ANNUAL REPORT 2005
PREFACE

This twenty-seventh Annual Report of ICDDR,B documents many aspects of the Centre’s activities during 2005, 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. A list of ongoing protocols during 2005 with the names of principal investigators and funding agencies has been included to identify and recognize the involvement of scientists in their work.

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 2005 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 director@icddrb.org.
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BOARD OF TRUSTEES 2005

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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
Development Partners Group  

Board of Trustees  

Executive Director  

Mandatory Committees  

Deputy Executive Director  

Clinical Sciences Division  

Health Systems and Infectious Diseases Division  

Laboratory Sciences Division  

Public Health Sciences Division  

Information Sciences Division  

Executive Director's Division
The year 2005 was highlighted by many accomplishments and some turning points. These included several noteworthy publications which testify to the productivity of the Centre, honours for our scientists, international conferences which will guide the use of zinc in the future, increased partnership with the Government of Bangladesh, including key studies on emerging infections, a large grant through the Ministry of Health and Family Welfare to “Improve Health for the Poor” and the first graduating class from the BRAC University James P. Grant School of Public Health (a joint initiative with ICDDR,B). Also, a key decision by our Board of Trustees in November to withdraw from certification from certain policies of USAID will result in the cessation of our cooperative agreement with USAID/Dhaka. Finally, the year was highlighted by a visit from Bill and Melinda Gates, who stopped in Dhaka on the first leg of their recent Asian trip to see our Kamalapur field area, the Centre’s hospital and labs. I’ll attempt to highlight each of these in this report.

Board of Trustees

Under the leadership of Professor Terrance H. Hull as Chairperson, the Board held two meetings during 2005. Several new members joined the Board during the year, including Mr. Abu Md. Maniruzzaman Khan, Secretary of the Ministry of Health and Family Welfare of the Government of Bangladesh, Dr. A.Z.M. Zahid Hossain, from Bangladesh, Dr. Mary Ann Lansang from the Philippines, Dr. Suttilak Smitasiri from Thailand, Dr. José Ignacio Santos Preciado from Mexico, Professor Peter Tagwell from Canada, and Dr. Timothy Evans, Assistant Director General of the World Health Organization. Board members who completed their terms included Professor A.K. Azad Khan from Bangladesh and Professor N.K. Ganguly from India.

Prior to the June meeting, the Board organized an external review of the Information Sciences Division where they prepared several recommendations, including the importance of increasing the digital environment at the Centre and insuring that all staff had access to, and were using, computers. External reviews are a regular function of the Board and generally such a review is carried out with one of the divisions each year. In recent years, the Laboratory Sciences Division (2002) and the Clinical Sciences Division (2003) were reviewed. Findings from the reviews are incorporated into the plans and developments of the Centre.

An important policy issue examined during the November meeting concerned certifications required by certain donors. The specific certifications under discussion were those required by the United States Agency for International Development (USAID) called the Mexico City Certification (MCP) and the Trafficking Certification. The first requires that all non-governmental, non-US organizations receiving USAID population funds must certify that they do not perform or promote abortion as a method of family planning (regardless of the source of the funds). Since ICDDR,B does not provide abortions, the Centre has been certifying to the MCP. In Bangladesh, however, in the United States, early abortion is legal. In Bangladesh, this procedure is referred to as menstrual regulation (MR) and is differentiated from later abortions, which are not legal in this country. The MCP certification forbids the Centre or its staff from advising policy-makers regarding...
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national policies, restricts the Centre from working with non-governmental organizations that provide healthcare services following the national MR policies, restricts our community health workers from informing their clients of MR services that are available through Ministry of Health and Family Welfare, and also restricts the Centre’s research on reducing the burden from unsafe abortions.

The Trafficking Policy, which applies to the funds for HIV/AIDS activities, requires the Centre to have a policy against the legalization of prostitution. Since the Centre’s HIV and STI research protocols work with sex workers, and our Centre is interested in the well-being of all the persons with whom we work, this policy was also seen as problematic for the Centre.

After examining these certifications, the Board decided that, in the future, the Centre should not “enter into any contracts containing provisions that conflict with the Centre’s Mission or standing under the Ordinance, including provisions that restrict the scope or conduct of scientific research or the application of Best Practice clinical services.” As a result of this resolution made at the November meeting, the Centre will no longer be certifying to the MCP or Trafficking Certifications as of 1 July 2006. While this decision was a matter of principle for the Board, it also has very real practical implications. The Centre will no longer have support through a cooperative agreement with USAID/Dhaka; thus, there is a significant financial loss in revenue. This decision signals the end to support from USAID/Dhaka, which has been continuous since 1971.

While this decision affects the funding through USAID/Dhaka, we anticipate that the Centre will continue to receive funding from the US Government through grants from the National Institutes of Health (NIH), the Centers for Disease Control and Prevention (CDC) as well as USAID-supported projects through subcontracts with other partners on projects that do not require these certifications. However, the reduction of revenue from USAID/Dhaka (estimated to be about US$2.5 million annually) will have a major impact on the Centre’s planning and programme. We hope that increased donations from other development partners will help offset this funding gap in the coming years.

Changes in Leadership at the Centre

Professor Alejandro Cravioto joined the Centre as Deputy Executive Director in July 2005. He comes from Mexico City where he was the Dean of the Faculty of Medicine at the Nacional Autónoma de México in Mexico City for eight years. Professor Cravioto is internationally known for his research work in pathogenic Escherichia coli, but he also brings broad experience in public health and administration. He is primarily overseeing and guiding and monitoring the research activities of the Centre.

Dr. Lars Henning joined the Centre in September on secondment from the Swiss Tropical Institute. With a background in HIV/AIDS and an interest in infectious diseases, he is working in the Clinical Sciences Division. Eric Nelson from Tufts University joined the Centre in September through an arrangement with the Fogarty Foundation and Harvard University. He is working in the Immunology Laboratory in the Laboratory Sciences Division. Eban Kenah, a statistician from Harvard University, was recruited jointly by ICDDR,B and BRAC University. He is especially interested in research on computer models of infectious diseases. Adrian Cameron, public health researcher and biostatistician, joined the Centre as an Australian Youth Ambassador for one year, mainly based in the Training and Education Unit of the Information Sciences Division.

Two international scientists left the Centre during the year. Dr. Lauren Blum, an anthropologist
and social scientist who was based in the Public Health Sciences Division, moved to Kinshasa, Congo, after working at the Centre for five years. Dr. Beena Vargheese, a health economist in the Health Systems and Infectious Diseases Division, left the Centre after completing her contract. Both continue to work with the Centre as consultants on specific projects. Ms Hannah Lemon, Senior Associate, ERID Office, left the Centre in March.

The Centre is very proud that the Third World Academy of Sciences (TWAS) has recently announced Dr. Shah M. Faruque, Head of the Molecular Genetics Laboratory at the Centre as the recipient of the 2005 TWAS Prize in Medical Research. The ‘TWAS Prize’ is awarded to individual scientists in recognition of outstanding contributions to knowledge in different fields of science. Dr. Faruque’s research has contributed to our understanding of natural mechanisms associated with the emergence of bacterial pathogens, especially *Vibrio cholerae*. Dr. Faruque and his co-workers have published a series of papers in eminent journals describing the molecular analysis of *V. cholerae* and the basis for the origination of new *V. cholerae* strains with epidemic potential. Especially revealing was their studies elucidating a new understanding of the self-limiting nature of cholera epidemics—a phenomenon associated with the occurrence of environmental cholera phages. Faruque and colleagues have shown that certain cholera phages kill the vibrio and that when the balance of phage and bacteria tips in favour of the phage, there is a dramatic decline in numbers of bacteria to a point where they are no longer able to sustain the epidemic. Dr. Faruque collaborates with investigators in different countries, including the USA, India, Sweden, Japan, and the UK.

The first class of 25 MPH students started their one-year course in February 2005. This new school is a joint initiative of BRAC and ICDDR,B with considerable faculty support from Columbia University, Harvard University, London School of Hygiene & Tropical Medicine, Uppsala University, Johns Hopkins University, and University of Amsterdam. Students in the first class came from Bangladesh, Afghanistan, India, Kenya, Nepal, Pakistan, The Philippines, Uganda, and the USA. The new school is truly unique and will train a new generation of health leaders for Bangladesh and other countries in Asia and Africa. It uses the best curricula and faculty from western countries, along with the field and intellectual resources of BRAC and the ICDDR,B to create an environment most appropriate to learn public health relevant to developing countries.

The Centre frequently hosts distinguished visitors, including heads of state, royalty, ambassadors, and other dignitaries. Rarely, however, do we host a couple whose efforts and generosity have truly changed the nature of international health programmes and health research to benefit people living in developing countries. Melinda and Bill Gates visited the Centre on 5 December as a first stop on their trip to South Asia. Immediately after landing at Zia International Airport from Seattle, they were taken to Kamalapur to see, first hand, the projects on pneumonia, including a zinc intervention trial in this urban slum. They then visited the Centre where Melinda helped administer ORS to a child who was rapidly recovering from dehydration, and they were impressed by the large numbers of severely-ill patients, many with cholera, who were being treated so...
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Bill and Melinda Gates in the Dhaka hospital efficiently. Later, over lunch of rice and curry, they had a chance to gain an overview of the Centre’s work using a PowerPoint presentation (which worked perfectly and needed no assistance from Mr. Gates!) with the Scientific Council. After lunch, they proceeded to visit the Prime Minister in her office. Overall, and with tight security, this was a day to be remembered. Photos on their ICDDR,B visit were published in Time Magazine when they were selected as “Persons of the Year” three weeks later.

Gender Equality

Gender issues continue to be central to the mission of the Centre. During the year, persons have been designated as gender focal points in one division and field site to insure that all staff members have access to resources to deal with gender issues. This is a pilot project that will be evaluated in 6 months and, if successful, will be implemented across the Centre. The gender policy is important, not only to our staff but also to our patients and to our research. All protocols are reviewed from a gender perspective, and this ‘gender lens’ enhances the overall scientific validity of the research. Sometimes, this perspective leads to unexpected but important findings, such as differential risks for specific infectious diseases, as well as new understandings on their control.

Hospital Services

People in Bangladesh still know the Centre as the ‘Cholera Hospital’ because of our lifesaving services in the hospitals in Dhaka and Matlab. For reasons not totally understood, the increasing trends toward more cases and more severe cases of cholera have continued. For two years, V. cholerae is the most common pathogen identified, with more than 30,000 cases treated in 2005. Unfortunately, the V. cholerae has become resistant to most antibiotics, and this has led to a longer hospital stay, further stressing the resources of the hospital. For an update on the trends in antibiotic resistance, readers can consult the Health and Science Bulletin (HSB) on our web site http://www.icddrb.org/hsb/.

During the year, the inpatient unit of the hospital received some much-needed renovations. These included a new special care unit for the sickest patients who need very intensive nursing care, and the general inpatient unit for the patients whose diarrhoeal illness was complicated by other illnesses, such as pneumonia, severe malnutrition, sepsis, or meningitis. Fortunately, the protocolized management of severe malnutrition continues to save lives of children admitted to the hospital with a case-fatality rate of less than 5%. This is a decrease from 20% just a decade ago. The protocolized management of severe malnutrition is now being scaled up in other hospitals in Bangladesh and is being taught through the training courses being organized in cooperation with World Health Organization.

Centre’s Finances

The Centre’s budget has continued to increase by about US$1 million, to a total of about US$19 million in 2005. The increasing budget is due to steadily-increasing project activities and the consistent support of our core donors. The Centre has now had a balanced budget for seven years; although the Centre is still dealing with a cumulative deficit, now reduced to about US$2 million. The Centre continues to pay down this deficit each year. It seems that this deficit will be with us for a few more years, but it is less of a drag on our programmes than in the recent past.
Fortunately, the endowments which were started during the 1990s have been a great source of stability to the Centre. These donations, with a market value of about US$10.5 million, are managed conservatively in instruments through TIAA-CREF with the guidance of a Fund Management Committee and oversight by the Board of Trustees. The Centre is able to use up to 5% of the endowment each year, but only with approval of the Board. We want to thank governments and individual donors who have contributed to this critically important endowment.

As the Executive Director, I cannot overstate the importance of the endowments to the Centre. This is where I choose to give when I donate to the Centre, since I know this investment will continue the scientific productivity and the lifesaving services to our patients. With an average cost of $15 per patient treated, our hospital saves more lives at the lowest possible cost. Among the 100,000 patients treated, 15% would have died without our care. I doubt that any other public health programme could save so many lives at such a small cost.

Suchona, the new management information system at the Centre

For the last few years, we have been mentioning our new management information system and this year, we report that it continues to serve the Centre well. In fact, many of the staff members now take it for granted. Still we continue to update it, validate it, and make it more adaptable. During the coming year, we will focus on improving the system for project monitoring. Hopefully, this will assist the scientists in being even more productive and efficient.

Strategic Plan and the Millennium Development Goals

Our priorities as outlined in the Strategic Plan to the Year 2010 and the Millennium Development Goals (MDGs) continue to guide the activities at the Centre. The cover of this year’s Annual Report illustrates one of the highest priorities for the Centre, that of scaling up the use of zinc for all children in Bangladesh, whenever they have an episode of diarrhoea. The other highest priorities are shown in the table.

In each area, the Centre has developed activities and research protocols to accomplish the task, and this Annual Report provides more details on our progress toward each of the priorities identified in the Strategic Plan.

The SUZY (Scaling Up Zinc for Young Children) Project, with funding from the Bill and Melinda Gates Foundation, is leading our efforts to introduce zinc as a standard treatment for diarrhoea while continuing the research on the use of zinc for diarrhoea and other infections. As part of this effort, the Project sponsored the second international conference on zinc, and this conference is becoming an annual event. The Centre published another key paper on the lifesaving benefits of zinc, this time showing that prophylactic zinc given weekly prevented a very large proportion of all deaths in young children. Based on data from verbal autopsies, it seems the greatest differences in numbers of deaths between the groups receiving zinc or placebo were those from pneumonia. Thus, although the treatment strategy is to give zinc with each episode of diarrhoea—and it is effective in reducing the severity and duration of

Expected Accomplishments during the Decade

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<td>Introduce cost-effective strategies for zinc therapy for diarrhoea</td>
<td>Define the burden of tuberculosis and identify effective strategies for prevention and control</td>
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<td>Help reduce maternal morbidity and mortality and improve perinatal and neonatal health</td>
<td>Address stagnation of fertility decline</td>
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<td>Develop a package for the prevention of foetal growth restriction</td>
<td>Help prevent epidemic of HIV/AIDS and RTI/STI</td>
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<tr>
<td>Help identify a package of suitable vaccines for diarrhoea and acute respiratory infections</td>
<td>Contribute to knowledge that can impact the burden of vector-borne diseases</td>
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the diarrhoeal episode—the long-term reduction in mortality may relate even more to its ability to reduce pneumonia. We anticipate that the disposable zinc tablets will be available soon in Bangladesh.

The Child Health Programme has been evaluating two major interventions to reduce childhood mortality. In one study, the impact of the integrated management of childhood illness (IMCI) on overall mortality will be more fully understood. This is part of a multicountry evaluation of this approach which is being carried out by the Government of Bangladesh. As documented in a recent Lancet article, we already know that communities are more likely to seek care for their sick children in areas that are using IMCI. The impact on mortality will be known soon.

A second major intervention relates to a community-based approach to reducing neonatal mortality. In a study called ‘Projahnmo’ being conducted in collaboration with Save the Children-USA, Johns Hopkins University, and Shimitak (a local non-governmental organization) as well as the Government, it is hoped that this large-scale evaluation will demonstrate that newborns’ lives can be saved with this practical approach. Of all the infants who die in their first year, about 70% die in the first 28 days (the neonatal period) and most of these during the first few days. Ninety percent of deliveries take place at home; thus, programmes to save these babies must start in the villages where the events are happening.

The Projahnmo intervention developed its strategies around a careful understanding of the behaviours surrounding childbirth and a negotiation process with the community to change those patterns that can provide the most benefit to the mothers and babies. We anticipate that relatively simple changes in planning for the delivery as well as planning for possible complications can have major consequences. Some of the changes include (for example) keeping the baby warm, delaying bathing, immediate initiation of breastfeeding, and management of early infections. Evaluation of the impact of this strategy will be carried out in 2006, and we anticipate that the results will result in further scaling up of the successful components into a ‘life-cycle strategy’ to include other community-based strategies for mothers, newborns, and children.

The Reproductive Health Programme similarly is working on understanding how to address the needs of pregnant mothers and integrating interventions for the mothers with those of the children. The life-cycle approach goes beyond the interventions during pregnancy. It recognizes other crucial stages of the life-cycle, including childhood, adolescence, and needs for contraception and birth-spacing. A key question for the Reproductive Health Programme is how to provide safe delivery services in an environment in which 90% of the deliveries continue to be at home and in which skilled birth attendants are rare. Our Matlab field area has sub-centres for basic obstetric services with midwives, and we are learning if this can be a model for other parts of the country and the world. Skilled birth attendants are urgently needed, but it will be many years before a sufficient number can be trained. Even then, we need to learn how they can best be utilized.

An example of a specific research project from the programme on reproductive health is a study to document the effectiveness of misoprostol to prevent postpartum haemorrhage. This complication is a major cause of maternal mortality, and it seems that misoprostol may be able to be used even at home, but its safety and efficacy needs to be established. Other examples are development of strategies to target family-planning services to those families who already have three or more children or those who desire no additional children.

The Nutrition Programme is continuing its analysis of the baseline survey for National Nutrition Programme, scientists continue to study the burden of disease from rotavirus infection and the usefulness of a vaccine for this common diarrhoeal illness. An update of the disease burden of rotavirus, and we anticipate initiating an efficacy study of a rotavirus vaccine soon in collaboration with the Rotavirus Vaccine Programme (Rotavac ADIP).

Other scientists are evaluating an attenuated vaccine for cholera called Pefu-15. Based on its safety and immunogenicity in age-groups as low as 9 months, we anticipate further studies which...
In recognition of the medical research and clinical services, ICDDR,B received the Independence Day Award 2005—the highest national honour in Bangladesh will hopefully lead to an efficacy study in the near future. Additionally, the Centre continues its interest in killed oral vaccines for cholera and enterotoxigenic *E. coli*. If vaccines for these three infections could be developed and used (rotavirus, cholera, and ETEC), we could prevent 70% of the diarrhoeal illnesses currently coming to the ICDDR,B hospitals.

Other projects are evaluating vaccines for respiratory infections, including viral influenza, *H. influenzae* type b (Hib), and *S. pneumoniae*. The studies in collaboration with GAVI through their ‘Pneumo-ADIP’ programme continue to provide crucial data on the epidemiology and aetiology of pneumonia in urban and rural Bangladesh and recently-presented results have documented the high rate of pneumococcal disease in Bangladesh, as high as in The Gambia.

During 2005, the threat of avian influenza caused by H5N1 strains was highlighted throughout the world. Bangladesh is a country at high risk for this infection but, currently, it has no laboratory facilities for detecting these strains. We anticipate that these laboratories can be developed soon.

The Centre’s scientists continue to track Nipah virus which causes fatal encephalitis and is spread by fruit-bats. Working with IEDCR and CDC, we are attempting to understand how the virus is transmitted from bats to people and to understand the basic biology of the virus in the bat, including the movement of the infected bats.

The HIV/AIDS Programme continues to conduct several activities to minimize the chance of a rapid increase in rates of HIV/AIDS. Our scientists carry out HIV surveillance on behalf of the Ministry, and are working with the IEDCR so that this activity can be carried out by this national institute in the future. The voluntary counselling and testing unit (Jagori) is serving increasing numbers of clients. Large-scale surveys have been carried out to understand knowledge, attitudes, and practices of groups at risk of HIV/AIDS. The injecting drug user group is especially vulnerable, but other groups including those who migrate overseas for employment are also at risk. This group of migrants is especially challenging since they have many needs for HIV prevention, but these needs must be met in a manner that does not stigmatize them.

The Population Sciences Programme monitors and interprets the population trends in our field areas and in national surveys. We continue to be concerned with the plateau in many of the key indicators, especially the infant mortality rate and the total fertility rate (IMR and TFR) and are attempting to understand reasons for the plateau. If Bangladesh is to reach the MDGs by 2015, we need to understand these trends and find ways to restart the improvements. We do know that gender preference is a major factor in the plateau in TFR, but other factors are also important.

ICDDR,B continues to be an exciting place to work and to contribute. Every week, there are conferences, publications, and new observations, which provide insight into the problems of improving health in Bangladesh, and these findings have direct application to the world. Every week, we host visitors from around the world, who come to see our work and to take away a bit of our enthusiasm. Hopefully, this Annual Report will provide you with a visit to the Centre, and you may also take away some of our enthusiasm. 

We anticipate that you will find the information provided in this report useful. Please feel free to contact us if you wish to be placed on our mailing list for Glimpse and the Health and Science Bulletin. You may also wish to subscribe to the Journal of Health, Population and Nutrition. These publications are freely available on our website: http://www.icddrb.org/pub/.

For those who can give, we also ask for your financial support, especially for the Hospital Endowment. As I am writing this report, our hospital is seeing almost 500 patients per day, nearly half of whom have cholera! We are grateful to all of you who have contributed to the endowment and made it possible for us to save the lives of over 15,000 patients every year—and to train more than 400 healthcare providers who multiply our efforts around the world—as well as provide stability for the dedicated staff conducting the research that is so vital for the long-term health of people living in poor countries.

David A. Sack, MD
Executive Director
May 2006
ICDDR,B’s Child Health Programme helps to 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.

What do children die of in Bangladesh?

In 2005, the Child Health Programme completed its report for the cause of death in the under-fives component of the 2004 Bangladesh Demographic and Health Survey (BDHS). The third such survey in 10 years, this provides important information on the causes of death among this age group and helps us to better understand the remarkable declines seen in under-five death rates in Bangladesh.

The report showed that newborn (neonatal) deaths account for almost half of childhood deaths in Bangladesh and are mostly due to lack of oxygen (asphyxia) at birth, infections, and prematurity/low birth-weight (Fig. 1). In older children, acute respiratory infections and other infections are the biggest killers.

Integrated Management of Childhood Illness

Since 1999 the Centre has been collaborating with the Bangladesh Government as part of the Multi-Country Evaluation (MCE) of the Integrated Management of Childhood Illness (IMCI) project. This project is supported by WHO (with funds from the Bill and Melinda Gates Foundation) and USAID. The Bangladesh study, conducted in Matlab, is evaluating the health impact and cost-effectiveness of IMCI when implemented under the best circumstances. Investigators from the Johns Hopkins University, the London School of Hygiene & Tropical Medicine, and Tulane University are collaborating with ICDDR,B on this project. Final evaluation is planned for 2007. Details of the study design were reported in ICDDR,B’s 2001 Annual Report.
**Project interventions**

Based on earlier studies, researchers introduced community-based IMCI interventions into study areas in mid-2003. These involve home visits by community-based nutrition workers who teach mothers and families (1) how to care for mother and child and (2) when and where to seek care for sick children. This work aims to improve care-seeking practices for childhood illness and child-care and feeding. Community mobilization through meetings and local theatres is also part of the intervention package. The project has also identified village doctors and trained them to avoid harmful practices and refer severely-ill children to hospital.

However, although the coverage of community interventions is higher in the study’s IMCI areas, these are still too low to have a substantial impact on childhood illness and death (Fig. 2).

The number of children treated by trained care providers, especially at IMCI facilities, has increased. But, trained care providers are still only treating 22% of the sick children who require their services. Village doctors, most of whom remain outside the intervention net, still treat most of the sick children in these areas (Fig. 3).

To improve this situation, researchers introduced 65 new village health workers into the study area in 2005—one for about every 2,400 people (the average number in two villages). These village health workers were trained to manage common childhood illness in the community and to provide education and counselling to families.

**Disseminating project findings**

2005 was also marked by major efforts to disseminate project findings. To track progress in child survival, for example, the first of a series of biennial global conferences (Countdown to 2015) was held in London from 12 to 14 December 2005. Papers from the project presented at the conference focused on experiences with community interventions for child survival and with changes in the management guidelines for severe illness. Researchers also presented lessons learnt from the contribution the project made to the scale-up of IMCI in Bangladesh.

**Upscaling the Project**

The Bangladesh Government has already adopted the IMCI strategy as a key policy in its plans to achieve the Millennium Development Goal of reducing mortality among the under-fives. As a result, by 2005, it had expanded facility-based IMCI to 98 sub-districts, and is now piloting community-based IMCI in six of these sub-districts. The project has helped the Bangladesh Government, WHO, and UNICEF to adopt and implement the interventions tested in Matlab. It has also helped to forge effective partnerships that now provide the momentum for the national IMCI programme (Fig. 4).
Newborn health interventions

The Projahnmo Project

Projahnmo is a neonatal (newborn) intervention research initiative which ICDDR,B and its partners began implementing in 2002 in 24 unions of the Beanibazar, Zakiganj, and Kanaighat upazilas (sub-districts) of the Sylhet district and in 12 unions of the Mirzapur upazila in the Tangail district. The project aims to evaluate the impact that a package of care for pregnant mothers and their babies will have on newborn mortality. In Mirzapur, the project also aims to identify the organisms which cause serious infections in newborn babies.

The various studies that make up the initiative are supported by USAID, the Saving Newborn Lives Initiative (SNL) of Save the Children, USA, and the Wellcome Trust. They are being implemented in partnership with Johns Hopkins University, Shimantik, Bangladesh’s Ministry of Health and Family Welfare, Dhaka Shishu Hospital, Kumudini Hospital (Mirzapur, Tangail), and the Institute of Child and Mother Health (Dhaka), amongst others.

Project monitoring and survey results

In 2005, the Projahnmo project’s management information system continued to routinely monitor study interventions. The project also conducted interim household surveys to track changes in behaviours and practices in the community. In the last quarter of the year, end-of-project household surveys were started as well. These will run throughout the first half of 2006 and will be used to estimate newborn death rates in the different areas targeted by the project.

A high level of coverage has been achieved in the communities where the project is improving home care. For example, 81% of pregnant women and their families in Mirzapur, and 92% in Sylhet are now receiving antenatal counselling and education on birth preparedness and care of newborns. In addition, 94% of newborns in Mirzapur, and 89% in Sylhet, are now assessed within 24 hours of being born. Almost all families in both Sylhet and Mirzapur chose to get project-trained birth attendants and newborn caregivers to provide care during and after delivery of the baby. However, families in Mirzapur were more likely to have arranged for emergency transport and...
Fig. 5. Increased use of antenatal-care services in the Projahmno Project, which aims to improve newborn health in two rural areas of Bangladesh: Sylhet and Mirzapur. Findings from repeat household surveys.

Fig. 6. Increased use of clean cord-cutting instruments after babies are born, in the Projahmno Project areas of Sylhet and Mirzapur, Bangladesh. Findings from repeat household surveys.

Fig. 7. More babies now receive their first bath at least three days after birth—in the Projahmno Project areas in Sylhet and Mirzapur, Bangladesh. Findings from repeat household surveys.
In 2005, improvements continued to be seen in selected indicators of household practices, such as the use of antenatal-care services (Fig. 5). The use of trained attendants for delivery also increased from 9% in 2003 to 42% in 2005 in Sylhet (in the home-care arm of the study) and from 40% to 54% in Mirzapur. The same is also true of the practice of breastfeeding immediately after birth, which rose from 46% to 94% in Sylhet and remained high (around 95%) in Mirzapur.

There has also been a good response to the messages (1) that nothing should be applied to the umbilical stump after the cord has been cut (which was adhered to in 95% of cases in Mirzapur and in 65% cases in Sylhet); (2) that clean instruments must be used to cut the cord (Fig. 6); and (3) that the infant's first bath should be delayed after birth (Fig. 7). In general, improvements have been more marked in the home-care arms of the Sylhet and Mirzapur studies, and have been smaller in the community-care arm of the Sylhet study.

Additional studies undertaken using the Project's infrastructure

Projahnmo is also providing the research base and infrastructure needed to conduct a variety of additional studies. These aim to estimate just how much pneumococcal disease and typhoid fever occurs in rural Bangladesh, and to evaluate the effects of community-based interventions on maternal death rates. Studies are also validating the algorithms used for clinical assessment and the verbal autopsy tools being used to assess causes of newborn death. In addition, formative research—which aims to ensure that interventions are well-designed and targeted for specific communities—is also being conducted on integrated fertility and post-birth care.

Child Development Unit

In 2005, the Child Development Unit (CDU) of the Clinical Sciences Division continued to expand its efforts to measure the effects that nutritional deficits, poor health, and deprivation have on children’s development. It also increased its efforts to design and evaluate low-cost, feasible interventions to address these problems.

2005 was also a busy year for the Unit in terms of data analysis and the generation and dissemination of new findings. The Unit’s scientists published seven papers in peer-reviewed journals and presented four abstracts at regional and international conferences, for example.

Collaborations

This year the Unit embarked on new collaborations with ICDDR,B’s Health Systems and Infectious Diseases Division (HSID). It also continued to collaborate with various partners, from outside ICDDR,B as well as from within it. Researchers from the Unit are also currently working with the Public Health Sciences Division (1) to assess postnatal depression and (2) to determine the causes of maternal ill health and death and to study the psychological impact these have on children.

