Epidemiology of human papillomavirus-associated infection among females in Bangladesh
Funded by: Improved Health for the Poor, Government of Bangladesh under RTI/STI activity in Bangladesh

Mondal D. Development of implementation strategies for visceral leishmaniasis treatment in Bangladesh–visceral leishmaniasis-related knowledge, attitude, and practices in the community and healthcare providers
Funded by: WHO-TDR, Switzerland

Munira S. Molecular and biochemical analysis of intestinal microflora in severely-malnourished children with cholera treatment with oral rehydration solution with and without amylase-resistant starch
Funded by: Nestlé Foundation, Switzerland

Nahar S. Genetic diversity of *Helicobacter pylori* in colonization and infection: role in disease outcome (symptomatic and asymptomatic) and transmission.
Funded by: Sida/SAREC, Sweden

Qadri F. Immunomodulating effect of a probiotic *Bifidobacterium breve*, on the immunogenicity of the oral, whole-cell killed cholera vaccine in Bangladeshi children
Funded by: Yakult Bio-Science Foundation, Japan

Qadri F., Larson CP. Immunological and clinical responses to zinc: a randomized, double-blind trial of zinc treatment vs zinc treatment plus daily supplementation for 3 months among children under 2 years of age with an acute diarrhoeal illness
Funded by: Bill and Melinda Gates Foundation, USA

Qadri F. Studies of mucosal and systemic immune responses in *Helicobacter pylori*-infected subjects
Funded by: Sida/SAREC, Sweden

Qadri F. Pathogenesis of enterotoxigenic *Bacteroides fragilis*-associated infection
Funded by: NIH, USA

Qadri F., Faruque ASG. Protective immunity to human cholera in Bangladesh
Funded by: NIH-USA and International Collaboration in Infectious Disease Research (ICIDR), USA

Qadri F. Studies to enhance and improve immunogenicity of cholera and enterotoxigenic *E. coli* vaccines
Funded by: Sida/SAREC, Sweden

Qadri F. Studies to evaluate vaccines against watery diarrhoea suitable for use in Bangladesh: Part I. Studies to facilitate ETEC vaccine efficacy trials. Part II. Cholera and ETEC vaccine studies
Funded by: Sida, Sweden

Qadri F. Mucosal immune response to oral cholera vaccine Peru 15
Funded by: NIH, USA

Raqib R. Evaluation of the ALS (antibodies in lymphocyte secretions) method for diagnosis of tuberculosis in children
Funded by: Third World Academy of Science (TWAS), Italy

Raqib R. Therapeutic induction of endogenous antibiotics for improved recovery in shigellosis
Funded by: Sida/SAREC, Sweden

Raqib R. The multi-centre pre-evaluation study of the logistic feasibility of using the Step 1 LAMP assay to detect pulmonary tuberculosis in symptomatic adults
Funded by: FIND Diagnostics, USA

Raqib R. Validation of the ALS assay for diagnosis of active tuberculosis and setting up of the tuberculosis specimen bank
Funded by: USAID/Washington

Wahed MA. The efficacy of vitamin A-rich small fish in improving vitamin A status in children in Bangladesh
Funded by: Thrasher Research Fund, USA
Matlab HRC

Child Health Unit
  + Child Health Programme

Reproductive Health Unit
  + Reproductive Health Programme

Health and Demographic Surveillance Unit
  + Population Programme

Social and Behavioural Sciences Unit
  + Poverty and Health Programme

Surveillance projects for special studies of cholera, rotavirus, and other diarrhoeal diseases in rural Bangladesh
What does the Division do?

The Public Health Sciences Division (PHSD) focuses on developing and evaluating population-based interventions designed to address the major health problems faced by low-resource countries. In so doing, it addresses the Millennium Development Goals of reducing child mortality, improving maternal health, and controlling HIV/AIDS, malaria, and other infectious diseases, while taking issues of social equity and gender equality into account.

More specifically, the Division provides the infrastructure to test vaccines, determine drug resistance in disease-causing organisms, and explore the causes, distribution, means of prevention and treatment, and consequences of specific problems, such as low birth-weight, maternal morbidity, and arsenic contamination. It also conducts surveillance to identify and monitor illnesses, such as cholera and tuberculosis, and to follow the trends in fertility, population growth, urbanization, and migration. Integral to these efforts, the work of the social and behavioural scientists in the Division is to increase understanding of recognition and response of individuals to illnesses, their care-seeking patterns, and social equity in the use of health interventions and their provision.

Generally, the Division seeks to identify what ensures health and what generates disease in communities, especially in the vulnerable or disadvantaged groups. It searches for simple, cost-effective approaches that could be widely applied to increase health levels equitably.

How are we organized?

The Division is divided into 5 units: Child Health, Health and Demographic Surveillance, Reproductive Health, Social and Behavioural Sciences, Matlab Health Research Centre, and one special project named Surveillance Projects for Special Studies of Cholera, Rotavirus and Other Diarrhoeal Diseases in Rural Bangladesh (previously known as ECPU). The Division also houses 4 theme-based Centre-wide research programmes: Child Health, Reproductive Health, Population Sciences, and Poverty and Health.

The research efforts of the units and programmes are spread among several sites throughout Bangladesh; most notable are those in rural Matlab (Chandpur district), Mirzapur (Tangail district), and Chakaria (Cox’s Bazar district). Training is also a focus of the Division. The International Training Centre at Matlab provides facilities for local, regional, and international training courses, while the training centre at Chakaria mostly caters to local needs.

With 51 ongoing protocols, the Division continues to expand. Its scientific staff currently consists of public-health professionals, epidemiologists, social scientists, demographers, anthropologists, and health economists. In 2006, more than 1,158 staff members worked on long- and short-term contracts, 9 of them at an international level.

Dr. Heidi Johnston, a Social Scientist, and Dr. Allisyn C. Moran, Scientist, are two new international staff members who joined the Division in 2006. Dr. Mahbub Elahi Chowdhury, Associate Scientist, took over the charge of Acting Head of the Reproductive Health Unit in December 2006.

Staff development

In 2006, Dr. Dewan S. Alam completed his post-doctoral programme from Cornell University, USA, and returned at the end of March 2006. During the period, he worked with Professor Kathleen Rasmussen and was mainly involved in data analysis and paper writing using data from the MINIMat study.

Mr. Ashraful Alam obtained a PhD in Anthropology from Australian National University, Canberra, Austra-
Matlab Health Research Centre
Head: Md. Yunus

The Matlab Health Research Centre (MHRC) is the oldest and the largest population-based field site of ICDDR,B. The MHRC consists of the following three research branches:

- Clinical Research Branch—which provides clinical services and research facilities;
- Community Health Research Branch—which offers reproductive and child health services within communities and helps implement community-based research and interventions; and
- Health and Demographic Surveillance System (HDSS)—which covers a population of about 225,000 and provides data necessary to plan, conduct, and evaluate various types of public-health research.

The MHRC has a training facility, which operates with international standards and also has an administrative and logistics support services branch, which facilitates efforts to conduct research and training, and provide services.

The Matlab site is a unique research and training facility targeting public-health issues relevant to developing countries like Bangladesh. At Matlab, clinical, epidemiological, nutritional, and environmental health research are linked to health services that the MHRC provides to the study population. In this way, the MHRC addresses a wide range of health problems, including diarrhoea, acute respiratory infections, malnutrition, illness caused by arsenic-contaminated drinking-water, and reproductive-health problems. It also addresses issues of basic maternity and newborn care.

Lessons learnt from research in Matlab over the past 3 decades have contributed significantly to the policy and policy-related actions of international agencies and the governments of developing countries, including Bangladesh. The research structure of the MHRC includes a team of well-trained and committed village-based community health research workers, 4 sub-centre clinics (each serving around 28,000 people and run by paramedical staff), and a primary-care hospital that has basic laboratory facilities and deals with diarrhoea, acute respiratory infections, malnutrition, and other child- and reproductive-health problems, including maternity care.

Number of patients treated

Over the past year, 10,466 patients with diarrhoea were treated at the Matlab Hospital. Of them, 15% had to be admitted. The overall case-fatality rate for this group was low (0.12%). Thirty percent of the diarrhoea patients came from the Matlab Health and Demographic Surveillance System (HDSS) area. A further 1,756 patients were treated for diarrhoea at 3 community-based treatment centres administered primarily by local community initiatives with support and supervision from the MHRC.

In 2006, another 15,135 patients (7,947 women of childbearing age and 7,188 children aged below 5 years from the ICDDR,B service area were treated at the Matlab MCH-FP (Maternal and Child Health and Family Planning) clinic: 85% as outpatients and 15% as inpatients. Of 750 inpatients in labour, 667 (89%) delivered at the Matlab facility, and 83 (11%) were referred to the Chandpur District Hospital, as were another 55 women from outpatient clinics whose deliveries showed signs of complications.

In total, 1,218 children aged under 5 years were admitted as inpatients during the year, 942 (77%) of whom were treated for acute lower respiratory tract infections. The case-fatality rate among this group was 0.32%.

During 2006, the MHRC's four sub-centre clinics in Matlab also treated 27,861 patients for various conditions. This group consisted of women of childbearing age, children aged under 5 years, and adult males from the ICDDR,B's intervention area. The treatments given ranged from antenatal and postnatal care to treatments for sexual health problems in the case of some men. The sub-centre clinics also handled 533 deliveries in 2006.

The village-based community health research workers (CHRWs) of the MHRC also treated 38,061 women of childbearing age and children aged below 5 years for common complaints, such as fever, cold, pneumonia, skin diseases, and worm infestations. These services were provided from 56 fixed-site clinics run by the CHRWs once a week in the ICDDR,B service area.

Monitoring for cholera and Shigella species

Culturing stool specimens from 1,323 patients drawn from the HDSS area identified Vibrio cholerae O1 (5.5% of cases) and Shigella species (8%). Shigella flexneri was most common (71%). No V. cholerae O139 or S. dysenteriae type 1 were found.

Training and seminars

The International Training Centre at Matlab hosted several local and international training courses and seminars in 2006. In addition, 218 national and international visitors visited the Matlab facilities and its ongoing research activities.

With support from the Government of Bangladesh (Improved Health for the Poor) and in collaboration with the Training and Education Unit of ICDDR,B, NIPORT, and the Directorate General of Family Planning, Government of Bangladesh, the MHRC conducted two 5-day workshops in 2006 on reproductive health for mid- and senior-level family-planning managers, researchers, and trainers from government family-planning programmes, and other training institutions.
These workshops (a) familiarized the participants with outcomes of interventions gained from the experiences of ICDDR,B’s Matlab Maternal, Child Health and Family Planning Project and MCH-FP Extension Project; (b) acquainted the participants with operations research activities into the process of policy formulation in the field of population and reproductive health; and (c) developed an understanding of the recent issues of population and development, health, poverty and equity, violence against women, gender issues in health and population service and management, determinants of fertility, adolescent health and HIV/AIDS situation, HNPSF field services, and logistics management.

In total, 29 participants from district and upazila family planning programmes, Directorate General of Family Planning, and NIPORT attended these workshops. The speakers were selected from scientists of relevant ICDDR,B programmes and concerned directors from the government directorates, and NIPORT. The workshops are expected to have positive impact in programme management and planning.

**Results from completed studies**

**Pattern of gestational weight gain and birth-weight**

Gestational weight gain (GWG) is a well-established important determinant of birth-weight. Data on GWG were collected from 904 women who participated in Maternal and Infant Nutrition Intervention at Matlab (MINIMat), a food and micronutrient-supplementation study during pregnancy and delivered in clinics for immediate determination of birth-weight. The findings suggest that in circumstances in which total weight gain was relatively low, adequate GWG after 30-week gestational age was not only associated with an increase in birth-weight but also with a substantial reduction in low birth-weight, and intervention for GWG could be prioritized accordingly in situations with resource constraint. More about the studies are reported in the chapter on Reproductive Health Programme.

**Exposure to under-nutrition during prenatal life and impaired glucose tolerance in early adulthood**

Epidemiological studies in human subjects and experimental studies in animals suggest that under-nutrition during foetal life is associated with permanent changes in structure, physiology, and metabolism. Association between prenatal exposure to under-nutrition and glucose and lipid metabolism in young adults was examined in rural Matlab, Bangladesh. Exposure to the Bangladesh famine 1974-1975 during the foetal life was used as a proxy for prenatal under-nutrition. Adults aged 27-31 years in rural Matlab either exposed (n=68) or non-exposed, born before (n=81) and after (n=70) the famine with comparable sex distributions were randomly selected from the Health and Demographic Surveillance System database. Plasma-glucose concentrations were measured after overnight fast and 2 hours after 75-g glucose challenge. Lipids were measured on a fasting blood sample. Preliminary analysis showed no significant difference in fasting plasma-glucose concentration and that after two hours of the challenge however, the prevalence of impaired glucose tolerance (IGT) was 3 times higher in exposed than the both non-exposed groups (IGT: 11.8% vs 3.7/4.3%; p<0.03). Neither of the parameters of lipid profile nor the prevalence of lipid abnormality differed significantly. These findings suggest that exposure to under-nutrition during foetal life is associated with abnormal glucose metabolism and elevated risk of impaired glucose tolerance, which have implications for future development of type 2 diabetes.

**Arsenic and health**

Over 100 million people in the world are chronically exposed to inorganic arsenic (InAs), a class-one human carcinogen. The number is increasing with elevated arsenic concentrations in groundwater used for drinking purposes. The arsenic and health studies at ICDDR,B include screening the entire 225,000 population of Matlab for arsenic-induced skin lesions, measuring arsenic contamination in all 13,286 tubewells in the area, and initiating mitigation activities.

**Major accomplishments by the project in 2002-2005**

The Project, “Arsenic in tubewell water and health consequences” in Matlab was initiated in 2001 and the field work had been completed in 2003. Field work included screening of 220,000 people for arsenic-induced skin lesions and measuring arsenic contamination in 15,000 tubewells, and initiating mitigation activities in the entire area. An arsenic database has been added to the Matlab Health and Demographic Surveillance System, including geographical coordinates, age, depth, and arsenic concentrations in the water of all tubewells. In the database, information is also included about skin lesions in individuals and their water consumption pattern over the years. The competence of field workers, study physicians, laboratory staff, mitigation team, etc. has been systematically built, and new equipment at ICDDR,B laboratories have been procured. A strong link with Sweden has been established to strengthen the capability of managing all phases of the arsenic project. A collaborative team has been formed comprising personnel of ICDDR,B, BRAC, Division of Metals and Health, Karolinska Institute, and International Maternal and Child Health Department, Uppsala University in Sweden.

- Arsenic concentrations range from <1 to 3,644 µg/L, one of the highest ever reported in Bangladesh. More than 70% of tubewells in Matlab exceed the WHO guideline of 10 µg/L, and about 63% exceed the Bangladesh limit of 50 µg/L.
- Assessment of the intensive longitudinal exposure provided evidence of a dose-response relationship of arsenic in tubewell water with arsenic-induced skin lesions in Bangladesh. Men were more affected than women.
- There is substantive evidence that arsenic is an important predictor for early neonatal and infant deaths.
- Water containing more than 50 µg/L of arsenic has detrimental effect on child development.
• There was modest increase in excess cardiovascular and cancer deaths relating to exposure to arsenic in tubewell water.

**Follow-up survey on water-use habits**

The project activities included: (a) involvement of community members in choosing, implementing, and maintaining alternative sources for safe drinking-water, (b) determination of the viability and effectiveness of different mitigation options and assessment of their relative acceptance by villagers; (c) making the community aware of arsenic poisoning. All provided options were revisited during 2004–2005 to assess their performance and their preference by users, through questionnaire interview. Information regarding sharing of existing green-marked tubewells and the present coverage of safe water options was also collected using the same questionnaire. Furthermore, knowledge and perceptions regarding arsenic exposure were also determined.