The collaborative work undertaken with HSID will assess long-term neurological, cognitive, and functional consequences experienced by survivors of the Nipah virus and Japanese encephalitis. For this work, the Unit has acquired new tools and provided staff with the training they need to conduct tests—further boosting the capacity of the Unit. Plans are also underway to work with HSID to assess the long-term effects suffered by children who survive non-meningitis invasive pneumococcal infections.

This year the Unit was also recognized as a centre for early childhood development (ECD) in Bangladesh, and was added to the ECD directory published by ECD partners in Bangladesh. It also concluded its collaboration with UNICEF on a multi-site project to assess family psychosocial care indicators. The Unit’s final report on this collaboration has already been submitted to UNICEF.

New projects

The Unit started several new projects this year, including one that is examining the link between arsenic exposure during pregnancy and the development of pre-school and school-age children. Tools and instruments for assessing the development of these children have been designed for the project. A second project is evaluating the efficacy of a community-based follow-up programme. This project compares the benefits of follow-up services in the community with food supplementation or psychosocial stimulation, or both. Several studies were also concluded in 2005, and some of the results are described below.

Assessing how mother–child interaction affects children’s feeding patterns

To assess children’s self-feeding behaviours and the interactions between mother and child during feeding, researchers recorded the behaviour of 54 mother–child pairs over the course of one mealtime. Results showed that only one-third of mothers had a feeding style which responded to cues from their children, and that their children tended to eat more.
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Mothers who instead used strategies such as telling the child to eat and refocusing the child’s attention to encourage eating tended to have children who refused food and ate less. A pilot study, which evaluated a four-session intervention aiming to encourage responsive and age-appropriate self-feeding, showed that children whose mothers attended the group ate more mouthfuls, refused food less often, and engaged in more self-feeding.

Effects of psychosocial stimulation on the recovery of malnourished children

Researchers assessed how psychosocial stimulation (such as encouraging play) affects the recovery of severely-malnourished children. This compared 39 severely-malnourished children being rehabilitated by ICDDR,B’s Nutrition Rehabilitation Unit (NRU), with another 33 severely-malnourished children being treated by the same Unit but also receiving psychosocial stimulation in the NRU. In addition, the second group’s parents were counselled on child care and stimulation.

Six months after discharge from the NRU, the mental and motor scores, and weight-for-age of the children receiving psychosocial stimulation were considerably better than those of the other group. This indicates that psychosocial stimulation can increase the benefits children gain from nutritional rehabilitation.

Assessing the effect of psychosocial stimulation on children’s psychomotor development

In the same study, researchers studied psychosocial stimulation in 18-month-old children, using the indicator Home Observation for Measurement of Environment (HOME). The aim was to see whether HOME predicted children’s development and behaviour. Researchers’ results were significant, showing that HOME did predict the children’s mental and psychomotor development indices, activity, and their comprehension and use of language.

These results indicate that decision-makers should seriously consider implementing programmes designed to improve the quality of psychosocial stimulation children receive at home. Such programmes have already proved to be effective when used with children in other countries.

Assessing the link between maternal depression and children’s nutritional status

ICDDR,B researchers recently investigated whether there were any links between maternal depression and children’s nutritional status, cognitive development, and behaviour. The study assessed mothers who had given birth 12 months previously, and mothers who had given birth 18 months previously.

At 12 months, maternal depression was not found to be linked with any maternal characteristics or with the children’s physical and mental development. At 18 months, however, the researcher found that higher levels of maternal depression were significantly correlated with lower activity in children, a lower response to the examiner, lower emotional tone, and decreased language use. These results suggest that mothers showing symptoms of depression need to be identified and treated in order to improve the development of their children.

Hospital-based study of maternal depression and its effects on mother and child

A small pilot study at the Dhaka hospital examined how maternal depression relates (1) to the nutritional status of mothers and their children, and (2) to their families’ socioeconomic conditions. Mothers suffering from appetite disturbance were found to have larger families and lower-income jobs, and fatigue correlated with assets. Greater appetite disturbance in mothers was also related to poorer nutritional status—both theirs and that of their children.

Mood disturbance, however, was found to increase when families had more assets and better housing, and when the husbands held better jobs. Sleep disturbance increased as family size increased, and was significantly associated with having more children. Having fewer children, however, was associated with feelings of worthlessness. No significant correlation was found between parental education and maternal depression scores.

Studies of the effects of malnutrition and food supplements on child development and behaviour

To determine if stunting (a low height for a particular age) was associated with lower developmental scores, researchers assessed the development and behaviour of both stunted and non-stunted children in a poor urban area in Dhaka. They found that the stunted infants scored significantly lower on the psychomotor development index; they were also significantly less active and less happy than the non-stunted children.

In another study, a preliminary assessment of the effects of giving food and micronutrient supplements to pregnant mothers in Matlab (part of the MINImat project) has shown that doing so benefits...
both the development and behaviour of children whose mothers are thin.

In a different study, researchers looked at how the temperaments of malnourished and adequately-nourished children differed. Malnourished children were found to be significantly more fearful and less attentive/task-orientated than the adequately-nourished children. The malnourished children also tended to be more ‘fussy’ than the adequately-nourished children, although the difference between the two groups was not quite statistically significant.

**Child Health and Nutrition Research Initiative**

The Child Health and Nutrition Research Initiative (CHNRI) is an international network of interested partners supported by the Global Forum for Health Research, Geneva, Switzerland. CHNRI supports the Millennium Development Goals of eradicating extreme poverty and hunger, reducing child mortality, and combating malaria, HIV/AIDS, and other diseases in children. Its overall goal is to improve child health and nutrition through appropriately targeted research.

The Secretariat of CHNRI is located in ICDDR,B’s Child Health Programme. CHNRI is governed by a board with expertise in international public health. It is in the process of becoming a Swiss Foundation; this should be completed by June 2006. For further information on CHNRI please visit www.chnri.org.

**Identifying the best areas for investing child health research funds**

In 2005, CHNRI began working to apply a systematic methodology designed to identify the priority research options that will have the most influence.
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on reducing childhood illness and death. This could help researchers, donors, and decision-makers decide what child health and nutrition research to invest in. This new methodology will adopt the strengths of previous approaches. It will be based on a conceptual framework that will allow competing research options to be systematically listed and scored in a fair and transparent way. Individuals with expertise in different illnesses and risk factors have agreed to test the methodology.

As part of this initiative, CHNRI organized two workshops in 2005—one in Baltimore to finalize the methods and one in Dubrovnik to work with seven teams of experts and help them learn how to use them. These teams are currently applying the methodology and will produce drafts of their results by April 2006.

New online communication and capacity building platform for child health

CHNRI is planning a global online community for researchers, policy-makers, and implementers. This will build research capacity, particularly among researchers in the low- and middle-income countries, and promote informed policy-making by countries and organizations. The platform will provide users with information and tools designed to support child health and nutrition research.

Resources will include up-to-date scientific literature and links to journals. The platform will also provide information about funding, and a database of researchers, funding agencies, NGOs, and government policy-makers working in child health and nutrition research. Users will also be able to access schedules of meetings, and resources that will help them to disseminate research findings and ensure that research is undertaken appropriately. The platform will also provide a forum for collaboration and discussion.

To push forward this work, CHNRI sponsored a workshop in Geneva on the issues and challenges related to establishing and promoting web-based global networks. Efforts are currently underway to identify a technical partner who can help develop the web-based network proposed.

Plenary session on child and maternal health

In September 2005, during Forum 9 of the Global Forum for Health Research in Mumbai, India, CHNRI organized a plenary session on child and maternal health: 'Reducing global disparities in maternal and child health'. CHNRI also issued its fourth call for proposals for research designed to improve our understanding of the effectiveness of large-scale child health and nutrition interventions.

Childhood drowning

Since the mid-1980s the number of deaths due to infectious diseases in Bangladesh has fallen—causing an impressive decline in the number of childhood deaths overall. This means that other causes of childhood death are now proportionately more important. Drowning is a good example, as it is now responsible for 19% of deaths among 1 to 4 years olds in the country, even though the number of drownings per year has not increased (Fig. 8). In Matlab, for example, drowning now accounts for reducing childhood illness and death. This could help researchers, donors, and decision-makers decide what child health and nutrition research to invest in. This new methodology will adopt the strengths of previous approaches. It will be based on a conceptual framework that will allow competing research options to be systematically listed and scored in a fair and transparent way. Individuals with expertise in different illnesses and risk factors have agreed to test the methodology.

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Interventions for the prevention of death from drowning emphasize preventing the young child from being able to go to nearby water bodies.
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for more than half of deaths among 1 to 4 year(s) old children each year. The size of the problem highlights the need to integrate drowning-prevention programmes into ongoing child health and development activities throughout Asia.

In 2005 therefore researchers from ICDDR,B and the Johns Hopkins University (USA) began work on a project which aims to develop and pilot-test ways of preventing children from drowning. This work is funded by DFID, USAID, and UNICEF.

Early research indicated that door-barriers and playpens were the methods of keeping children away from water that would be most acceptable to local communities. It also showed that the introduction of such tools would have to be backed up by well-designed programmes to teach families and caretakers how to use them. These programmes would also have to teach people about sources of risk, good child supervision, and child safety.

Six villages in Matlab were therefore selected for a pilot study designed (1) to determine the best mix of intervention strategies and (2) to refine the tools and educational messages devised. Researchers surveyed these villages to identify households with 1 to 4 year(s) old children and assess any practices relevant to childhood drowning. They then developed a type of playpen and a doorguard, as well as educational messages, by working closely with the communities.

Each of the villages chosen for the study contained about 1,000-1,200 people and 80-100 children under five. In two of the villages (randomly selected) the study introduced playpens and provided child safety education. Doorguards and child safety education were also introduced in two other villages. Finally, people in another two villages were also given child safety education but were not provided with playpens or doorguards.

Early experiences made clear that both the playpen and doorguard would have to be modified. So, for example, a removable iron-mesh floor was added to the playpen to prevent children from lifting it up and escaping. Researchers also adjusted the width and height of the doorguard and its lock system. In some cases, they also had to add door-frames to houses to allow the doorguard to be used.

The pilot study also showed that some of the options being promoted by the study were difficult for families to put into practice. In the villages where only educational interventions were used, for example, it was difficult for mothers from nuclear families—in which they were the main and only caretaker—to supervise their children and attend to the various jobs that they needed to do.

Results to date have been positive, and families are using the new tools despite some early technical problems. Importantly, people have been adapting the interventions to better suit their everyday lives. Mothers, for example, have begun putting their children to sleep in the playpen in the daytime and covering them with mosquito nets—something researchers have not promoted. Final results from the pilot tests are expected in 2006.
What does the Programme do?

The Reproductive Health Programme works to develop strategies to improve maternal health as well as tools to monitor progress towards achieving the Millennium Development Goals (MDGs). In this way the Programme aims to make 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 adolescents’ knowledge of sexual health and to teach them how to avoid risky behaviour.

Programme researchers 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.

Measuring and understanding the fall in pregnancy-related deaths in Matlab

Over the last few decades, the number of pregnancy-related (obstetric) deaths has fallen in ICDDR,B’s Health and Demographic Surveillance System (HDSS) area in Matlab. The Centre has therefore conducted studies to find out why, and to determine by how much, pregnancy-related deaths have fallen.

To do this, researchers analyzed data concerning 191,465 pregnancies within ICDDR,B’s intervention area and its comparison area during the period 1976-2001. Both areas are within the Matlab study site. These data were gathered by HDSS.

In addition, various verbal autopsies covering the period were used to identify pregnancy-related deaths in Matlab. This required researchers to define pregnancy-related deaths uniformly, as ‘deaths occurring during pregnancy or within 90 days of the end of pregnancy’. The study then classified types of death according to the following categories: ‘direct obstetric’, ‘abortion-related’, and ‘indirect and injury-related/accidental’. These data were linked to the corresponding death and pregnancy records collected by the HDSS.

Assessing significant trends in pregnancy-related death

Researchers found that, over time, the chances of dying as a result of pregnancy had decreased significantly in both the 19-and-under and 20-29 age groups (Fig. 1). On average, between 1976 and 2001, the pregnancy-related death rate in the study area fell by 4% per year in the 19-and-under age group, and by 2% per year in the 20-29 age group.

Using a stratified analysis, researchers also compared the declines seen in direct pregnancy-related and abortion-related deaths in the intervention area, with declines observed in the com-
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They found that between 1996 and 2001 in the intervention area, a woman was 57% less likely to die as a direct result of pregnancy, and 69% less likely to die as a result of abortion, than was the case during the period 1976-1980.

In the comparison area, by contrast, there was no significant decrease in pregnancy-related deaths. In fact, the likelihood of dying as a result of pregnancy was only 29% less during the period 1996-2001 than it had been during the period 1976-1980. In addition, women’s chances of dying as a result of abortion-related deaths had not improved at all in the comparison area.

Effects of mothers’ age and number of pregnancies

Researchers worked to determine exactly why pregnancy-related deaths had declined in the study area. Their analysis suggested that women are getting pregnant for the first time at a much later age than used to be the case. In fact, 70% of women had undergone their first pregnancy aged 19 or less during the period 1976-1980. By contrast, less than 40% of first-time pregnancies involved women of 19 or under during the period 1996-2001. Researchers also found that the proportion of women who had been pregnant two or three times by the age of 19 had fallen sharply—from about 24% to 5%—during the same period. By the same token, the proportion of 20-29 year olds who had been pregnant two or three times had increased, rising from 68% in 1976-1980 to over 80% in 1996 and later. In the case of women who had been pregnant more than three times, researchers found no clear changes between 1976 and 2001 in any of the age groups studied.

Researchers also considered how many women died as a result of their first pregnancy, and compared these data with the number of women who died as a result of their second and third pregnancies. They also assessed whether deaths per ‘pregnancy order’ (i.e. first, second, third pregnancy, etc.) had changed over the time period considered.

They found that for both first, and second and third pregnancies (combined), pregnancy-related deaths had decreased substantially over time (Fig. 2). In the case of first-time pregnancies, for example, 963 women died per 100,000 pregnancies in the period 1976-1980, a figure that had fallen to 371 per 100,000 pregnancies in 1996-2001. In the case of women who died as a result of their second or third pregnancy, numbers fell from 290 to 191 women per 100,000 pregnancies over the same period.

On average, the number of pregnancy-related deaths fell by 6% per year between 1976 and 2001 in the case of first-time pregnancies. The number of women dying during their second or third pregnancy fell by 3% per year over the same period. However, there was no clear fall in pregnancy-related death rates in the group who had experienced four pregnancies or more.

Effects of ICDDR, B’s Safe Motherhood Programme

Researchers investigated the effect that ICDDR, B’s Safe Motherhood Programme has had on pregnancy-related deaths. Since 1987, this programme has been using trained midwives to provide skilled obstetric care to women in the intervention area.
The study showed that between 1987 (when the programme began) and 2001, women in the intervention area were 25% less likely to die from direct obstetric- or abortion-related causes than were women in the comparison area (where only regular government services were provided). During the period 1976-1986, however (before the programme began), there was no significant difference between the two areas. This suggests that the fall in pregnancy-related deaths in the intervention area was partly due to the activities of the Centre’s Safe Motherhood Programme.

The fall in pregnancy-related deaths in the MCH-FP area was partly due to the activities of the Centre’s Safe Motherhood Programme.

Greater access to skilled birth attendants: studying equity and barriers

One of the indicators used to assess progress towards MDG 5 (reducing the maternal mortality ratio) is the proportion of births attended by skilled health personnel. But what is the most effective way of raising this proportion?

Home-based deliveries are both common and culturally acceptable in developing countries like Bangladesh. However, before home-based birth strategies are further reinforced in developing countries (by providing skilled attendants to women at home), research is needed. This must compare the feasibility, cost, effectiveness, acceptability, and equity implications of skilled home-based and facility-based obstetric care. Through various programmes and studies, ICDDR,B is working to help provide the information that decision-makers need to assess this issue.

In 1987, ICDDR,B began the Safe Motherhood Programme, which gives more pregnant women in Matlab access to trained birth attendants. At first, services were provided to women in their own homes. In 1996, however, focus gradually shifted towards providing services at local health care facilities. Both types of service were provided free of charge. In 2005, the Centre assessed the use that women had made of these two types of service, the changes in use over time, and any inequities in service use between different socioeconomic groups.

To do this, researchers analyzed data on 41,419 births recorded in the area between 1987 and 2001. When the study began in 1987, a worryingly low proportion (5%) of women in the study area received care from a trained midwife at around the time they gave birth. During the course of the programme, however, the percentage of women receiving care at home rose steadily, climbing from 5% in 1987 to 20% in 1992 (Fig. 3). Similarly, the percentage of women who saw midwives at a facility rose from 0% in 1987 to 27% in 2001 (Fig. 3).

The researchers’ analyses also showed that use of a trained birth attendant differed markedly according to how wealthy households were. In the poorest 20% of households, only 12% of women sought care from a trained midwife around the time of delivery, whether at home or in a facility (Fig. 4a). By contrast, this figure was much higher (29%) in the ‘least poor’ group (the 20% of households with the highest income and assets). Overall, the least poor were three times more likely than the poorest to seek care from a trained midwife around the time of birth—either at home or at a facility.

Results also showed that the use of trained midwives increased steadily as the educational level of both mothers and fathers increased (Fig. 4b, 4c). However, the use made of trained carers—whether at home or in a facility—fell sharply among households living more than 1 km away from a facility (Fig. 4d).

Although use of a trained birth attendant rose over time in all wealth groupings, it rose most in the ‘least poor’ group (Fig. 5). This indicates that, although access to trained care improved, inequity also increased. In 1987-1989, 10.2% of the least poor took advantage of the service, as opposed to 5.4% of the poorest: a gap of 4.8 percentage points. This gap had widened to 27.1 percentage points by 1999-2001, when most births took place in healthcare facilities.

In this poor, rural area of Bangladesh women face considerable cultural and community-enforced barriers that prevent them from seeking care outside their home. This means that, while a shift from home-based to facility-based basic obstetric care is feasible, it may increase inequalities in access to care. However, it must be remembered that there is evidence that home-based care is also associated with substantial inequities.

Home-based versus clinic-based deliveries? The views of skilled birth attendants

In developing countries, decision-makers need to clarify what their policies are with regard to where women deliver, and then either commit to a facility-based strategy or make explicit the rationale for choosing other alternatives. To help provide information for such decision-making, ICDDR,B continues to explore options for service-delivery by skilled birth attendants.
REPRODUCTIVE HEALTH

The Centre introduced skilled attendance for home-based deliveries in 1987, because cultural norms favoured births at home. However, researchers have also found that these same cultural norms often prevent attendants from performing their duties, as in their own homes families expect to have control over the birth. In reality, cultural norms usually dictate that such births should be guided by elderly female relatives and that they should encompass a mix of traditional and modern practices.

The Reproductive Health Programme therefore recently conducted a study to discover how feasible 13 skilled birth attendants felt home-based and facility-based care are. To fully explore the attendants’ views, the study used key-informant and in-depth interviews, as well as group discussions.

The study highlighted the difficulties which confronted skilled birth attendants during home deliveries. These included poor transportation, inappropriate (e.g. insufficiently clean) environments for delivery, and lack of supplies and equipment. Attendants also said that they did not always feel secure (safe), and that they sometimes lacked supervision and did not always have enough skill to address certain problems.

The attendants identified two constraints which they considered to be most serious. One was the pressure that families put upon them to adhere to the traditional norms of childbirth. The other was that it was difficult to convince families to allow patients to be referred to a health facility when the need arose.

Attending births in a health facility had a number of advantages, according to the attendants. These included proper transportation, inappropriate (e.g. insufficiently clean) environments for delivery, and lack of supplies and equipment. Attendants also said that they did not always feel secure (safe), and that they sometimes lacked supervision and did not always have enough skill to address certain problems.

Other issues to consider are the fact that home-delivery care makes inefficient use of midwives’ time, and can limit their ability to cope with emergencies. There also exists the risk that midwives deployed at the community level may not actually provide much outreach, instead serving only those closest to themselves.

Fig. 3. Trends in use of basic obstetric care from a midwife, either at home or at a health facility, in the intervention area, Matlab, Bangladesh (1987-2001)

Fig. 4a-d. Percentages of births, within groups of households with particular socioeconomic characteristics, for which women used skilled obstetric care from a midwife (1987-2001). Women were least likely to seek care from a midwife if they came from the poorest households, if they and their babies’ fathers had no formal education, and if they lived more than 3 km away from a health facility.

Fig. 5. Trends in use of basic obstetric care from a midwife (at home and in a healthcare facility) between 1987 and 2001, per wealth grouping (quintile).
Estimating what percentage of women do not receive the life-saving obstetric care they need

Every year, over 500,000 women around the world die because of complications related to pregnancy and childbirth. Over 99% of these deaths occur in developing countries such as Bangladesh. Reducing the maternal mortality ratio is therefore a Millennium Development Goal and a major objective of Bangladesh’s national health programme.

ICDDR,B’s Unmet Obstetric Needs project works to find the best way of ensuring that women receive the care they need when life-threatening complications occur during and after pregnancy. The project has already developed a new indicator of maternal health: the ‘Major Obstetric Interventions for Absolute Maternal Indications’ (MOI-for-AMI) indicator (see box). ‘Major obstetric interventions’ refers to the types of pregnancy-related surgery necessary, while ‘absolute maternal indications’ refers to the types of complication arising from pregnancy that require surgery to correct. In 2005, ICDDR,B piloted the MOI-for-AMI indicator alongside other existing maternal health indicators in a large-scale study in 12 districts of Bangladesh.

This work was undertaken in partnership with teams from the Civil Surgeon’s Office in each district. The districts in which the study was run were selected in collaboration with the Directorate General of Health Services (DGHS) and various donor agencies, including USAID and UNICEF.

Researchers ensured that the MOI and AMI used in the study (Table 1) covered the major life-threatening complications affecting women and could be accurately and practically measured. They did this by conducting in-depth discussions with obstetricians working in different settings, and considered a range of criteria. The AMI chosen therefore reflected the following: (1) complications that (always) need specialized obstetric care to save the life of the mother, (2) complications that are stable across population groups and over time, and (3) complications which are accurately diagnosed by a wide variety of health service providers.

The Project validated the new indicator at ICDDR,B’s Matlab Health and Demographic Surveillance site, where it found that 7 in every 1000 pregnant women (0.7%) required care because they were suffering from one (or more) of the AMI listed in Table 1. During the project, researchers also collected information on obstetric surgery over the last year and on the quality of care provided by facilities (government, NGO, and private) in the selected districts. This allowed them to estimate the met and unmet needs of MOI-for-AMI (Table 2).

Researchers found that the percentage of women suffering an AMI who did not receive the life-saving surgery they needed ranged from 24% (in Jessore district) to 73% (in Hobiganj district; see Table 2).

Table 1. Major obstetric interventions (MOI) needed for absolute maternal indications (AMI) used in the ICDDR,B-developed indicator of maternal health ‘MOI-for-AMI’

<table>
<thead>
<tr>
<th>What are the MOI?</th>
<th>What are the AMI?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caesarean section</td>
<td>Antepartum haemorrhage due to placenta previa or abruptio placenta</td>
</tr>
<tr>
<td>Internal version and extraction</td>
<td>Transverse or oblique lie</td>
</tr>
<tr>
<td>Craniotomy/evisceration/cranioclasis/symphysiotomy</td>
<td>Face or brow presentation</td>
</tr>
<tr>
<td>Laparotomy to repair the uterus to stop postpartum haemorrhage</td>
<td>Major cephalopelvic disproportion</td>
</tr>
<tr>
<td>Hysterectomy for uterine rupture or uncontrollable haemorrhage</td>
<td>Ruptured uterus</td>
</tr>
<tr>
<td></td>
<td>Uncontrollable postpartum haemorrhage</td>
</tr>
</tbody>
</table>

What is the ‘MOI-for-AMI’ indicator?

Measuring the maternal mortality ratio is difficult and costly for a variety of reasons. As a result, researchers use alternative tools (indicators) to provide the information needed to plan new safe-motherhood strategies and regularly monitor the progress of work designed to reduce maternal mortality. Developed by ICDDR,B, the major obstetric interventions (MOI) for absolute maternal indications (AMI)—MOI-for-AMI—is a powerful indicator that can be used to measure both the functioning of health services and how many women fail to receive the obstetric care they need (i.e. the ‘unmet need for obstetric care’), this indicator focuses on certain complications for which obstetric surgical interventions are absolutely needed to save the mother’s life (Table 1). A good example is a caesarean section, which may be necessary to prevent death when, among other things, the baby is awkwardly positioned.
REPRODUCTIVE HEALTH

The study concluded that incorporating the MOI-for-AMI indicator into the Bangladesh Government’s management information system will make it easy to estimate the met and unmet need for specialized obstetric care within districts. Using the indicator at the sub-district level (Fig. 6) will allow under-served areas within the district to be identified. It will also help decision-makers to draw consistent comparisons among the districts. Finally, use of the indicator will allow health managers to prioritize healthcare activities, and improve record-keeping in healthcare facilities.

Translating research into action: MotherNewBorNet

Health programmes often fail to recognize that mothers and newborns are very vulnerable during the first few weeks after birth (the postpartum period). In fact, of the 529,000 maternal deaths that the WHO estimates occurred in 2000, 60% involved mothers who died either in childbirth or...
during the week following. In addition more than 4 million newborn babies die every year—50% of them within 72 hours of delivery. Most of these deaths occur in developing countries, where women lack skilled care during labour and in the critical few weeks following.

In April 2005 ICDDR,B and its partners established MotherNewBorNet in order to address these problems. Since then the number of partners involved in this network has grown rapidly—more than doubling from 66 partners in April to 153 in December 2005. This network of partners is designed to make it easier to translate into practice research results that will ensure the survival and well-being of mothers and newborns in the community. Specifically, it aims to strengthen and scale up community-based maternal and newborn health programmes in developing countries.

To do this, the initiative is promoting a range of already-proven technical interventions, including family-planning interventions. It is being implemented by partner organizations from Asia and the Near East.

ICDDR,B is currently hosting the network, and financial assistance is being provided by USAID through the Johns Hopkins Bloomberg School of Public Health’s Global Research Activity (GRA). Technical support is also being provided by USAID’s Global Health Bureau and several of its global projects, including ACCESS, BASICS, ESD, JHU/GRA, and POPPH.

MotherNewBorNet activities in 2005

By the end of 2005, MotherNewBorNet had already helped to develop a new maternal and newborn health programme in Cambodia. It had also facilitated the production of health-promotion materials for postpartum (after delivery) care in East Timor. The programme has also developed a list of common indicators (Table 3) which can be used to monitor the progress being made to improve maternal and newborn survival and health.

Work is also ongoing to promote both the network and the techniques it uses. As a result, by the end of 2005, MotherNewBorNet had already developed a policy briefing on community-based postpartum care, as well as multimedia presentations for explaining the importance of such care to technical experts and policy-makers. During the same period, the network also published the first issue of its quarterly newsletter (MotherNewBorNews), as well as a brochure explaining MotherNewBorNet and a report considering ‘hot topics’ in the area of maternal and newborn health.

In 2005, the network also presented two research papers on community-based early postpartum care for mothers and newborns. Both papers were given at high-profile international venues: one at the Third Asia Pacific Conference on Reproductive and Sexual Health in Malaysia (November 2005) and one at the Child Survival Countdown Meeting in the UK (December 2005).

More information about MotherNewBorNet can be found on the programme’s new website: http://www.icddrb.org/activity/TypeOfActivity=MotherNewB.

### Table 3. Indicators developed by MotherNewBorNet to monitor the progress made towards ensuring maternal and child survival

<table>
<thead>
<tr>
<th>Service indicators</th>
<th>Knowledge indicators</th>
<th>Behaviour indicators</th>
<th>Impact indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Percentage of pregnant mothers who received antenatal care (at least three times) from a trained Health Care Worker (HCW)* during their last pregnancy</td>
<td>7. Percentage of mothers who know at least two maternal danger signs</td>
<td>9. Percentage of births with new or sterile blade or other equipment for cutting the cord</td>
<td>14. Neonatal (newborn) mortality rate</td>
</tr>
<tr>
<td>2. Percentage of mothers whose last delivery was attended by a skilled birth attendant</td>
<td>8. Percentage of mothers who know at least two newborn danger signs</td>
<td>10. Percentage of babies who were breastfed within one hour after delivery</td>
<td></td>
</tr>
<tr>
<td>3. Percentage of mothers who received tetanus toxoid vaccine in their last pregnancy</td>
<td></td>
<td>11. Percentage of babies who had been dried and wrapped immediately after birth</td>
<td></td>
</tr>
<tr>
<td>4. Percentage of mothers who received care within three days postpartum, from a trained HCW</td>
<td></td>
<td>12. Percentage of women using family planning (any modern methods) six weeks postpartum</td>
<td></td>
</tr>
<tr>
<td>5. Percentage of newborns who received care within three days after birth, from a trained HCW</td>
<td></td>
<td>13. Percentage of caretakers seeking care from skilled care providers for sick newborns</td>
<td></td>
</tr>
<tr>
<td>6. Percentage of births in facilities that received active management of the third stage of labour to prevent postpartum haemorrhage</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

*HCWs include skilled birth attendants and trained community health workers
NUTRITION

Programme Head Tahmeed Ahmed

What does the Programme do?

Malnutrition stunts children’s growth and mental development. It also makes people more susceptible to disease 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. ICDDR,B’s Nutrition Programme therefore works to have a wide-ranging impact on the health of the population by cutting cases of malnutrition.