The preliminary analysis revealed that nearly 95% of respondents participated in the drinking-water survey interview. The interview was based on structured questionnaire which were used for collecting information on current drinking-water sources. If people were using mitigation options, information on their cost, willingness to pay the cost, and perceptions regarding different mitigation options was collected. The majority (82%) of the respondents were female, and the mean age of the respondents was 41 years. About 90% of the respondents were currently using tubewell water, and of them, 82.5% were using it for drinking purposes only and 17.5% for both drinking and cooking purposes. Collection of water from green-marked tubewells was considered to be a preferred option for drinking-water by the rural population. About 33% of households were still using red tubewells. Non-availability of green tubewells in nearby area and their distance were the two major reasons for using red tubewells. It was observed that local drillers (masons) started motivating relatively well-off villagers to re-sink their existing tubewells or to install new wells within a depth range of 50-100 m to get arsenic-free water which is easier and less expensive than installing deep tubewells or any other options.

**Seasonal variation or time trend**

Arsenic contamination in groundwater is increasing rapidly. Evidence suggests that arsenic may be present in groundwater in Bangladesh throughout the region defined as Deltaic Plain. Little attention has been paid regarding the potential variation in concentrations of arsenic in well-water over time. This is important in terms of investigations of health effects, especially when we measure health and retrospective exposure. The overall aim was to monitor the change in arsenic concentration during the different seasons in a 4-year period from 2002 to 2005 in selected tubewells in the arsenic-affected area in Matlab (Fig. 1).

![Fig. 1. Seasonal variation of water samples collected from Matlab during 2002-2005](image)

As a part of the earlier study, conducted during 2001-2003, arsenic concentration has been measured in a sub-sample of 600 randomly-selected tubewells from the Matlab area.

**Variations in different storage pattern of water**

In certain circumstances, e.g. when arsenic-contaminated water is stored in a ‘kolshi/pitcher’ or a bucket, its arsenic concentration has been observed to reduce significantly. In such situations, the arsenic concentration in water is reduced through the process of passive sedimentation that settles and removes suspended particles (arsenic flocculates in this case) when water remains stand-still. Flocculation is the agglomeration of suspended and colloidal (size range: 5.10^-6 - 2.10^-4 mm) matter in water. The flocks have a mass density (specific weight) higher than that of water and, thus, settle to the bottom of the container. This component has been done through ethnographic approach and follow-up survey.

Only a few percentages of respondents were storing tubewell water before drinking (Table 1).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Before storage</th>
<th>After storage</th>
</tr>
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<tbody>
<tr>
<td>Number</td>
<td>118</td>
<td>118</td>
</tr>
<tr>
<td>Mean</td>
<td>190.5</td>
<td>130.5</td>
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<tr>
<td>Median</td>
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<td>110.5</td>
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<tr>
<td>Standard deviation</td>
<td>176.5</td>
<td>124.2</td>
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<tr>
<td>25th percentile</td>
<td>23.8</td>
<td>8.8</td>
</tr>
<tr>
<td>75th percentile</td>
<td>327.3</td>
<td>219.0</td>
</tr>
</tbody>
</table>

Table 1. Distribution of arsenic concentration before and after storing
Exposure to arsenic through rice and vegetables

Rice comprises three-quarters of Bangladesh’s energy intake. Arsenic contamination of rice by irrigation using water from an arsenic-containing aquifer would, therefore, can significantly contribute to the total exposure of the individual. In the Matlab area, and maybe also in other parts of Bangladesh, rice is usually cooked with surface water. All samples, mainly vegetables, were randomly collected from the field site. The samples were kept in an ICDDR,B laboratory in Dhaka where analysis using atomic absorption spectrophotometry was performed. The results were presented in Table 2.

Table 2. Distribution of arsenic concentrations in different vegetables before and after cooking

<table>
<thead>
<tr>
<th>Item</th>
<th>Number</th>
<th>Raw (µg/kg)</th>
<th>Mean</th>
<th>SD</th>
<th>Cooked (µg/kg)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Range</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amaranth</td>
<td>8</td>
<td>18-26</td>
<td>22.8</td>
<td>3.7</td>
<td>72-309</td>
<td>145.6</td>
<td>141.3</td>
</tr>
<tr>
<td>Arum</td>
<td>9</td>
<td>6-7</td>
<td>7.03</td>
<td>0.07</td>
<td>49-236</td>
<td>121.5</td>
<td>100.4</td>
</tr>
<tr>
<td>Banana</td>
<td>4</td>
<td>4-7</td>
<td>5.3</td>
<td>1.6</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Corolla</td>
<td>4</td>
<td>1-6</td>
<td>3.1</td>
<td>2.6</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Data</td>
<td>4</td>
<td>0.5-3</td>
<td>1.3</td>
<td>1.1</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Egg Plant</td>
<td>4</td>
<td>3-9</td>
<td>7.0</td>
<td>3.0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Potato</td>
<td>4</td>
<td>4-6</td>
<td>5.4</td>
<td>0.4</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Rice</td>
<td>8</td>
<td>219-253</td>
<td>240.8</td>
<td>18.6</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Spinach</td>
<td>8</td>
<td>14-16</td>
<td>15.3</td>
<td>0.6</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

SD=Standard deviation

Reversibility of skin lesions

In total, 504 individuals with arsenic-induced skin lesions identified in the project during 2001-2003 were invited for a repeated clinical examination at the ICDDR,B sub-centres in Matlab. The study physicians carefully re-examined all the individuals with skin lesions and took repeated photographs of the skin lesion by a digital camera under standardized conditions to be used for assessment of any positive improvement in the lesions. Two experienced dermatologists participated in late 2006 in the assessment of change. In total, 449 confirmed arsenic-induced skin lesion cases were examined for the assessment of skin reversibility, which revealed that 10% positive change occurred for palm keratosis, whereas 72% positive change has been seen for sole keratosis; however, >90% positive changes have been observed for melansosis and lecuacomelanosis.

Arsenic exposure and chronic lung disease

A study titled “Epidemiology and surveillance of tuberculosis (TB)” identified individuals aged less than 15 years with chronic cough. Five hundred recent cases with history of cough of less than 3 weeks were randomly selected from the TB surveillance study, and another 500 age- and sex-matched referents also selected from the TB surveillance study were included in this sub-study. The study physician clinically examined them in a clinic with emphasis on respiratory (crepitations, peak expiratory flow) and nutritional status (height, weight). Smoking habits were also assessed using a questionnaire. Exposure information about cases and controls was based on measurements of current arsenic concentration in tubewells and interviews on time periods of the use of current and previous drinking-water sources from the AsMat survey 2002-2003. Additional information was obtained from interviews. In total, 467 cases and controls participated, and the sex ratio was 2:3 (male vs female).

Health and Demographic Surveillance Unit

Head: P.K. Streatfield

In 2006, the Health and Demographic Surveillance Unit (HDSU) made considerable progress towards increasing efficiency in data-collection practices and improving the timeliness for the availability of, and access to, demographic surveillance data. In addition, the recent Socio-economic Census (conducted in 2005) was reported.

CHRW’s visitation cycle and special modules

A major change to the CHRW’s visitation cycle was proposed that would reduce the frequency of visits to each household, from once a month to once every two months. It is anticipated that this change will not compromise the reliability and accuracy of surveillance data. The reduction in household-visits required fewer CHRWs and a restructuring of their work schedule.

There were 61 CHRWs in the ICDDR,B area to provide MCH-FP services and to collect HDSS data. Responsibilities of these CHRWs were re-distributed so that 19 collect HDSS data for the ICDDR,B area. In the government area, the number of CHRWs reduced from 30 to 19. The working units of these CHRWs were reorganized, and their field census volumes were also redefined. The mini
record-keeping book (RKB) was redesigned with no provision for collecting child morbidity data. The CHRWs will visit each household once every two months, collect HDSS data, and update the mini RKB. Methodology for the collection of child morbidity data (ARI and diarrhoea) was developed, questionnaire pre-tested using Personal Digital Assistant (PDA) and matched these data with the database and reports generated. A 5-member team of CHRWs will collect child morbidity data twice a year (in the first two of the four 3-monthly rounds, and the other two rounds will be allocated for collecting data on special modules (poverty/food security and education). Adding such modules in the workbook would enhance the value of surveillance data.

Streamlining of HDSS data-flow

Through a very brief assessment of the data-collection and data-entry practices, some duplication of activity was found between the data-processing office in Matlab and in Dhaka. To speed up the flow of HDSS data and to ensure publication of HDSS annual reports on time, some tasks were re-allocated to remove the redundant activities.

HDSS database migration

In 1996, Database Management System (DBMS) transferred to Oracle relational database (Version 7.3) under Sun Solaris Unix (Version 4.5) operating system. In 2006, the HDSS management decided to upgrade Oracle from 7.3 to 10-G and the operating system from Sun Solaris to Linux server. The software used for front-end applications was also enhanced from Developer 2000 (version 4.5) to 10-G. This was done to upgrade the system and to reduce cost of the DBMS. Assessments were carried out to ensure reliability and functionality of the new system. Database migration was completed, and application conversion is in progress.

Improving access to data

Access to information on demographic events in the current database has been improved. A long-term workbook, developed in Excel, houses all demographic events indexed by area (ICDDR,B area and government services area), year, sex, and age-group. This format provides a user-friendly data-management tool to facilitate inquiry (hence research) of the Matlab HDSS data. Plans are underway to allow to access the workbook through the Centre’s website. The launching of this is expected to occur at the time of the 40th Anniversary of HDSS celebration in March 2007.

A second workbook is currently being developed to house data relating to mortality. This workbook will accommodate data for all deaths from specific causes and appropriately combined causes, and indexed by area, year, sex, and age. In addition to facilitating inquiry into causes of death by any or all of the above dimensions, the mortality workbook may also be used for undertaking research on the burden of diseases.

Both the workbooks have been constructed to hold data to 2020, thereby providing an excellent tool for monitoring progress in Matlab towards MDG 4 and 5. An additional feature of the workbook is the applicability of the structure and function to similar other data collections, such as data from other surveillance sites of the Centre.

**Historical data (1974 to 1982)**

Considerable progress has been made with regard to the transfer of historical demographic surveillance records (1974 to 1982), from flat files to a relational database. The database to house the historical records has been created, and all 1974 Census records have been distributed among the appropriate tables. The (historical) database mimics the current database in structure and function, thereby facilitating similar methodology for data extraction.

Computer programs have been written and tested for uploading the remaining demographic event records (approximately 250,000). A pilot run of the uploading program, covering 4 of the 6 events, indicated a low error rate (around 5%). Allowing for processing time and error-checking for all events, data-loading should be completed by the end of August 2007.

**Renovation of Matlab computer room**

The computer room has been renovated to accommodate 16 Data Entry Technicians (DETs) and 3 Programmers and one modern server. This room is equipped with new furniture, the latest-model server (with more secured Redhat Linux operating system and an Oracle 10-G database platform). Currently at Matlab, there are about 15 projects that are linked with the HDSS database.

**Data archiving**

In 2006, the HDSS data and data for special studies in Matlab were archived. The development of a unified data policy is in progress so that researchers can request and use the Matlab data in a consistent manner.

Work has also begun to improve the current data-archiving system using the Australian Social Science Data Archive (ASSDA) system.

The system will encompass the PHSD data archive and subsequently can be extended for a Centre-wide data archive. The system will be accessible and comprehensive, allowing researchers to locate, request, retrieve, and use data resources efficiently.

**Geographic information system**

The geographic information system (GIS) collected data on location of new *baris* in the Matlab HDSS area. These data were added to the Master Geo-database. Spatial data on cholera patients in sub-districts of Mathbaria and Bakerganj were also collected and mapped.

Quick Bird Satellite images of the Matlab HDSS area have been composed with the vector data (i.e. village boundaries, hospital, and sub-centre) to improve the relevance.
of the system. Images have been printed and posted in the Health and Demographic Surveillance Unit (Dhaka and Matlab) offices for interested researchers.

**Unit-level Retreat**

The HDSSU Retreat took place on 20 December 2006 in the ICDDR,B Guest House in Gulshan, Dhaka. The major resolutions arising from the retreat were to undertake more research activities, alongside the routine HDSS to improve the reliability and timeliness of surveillance reports, and to develop more robust coordination between the Dhaka and Matlab activities.

**Celebration of the 40th Anniversary of Matlab-HDSS**

The year 2006 marked the 40th anniversary of Matlab HDSS, and the anniversary celebration will be held on 7-8 March 2007, following the 11th Annual Scientific Conference. Twelve international guests are expected to attend the celebration. Dr. James Phillips will be the keynote speaker and Prof. Henry Mosley, Prof.. Stan Becker, and Prof. Terry Hull, among others, will give speeches to mark the occasion.

**Social and Behavioural Sciences Unit**

Head: Abbas Bhuiya

The Social and Behavioural Sciences Unit (SBSU) works towards bringing social, cultural and behavioural perspectives to health by way of understanding the social, cultural and behavioural determinants of health. The Unit has also been supporting and strengthening social and behavioural science research in ICDDR,B. It hosts the secretariats of the Poverty and Health Programme of ICDDR,B and the Bangladesh Health Equity Watch. Both provide active support to research, capacity-building, and dissemination activities relating to issues of health, poverty, and equity. However, the Unit aims at providing support to ongoing and new research and capacity-building activities within and beyond these themes. Some of the activities being supported explore a range of topics, including pro-poor monitoring of health systems, violence against women, self-help for health, and socialization and sexuality constructions of Hijra (transgender) to name a few.

**Poverty and Health Programme**

The Social and Behavioural Sciences Unit is the base of the Poverty and Health Programme. The programme carries out various research, capacity-building, and dissemination activities that fall within its theme, including round-table seminars, skill-building seminars, training courses, and workshops.

Activities of the Programme are reported in the chapter on Poverty and Health.

**Bangladesh Health Equity Watch (BHEW)**

Bangladesh Health Equity Watch (BHEW) is a collaborative effort of ICDDR,B, Bangladesh Bureau of Statistics (BBS), Bangladesh Institute of Development Studies (BIDS), and BRAC. BHEW has contributed to the development of a course on ‘Equity in Health Systems’ in collaboration with the Global Equity Gauge Alliance (GEGA), based in South Africa and other South Asian equity gauges. All modules of the course have been finalized, and a condensed pilot course has been prepared. The pilot course was held in Colombo, Sri Lanka from 4 to 9 December 2006.

In the recent past, the BHEW partners facilitated a process to form a new civil society initiative called Bangladesh Health Watch (BHW), which was formally launched on 17 April 2006. BHW’s objective is to compile information on the state of affairs in the health sector in the country and its performance in improving the health of population in general and of poor in particular. Success and failures in the health systems and policies will be identified, and dialogues for changes will be organized. While BHEW will continue to generate and compile evidence, BHW will use the information in generating discussions for policy and programmatic change. On 26 December 2006, Nobel Laureate Professor Amartya Sen launched BHW’s first publication titled “State of Health in Bangladesh 2006: Challenges of Achieving Equity in Health.”