2005 was an eventful year for the Programme. Researchers have initiated a number of new studies under the ‘Improving the Health of the Poor’ project, for example. The Programme has also established a number of collaborative initiatives with different partners—both in Bangladesh and abroad.

Baseline survey completed for Bangladesh’s largest nutrition initiative

Working with the Institute of Public Health Nutrition and the National Institute of Population Research and Training, in 2005 the Programme completed the baseline survey for Bangladesh’s National Nutrition Programme (NNP). This covered a quarter of a million households and gathered detailed information from 27,000 respondents.

The report produced by the baseline survey makes many important recommendations. Specifically, it states that efforts to monitor and promote children’s growth should be widened and that the activities of community nutrition promoters should be prioritized. The importance of teaching people how to care for themselves and their families was also in the report, as was the need to counsel male household heads and mothers-in-law, who play important roles in decision-making in the families. It also highlighted the need to strengthen forums which allow adolescent girls to discuss and learn about good health practices.

Women—particularly new mothers—were singled out as a vulnerable group needing support. It was recommended that all mothers should be given vitamin A supplements soon after giving birth. It was also concluded that antenatal care should be broadened generally, to improve the health of both mother and child.

More generally, the survey also highlighted the need to provide treatments for parasitic worms (anti-helminthic treatments), and to establish an effective referral system, and safety net for the poor. Ways of improving services were also identified. These included ensuring that communities have more of a stake in the running of community nutrition centres (through participatory management) and that they are appropriately supervised. The report also recommended the better targeting of food supplementation, improving the nutrient content of the food supplements, promoting the consumption of iodized salt in the diet, and efforts to increase the coverage of iron supplementation during pregnancy.
Intensive nutrition education improves the nutritional status of moderately-malnourished children

To assess how effectively intensive nutrition education combats childhood malnourishment in rural Bangladesh, researchers randomly chose 282 moderately-malnourished children aged 6-24 months from different Community Nutrition Centres. At the start of the study, these children weighed only 61-75% of what NCHS/WHO guidelines consider normal for that age. The mothers and the children were all part of the Bangladesh Integrated Nutrition Project (BINP).

The 282 mothers involved were then divided into three roughly equal groups. The first group received intensive nutrition education from project educators twice a week for 3 months. The second received the same intensive education but were also given food supplements for their children. The third received the twice-monthly nutrition education routinely given by BINP community nutrition promoters.

After 3 months, researchers assessed all the children to determine which ones had improved from ‘moderately malnourished’ to become either only ‘mildly malnourished’ or ‘normally nourished’. This was assessed based on NCHS/WHO guidelines which indicate what a healthy child should weigh at a certain age.

The study found that only 18% of the children benefiting from the normal regime of BINP nutrition education showed nutritional improvements. By contrast, significantly more (37%) of the children in the intensive education group (no food supplement) showed such an improvement. The results were even better among the children who benefited from food supplements as well as intensive nutrition education, as 47% showed an improved nutritional status.

Once interventions ceased, the children were observed for a further 6 months. During this time the proportion of children displaying an improved nutritional status increased in all groups. But, again, the proportion of children showing improvements was significantly higher.
in both the intensive education group (59%) and the intensive education + supplements group (86%), than it was in the control group (30%).

The study also assessed how the different regimes affected the child-feeding practices of the mothers. In both intensive education groups, the frequency of child-feeding and complementary feeding (food given after six months once exclusive breastfeeding ends) improved significantly throughout the study. Analyses showed that the improvements seen in children's nutritional status were correlated with how often their mothers fed them *khichuri* and egg.

Researchers also found that the mothers' ability to recognize malnutrition improved from 15% to 99% in the intensive education group and from 15% to 100% in the intensive education + food supplement group. However, no improvement occurred in the control group. In addition, in both the intensive education groups the use of separate feeding-pots for children increased, as did the frequency of feeding, and the cooking of additional complementary food.

The results suggest that the nutritional status of moderately-malnourished children can be improved through intensive nutrition education alone, and can be further improved when supplementary foods are provided as well.

**New hospital units to treat children with severe malnutrition**

The facilities of Bangladesh's medical college hospitals are limited to treating only the complicating illnesses (such as pneumonia) which arise from malnutrition, rather than providing holistic care for the malnutrition itself. To treat malnutrition and achieve the Millennium Development Goals relating to child nutrition and mortality, a wider range of care is needed. This should include improved feeding practices and clinical services that meet internationally-recognized guidelines—like those set out by the WHO. More generally, the country also needs to improve the child-nutrition education and training that carers receive.

To address these issues, researchers have initiated a pilot project at the Chittagong and Khulna Medical College Hospitals. The project has already established nutrition blocks in both hospitals that are able to treat children with severe malnutrition. The units are also providing hands-on training to students, doctors, nurses, and NGO staff working to fight malnutrition—39 medical students and 12 intern doctors have already been trained.

During the period June-December 2005, 104 severely-malnourished children were admitted to the nutrition block of Chittagong Medical College Hospital. Seventy-one children were discharged after successful management. The case-fatality rate was only 9.8%, a figure that is lower than would be expected among severely-malnourished children arriving at a normal hospital not specially-equipped to deal with malnutrition.

### Training provided and new courses developed in 2005

At the request of the World Health Organization and His Majesty's Government of Nepal, the Nutrition Programme organized a training course on the management of severe malnutrition in Kathmandu (Nepal) in July 2005. Eight facilitators and 21 participants received hands-on training.

In collaboration with ICDDR,B’s Training and Education Unit, the Programme also conducted a training course on research methods for FCPS and MD students from the Department of Paediatrics, Dhaka Medical College. This very successful course was first run in June-July, before being repeated in September. Participants described it as ‘very useful’, and recognized its value in building the capacity of the country’s future experts.

The Programme has also been helping Uppsala University (Sweden) to develop its courses on international health and nutrition. In addition, it helped to design and deliver the nutrition course for the Master of Public Health programme run by the James P. Grant School of Public Health, BRAC University, Dhaka. This course was organized in partnership with staff from Uppsala University and the University of Dhaka.
Micronutrient malnutrition is a huge problem in Bangladesh, causing a range of debilitating—and avoidable—diseases. To help to overcome this, the Government has formed a national food-fortification alliance chaired by the Minister of Industries. The head of the Nutrition Programme (Dr. Tahmeed Ahmed) has been given a place on the Alliance’s National Committee, while another senior member of staff (Dr. Ahmed Shafiq) is sitting on the Technical Committee. As part of its work with the Alliance, the Programme is helping to map out a food-fortification strategy for the country.
ICDDR,B’s Nutrition Programme is working with the WHO to address the problem of severe malnutrition. The Head of the Programme, for example, shared ICDDR,B’s expertise on the management of severe malnutrition with other experts in the field at a WHO-led consultation meeting in Geneva in 2004. In 2005, the conclusions of this meeting were published as a WHO report. The Centre’s expertise will be used by the WHO when it revises its guidelines for the management of childhood malnutrition.

In September 2005, the Malnutrition Task Force was launched at the Congress of the International Union of Nutritional Sciences in Durban (South Africa). The Task Force is a worldwide advocacy and capacity-building initiative which aims to make people aware that tackling child malnutrition is key to improving child survival. The Head of ICDDR,B’s Nutrition Programme was nominated to act as the focal point of the South Asia network of the Task Force.

ICDDR,B’s Nutrition Programme is managing a major new World Bank initiative. This aims to firmly integrate efforts to improve nutrition into the mother and child health activities already being undertaken in developing countries. It will focus on (1) national-level capacity building in selected countries, (2) sharing and disseminating knowledge and global advocacy work, (3) providing technical support to countries developing mother and child health plans that take nutrition into account, (4) finding future funding that can be used to integrate nutrition into mother and child health activities, and (5) setting priorities for integrated efforts to achieve Millennium Development Goals 1, 4, and 5, i.e. eradicate extreme poverty and hunger, reduce child mortality, and improve maternal health.

The initiative will produce global public goods that will benefit people worldwide. The first year of the project will involve major efforts to build evidence, prepare a conceptual framework, and conduct small-scale operations research. Cornell University and the Aga Khan University are among the many partners involved in the initiative. The work-plan is currently being prepared.

Between 6 and 8 February 2006, ICDDR,B will host the Commonwealth Congress on Diarrhoea and Malnutrition: “Combating malnutrition and intestinal diseases: are we doing enough?”. The Centre’s Nutrition Programme is playing a key role in organizing the meeting, which will cover a wide range of fields. About 500 participants, including 100 from outside Bangladesh, are expected to attend.

Four new studies began in 2005 (see list below). Some of these have already begun to collect data, while others are still enrolling their study subjects.

1. The efficacy of community-based follow-up, food supplementation, and psychosocial stimulation in the home-management of young, severely-malnourished Bangladeshi children: a randomized intervention trial.
2. The effects of frequency of feeding and energy density of complementary foods on total energy intake by healthy, breastfed children in Bangladesh.
3. The effect of 200,000 International Units (IU) of vitamin A followed by 5,000-IU daily doses versus daily 5,000-IU doses of vitamin A on recovery from diarrhoea and acute lower respiratory infections in severely-malnourished hospitalized children.
4. The efficacy of lysine supplementation in reducing attack rates of diarrhoea in adults: a community-based randomized trial in urban Bangladesh.
What does the Programme do?

Although the Infectious Diseases and Vaccine Sciences Programme is housed within the Health Systems and Infectious Diseases Division (HSID), it actually works with many different programmes across the whole of ICDDR,B. In this way it focuses the Centre’s efforts to combat important infectious diseases affecting Bangladesh and other developing countries.

The Programme addresses the causes, distribution, and control (epidemiology) of key infectious diseases, and evaluates rapid, simple diagnostic tests. It also works to evaluate promising vaccines and enhance researchers’ capacity to investigate and respond to disease outbreaks in the region. Other major activities include assisting with technology transfer (to help other countries manage emerging infectious diseases) and using genomic analysis to gain a better understanding of disease-causing microorganisms identified across South Asia.

The Programme also collaborates with Bangladesh’s Ministry of Health and Family Welfare, and its Directorate General of Health Services, as well as with nine hospitals within the country. International partners include Thailand’s Armed Forces Research Institute for Medical Sciences, and the USA’s Harvard University, Johns Hopkins School of Public Health, and Centers for Disease Control and Prevention (CDC).

Awards and honours

A team of researchers led by Dr. Rob Breiman (the former Head of this Programme) won the Shepard Award—the highest scientific award given by the US Centers for Disease Control and Prevention— for their manuscript on the impact of childhood vaccination on death rates in Matlab, Bangladesh.

A manuscript written by Dr. Abdullah Brooks and colleagues on the use of zinc for pneumonia in very young children was included by the USA’s National Institutes of Health in their 2004 Annual Bibliography of Significant Advances in Dietary Supplement Research. Work on zinc by Dr. Brooks and colleagues was also included in Time magazine’s list of “The Year in Medicine from A to Z.”

Diseases of the intestine

Cholera epidemics and the role bacteriophages may play in ending them

Cholera epidemics (caused by the bacterium *Vibrio cholerae*) cause widespread illness and death in developing countries. The Ganges Delta region of Bangladesh and India, for example, suffers two cholera epidemics each year. ICDDR,B researchers and Harvard Medical School have therefore been working to identify what factors trigger and end these seasonal epidemics. Results suggest that bacteriophages (viruses that attack bacteria) may play a key role.

“Researchers will use their improved understanding of the interactions among hosts, *V. cholerae*, and cholera-killing bacteriophages to identify new ways of preventing cholera epidemics.”
During a three-year study of patients in ICDDR,B's Dhaka hospital, researchers confirmed that the number of cholera patients (which varied seasonally) often coincided with the presence of disease-causing *V. cholerae* strains in water samples. They also showed that, during epidemic-free periods, water supplies typically contained cholera-killing phages but no viable bacteria.

Importantly, researchers also found that the phage peak in water samples coincided with a rise in the number of phages found in the excrement of cholera patients. So, it seems that the epidemics are ended by phages which amplify in people with cholera—these then attack the cholera bacteria once they are excreted and enter water supplies. This may well explain why the seasonal cholera epidemics that occur in Bangladesh are self-limiting.

Before the development of modern antimicrobials, phage therapy was considered a feasible option for the treatment of bacterial infection. The study team will therefore use their improved understanding of the interactions among hosts, *V. cholerae*, and cholera phages to identify new ways of preventing cholera epidemics.

**Do treatments for Shiga toxin-producing bacteria lead to haemolytic-uraemic syndrome?**

Haemolytic-uraemic syndrome is a severe and potentially lethal result of infection with bacteria that release Shiga toxin. Symptoms of the syndrome include acute kidney failure. However, studies from developed countries have suggested that antimicrobial drugs can actually increase the risk of the syndrome.

ICDDR,B's researchers therefore reviewed seven drug trials conducted between 1988 and 2000 to determine whether antimicrobial therapy was triggering the syndrome. They found that the syndrome was rare, affecting only one in every 378 persons with *Shigella dysenteriae* type 1. They also found that Shiga toxin concentrations decreased in the faeces of 85% of the children who received antimicrobial agents. These findings suggest that the risk associated with using antimicrobial drugs to treat Shiga toxin-producing bacteria is small, and probably does not outweigh the benefits.

**Long-term monitoring of typhoid: a leap in drug-resistant strains**

Since 2001, the Programme has been monitoring cases of febrile (fever-causing) diseases in Kamalapur slum (Dhaka), an ICDDR,B study site. Throughout the study, *Salmonella* Typhi was the pathogen most commonly found in blood samples.

Researchers also found that pre-school children are around nine times more likely to catch typhoid than older people, and are just as likely to become seriously ill as a result. Worryingly, results also show that the proportion of cases resistant to quinolone antibiotics leapt to nearly 80% in 2005—from only 4% in 1999.

In 2005, the laboratory studies of *S. Typhi* included extensive molecular characterization of 237 strains from different patients. Importantly, this identified multi-drug-resistant strains of *S. Typhi* that did not contain the plasmid that was expected to be responsible for their multidrug resistance. Instead, some strains had multidrug resistance encoded directly onto the chromosomal DNA. This shows that *S. Typhi* has developed multiple means of developing drug resistance.

*An electron micrograph of bacteriophage from environmental samples*
Researchers also found that the S. Typhi strains characterized were markedly different from each other. This suggests that the high rate of typhoid seen in Kamalapur slum does not involve large outbreaks of just a few strains, but rather ongoing exposure to many different strains.

Ultimately, the study shows that children are most at risk of catching typhoid fever. It also highlights the fact that, due to the appearance of various strains more resistant to antibiotics, health services are losing their ability to easily treat this potentially deadly infection. Because of the increased difficulty in treating S. Typhi, Centre scientists are currently working to identify effective prevention strategies for S. Typhi.

**New strains of Shigella bacteria identified**

Studies of pathogens infecting patients being treated for severe diarrhoea at ICDDR,B's Dhaka hospital are providing researchers with a better understanding of Shigella. In 2005, researchers completed a detailed molecular characterization of Shigella sonnei—one of the types of Shigella most commonly found in Bangladesh. They discovered high levels of resistance to commonly-used antimicrobials, and considerable differences between the various strains identified. Researchers also found four different plasmids that contributed to drug resistance.

**Cholera strains characterized and a new Shigella boydii serovar identified**

ICDDR,B's researchers have also been collaborating with the International Vaccine Institute in Seoul (Korea) and Mozambique's Ministry of Health to characterize V. cholerae strains from Mozambique. Researchers found that the V. cholerae O1 strains studied contained genetic material from both classical and the highly virulent El Tor cholera strains. The study then reviewed the archives of V. cholerae O1 strains found in Bangladesh, and identified seven more strains that shared genetic material from both classical and El Tor cholera.

In 2005, ICDDR,B also identified a new serovar of S. boydii: 'Shigella boydii 19'.

Through microbiological studies such as these, ICDDR,B researchers improve our knowledge of diarrhoea-causing organisms around the world. The work also allows them to monitor changes and identify strategies for preventing the spread of these diseases.

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**Studies to identify effective, cheap alternatives for treating cholera**

Treating cholera patients with appropriate antimicrobials means they suffer fewer days of diarrhoea. However, ICDDR,B is finding more and more V. cholerae strains that are resistant to cheap and effective first-choice (first-line) antimicrobials. Researchers are therefore conducting studies to find new drugs that are cheap but effective.

To this end, ICDDR,B hospital scientists evaluated rifaximin as an alternative to standard treatment with ciprofloxacin, but found that it was no more effective. However, a separate study of adult patients with severe cholera found that low-cost, single-dose azithromycin effectively reduced the number of days of diarrhoea, as well as stool frequency and volume.

**Efforts to find new non-drug based methods of fighting intestinal diseases**

Rising resistance to standard drugs threatens to reverse the advances made in treating microbes that cause diseases of the intestine (enteric diseases). The Centre's scientists are therefore working on a number of approaches designed to treat the diseases without using antimicrobials.

In 2005, ICDDR,B hospital scientists assessed how well salmonum egg-powder (which contains anti-secretory factors) and amylase-resistant starch added to oral rehydration solution reduced the severity and duration of diarrhoea. Unfortunately, neither was effective.

However, more promising results were obtained for the treatment of shigellosis. In this study, researchers used rabbits to test whether administering a short-chain fatty acid (butyrate) increased the release of CAP 18, a naturally-occurring antibacterial peptide secreted by the lining of the intestine. Normally, infection with Shigella decreases the production of CAP 18.

Researchers found that the butyrate-treated rabbits had fewer Shigella strains in the intestinal cavity and showed less intestinal cell damage. This suggests that the intestine's own antibiotic could be used to treat intestinal pathogens.

**Diseases of the respiratory system**

Respiratory tract infections are the leading cause of death among children, both in Bangladesh and worldwide. Recognizing this, the Programme runs various projects designed to study the causes, distribution, and control of respiratory diseases.
Monitoring the influenza virus

The influenza virus undergoes frequent genetic changes, and regularly produces new strains. As a result, it has caused three global pandemics and killed over 50 million people in the last century alone. However, despite the seriousness of the disease and the fact that most new types are thought to emerge from Asia, influenza strains were not monitored in Bangladesh until 2001, when ICDDR,B began a pilot project.

In 2004, ICDDR,B launched a two-year study of influenza in Bangladesh in collaboration with the Influenza Branch of the Centers for Disease Control and Prevention. Run at ICDDR,B’s Kamalapur urban field site, the study monitors 5,200 children for respiratory diseases.

When a child at the site falls ill, he or she is evaluated by medical officers at the clinic using a standard protocol. One out of every five children showing symptoms of serious respiratory disease is approached for the study. If their parents give consent, both a serum sample and a nasal wash sample are collected. Nasal wash samples are then cultured in ICDDR,B’s Immunology Laboratory, to identify the disease-causing organism.

Between April 2004 and September 2005, researchers found influenza in 15% of the specimens collected. In fact, it was the most common respiratory pathogen identified, and was found year round. The influenza strains isolated included both influenza A (H3N2 and H1N1) and influenza B (Shanghai and Hong Kong). These findings are important because they show that influenza makes a major contribution to respiratory disease in children in Bangladesh.

Information on the strains identified by the study is shared with the World Health Organization—to help it follow changes in influenza strains worldwide. Indeed, Bangladesh is a high-risk country for the emergence of dangerous new strains of influenza that could spread globally. Bangladesh has the highest population density of any country in the world that is not a small city state. In addition, millions of households in Bangladesh raise poultry in backyard farms. This study demonstrates that influenza commonly circulates among people in Bangladesh. Centre scientists are working to expand surveillance for this important pathogen.

Monitoring pneumococcal infection in Bangladesh

Streptococcus pneumoniae (pneumococcus) causes severe respiratory disease and meningitis, and is thought to be a leading cause of childhood death. However, it’s difficult to diagnose, and difficult to grow and identify in laboratories. As a result, researchers aren’t sure how many people it affects each year.

Effective new vaccines are being developed. However, these are expensive. Researchers need to better understand how widespread pneumococcus is, in order to allow appropriate decisions to be made about vaccine use. Information is also needed because there are many serotypes of pneumococcus, and the vaccines are only effective against particular ones. Finally, because of the costs involved in introducing preventative approaches such as a new vaccine, decision-makers need to be sure that there really is a problem to be addressed.

ICDDR,B scientists are therefore monitoring for pneumococcus at seven hospitals in Bangladesh and at two community field sites—urban Kamalapur in Dhaka city and rural Mirzapur in the Tangail district. This work is supported by the Pneumococcal Vaccines Accelerated Development and Introduction Plan, which is headquartered at Johns Hopkins University and funded by the Bill and Melinda Gates Foundation.

After one year of data collection, researchers have already shown that pneumococcal illness is widespread among children in Bangladesh. They also found that, of the seriously-ill hospitalized children in whom pneumococcus was confirmed, 23% died—despite being treated with an appropriate antimicrobial.

The community-based surveillance at the two field sites allows researchers to estimate how widespread pneumococcal disease is in real populations. The data collected up to September 2005 suggest that already-developed conjugate vaccines would be effective against 30-60% of the serotypes identified in both hospitalized children and those in the community.

Based on results to date, the Kamalapur field site was selected as one of the four sites in Asia that will be used to develop and test a new conjugate pneumococcal vaccine. Efforts are underway to capture additional funding and it is expected that new work will begin to assess healthcare use, vaccination status, and pneumococcal incidence.
**Tuberculosis**

Tuberculosis (caused by *Mycobacterium tuberculosis*) kills around 70,000 people a year in Bangladesh, and around 2 million worldwide. ICDDR,B's researchers are therefore working to better understand the distribution and basic microbiology of *M. tuberculosis* in order to find ways to control it.

Researchers are monitoring tuberculosis in Matlab and in urban Dhaka to determine the disease burden, methods of transmission and care-seeking behaviour. They are also assessing the economic impact of the disease and drug-resistance patterns. Sampling in these areas found that 95 out of 100,000 people aged 15 or older had tuberculosis. The study also found that cases of tuberculosis clustered geographically in Matlab. Worryingly, the researchers also observed that 48% of the tuberculosis isolates obtained were resistant to at least one drug, while 5.5% were resistant to multiple drugs.

ICDDR,B's researchers genotyped 350 *M. tuberculosis* strains from urban communities and 349 strains from rural areas of Bangladesh using a range of techniques. This showed that modern epidemic strains (which are more often associated with drug resistance) were twice as common in urban areas as in rural areas.

The study also found that 87% of the 100 strains identified in rural Matlab were genetically unique—the other 13% displayed genetic patterns that were identical to those found in at least one other isolate. These 13 isolates were grouped into five different clusters, the largest of which consisted of five isolates of the 'Beijing' genotype. The remaining four clusters each consisted of two isolates. No epidemiological link was found among the identical strains. These results suggest that increases in tuberculosis in rural Bangladesh have been to a large extent due to the 'reactivation' of latent disease acquired many years earlier, and mostly caused by 'ancestral' strains.

The presence of newer strains in urban areas probably reflects the fact that the people living there have more contact with people they don’t know. It also means that, although tuberculosis is more widespread in rural areas, emphasis must be placed on controlling urban tuberculosis to prevent the epidemic worsening.

**Parasitic diseases**

**Effective new drugs tested for the treatment of malaria**

Worldwide, a child dies of malaria every 30 seconds, and the disease is a severe problem in Bangladesh. Large numbers of people living near Bangladesh's border with Myanmar and its eastern border with India face a severe risk of illness. The problem is made worse by the development in Southeast Asia of multi-drug resistant forms of *Plasmodium falciparum*—one of the organisms that cause malaria.

In 2005, Bangladesh’s Ministry of Health and Family Welfare stated that artemether-lumefantrine (Coartem®) was to be the new first-choice treatment for uncomplicated malaria in Bangladesh. Working with the Armed Forces Research Institute of Medical Sciences (Bangkok), ICDDR,B therefore evaluated its efficacy by conducting a study in southeastern Bangladesh (in the Lama area of Cox’s Bazar district, near the Myanmar border). In total, 388 patients with fever and suspected uncomplicated falciparum malaria were screened; 67 of these were confirmed to have falciparum malaria and completed the full 42-day follow-up.

All subjects were clear of parasites within 7 days of the start of the treatment and remained clear at day 28—showing that the new drug is an effective treatment for uncomplicated falciparum malaria in Bangladesh. Because of the risk of drug resistance, ICDDR,B will continue to monitor the efficacy of anti-malarial treatments such as this one.

**Assessing which type of Giardia is most likely to cause diarrhoea**

*Giardia lamblia* is the most common protozoan parasite of the intestinal tract. People infected with this single-celled microscopic parasite may show no signs of infection. Or, they may show a range of symptoms including diarrhoea and an impaired ability to absorb nutrients from food (malabsorption). It isn’t clear why these differences occur from person to person. However, it has been suggested that the differences are the result of infection with different genotypes. In fact, there are two major sub-types of *Giardia* which infect humans: A and B. These are so different genetically that some researchers feel they should be considered to be two separate species.

To identify whether *G. lamblia* A or B was more likely to be associated with diarrhoea, ICDDR,B’s researchers studied 2,534 patients. Of them, 18% were infected but showed no symptoms.

The study found that 90% of those patients who didn’t show symptoms were infected with genotype A. Diarrhoea, by contrast, was more common in those with genotype B. This suggests that the different genotypes of *Giardia* may actually cause different symptoms.
New evidence that Entamoeba stunts children’s growth

Because parasitic infections can stunt children’s growth, ICDDR,B’s researchers have been assessing whether *Entamoeba histolytica* has such an effect. This parasite is common in Bangladesh, and causes amoebic dysentery.

After evaluating the growth of 225 children in an urban slum at Mirpur, Dhaka, researchers found that those who had suffered more episodes of *E. histolytica*-associated diarrhoea weighed less and were shorter than other children of the same age. This strongly suggests that *E. histolytica* may contribute to poor growth among children in Bangladesh.

Emerging and re-emerging diseases

New understanding of the spread of Nipah virus

ICDDR,B is working with international partners and the Government of Bangladesh to improve our understanding and ability to respond to the Nipah virus. This is a newly-emerging and deadly paramyxovirus which causes fever and encephalitis (swelling of the brain). Between 2001 and 2004, there were four outbreaks of Nipah virus in central and western Bangladesh. These outbreaks always occurred between January and May, and were associated with different forms of transmission, including person-to-person.

In January 2005, the Programme and its partners worked to investigate the fifth recognized outbreak of Nipah encephalitis in Bangladesh. During this outbreak, 12 people were identified as showing the symptoms of Nipah, 11 (92%) of whom died. Sera were collected from three cases and analyzed by Centers for Disease Control and Prevention, and two of the people sampled were found to be producing immunoglobulin M (IgM) antibodies against the Nipah virus.

The next step was to find out how people had contracted the virus. Researchers found that the only exposure that was significantly associated with Nipah was drinking raw date-palm juice. It seems that people had contracted Nipah by drinking date-palm juice which had been infected by fruit-bats (*Pteropus giganteus*), which are thought to be the wild reservoir for Nipah virus in Bangladesh.

Date-palm juice producers view fruit-bats as a nuisance, because they frequently drink palm juice directly from the tap (cut in the tree) or the clay-pot used to collect this sweet sap overnight. In this case, it seems that infected bats had contaminated the date-palm juice during the night. As usual, the juice was then gathered in the morning and sold fresh to avoid its spoiling. Since palm juice is always consumed within a few hours of harvesting, even a virus that can only survive for a short time outside the host could probably have been transmitted.

These findings, coupled with those from past studies, show that the virus can spread via several routes from fruit-bats to humans. ICDDR,B is expanding its monitoring activities and its collaboration efforts in order to further improve its investigation of future Nipah outbreaks and prevent future transmission. The new collaboration efforts include work with bat experts, which will help us to better understand how the virus is transmitted.

Monitoring hepatitis E virus

The hepatitis E virus (HEV) causes epidemics worldwide. And, though it isn’t generally fatal, it does threaten pregnant women—killing more than 20% of those hospitalized in their second and third trimesters. The virus is thought to be endemic in many developing countries. However, little research has been done to find out how common it is in Bangladesh.

A team of ICDDR,B researchers therefore conducted a cross-sectional seroprevalence study of a random sample of people from Bangladesh’s rural Matlab area. In this, they were partnered by the National Institutes of Health (USA) and the Johns Hopkins University (USA).

The study took samples from 1,134 people, and found that 146 (13%) displayed elevated anti-HEV immunoglobulin G (IgG) levels, indicating that...
they had been infected with HEV at some time in the past. The study also found that elevated anti-HEV IgG occurred in fewer women (11%) than men (15%).

What this means is that the hepatitis E virus is present in a typical rural community in southern Bangladesh, and may well be causing deaths among pregnant women. Further studies to estimate the incidence of disease and risk factors for transmission are underway.

**Vaccine studies**

**Promising new cholera vaccine tested**

An effective cholera vaccine which uses dead *Vibrio cholerae* bacteria (the killed oral cholera vaccine) is currently available. However, more than one dose have to be given, and the protection it provides is short-lived—especially in children. Funded by the Bill and Melinda Gates Foundation, and in collaboration with the International Vaccine Institute and Harvard University (USA), ICDDR,B has therefore been working to test an easily-administered vaccine that protects children for longer and is effective after only one dose.

Taken by mouth, the vaccine uses live, but very weakened, cholera bacteria. This live-attenuated oral cholera vaccine is known as Peru-15. To ensure that the vaccine was safe, an initial batch of subjects was tested in ICDDR,B’s newly-established inpatient facility using progressively higher doses of the vaccine.