**Violence against women and the risk of under-five mortality: A community-based study in rural Bangladesh**

It is well-documented that violence against women has harmful effects on women’s mental, physical and reproductive health. Studies also show that life-time experience of domestic violence is an important risk factor for under-five mortality. Against this background, this study was carried out to assess if different forms of violence against women were associated with increased mortality risks of their daughters and sons before the age of five. Secondary analysis was done on longitudinal data from rural Bangladesh of 2,691 liveborn children in relation to their mother’s experience of physical, sexual and emotional violence from partner and the level of controlling behaviour in marriage. Analyses were adjusted for potential confounders and stratified for gender. Results show that under-five mortality was 88 per thousand in this cohort. Overall, there was no association between different forms of violence against women and under-five mortality. Further analysis stratified by the education of mothers show that more-educated women had an increased risk of under-five deaths of their female offspring if ever exposed to severe physical violence (adjusted HR 2.1) or to a high level of controlling behaviour in marriage (adjusted HR 2.5). These associations were not shown for boys. Both severe physical violence and controlling behaviour in marriage were associated with higher under-five mortality among daughters of educated mothers, indicating gender-biased consequences of violence against partners for child mortality.

**Chakaria Field Site**

The ICDDR,B field site in Chakaria has been testing a community-initiated primary healthcare model in the area since 1994. Chakaria is a remote rural upazila in Cox’s Bazar district in the southeastern coastal area of Bangladesh. The population of Chakaria is vulnerable to...
natural disasters and is a low performing group in terms of health indicators. The following are some of the activities of the field site:

**Health and Demographic Surveillance System (HDSS)**

The HDSS in Chakaria collects data on a quarterly basis from 1999. So far, data have been collected on household and population characteristics, health and health practices including family planning, fertility, mortality and safe motherhood practices, with a focus on the poor and the vulnerable.

**Village Health Posts**

Seven Village Health Posts (VHPs) have been established by the villagers in six unions of Chakaria. The VHPs are run by an MBBS doctor who provides primary healthcare to the community. The salary of the doctor is provided by the villagers.

**Voucher System**

A pre-paid voucher system has been introduced since January 2006 by the Chakaria Community Health Project to enhance the use of safe maternal health services to poor pregnant women. Since the introduction of this system to women in the bottom 40% of the asset quintiles, the use of antenatal care, postnatal care, and delivery assistance from the Skilled Birth Attendants (SBAs) has been increasing.

**Poverty and Health Knowledge Project**

The DFID-supported poverty and health project—Building the Knowledge Base for Attaining Equitable Health in Poor Countries—is a major activity coordinated by the Poverty and Health programme which ended in December 2006. This project worked to identify cost-effective solutions for prevention and management of major health problems facing the poorest segment of the population in Bangladesh by studying their inter-relation with poverty.

The issues that were researched include:

- Safe motherhood
- Neonatal health
- Childcare and development
- Adult health and the burden of elderly diseases
- Reducing the burden of tuberculosis
- Measuring poverty and health

**Sexuality and sexual health**

Currently, the SBSU is hosting two collaborative research projects on sexuality and sexual health-related issues. In the project titled “Socialization and sexuality constructions of Hijra: implications for STIs/HIV and sexual health interventions in Bangladesh,” multiple data-collection tools have been integrated to obtain insights into Hijra sexuality and their sexual-socialization process. A research team of both Hijra and non-Hijra members are currently involved in the fieldwork with assistance from a Hijra community-based organization—Badhan Hijra Shangha. A theatre-based organization—TREE Foundation Limited—has assisted Badhan to form a Hijra theatre group—Rongberong, Rongberong performed their first drama at the Sacakawa Auditorium at ICDDR,B to ensure some action-oriented output; measures were taken to translate the findings into appropriate behaviour change intervention (BCI) materials for the Hijra community, which are now lacking. The TREE Foundation Limited has been working with the research team in preparing the pictorial curriculum for the Hijra community where the problems of the Hijra life will be contextualized and discussed.

The SBSU is conducting an anthropological assessment of risks and vulnerabilities to STIs/HIV of the indigenous community in the northwestern belt of Bangladesh. A comprehensive anthropological assessment is being conducted to obtain rich understanding of the tribal life situation to analyze the context of risk and vulnerabilities of the Santal and Oraon populations to STIs/HIV. Four tribal staff members were recruited as research assistants. Dustha Manobatar Seba Sangsttha (DMSS), a local NGO working with Santal and Oraon populations since 1991 in Jaipurhat district has collaborated with us in creating access to the tribal community. It is expected that findings of this rapid situation assessment will identify components and recommendations to design STIs/HIV and sexual health interventions for the tribal community and demonstrate future research priorities.

The SBSU has also extended their inter-unit and interdivisional collaborations and participated in the following studies to conduct the qualitative component:

- Vulnerability of female IDUs in Dhaka to HIV infection (with Laboratory Sciences Division)
- Respondent-driven sampling of males who have sex with males in Dhaka (with Laboratory Sciences Division)
- Understanding and overcoming barriers to condom use by sex workers in Bangladesh (with Reproductive Health Unit)
- An analysis of social, behavioural and biomedical risk factors of adolescents and young clients of female sex workers (with Laboratory Sciences Division and Health Systems and Infectious Diseases Division)
- Partner notification study (with Reproductive Health Unit)

**Reproductive Health Unit**

Head: Marjorie Kobinsky (up to November)
Acting Head: Mahbub Elahi Chowdhury (from December)

The Reproductive Health Unit (RHU) addresses issues of reproductive health research, focusing on the need
to find simple and cost-effective methods of preventing and managing ill-health. The major emphasis is placed on making motherhood safe, improving family planning, and preventing and treating sexually transmitted infections in different parts of Bangladesh.

The main activities of the Unit in 2006 are reported in the chapter on the Reproductive Health Programme in this Annual Report. Activities not dealt with there are described below.

**International working group meeting of investigators of the study “Determining the burden of maternal ill-health and death”**

During 11-14 September 2006, the RHU organized an international working group meeting of investigators for the study “Determining the burden of maternal ill-health and death.”

The inauguration of the meeting was held at ICDDR,B in Dhaka and the two-and-a-half-day workshop took place at the International Training Centre (ITC) in Matlab. In total, 28 participants from ICDDR,B and abroad attended the meeting.

The objectives of the meeting were to: (a) revise the conceptual framework for different study components to ensure that they reflect the current understanding of potential pathways by which maternal morbidity impacts further morbidity (e.g. chronic problems) and mortality of the woman and her newborn, and the consequences of maternal morbidity and mortality on the mental, social and economic status of women and their families; (b) review and confirm the study design and case selection methods; (c) refine the data-collection instruments to capture the consequences of morbidities as specified in conceptual frameworks; and (d) determine what is needed to develop an advocacy tool for policy-makers for maternal ill-health through the use of the REDUCE model or other instruments.

Substantial feedback was received from the participants to refine the conceptual framework. Investigators presented similar studies on maternal ill-health in other countries and discussed commonalities and possible cross-site analysis. Dr. Kirti Iyengar (Action Research and Training for Health, Rajasthan, India), Dr. Veronique Filippi (London School of Hygiene & Tropical Medicine, UK), and Dr. Danni Daniels (Centers for Disease Control and Prevention, USA) presented methods/findings of similar studies in India, Burkina Faso/ Benin, and Tanzania respectively. These presentations allowed for an exchange of views among the investigators to find solutions to common issues. Bart Burkhalter from University Research Corporation, USA, discussed the data requirements for the REDUCE model—an advocacy tool for policy-makers based on the global burden of diseases. The participants worked on refinement of draft data collection tools for different components of the study.
Dissemination workshop on the study “Evaluation of two home-based skilled birth attendants’ programmes in Bangladesh”

The dissemination workshop of the above study was organized on 29 June 2006 at Sasakawa Auditorium in ICDDR,B attended by over 100 participants from various organizations working on safe motherhood in Bangladesh.

The RHU evaluated the knowledge, skills, and performance of NGO Service Delivery Program (NSDP) and Bangladesh Association for Voluntary Sterilization (BAVS)-trained Skilled Birth Attendants (SBA) to determine if they are able to achieve the basic knowledge and skills and provide quality care as envisioned in the WHO/FIGO criteria for an SBA. The SBAs of BAVS had 5-10 years of schooling and received 6-month training on antenatal and postnatal care, conduction of normal delivery, and referral. The training took place at the BAVS clinic and district-level emergency obstetric care facilities. The SBAs of NSDP had at least 10 years of schooling and had either 18-month paramedical or 4-year nursing training from recognized institutions.

Results of the evaluation showed that the overall knowledge and skills were poor for both the groups as envisioned in the WHO/FIGO definition of a SBA. The percent mean scores for knowledge test were 41% for the BAVS group and 68% for the NSDP home-based SBAs, while the percent mean scores for skills test were 56% and 65% for BAVS and NSDP home-based SBAs respectively (Fig. 2).

Competency was poor on key lifesaving techniques, such as use of partograph (BAVS 11%; NSDP 52%), management of postpartum haemorrhage (PPH) (BAVS 50%; NSDP 56%); eclampsia (BAVS 45%; NSDP 54%), postpartum infection (BAVS 36%; NSDP 68%) and newborn resuscitation (BAVS 46%; NSDP 52%) as shown in Fig. 2. The SBAs of BAVS did not have skills on active management of the third stage of labour but 90% SBAs of NSDP could perform it.

Dissemination seminar of the study “Reproductive health practices and sexual network among men in general population of Bangladesh”

A seminar to disseminate findings of the above study was arranged on 01 February 2006 in Sasakawa Auditorium of ICDDR,B, with over 100 researchers, policy-makers, and programme managers from various organizations involved in HIV/AIDS activities in Bangladesh.

This study was conducted in collaboration with the Family Health International-Bangladesh, with objectives (a) to estimate the proportion of general male population (aged 18-49 years) in Bangladesh who had pre- and extra-marital penetrative sex in the last one year and (b) to compare the response rates to sensitive questions on sexual behaviour with two different interviewing techniques: (i) asking sensitive questions in face-to-face interview (FTFI) and (ii) administering the sensitive questions by a pre-recorded audio system—modified ballot-box method (MBBM)—collecting the responses with the use of a ballot-box and ballot-slips (strips of paper to provide answer) to maintain confidentiality, among the general male population in Bangladesh.

Non-marital sex with high-risk partners was common among the general male population in Bangladesh. The MBBM was more effective than FTFI in eliciting higher responses regarding non-marital sexual contact from males, especially sex with female sex workers and males/transgenders (Fig. 3). The MBBM may be useful in improving response rates to sensitive questions on sexual behaviour among the general male population.

One of the important contributions of this study is to improve the modelling of the possible HIV epidemic in Bangladesh. The study findings are also important to
develop intervention programmes targeted to the general male population in Bangladesh for the prevention of a possible HIV epidemic. Another implication of this study is the usefulness of the MBBM on sensitive issues on sexual behaviour in community surveys for resource-poor settings.

**What are the barriers to condom-use in commercial sex workers and their clients in Bangladesh?**

In Bangladesh, condom-use rate during commercial sexual encounters is extremely low even after years of targeted intervention. Available information that exists on barriers to condom-use is not enough to develop an effective intervention programme to promote condoms in commercial sex. The RHU has recently implemented a research project to investigate barriers that hinder condom-use among commercial sex workers and their clients.

Study subjects included both commercial sex workers and their clients from selected hotel, brothel and street-based sex trade settings in Bangladesh. Structured questionnaire were administered among 400 commercial sex workers in each setting of hotel, brothel and street. In addition, from each of the above settings, over 500 clients of the sex workers were also interviewed.

The last time condom-use rate by female sex workers in hotels, brothels, and streets were 73.5%, 64.7%, and 41.4% respectively. The corresponding figures for clients of sex workers were 66.4%, 51.4%, and 25.2% respectively. The major barriers to condom-use reported by sex workers and their clients were partners’ objection and unfulfilled sexual pleasure (Fig. 4 and 5).

To increase condom-use, it is important to address barriers from both demand and supply sides. For the demand-side barriers, effective behaviour change communication programmes targeted to sex workers and their clients need to be implemented. For the supply-side barriers, availability of condoms needs to be assured.

**Child Health Unit**

Head: Shams El Arifeen

The Child Health Unit (CHU) contributes to the development of cost-effective child health and survival programmes by enhancing our understanding of the causes of childhood illness and death and by testing cost-effective public-health interventions. The mandate of the Unit is (a) to conduct programmatic and policy-relevant child health research in collaboration with different research programmes and divisions within the Centre and with national and international institutions and (b) to assist the Government of Bangladesh and other partners to develop programmes, and review and analyze policy.

In 2006, the Unit conducted 21 research projects, including 7 major activities that include the evaluation of neonatal health interventions, Integrated Management of Childhood Illnesses (IMCI), rotavirus and pneumococcal vaccines, and maternal-infant nutritional intervention. The Unit was also active in the surveillance of the burden of tuberculosis, pneumococcal and typhoid diseases. These studies are conducted in several field sites of the Unit located in Dhaka, Matlab, Mirzapur, and Sylhet.

**Facilities available**

To provide all necessary support to these research studies the Unit has 2 support teams: (a) Data Management Team (DMT) and (b) Administrative Support Team (AST).

The Data Management Team has 27 staff members with required computers and other equipment for their work. There are 3 programmers, one senior data management supervisor, and 23 data management assistants. The team is headed by an experienced analyst programmer. This is a very professional team that supports the research teams with data-entry, programming, analysis, and report generation for the dissemination of new findings of the research activities. This team has also provided support to other units of the Centre.

The Administrative Support Team consists of 22 staff members with 4 experienced senior administrative officers and 18 junior staff members who include 4 drivers and 5 attendants. Three of the staff members are based in Mirzapur, Tangail. The multi-disciplinary functions of this team aims at providing smooth administrative, financial and logistics support to all research projects of the Unit.

**Renovation work**

During the year, a major renovation work of offices was undertaken for the neonatal intervention project staff in the Institute of Public Health building where at least
8-10 staff members will be able to work proficiently in good environment.

New equipment

A Canon iR5570 photocopier with network facilities and multi-function capabilities (copier-cum-printer-cum-scanner) was installed for bulk printing of data sheets/questionnaire with computer-generated ID of each individual subjects by the data management office for use by our surveillance data-collection team in the field. Besides, one laminating machine was provided for customized services for smooth field operation.

Surveillance projects for special studies of cholera, rotavirus, and other diarrhoeal diseases in rural Bangladesh (previously known as ECPU)

Head: A.K. Siddique

Epidemiology and ecology of *Vibrio cholerae* in Bangladesh

The surveillance activity of the above study is conducted along with the Environmental Microbiology and Molecular Genetics Laboratories of the Laboratory Sciences Division. The clinical surveillance is conducted in collaboration with government health facilities at Bakerganj and Mathbaria upazilas. The study also collaborates with the Johns Hopkins University, University of Maryland, and Emory University of USA.

During January-December 2006, 12,622 patients attended the two health complexes for the treatment of different diseases, of whom 584 (4.6%) had acute watery diarrhoea. Of the acute watery diarrhoea patients, 306 (52.4%) required hospitalizations. About 20% of all hospitalizations were due to acute watery diarrhoea. In total, 464 rectal swabs were collected and transported in Cary-Blair media to ICDDR,B for culture of *V. cholerae*. Of all the specimens, 25.2% (117/464) were positive for *V. cholerae* O1. *V. cholerae* O139 was not isolated in any of the sites. The age distribution of cholera patients (117) revealed that 30.8% were aged less than 5 years, and 54.7% were aged 5-44 years. Most (88.9%) cholera patients had signs of dehydration. The distribution of acute watery diarrhoea and cholera patients during 2006 is presented in Figure 6.

**Important observation**

In Bakerganj, *V. cholerae* was isolated nearly throughout the year, while in Mathbaria, *V. cholerae* was isolated only during the dry season (March-May). A difference in serotype-specific antibiotic sensitivity and resistance patterns of *V. cholerae* O1 El Tor biootype was observed. The Ogawa serotype was mostly (75%) resistant to tetracycline and erythromycin, whereas 75% of Inaba isolates were sensitive to these drugs. However, both the serotypes were sensitive to ciprofloxacin. The contrasting patterns of drug sensitivity discouraged the use of tetracycline and erythromycin, the most commonly-used drugs for the treatment of cholera patients in our surveillance facilities.

**Surveillance of rotavirus-associated diarrhoea in rural hospitals in Bangladesh**

Since August 2005, a surveillance of rotavirus-associated diarrhoea in children aged below 5 years has been conducted at two rural health facilities—Bakerganj and Mathbaria Upazila Health Complexes (UHCs) in southern Bangladesh. The main objectives of the study were to assess the number of patients with rotavirus-associated diarrhoea among rural children aged below 5 years seeking treatment for diarrhoea and also to determine the proportion of hospitalizations associated with rotavirus diarrhoea in rural Bangladesh.

**Results**

During January–December 2006, 235 patients aged less than 5 years, suffering from acute watery diarrhoea, were examined during the 147 days of systematic clinical surveillance in Bakerganj and Mathbaria government health facilities. Stool specimens were collected from 228 (97%) patients and were later transported to the Virology Laboratory of ICDDR,B in Dhaka for the detection of rotavirus. Of all the specimens tested, 26.3% (60/228) were positive for rotaviruses, of which 66.7% (40/60) of the patients were hospitalized.

Analysis of hospitalization data revealed that, during the surveillance period, 286 children aged below 5 years were hospitalized for the treatment of different diseases, and 35.3% (99/286) of them had acute watery diarrhoea. The proportion of rotavirus-associated infection among the patients hospitalized for acute watery diarrhoea was 40.4% (40/99). Overall, rotavirus-associated infection accounted for almost 14% (40/286) of all hospitalizations in children aged below 5 years in the two surveillance sites. The age
distribution of rotavirus-positive patients revealed that most (80%) of them were aged below 2 years. Our surveillance also revealed that G2[P4] (41.3%) and G1[P8] (40%) were the two most frequently identified serotypes in the rural areas. The distribution of acute watery diarrhoea and rotavirus cases in 2006 is presented in Figure 7.

**Ongoing Protocols**

Alam DS. Prenatal exposure to Bangladesh famine (1974-75): association with blood pressure, glucose tolerance, lipid profile, and coronary heart disease among young adults
Funded by: DFID, UK

Alam DS. Randomized double-blind controlled community trial to compare the efficacy of a short-course (5-day) and 10-day course of 20 mg/day of elemental zinc in the management of acute diarrhoea in young children
Funded by: Bill and Melinda Gates Foundation, USA

Anwar ATM. Evaluation of two home-based skilled birth attendant programmes in rural Bangladesh
Funded by: USAID

Arifeen SE. Combined interventions to promote maternal and infant health: effects over a pregnancy cycle and on children of 0-24 month(s)
Funded by: UNICEF and USAID/Dhaka

Arifeen SE. Effectiveness of the community-IMCI and community-IMCI with ARI emphasis intervention models in increasing rates of correct ARI treatment and appropriate referral in NSDP areas in rural Bangladesh
Funded by: USAID, Global Research Aid (GRA), USA

Arifeen SE. Aetiology, prevention, and treatment of neonatal infections in the community
Funded by: Wellcome Trust, UK

Arifeen SE. Evaluation of the effects of community-based interventions on maternal behaviours and morbidity during labour, delivery, and the early postpartum in rural Bangladesh
Funded by: USAID/Dhaka

Arifeen SE. An evaluation of the health and economic impact of Integrated Management of Childhood Illness (IMCI), Matlab, Bangladesh: a randomized experimental study
Funded by: WHO, Switzerland

Arifeen SE. Formative research on healthy fertility practices and postpartum care in Sylhet district, Bangladesh
Funded by: USAID, Global Research Activities, USA

Arifeen SE. Formative research on umbilical and skin-care practices for newborns in Sylhet district, Bangladesh
Funded by: USAID

Arifeen SE. Impact of umbilical cord cleansing with chlorhexidine on neonatal mortality and omphalitis in rural Sylhet district of Bangladesh
Funded by: USAID/Save Newborn Lives, USA, USA

Aziz RR. Improving the utilization of healthcare services through community empowerment and participatory monitoring in a rural area of Bangladesh
Funded by: International Nutrition Foundation (INF), Japan

Bhuiya A. Improvement of health through community development-oriented programme in rural Bangladesh
Funded by: Swiss-German-Danish Red Cross

Bhuiya A. Monitoring the disparity in health status and access to and utilization of healthcare services: Bangladesh Health Equity Gauge—Phase I
Funded by: New York University School of Medicine (NYUSM), USA

Bhuiya A. Reinitiating fertility decline in Bangladesh by meeting the needs of high parity couples
Funded by: USAID/Dhaka

Chowdhury HR. Causes of and healthcare-seeking in relation to neonatal deaths in rural Bangladesh: the use of verbal autopsy
Funded by: Curtin University, Australia

Gausia K. Epidemiology of postnatal depression in rural Bangladesh
Funded by: Edith Cowan University, Australia

Hasan KZ. Perez-Perez Guillermo I. Longitudinal study of events associated with *H. pylori* acquisition in Bangladeshi children
Funded by: NYUSM, USA

Khan AF. Epidemiology of bronchial asthma among children in rural Bangladesh at Matlab
Funded by: University of Tokyo, Japan

Khan MEEK. HIV/AIDS prevention project: brothel-based sex workers in Bangladesh
Funded by: UNICEF/Government of Bangladesh

Koblinsky M. Assessing unmet need for major obstetric interventions in different districts of Bangladesh to improve coverage of maternal healthcare services
Funded by: USAID/Dhaka
Koblinsky M. Better understanding of recognition and response to postpartum haemorrhage
Funded by: NIH, USA

Koblinsky M. Case studies for safe motherhood: learning from South Asian programmes
Funded by: DFID, UK

Koblinsky M. Determining the burden of maternal ill health and death and its programmatic implications in rural Bangladesh: understanding the incidence of moderate/severe obstetric complications and maternal death, their physical consequences; psychological, economic and social impact; and determinants in rural Bangladesh
Funded by: USAID

Khan SI. Socialization and sexuality constructions of Hijra: implications for STI/HIV interventions
Funded by: DFID, UK

Khan SI. Understanding the context of risks and vulnerabilities to STIs/HIV and sexual health: a rapid anthropological assessment of the tribal community of the northwestern belt of Bangladesh
Funded by: DFID, UK

Mridha MK. Extent and consequence of catastrophic cost for caesarean section delivery among poor households
Funded by: NIH, USA

Nahar P. Infertility: a lens to see women’s situation in the context of Bangladesh
Funded by: Monash University, Australia

Naved RT. Does counselling of abused women using primary level healthcare promoters help the women
Funded by: Uppsala University, Sweden

Naved RT. Effectiveness of large-scale supplementation activities for pregnant women: the role of community nutrition promoters
Funded by: Uppsala University Sweden

Naved RT. The impact of violence against women on reproductive outcome and child survival: a secondary data analysis
Funded by: Uppsala University, SAREC, Sweden

Naved RT. Perceptions, attitudes, and practices relating to gender and their linkages to low birthweight
Funded by: International Center for Research on Women, USA

Rahman M. Arsenic in drinking-water and child development—Phase 1: Continued activities 2005-2007: understanding the dynamics of arsenic exposure, developmental and cognitive function in children
Funded by: Sida/SAREC, Sweden

Rahman M. Arsenic in tubewell water and health consequences. Phase 2: continued activities 2003-2006: understanding the dynamics of arsenic exposure, arsenic-related diseases, and the shift to arsenic-free drinking-water
Funded by: Sida, Sweden

Rahman M. Chemo prevention of arsenic-induced skin cancer
Funded by: NIH, USA

Rahman MA. Comprehensive maternal, neonatal and child healthcare to reduce mortality: a programmatic approach through a continuum of care to increase facility-based delivery in a rural community in Matlab, Bangladesh
Funded by: USAID

Rasheed S. Exploration of the determinants of infant-feeding practices in Matlab Bangladesh
Funded by: NIH, USA

Siddique AKM, Nair GB. Epidemiology and ecology of V. cholerae in Bangladesh
Funded by: Johns Hopkins Bloomberg School of Public Health, USA

Streatfield PK. Evaluation of partner notification for sexually transmitted infections among service providers in Bangladesh
Funded by: AusAID

Streatfield PK. Poverty and health in ageing in Bangladesh
Funded by: DFID, UK

Streatfield PK. Study on global ageing and adult health, INDEPTH–WHO collaboration
Funded by: National Institute of Ageing (NIA)/NIH, USA and WHO, Switzerland

Streatfield PK. Study to understand barriers to condom use among female sex workers in Bangladesh
Funded by: AusAID

Yunus M. Cholera across scales: oceanic links to climate and local estuarine influences
Funded by: National Oceanic and Atmospheric Administration, USA

Yunus M. Evaluating the efficacy of sari filtration for cholera prevention
Funded by: Thresher Research Fund, USA

Zaman K. Continuation of surveillance and vaccination of mother-infant pairs enrolled in the pneumococcal vaccine study
Funded by: JHU, USA
Zaman K. Defining incidence of intussusception in Bangladesh in preparation for a phase III trial of a new rotavirus vaccine
Funded by: Johns Hopkins Bloomberg School of Public Health, USA

Zaman K. Epidemiology and surveillance of multidrug-resistant Mycobacterium tuberculosis and assessment of directly-observed therapy short course (DOTS) programme in selected areas of Bangladesh
Funded by: USAID/Washington

Zaman K. Epidemiology of hepatitis E virus-associated infections in rural Bangladesh at Matlab (revised)
Funded by: Johns Hopkins University, USA

Zaman K. A phase II, randomized, placebo-controlled study of the immunogenicity, safety, and reactogenicity of an orally-administered human rotavirus vaccine (RIX4414) in healthy infants in Bangladesh
Funded by: Program for Appropriate Technology in Health Rotavirus Vaccine Program

Zaman K. Randomized comparison of maternal and infant immunization strategies to prevent pneumococcal disease
Funded by: Johns Hopkins University, USA

Zaman K. Tuberculosis in rural and urban areas in Bangladesh
Funded by: Global Fund to Fight AIDS, Tuberculosis and Malaria, Improved Health for the Poor Project
What does the Division do?

The Information Sciences Division (ISD) works to ensure that information flows into and out of the Centre efficiently. Capacity-building (through training courses and internships) and producing and distributing print and electronic publications are major focuses of the Division. ISD also ensures that the Centre’s researchers have access to up-to-date literature and a modern telecommunications infrastructure—which allows them to remain in touch with their colleagues across the world. In this way, the Division helps ensure that knowledge is shared and used for improving the well-being of the poor.

How are we organized?

The Division consists of the Technical Training Unit (TTU) [a new name for the former Training and Education Unit], Publications Unit (PUBU), Library and Information Services Unit (LISU), Computer Information Services Unit (CISU), and Audiovisuals Unit (AVU).

Structural renovations for improved service and security

Following recommendations by the ISD Review Team in 2005 and by a consultant from PricewaterhouseCoopers in 2006, the data centre in the Computer Information Services Unit (CISU) was completely re-engineered—equipment was placed on racks, cabling standards were applied, new air-conditioning, fire detection and power management systems were installed, and access control was introduced. Prof. David A. Sack, Executive Director of ICDDR,B, inaugurated the new data centre on 23 November 2006.

Renovation work in the Library (LISU), following ISD review recommendations, has included exposing more windows in the reading room, fitting better-quality lighting throughout, re-organizing the workstations for library staff to provide better contact with users, and improving the computer access for users.

The Centre’s new image

The Division Director and the staff of PUBU, AVU, and CISU played a major role with the Communications Unit in the rebranding exercise undertaken by ICDDR,B in 2006. All the Centre’s publications have now been subjected to rebranding to provide a clearer identity for the Centre. This applies to both electronic and printed publications. ICDDR,B publications and the ICDDR,B website now present a brighter, more modern face to our readers and are instantly recognizable as Centre materials.

A training strategy for the Centre

For several years now, the Centre has felt the need for strategic direction in its training activities. This need was also emphasized by the ISD review and others looking at ICDDR,B activities. One of the first tasks of the incoming unit head in the Technical Training Unit (TTU) was to take a fresh look at training in the Centre and come up with a draft strategic document. This is now available and will be published in 2007 after consideration by the management.

Steps in the development of a training strategy

- Assessment of current training activities
- Discussions with senior Centre staff
- Alignment of ideas with the ICDDR,B mandate, ISD-review recommendations, AusAID review recommendations and, above all, the Centre’s Strategic Plan
- Report and proposals for development of a strategic training plan
- Reorganization of the Unit to meet these needs
- Transparent and unambiguous role definition and direction from the Centre management
Digitization for conservation and dissemination

LISU has been carrying out a project in cooperation with a local scanning bureau to digitize much of the older material in the library. This includes the minutes of the Board of Trustees, from the early days of the Cholera Research Laboratory (1960), protocols written by Centre scientists as a prerequisite to carrying out research studies, and reprints of papers published by ICDDR,B scientists in international journals. A start has also been made on scanning the older items kept in PUBU’s publications store—all the Centre’s publications since the late 1990s are already available in digital format, and most of these are available on the Centre’s website.

The project aims to make copies of these documents more easily available, both to the Centre’s own staff and to interested researchers and others from outside the Centre. By reducing the amount of printed material that has to be stored, it will also free up space in the library and in the publications store.

LISU has also been working with CISU to set up an institutional repository. This is a computer system accessible via the Centre’s website which stores material coming from the Centre’s research. While most files included are expected to be papers or reports of some kind, in PDF or MS Word format, any sort of computer file can be stored in the repository—graphics, spreadsheets, datasets, etc. Access may be given to anyone via the website, or access to some areas can be restricted to internal users or to selected external users. Some of the material scanned under the digitization project will be made available to users via the repository.

Support to conferences and meetings

During the year, PUBU and AVU provided considerable support to the 8th Commonwealth Congress on Diarrhoea and Malnutrition held at ICDDR,B from 6 to 8 February 2006. They were also heavily involved in the preparations for the Centre’s 11th Annual Scientific Conference to be held in early 2007. Activities involved sending out conference announcements to potential participants and authors, receiving and managing abstracts from potential authors, sending these abstracts to reviewers, communicating with reviewers and authors, editing of the abstracts to ensure their accuracy and quality, and the collection of advertisements to offset the production cost of publications. The staff also helped support the meeting of the ICDDR,B Alumni Association held on 8 December 2006.