This was followed by an outpatient phase, which tested the vaccine on 310 people in the community in Mirpur. These subjects were randomly selected, with some being given the real vaccine and some a placebo. Neither the researchers giving the doses nor the subjects receiving them knew which had been given (known as a double-blind technique).

Results showed that the vaccine was safe and didn’t cause any harmful effects in the people tested. A single dose of 2 $10^8$ colony-forming units of Peru-15 stimulated immunological responses in adults, toddlers, and infants. In fact, 75% of adults, 84% of toddlers and 70% of infants had antibody levels in their blood that were capable of killing cholera bacteria. The safety of Peru-15, and the high level of immune response it causes, make it a suitable candidate for broader efficacy trials.

**Assessing the incidence of intussusception caused by vaccines**

Rotaviruses cause gastroenteritis and diarrhoea, and are a leading cause of death and illness in young children around the world. However, in 1999 a promising rotavirus vaccine had to be removed from the market because it was thought to increase intussusception. This is a rare, but potentially fatal condition in which one part of the intestine slides into another—a little like the sections of a telescope. New vaccines are being developed. But, at any site at which they are being evaluated, researchers must be able to detect and manage intussusception.

ICDDR,B’s researchers have therefore created a systematic approach that can be used to diagnose and rapidly manage intussusception. In 2004 and 2005, the approach was tested at the Matlab field site, the most likely site for a new rotavirus vaccine study.

Over one year of monitoring, community health research workers referred 28 children under two to the Matlab hospital with suspected intussusception. Of these, only two cases met the definition of ‘probable intussusception’ set by the Brighton Collaboration (a working group of experts which defined the symptoms of intussusception). However, ultrasonograms showed that these children were not actually suffering intussusception. As a result of this work, researchers at Matlab now have the capacity needed to identify intussusception (based on symptoms and ultrasonograms) making the site suitable for use in any future rotavirus vaccine studies.
ICDDR,B’s Health and Family Planning Systems Programme (HFPSP) is broadly concerned with improving people’s access 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 public–private sector interactions.

Several other research programmes within ICDDR,B also work to improve health systems. As a result, HFPSP also works closely with these programmes as well as with the Centre’s Health Systems and Economics (HSE) Unit.

Validating the newborn death rates recorded by an NGO in Bangladesh

About half of all the children under five who die in Bangladesh die as newborn babies. If the country is to achieve the Millennium Development Goal of reducing the under-five mortality rate by two-thirds, it has to slash the number of neonatal (newborn) deaths. To monitor progress, it is vital to have an accurate idea of the country’s mortality rates.

Given the importance of this finding, ICDDR,B conducted a study to check that neonatal deaths had been accurately recorded among the group of children whose births were registered in 2003.

The study focused on 12 of the 27 areas in which the NGO in question has been providing health services since 1996. To assess the validity of the NGO’s data, researchers studied its register of neonatal deaths as well as verbal autopsy reports, and immunization records (to confirm survival). They also interviewed as many of the mothers whose infants had died within 28 days of birth as they could, as well as a sample of 109 mothers who had registered stillbirths.

Using these methods, the researchers found 210 neonatal deaths in 2003. However, only 194 were registered in the NGO’s system for that year.
Given that there were 11,253 livebirths registered in 2003, the researchers calculated an overall NMR of 18.7 per 1,000 livebirths. Within 11 of the NGO areas, the NMR ranged from 15 to 29 per 1,000 livebirths.

Evidence from an independent household survey suggests that the NGO’s system may have underestimated the NMR by a considerable degree. In fact, for the period 1999-2003, the underestimation was as large as 55% in some cases. However, even allowing for under-reporting, the NMR in some NGO areas is certainly lower than the national figure of 41 per 1,000 livebirths for 1999-2003. In these areas, neonatal deaths were actually below 30 per 1,000 livebirths in 2003, despite these being remote and difficult for the Government to reach with health services.

Identifying the causes of death among newborn babies in rural Bangladesh

HFSP has been working to identify the main factors related to newborn deaths in areas served by a large consortium of NGOs. The information gathered will be used to identify and support the best ways of preventing newborn babies from dying.

Researchers collected data from 142 mothers whose children were born alive in 2003 but died within 28 days of birth. As a control, the study also considered 617 mothers whose babies had lived—241 from the same neighbourhood as the mothers whose infants had died and 376 from different neighbourhoods. A similar proportion of the mothers of babies who died and of mothers whose babies had lived had received NGO health education and maternal health services.

The study found that in the case of 122 singleton (born-alone) babies, the main risk factors associated with death were (1) complications during delivery, (2) prematurity, (3) care by an unlicensed ‘traditional’ healer, and (4) care not being sought for the infant. It found that newborns who had an older sibling who had not been vaccinated against measles were most likely to die.

Researchers also found that 40% of the deaths studied occurred within 24 hours of delivery. Clearly, therefore, babies facing a high risk of death need to be identified quickly so that medical interventions can be provided soon after birth.

Efforts to reduce the number of infant deaths should also include special counselling for pregnant mothers at risk of losing their newborns. Mothers should also be told where to get appropriate care for a sick baby, and birth attendants should be trained to give resuscitation. In addition, babies identified as being at high risk when they are born should be given postnatal check-ups in the home soon after birth. Finally, efforts must be made (1) to improve the capacity of sub-district hospitals to provide emergency obstetric and newborn care and (2) to encourage mothers to give birth in hospital.

Dispersible zinc tablets: a lifesaving diarrhoea treatment for children

ICDDR,B is working to develop a dispersible zinc tablet that can be used to treat children with acute diarrhoea. To be successful, these efforts have to take into account both the taste and cost of the tablets, as well as how feasible it is to distribute and store them.

Researchers therefore conducted a community-based study of under-fives to determine (1) whether children would willingly take the formulation and (2) whether children took the full course of treatment.

The study supplied local drug-vendors in selected urban and rural communities with dispersible zinc tablets in 10-tablet blister packs. They also taught them how to prescribe and administer the tablets. Parents or guardians seeking help for children with acute childhood diarrhoea from these drug-vendors were therefore provided with these zinc tablets and instructions for treatment. Field research assistants then surveyed the patients 2-3 weeks later.

Researchers observed that under-fives found the formulation highly acceptable. In fact, over 90% of the parents or guardians felt that the children found them just as acceptable as other medicines, or even more so. Importantly, the standard dose of one tablet per day was correctly received by 98% of the children, while 56% of the children completed the full 10-day course of zinc treatment (something which did not vary according to the child’s age or gender).

These findings indicate that the tablet formulation is acceptable and easy to administer. How-
ever, further efforts must be made to ensure that children finish the full 10-day course of treatment.

**Determining the safety of zinc treatment for acute childhood diarrhoea**

Zinc causes nausea and vomiting in adults if doses of more than 50 mg are given. HFPSP therefore ran a study to determine whether the 20-mg dispersible zinc sulphate tablet formulation being prescribed to children increases the risk of vomiting or regurgitation after the first dose.

The study considered 1600 children—800 in ICDDR,B’s Dhaka hospital and 800 in an adjacent NGO outpatient clinic. Once they had been rehydrated with oral rehydration salts solution (ORS) and were not vomiting, these children were randomly assigned to one of three groups: (1) no treatment, (2) treatment with placebo dispersible tablets, and (3) treatment with 20-mg dispersible zinc sulphate tablets. All vomiting or regurgitation episodes were then recorded over a 60-minute observation period.

In comparison with children given the placebo, children given the zinc tablets were 14% more likely to vomit and 5.2% more likely to regurgitate. However, of the children treated with zinc who did vomit (around 26%), the great majority (91%) only vomited once. Overall, during the observation period, 40% of the vomiting episodes recorded occurred in the zinc treatment group, while 26% occurred in the placebo group, and 34% in the non-treatment group.

The findings suggest that, at a dose of 20 mg, dispersible zinc sulphate tablets do increase the risk of vomiting and regurgitation. However, these side-effects occur only for a short period of time.

**Evaluating the safety of routine zinc therapy for children with diarrhoea**

The results of the previous study are confirmed by the findings of a much larger study the Programme ran to assess how safe it is to routinely use zinc to treat acute or persistent diarrhoea in children. Conducted at ICDDR,B’s Dhaka hospital and an outpatient clinic operated by a local health NGO (Progoti Samaj Kallyan Protishthan), this study considered 20,246 of the 42,440 chil-
dren treated with zinc over a one-year period. Over the course of the study, researchers worked to identify (1) what adverse effects children suffered and (2) how severe these effects were.

Children aged 3-59 months, who were prescribed one 20-mg dispersible zinc sulphate tablet per day, were observed for 60 minutes after taking the first dose. No adverse events other than vomiting or regurgitation were observed. None of the children revisited the hospital because of recurrent vomiting after they had been discharged.

During the 60-minute observation period, 4,392 (22%) of the children regurgitated or vomited. In all, 90.8% experienced one episode of vomiting or regurgitation, while 8.7% experienced two episodes. Only 0.5% experienced more than two episodes of vomiting or regurgitation.

Clearly, a significant proportion of infants and children may experience vomiting or regurgitation after they receive their first dose of zinc. However, this usually only occurs once, and the side-effect passes quickly. Importantly, this short-lived side-effect does not affect zinc treatment and does not mean that treatment cannot be continued.

Finding the best methods to distribute zinc tablets effectively

The USAID-funded NGO Service Delivery Program (NSDP) is one of the largest NGO health service delivery systems in Bangladesh. It includes 318 permanent ‘Smiling Sun’ clinics, 8,000 satellite clinics, and over 7,000 community health workers (or depot-holders). Every month the NGO provides healthcare services to around 2 million people in remote rural areas or urban slums.

Depot-holders distribute medicines and promote preventive healthcare measures. Theoretically, therefore they could prescribe and distribute zinc tablets for the treatment of childhood diarrhoea. To determine if this was feasible, researchers surveyed 64 community depot-holders and 600 caretakers with a child who had diarrhoea. They then provided the depot-holders with one week of training in diarrhoeal disease management, as well as support in the field as needed. The study also worked to make people aware that zinc treatment was available—by informing community leaders and providing posters.

A follow-up survey 4 months after the depot-holders were trained showed that the service wasn’t really being used. In fact, the number of cases of childhood diarrhoea treated in each community only rose from less than 2 to around 3 per month on average.

Under current conditions therefore using depot-holders as distributors would not increase the number of children benefiting from zinc treatment. ICDDR,B will therefore work with NGOs to identify other, more effective, delivery strategies.

Field-testing of a new intrauterine device screening tool

International guidelines for intrauterine devices (IUDs) have changed considerably—making more women eligible for this method of birth control. But, service providers in Bangladesh are not yet aware of these changes. This means that women aren’t receiving services they are eligible for. To address this, HFPSP has taken part in an initiative which Family Health International (FHI) is running in Asia, Africa, and Latin America.

The work aimed to test a screening checklist developed by FHI and to make service providers
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aware of the new eligibility guidelines. The check- list had already been reviewed by a panel of 12 international experts. A pelvic examination, and questions concerned with sexual behaviour and medical history were used to identify any factors which would make an IUD unsuitable for a particular woman.

The study was run at two urban and two rural sites, and included family-planning service providers from the government and from NGOs providing IUD insertion in the field. All were trained in IUD provision and were provided with 5-10 IUDs during the last month of data collection.

In general, participants agreed that the new checklist was comprehensive and easy to use. They also stated that the inclusion of new groups would increase IUD use and that they would be willing to provide IUD services to the new groups if authorized to do so. However, participants did raise concerns about the fact that the checklist omitted exclusion criteria which they currently apply and which are relevant specifically to Bangladesh.

Increasing adolescents’ awareness of sexual health

Radio programmes and educational booklets are being used to teach adolescent school children in Bangladesh about sexually transmitted infections (STIs), including HIV/AIDS. ICDDR,B has therefore conducted research to determine how effective these efforts are.

Based on the school they attended, male and female students were assigned to different groups. These groups were used to compare (1) students who had listened to a radio programme concerned with sexual health, (2) students who had received educational booklets on puberty, family planning, and STIs and HIV/AIDS, and (3) students who had both received the educational booklets and listened to the radio programme.

Before either hearing the radio programme or reading the booklets, however, students were surveyed to determine their knowledge of reproductive health. Over the following year, the radio programme was aired and the booklets distributed, and 18 months after the first survey the students were surveyed again.

Overall, the radio programme alone and the booklets alone both increased boys’ and girls’ knowledge significantly—though the increase was relatively small. Researchers found, however, that the boys who listened to the radio programme and also received booklets demonstrated a significantly greater increase in knowledge than those boys who only received booklets.

Radio programmes alone are not sufficient to improve adolescents’ knowledge of sexually transmitted infections

Overall, the study found that radio programmes and booklets on STIs and HIV/AIDS do improve knowledge of these issues among adolescents in rural Bangladesh—especially males. However, it also showed that radio programmes alone are not sufficient to improve adolescents’ knowledge.

Effective daycare-based management of young children with severe pneumonia

In Bangladesh, lack of hospital beds means that many children suffering from severe or very severe pneumonia cannot be hospitalized and don’t receive the treatment they need—such as suction to clear airways, oxygen therapy, and bronchodilation.

To find an effective alternative to hospitalization, the programme conducted a two-year study (June 2003 to May 2005) to determine whether children with pneumonia can be managed on a daycare basis. The study provided care to 251 children suffering from pneumonia, 86% of whom were infants, and over half of whom (63%) were boys. All had been refused a bed by hospitals in Dhaka.

These children were therefore enrolled at the Radda MCH-FP Centre (Radda Clinic) in Dhaka. Each day, including weekends and holidays, parents/guardians brought their children to the Clinic at 8:00 am, where they received antibiotics, food, and care such as oxygen therapy until 5:00 pm. The study also taught caregivers how to care for the children at home. Treatment
Saving Sufia

Sufia is a typical example of the children who could be helped by providing effective daycare for children with pneumonia. Born to a poor family with a monthly income of Taka 4,200 (around US$65), Sufia was 3 years old when her mother brought her to Radda Clinic in Dhaka.

Sufia was suffering from severe pneumonia and low blood oxygen levels (hypoxia), and was immediately referred to a hospital for treatment. Unfortunately, when her parents got to the local hospital they were told that no bed was available free of charge for their daughter. Normally, because they couldn’t afford to pay for treatment, Sufia’s parents would not have been able to get medical care for the little girl. Situations like this are not uncommon in developing countries like Bangladesh, and normally we just don’t know what happens to the children that hospitals turn away. Sufia was lucky however—Radda Clinic was taking part in an ICDDR,B study to determine whether daycare can be successfully used to treat pneumonia. Her parents had been told that if the hospital refused to admit Sufia they could return to the Clinic and take part in the study, which had already been fully explained to them. By the time Sufia’s parents returned to the Clinic the little girl’s condition had worsened greatly. So staff gave Sufia a bed and provided a range of treatments to stabilize her—by treating her with an antibiotic, clearing her nose and throat, and raising the amount of oxygen in her blood to normal levels. They also x-rayed her to gain a better understanding of her condition.

Sufia had to go home when the Clinic closed. So, staff also taught her mother how to care for her at night (by keeping her airways clear and assessing any deterioration that would require her to go to hospital for emergency treatment). They also provided suitable food for her. Nursed at home by her mother, the little girl lived through the night. She returned to the clinic next day at 6:00 am to continue her treatment. Over the next 10 days of treatment, Sufia made a full recovery. Once treatment stopped, she received follow-up every 2 weeks for the next 3 months.

Treating Sufia in this way didn’t only save her life, it also improved her mother’s ability to care for her long term—as staff taught her how to prepare a cheap but appropriate diet using locally-available foods like khichuri and milk-suji. Plus, unlike hospitals, the Clinic didn’t require Sufia’s mother to stay with her. This meant that she could still care for the rest of her family while Sufia was being treated in a clean environment that didn’t suffer the over-crowding seen in most public hospitals.
continued until each child’s condition substantially improved—their progress was then followed up every 2 weeks for 3 months after treatment ceased.

According to WHO definitions, 80% of the children had severe and 20% very severe pneumonia when they were admitted—57% were suffering low blood-oxygen levels. On average, they were treated in the clinic for 7 days. In total, 234 (93%) were treated successfully, while 11 (4.4%) had to be referred to a hospital. A further 6 (2.4%) discontinued treatment against medical advice. There were no deaths during management at the clinic.

The results of this study indicate that established daycare clinics can be used to successfully manage severe pneumonia in children. However, for such efforts to be successful, these clinics must have both the necessary equipment and adequately-trained and well-motivated staff.

A few years ago the Bangladesh Government established essential services package (ESP) clinics to reduce the pressures faced by hospitals. It must be recognized, however, that the care provided by the study at the Radda Clinic goes far beyond the care these ESP clinics can deliver. They are expected to refer such cases to hospitals. Clearly, therefore health service delivery systems, mid-way between ESP clinics and tertiary-care hospitals, need to be established to provide lifesaving mid-level/emergency care.
What does the Programme do?

ICDDR,B’s Population Sciences Programme works to understand a whole range of issues related to changes in Bangladesh’s population. Focuses include work to identify why the decline in fertility rates has started to level off in Bangladesh, as well as efforts to understand the health problems of adults and the elderly—and how best to provide support. The Programme also studies rural-to-urban migration and changes in health equity, and aims to develop and monitor interventions to better manage health and population challenges in Bangladesh and other areas of the world.

Links between fertility changes and mother and child mortality

Impacts of changes in fertility levels and patterns on maternal death rates

In Bangladesh, the maternal mortality rate (MMR), or the number of deaths per 1,000 livebirths, fell by 20% between 1985 and 2000. However, changes in the absolute numbers of maternal deaths are not clear, because the MMR statistic is calculated using the number of births, which has fallen markedly in recent years. In fact, the country’s fertility rate (the number of children born to the average woman) has halved since the early 1980s—a remarkable achievement.

In a study covering the period 1983-2003, ICDDR,B therefore studied maternal deaths in its rural Matlab field site in relation to changes in fertility levels and fertility patterns (the number of children that women of different ages have). To do this, researchers first calculated the maternal mortality rate in relation to the age of mothers and the number of children they had already had (Fig. 1).

To estimate the numbers of deaths, researchers then considered three scenarios (Fig. 2). The first used the actual fertility levels and patterns observed per year in Matlab. The second assumed that both the fertility level and fertility pattern remained the same over time as they had been in 1983. The third scenario used the actual fertility level observed per year in Matlab (which fell over time), but assumed that the fertility pattern remained the same over time (the pattern observed in 1983).
By comparing the number of deaths estimated in the different scenarios, researchers found that the decline in the fertility level over time was responsible for a 27.9% fall in maternal deaths. The change in fertility pattern was responsible for a further 9% fall in maternal deaths.

Overall, therefore, the study found that maternal deaths in Matlab have fallen by one-third simply as a result of the decline in fertility levels and a change in childbearing patterns (i.e. women are having fewer children). Findings also showed that maternal deaths had actually fallen by a much greater extent than was reflected in the fall in the maternal mortality rate (MMR).

**Impact of changes in fertility levels and patterns on infant deaths**

Researchers assessed the impacts of fertility changes on infant deaths. They used the same approach as was used to investigate maternal deaths (above). The findings were similar (Fig. 3). The decline in the fertility level over time was responsible for a 27.9% fall in infant deaths, while changes in the fertility pattern resulted in a further 6% fall. This is because having fewer children lowers the proportion of high-risk births.

**Pregnancy spacing and maternal illness**

Findings from a recent analysis of Matlab data indicate that women who leave 2-4 years between pregnancies are at less risk of high blood pressure and pre-eclampsia (which can cause coma and convulsions) than either those who wait more than 4 years or those who wait less than 2 years. The interrelationship between maternal age and parity (number of children born) is complicated. However, the study found that while being ‘too old’ does damage mothers’ health and chances of surviving a pregnancy, being ‘too young’ does not. In fact, of the five ‘too’s’ used to characterize pregnancies associated with poor outcomes, being ‘too old’ is associated particularly with anaemia and oedema (the excessive accumulation of fluids) while being ‘too young’ is not.

The study also found that ‘too many’ pregnancies are associated only with a higher risk of anaemia—in fact, the risk of developing other types of ill health, especially pre-eclampsia and oedema, seem to be lower. However, leaving shorter intervals between pregnancies (‘too close’) was found to be associated with increased risks of pre-eclampsia, as well as high blood pressure, and the premature rupture of membranes.

Finally, leaving ‘too long’ between each pregnancy is associated with a higher risk of illness, including pre-eclampsia, high blood pressure, and oedema. Pregnancies after such long intervals are similar to first pregnancies, suggesting that any protection derived from childbearing might be lost over long periods.

**Studying changes in health equity in rural Matlab**

Studies show that it is wrong to assume that people living in poor countries are all equally poor or equally unhealthy. In fact, health status and access to services differ significantly according to people’s socioeconomic conditions and gender. It is also clear that such differences can change over time. This means that longitudinal data (following households over time) can throw light on trends in equity and provide explanations in a way that cross-sectional survey data (snapshots taken at one point in time) frequently cannot.

Results of a 2005 ICDDR,B study have shown that between the mid-1980s and the mid-1990s, infant
and child deaths fell sharply in Matlab. And, as might be expected, they fell by a greater extent in the half of the surveillance area where ICDDR,B was providing health-related services.

Surprisingly, however, researchers found that the gap between poor families and better-off families, in terms of infant and child deaths, actually widened during this process of overall decline. Put simply, the better-off benefited more from health interventions than the poor, and health equity decreased after virtually free health services were provided.

The study also found that child mortality was initially much higher among girls than boys (though infant mortality was slightly lower for girls initially). However, child mortality declined more among girls as time went on. In fact, the decline was so great that, by the time children were aged between one and five, death rates were lower for girls than for boys.

The study also explored the specific causes of death underlying these patterns and the cost of the interventions. While generalizations are risky, it seems that girls benefit from low-cost or free health interventions, but boys are more likely to be given costly healthcare. This results, for example, in greater declines in diarrhoea among girls where low-cost oral rehydration salts (ORS) are effective, but smaller declines in pneumonia among girls where more costly antibiotics are required.

The above analyses were based on earlier socioeconomic (SES) censuses (1982 and 1996) undertaken in Matlab. It has long been felt that a new SES census needs to be undertaken, and this was done in 2005.

**Household socioeconomic census, 2005**

As ICDDR,B’s poverty-related research expands, measuring households’ economic status is vital. A complete socioeconomic census was therefore conducted—the fourth in three decades. This census will allow equity analyses to be undertaken for a wide range of studies.

The household component of the census included a variety of new socioeconomic variables, in order to capture the more dynamic nature of poverty within economically borderline households. The data gathered include information on household sources of income within the last 12 months, as well as information about durable household items, food security, sanitation, sources of drinking-water, and NGO membership.

During the census, Community Health Research Workers (CHRWs) also updated the information on individuals’ education, occupation, marital status, and the type of apparel the ‘ever-married’ (married, divorced, or widowed) women usually wear.

The data from the 2005 SES Census, which will be available soon, will allow researchers to conduct longitudinal analyses of economic change within all households in the area over three decades. Importantly, the data gathered are virtually unique in the developing world and will be able to throw light on how households rise out of, or fall into, poverty, and why they fail to improve their circumstances.

**Adult health studies**

Changing demographic patterns and disease patterns mean that the requirements of health systems are changing rapidly. Much work is now being done on adult health and the growing importance of non-communicable diseases (such as heart disease), especially among the economically-productive age groups.

**Daily activities among the elderly**

Bangladesh’s population is large and still growing, with the largest levels of growth being seen among the elderly. The number of people aged 60 years and above has increased some nine times this century, while the number of young people (under 15 years) will not increase at all.

In the West, the elderly often retire from productive activities. In developing countries, however, they rarely have that opportunity. And, there is also evidence that the self-esteem of the elderly in poor countries is closely linked to (a) having a role to play in family life and (b) being physically and economically active. ICDDR,B has therefore studied the important issue of elderly people’s levels of activity.

The number of people aged 60 years and above has increased some nine times this century.

The study, which considered 625 elderly Bangladeshi (280 men and 345 women), has shown that they demonstrate an encouragingly high level of physical activity. In fact, 95% of men and 92% of women were involved in at least one productive activity.
Such activity can be poverty-driven, however—particularly as the active elderly tend to be less likely to be living with their children and so are less likely to receive social and financial support. Then again, poverty analyses also indicate a strong association between being poor and requiring assistance with self-care and movement, being poor and living alone, and being poor and living in a very small household.

The types of physical and productive activities that the elderly undertook were found to differ according to gender. Women were more likely to undertake domestic activities (cooking, cleaning, and caring for grandchildren), while men were more likely to undertake activities that involved going out of the house (for example shopping, taking grandchildren to school, and participating in community-group activities). A substantial number of older women did, however, frequently participate in NGO and religious activities outside the house.

Because traditionally husbands tend to have much younger wives, the majority of women were widowed (72%); the percentage of widowed men was much lower (9%). Women were equally as likely to be living with their children (71%) as men were (76%). All these factors have social-support implications.

Non-communicable diseases of the elderly

In 2005, ICDDR,B examined elderly residents of Matlab for clinical signs of ill health (physical and mental). Around 1 in 5 were found to have elevated blood pressure, with more women (24%) suffering from high blood pressure than men (15%).

Cholesterol levels were generally low, though they were elevated in 1 in 20 elderly people. Women were twice as likely as men to have elevated cholesterol (7% and 3% respectively). The reasons for this difference are not clear, although they may be related to physical activity. Similarly, 1 in 20 elderly persons had elevated random blood glucose (an indicator of diabetes). This was slightly less common among women than among men—4.6% compared with 6%, respectively.

Around 15% of the elderly surveyed smoked, with the rate being higher among men than among women. The pattern of elevated cholesterol and high blood pressure among women with lower levels of smoking is not what would be expected, and this finding should be investigated further.

Around half of the elderly people who took part in the study were under-nourished—as indicated by a body mass index (BMI) of less than 18.5. One in 20 were over-nourished, however, with overweight women being slightly more over-nourished than men.

With the exception of total cholesterol, there was no obvious link between any of the above indicators and increasing age. Elevated cholesterol was slightly more common among the ‘younger’ elderly (in their 60s) than it was among the ‘older’ elderly (70s plus).

Assessing causes of death in the Matlab Health and Demographic Surveillance System (HDSS)

Over the past years, considerable efforts have been made to improve ICDDR,B’s capacity to diagnose non-communicable causes of death among people of all ages—particularly the elderly. Verbal autopsies (VAs) are one useful way of identifying causes of death, and ICDDR,B is seeking to produce new VA tools that will yield consistent results.

Studies to achieve this have been ongoing since 2003, when new verbal autopsy tools were introduced. During this first year, both old and new tools were used in tandem, which gave researchers the opportunity to compare them. In this system, the old-style HDSS Death Forms were first reviewed by an independent Medical Assistant (MA), who used the information they contained to assign a possible direct cause of death. Later, the MA reviewed the new VA tools and assigned a ‘direct’ and ‘originating’ cause of death. Both the old and the new tools were then again reviewed independently by a Medical Officer (MO), who again assigned a cause of death.

Researchers found that the MA and MO agreed more often about cause of death when using the new VA system (in about 64% of cases) than they did when using the old system (50% of cases). They also found that fewer deaths were assigned to chronic and non-communicable diseases, like cancer, strokes, and heart failure, in the old VA system than in the new system. In the case of accident- and injury-related deaths, however, the MA and MO agreed about cause of death in almost 100% of cases using both the old and the new tools. These differences suggest that certain chronic diseases are very difficult to diagnose without very detailed and structured verbal autopsy tools.

In the case of newborn deaths, reviews also showed that more deaths were assigned to birth-asphyxia using the new system than was the case with the old. Agreement was very high between MA and MO in the case of most of the major neo-
natal causes of death. The exception was sepsis (blood poisoning).

Since 2004, only the new VA tools have been in operation. These continue to be reviewed by both an MO and an MA. Researchers have therefore again assessed how often the MO and the MA agreed when assigning a cause of death using the new VA tools.

These studies showed that, with the new system, the MA and MO agreed about the cause of death in about 75% of cases when chronic diseases such as tuberculosis, neoplasm, and stroke were involved. However, they only agreed in 49% of cases when acute and infectious diseases were involved. Studies also showed that, contrary to what researchers expected, in both 2003 and 2004 the MO diagnosed 'senility' or 'unknown' more often than the MA did. Reviews also showed that the MA and MO tended not to agree when coding the causes of death resulting from communicable diseases.

The lack of agreement observed raises a number of issues relating to consistency of diagnosis, and has implications for the involvement of MOs. More detailed analyses of the cause-of-death data from 2003-2004 are underway, the results of which may cause the Centre to revise the process used when assigning cause of death based on a verbal autopsy. To try to ensure consistency, each MA and MO is currently provided with a copy of the Manual for Assigning Cause of Death from Verbal Autopsy. It is likely, however, that only VAs involving individuals with a history of less clear-cut disease symptoms will be reviewed jointly by an MA and an MO in the future.

### Migration from Matlab: who, why, and how much?

The most important demographic phenomenon of this century is rapid urbanization, which Bangladesh, like most developing countries, is experiencing. ICDDR,B is exploring this issue because it has implications for future poverty levels and the population's health status. Moreover, the Matlab study area provides a good opportunity for researchers to gain a better understanding of the many factors driving rural-to-urban migration.