Technical Training Unit

Head: A.N. Alam (until July)
Aftab Uddin (from August)

During 2006, the Technical Training Unit (TTU), in collaboration with the Centre’s scientific divisions and, in some cases, in partnership with national and international organizations, conducted 15 training courses and several workshops and short orientation courses for researchers, public-health professionals, and others (Table). These aimed to (a) increase research capacity in developing countries, (b) provide hands-on training on diarrhoeal disease and nutritional problems, and (c) improve responses to new and emerging issues in health and population sciences. TTU also managed and
### Table. Details of ICDDR,B’s fellowship programmes, training courses, and workshops conducted in 2006

<table>
<thead>
<tr>
<th>Title of course, workshop, or programme</th>
<th>Type of participants</th>
<th>Countries represented</th>
<th>No. of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>International</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Emerging and Re-emerging Pathogens</td>
<td>• Medical doctors</td>
<td>Japan</td>
<td>6</td>
</tr>
<tr>
<td>Emergency Response to Cholera</td>
<td>• Programme directors</td>
<td>Afghanistan (9)</td>
<td>31</td>
</tr>
<tr>
<td>and Shigellos Epidemics (9–20 April</td>
<td>• Programme/Project managers</td>
<td>Angola (1)</td>
<td></td>
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<tr>
<td>and 26 November–7 December)</td>
<td>• Desk officers in Disaster operations</td>
<td>Bangladesh (5)</td>
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<td></td>
<td>• Epidemiologists</td>
<td>Canada (1)</td>
<td></td>
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<tr>
<td></td>
<td>• Medical doctors</td>
<td>Indonesia (4)</td>
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<td></td>
<td>• Health and nutrition specialists</td>
<td>Japan (3)</td>
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<td></td>
<td>• Technical advisors for environmental Health</td>
<td>Kenya (3)</td>
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<td></td>
<td></td>
<td>Sudan (4)</td>
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<td></td>
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<td>Uganda (1)</td>
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<tr>
<td><strong>Total</strong></td>
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<td>37</td>
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<tr>
<td><strong>National</strong></td>
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<tr>
<td>Clinical Management of Diarrheal</td>
<td>• Medical doctors</td>
<td>Bangladesh</td>
<td>28</td>
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<tr>
<td>Disease for Doctors (15–19 January)</td>
<td></td>
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<tr>
<td>Epidemiology, Clinical Management and</td>
<td>• Postgraduate medical doctors</td>
<td>Bangladesh</td>
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<tr>
<td>Prevention of Diarrheal Diseases for</td>
<td>enrolled in Diploma-in-Child Health, Fellowship of the College of Physicians and Surgeons (FCPS) and MD courses</td>
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<tr>
<td>Doctors (12–16 and 19–23 March)</td>
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<tr>
<td>Workshop on Reproductive Health for</td>
<td>• Medical doctors from upazila health complexes</td>
<td>Bangladesh</td>
<td>29</td>
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<tr>
<td>Family Planning Managers: Sharing ICDDR,B Experiences (1–5 January and 4–8 June)</td>
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<tr>
<td>Training Course on Diagnostic Laboratory Methods (2–20 July)</td>
<td>• Chief laboratory technicians</td>
<td>Bangladesh</td>
<td>24</td>
</tr>
<tr>
<td>Management of Severely-malnourished</td>
<td>• Medical doctors and nurses working at tertiary-level hospitals</td>
<td>Bangladesh</td>
<td>15</td>
</tr>
<tr>
<td>Children for Doctors and Nurses from</td>
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<tr>
<td>Chittagong and Khulna Medical College</td>
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<td>Hospitals, and Khulna Shishu Hospital</td>
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<td>(27–31 August)</td>
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<tr>
<td>Introductory Course on Epidemiology</td>
<td>• Doctors</td>
<td>Bangladesh</td>
<td>31</td>
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<tr>
<td>and Biostatistics (30 April–25 May and 27 August–21 September)</td>
<td>• Counsellors</td>
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<td></td>
<td>• Public health managers</td>
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<td></td>
<td>• Young researchers</td>
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<tr>
<td></td>
<td>• Centre staff from LSD, PHSD, and HSID</td>
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<tr>
<td><strong>Total</strong></td>
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<td>158</td>
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<tr>
<td><strong>Orientation</strong></td>
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<tr>
<td>Short orientation training</td>
<td>Students from different institutions, such as government and private medical colleges, public health institutions, etc.</td>
<td>Bangladesh</td>
<td>827</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>827</td>
</tr>
<tr>
<td><strong>Fellowships/Electives</strong></td>
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<tr>
<td>Elective Fellowships</td>
<td>Students from universities at national, regional and global levels studying medicine and/or public health</td>
<td>Australia (2)</td>
<td>82</td>
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<tr>
<td></td>
<td></td>
<td>Bangladesh (41)</td>
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<td></td>
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<td>Canada (6)</td>
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<td>Denmark (1)</td>
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<td>India (2)</td>
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<td>Iran (1)</td>
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<td>Japan (10)</td>
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<td>Mexico (2)</td>
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<td>Sweden (1)</td>
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<td>The Netherlands (2)</td>
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<td>Uganda (2)</td>
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<td>UK (1)</td>
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<td></td>
<td></td>
<td>USA (10)</td>
<td></td>
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<tr>
<td>Clinical Fellowship</td>
<td>Young medical doctors</td>
<td>Bangladesh</td>
<td>15</td>
</tr>
<tr>
<td>Nursing Fellowship</td>
<td>Staff nurses</td>
<td>Bangladesh</td>
<td>13</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
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<td>110</td>
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<tr>
<td><strong>Grand total</strong></td>
<td></td>
<td></td>
<td>1,132</td>
</tr>
</tbody>
</table>
coordinated internship and fellowship programmes for both national and international participants. In total, 1,132 trainees, students, and fellows from 17 countries across the globe, including Bangladesh, attended training courses, fellowship and elective programmes at the Centre. It is noteworthy that a USAID-sponsored international training course attracted 31 participants from 9 countries, including Afghanistan, Indonesia, and Sudan, that have been facing the challenges of both man-made and natural emergencies.

Future Directions

The comprehensive training strategy for the Centre, being developed by TTU to meet the challenges of ICDDR,B's strategic needs, will help develop an institutional capacity-building approach for forming lasting partnerships with institutions, foster a performance-oriented training methodology, and share and market the Centre's expertise towards sustainability.

Publications Unit
Head: M. Shamsul Islam Khan

The mission of the Publications Unit is to disseminate the results of research on health, population, and nutrition for solving the common health, nutrition and population problems, especially in the context of the developing world. The Unit works to disseminate the Centre's research by producing annual reports, scientific reports, a peer-reviewed quarterly journal, newsletters, working papers, and other publications posted on the Centre's website. It also edits scientific papers for international publications, dissertations, documents for projects and other ICDDR,B units and helps them produce high-quality publications. The Unit also ensures that the electronic and print-copies of publications it receives from various sources each year are shared with the relevant scientists and library personnel within the Centre. Mr. Syed Hasibul Hasan and Ms Laila Farzana joined the Publications Unit as Senior Information Officer and Information Officer respectively. Six staff members manage the activities and services of the Unit.

Improvements in the look and contents of publications

In 2006, the Centre used the services of SCRIPTORIA—a UK-based organization to refine the text of the 2005 Annual Report of the Centre. This initiative substantially improved the quality of presentation style of the report. The Centre's quarterly English newsletter Glimpse and the Bangla health magazine Shasthya Sanglap have undergone major changes in 2006 in terms of look and contents. Following a branding exercise initiated by Centre management, new mastheads for both publications were designed with the new logo and tagline in 3 specific colours. The same pattern has been reflected in the page-layout of the two periodicals.

During 2006, staff members of the Unit participated in several meetings concerning the new communication guidelines and provided significant input in the new identity toolkit. Beginning with the June issue, the Journal of Health, Population and Nutrition (JHPN) was upgraded with the Centre's new logo and cover scheme.

SUZY News—a periodical of the SUZY Project—was also restructured and redesigned in accordance with the new guidelines. The Centre brochure and the Chakaria Health and Demographic Surveillance System report (Scientific report no. 94) were designed following the guidelines, and the Unit also contributed to the design of the Centre's Sexual Harassment Policy handbook.

Publications production and distribution

In 2006, the Unit organized, edited, and produced the Centre's 2005 Annual Report, 3 issues of Glimpse, 4 issues of JHPN, 3 issues of Shasthya Sanglap, the CAPGAN Abstracts Book, the CAPGAN Programme book, and an illustrated souvenir for the Centre's Alumni Association.

The Unit produced and printed 60,000 copies of Shasthya Sanglap for use by grassroots-level health workers, upazila-level physicians, family-planning officers, district-level surgeons, housewives, teachers, and students; the magazine aims to enhance their knowledge of health, nutrition, and related issues.

As well as making the Centre's latest internal publications available on its website, the Unit also distributed 229,200 copies of different publications to readers in over 120 countries—this is over 89,000 copies more than in 2005. The Centre and its activities were also promoted by display and distribution of publications at various important meetings, workshops, and conferences. The Unit has also been working to update the 9,200 or so addresses that make up its publications mailing list. In 2006, the Unit added to and/or updated over 1,500 addresses in the Centre's Central Contacts List database.

Journal of Health, Population and Nutrition: All-out efforts were made to further improve the quality of the Journal. In 2006, the Journal received 175 manuscripts from 40 countries—16 from Nigeria, 17 from Turkey, 32 from India, 19 from Bangladesh (plus 15 from ICDDR,B), and the rest from other countries, including UK, USA, Canada, Australia, China, South Africa, Botswana, Pakistan, Brazil, and Iran. The large number of manuscripts received from developing countries demonstrates that JHPN continues to emphasize studies conducted in developing countries. In the 4 issues of 2006, the Journal published 63 articles. The June and September issues were special issues on the health effects and mitigation of arsenic in developing countries, while the December issue was dedicated specially to reproductive and newborn health. In 2006, 239 experts reviewed JHPN manuscripts, which resulted in the rejection of 96 manuscripts. The rejection of a large number of manuscripts again indicates the Journal’s commitment to publishing high-quality papers.

Glimpse. The quarterly newsletter continued to highlight the important findings of research carried out in the Centre, various achievements of the Centre and its...
Shasthya Sanglap. This Bangla magazine is published 3 times a year. In 2006, 119,000 copies of the newsletter were distributed all over Bangladesh and in several other countries where Bangla-speaking people live. In its 3 issues, the newsletter covered or highlighted issues, such as bird flu, abortions, nose-bleeding, the role of cholesterol in heart disease, constipation, environmental pollution, gender issues, reproductive health problems, drug resistance, rheumatic fever, chickenpox, and pneumonia.

Promotion of JHPN

The Head of the Publications Unit visited Malaysia, Singapore, and Thailand and met librarians, scientists, and subscription agents in these countries to introduce and promote the Journal. During his visit to Malaysia, he attended a two-day workshop on biomedical publishing and made a presentation describing the Journal; JHPN was one of three journals selected from the Asian countries for presentation. The participants were impressed by the high quality of the Journal. He also conducted three seminars on JHPN at Hatyia University, Thailand. The contents of the Journal are also disseminated through various international websites.

Upgrading equipment

The Unit acquired two faster personal computers with larger monitors to replace the old ones and to help improve the work capability of the staff members.

External capacity-building

The Head of the Publications Unit gave lectures during various training programmes and workshops in Dhaka. These aimed to share the Unit’s knowledge on subjects such as digital librarianship, ethical issues in publication, writing of high-quality scientific abstracts, and the use of, and access to, electronic information resources.

Library and Information Services Unit

Acting Head: Peter Thorpe (until October)
Head: Talut Solaiman (from November)

ICDDR,B’s library serves both the Centre’s scientists and external health professionals associated with the Centre, such as university lecturers and students. As well as maintaining its hard-copy collection, the Unit provides access to an extensive range of online information resources and a variety of modern IT tools. During 2006, LISU updated its Intranet pages and included links to all free and subscribed resources to enable easy access for the Centre’s staff from one place.

In 2006, the total collection reached over 42,639 books, project protocols, and bound journals. The library also considerably strengthened the referral, bibliographic, photocopying, and Internet services it provides, as well as its online dissemination of information. Five staff members managed the library activities. During the year, the library catalogued and added to the library database 1,873 books, reprints, CDs, and bound and loose journals. It also lent 29,025 books and journals from its collection and was visited by 30,540 readers. The library’s photocopying service provided 67,146 pages of photocopies, around two-thirds of which were for external users.

Library services improved

The library renovations have helped maximize space for users. During 2006, the library registered 119 external library members, excluding students from the James P. Grant School of Public Health, who are also provided with library services. The library catalogue has been mounted on the Internet, and computer facilities for users have been upgraded with Internet connections. These facilities were used by 3,270 users in 2006. There are three resource centres in the library, focusing on Poverty and Health, Family Health, and Gender Issues.

Interlibrary loans, partnerships, and new acquisitions

The library continues to maintain an inter-library loans relationship with several libraries in Dhaka city. These include the libraries of the Bangladesh Institute of Development Studies, the Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders, BRAC University, East-West University, British Council Bangladesh, ACME Laboratories Ltd, and the World Bank, as well as the National Health Library and Documentation Centre. During the year, 610 books and bound journals were lent to these organizations. ICDDR,B’s library also borrowed books and videos from the British Council Library in Dhaka on behalf of the Centre staff. As in previous years, the British Medical Association’s Nuffield Library continued to provide photocopies of journal articles free of charge. The ICDDR,B library also donated a total of 1,413 issues of 13 old journals to the National Health Library and Documentation Centre.

Through its New Acquisition List, the library also ensured that the Centre’s scientists were kept informed of incoming learning resources. During 2006, LISU produced 14 lists, 315 citations for books and CDs, and 318 citations for journals articles.

Training courses and staff development

As part of its information literacy programme, the library conducted several training programmes during 2006. A three-day training course on Library and Information Management was organized for GTZ from 16 to 18 April 2006. Six students from the Department of Information Science and Library Management, University of Dhaka, also completed a 2-month hands-on internship in the Unit. In December, LISU conducted a training programme for Matlab Health and Research Centre (MHRC) staff on Library and Information Services using ICDDR,B’s library.
resources. A total of 18 staff members participated in two training sessions.

Under the staff-development programme, senior library staff also attended several national and international training programmes, workshops, and conferences in 2006 to increase their knowledge of digital library environments.

**Audiovisuals Unit**  
Head: Asem Ansari

The Audiovisuals Unit (AVU) prepares graphics for the Centre’s scientists, posters, and other display materials. It also provides design and layout services for some ICDDR,B publications, takes and archives important photographs, and records all major events. In 2006, the AVU prepared and printed 5,785 graphics and invitation cards, supplied 9,431 prints of visiting card, 98 big posters and designs, made 181 laminations, prepared 10 ICDDR,B photo albums, and formatted Annual Report 2005, 3 issues of Glimpse, and 48 weekly schedules. It also designed and produced the year planner and the 2007 calendar. The unit also provided 302 hours of multimedia projections and recorded various important meetings, seminars, symposia, and conferences organized by the Centre.

**Computer Information Services Unit**  
Head: M. Farhad Hussain

The Computer Information Services Unit (CISU) provides, coordinates, and manages information and communication technology (ICT)-related services at the Centre. It supports the Centre’s research and management programmes with efficient, cost-effective information systems, networking and communication services. The objectives of the CISU are to: (a) provide state-of-the-art computing and communication facilities; (b) provide high-quality, centralized and integrated support services; and (c) develop appropriate ICT policies, standards, and guidelines. The unit has a staff of 12.

The Centre’s computer network is connected to the international Internet backbone through a satellite-based communication system, and its Dhaka and Matlab stations are connected through a microwave link with Internet, e-mail and data-transmission facilities. CISU maintains the Centre’s communication infrastructure and local area network that includes more than 700 computers.
New software applications developed to improve research and management

CISU has developed several customized software applications for different research laboratories and other departments in the Centre:

- A comprehensive cost-management system has been developed for the staff clinic (Dhaka and Matlab)
- A website has been developed exclusively for members of the Research Review Committee
- Open source institutional repository software for the Centre has been installed in collaboration with LISU
- Open source document management systems have been installed to enable collaborating groups around the world to have access to files and working papers via a private website, and to update the Centre's Intranet

Disaster Recovery Plan

In March 2006, the management agreed that a Disaster Recovery Plan (DRP) was needed for the mission-critical application ‘Suchona’ (the management information system based on MS Navision, introduced in the Centre in February 2004). PricewaterhouseCoopers (PwC) was appointed to develop a DRP on the Suchona infrastructure. While executing the DRP project, PwC also carried out a Business Impact Analysis (BIA), Risk Assessment, and Strategy Selection, and finally submitted an Improvement Opportunity Report. Probable risks were identified, and their possible impacts were explained in the Risk Assessment Report.