Most studies of urban migration consider people already in urban areas, and so examine the 'pull factors' that attract people to cities. Few look at the 'push factors' that drive rural people out of the countryside. Such push factors include poverty and increasing rural landlessness due to river erosion and other natural disasters. As a result, many rural-urban migrants are poor and end up in urban slums.

This means that, while urban areas are growing at 3.5% per year, slums are growing at 7% per year. The number of people living in slums will therefore double over a 10-year period. Dhaka is now 45% slums and Chittagong is 50% slums. Cities in Bangladesh will have to adapt to this rapid growth, and future migration from rural areas will have to be minimized.

In 2005, the Division explored some of the 'push factors' driving rural-to-urban migration. Residents in the Health and Demographic Surveillance System (HDSS) area in Matlab were monitored monthly during 1998-2002 to determine their residence status, reasons for migration, and places of destination. People were classified as 'migrating' if they left their residence permanently, or for at least six months, for any reason other than marriage. Researchers also used the 1996 Household Socioeconomic Census to compute a wealth index to classify households into five wealth groupings (quintiles).

The study found that, during the period 1998-2002, 14,382 of 56,595 men aged 15-59 years, and 8,616 of 61,884 women of a similar age migrated out. This yielded an out-migration rate of 25% for men and 14% for women. Men migrated primarily for economic reasons (76%), followed by a desire to receive education and training (7%). Women migrated primarily in order to join family members (72%), as well as for economic reasons (17%).

Rural-urban migration (mainly to the capital city) accounted for 61% of the cases of male migration and 66% of the cases of female migration. The corresponding figures for international migration were 27% and 2%. Higher levels of education were associated with greater migration to urban areas among men and women. However, unlike men, women belonging to households placed in the third, fourth, and fifth quintiles (the fifth being the poorest 20% of households) were less likely to migrate than women from households in the first and second quintiles (i.e. the richest 40% of households).
POVERTY AND HEALTH
What does the Programme do?

Housed within the Public Health Sciences Division, ICDDR,B’s Poverty and Health Programme works to ensure that all the Centre’s research activities address poverty. To this end, the Programme emphasizes the need to study the barriers that prevent the poor from accessing healthcare and other services.

The Programme also provides a platform for the exchange of ideas—so generating new studies into poverty and health both within ICDDR,B and outside it. Building capacity for poverty-focused research is another major aim of the Programme. It therefore organizes training courses and workshops and collaborates with various partners—both at home and abroad.

Major study of domestic violence in Bangladesh

Around the world, women suffer from poverty and discrimination more than men. However, the problem is particularly severe in South Asia. Violence towards women is often ignored as an issue of poverty, even though it results from a lack of power, resources, and freedom, as well as poor health. Thus, of the many studies conducted by the Poverty and Health Programme over the last year, we are highlighting this issue here.

The Programme recently conducted a study to explore the amount of violence women face and the different forms it takes. It also considered (1) the factors that increase or decrease the risk of violence, (2) the health consequences of violence, and (3) the coping strategies used by abused women. To do this, researchers analysed data from a survey of 2,702 women of reproductive age from an urban and a rural area. They also reviewed 28 in-depth interviews with women who had been physically abused by their husbands. These data were gathered in 2000 and 2001, and are the most recent available. The study also looked at how willing women were to admit that they had experienced abuse and to seek help.

High levels of abuse identified

Worryingly high levels of abuse were identified, as the study found that many of the women surveyed had been physically assaulted by their husbands: 40% in the urban area studied and 41% in the rural area studied. About 19% of the women in both areas had experienced severe physical violence, which was defined as being hit with a fist or object, kicked or dragged, beaten up, choked, burnt, or threatened/injured with a weapon or object of some kind.

In addition, 19% of the women surveyed in the urban area, and 16% of those in the rural area, stated that their husbands had physically abused them during the previous 12 months. Furthermore, a large percentage of these abused women had been attacked repeatedly over that period (Fig. 1 and 2).
POVERTY AND HEALTH

Identifying what makes abuse more likely

Multi-level analysis was used to identify the factors that made abuse most likely to occur. This revealed that, in both the urban and the rural area, a husband was more likely to abuse his wife if his father had abused his mother or if dowry demands had been made (as these reflect the family’s attitude towards the bride). It also showed that the risk of violence fell when there was better communication between husband and wife and when the husband had been educated beyond tenth grade.

In the urban area specifically, women whose fathers had abused their mothers were more likely to be abused in turn by their husbands. The risk of violence also increased when women were younger, and when they took part in savings and credit groups. In the urban area, husbands educated beyond the sixth grade were less likely to physically abuse their wives. In the rural area, income-earning by a woman increased the risk of violence.

Assessing what women do to escape abuse

With regard to help-seeking patterns and whether or not women could get help, the study found that the majority (66%) of abused women had never told anyone that they were suffering abuse. The main reasons for their silence were (1) the fact that violence in marriage is commonly accepted by society, (2) a fear of social stigma, and (3) the fear that their husbands would become more violent if they found out.

The survey showed that 60% of the urban women, and 51% of the rural women surveyed had never received any help. And, only 2% had ever sought help from institutional sources (such as local leaders, doctors or health workers, or the police). In fact, women approached these sources only when they could no longer endure the violence, or when it threatened their lives or the health of their children. Clearly, therefore, it is not enough simply to set up services for abused women—the barriers which prevent women from accessing such services also need to be broken down.

Study conclusions

The study made clear that, given the scale of the problem, providing appropriate services to help victims of domestic violence is an absolute necessity. At the same time, however, efforts must also be made to ensure that women know these services are available. Work is also needed to overcome the barriers which prevent women from accessing these services. One way forward, for example, would be the use of community education to remove social stigma and ensure that domestic violence isn’t accepted by society.

The survey clearly showed that domestic violence in urban and rural areas is influenced by different factors. This must be taken into account if future interventions to curb domestic violence are to be successful.

Capacity-building seminars and meetings

The Poverty and Health Programme organized five skill-building seminars in 2005. These were delivered by experts from throughout the Centre and were attended by participants from various disciplines within ICDDR,B. The themes of these
technical seminars were:
- Measuring poverty using principal component analysis and factor analysis
- Measuring inequality in health using the concentration index
- Decision-tree modelling
- Using the Health Internetwork Access to Research Initiative (HINARI) for research
- Using a database program to manage bibliographic references.

The Programme also held monthly meetings which were attended by staff from various divisions across the Centre. These allowed staff to share research findings, explore new directions for research, and develop capacity for poverty-focused research.

Major topics of interest discussed at these meetings included the prospects of achieving the Millennium Development Goals in developing countries, disease and healthcare-seeking, the cost of catastrophic illness and poverty, poverty and wellbeing, and health profiles of the elderly in rural Bangladesh.

Building partnerships and strengthening capacity by hosting research fellows

To build capacity, and strengthen links with partner institutions, the Programme hosted four Poverty and Health Research Fellows in 2005. Three of them were from ICDDR,B partners in Bangladesh—PROSHIKA, Surovi, and INCIDIN Bangladesh. They completed their one-year residencies in June 2005.

During their time at the Centre, and under the mentorship of senior ICDDR,B staff, the three researchers completed the following studies: (1) Education and health services for under-privileged children in Dhaka city: a case study of Surovi schools, (2) The antenatal healthcare-seeking behaviour of adolescent street-based sex workers in Dhaka city, and (3) Poverty and well-being: the dimensions of well-being in livelihoods and health behaviour in an urban community.

The fourth research fellow was from the Pakistan Institute of Development Economics. Currently finishing his second year at ICDDR,B, he has already completed a study on poverty-reducing strategies in low-income countries and achieving the Millennium Development Goals. He is now researching the links connecting children’s health, healthcare-seeking behaviour, and the concentration of poverty within their communities.

Workshops to communicate important findings to decision makers

Every three months the Programme holds a workshop for 25-30 mid-level officials from the Government of Bangladesh. Organized by a professional consulting agency, these meetings are designed to disseminate the Programme’s findings and to help decision-makers take action on inequities affecting healthcare in Bangladesh.

By presenting the results of analyses that consider a range of issues (from economic status and gender to mortality rates and disease prevalence) the Centre’s experts raise decision-makers’ awareness of both the monitoring that is being done and the need to address health inequities.

A slum beside a high-rise building is a common scene in urban Dhaka. Inequity in lifestyle including care-seeking practices, thus, prevails among residents of the same area.

Bangladesh Health Equity Watch publications

The Programme is continuing to collaborate with Bangladesh Health Equity Watch to produce, publish, and disseminate working papers and newsletters. One working paper (Monitoring the status of health equity in Bangladesh: the BHEW Survey 2002) was published in 2005. Four issues of the Equity Dialogue newsletter were also published, both in hardcopy and on the Centre’s website.
HIV/AIDS

Programme Head Tasnim Azim

What does the Programme do?

ICDDR,B’s HIV/AIDS Programme monitors the spread of HIV in Bangladesh and works to increase our understanding of the dynamics of the epidemic. The Programme also provides voluntary counselling and testing and outdoor clinical facilities. As well as studying groups most at risk, in 2005 the Programme also worked to gauge the vulnerability of the general population.

Assessing HIV rates and risks faced by injecting drug users

For several years ICDDR,B has been collecting and analyzing blood to monitor the spread of HIV on behalf of Bangladesh Government. The sixth round of this serological surveillance (2004 to 2005) found that 4.9% of injecting drug users (IDUs) in Central city A were HIV-positive (the study assigns codes to each of the cities being monitored). This shows that HIV cases are continuing to increase among this group in the city.

For the first time, HIV was detected in IDUs from two of the other cities previously surveyed (Southeast-D and Northwest-F1) (Fig. 1).

This year, the Programme also sampled IDUs from 16 cities, so covering a much larger area than in past years.

In an ongoing study, the Programme also studied injection-risk behaviour and sexual-risk behaviour in three separate groups of male and female injecting drug users. This cohort study follows the progress of group members, all of whom were HIV-negative when the study began. Studying groups over time like this offers a number of benefits—for example, it has already allowed the Centre to identify the epicentre of a localized HIV epidemic in one neighbourhood of Dhaka city.

When the study of female injecting drug users began, none of the 135 women in the female group had yet contracted HIV. However, rates of lending (24%) and borrowing (29%) used needles or syringes and other injection paraphernalia (67%) were high. In addition, a large majority (72%) had sold sex. Assessing these behaviours is important because female drug-users who sell sex and share injection paraphernalia are a direct bridge for the transmission of HIV to the general population.

When studying the 55 drug users in the groups who are now HIV-positive, the study also identified 89 IDUs who were sharing injections with them. Of these 89, a high proportion (11.3%) were themselves HIV-positive. Identifying networks of IDUs (who are most at risk of acquiring HIV) allows the HIV-prevention NGOs working with injecting drug users to better target their programmes.

Fig. 1. Prevalence of HIV in injecting drug users (IDUs) from Round II (2000-2001) to Round VI (2004-2005) in three regions where HIV was detected
Assessing HIV rates and risk behaviour in other at-risk groups

Surveillance is also being used to assess HIV rates in other at-risk groups, such as women who sell sex in brothels, hotels, and on the streets, and casual (part-time) female sex workers. It also considers male sex workers, men who have sex with men, transgender males (Hijras), and heroin-smokers (Table 1). In all of these groups, the occurrence of HIV remains low (less than 1%).

<table>
<thead>
<tr>
<th>Population group and location</th>
<th>Percentage of HIV-positive people</th>
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<tbody>
<tr>
<td>Heroin-smokers: Central-A</td>
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<td>Brothel-based female sex workers: Central-B</td>
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<tr>
<td>Central-B</td>
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<td>Central-C</td>
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<td>Southeast-A</td>
<td>0.4</td>
</tr>
<tr>
<td>Northeast-A</td>
<td>0.4</td>
</tr>
<tr>
<td>Hijras: Central-A, G</td>
<td>0.8</td>
</tr>
</tbody>
</table>

‡Southwest A and C: two geographically-related areas together representing one site
§In some sites, male sex workers (MSW) and could not be differentiated from non-sex worker MSM, so all were sampled as a single group
Testing also considers the rates of sexually transmitted infections (STIs) other than HIV. This information is important, because sexually transmitted infections like syphilis can greatly increase the chances that a person will pass on or contract HIV.

Testing for sexually transmitted infections like syphilis is important because they can greatly increase the chances that a person will pass on or contract HIV.

Rates of active syphilis remain high in female sex workers in general. Encouragingly, however, they have declined significantly in street-based female sex workers in Central city A—falling from 35% in the first round of testing to 6.2% in the last round. In brothels the picture is more mixed, as active syphilis rates had declined in brothels in three of the cities sampled, but remained unchanged in a further six.

**Survey of sex workers in brothels in eight areas of Bangladesh**

Bangladesh Government is currently implementing its HIV/AIDS Prevention Project (HAPP). This consists of many projects, each being implemented by a different NGO in various parts of the country. As part of one of these projects, ICDRR,B conducted surveys with sex workers in eight brothels in eight different areas of Bangladesh's Dhaka and Barisal divisions between December 2004 and March 2005 (Fig. 2).

Of the 2,927 active sex workers in these eight brothels, 750 were randomly selected for the survey and 596 were successfully interviewed. Interviews were used to assess risk behaviours and the care sought for STIs. The majority of respondents also provided blood or swab samples, which allowed researchers to assess the rates of HIV and other STIs.

Laboratory tests showed that 66% of those tested had bacterial vaginosis, while 35% had *Trichomonas vaginalis*, 13% *Chlamydia trachomatis*, 12% *Neisseria gonorrhoeae*, and 6% active syphilis. None of the respondents tested had HIV.

The study found that 15% of the active sex workers were only 14-19 years old and that 74% had no formal education. It was also found that 5% were currently married. On average, the sex workers surveyed entertained 2.5 clients per day, earning only around US$3.60. Condom use, which helps to prevent the spread of STIs, was low. In all areas except one, however, condom use was higher with new clients than with regular clients (Fig. 2). Clients’ dislike of condoms was given as the major reason for not using them (75%).

**Assessing the prevalence of HIV and syphilis in sex workers on Bangladesh’s borders**

The Programme sampled women who sold sex part time (casual female sex workers) from three border cities—two in northwest Bangladesh (bordering India) and one in the southeast (bordering Myanmar). It is important to monitor areas such as this because they are close to high HIV-prevalence countries and could represent points of entry for the epidemic.

The sex workers from these two northwestern cities commonly cross over into India to sell sex. In one city (Northwest-K1), 1.7% of the sex workers surveyed had HIV. By contrast, only a small proportion of sex workers from Southeast-H1 cross over to Myanmar to sell sex. Although no HIV was detected among sex workers in this city, the active syphilis rate in this group was high (10%).

**Assessing the risk behaviours of men working away from home**

People working abroad are particularly vulnerable to HIV. In fact, many passively-reported cases involve people who may have contracted the virus while working overseas. This is obviously important, as in the last 10 years alone over 200,000 Bangladeshi men officially left the country to find work. Plus, an even higher number are known to have left unofficially.

To gather more information, ICDRR,B’s HIV/AIDS Programme conducted a survey to study the sexual behaviour of married men working away from home (both in Bangladesh and overseas) and their wives. Data for the wives is still being processed. However, the results already available
for the men show that the sexual behaviours of married men living away from home put both them and their wives at a greater risk of HIV infection.

The survey involved a random sample of 1,175 married women and 703 married men in two rural areas of Bangladesh. Data on sexual-risk behaviours, condom use, and knowledge of HIV/AIDS were collected. Most of the men who had worked abroad had been employed in the Middle East (71%); others had worked in Pakistan (8%), Malaysia (6%), and India (3%). Of those who moved away from their families to other parts of Bangladesh, most had worked in either the Chittagong, Dhaka or Khulna divisions—mainly in the major port of Chittagong (43%) or the capital Dhaka (19%).

More than half (60%) of the men working elsewhere in the country, and two-thirds (67%) of those who had lived abroad had had penetrative sex with someone other than their wife since marriage. These figures were significantly higher than the 26% who had had penetrative sex with someone other than their wife while living at home.

About half of the men who had lived away from home had had sex with a sex worker since marriage, compared with only 15% of men who had not lived away (Fig. 3). Some men had had sex with a sex worker before they began to work away. However, this rate doubled or trebled once they began living away from home. Of the men who had had sex with a sex worker while abroad, 3.9% had also had intercourse with a sex worker in Bangladesh in the last 12 months—this could be a potential route for the spread of HIV.

The studies discussed above suggest that Bangladesh’s most at-risk populations and its general population are linked. So, once HIV is established in the most at-risk populations, it will spread to the general population. Because this spread will be determined by how risky people’s sexual behaviour is, it is very important to clearly understand it. We also need to determine how aware people are of HIV/AIDS and the ways of avoiding infection.

As part of a project funded by the Global Fund for AIDS, Tuberculosis and Malaria, Bangladesh Government, through NGOs and other organizations, is working to prevent the spread of HIV/AIDS by raising teenagers’ awareness of a range of STIs. The Centre has therefore conducted an in-depth survey of sexual practices and people’s knowledge about STIs and STI infection rates. This focused specifically on adolescents. In all, researchers interviewed 12,729 youths (15 to 24 years of age), 727 parents/guardians, 10 policy planners, 875 health service providers, and 722 teachers and community/religious leaders. These respondents were drawn from 360 randomly-selected and representative areas from six divisions and two cities in Bangladesh.

Education is needed.

Most of the people surveyed thought they could avoid contracting HIV/AIDS by washing after sex, while 54% thought that taking antibiotics would protect them.

The study looked at both urban and rural areas and married and unmarried people. In addition, male youths aged 18 years and above who had left school and were earning an income were assessed as a ‘special group’, because they are more at risk. As well as using a questionnaire to assess their knowledge and behaviour, the survey also analyzed blood from a sub-sample of youths.

Researchers found that about 7% of married males and 0.3% of married females had had extramarital sex. They also found that only 35% of sexually-active males (or 46% in the case of the ‘special group’) used a condom during their last sexual encounter. At the same time, 0.6% of those sampled tested positive for syphilis, while 16.5%
HIV/AIDS

tested positive for the type-2 herpes simplex virus. HIV was not tested for in this study.

Importantly, the survey found that many people did not know exactly how HIV/AIDS is spread or how it can be prevented. In fact, in all groups, less than half of the respondents could correctly name two or more routes of HIV/AIDS transmission (33% of urban males, 23% of rural males, 47% of urban females, and 30% of rural females).

By the same token, a few interviewees knew of two or more ways to prevent themselves becoming infected with HIV/AIDS (only 43% of urban males, 31% of rural males, 51% of urban females, and 32% of rural females). This lack of knowledge extended to other STIs as well. Only about 34% of urban males, 29% of rural males, 15% of urban females, and 13% of rural females could name at least two modes of STI infection/transmission.

The survey also found that people held a lot of misconceptions—placing them at more risk. In fact, 57% of respondents thought that they could prevent themselves from catching HIV/AIDS by washing after sex, while 54% thought that taking antibiotics would protect them. Moreover, about 52% of respondents believed that coughing and sneezing can spread HIV, while 50% believed that sharing food or water with an HIV-infected person could transmit the disease. Worryingly, only 2.2% of males and 1.1% of females felt that they faced any risk of contracting HIV. These results suggest that there is an urgent need for public awareness campaigns to slow the spread of sexually transmitted infections like HIV.

**Getting the real story: trial of a new survey method**

Surveys on sexual behaviour involve collecting data on very personal issues. Sometimes people don’t want to answer questions honestly because they feel that others (including the interviewer) will judge them. Respondents may, as a result, simply provide answers that they feel are socially acceptable.

To overcome this, the Centre tried out a new interview method which uses a modified ballot-box system. This allows respondents to answer pre-recorded questions played to them using a portable cassette player and headphones. They then write their answers on a ballot slip which they fold up and place in a box without the interviewer seeing their answer (Fig. 4).

Between February 2004 and 2005, researchers conducted a study to compare this new method with the traditional face-to-face interview technique. The study involved 7,122 males aged 18-49 years from three representative urban areas (Dhaka city, Chittagong city and Bogra town) and three representative rural areas (Faridpur, Rajshahi, and Cox’s Bazar). Roughly half the respondents were interviewed using the face-to-face technique and the rest using the modified ballot-box method.

Researchers found that more of the modified ballot-box group admitted to having extra- or pre-marital sex in the last year. They also found that more men in the modified ballot-box group admitted to having sex with female sex workers or males/transgender males.

Participants responded well to the new interview technique, and even respondents with no or minimal education were able to answer questions following an initial demonstration. This new interview technique could, therefore, improve the accuracy of the results obtained when communities are surveyed to determine what high-risk sexual behaviours are practised.

**Providing care and support for people with HIV**

To support local communities, ICDDR,B runs four Voluntary Counselling and Testing (VCT) Units (also known as Jagori). Located in Dhaka, Chittagong, Sylhet, and Chandpur, these units provide a range of services to a variety of clients, and do not only deal with HIV/AIDS (see Table 2). The number of clients using Jagori has risen substantially since 2002.
Table 2. The range of new clients who first attended ICDDR,B’s Voluntary Counselling and Testing Units (Jagori) between January and 15 December 2005

<table>
<thead>
<tr>
<th>Characteristics of Jagori clients</th>
<th>Dhaka</th>
<th>Chittagong</th>
<th>Sylhet</th>
<th>Chandpur</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of new clients (adults and children)</td>
<td>526</td>
<td>116</td>
<td>136</td>
<td>38</td>
<td>816</td>
</tr>
<tr>
<td>Number of children under 15 years</td>
<td>18</td>
<td>5</td>
<td>14</td>
<td>0</td>
<td>37</td>
</tr>
<tr>
<td>Number of HIV-positive cases (adults and children)</td>
<td>46</td>
<td>8</td>
<td>38</td>
<td>0</td>
<td>92</td>
</tr>
<tr>
<td>Number of HIV-positive children</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>HIV-positive Male:female ratio</td>
<td>33:13</td>
<td>8:0</td>
<td>23:15</td>
<td>0</td>
<td>64:28</td>
</tr>
</tbody>
</table>

Overcoming obstacles in treating children with HIV

Working under difficult conditions, the Programme successfully supports children with HIV and provides anti-retroviral (ARV) drugs when required. A good example is offered by Lina (name changed) a 36-month-old girl with HIV who was referred to one of ICDDR,B’s VCT units (Jagori) from Mukto Akash (a support-group organization for HIV-positive people) for evaluation and ARV therapy in November 2004.

Lina had been suffering from various illnesses since she was six months old, but the different hospitals she was referred to weren’t able to treat her adequately. When she arrived at the unit, she was severely malnourished, and displayed delayed milestones of development. She was also suffering massive enlargement of the liver and spleen (hepatosplenomegaly), generalized enlargement of the lymph nodes (lymphadenopathy), and a chronic pus-forming infection of the middle ear (otitis media). Staff confirmed that she was at clinical stage III (WHO staging) of AIDS.

Laboratory investigations revealed that her haemoglobin level had fallen to 9.4 g/dL and her CD4 cell count to 260/µL. Staff therefore treated her by providing ARVs, antibiotics for the opportunistic infections, and nutritional rehabilitation. However, paediatric formulation ARVs are not available in Bangladesh. Staff therefore had to break up tablets meant for adults and then use them to prepare suspensions. ICDDR,B’s Nutrition Rehabilitation Unit also taught Lina’s mother how to provide an appropriate diet. Finally, Lina was also given micronutrient supplements, and her mother was advised to bring her back for monthly follow-up visits.

Lina is a success story. Having shown marked improvements after 10 months of treatment, she is now only moderately malnourished and demonstrates milestones of development that are almost appropriate for age. In addition, her liver and spleen have reduced in size while her CD4 count has risen to 490/µL. Reassessing her, staff have found that her condition has improved so that she is now in clinical stage I of AIDS.
As well as counselling and testing, the unit in Dhaka also provides clinical services, such as CD4 counts, treatment to manage opportunistic infections, and referral services—to ensure that individuals can receive appropriate STI treatment, antenatal care, and psychiatric treatment. Clinical follow-up for people with HIV/AIDS is also provided when necessary—during antiretroviral (ARV) therapy, for example.

From January 2003 to December 2005 the Dhaka unit treated 142 people with HIV/AIDS. Of them, 30 were in stage I, 54 in stage II, 25 in stage III, and 23 in stage IV according to the WHO clinical staging system. The units also provided seven pregnant HIV-positive women with ARVs, to prevent the virus being transmitted to their unborn children. They also assessed four individuals to determine whether post-exposure preventative treatment with ARVs should be provided. Such preventative treatment was only deemed necessary in one case, however.

The Centre’s VCT units also treat children with HIV/AIDS with ARVs when necessary. However, the units face several obstacles. For example, paediatric-formulation ARVs are not available in Bangladesh, and it is difficult—if not impossible—to provide children in rural areas with the follow-up they need after treatment. Throughout the country as a whole, clinicians lack the knowledge needed to properly manage paediatric AIDS. This compounds the problems faced by families unable to afford both the ARVs and food that children suffering from HIV/AIDS need (see Box).