While assessing the ‘Suchona’ infrastructure, CISU’s data centre was identified as a major risk area. Considering all risk factors, PwC suggested the re-engineering of the existing centre by following a structured approach within the confines of accepted industry standards. Accordingly, the work of re-engineering the data centre was carried out and Prof. David A. Sack, Executive Director, inaugurated the new data centre on 23 November 2006. The re-engineered data centre has brought many significant changes in terms of its aesthetic look, security, safety, cabling standards, manageability, air-conditioning, back-up power supply, modularity, and scalability. The data centre is no longer a major risk area.

Future planning

We know that the Internet is not a single network, but a worldwide collection of loosely-connected networks that are accessible by individual computer hosts in various ways, including gateways, routers, dial-up-connections, and Internet service providers. The Internet is easily accessible to anyone with a computer and a network connection. Individuals and organizations worldwide can reach any point on the network without regard to national or geographic boundaries or time of day. However, along with the convenience and easy access to information come the new risks. Among these are the risks that valuable information will be lost, stolen, corrupted, or misused and that computer systems will be corrupted. Computer security issues range from viruses to automated attacks to outright theft, and the cost of these issues takes the form of lost information and lost time.

At the present stage of our ICT use, we feel the need of proper network and Internet security. We now need to ensure confidentiality, integrity and availability of the information, and we also need to look into authentication, authorization, and non-repudiation issues. In light of the above, our future plan is to ensure secured and smooth access to information systems, applications, and other resources to both internal and external users.

Over 26,000 people have received training at ICDDR,B. One of those is Dr. Abdullah Abed who completed the course on managing cholera and Shigella epidemics during emergencies in December 2006. This course is sponsored by USAID’s Office of Foreign Disaster Assistance.

Dr. Abed is a Senior Programme Manager at the Agency for Assistance and Development of Afghanistan (AADA) in Kabul, where he provides technical support to health projects to improve preventative activities at the field level, develops and implements treatment protocols for communicable diseases, and coordinates routine health activities and outbreaks of communicable diseases. This story presents Dr. Abed’s responses to some specific questions on how he can apply the training experience in his own country:

What are your key areas of interest?

The conflict in my country has had a significant impact on the health system, and in combination with the difficult geographical environment, has resulted in poor access to basic healthcare services for most population. One of my priority areas is, therefore, looking at factors affecting health and rural development.

Secondly, the development of human resources and training systems is crucial to delivering better healthcare services and improving public health. A gap currently exists, and we need to work on strengthening and coordinating the skills base for our health workers. For example, we have been filling the gap for midwives and female doctors: the accreditation of midwifery education programmes in Afghanistan has been very well-achieved, by using a standard-
based educational management system. A national midwifery education accreditation board has been established, with a framework for successful recruitment, education, and deployment of midwives in the country.

What’s the biggest health challenge for Afghanistan at the moment?

With 1,600 deaths per 100,000 livebirths, maternal mortality is one of the leading causes of death in
Afghanistan and is one of the highest rates in the world. Women die from problems relating to pregnancy and childbirth or experience complications during pregnancy, many of which are life-threatening for them and their children. Forty percent of deaths among women of childbearing age are caused by complications in pregnancies that are preventable.

**How is Afghanistan progressing towards the MDGs?**

Obviously, we are making inroads towards improving maternal health but there is some concern about the sustainability of services, by depending on non-governmental organizations to sponsor the majority of health facilities in the country. We need to be measuring the impact of our measures and our progress by assessing improvements in health provision, and levels of mortality and morbidity.

**What would you like to see for health services in Afghanistan during the next ten years?**

The major areas of focus should be sustainability of services and quality control of private practice in the country; capacity-building and development of providers and practitioners; a reduction in key health indicators, particularly maternal mortality and morbidity; and health education is to be included in basic education.

**What's the most valuable knowledge you have gained this week?**

That cholera does not have to be fatal, and the importance of water management in disease prevention.

**How do you plan on sharing your knowledge from the course with your colleagues in Afghanistan?**

I will replicate the ICDDR,B training course with our NGO staff, which includes 560 health workers—doctors, midwives, nurses—with a focus on preventative measures in their integrated services provision.
Executive Director

- Deputy Executive Director
- Executive Director's Office
- Research and Project Support Department
- External Relations and Institutional Development Department
- General Counsel's Office
- Communications Unit
- Human Resources
- Finance Department
What does the Division do?

The Executive Director’s Division provides support to all other divisions of the Centre and interfaces with the donor community.

How are we organized?

The Division is made up of the following areas: Human Resources, Finance, External Relations and Institutional Development, Communications, Research and Project Support, and General Counsel.

Human Resources

Director: Ann Gauvin Walton

Human Resources provides quality HR management services in the areas of recruitment; contract administration; compensation and benefits; gender issues; staff training and development; performance management; succession planning; and employee counselling. Human Resources also oversees various activities through the Transport, General Services and Cafeteria Services and operates Staff Clinics for Centre staff and their dependants.

Increased human resources activities

Human Resources experienced an increased level of activity in 2006. HR recruited 471 employees in various positions, processed over 1,300 contract extensions and hired approximately 1,100 daily-wagers. In addition, Human Resources conducted a salary survey, completed modifications to the Centre’s integrated information system, and carried out a successful post-implementation review of the system.

Gender Awareness Workshop conducted

As part of the implementation of the ICDDR,B Gender Policy, more than 1,700 staff members participated in a Gender Awareness Workshop. The four-hour dissemination module raised awareness on gender issues and provided staff with an understanding of the Centre’s Gender Policy in place since 2003. The Policy complements and strengthens the focus on gender equality in the Centre’s Strategic Plan.

Daycare centre inaugurated

Recognizing the need of parents to have a caring environment for their children during working hours, ICDDR,B inaugurated Shishu-Aloy, a new daycare facility, in October. Although ICDDR,B has operated a crèche for several years, it was determined that improved facilities would be beneficial for the children. Shishu-Aloy aims at providing a safe and healthy environment where each child can enjoy age-appropriate activities with emphasis on developing independent skills.
Two brightly-decorated rooms and an outdoor playground now accommodate 20 children, aged 4 months to 4 years, 6 days per week. The children develop skills, creativity, and imagination, through structured daily activities.

**New database for Staff Clinics**

Human Resources has developed and implemented a database to track expenditure and services provided by the Centre’s Staff Clinics in Dhaka and Matlab. The Staff Clinic doctors, nurses, and pharmacists have been trained to operate the new online system, and authorized users can view information relating to treatment of staff. The application provides the necessary data required to make informed decisions regarding the employees’ health-related expenditure and pattern of usage. The Staff Clinics treated over 32,000 patients in 2006.

**Human Resources Development**

Under Human Resources Development (HRD), 153 staff members received financial support for training and higher studies during 2006. These funds were granted by the Staff Development Fund, various ICDDR,B projects, and through fellowships provided by several agencies.

**Training abroad**

In 2006, 59 staff members attended courses/study programmes in 11 countries: Australia, Canada, Japan, Sweden, Thailand, India, Germany, France, The Netherlands, the UK, and the USA. Of those, 22 completed their studies and training in 2006, 4 received PhDs, 8 completed partial requirements towards their doctoral studies, 6 obtained Masters degrees, and 12 completed diploma and non-degree training in various disciplines. A further 19 staff members (11 males and 8 females) left to begin studies for higher degrees. Thirty-seven staff members (23 males and 14 females) are still enrolled in studies for higher degrees.

**In-country training**

Twenty-one staff members received in-country training on various disciplines. Of those, one was sent for long-term study for a Masters degree in Business Administration (MBA), 2 were sent for Masters degrees in Computer Science, one for a Masters degree in Public Health, and another for a Postgraduate Diploma in Personnel Management. The remaining staff members participated in different short courses.

**In-house training**

The Centre offered the following in-house courses in 2006: Inter-personal Communication Skills; Advance Team Leader; Essential Skills for Managers; Emerging and Reemerging Pathogens; Emergency Response to Cholera and Shigella Epidemics; Clinical Management of Diarrhoeal Disease; Epidemiology; Clinical Management and Prevention of Diarrhoeal Disease; Diagnostic Laboratory Methods; and Management of Severely-malnourished Children.

**New international staff**

Dr. Heidi Bart Johnston, an American national, joined ICDDR,B as Social Scientist on 17 January 2006; Dr. Elizabeth Oliveras, an American national, joined ICDDR,B as Operations Research Scientist on 17 January 2006; Dr. Allisyn C. Moran, an American national, joined ICDDR,B as Scientist on secondment from Johns Hopkins University, Baltimore, USA, on 1 September 2006; Dr. Md. Khalequzzaman and Dr. Tahmeed Ahmed were promoted to international professional level as Scientists on 1 January 2006.

**Finance Department**

Director: Aniruddha Neogi

The Finance Department is responsible for financial operations, along with inventory control and management of fixed assets. The Procurement Office, under the Department, purchases scientific equipment, perishable and non-perishable chemicals and reagents, drugs and medicines, consumables, and services, from overseas and local markets.

Cash management and custodianship of all funds, management of staff salary, compensations and benefits, preparation of the annual budget, ensuring donors compliances, recording of all financial transactions and commitments, preparation of financial reports for the Board of Trustees, management, and donors are among the functions of the Department. The Finance Department also facilitates audits and financial reviews of the Centre.

**Financial highlights for 2006**

- Total contribution from donors was US$23,750,000, which is an increase of 26% over the previous year.
- Core contribution increased by US$2,794,000 (63%) compared to the last year.
- Project contribution increased by US$3,145,000 (24%) compared to the last year.
- Total expenditure was increased by US$5,774,000 (31%) over the previous year.
- Operating surplus for the year increased by US$46,000 (28%) from US$165,000 in 2005 to US$211,000 in 2006.
- Cumulative deficit on operating account decreased by US$281,000 (US$211,000 Operating Surplus and US$70,000 from Reserve Fund) from US$2,214,000 to US$1,933,000.
Personnel cost for national and international staff was increased by US$2,027,000 (17%) compared to the previous year from US$11,893,000 to US$13,920,000. In respect of total expenditure in 2006, this cost was 56% compared to 63% in 2005.

Procurement of consumables worth US$2,268,000 (US$1,980,000 in 2005), which increased by US$288,000 (15%) compared to the last year.

Capital procurement was US$2,667,000 compared to US$11,230,000 in 2006.

Year-end market value of endowment funds increased by US$919,000 (9%) over the previous year from US$10,311,000 to US$11,230,000.

Functions of the Engineering Units and Travel & Estate Unit are also overseen by the Finance Department.

Engineering Units develop and maintain the Centre’s physical infrastructure and facilities. Civil Engineering Unit maintains utility services, civil structure, renovations of office space and laboratories, carpentry, water supply, etc. Electrical and Telecom Engineering Unit is involved in the routine maintenance of electricity supply system, laboratory equipment, generator, and telecommunication systems, and initiates renovation work relating to electricity supply. During the year, a 2000-KVA Generator was installed, and vertical extension of the Research and Hospital Building has started.

Travel and Estate Unit provides travel-related services to staff members, visitors, trainees, and members of the Board of Trustees. It liaises with concerned ministries, departments, and different high commissions/embassies for obtaining visa and clearance for travel. The Unit also maintains the Centre’s Guest House and facilitates contracts relating to utilities.
1. We have audited the financial statements of INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH, BANGLADESH (ICDDR,B) for the year ended December 31, 2006, from which these abridged financial statements were derived.

2. Balance of “ICDDR,B Employees Separation Payment Fund” as at December 31, 2006 of US$ 14,217,105 and corresponding investments with Generali Worldwide Insurance Company Limited of Guernsey, Channel Islands have not been recognized in the financial statements.

3. 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 in accordance with the accounting policies disclosed therein, subject to our observation in Paragraph 2 above.

4. 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.

5. 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.

S.F. Ahmed & Co
Chartered Accountants

Dhaka, March 22, 2007
EXECUTIVE DIRECTOR’S DIVISION

INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH, BANGLADESH

STATEMENT OF FINANCIAL POSITION AS AT DECEMBER 31, 2006 (US $ 000) - ABRIDGED

2006  2005

Total Assets  30,701  23,972

Assets  30,701  23,972
Cash and bank  8,616  6,144
Accounts receivable  6,082  3,838
Hospital Endowment Fund Investments  5,739  5,685
Centre Endowment Fund Investments  4,105  3,846
Inventories  474  515
Fixed assets  5,685  3,944

Total Liabilities and Fund Balances  30,701  23,972

Current Liabilities and Provisions  15,099  10,707

Fund Balances  15,602  13,265
Fixed Assets Fund  5,685  3,944
Hospital Endowment Fund  5,739  5,685
Centre Endowment Fund  4,105  3,846
Reserve Fund  2,006  2,004
Operating Fund  (1,933)  (2,214)

STATEMENT OF ACTIVITY (OPERATING FUND) (US$ 000) - ABRIDGED

Income  24,909  19,089
Contributions  23,750  17,811
Contributions from Hospital Endowment Fund -  200
Other items  1,159  1,078

Expenditure  24,698  18,923
Salaries and benefits  13,889  11,893
Supplies and materials  2,268  1,980
Capital expenditure and commitments  2,667  714
Other items  5,874  4,336

Surplus for the year before depreciation  211  166
Depreciation (without effect on Operating Fund)  (925)  (898)
(Deficit) for the year after depreciation  (714)  (732)

STATEMENT OF CASH FLOWS (US$ 000) – ABRIDGED

Cash flows from operating activities  4,890  1,837
Cash used in investing activities  (2,418)  (466)
Cash flow from financing activities -  (102)

Net Increase in cash and cash equivalents  2,472  1,269

Cash and cash equivalents at beginning of the year  6,144  4,875
Cash and cash equivalents at end of the year  8,616  6,144

Executive Director, ICDDR,B  Member, Board of Trustees

Dhaka, March 22 2007

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

S. F. Ahmed & Co.  KPMG
Chartered Accountants

Dhaka, March 22 2007

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## Contributions:

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<thead>
<tr>
<th>Contribution</th>
<th>2006</th>
<th>2005</th>
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<tbody>
<tr>
<td>Australia - AusAID</td>
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<td>247</td>
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<td>Bangladesh</td>
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<td>Canada – CIDA</td>
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<td>International Nutrition Foundation</td>
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<td>Japan-JICWELS &amp; Others</td>
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<td>MGH-Harvard University</td>
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<td>Netherlands</td>
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<td>Switzerland - SDC</td>
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<td>The Johns Hopkins University</td>
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<td>Flood Relief -2004</td>
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<td>Others (net) (b)</td>
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<td><strong>Total Contributions</strong></td>
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<td><strong>17,811</strong></td>
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a) Includes subcontracts from the National Institutes of Health (NIH), USA

b) Contributions in 2006 from “Others” for project funds include: ABT Associates Inc., Belgium Technical Cooperation (BTC), BioScale Inc. USA, CISTEM Biotechnologies GmbH, Concern, Ellison Medical Foundation, FGF - Basel, Foundation for Innovative New Diagnostics (FiND), Health System Trust, Harvest Plus, Institute of Pasture, International Center for Research on Women, International Atomic Energy Agency (IAEA), International Vaccine Institute (IVI), Lunds Universitet - Sweden, Ministry of Health-Bhutan, Napo India Private Limited, Nestec Ltd, Nestlé Foundation, New York University School, Novartis Consumer Health SA, Nutrition Third World, Plan International - Bangladesh, Self Sustaining Units, Siemens - Bangladesh, SpaandanB - USA, Swiss Tropical Institute, Swiss Research Foundation (SRF), The INDEPTH Network, University of Vermont, University of Basel, University of Queensland, UNDP - Bangladesh, United Nations Office for Project Services (UNOPS), Uppsala University, and Board of the Netherlands Foundation for the Advancement of Tropical Research (WORTO).

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**Executive Director, ICDDR,B**

Dhaka, March 22, 2007
In the late 1970s, Ms Rahima Khatun, a nurse, first came to ICDDR, B as part of a volunteer group for the Health Science Exhibition. She has since continued to keep in touch with the Centre and has shown much interest in its activities. In 2005, she came to the Centre to visit a friend. The receptionist noticed this middle-aged, teary-eyed woman barely able to climb the stairs.

It was later found that she is in the advanced stages of leukemia and undergoing chemotherapy. She had learnt of the Hospital Endowment Fund and decided to give away her pension money amounting to US$4,000 to this great cause. We are touched by her gesture and spirit.

Seen in the picture is Ms Rahima Khatun handing over her cheque for US$4,000 to Professor David A. Sack.

Contributors to Hospital Endowment Fund
(In alphabetical order)

Andrew Dannenberg
Anne Elsworth
David and Joanna Sachar
David A. Sack
David Hughart
Denita Wild
Dhaka Hospital Employees Welfare Co-operative Society
Edward T. Ryan
Elizabeth Garcia-Gray
Fouag
Helene G. Martin
ICDDR,B Employees Multipurpose Co-operative Society Ltd.
James Coghlan
Jane Anita Kusin
John Eckstein
Kul Gautam
Marissa Garcia
Nancy Hughart
Nobukatsu Ishikawa
Omidyar Network Services
Phyllis Hurley
Post Factory
Rahima Khatun
Raj Bte. Abdul Karim
Real Estate & Housing Association of Bangladesh
Riccardo Russo
Robert C. Terry
Rory Turner
Sheila Ryan
Sirajul Islam
Stewart Simonson
Terence H. Hull
Timothy G. Evans

External Relations and Institutional Development Department
Head: Ishfaq A. Zaman

The primary task of the External Relations and Institutional Development (ERID) Department is to generate resources for implementing the planned activities of ICDDR,B. The Department also assists the Centre’s Executive Director in his negotiations with the donors. It orchestrates communication for ICDDR,B with the Development Partners, Government of Bangladesh, NGOs, business community, and different institutions throughout the world to raise the profile of and the funding for, the Centre. The Department continued to lead the efforts for the growth of the Centre’s Endowment Fund and the ICDDR,B Hospital Endowment Fund campaigns.

Major highlights of 2006

Inclusion of ICDDR,B in 3 operational plans under HNPSP pool-financing

The Government of Bangladesh and the Development Partners have undertaken a new sector approach to health, nutrition, and population and have spelled out a Strategic Investment Plan for this sector. Under the pool-financing mechanism, the concurrence of the Government of Bangladesh is needed to release these targeted Health, Nutrition, Population Sector Programme (HNPSP) funds. There are 38 Operational Plans under the HNPSP, and donor funding to this sector will be coordinated through 38 Operational Plans over the next 5 years. During 2006, ICDDR,B was included in 3 such Operational Plans under the HNPSP pool-financing till 2010.

Securing bilateral funds from the Development Partners

For ICDDR,B to secure bilateral funds, the approval of the Government of Bangladesh and that of the donor agency is required. During 2006, negotiations continued for a collaborative 5-year research project with National Institute of Population Research and Training of the Ministry of Health and Family Welfare (MoHFW) of the Government of Bangladesh. NIPORT is the primary institution responsible for any research initiatives from the Government side.
ICDDR,B secured multi-year funding for the Improved Health for the Poor (IHP) project using bilateral funds. As the Project Director’s Office of this major grant, the monitoring of this project is currently being undertaken by the ERID Department.

**Capital development funds**

In 2006, the ERID initiated contacts with the Government of Bangladesh to access capital development funds available through the HNPSP’s pool financing mechanism to construct an additional 5 floors of the current main building of ICDDR,B thus completing the building which was started in 1981. The Government of Bangladesh has provided an initial amount of Tk 5 crore, with an anticipated additional funding.

**Increase in core grants**

The Department for International Development, UK, increased its annual and designated contribution to ICDDR,B by signing a new 5-year grant from 1 July 2006. The annual core contribution now stands at 1.5 million pound per year—an increase of half a million pound over previous years. Similarly, the Swedish Government announced an increase in core funds to the Centre amounting to US$812,00 in 2006.

**CAPGAN meet**

The ERID Department appealed to the Development Partners for funds so that ICDDR,B could host the 8th Commonwealth Congress on Diarrhoea and Malnutrition (CCDM) of CAPGAN, and this was successfully held in Dhaka in February 2006.

**Communication**

- **New tagline and logo:** The ERID Office worked with the Communications Unit to disseminate the new tagline of the Centre ‘Knowledge for Global Lifesaving Solutions’.
- **Time magazine coverage:** The Centre was featured in the cover page of the prestigious *Time* magazine in its 16 October 2006 issue. This led to a worldwide media coverage of the Centre’s good work that has saved the lives of over 40 million children with its effective discovery of oral rehydration solution (ORS).
- **Goodwill ambassador:** Internationally-acclaimed master chef Mr. Tommy Miah was made the Goodwill Ambassador of ICDDR,B in September. Mr. Tommy will work to
promote ICDDR,B's products in Bangladesh and in the UK.

**Book launching:** Mr. Tommy Miah launched his latest book titled *Healthy Recipes* in Dhaka at a press conference organized by ICDDR,B. Proceeds from this book will be donated to support the humanitarian work of ICDDR,B. A number of dignitaries, diplomats, members of the Development Partners group, senior civil servants, NGO leaders, members of the business community, print and electronic media, and a host of friends of ICDDR,B were present on the occasion.

**Lunch’n’learn: promoting use of vitamin A:** ICDDR,B and Mr. Tommy Miah organized a lunch’n’learn event on ‘Preparing vitamin A-enriched foods’ at ICDDR,B. The celebrity chef joined his hands with ICDDR,B to demonstrate how a nutritionally-correct vitamin A-enriched food can be produced for children at a very affordable price. Tommy used green-leafy vegetables, such as spinach, carrot, pumpkin, and small fish to prepare dish for the audience and the patients at the Dhaka Hospital of the Centre.

Later, Mr. Tommy Miah visited ICDDR,B’s *Projahnmo* project in Sylhet—a community-based intervention to reduce neonatal mortality in Bangladesh. *Projahnmo* is implemented by ICDDR,B in partnership with local and international organizations. The visit of Mr. Tommy Miah, who grew up in Sylhet, was well-covered in the local media and subsequently by the British media as well.

**Event in the UK:** Facilitated by Mr. Tommy Miah, ICDDR,B and the Trustees of the International Health Solutions Trust, UK, jointly sponsored a reception in November at Sonargaon Restaurant in London’s Aldgate neighbourhood to raise awareness about the international outreach of ICDDR,B’s work. The dinner featured His Excellency Mr. Sabihuddin Ahmed, Bangladesh’s High Commissioner in the UK. About 250 dignitaries attended the dinner. A press conference was organized which was attended by over 50 journalists from various electronic and print media.

**Dissemination**

The Head of ERID Department accompanied the Centre’s Executive Director during his visit to Japan at the invitation of the Japanese scientists to attend an international seminar in Nagasaki, Japan. At the concluding day of this two-day seminar, ICDDR,B organized a meeting of the ‘Friends of ICDDR,B in Japan’, which was attended by the well-wishers of ICDDR,B.

**Grants monitoring**

The Grants Management Office in the ERID Department began the process of handing over the task to the newly-formed Research and Project Support Department (RPSD). This involved training up the new recruits in the RPSD and to liaise with the General Counsel’s Office (previously known as Grants and Contracts Administration) and the Finance Department to ensure that these new offices will be equipped to ensure that the terms and conditions of grants entered by ICDDR,B lead to fair partnerships.

**Meeting of the core donors**

In September, the Centre’s core donors met to discuss how to provide the Centre with support under a pool-funding arrangement. Representatives of AusAID, Sida, CIDA, DFID, The Netherlands, and SDC took part in the meeting.

**Meeting with the donors at ERD**

The Centre’s Trustee and Secretary, Economic Relations Division, organized a meeting in August where members of the local donor group were invited to a presentation by the Centre’s Executive Director Professor David A. Sack. In his presentation, Prof. Sack highlighted the work of the Centre that can be useful in promoting the health sector in Bangladesh. While acknowledging the research, training, and service activities of ICDDR,B, the ERD Secretary termed his secretariat as a strategic partner of the Government of Bangladesh and called upon the donor community to find ways to provide unrestricted support to ICDDR,B from bilateral pool-funding.

**Development Partners Group Meetings**

To ensure open lines of communication with the Development Partners and to provide an opportunity for ICDDR,B to present its programme, meetings of the Development Partners Group (DPG) were held in June and December.

The meetings provided opportunities for the DPG to interact with senior members of the management team, scientists, and Trustees of ICDDR,B. Dr. Iyorlumun Uhao of UNICEF Bangladesh was the Chairperson of the DPG.

**Visitors to ICDDR,B**

A number of dignitaries who visited ICDDR,B in 2006 included policy-makers, ambassadors, researchers, health professionals, and many others. In February, the ERID Department organized a separate trip to Matlab for the Dutch Minister for Development Cooperation. The trip led to the announcement by the Dutch Minister
to provide an additional 1 million euro as core support to ICDDR,B following ICDDR,B’s decision to withdraw from the USAID’s Mexico City Policy on abortion.

Dignitaries who visited the Centre in 2006 included: Dr. Khandaker Mosharraf Hossain, Hon’ble Minister for Health and Family Welfare (MoHFW) and Mr. Abdullah Al-Noman, Hon’ble Minister for Fisheries and Livestock, Government of Bangladesh; His Excellency Mr. Douglas Foskett, High Commissioner, Australian High Commission in Bangladesh; H.E. Ms Barbara Richardson, Canadian High Commissioner in Bangladesh; H.E. Mr Masayuki Inoue, Ambassador of Japan to Bangladesh; H.E. Ms Patricia A Butenis, U.S. Ambassador to Bangladesh; H.E. Ms Britt Hagstrom, Swedish Ambassador to Bangladesh; H.E. Mr. Einer Hebogaard Jensen, Danish Ambassador to Bangladesh; Mr. Gene George, Mission Director, USAID Bangladesh; and many others.

Communications Unit
Head: Henry Richards

The Communications Unit (CU) was established in July 2006 to assist all ICDDR,B employees in disseminating the research findings of the Centre.
Branding development, launching, and implementation

The Communications Unit spent much of 2006 managing the branding process. This included ongoing meetings and correspondence with the branding designers, launching the new logo and tagline internally and publicly in September, and carrying out branding training for selected branding representatives throughout the Centre.

A Branding Resources section has been established on the Centre’s Intranet site, which includes a Branding Toolkit and various other templates and resources to assist staff in adhering to the branding. This process also included applying new branding to Centre signs, cars, employee ID cards, vacancy announcements, clothing, stationery and internal documents, and some publications, such as the Strategic Plan.

New Centre brochure

The Communications Unit, working in conjunction with ERID, created a new general brochure on the Centre. This brochure gives an overview of the Centre while also presenting it in accordance with the new branding guidelines, presenting ICDDR,B as an internationally significant public-health organization and highlighting the new tagline ‘Knowledge for Global Lifesaving Solutions’. The brochure was distributed at various fundraising events throughout the year. In addition, the Unit worked in collaboration with the ERID office on various fundraising projects and public events.

Photo shoot

One major undertaking of the CU was to arrange a photo shoot of the Centre’s facilities and personnel using a freelance photographer hired from the Map Photo Agency in Dhaka. This library of over 1,000 high-quality photos of professional standard includes photos of the ICDDR,B hospitals, laboratories at Matlab and sub-centres, rural shots from the Matlab Surveillance System area, and staff portraits suitable for use in many publications and brochures the Centre produces. A plan is in place to make this database of photos, combined with the photos the AVU archive has in its archives, available in a searchable low-resolution format for all the employees of the Centre.

General Counsel’s Office
General Counsel: Michael Behan

New contracts and agreements

During 2006, ICDDR,B signed 78 research agreements, including 45 with foreign universities and research institutions, 11 with local NGOs providing service components to our research initiatives, 8 with international organizations and donor agencies, 9 with UN agencies, and 5 with the Government of Bangladesh. The Centre also signed 37 modifications (providing increased funding under existing agreements), 17 consultancy agreements, 3 confidentiality agreements, and 6 Memoranda of Understanding (MOU) for collaborative research work during this period. These include the following accomplishments:

- **Clinical research**: Clinical research agreements were signed with NAPO Pharmaceutical, Inc., USA; Novartis Consumer Health SA, Switzerland; Institute for OneWorld Health, USA; Nestlé Research Centre, Switzerland; and The Nestlé Foundation, Switzerland
- **Nutrition**: Signed a grant award with the World Bank for the Mainstreaming Nutrition Programme
- **Infectious diseases**: An MOU was signed with the Department of Health and Human Services of the US Government to improve preparedness and response to infectious diseases, with particular regard to influenza and other respiratory diseases

Her Excellency Ms Patricia A. Butenis, US Ambassador to Bangladesh, among others, in the signing ceremony of a Memorandum of Understanding between ICDDR,B and the US Department of Health and Human Services

- **Goodwill Ambassador**: An MOU was signed with celebrity chef Tommy Miah as ICDDR,B’s first Goodwill Ambassador
- **Zinc study**: An agreement was signed with Dhansiri Media Production House, Dhaka, and Bitopi Advertising Ltd., Dhaka, for the promotional campaign for Baby Zinc
EXECUTIVE DIRECTOR’S DIVISION

- HIV/AIDS: An agreement was signed with a health insurer (GMC Henner based in Paris, France) to provide VCT services on HIV/AIDS for its foreign insured members living in Bangladesh.

- A Directors and Officers Liability Policy was signed with Green Delta Insurance Company Limited, Dhaka.

Research and Project Support Department
Coordinator: A.H. Helal

The Research and Project Support Department (RPSD) started functioning on 1 July. The Centre has over 100 ongoing research protocols and studies and about 55 project donors, encompassing various disciplines and themes. Facilitation of these projects was previously accomplished through multiple offices. This new department, under the guidance of the Deputy Executive Director, is providing overall support to Principal Investigators (PIs) for initiating, approving, monitoring, and organizing dissemination of the scientific work of the Centre. The Department brings together project facilitation functions under one umbrella and provides ‘one-stop service’ for the PIs and the Centre management.

The mandate of RPSD is to increase efficiency in protocol management through monitoring protocol development, implementation, policy compliances, and timely completion of study reports. The improved coordination of projects from their inception to final reports should make the work of the Centre more efficient. The RPSD will help the Centre keep on track towards its goals as defined in the Centre’s Strategic Plan and the Millennium Development Goals.