In addition to Jagori clients, ICDDR,B is also treating HIV-positive injecting drug users who are taking part in a cohort study run by ICDDR,B and CARE Bangladesh. This includes twice-yearly follow-up. During 2005, 55 HIV-positive IDUs received specific study-related services from ICDDR,B and a comprehensive set of clinical and support services from CARE. These included weekly outdoor clinics and emergency medical care, provided by a dedicated clinician, and referral to different hospitals as and when necessary. Dedicated counsellors, especially trained to work with IDUs, are also available in the field.
Clinical Sciences Division

Aboud FE. 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), USA

Ahmed T. Identification and validation of an optimum clinical scoring system for diagnosis of tuberculosis and estimation of prevalence of multiple drug resistance in children
Funded by: Department for International Development (DFID), UK

Alam NH. Efficacy of benefiber added, reduced-osmolarity WHO-ORS in the treatment of cholera in adults
Funded by: University of Basel, Switzerland and Novartis Consumer Health SA, Switzerland

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

Alam NH. Oral rehydration solution containing amylase-resistant starch in severely-malnourished children with watery diarrhoea due to *Vibrio cholerae*
Funded by: Nestlé Foundation, Switzerland

Ashraf H. Daycare-based management of severe pneumonia in under-5 children when hospitalization is not possible due to the lack of beds
Funded by: University of Basel, Switzerland

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

Chisti MJ. Risk factors for sclerema in infants with diarrhoeal disease
Funded by: ICDDR,B: Centre for Health and Population Research

Hossain ML. Efficacy of community-based follow-up, food supplementation, and psychosocial stimulation in the home management of young severely-malnourished Bangladeshi children: a randomized intervention trial
Funded by: Swedish International Development Agency (Sida), Sweden
Hossain MJ. Epidemiology and aetiology of encephalitis and other arboviral diseases in Bangladesh Funded by: Centers for Disease Control and Prevention (CDC), USA

Hossain MJ. Long-term neurologic and functional outcome in patients with Nipah virus infections Funded by: CDC, USA

Islam MM. 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: Government of Bangladesh

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: International Atomic Energy Agency (IAEA), Austria

Jamil KMA. Estimation of the average vitamin A requirement of adult males Funded by: University of California at Davis (UC Davis), USA

Jamil KMA. A pilot study to assess antioxidant status in healthy and malnourished Bangladeshi children Funded by: UC- Davis, USA

Khan AM. Introduction of routine zinc therapy for children with diarrhoea: safety, compliance, and acceptability Funded by: Bill and Melinda Gates Foundation, USA

Nahar B. Effect of psychosocial stimulation and parental counselling on cognitive function of severely-malnourished children in a nutritional rehabilitation unit Funded by: Sida, Sweden

Rabbani GH. Clinical trial of L-histidine in childhood shigellosis Funded by: Thresher Research Fund (TRF), USA

Rabbani GH. The effectiveness and utility of a green banana diet in the home management of acute and persistent childhood diarrhoea Funded by: United States Agency for International Development (USAID), Dhaka

Salam MA. Evaluation of early childhood initiatives of Plan Bangladesh Funded by: Plan International, Bangladesh

Salam MA. A pilot clinical trial to determine the potentials of a 3-day, 200 mg 6-hourly course of rifaximin by comparing its efficacy with that of a 3-day, 500 mg 12-hourly dose of ciprofloxacin in the treatment of adults with clinically severe cholera due to \( V. \) cholerae O1 or O139 Funded by: Salix Pharmaceuticals Inc., USA

Salam MA. Randomized, double-blind, controlled clinical trial to compare the efficacy of a single-dose of azithromycin versus a single-dose of ciprofloxacin in the treatment of adults with clinically severe cholera due to \( V. \) cholerae O1 or O139 Funded by: New England Medical Center, USA

Sarker SA. Evaluation of the efficacy of Llama-derived anti-rotavirus antibody fragment in children with rotavirus diarrhoea Funded by: Unilever Nederland Holdings B.V., The Netherlands

Sarker SA. Prebiotic effects of daily fructooligosaccharide intake on weight gain and reduction of diarrhoea incidence among young children in urban Bangladesh: a pilot study Funded by: Siebold University of Nagasaki, Japan

Sarker SA. The usefulness of ferrous fumarate and ferric pyrophosphate as food fortificants in developing countries Funded by: University of Basel, Switzerland, Nestlé Foundation, Switzerland, and Nutrition Third World, Belgium

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
**Health Systems and Infectious Diseases Division**

Brooks WA. Efficacy of zinc in the treatment of outpatient pneumonia in an urban slum among children aged less than 2 years  
Funded by: Bill and Melinda Gates Foundation, USA and TRF, USA

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

Faruque ASG. Time series study of the relationship between rainfall and diarrhoea  
Funded by: London School of Hygiene & Tropical Medicine (LSHTM), UK

Gazi R. Assessment of vulnerability to HIV infection of boatmen in Teknaf, Bangladesh  
Funded by: Department for International Development (DFID), Bangladesh

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

Hossain SAS. Management of tuberculosis by private practitioners and health-seeking behaviour of symptomatic adults/TB suspects  
Funded by: USAID/Dhaka

Islam Z. Cost of illness of cholera in Matlab, Bangladesh  
Funded by: International Vaccine Institute (IVI), South Korea

Khanam R. Vulnerability to HIV/AIDS of migration-affected families  
Funded by: USMID/Dhaka

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

Larson CP. Baseline survey on HIV/AIDS among youth in Bangladesh  
Funded by: Save the Children, USA

Larson CP. Rapid assessment of youth perspectives on health services  
Funded by: Save the Children, USA

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

Luby SP. Assessing and improving drinking-water quality following flooding  
Funded by: United Nations Children’s Fund (UNICEF), Bangladesh

Luby SP. 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 University (JHU), USA

Luby SP. Investigation of the Nipah virus outbreak in Tangail district: an in-depth examination of beliefs and practices associated with the disease  
Funded by: USAID/Dhaka
ONGOING PROTOCOLS

Luby SP. Nipah virus transmission in Bangladesh
Funded by: Case Western Reserve University/NIH, USA

Luby SP. Surveillance for hospitalization and death due to pneumonia, meningitis, and sepsis in Dhaka, Bangladesh
Funded by: JHU, USA

Mercer JA. Use of ESP services and other factors associated with neonatal survival in rural areas of Bangladesh served by a large NGO programme (BPHC)
Funded by: DFID, Bangladesh

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 IVI, South Korea

Naheed A. Evaluation of laboratory assays for the rapid diagnosis of *Shigella dysenteriae* type 1 infection in Bangladesh
Funded by: CDC, USA

Naheed A. Evaluation of laboratory assays for the rapid diagnosis of *Vibrio cholerae* infection in Dhaka, Bangladesh
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Quaiyum MA. Feasibility, acceptability, and programme effectiveness of misoprostol in preventing post-partum haemorrhage in rural Bangladesh
Funded by: USAID/Dhaka

Sultana S. Understanding the patterns of chronic obstetric morbidity and validation of the self report by women living in an urban slum district of Dhaka, Bangladesh
Funded by: Swiss Tropical Institute, Switzerland

Van Mels CT. The effects of crowding and indoor air pollution on acute lower respiratory infections in children aged less than 5 years
Funded by: CDC, USA
ONGOING PROTOCOLS

Public Health Sciences Division

Alam A. Nature of ageing and family care for the elderly in rural Bangladesh
Funded by: Australian National University, Australia and ICDDR,B

Alam NM. Time since pregnancy and mortality in women of reproductive age in Matlab, Bangladesh
Funded by: LSHTM, UK

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

Arifeen SE. Combined interventions to promote maternal and infant health
Funded by: LSHTM, UK, Government of Japan, Umea University, Sweden Global Forum for Health Research, Johns Hopkins Bloomberg School of Public Health, and UNICEF, Bangladesh

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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 programme areas in rural Bangladesh
Funded by: JHU, USA

Arifeen SE. An evaluation of the health and economic impact of integrated management of childhood illness, Matlab, Bangladesh: a randomized experimental study
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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 and JHU, USA

Bhuiya A. Improvement of health through community development-oriented programme in rural Bangladesh
Funded by: Consortium of Swiss, German, and Dutch Red Cross, Switzerland

Bhuiya A. Monitoring the disparity in health status and access to and utilization of healthcare services: Bangladesh Health Equity Gauge Phase I
Funded by: Rockefeller Foundation, USA and Health Systems Trust, South Africa

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

Blum LS. The acceptability, effectiveness, and cost of strategies designed to improve access to basic obstetric care in rural Bangladesh
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Blum LS. Understanding unintended pregnancies from the perspective of Bangladeshi couples
Funded by: JHU, USA

Bottero R. Assessing unmet need for major obstetric interventions in different districts of Bangladesh to improve coverage of maternal healthcare services
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Bottero R. Better understanding of recognition and response to postpartum hemorrhage
Funded by: Emory University, USA

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Funded by: Belgium Technical Cooperation, Belgium
Chowdhury MEEK. HIV/AIDS prevention project: brothel-based sex workers in Bangladesh
Funded by: UNICEF, Bangladesh

Ferdous Z. Barriers to the use of antenatal care and safe delivery in Matlab, Bangladesh
Funded by: Wellcome Trust, UK

Gausia K. Epidemiology of postnatal depression in rural Bangladesh.
Funded by: DFID, UK and ICDDR,B

Hasan KZ. Longitudinal study of events associated with H. pylori acquisition in Bangladeshi children
Funded by: New York University School of Medicine, USA

Hossain S: Modelling the impact and incremental cost-effectiveness of introducing vaccines against hepatitis B, Haemophilus influenzae type b, and rotavirus into routine infant immunization programmes in Bangladesh and Peru
Funded by: LSHTM, UK

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

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

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

Mannan I. Using management information system to improve quality of services through strengthening supportive supervision in a community-based intervention in rural Bangladesh
Funded by: JHU, USA

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

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, Sweden

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

Rahman M. Arsenic in drinking-water and child development continued activities 2005-2007: understanding the dynamics of arsenic exposure, developmental and cognitive functions in children
Funded by: Sida, Sweden

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Funded by: Sida, Bangladesh and Karolinska Institute, Sweden

Rahman M. Efficacy of flocculent technology as an arsenic mitigation strategy
Funded by: Proctor and Gamble, USA
ONGOING PROTOCOLS

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Funded by: Columbia University, USA

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

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Funded by: WHO, Switzerland and Rotavirus Vaccine Program, USA

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

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

Yunus M. Cholera across scales: oceanic links to climate and local estuarine influences
Funded by: Portland State University, USA

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Funded by: University of Maryland Biotechnology Institute, USA

Yunus M. Prenatal exposure to Bangladesh famine (1974-1975): association with blood pressure, glucose tolerance, lipid profile, and coronary heart disease among young adults
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Funded by: Bill and Melinda Gates Foundation, USA

Zaman K. Defining incidence of intussusception in Bangladesh in preparation for a phase III trial of a new rotavirus vaccine
Funded by: JHU, USA

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ONGOING PROTOCOLS

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What does the Division do?

Working both in hospitals and in the community, ICDDR,B’s Clinical Sciences Division conducts clinical studies of diarrhoeal illnesses, respiratory infections, nutrition, and child development. The Division also operates ICDDR,B’s Dhaka hospital, which treated 110,994 patients in 2005. 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 also 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. Its staff include two international professionals and 225 fixed-term members, in addition to 85 health workers, 39 staff members on contractual service agreements, 15 trainee doctors, and 10 trainee nurses. An international research fellow from the Swiss Tropical Institute joined the Division in 2005. A consultant paediatrician also helped to train the Division’s staff and clinical fellows.

Monitoring

Monitoring for diarrhoea-causing diseases in ICDDR,B’s Dhaka and Matlab hospitals

Every year, ICDDR,B’s Dhaka hospital treats over 100,000 people for diarrhoeal illnesses and associated health problems. To help with this work, the Centre’s Diarrhoeal Disease Surveillance System has been monitoring patients in the hospital since 1979. Seven years ago, monitoring activities were extended to include the Centre’s hospital in Matlab, which treats a further 10,000 people for diarrhoea-related health problems each year.

In the Dhaka hospital, the monitoring efforts involve systematically studying 2% of the patients treated. In the Matlab hospital, on the other hand, everybody who attends the hospital from an area defined by the Centre’s Health and Demographic Surveillance System is systematically studied.

To gather socioeconomic and population data, trained staff members interview patients and/or those accompanying them. They also gather information about their housing and environmental conditions, feeding practices (particularly with infants and young children), and ability to give fluid therapy at home.

“By gathering information to detect new pathogens and identify disease outbreaks early, ICDDR,B helps the Bangladesh Government to put prevention and control measures in place quickly and efficiently”

Researchers also record data such as the symptoms patients experience, their body measurements (anthropometrics), the treatments they receive, and how well they recover. In addition, stool sam-
Clinical sciences division

Samples are analyzed using a variety of techniques—ranging from microscopic studies to enzyme-linked immunosorbent assay (ELISA). This allows researchers to identify specific diarrhoea-causing pathogens (Table 1) and determine what drugs will be effective when treating a particular illness.

Gathering information in this way helps the Centre to detect new pathogens and identify disease outbreaks early—which helps the Bangladesh Government to put prevention and control measures in place quickly and efficiently. It also makes it easier to monitor important issues like (1) where particular pathogens occur, (2) which are most common (Fig. 1), and (3) which show resistance to antibiotics. The information also helps researchers to validate research results, develop new studies, and explore the causes and control of disease in populations.

Monitoring shows a rise in cholera cases

The Division’s research has shown that the percentage of patients infected with *Vibrio cholerae* exceeded the percentage infected with rotavirus for two years in a row in 2004 and 2005. This is the first time that this has happened in more than 20 years (Fig. 1).

It isn’t yet clear why this has happened. Possibly resistance to erythromycin and decreased sensitivity to ciprofloxacin played a part—as both drugs are commonly used in the community to treat the severe watery diarrhoea suspected to be caused by *V. cholerae*. However, it is also possible that more people with milder cases of diarrhoea caused by rotavirus are simply seeking treatment within their communities and not going to hospital for treatment.

New, multi-drug-resistant strains of *Vibrio cholerae O1* (El Tor) identified and treated

In 2005, ICDDR,B researchers identified several new *V. cholerae* O1 strains resistant to a range of drugs, including erythromycin (Fig. 2). The illnesses caused by these resistant strains placed a serious strain on hospital resources and made it necessary to revise the treatment given for cholera.

Problems first began to be encountered in October 2004, when 43 strains of *V. cholerae O1* resistant to tetracycline, as well as to trimethoprim-sulphamethoxazole and furazolidone, were found in samples from patients at ICDDR,B’s Matlab hospital.

<table>
<thead>
<tr>
<th>Table 1. Main results of monitoring to determine the causes of diarrhoea, Dhaka and Matlab, January-December 2005</th>
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<tr>
<td>Pathogen identified</td>
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<td>No.</td>
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<tr>
<td><em>Vibrio cholerae</em> O1</td>
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<td><em>Vibrio cholerae</em> O139</td>
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<td>Shigella</td>
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<td>Salmonella</td>
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<td>Rotavirus</td>
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<td><em>Entamoeba histolytica</em></td>
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<td><em>Giardia lamblia</em></td>
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Fig. 1. Changes in the isolation rates of major enteric pathogens (Dhaka Hospital Surveillance System, 2000-2005)

Fig. 2. Resistance of *V. cholerae* O1 to two different antimicrobials in Dhaka hospital (November 2004 to December 2005)
Things grew worse from November 2004 onwards, as more and more new multi-drug-resistant strains of *V. cholerae* were identified in patients at both the hospitals: Dhaka and Matlab.

By March 2005, nearly all the strains being identified in both hospitals were also resistant to erythromycin, doxycycline, and azithromycin. In fact, laboratory work showed that the only drugs that were still effective were chloramphenicol and ciprofloxacin. Fortunately, controlled clinical trials had already shown that both drugs are effective against *V. cholerae* O1 strains.

These new strains of *V. cholerae* had a significant impact, causing overcrowding in ICDDR,B’s hospitals because cholera patients had to be kept in for longer than usual. To cope with this, the hospitals had to temporarily house patients in tents. They also had to recruit additional staff, including doctors, nurses, and health workers, and procure extra intravenous fluids and oral rehydration salts (ORS).

To deal with the fact that the usual antimicrobial therapies weren’t effective, staff also had to develop a new treatment regime. Based on results of past randomized clinical trials they therefore treated adults weighing 30 kg or more with a single dose of 1 g of ciprofloxacin. Children older than 2 years of age were given a 20-mg/kg dose of the same drug. This form of therapy is more expensive than doxycycline but cheaper than erythromycin.

Because ciprofloxacin cannot be given to pregnant or breastfeeding women, such women were treated simply by ensuring that they were properly fed and hydrated—through the use of oral rehydration salts. Intravenous polyelectrolyte solution was also provided when appropriate.

Despite the extra efforts taken, doctors soon observed that diarrhoea was not responding to ciprofloxacin treatment as expected. To identify why, they reviewed past studies of single-dose therapies for cholera in adults and children. This showed that the drug has steadily become less effective against *V. cholerae* isolates over the last ten years or so. In fact, minimum inhibitory concentrations (MICs) had risen from 0.003 μg/mL to 0.38-0.50 μg/mL between 1994 and 2005.

These results are extremely important, and steps must be taken in advance to combat these multi-drug-resistant strains of *V. cholerae* O1. There is therefore an urgent need to monitor how susceptible *V. cholerae* isolates in different areas are to different drugs. This information should then be given to policy-planners and healthcare providers so that they can work to ensure patients are not being given ineffective drugs. This is vital, because providing inappropriate drugs wastes tremendous amounts of money. It also results in people taking much longer to recover and using up resources like beds and rehydration fluids unnecessarily.

Public-health measures are also needed to combat these new cholera strains. These should include providing safe drinking-water and teaching people about personal hygiene and food safety. The country will also have to produce more intravenous fluids and oral rehydration salts and ensure that more ciprofloxacin is available country-wide. Healthcare providers will also have to be taught how to efficiently manage and control the large-scale outbreaks that multi-drug-resistant *V. cholerae* O1 will cause.

Finally, Bangladesh’s neighbours and other countries in the region must be warned about the threat posed by the new multi-drug-resistant strains identified.

"Bangladesh’s neighbours and other countries in the region must be warned about the threat posed by the new multi-drug-resistant strains identified"

Mother and Child Health Services

Keeping people healthy (by improving their diets or immunizing them, for example) is more efficient than treating them after they become ill. The Division’s Mother and Child Health Services (MCHS) at Dhaka hospital therefore provides free curative and preventative health services to mothers seeking treatment for a diarrhoea-related disease. As a result it provides a comprehensive health package not usually available in developing countries.

**Helping severely-malnourished children under five to grow properly**

The Nutritional Rehabilitation Unit (NRU), uses a standardized diet to help severely-malnourished children under 5 years of age grow rapidly. This uses low-cost, culturally-appropriate, nutritious ingredients that are available locally. Essential micronutrients, psychosocial stimulation, and health and nutrition education are also provided to the attending caregivers. During 2005, the Unit successfully rehabilitated 318 very severely-malnourished children.
Monitoring the progress of malnourished children after leaving hospital

The Nutrition Follow-up Unit (NFU) monitors the growth of severely-malnourished children after the Nutritional Rehabilitation Unit has discharged them. It also monitors severely underweight children discharged from the hospital once their caregivers have been advised how to care for them appropriately. The Unit also treats any illnesses that may arise and reinforces the health and nutrition education families have been given. In total, it treated 1,270 severely-malnourished children in 2005.

Teaching families the importance of birth-spacing

The MCHS's birth-spacing counselling unit teaches parents that waiting a certain time before having another child can have significant health and social benefits. In 2005, the unit provided birth-spacing counselling and contraceptives to 257 parents who had to bring their children to the hospital.

Teaching mothers how to feed children properly and keep them healthy

Trained health workers from within MCHS use discussion groups to provide health and nutrition education that teaches mothers how to keep their children healthy. These discussions are held at specific times and places in the hospital. They typically focus on a specific topic and involve 5-6 mothers. The subjects considered include how to prepare nutritious low-cost food, home management of diarrhoea, the importance of immunization, and the importance of birth-spacing. In 2005, MCHS provided 16,301 health-education sessions to mothers and female guardians.

Immunizing children against the six killer diseases

The MCHS also runs the largest, fixed-site immunization centre in the country. This provides single and combination vaccines which immunize children against the six killer diseases covered by the worldwide expanded programme on immunization (EPI): polio, diphtheria, tuberculosis, pertussis (whooping cough), measles, and tetanus. In 2005, the Centre gave 3,729 doses of vaccine to children, and 12,197 doses of tetanus toxoid to women of childbearing age. As part of a government initiative, it also immunized 2,157 children against hepatitis B.

Providing vitamin A supplements

Providing vitamin A supplements reduces illness and death among children. MCHS health workers therefore routinely administer high-potency vitamin A capsules to children who need them. In 2005, vitamin A supplements were given to 8,579 children who would not have received them otherwise.

Promoting oral rehydration therapy

Oral rehydration is a cornerstone of diarrhoea treatment. MCHS staff therefore routinely help mothers to give oral rehydration solutions to their children. They also show people how to properly prepare home-made rehydration solutions (sugar-salt solutions) using locally-available ingredients.

Combating childhood tuberculosis

Tuberculosis (TB) in children is a neglected disease—most public-health drives focus on TB in adults. MCHS therefore works to diagnose and manage TB in children attending the hospital and their close contacts (such as parents). By the end of 2005, MCHS had treated more than 600 children with TB—providing medicines free of charge. Seventeen new patients were diagnosed in 2005.

Training health professionals

The Division’s Mother and Child Health Services have been highly successful in teaching people how to care for themselves and their families and in providing healthcare in the community. Because of this, its activities have been incorporated into the training courses the Division provides to national and international health professionals.

This year, a variety of institutions received technical advice from MCHS. Examples include the Khulna and Chittagong Medical College Hospitals, and Concern Bangladesh. Staff also provided hands-on training in the management of severely-malnourished children to two undergraduate students: one from the USA and the other from Canada. It also trained 38 Master of Public Health Programme (MPH) students from the James P. Grant School of Public Health, Dhaka, and Uppsala University (Sweden) in the assessment and management of severe malnutrition.

Research into malnutrition

MCHS is the centre of ICDDR,B's research into severe malnutrition. In 2005, it conducted studies to determine how psychosocial stimulation affects the Nutritional Rehabilitation Unit’s treatment of severely-malnourished children and to what extent community-based follow-up, food supplementation, and psychosocial stimulation help with the home-management of severely-malnourished young Bangladeshi children.
Franchising ICDDR,B’s services

Progoti Samaj Kallyan Protisthan (PSKP) is an NGO which provides health services in Bangladesh. For several years, it has been running community-based primary healthcare and family planning clinics as part of Bangladesh’s Essential Services Package (ESP). In collaboration with the Centre, PSKP has established an ESP clinic within ICDDR,B’s campus to franchise the management of diarrhoea cases from ICDDR,B’s Dhaka hospital.

The clinic is open from 6:00 am to 10:00 pm seven days a week. In this way, it reduces the pressure placed on the Dhaka hospital by dealing with cases that don’t require hospital care. In 2005, 32,365 people were referred to the PSKP clinic for treatment by the Dhaka hospital—which actually dealt with 110,994 patients in total. Only 1,884 had to return to the hospital for further management.

Until recently, the clinic was funded by the NGO Service Delivery Programme (NSDP). However, this funding had to be withdrawn in 2005, which made it difficult for the clinic to continue to operate. Because of the good work it does, however, PSKP has decided to continue operating the clinic using its own resources, with some assistance from ICDDR,B.

Promoting breastfeeding

Breastfeeding, and particularly exclusive breastfeeding during the first six months of life, greatly benefits infants’ health and development. However, the rate of exclusive breastfeeding is very low in Bangladesh: around 10%. A recent study showed that counselling mothers who had recently stopped breastfeeding can increase the rate of breastfeeding to about 70%.

ICDDR,B therefore now routinely provides breastfeeding counselling in its Dhaka hospital. This aims to encourage mothers to feed their infants exclusively with breastmilk until they are 6 months old (though obviously oral rehydration fluids and other medicines can also be given). After this, they are encouraged to continue breastfeeding for 2 years or more while providing appropriate complementary foods. As part of this activity, ICDDR,B has taught physicians, nurses and other paramedics working at the Dhaka hospital how to promote and support breastfeeding.

In 2005, 3,753 mothers were given breastfeeding counselling. At admission, all babies were only being breastfed for some of the time. By the time they were discharged from the Clinical Research and Service Centre, however, 72% of the mothers were feeding their babies exclusively through breastfeeding—showing that the counselling programme is highly effective.

Nursing Services

The Division’s Nursing Services plan, direct, and monitor the care provided by the 48 nurses who, along with 10 trainee nurses, look after patients with diarrhoea and associated health problems at ICDDR,B’s Dhaka hospital. Its staff also take part in the Centre’s training and research activities—including those organized by its Training and Education Unit. This work also involves helping the State University of Bangladesh, the University of Dhaka, and Bangladesh’s Open University to train undergraduate nursing students.

In 2005, one Nursing Officer and one Senior Staff Nurse received further training on caring for newborns from the International University of Business Agriculture and Technology (IUBAT). In addition, nine other nurses were taught how to provide breastfeeding counselling. In July 2005, the service also set up an in-house training programme for senior nursing staff and gave practical training on the management of diarrhoeal diseases to 10 trainee nurses at the hospital.

Hospital infection control

Improved methods of infection control

Working to control the spread of infection is a key activity in all hospitals. Infection control activities at ICDDR,B’s Dhaka hospital are headed by an Infection Control Officer, supported by an Infection Control Committee. At the recommendation of external reviewers, infection control activities were boosted this year, using monthly meetings to guide the action taken.

This led to a variety of infection control measures being improved and implemented. Efforts included the updating of infection control manuals and the strengthening of universal precautions such as hand-washing, as well as the provision of more sanitary food services, and better hospital waste management (addressing issues such as...
the safe disposal of needles and other ‘sharps’). Infections related to intravenous-line use are also now monitored, and all clinically-diagnosed cases of hospital-acquired (nosocomial) infections are recorded.

Hand-washing facilities were also improved, with new supplies of liquid soap and elbow-taps. In addition, all hospital staff were trained in proper hand-washing techniques and the use of alcohol-based hand-rub—the hospital has also been giving small portable bottles of this hand-rub to doctors and nursing staff since the beginning of 2005. Periodic insect (cockroach) control measures were also used throughout 2005. These included the use of ‘magic chalk’. Toilets and sinks were also cleaned more frequently than in the past.

Staff members were also taught to always use disposable gloves when performing any invasive procedures (such as taking blood from a vein or giving an intravenous solution). This will reduce the risk of blood-borne infection.

**Study to assess the rates of hospital-acquired infections**

The Division has been working to assess how often infections are acquired in its Dhaka hospital and to determine whether repeat surveys could be used to show any trends. For this, trained staff reviewed the charts of 4,980 (96%) of the 5,206 patients admitted to the hospital’s longer-stay ward during the study period. The study defined nosocomial infection either as any new infection occurring 48 hours or more after admission or up to 3 days after hospital discharge. Infection was either identified through laboratory cultures or through the assessment of symptoms. The study also required researchers to be sure that there was no possibility that a patient was incubating an infection before he or she was admitted.

During the periods August-December 2004 and May-August 2005, hospital-acquired infections occurred in 7% of patients admitted to the hospital longer-stay ward during the study period. The study defined nosocomial infection either as any new infection occurring 48 hours or more after admission or up to 3 days after hospital discharge. Infection was either identified through laboratory cultures or through the assessment of symptoms. The study also required researchers to be sure that there was no possibility that a patient was incubating an infection before he or she was admitted.

In 2005, the X-ray Unit’s two radiographers performed 7,870 X-ray examinations. These technicians also performed 471 electrocardiogram (EKG) examinations during the year. Although a consultant radiologist conducts training sessions for Clinical Fellows and interested CSD staff, the Unit does not currently have a regular radiologist. It aims to recruit one in the near future.

**X-Ray Unit**

ICDDR,B’s Special Procedure Clinic processes laboratory specimens on behalf of both individuals and clinics within Dhaka city and provides people with consultation services when necessary. The clinic also conducts endoscopic gastrointestinal examinations and vaccinates people against poliomyelitis, diphtheria, pertussis, tetanus, measles, mumps, rubella, varicella, hepatitis A and B, *H. influenzae* type b, typhoid, and tuberculosis. In 2005, 1,786 people made use of the clinic. Since the clinic is not free, this brought in a total of Tk 1,321,235.

**Special Procedure Clinic**

ICDDR,B’s Physiology Laboratory is equipped for both clinical experiments and experiments that use animals. As a result, researchers from both the Clinical Sciences Division and Laboratory Sciences Division use it to study intestinal and metabolic disorders. Current studies include research into intestinal infections, electrolyte transport, environmental toxicity, and the development of antisecretory agents.

In 2005, work continued on analyzing the links between inflammation of the intestine and the presence of (1) short-chain fatty acids and (2) myeloperoxidase in stool samples. The findings will be used to better understand the mechanisms underlying intestinal diseases and their successful treatment.

In addition, the Laboratory also used assays of biomarkers to assess the oxidative and antioxidative status of rabbits with arsenic poisoning and children with shigellosis. These markers were found to be good indicators of oxidative damage, as they were consistent with cellular damage.

ICDDR,B researchers also worked with the University of Dhaka to determine whether plant polyphenols extracted from tea leaves reduced the effects of arsenic poisoning in rabbits. Researchers found that the tea extracts significantly reduced cell damage in these animals and are preparing their results for publication.
Biophysics Laboratory

The Division has recently established a Biophysics Laboratory equipped with a Delta-Trac machine for measuring energy expenditure. It also contains a new multi-frequency bioelectric impedance analysis (BIA) machine, which can be used to determine body composition. This piece of equipment was donated to the Laboratory by Prof. Mohammad Khaled of the University of Alabama, Birmingham, USA.

In 2005, researchers conducted a study to validate the results obtained using the new BIA machine. This used volunteers from ICDDR,B’s staff, and will compare the values obtained from them with those obtained using the deuterium dilution technique. The results will then be used to develop a prediction equation for use with the BIA machine. The biological samples for the measurement of deuterium have been transferred to a laboratory in India for analysis, and results are pending.

Child Development Unit

Established in 1996, ICDDR,B’s Child Development Unit (CDU) is involved in research, training, and patient-care activities. Its main aims are to examine the effects that nutritional deficits, poor health, and deprivation have on children’s development—and to design and evaluate innovative, low-cost, and sustainable methods of addressing these issues. The Unit has won competitive research grants from UNICEF, DFID (UK), USAID, SAREC, and Sida.

The Unit collaborates extensively with Centre’s different scientific divisions and programmes, as well as with national and international organizations, such as the Institute of Nutrition and Food Science of the University of Dhaka, the Institute of Child Health (ICH) of the University College London, and Cornell University USA. It also collaborates with the national Child Development ‘Shishu Bikash’ Network—a forum of professionals working in different areas of child development.

Nandipara Clinic

The researchers of the Clinical Sciences Division use ICDDR,B’s Nandipara Clinic (12 km east of Dhaka city centre) to carry out community-based research. In recent years the area covered by the clinic has been expanded to support ongoing studies, and now includes three new areas: Trimohoni, Madertek, and Dakhingaon. Current research includes a community-based study to assess how well different food-fortification compounds—particularly ferrous fumarate and ferric pyrophosphate—prevent iron-deficiency anaemia in preschool children.

In 2005, the Clinic provided outpatient services to 19,537 people—mostly women and children with common medical problems. It also conducted a census this year, which registered 5,797 families in the area. This will provide demographic information on the community, which will be useful in planning and conducting research studies involving local people.

In addition, the area covered by the clinic has been chosen for a study that aims to determine how infections associated with Helicobacter pylori are transmitted. This bacterium can cause a variety of problems, including ulcers and long-lasting inflammation of the gut. The study will also consider the role that genetic diversity plays in H. pylori colonization, and how it affects the absorption of vitamin B12 in children.

Another study based in the clinic also began recently. This aims to design an optimal complementary feeding regime that mothers can use with healthy breastfed children. Participants are being recruited from the community living near the field office.

Fellowship programmes

The CSD’s clinical fellowship programmes (established more than 15 years ago) provide further training to young doctors who have demonstrated a talent for postgraduate studies in paediatrics and internal medicine. Fifteen Fellows receive hands-on training for 1-2 year(s) on how to manage cases of diarrhoeal disease and associated problems. The programme is recognized by both the University of Dhaka and the Bangladesh College of Physicians and Surgeons. In addition, the Division’s Clinical Research and Service Centre runs a nurse fellowship programme which provides hands-on training to 10 nurses each year.
Recent changes in the Clinical Sciences Division

Establishing a participatory management system at Dhaka hospital

In late 2003, CSD was assessed by external reviewers in order to improve its activities—including the quality of the patient care provided at Dhaka hospital. This review recommended that the way Dhaka hospital was managed should be revised, to provide a participatory system that would allow all categories of hospital staff to contribute to problem-solving and so improve the quality of care.

Acting on this, the Centre engaged the consulting firm PRIP Trust to help CSD implement a participatory management system. The name Proyas (or ‘Endeavour’) was selected for the project by staff through a participatory process, and it was officially launched in April 2005.

Dhaka hospital’s physical facilities improved

In 2005, CSD continued to improve the physical facilities available in Dhaka hospital, by installing adequate hand-washing facilities for example. Major renovation work was also undertaken. These included the relocation of the Special Care Unit (SCU) and the pharmacy as well as the establishment of a procedure room and an isolation room next to the SCU. In addition, central oxygen supply and suction systems were installed in the SCU and isolation room, and 10 paying-beds were established on the longer-stay General Ward. Furthermore, renovation work on the General Ward
has almost been completed. This includes the creation of separate rooms for adult men and women, and improved privacy for all patients.

**Training**

During 2005, one member of staff was awarded a Masters degree in Health Science from Johns Hopkins University Bloomberg School of Public Health (USA). The same person also completed a fellowship in Clinical Pharmacology from the Johns Hopkins School of Medicine (USA). Another staff member was awarded an MPhil by University College London (UK). This will eventually lead to a PhD degree. Three other staff members are continuing their Doctoral and Masters studies at the University of California-Davis (USA) and the London School of Hygiene & Tropical Medicine (UK).

**Dhaka Hospital attendance levels**

During 2005, 110,994 patients attended Dhaka Hospital seeking treatment for a diarrhoeal disease or associated health problem (Fig. 3). Of these, 99.78% survived. In total, 32,357 patients with mild diarrhoea were referred to the PSKP clinic, 1,868 (5.8%) of whom were referred back as they had to be hospitalized.

Patient visits during the first four months of 2005 were higher than during the same months in the previous four years. In April 2005 there was a sharp rise in patient visits due to a cholera outbreak. A second smaller peak occurred in September.

Of the 110,994 patients who attended the hospital in 2005, 71.9% were admitted to the Short-stay Ward (SSW). Another 6,995 (8.8%) patients required admission to the longer-stay wards (i.e. the General Ward, the Special Care Unit, the Research Ward, and the Nutrition Rehabilitation Unit). The mortality rates in the Short-Stay Ward, General Ward, and Special Care Unit were 0.015%, 0.16%, and 14.7%, respectively.

Of the 6,995 patients admitted to the longer-stay wards, 123 (1.8%) took part in the Centre’s research projects, 188 (2.7%) absconded, 238 (3.4%) discharged themselves against medical advice, and 74 (1.1%) were referred to other hospitals for management of complications.

In total, 209,730 litres of intravenous fluids (1.9 litres/patient), and 509,918 litres of oral rehydration solution (4.6 litres/patient) were used at the Dhaka hospital in 2005.
HEALTH SYSTEMS AND INFECTIOUS DISEASES DIVISION

What does the Division do?

ICDDR,B’s Health Systems and Infectious Diseases Division (HSID) works to (1) improve healthcare services in developing countries and (2) reduce the impact that infectious diseases have on the poor.

The Division’s health systems researchers design and test cost-effective and sustainable healthcare interventions. This involves looking at the field work done by ICDDR,B and other organizations and identifying promising strategies. These are then developed and adapted to ensure that they suit real-world settings and are easy to reproduce. Efforts in this area range from making primary (local) healthcare more effective to scaling up proven life-saving technologies.

In 2005 more than 7,500 health professionals around the world regularly received the Division’s three-monthly Health and Science Bulletin.

The Division’s infectious disease researchers study high-priority diseases threatening people in developing countries like Bangladesh. Their work includes studies of the causes, spread, and control of disease (epidemiology) as well as outbreak investigations. They also conduct vaccine trials and clinical field trials to improve healthcare systems.

HSID also maintains three field study sites which are used by all of ICDDR,B’s divisions. These are an urban slum field station in Dhaka city and two rural field stations: one in Mirkarai (in southern Chittagong) and the other in Abhoynagar (in western Khulna, on the Indian border).

To ensure that important findings reach healthcare providers and decision-makers, the Division publishes its Health and Science Bulletin (HSB) every three months. Demand for the bulletin (available at www.icddrb.org/hsb) is growing steadily—in 2005 more than 7,500 health professionals at home and abroad received it regularly. These dissemination efforts have been further boosted by the Daily Star (a leading newspaper in Bangladesh) which regularly picks up findings from the HSB and publishes them in its Sunday health section.

How are we organized?

The Division is divided into four administrative units: (1) Health Systems and Economics, (2) Infectious Diseases, (3) Surveillance and Data Resources, and (4) Field Sites. In 2005, its staff included 7 international scientists (from the UK, Canada, the Netherlands, and the USA), 46 national officers, and 178 general services personnel.

The activities of most of these units are described below. The exceptions are the Infectious Diseases Unit and the Health Systems and Economics Unit, which are dealt with in the relevant Research Programme reports (‘Infectious Diseases and Vaccine Sciences’ and ‘Health and Family Planning Systems’).

Surveillance and Data Resources Unit

Head: Carel van Mels

HSID’s Surveillance and Data Resources Unit ensures that the Division’s data are collected and
managed to a high standard. It also conducts studies to characterize the populations at its three field sites over time (longitudinal demographic surveillance). The Unit collects data from the Division’s two rural field sites every three months, and publishes every two years. In 2005, it published its surveillance report for the period 2002-2003.

The wide range of descriptive statistics this report contains helps health professionals to monitor service use and coverage and identify emerging threats to health—amongst other things. The data produced by the Unit therefore has very practical uses. It has shown, for example, that Bangladesh’s

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>Have smoked in the past</th>
<th>Currently smoke</th>
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<tr>
<td></td>
<td>Male</td>
<td>Female</td>
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<td>60.7</td>
<td>0.9</td>
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<td>45-54</td>
<td>60.5</td>
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<tr>
<td>55-64</td>
<td>59.0</td>
<td>2.4</td>
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<td>Total</td>
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Expanded Programme on Immunization (EPI) is achieving relatively high coverage rates at both rural field sites (Figure). It is also being used to monitor Bangladesh’s progress toward achieving the Millennium Development Goals. In 2005, the Unit completed a user-friendly version of its surveillance database. This will make it easier for researchers to access the important data it contains.

The Division’s rural field sites have also been used as part of the INDEPTH network. This provides information which developing countries can use to set health priorities and policies. In 2005, INDEPTH started adult health and ageing surveys in 10 countries to assess risk factors such as smoking in adults. The study found that over half of the men surveyed in Bangladesh were cigarette-smokers (Table). This alarming figure suggests that deaths from heart disease and cancer could soon rise steeply.

**Family Health Research Project**

**Chief of Party: David A. Sack**

Funded by USAID, the Division’s Family Health Research Project (FHRP) has been conducting applied research and disseminating results since 2001. The Project also provides technical assistance to other ICDDR,B scientists and research partners.

FHRP also works closely with national and international NGOs and Bangladesh’s Ministry of Health and Family Welfare. This helps it to design practical programmes that partners can reproduce. A good example is offered by the Project’s work to develop and implement sustainable healthcare delivery and support systems for Bangladesh’s Essential Services Package (ESP). Overall, the project focuses on improving the health services available to the poor and vulnerable and on developing new, more cost-effective methods for allocating health resources.

FHRP funds a variety of studies, seven of which were completed in 2005. These included a study of unintended pregnancies in rural Bangladesh, and a study of the health and economic impacts of efforts to apply the WHO and UNICEF strategy for the integrated management of childhood illness (IMCI). Other studies evaluated simple, rapid tests for diagnosing syphilis, considered the link between migration and vulnerability to HIV/AIDS, and focused on the ‘newly-discovered’ Nipah virus. Researchers also assessed a community-based intervention that aimed to cut down the number of children who drown each year in Bangladesh.

To share the results of newly-completed studies with researchers, decision-makers and donors, six seminars were held in 2005. These provided constructive feedback and new ideas, and an opportunity to campaign for changes in evidence-based programme strategies and policy.

In 2005, FHRP’s Leadership, Coordination and Research Development Unit (LCRDU) continued to provide administrative support—by reporting on projects, monitoring budgets, and coordinating the dissemination of research findings. The Unit also ensured that projects complied with USAID’s regulations, policies, and procedures.

In 2005, the Unit worked closely with scientists and stakeholders outside ICDDR,B to help them develop 36 concept papers. Twenty of these were submitted to USAID for approval and funding. The Unit also ensured that research protocols were developed in line with the joint priorities of ICDDR,B and USAID.

**Scaling up Zinc for Young Children Project**

**PI: Charles P. Larson**

Zinc can provide a life-saving treatment for young children suffering from diarrhoea. The Scaling up Zinc for Young Children (SUZY) Project therefore aims to ensure that all children under five receive zinc tablets during diarrhoeal episodes—regardless of their socioeconomic status or gender. Special emphasis is being given to reaching malnourished children and the poorest of the poor.

The Project is being funded until 2007 by the Bill and Melinda Gates Foundation. Project activities are discussed below.

**Producing and distributing dispersible zinc tablets**

Dispersible, easy-to-take, zinc tablets packaged in heat- and humidity-stable blister packs are the best way to provide zinc treatment, as they are cost-effective and easy to produce and distribute on a large scale. However, only one company in the world (Nutriset Ltd, France) currently makes dispersible zinc tablets of the quality required for country-wide use.

The Project has therefore been working to reach an agreement with Nutriset that would allow suit-
able pharmaceutical laboratories in Bangladesh to produce large quantities of these tablets. In 2005, this led to ICDDR,B and Nutriset signing a patent licence agreement. The Centre also reached an agreement with a local pharmaceutical laboratory (ACME) able to produce high-quality tablets. As a result, ACME has successfully registered the zinc formulation in Bangladesh under the brand name ‘Baby Zinc’.

Promoting zinc treatment through providers and mass media

Because making zinc tablets available isn't enough in itself, the Project is also launching a nationwide mass media campaign. This will promote Baby Zinc and make people aware that zinc tablets can treat diarrhoea in young children effectively.

Based on competitive tender, the Centre has employed the advertising firm Dhansiri to organize this campaign. To reach the widest possible audience, the campaign will include TV airtime, radio commercials, adverts in the press, and the use of billboards, banners, leaflets, stickers, etc. It will actively work to reach people living in remote rural areas. Based upon research findings, work has already begun to produce culturally-appropriate messages for the public.

In addition, ACME Pharmaceuticals will work to promote Baby Zinc among service providers. Their network of 1,500 drug salespeople will reach over 90,000 private-sector providers.

Integrating zinc treatment into health service delivery systems

In July 2005, based on the Centre's work, the Bangladesh Paediatric Association endorsed the use of zinc to treat childhood diarrhoea. As a result, the Government's Zinc Implementation Committee—co-chaired by the World Health Organization—will now create policy recommendations and service directives. Zinc treatment will then be integrated into the IMCI programme within the public health service.

Within the private sector, curative care is strongly influenced by paediatricians. Use of a product by paediatricians results in use by Bachelor of Medicine and Surgery (MBBS) doctors and then by unregulated service providers like village doctors and drug-vendors. Recognizing this cascade effect, the SUZY team has attended local conferences and held many workshops to make paediatricians aware of the benefits of zinc treatment. As a result, nearly all paediatricians in Bangladesh are now prescribing zinc.

Popularity of dispersible zinc tablet over currently available liquid formulations is increasing in Bangladesh
Once Baby Zinc begins to be produced in Bangladesh, the Centre will promote zinc treatment among other providers. To this end, the training team has already developed a range of information materials. These include diarrhoea-management guidelines for nurses, paramedics, and health assistants. Flip charts have also been produced for community health workers (depot holders) and other, less well-educated, healthcare providers, as have information sheets and posters to educate local communities. Other training and information materials are currently being developed. These include information cards for drug-sellers, and video clips for paramedics, unlicensed service providers, and communities.

**Networking and dissemination**

As well as publishing the results of studies in ICDDR,B’s Health and Science Bulletin, the SUZY Project disseminates its own newsletter (SUZY News). It also uses events to disseminate results and encourage action. In 2005, the Project worked with Bangladesh’s Directorate General of Health Services to organize the 2nd International Zinc Conference (17-18 April). Preparations are already underway for the 3rd International Zinc Conference. This will be followed immediately by a regional meeting of the South and South East Asian countries included in the global Zinc Task Force scale-up Project.
LABORATORY SCIENCES DIVISION

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 covered 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 most of the laboratories), Services (under which the laboratories and units of the Clinical Laboratories Services fall), and the HIV/AIDS Programme. In 2005 the Division had 317 staff members, including 26 scientists.

2005 highlights

The Laboratory Sciences Division achieved excellent results in 2005, completing eight studies, and beginning 12 new ones. A further 39 studies are still ongoing. These involve collaboration with the rest of ICDDR,B, as well as with other national, regional, and international research institutions. In 2005, the Division’s scientists published 59 papers in well-respected peer-reviewed journals.

LSD scientist to be honoured for work on cholera

Dr. Shah M. Faruque, Head of the Molecular Genetics Laboratory, is to be awarded the 2005 TWAS Prize for Medical Research by the Academy of Sciences for the Developing World. The announcement was made in December 2005 at the General Meeting of the Academy in Alexandria.

The TWAS Prize is awarded to scientists who make outstanding contributions to different scientific fields. Dr. Faruque’s research addresses health problems in developing countries, and has contributed significantly to our understanding of how new bacterial pathogens emerge naturally. Toxin-producing (toxigenic) Vibrio cholerae, which causes cholera epidemics is a good example, as it evolved from non-disease-causing V. cholerae by acquiring genes which made it capable of causing disease.

"Dr. Faruque’s research has contributed significantly to our understanding of how new bacterial pathogens emerge naturally"

Dr. Faruque and his co-workers have contributed substantially to our understanding of (1) the molecular mechanisms by which virulence genes are transmitted, and (2) the evolutionary events that lead to the emergence of new epidemic strains of V. cholerae. They have also proposed models to explain the dynamics of seasonal
cholera epidemics. The research findings of Dr. Faruque and his colleagues have been published in a number of eminent journals.

**Training**

In 2005, one member of staff completed postgraduate training in nutrition while another obtained a PhD in microbiology. Three obtained Masters degrees in bioinformatics, microbiology, and immunology. Three members of staff also undertook short-term training overseas. Four more staff members are studying for PhDs abroad, while another is undergoing short-term training in the USA. In addition to this, 27 of the Division’s staff attended different international scientific conferences, workshops, and seminars during the year.

**Improving services and efficiency**

The Division’s diagnostic service laboratories continued to improve their facilities in 2005, and new laboratory software is being used to improve the service provided to both internal users and external users. Software is now also being used to archive laboratory data and produce financial reports—completely eliminating the need to produce reports manually. The laboratories’ data are now also pooled on a dedicated server, for easy access by researchers.

The Division also uses a full version of ICDDR,B’s Laboratory Management System Software (LMSS) to maintain good practice within its laboratories. This was developed jointly by the Division’s Nutritional Biochemistry Laboratory and the Centre’s Computer Information Services Unit. In-house training means that all the Division’s staff are now able to operate its inventory control system, a prerequisite for modern laboratory management.

As part of a renovation programme, the Division also upgraded its Environmental Microbiology Laboratory, to ensure that it could conduct state-of-the-art research activities. It has also established a new Water Laboratory within the same Laboratory, improved the Animal Resources Branch’s facilities, renovated the Specimen Reception Unit, and installed a new electrical power distribution system.

**Capacity building and workshops**

In line with ICDDR,B’s policy of regional cooperation, six consultants from the Division provided consultancy services in Mozambique, Pakistan, Nepal, and Bhutan this year. Consultants also developed and delivered a one-week course on the laboratory aspects of public health for Masters in Public Health students from Bangladesh’s BRAC University, Dhaka. This was attended by 25 students from nine different countries.

This year, the Head of the Nutritional Biochemistry Laboratory was asked to act as Convener for the Bangladesh Standards and Testing Institution (BSTI) Subcommittee for Food and Beverage. He also provided his expertise at the “Training of Trainers in Nutrition” workshop organized by Bangladesh’s Ministry of Agriculture.

The Division held a retreat at Cox’s Bazar in February 2005. This gave scientists and heads of laboratories and branches the chance to brainstorm future research interests, identify ways of making management more efficient, and identify further options for expanding the Division’s facilities. Many useful recommendations were made during the retreat, some of which have already been implemented.

**Technical cooperation with Nepal: follow-up to new disease monitoring efforts**

Between 1999 and 2003, scientists from the Division worked with the Nepalese Government to develop and strengthen facilities at nine laboratories in Nepal. This work aimed to ensure that the laboratories could efficiently monitor for key infectious disease causing pathogens like *V. cholerae* and *Shigella* (which cause diarrhoeal diseases), *Streptococcus pneumoniae* and *Haemophilus influenzae* (which cause acute respiratory infections), *Nisseria gonorrhoeae* (a sexually transmitted pathogen) and *Salmonella* Typhi (which causes typhoid).

Activities included providing training and helping Nepal’s government to develop an external quality control network. Though the programme is now run by Nepal’s Ministry of Health, the Divi-
sion’s scientists still monitor and evaluate activities once a year. In 2005, the Division’s expert visited the laboratories and found that the programme was still using the same procedures as ICDDR,B and that the labs were performing well.

**Acute Respiratory Infections Laboratory**

**Head: Mahbubur Rahman**

Acute lower respiratory infections, mainly pneumonia, are a leading cause of illness and death among the under-fives in Bangladesh. In fact, pneumonia (often caused by *S. pneumoniae* or *H. influenzae*) actually accounts for about 25% of all the under-fives who die and about 40% of all infant deaths.

Using clinical and molecular-microbiological tools and techniques, the Division’s Acute Respiratory Infections Laboratory studies the causes, distribution, and control (epidemiology) of pneumonia in the under-fives. It also works to track resistance to antimicrobial drugs among the bacteria that cause pneumonia in young children. Information on this is then made available to decision-makers and health workers so that they can act on it in a timely manner. This is particularly useful for the acute respiratory infection control programmes run by the Bangladesh Government.

The Laboratory’s current work includes efforts to produce pneumococcal vaccines that can be used to vaccinate mothers, who then pass that immunity on to their babies. Researchers are also collaborating with ICDDR,B’s Public Health Sciences Division to study the molecular make-up of respiratory pathogens using serotyping, multilocus sequence typing, and eBURST analysis.

**Enteric Microbiology Laboratory**

**Head: G. Balakrish Nair**

The Division’s Enteric Microbiology Laboratory works to develop and apply ways 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 polymerase chain reaction (PCR) to enzyme-linked immunosorbent assay (ELISA). The Laboratory also uses animals to study the mechanisms of disease and to produce antisera which are used to identify bacteria.

The Laboratory has recently standardized a new technique—known as lipooligosaccharide (LOS) class PCR—to allow it to be used to characterize *Campylobacter* strains from different sources. It is also using real-time PCR to rapidly detect *Shigella* species by targeting the *ipaH* gene, and has recently begun to study the microbiology of certain foods.

Researchers in the Laboratory are currently carrying out in-depth studies of *V. cholerae*, *V. parahaemolyticus*, *Campylobacter*, *Escherichia coli* (especially Shiga toxin-producing *E. coli*), *Shigella*, *Salmonella*, and *Aeromonas*. Studies on the antibiotic-resistance mechanisms of *Shigella* and *S. Typhi* are also ongoing.

To build capacity, the Laboratory also frequently trains fellows both from Bangladesh and abroad in various aspects of molecular biology. Working with a number of universities (again both at home and abroad), laboratory researchers also routinely supervise MSc, MPhil and PhD students working in the Laboratory.

**Environmental Microbiology Laboratory**

**Head: Md. Sirajul Islam**

The Environmental Microbiology Laboratory studies the microbiology and chemistry of water, to allow researchers to better understand the ecology and epidemiology of *V. cholerae*. It is currently also developing guidelines for point-of-use water treatment for surface and groundwater in Bangladesh. Five studies were conducted during 2005.

The Laboratory also tests environmental samples supplied to it by three other divisions: Clinical.
Sciences, Public Health Sciences, and Health Systems and Infectious Diseases. The same services are also supplied to a variety of national and international institutions and non-governmental organizations working in Bangladesh. In 2005 the Laboratory tested 1,890 environmental samples (including water, prawns, fruit juice, and other beverages).

**Immunology Laboratory**

**Head: Firdausi Qadri**

The Immunology Laboratory combines up-to-date thinking in microbiology and immunology with research into vaccines and the nutritional aspects of immunity. Its work involves studies on adults, children, infants and the elderly, and observational studies of animals.

The Laboratory works to better understand why candidate vaccines succeed or fail and builds on this to design better ones. It also investigates alternative strategies for treatment and the immunological basis of such therapies. Its areas of interest include combating *Shigella, V. cholerae, V. parahaemolyticus, enterotoxigenic E. coli, S. Typhi, Mycobacterium tuberculosis* and *H. pylori*.

The Laboratory has continued to introduce state-of-the-art techniques, including gene and protein microarray. It has also been keeping up with the latest developments in immunology by actively collaborating with scientists in the USA, Sweden, France, Japan, and India. To build capacity, the

**Molecular Genetics Laboratory**

**Head: Shah M. Faruque**

The Molecular Genetics Laboratory develops and applies molecular techniques that can identify and characterize diarrhoea-causing organisms. Researchers mainly focus on molecular epidemiology and vaccine development and use a wide variety of techniques. These range from gel electrophoresis to the more sophisticated methods such as DNA amplification using PCR.

The Laboratory also collaborates with various international institutions, such as Harvard Medical School and Johns Hopkins University (USA), and Osaka Prefecture University and Kyoto University (Japan). This gives our researchers access to other advanced techniques, such as DNA sequencing and microarray analysis.

Researchers are also working to better understand how new pathogens emerge and evolve. The Laboratory has already made considerable progress in understanding the evolution of *V. cholerae* strains and the factors controlling cholera epidemics. It is also helping to fight disease by creating attenuated (weakened) *V. cholerae, Shigella*, and *E. coli* mutants, which it then assesses to determine whether they can be used to produce efficient vaccines. The Laboratory also works to control disease-causing organisms by investigating their occurrence in the environment and their biology.

**Nutritional Biochemistry Laboratory**

**Head: M.A. Wahed**

In 2005, the Nutritional Biochemistry Laboratory carried out 4,506 tests to support various research projects of the Centre, as well as continuing its research into various aspects of nutrition.

**Studying the benefits of fructo-oligosaccharides**

Fructo-oligosaccharides are simple carbohydrates found naturally in some fruits and vegetables. They have a prebiotic effect, stimulating the growth of bacteria in the gut that the body requires for good health. The Laboratory recently began a pilot study to assess what beneficial effects fructo-oligosaccharides have on children’s nutritional status (as reflected by weight gain) and whether they reduce the number of episodes of diarrhoea they suffer. Specifically, the study is monitoring 150 young children in urban slums in Mirpur (Dhaka) who have been randomly
assigned a daily dose of glucose or fructo-oligosaccharide.

**Combating vitamin A deficiency**

Vitamin A deficiency is a major public-health problem in many developing countries. Supported by the Thrasher Research Fund, researchers are now analyzing the results of a study which aims to assess whether eating small fish rich in vitamin A can improve the vitamin A status of children living in an urban slum. As part of this project, researchers also conducted two studies to determine whether acute-phase protein levels, whipworm (*Trichuris trichiura*) and maternal education are predictors of the levels of zinc and retinol (the dietary form of vitamin A) in the serum of the children studied (as zinc affects the body’s ability to take up vitamin A from food).

Results from these studies are being reported, which indicate that without correcting for acute-phase protein, the incidence of both vitamin A and zinc deficiency may be high at the population level. However, *Mola* fish may not have a clear role to play in improving the vitamin A status of children who are only slightly deficient in vitamin A.

**Analyzing arsenic levels in foods**

The Laboratory analyzed a number of foods (vegetables, rice, and raw and cooked banana) to determine how much arsenic they contained. Cooked rice and many of the raw vegetables analyzed were found to contain high levels of arsenic.

**Training and external assessment**

The Laboratory is currently supervising MSc students from different national and international institutions. The performance of the Laboratory was also graded ‘excellent’ this year following an assessment by the US National Institute of Standards and Technology and the Centers for Disease Control and Prevention (CDC) as part of the External Quality Assurance Programme.

**Parasitology Laboratory**

**Head: Rashidul Haque**

ICDDR,B’s Parasitology Laboratory focuses mainly on protozoan (single-celled) parasites of the intestine, though it does also conduct studies into...
malaria and leishmaniasis. It also provides diagnostic support to different ICDDR,B projects.

**Studies of malaria and leishmaniasis**

Work on malaria is currently limited to a small-scale study of drug resistance in one area of Bangladesh, though there are plans to expand the Laboratory's malaria research in the near future. These studies are being undertaken in collaboration with the Armed Forces Research Institute of Medical Sciences (Thailand). Leishmaniasis research, by the same token, is being undertaken in collaboration with CDC (USA) and various divisions of ICDDR,B.

**Diagnosing, understanding, and combating diarrhoea-causing parasites**

The Laboratory is collaborating with the University of Virginia and TechLab, Inc. (USA) to find quick and easy ways of diagnosing *Entamoeba histolytica*, *Giardia lamblia*, and *Cryptosporidium*. Rapid tests for the diagnosis of these parasites are therefore being evaluated and compared with real-time PCR tests.

Studies are also ongoing to determine exactly how much illness and death amoebic diseases cause in Bangladesh, and researchers are working with the University of Virginia to explore people’s innate and acquired immunity to *E. histolytica*, a major cause of amoebic infection. Similar work is also being carried out on *Cryptosporidium* in collaboration with both the University of Vermont and the University of Virginia.

Working with patients in ICDDR,B’s Dhaka hospital, the Laboratory is also attempting to discover whether symptoms like diarrhoea are associated with the specific genotypes of an organism. This research has already shown that diarrhoea seems to be caused more often by *G. lamblia* A than the more commonly occurring *G. lamblia* B. Whether different genotypes of *E. histolytica* and *Cryptosporidium* are linked with diarrhoea is now also being investigated.

The Laboratory is also studying protozoan infection in pre-school children in Mirpur and its effects on development. Studies of diarrhoeal stool samples from these children have shown that disease-causing intestinal protozoan parasites are very common. However, the research also indicates that only *E. histolytica* causes physical and mental development problems. The Laboratory is currently working to determine whether people’s genetic make-up is linked to infection with *E. histolytica* and *Cryptosporidium*.

**Reproductive-tract Infections/ Sexually Transmitted Infections (RTI/STI) Laboratory**

**Head: Motiur Rahman**

The RTI/STI Laboratory studies the causes, distribution, and control (epidemiology) of reproductive-tract infections (RTI) and sexually transmitted infections (STI) in different groups of people. Its work includes clinical trials of STI management strategies and validating different diagnostic tests for syphilis. It also monitors how susceptible *Neisseria gonorrhoeae* strains in Bangladesh are to antimicrobial drugs. This information is then published in ICDDR,B’s Health and Science Bulletin, significantly contributing to the Centre’s efforts to release important public-health information.

**Improving STI management and developing new tests**

The Laboratory is also working with Bangladesh’s National AIDS and STD Programme (NASP) to revise Bangladesh’s STI management guidelines—new drafts have already been reviewed by national experts. It has also recently evaluated two rapid diagnostic tests for syphilis (the Rapid Syphilis Device and immunochromatographic test [ICT]) for sensitivity, specificity, and performance. ICT was found to be acceptable for use by paramedics. This will replace the conventional rapid plasma reagin (RPR) and *Treponema pallidum* haemagglutination assay (TPHA) methods currently used during antenatal check-ups.

**STI surveys**

Although many integrated behavioural and biomedical surveys (IBBS) have been conducted among female sex workers in Bangladesh, IBBS have not been used to study their clients. Researchers therefore recently began using IBBS to survey the young clients of hotel-based female workers in Dhaka. The study aims to determine the patterns and riskiness of sexual behaviour in this group, as well as how many are infected with specific STIs.

In partnership with the Centre’s Health Systems and Infectious Diseases Division (HSID), researchers have also completed the first-ever nationally-representative population-based survey of HIV/AIDS and STI among youths in Bangladesh. The survey found that 0.6% of all youths and 1% of married males had syphilis, while around 16% of youths tested positive for herpes simplex virus 2 (genital herpes).
Training and laboratory-guideline development

The Laboratory is also actively involved in training. This year’s activities include an evening bioinformatics forum for the Centre’s junior researchers. Twenty young scientists attended this course, which ran from March to June. Working with HSID, the Laboratory is also developing standard guidelines to help people establish and operate laboratories in primary healthcare facilities in Bangladesh. Such guidelines are, at present, lacking. So, to develop them the researchers involved are surveying randomly-selected laboratories and assessing their needs.

New expertise in bioinformatics

The RTI/STI Laboratory contains the Centre’s DNA-sequencing facility as well as the Centre’s core of expertise in bioinformatics (the collection and retrieval of genomic data). Three new experts in this area have recently joined the Laboratory after training in the UK and India.

Ongoing studies

The Laboratory is continuing to conduct research to evaluate enhanced syndromic management (ESM) and to compare it with the periodic presumptive treatment (PPT) strategy for sexually transmitted infections.

The Laboratory is also continuing to study the incidence of gonococcal and chlamydial infections among hotel-based sex workers in Dhaka. It also acts as the focal point for Bangladesh's contribution to the Global Network for Perinatal and Reproductive Health (GNPRH) and the WHO Gonococcal Antimicrobial Susceptibility Programme (GASP).

Helicobacter pylori Laboratory

Head: Motiur Rahman

Helicobacter pylori infection is one of the most common gastric infections in Bangladesh, and considerable research interest in this organism has developed in ICDDR,B over recent years. The Laboratory is involved in (1) molecular characterization of H. pylori strains, (2) basic studies on antimicrobial resistance mechanisms in H. pylori, and (3) population genetics studies on H. pylori and how its diversity affects symptoms and transmission.