Major responsibilities of the RPSD
- Act as the Secretariat for the Research Review Committee (RRC), Ethical Review Committee (ERC), and the Animal Ethics Experimentation Committee
- Monitor and track progress of all ongoing research projects
- Perform the functions of grant management and monitor expenditure trends and budget performance of the ongoing protocols
- Facilitate national-level dissemination seminars, workshops, meetings, etc. and archive study reports
- Update and maintain Project Module in the unified management information system (Suchona).

Status of ongoing protocols

As of 31 December 2006, 117 protocols were ongoing. Of them, 38 were under PHSD; 37 under LSD; 26 under CSD, and 16 under HSID (Fig. 4).

According to the budgets that are attached to the RRC/ERC-approved protocols, the total amount of fund for these protocols was US$33.40 million (Fig. 5).

The distribution of ongoing protocols by thematic areas are presented in Table. Some of the protocols fall under several thematic areas, thus, the total exceeds 117.
Committees 2006

Programme Coordination Committee
Chairperson: Professor M.A. Matin

The Programme Coordination Committee (PCC) is mandated to strengthen coordination between ICDDR,B and the national health institutions through capacity-building for collaborative research. The Committee is composed of members with representatives from the Centre, Ministry of Health and Family Welfare, Government of the People's Republic of Bangladesh, universities, and non-government organizations involved in health, nutrition, education, population studies, health and family planning systems, poverty and health, HIV/AIDS, and development programmes.

Research Review Committee

The Research Review Committee (RRC) undertook critical review of all protocols and proposals that are being implemented under the auspices of the Centre to ensure their technical and scientific soundness and the dignity, rights, safety, and well-beings of potential study participants.

The RRC met 13 times in 2006. After screening and review with the Divisions, 51 research protocols were forwarded to the RRC, of which 48 were accorded approval after satisfactory addressing of the issues raised by the Committee. Moreover, approval was accorded to another two research protocols through an expedited review mechanism.

Of these approved protocols, 29 have started implementation after getting approval from the ERC and donors.

An additional 25 proposals, sent for addenda and modifications, were approved. Approval was also accorded to 4 proposals for addendum to, and modifications of, already-approved research protocols involving minimal risk to the study participants, through an expedited review mechanism.

Change in membership: Dr. G.H. Rabbani, a rotational member of the Committee retired after one year of service, and Dr. Ruchira Tabassum Naved joined to replace him. Dr. Elizabeth Oliveras, an Operations Research Scientist, Health Systems and Infectious Diseases Division of the Centre, joined the Committee as a member. Two more members from outside the Centre: Dr. Brajesh Panth from Asian Development Bank and Professor Hamida Akhter Begum from University of Dhaka joined the Committee in their individual capacity.

Ethical Review Committee

The Ethical Review Committee (ERC), in 2006, considered 48 research protocols, 44 of them received approval after satisfactorily addressing the issues raised by the Committee. Twenty-two proposals for addendum to, and modification of, already-approved protocols were also considered. All of them were approved after satisfactorily addressing the issues raised by the Committee.

Approval was also accorded to 3 research protocols and 4 already-approved research protocols were received with proposals for addendum, and modifications; approval was accorded all of them through an expedited review mechanism.

In reviewing the research protocols and proposals for addendum to, and modification of, the already-approved research protocols, the Committee followed the ethical principles laid down in the ERC guidelines and made risk/benefit analysis of the protocols. The protocols were approved after ensuring the safety, rights, and well-beings of potential participants.

The ERC obtained yearly reports of ongoing research protocols to monitor their implementation and to know whether there was any adverse events (AEs) or serious adverse events (SAEs) that could warrant the change in the Committee’s decisions on these research protocols. Annual review revealed that all protocols were conducted following the ‘Principles of Good Research Practice’ and as per the ERC-approved research protocols. No SAEs occurred in any of these research protocols, which could warrant the change in the Committee’s decision on them.

<table>
<thead>
<tr>
<th>Thematic area</th>
<th>Number of protocols</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrition</td>
<td>24</td>
</tr>
<tr>
<td>Population Dynamics</td>
<td>5</td>
</tr>
<tr>
<td>Reproductive Health</td>
<td>21</td>
</tr>
<tr>
<td>Vaccine evaluation</td>
<td>8</td>
</tr>
<tr>
<td>Environmental Health</td>
<td>13</td>
</tr>
<tr>
<td>Health Services</td>
<td>23</td>
</tr>
<tr>
<td>Child Health</td>
<td>44</td>
</tr>
<tr>
<td>Clinical Case Management</td>
<td>22</td>
</tr>
<tr>
<td>Social and Behavioural Sciences</td>
<td>24</td>
</tr>
<tr>
<td>Emerging and Re-emerging Infectious Diseases</td>
<td>45</td>
</tr>
<tr>
<td>HIV/AIDS</td>
<td>13</td>
</tr>
</tbody>
</table>

Table. Distribution of ongoing protocols by thematic area
In 2006, the ERC constituted three Data and Safety Monitoring Boards (DSMBs) for overseeing the implementation of the research protocols.

All the DSMBs periodically evaluated the accumulated study data for participants’ safety and oversaw conducting and progress of the study, and when appropriate, examined the efficacy; The DSMBs also made recommendations to the ERC concerning the continuation, modification, or termination of the trial. The boards considered study-specific data and relevant background documents and basic knowledge about the disease, test-agents, or patient population under study.

Literature/documents relating to bioethics were circulated to the members to update them in the field.

**Change in membership:** Professor A.K.M. Nurul Anwar (individual capacity) as Chairman and Mrs. Rabia Khatun, as a member retired after completing their 6-year terms. As no suitable candidate was found in the field of pharmacology, Professor Anwar accepted the membership of the Committee again while Mr. Mohammad Ullah, Nurse Manager, joined the Committee to replace Mrs. Rabia Khatun. Professor Md. Abdul Baqi, Professor of Islamic Studies, University of Dhaka, also joined the Committee to fill up a vacant position of the theology discipline.

**Animal Experimentation Ethics Committee**

The Animal Experimentation Ethics Committee (AEEC) met once in 2006 and reviewed two research protocols and reviewed and finalized a chapter of the manual for care and use of laboratory animals titled “Non-human Primate Macaca Mulatta”. The Committee also reviewed the progress of ongoing research protocols involving research animals and observed that the protocols were being implemented as approved by the Committee.

**Staff Welfare Association**

President: Md. Golam Mostafa

A new Executive Committee of the Centre’s Staff Welfare Association (SWA) was elected in December 2005. The Installation Ceremony of the new Executive Committee was held on 19 January 2006 in the Sasakawa International Auditorium where the newly-elected office-bearers of the Association were sworn in. The oath-taking of the new SWA executives was conducted by Professor David A. Sack, Executive Director of ICDDR,B and Patron-in-Chief of the Association. The ceremony concluded with a cultural programme and refreshments. Another ceremony was held at Matlab on 26 January 2006.

Immediately after the election, the SWA executives organized a picnic on 25 February at the Bhawal National Park, Gazipur. Nearly 800 people, including staff members, spouses, and children, attended the picnic, had lunch, fun, and games. A cultural programme was also enjoyed with a folk group playing traditional music. The Association organized an inter-division cricket tournament and indoor games for both male and female staff, observed the Independence Day 2006 by hoisting the Flag of Bangladesh at the Dhaka campus of ICDDR,B in presence of senior SWA executives and a group of staff.
members with Executive Director of ICDDR,B and SWA President. The Association also observed the Victory Day 2006, and the Bangla New Year 1413. In October, during the Annual General meeting, the Association distributed prizes among participants in cricket and indoor games. SWA distributed educational stipends to 10 dependants of low-paid employees.

**Institutional Collaborations 2006**

**International**

- Action Research and Training for Health, India
- Armed Forces Research Institute of Medical Sciences, Thailand
- Aga Khan University, Pakistan
- Australian National University
- Bill and Melinda Gates Foundation, USA
- Centers for Disease Control and Prevention, USA
- Columbia University, USA
- Consortium for Conservation Medicine, USA
- Cornell University, USA
- Department for International Development, UK
- Department of Cellular Microbiology, MaxPlanck, Germany
- Emory University, USA
- Family Health International, Thailand
- Global Forum for Health Research, Switzerland
- Harvard Medical School, USA
- Ministry of Health, His Majesty’s Government, Nepal
- INDEPTH, Ghana
- Institute for Infection Biology, Germany
- Institute for Tropical Medicine, Belgium
- Institute of Child Health, UK
- Institut Pasteur, France
- International Child Health Foundation, USA
- International Office of Migration, USA
- International Zinc Task Force
- Japan Health Sciences Foundation
- School of Public Health, Johns Hopkins University, USA
- Karolinska Institute, Sweden
- Kenya Medical Research Institute
- Kyoto University, Japan
- London School of Hygiene & Tropical Medicine, UK
- Lucas Hospital, The Netherlands
- Mahidol University, Thailand
- Massachusetts General Hospital, USA
- Michigan State University, USA
- National Centre for Plant Genome Research, Jawharlal Nehru University, India
- National Institute of Cholera and Enteric Diseases, India
- National Institute of Immunology, India
- National Institute of Infectious Diseases, Japan
- National Institute of Public Health, Mexico
- National Institutes of Health, USA
- National Vaccine Program Office, USA
- Netherlands Interdisciplinary Demographic Institute
- New England Medical Center, USA
- New York University, USA
- Nutriset-France
- Osaka Prefecture University, Japan
- Pathfinder
- Plan International
- Population Council
- PRISMA, Peru
- Public Health Nutrition Unit, London School of Hygiene & Tropical Medicine, UK
- School of Hygiene and Public Health, Johns Hopkins University, USA
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Swedish International Development Agency
Thrasher Research Fund, USA
Tuberculosis Research Centre, India
University of California at Berkley, USA
University of California at Davis, USA
University of Colorado at Boulder, USA
University of Edinburgh, UK
University of Göteborg, Sweden
University of Leuven, Belgium
University of Maryland Biotechnology Institute, USA
University of Maryland, USA
University of Michigan, USA
University of Newcastle upon Tyne, UK
University of Texas, USA
University of Tokyo, Japan
University of Umea, Sweden
University of Virginia, USA
University Research Co., LLC, USA
Uppsala University, Sweden
World Bank
World Health Organization

Bangladesh Center for Communication Programs
Bangladesh Health Equity Watch
Bangladesh Institute of Development Studies
Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders
Bangladesh Population and Health Consortium
Bangladesh Women’s Health Coalition
Bangladesh Livestock Research Institute
Bogra Medical College Hospital
BRAC
BRAC University
CARE Bangladesh
Central Drug Treatment and Rehabilitation Centre
Central Skin and Social Hygiene Centre, Chittagong
Chittagong Maa-Shishu O General Hospital
Chittagong Medical College Hospital
Concern Bangladesh
Department for International Development, Dhaka
Department of Public Health Engineering
Dhaka City Corporation
Dhaka Medical College Hospital
Dhaka Shishu (Children’s) Hospital
Directorate General of Health Services, Government of Bangladesh
Directorate of Family Planning, Government of Bangladesh
Durjoy Nari Sangha
EngenderHealth
EPI Headquarters
Family Health International
Family Planning Association of Bangladesh
Faridpur Medical College Hospital
Field Laboratory at Refugee Camp in Chittagong Hill Tracts

National

ACME Pharmaceuticals Ltd.
American International School, Dhaka
APOSH, Rajshahi
AusAID, Australian High Commission
Bandhu Social Welfare Society
Bangabandhu Sheikh Mujib Medical University
Bangladesh Agricultural University
Bangladesh Association for Voluntary Sterilization
Bangladesh Bureau of Statistics
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Gono Shasthya Kendra
Government Sadar Hospitals—Manikgonj, Rajbari, Meherpur, Naogaon, Joydebpur, and Tangail
Health Economics Unit, Ministry of Health and Family Welfare, Government of Bangladesh
Home Economics College
Independent University, Bangladesh
Inspectorate General of Prisons, Government of Bangladesh
Institute of Child and Mother Health
Institute of Child Health and Shishu Hospital
Institute of Diseases of Chest and Hospital
Institute of Epidemiology, Disease Control and Research
Institute of Health Economics, University of Dhaka
Institute of Nutrition and Food Science, University of Dhaka
Jagrata Jubo Sangha
JSI Deliver
Khulna Medical College Hospital
Kumudini Hospital
Lamb Hospital, Dinajpur
Mahila Mukti Sangha
Marie Stopes Clinic Society
Ministry of Health and Family Welfare, Government of Bangladesh
Ministry of Industries, Government of Bangladesh
Mukti Lawrence Foundation
Mymensingh Medical College Hospital
Nari Moitree
Nari Mukti Sangha
National Institute of Population Research and Training
National Institute of Preventive and Social Medicine
National Nutrition Project
National Tuberculosis Control Programme
NGO Service Delivery Program
North South University
NOVA Medical Centre
Obstetric and Gynecological Society of Bangladesh
Paricharja
Partners in Health and Development
Popular Diagnostics
PROCHESTA, Dhaka
Radda MCH-FP Centre
Rajshahi Medical College Hospital
Rangpur Medical College Hospital
RTM International
Salvation Army
Save the Children-Australia
Save the Children-USA
Saving Newborn Lives Initiative
SHIMANTIK, Sylhet
Shishu Shastha Foundation Hospital
Shisuk, Monowara Hospital
Sir Salimullah Medical College
Social Marketing Company
Square Pharmaceuticals
SRISTI
Sustha Jibon, Bandhan Hijra Sangha
Sylhet MAG Osmani Medical College Hospital
Tuber Crops Research Centre, Bangladesh Agricultural Research Institute
United Nations Children’s Fund
United Nations Population Fund
United States Agency for International Development
University of Dhaka
Urban Primary Health Care Project, Progoti Samaj Kallyan Protishthan
World Vision Bangladesh
A. Internal Publication Series


Scientific Reports

2. Bhuiya A, Hanifi SMA, Mahmood SS. Chakaria health and demographic surveillance system: focusing on the poor and vulnerable; socioeconomic, health and demographic profile, 1999-2000. 56 p. (Scientific report no. 94)

Special Publications


Journal and Newsletters

4. Shasthya Sanglap V. 14, no. 3, 1412; V. 15, no. 1, 1413
5. SUZY News V. 3, no.1, 2006
6. MotherNewBorNews V.1, no.1, 2005*

B. Original papers, including review articles and short reports, in journals


* Not listed in previous annual reports


46. Hill K, Arifeen SE, Koenig M, Al-Sabir A, Jamil K, Ragers H. How should we measure maternal mortality in the...
47. Islam A, Rahman A. Growth and development of information and communication technologies in Bangladesh. Electr Libr 2006 Apr;24(2):135-46


50. Islam MA, Heuvelink AE, Talukder KA, de Boer E. Immunoconcentration of Shiga toxin-producing Escherichia coli O157 from animal faeces and raw meats by using Dynabeads anti-E. coli O157 and the VIDAS system. Inter J Food Microbiol 2006 May;109(1-2):151-6


63. Khatun J, Roy NC. Missed opportunities for reproductive and child health services of clients in urban NGO clinics of Bangladesh. Matern Child Health J 2006 Nov;10(6):563-70


93. Nasreen T, Gomes DJ, Rahman M. Detection of *Haemophilus influenzae* type b and *Streptococcus pneumoniae* in culture-negative cerebrospinal fluids of patients with meningitis by multiplex polymerase chain reaction strategy. Bangladesh J Med Sci 2005 Sep;11(2):116-20*


C. Book chapters, papers in conference proceedings, and monographs


6. Mahmood SAI. Dengue: an epidemic is largely a failure in public health administration! The role of Dhaka City Corporation, DCC of Bangladesh. World Health Popul 2006 Jan;1:1-10


D. Letters, editorials, and abstracts in journals