Tuberculosis Laboratory

Head: Zeaur Rahim

Tuberculosis research

Tuberculosis (TB) is a major public-health problem in Bangladesh, and the scientists in the ICDDR,B's TB Laboratory work with both government and non-government partners to combat it. The Laboratory uses conventional, molecular and immunological techniques to diagnose TB. As part of its work on TB, researchers are studying the genetic diversity of isolated strains of Mycobacterium tuberculosis (the cause of TB) using deletion analysis, variable number tandem repeat (VNTR) of mycobacterial interspersed repetitive units (MIRU), and spoligotyping techniques. During 2005, the Laboratory also processed 700 sputum samples using conventional culturing techniques.

Staff members are also working to quantify just how big a problem TB is in Dhaka’s Central Jail. This work includes studies of multi-drug resistance and disease transmission. Prison inmates are interviewed, then sputum samples from suspected cases are screened using both conventional and molecular techniques. Knowledge acquired from this study will help Bangladesh Government to control the transmission of the disease in this difficult setting. The Laboratory is also collecting clinical samples (sputum, blood, urine, etc.) for a WHO TB specimen bank.

Collaborative work on leprosy

The Laboratory has also recently expanded its research activities to include leprosy, again using conventional, molecular, and immunological diagnosis techniques. In this, it is collaborating with the scientists from the Pasteur Institute, Paris.

It is also conducting a WHO-funded collaborative project on leprosy. This aims to use advanced genetic techniques to produce and characterize Mycobacterium leprae proteins and peptides that could be used as antigens when diagnosing the disease. The Laboratory has also recently become a member of the IDEAL (Initiative for Diagnostic and Epidemiological Assays for Leprosy) consortium. This will ultimately help to set up a network of research in the field of leprosy diagnostics and epidemiology.

Capacity building and training

Scientists from the Laboratory have continued to supervise the research work of BSc and MSc students from the University of Dhaka. To build the
capacity of the National TB Control Programme, the Laboratory also regularly helps to train laboratory technicians.

**Virology Laboratory**

**Head: Tasnim Azim**

The Virology Laboratory mainly focuses on Group A rotavirus, and its work includes testing to diagnose rotavirus and to type different strains. Using molecular epidemiological studies, researchers in the Laboratory have identified several new strains of rotavirus.

The Laboratory also conducts work on HIV and influenza. Part of this involves conducting HIV tests for various research studies, including those to monitor HIV in Bangladesh as a whole, as well as in injecting drug users. The Laboratory also tests samples for ICDDR,B's Voluntary Counselling and Testing Units (Jagori). Absolute CD4 (T-cell) counts for people living with HIV are determined using the Laboratory's FACSCalibur equipment. Efforts are also ongoing to support influenza surveillance by a programme of blood-sample testing.

**Clinical Laboratory Services**

**Head: M. Anowar Hossain**

ICDDR,B's Clinical Laboratory Services (CLS) consists of several diagnostic units: the Clinical Haematology, Biochemistry, Microbiology, Molecular and Serodiagnostic Laboratories, the Out-patient Service Unit in Dhaka and two clinical laboratories (at Matlab and Chakaria).

These units provide diagnostic services to ICDDR,B's Clinical Research and Service Centre, which cares for patients at the Centre's hospitals, and to various studies being undertaken. Diagnostic services are also provided to paying-users referred to CLS, and to the US Embassy, the US Peace Corps, the Japan International Cooperation Agency, and the medical units of the British High Commission.

In 2005, the laboratories processed 163,073 specimens and conducted 470,407 tests. The Out-patient Service Unit handled 96,461 patients, and blood samples had to be collected from 32,156 of these patients.

**Improving efficiency through a new local area network**

In 2005, CLS completed the development and installation of a dedicated local area network to connect its laboratory information management system (LIMS). The system is now being used by most Laboratories, though some further adjustments are needed to ensure that it is compatible with the Matlab laboratory. LIMS has resulted in specimens being processed more quickly, and in reports being produced faster. The system has made writing reports by hand unnecessary, and has also ensured that laboratory data are archived automatically. It has also made financial and management reporting easier.

**Use of new tests and equipment**

Various new tests were also introduced into different units this year. These included the Clinical Biochemistry Laboratory (which is now applying the troponin I and high-sensitive C-reactive protein test) and the Clinical Haematology Laboratory (which can now test for coagulation factors VIII and IX). CLS can now also use genotyping to identify hepatitis C.

CLS also purchased a variety of equipment in 2005, including (1) a chloride meter, a centrifuge, and a top-load balance for the Biochemistry Lab; (2) a gel doc unit and a dry heating block for the Molecular and Serodiagnostic Unit; (3) an incubator and a dark-field microscope for the Microbiology Lab; (5) a semi-automated photometer for the Matlab Laboratory, and (6) a back-up server, a thermal paper token printer, and a blood collection display unit for the Specimen Reception Unit. Facilities in CLS's specimen receiving area were also further improved, to reduce waiting time and overcrowding in the area used by paying-users.

**Research, conference, and training overview**

As well as undertaking a range of research, CLS's scientists also train national and international fellows and graduate and postgraduate students in diagnostic and laboratory research techniques.

In 2005, the laboratories supported 16 research protocols, and its senior staff published 12 papers and several abstracts. They also gave presentations at a variety of conferences and training workshops. The laboratories also trained five national clinical fellows, and 26 international students and fellows. These efforts included helping Master of Public Health students from BRAC University, Dhaka, to better understand the work done by CLS. For the last two years, CLS has also mentored two international students—one from King's College, London (UK) and another from Singapore National University.

The Head of Clinical Laboratory Services visited Kathmandu (Nepal) twice during 2005, once to...
help colleagues give a training workshop on antimicrobial resistance surveillance and again to participate in a training workshop concerned with the surveillance of *H. influenzae* type b. Three other senior members of staff also attended international conferences and meetings.

**Providing safe blood for transfusions in ICDDR,B’s hospitals**

Clinical Laboratory Services, through its Clinical Haematology Unit, also works to ensure that safe blood is available for the transfusions given in the Centre’s Dhaka and Matlab hospitals. In 2005, 188 bags of blood were purchased (A 52, B 43, AB 31, and O 62) and then screened for syphilis, hepatitis B and C, HIV, and malaria. Sixty-six bags were discarded as they tested positive for one of the above, while a further 63 bags could not be used because they had passed their expiry date—blood has a shelf life of about 35 days and has to be discarded if the hospital doesn’t request it within that time. Forty-seven blood bags were used in Dhaka hospital and 12 in the Matlab hospital. The cost of blood bags, testing, and documentation was borne by the Clinical Laboratory Services.

**Clinical Haematology Laboratory**

Head: M. Anowar Hossain

The Clinical Haematology Laboratory performed 130,352 tests on 58,409 specimens during 2005. Most specimens (65%) were from paying-patients. Malarial parasites (*Plasmodium vivax* and *P. falciparum*) were detected in 0.9% of the 872 suspected cases submitted to the Laboratory, while 78% of the 682 specimens submitted by MSF Holland from its field site in the Chittagong Hill Tracts were positive.

The Laboratory conducted analyses to support 16 research studies and trained three national and two international fellows in 2005. It also collaborated with scientists from other divisions of ICDDR,B on dengue, typhoid, asthma, and encephalitis studies.

One major advance this year was the purchase of a semi-automated coagulation analyzer. This measures erythrocyte (red blood cell) sedimentation rates using the laser barrier system. Laboratory scientists also participated in conferences and seminars and continued to publish their findings in peer-reviewed journals by producing papers and abstracts.

In 2005, the Laboratory was again rated ‘excellent’ by the External Quality Assurance Scheme (EQAS) of the College of American Pathologists (CAP) for its work in routine haematology, coagulation, and parasitology.

**Molecular and Serodiagnostic Laboratory**

Head: Khairun Nessa

The Molecular and Serodiagnostic Laboratory uses serological techniques to identify a range of diseases, including typhoid, rheumatic fever, rheumatoid arthritis, dengue, syphilis, hepatitis, brucellosis, HIV, and some cancers. The Lab also uses PCR technology, gel electrophoresis, and immunoochemicalimunescence to identify certain infectious diseases. During 2005, the Laboratory processed 9,648 specimens and conducted 12,945 tests. Most (79%) of this work was done for paying clients from outside the Centre.

In 2005 the Laboratory began applying several new tests. These include the anti-Chlamydia anti-body Rose-Waaler test, and the TORCH panel—which tests for *Toxoplasma*, *Rubella*, cytomegalovirus, and the herpes virus, type I and 2. A genotyping test for the hepatitis C virus (HCV) was also evaluated and adopted, and has now been made available to paying-users. Of the 90 cases tested for hepatitis C, 92% were positive. The virus was genotyped in nine cases, and genotype 3b was found to be the most common.

Antibodies to the hepatitis A virus were found in 43% of the 156 samples tested, while the hepatitis B surface antigen (HBsAg) was identified in 11% of the 2,396 samples analyzed. HCV was found in 16% of 391 samples tested, and hepatitis E virus in 30% of the 335 samples analyzed. Dengue was identified in 51% of the 390 paying-patients and staff tested. There was a cluster outbreak of dengue in Dhaka during the post-monsoon period. Antibodies (IgG) to *H. pylori* were found in 57% of the 37 cases screened. The Laboratory helped to train one international fellow from Singapore’s National University and two national fellows.

**Clinical Biochemistry Laboratory**

Head: Ashish Kumar Chowdhury

The Clinical Biochemistry Laboratory tests a wide range of samples, including blood, serum, plasma, stool, urine, cerebrospinal fluid, intravenous fluid, and oral rehydration solution. During 2005, it performed 173,339 tests on 44,500 specimens. In fact, the Laboratory’s workload increased by 6% this year, with paying-cases accounting for 68% of the work done.

A number of new tests/assays were introduced into the Laboratory this year, including the...
troponin I and C-reactive protein (CRP) tests for heart problems. These will either be used to generate new sources of income or to support the Centre’s research. New equipment was also added to the unit, including a clinical centrifuge machine, and a chloride meter.

The Laboratory was again assessed by the UK’s Wolfson EQA Laboratory this year as part of the WHO External Quality Assurance Scheme. Its performance was assessed as ‘Grade 1’—the best score possible.

The Laboratory also helped Bangladesh’s Institute of Public Health to check the quality of intravenous fluid products. Researchers also helped the country’s Kidney Foundation to further develop its laboratory, and ensure quality control, by providing training followed by periodic monitoring.

This year, Head of the Clinical Biochemistry Laboratory attended the conference of the American Association of Clinical Chemistry. The Laboratory supported 15 studies and helped to train two national fellows and two international fellows—one from the Singapore National University and the other from King’s College, London, UK.

Clinical Microbiology Laboratory

Head: Md. Khorshed Alam

During 2005, the Clinical Microbiology Laboratory performed 127,701 tests on 37,559 specimens. This work includes testing to determine whether isolates from the specimens were susceptible to antimicrobial drugs. The majority (53%) of the Laboratory’s workload involved testing specimens from patients hospitalized within ICDDR,B’s Clinical Research and Service Centre and work to support research protocols.

Common diarrhoeal pathogens were found in 28% of the 16,661 faecal samples tested. In all, 14% of samples contained V. cholerae O1, and 0.01% V. cholerae O139. Shigella was found in 6% of samples. S. Typhi and S. paratyphi A were found in 0.5% of samples, and non-Typhi Salmonella spp. in 1.5% of samples. Aeromonas spp. were found in 4%, and Plesiomonas in 1% of samples. In total, 2,350 samples were also tested for Campylobacter jejuni, 8% of which were positive.

V. cholerae O1 was found to be resistant to a variety of drugs, with 90.96% of samples being resistant to tetracycline, 99.61% to furazolidone, 99.96% to cotrimoxazole, and 82.73% erythromycin. The only drug to which 100% of samples were sensitive was ciprofloxacin. The phenotypic pattern of antimicrobial resistance is shown in Table 1.

Blood-borne pathogens were found in 8% of the 9,896 blood sample tested. Salmonella species were most common, with S. Typhi being found in 5% of samples, and S. paratyphi A and S. pneumoniae in 0.7% and 0.5% of samples respectively. H. influenza type b occurred in 0.2% of samples, N. menengitidis in 0.07%, Shigella spp. in 0.06%, Stenotrophomonas maltophilia in 1%, and Serratia spp. in 0.5%.

Of the S.Typhi isolates, five (1.1%) were 100% resistant to ampicillin, chloramphenicol, cotrimoxazole, nalidixic acid, and ciprofloxacin. Most (98.9%) strains also showed reduced susceptibility to ciprofloxacin and other fluoroquinolones and were only sensitive to third-generation cephalosporins and azithromycin. Details of the antimicrobial resistance of S. Typhi and its phenotypic pattern are shown in the figure. In all, 2,588 urine samples were tested, 31% of which were positive. The most commonly found pathogen was E. coli, for which 13% of samples tested positive.

<table>
<thead>
<tr>
<th>Table 1. Resistant phenotypes of <em>Vibrio cholerae</em> O1: percentage of samples resistant to different combinations of antimicrobial drugs</th>
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<tbody>
<tr>
<td><strong>Phenotype</strong></td>
</tr>
<tr>
<td>Te Sxt Fx E</td>
</tr>
<tr>
<td>Te Sxt Fx</td>
</tr>
<tr>
<td>Te Sxt E</td>
</tr>
<tr>
<td>Sxt Fx E</td>
</tr>
<tr>
<td>Sxt Fx</td>
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<tr>
<td>Fx</td>
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</tbody>
</table>

1 Te=tetracycline, Sxt=co-trimoxazole, Fx=furazolidone, E=erythromycin
LABORATORY SCIENCES DIVISION

To ensure the quality of its work, the Laboratory continued to participate in the External Quality Assurance Scheme in partnership with the College of American Pathologists. The Laboratory’s performance was excellent, with an overall rating of 100%.

The Laboratory’s scientists also participated in a range of conferences and seminars, as well as conducting methodological research. Collaborative research included work with the University of Cape Town (South Africa) to determine the serotyping pattern of \(C. jejuni\). The Laboratory supported 10 ICDDR,B research studies in 2005. It also worked to ensure microbial quality control in the Centre’s Matlab Clinical Laboratory.

**Matlab Clinical Laboratory**

**Head: Md. Golam Yeahia Khan**

In 2005 the Matlab Clinical Laboratory performed 21,996 tests on 9,953 samples from patients in the Matlab diarrhoea treatment centre, from research studies in the field, and from staff attending the staff clinic.

Microbiological tests were performed on 22% of these specimens. These tests included dark-field microscopy, culture and enrichment for isolation, and antimicrobial susceptibility tests. Of the 1,586 stool and/or rectal swab cultures, around 16% yielded \(V. cholerae\) O1, 0.4% \(V. cholerae\) O139, 8% \(Shigella\), and 3% \(Salmonella\) spp. Of the 356 blood, urine, and throat swab specimens, etc. sampled, 21% yielded isolates.

The remaining 78% of specimens underwent 10,893 tests for electrolytes, renal function, and blood glucose, as well as routine haematological tests, urinalysis, and stool microscopy for parasites. Microscopy of 2,548 stool specimens detected \(E. histolytica\) (in around 1% of samples), \(Giardia intestinalis\) (4%), \(Ancylostoma duodenale\) (1.5%), \(Ascaris lumbricoides\) (25%), \(Trichuris trichuria\) (17%) and \(Strongyloides stercoralis\) (1%).

To improve facilities, the Laboratory replaced its autoclave and increased its freezer storage capacity. In 2005, the Laboratory also supported five research protocols and extended short-term support to a variety of field studies.

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**Fig. Resistance of Salmonella Typhi to different antimicrobials**
Laboratory Sciences Division

Chakaria Diagnostic Laboratory
Pi: M. Anowar Hossain

The Division’s Chakaria Diagnostic Laboratory operates as part of the Chakaria Community Health Project run by the Public Health Sciences Division. It supports the research studies undertaken at the field station and provides low-cost, high-quality diagnostic facilities to the local community.

In 2005, 1,831 patients used the Laboratory’s services, providing 3,004 specimens. In all, 4074 tests were run on these. Internal quality control systems, including the testing of unknown samples, are used to ensure quality of service.

Media and Lyophilization

Head: Qazi Shafi Ahmad

This section consists of two units: Media Preparation and Decontamination and the Bacterial Stock Culture Collection. The Section is primarily responsible for preparing media for growing bacteria, preserving bacterial stock cultures, and decontaminating infectious laboratory wastes. The culture media it prepares and supplies to research projects and clinical laboratories at Dhaka and Matlab are used for the growth, isolation, and identification of microorganisms. In 2005, the Section provided support to 51 research projects, supplying different kinds of culture plates and culture broths (Table 2).

The Bacterial Stock Culture Collection Unit has facilities to freeze-dry (lyophilize) samples ranging in size from 0.2-mL ampoules to 300-mL bottles. In this way it preserves the cultures of the representative strains isolated every year by ICDDR,B’s clinical laboratories. In 2005, it supported 11 research projects and processed 4,393 samples of intestinal pathogens and other research specimens.

Animal Resources Branch

Head: K.M. Nasirul Islam

The Branch performs various animal experiments to support ongoing research in ICDDR,B in line with internationally-accepted ethical guidelines. It also formulates breeding plans to ensure that enough laboratory animals are available and collaborates with government institutions in Bangladesh.

In total, 415 rabbits, 553 guinea pigs, 310 rats, 8,627 Swiss albino mice, and 317 Balb/c mice were produced and supplied for research work. In addition, 43,309 mL of blood from different research animals was supplied by the Branch.

Ninety internee doctors from Government Veterinary Colleges in Bangladesh and one Senior Scientific Officer from Bangladesh Council of Scientific and Industrial Research, Rajshahi, received training from the Animal Resources Branch this year.

Biomedical Engineering Unit

Head: A.K.M. Rahmat Ullah

The Biomedical Engineering Unit installs, maintains, and repairs ICDDR,B’s analytical and biomedical equipment. Staff also set the technical specifications of machinery and evaluate equipment before it is procured. The Unit maintains about 600 pieces of equipment for the Division without having to hire outside contractors. Currently, 100% of the Division’s machinery is in good working order as a result.

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Table 2. Bacteriological media produced in 2005 for use in ICDDR,B research projects and clinical laboratories

<table>
<thead>
<tr>
<th>Media</th>
<th>Production (Litre)</th>
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</thead>
<tbody>
<tr>
<td>Culture media (solid)</td>
<td>3,568</td>
</tr>
<tr>
<td>Culture broth</td>
<td>698</td>
</tr>
<tr>
<td>Carbohydrate fermentation broth</td>
<td>39</td>
</tr>
<tr>
<td>Amino acid broth</td>
<td>12</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,317</strong></td>
</tr>
</tbody>
</table>
To comply with Rule 54 of Bangladesh’s 1997 Nuclear Safety and Radiation Control Ordinance, the Unit also acts as the Centre’s Radiation Control Officer (RCO). As such, it oversees the use of radioactive materials for biological research. It is also responsible for licences, permits and the safe disposal of radioactive wastes. Its work therefore includes acquiring licences for the Dhaka and Matlab hospitals’ X-ray units, and monitoring safety within those units.

Laboratory Logistics and Archives

Head: Md. Bodrul Ahsan Prodhan

The Logistics and Archives Branch provides managerial, logistic, and archival services to the Division. In this role, it oversees both local and foreign procurement of necessities such as scientific equipment, reagents, and consumables, and coordinates the installation, repair and maintenance of equipment. It also manages fixed-assets and maintains the cold room and the biological specimen bank. It also undertakes routine safety inspections. The Branch produces monthly financial recovery reports for the Media Preparation Unit and maintains a data bank of 14,000,000 records. In 2005, it coordinated the logistical aspects of the renovation of the Environmental Microbiological Laboratory, Animal Resources Branch, and other areas of the Division.
What does the Division do?

ICDDR,B’s 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 diseases, while taking issues of social equity and gender equality into account.

More specifically, the Division provides the infrastructure needed to test vaccines, determine drug resistance in disease-causing organisms, and explore the causes, distribution, control, and consequences of specific problems such as hepatitis E, arsenic contamination, and HIV/AIDS. It also conducts surveillance to identify and monitor illnesses such as cholera and tuberculosis, and to follow trends in fertility, population growth, and migration.

Reducing child mortality, improving maternal health, and controlling HIV/AIDS, malaria, and other diseases are all goals of the Public Health Sciences Division.

The Division’s social and behavioural scientists work within various projects across ICDDR,B to improve people’s understanding of how different issues (such as care-seeking patterns and social equity) help or hinder 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 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 six units: Child Health, Epidemic Control Preparedness, Health and Demographic Surveillance, Reproductive Health, Social and Behavioural Sciences, and the Matlab Health Research Centre. The Division also houses four theme-based Centre-wide research Programmes: Child Health, Reproductive Health, Population Sciences, and Poverty and Health.

The research efforts of these units and programmes are spread among several sites throughout Bangladesh; most notable are those in rural Matlab (Chandpur 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 one at Chakaria mostly caters to local training needs.

With 48 ongoing protocols, the Division is continuing to expand. Its scientific staff currently consists of public-health professionals, epidemiologists, social scientists, population specialists, and health economists. In 2005, more than 1,060 staff members worked on long- and short-term contracts, eight of them at an international level. Dr. Lauren Blum, a Medical Anthropologist, left the Centre in September 2005.
The Matlab Health Research Centre (MHRC) is ICDDR,B's oldest and largest population-based field site. Located in the Matlab Upazila (sub-district) of Chandpur district, it lies around 57 km south-east of Dhaka. MHRC consists of three research branches:

- a clinical research branch—which provides clinical services and research facilities;
- a community health branch—which offers reproductive and child health services within communities and helps to implement community-based research and interventions; and
- a health and demographic surveillance (HDSS) branch—which covers a population of about 225,000 and provides the data necessary to plan, conduct, and evaluate various types of public-health research.

The Matlab Centre has a training facility, which operates to international standards. It 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 the health services that MHRC provides to the area’s study population. In this way, 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 three decades have contributed significantly to the policy and policy-related actions of international agencies and the governments of developing countries, including Bangladesh. MHRC’s research structure includes a team of well-trained and committed village-based community health research workers, four 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, 13,581 patients with diarrhoea were treated at the Matlab hospital. Of these, 19% had to be admitted. The overall case-fatality rate for this group was low: 0.16%. Ten percent of the hospital’s diarrhoea patients came from the Matlab Health and Demographic Surveillance System (HDSS) area. A further 2,287 patients were treated for diarrhoea at three community-based treatment centres administered primarily by local community initiatives with support and supervision from MHRC.

In 2005, another 14,491 patients (7,632 women of childbearing age and 6,859 children under five) from the ICDDR,B service area were treated at the Matlab MCH-FP (maternal and child health and...
family planning) clinic: 87% as outpatients and 13% as inpatients. Of the 735 inpatients in labour, 657 (89%) delivered at the Matlab facility. The other 78 (11%) in this group were referred to Matlab Upazila/Chandpur District Hospital, as were another 50 women from outpatient clinics whose deliveries showed signs of complications.

In total, 877 children under five were admitted as inpatients during the year, 544 (62%) of whom were treated for acute lower respiratory tract infections. The case-fatality rate among this group was 0.36%.

During 2005, MHRC’s four sub-centre clinics in Matlab also treated 28,152 patients for a variety of conditions. This group consisted of women of childbearing age, children under five, 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 of the men. The sub-centre clinics were also responsible for 412 deliveries this year.

MHRC’s village-based community health research workers (CHRWs) also treated 35,455 women of childbearing age and children under five for common complaints, such as fevers, colds, pneumonia, skin diseases, and worm infestation. These services were provided from 57 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 1,344 patients drawn from the HDSS area identified *V. cholerae* O1 (13% of cases), *V. cholerae* O139 (0.07%), and *Shigella* species (9%). Of the *Shigella* species isolated, *S. flexneri* was most common (78%). No *S. dysenteriae* type 1 was found.

**Training and seminars**

The International Training Centre at Matlab hosted several local and international training courses and seminars in 2005. In addition, 154 national and international visitors visited the Matlab facilities and its ongoing research activities.

A retreat for PHSD staff was also run between 16 and 17 March at the ICDDR,B Guest House. Participants discussed both the ongoing and the proposed research agenda for the Matlab Health Research Centre.

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**Health and Demographic Surveillance Unit**

**Head: P.K. Streatfield**

In 2005, ICDDR,B’s Health and Demographic Surveillance Unit (HDSU) focused on conducting a household socioeconomic status (SES) census. Though undertaken using the Unit’s staff and resources, the census did not interfere with the smooth running of routine HDSS data collection. The Unit also made time to refine its verbal autopsy tools, field procedures, and cause-of-death diagnosis criteria this year. The major activities undertaken by HDSS in 2005 are reported.
**Data collection and processing**

A six-monthly HDSS data processing system introduced in late 2004 has been effectively used to reduce the time-lags between data collection, data cleaning, data processing, and reporting. New approaches are being explored to further reduce the time, cost, and errors involved in data collection and data entry.

**Computer programming and database activities in Matlab**

The Unit has created a database containing information on all ICDDR,B’s Matlab community health research workers. This will allow each to be provided with specific and appropriate feedback.

In 2005, a senior programmer also developed new programs for many of the projects operating in Matlab. Examples include a new program and an online database for registering Matlab hospital patients. These allow patient information to be linked with the Health and Demographic Surveillance System.

**Improving database-related activities in Dhaka**

Over the last year, to improve efficiency, HDSU has replaced its old Sun server and its Matlab Compaq server with Hewlett Packard servers. The Unit has also replaced the old Solaris operating system that was used with the Sun server with low-cost Linux RedHat Advanced Server software (version 4.0).

Staff members are also working to update the Oracle Database. As a result, in 2005 the HDSS was upgraded to Oracle 10G from Oracle 7.3. A Bangladesh-based company (IBCS-Primax) carried out the migration process, the accuracy of which is being tested by running the old and new databases in parallel and using both to process the SES census data and the demographic events of 2005.

In addition to the routine HDSS database-related work undertaken, work is ongoing to merge the 2005 SES census data with the longitudinal database in Dhaka and to update the socioeconomic information available on individuals and households.

**Making it easy to access old data**

Efforts have continued to clean up data gathered between 1974 and 1982 and link it to current databases of information gathered since 1982. Due to differences in variables, the records of 276,382 individuals have been transferred to a separate new database which will be linked to the post-1982 database. When completed, the database covering the 1974-1982 period will be easily accessible.

**More efficient storage of Demographic Surveillance System data, event forms, and reports**

A huge amount of space is required to store hard copies of the 2.5 to 3 million HDSS event forms that the Centre holds. To overcome this, HDSU has begun scanning event forms so that they can be stored digitally.

This process started in 2003 on a trial basis, when the event forms of 2001-2003 were scanned. Once the system proved successful, the event forms covering the period 1996-2000 were also scanned and then stored on hard disk and CD-ROM.

In addition, the contents of basic HDSS data tables have now been placed on the local server, while HDSS annual reports from 1995 to 2003 have been placed on the web and linked to the ICDDR,B website.

**Data archiving**

In 2005, HDSU worked to document special studies conducted in the HDSS area, a task which involved collecting both study documents and data. Work has also begun to improve the Unit’s current archiving system using the Australian Social Science Data Archive (ASSDA) system as a model. ASSDA is a very modern system for archiving data that are used in many countries.

The system is accessible and comprehensive, allowing researchers to locate, request, retrieve, and use data resources efficiently. It achieves three general processing goals: standardization, aggregation, and simplification. As a result, it makes it easier for data archivists to input data and corresponding documentation, process them, and produce useful outputs for both archival purposes and everyday use.
Geographic Information System

During 2005, the Geographic Information System (GIS) mapped all tubewells in Matlab and recorded the spatial data gathered. This allowed researchers to pinpoint and record both new and missing tubewells. Work to map the location of ponds, ditches and water bodies in Matlab (but not their size or depth) was also completed.

GIS has also produced adjusted maps that show the number of deaths among children under five, as well as birth cohorts and population by country. These will be disseminated and may be published.

Outside consultations

The Unit Head Dr P.K. Streatfield was asked to give advice to staff from the UK Department for International Development (DFID) at the Asia Regional Retreat in Beijing (5-6 December 2005). He advised them on the future trends that may be expected across Asia with regard to population, urbanization, and disease burden. He was also asked to consider related issues for which DFID would have to plan a response.

In Bangladesh, Dr. Streatfield worked with DFID staff to help them to develop their Country Assistance Strategy for the coming years. He also served as a member of the Technical Committee on Life Expectancy of the Bangladesh Bureau of Statistics. In addition to being a member of the Technical Task Force on the Urban Health Survey 2005-2006 (the partners include NIPORT, Measure Evaluation, and USAID), Dr. Streatfield is also a member of the Bangladesh Annual Programme Review for the Health, Nutrition and Population Sector Programme 2006-2010.


Epidemic Control Preparedness Unit

Head: A.K. Siddique

Vibrio cholerae surveillance within the Bakerganj and Mathbaria Upazila Health Complexes

In 2005, the Division’s Epidemic Control Preparedness Unit spent 147 days conducting clinical

Fig.1. Occurrence of cases of watery diarrhoea and V. cholerae at Bakerganj and Mathbaria Upazila Health Complex, southern coastal Bangladesh during 2005

![Chart showing occurrence of cases of watery diarrhoea and V. cholerae O1 and O139 from January to December 2005.](chart)
surveillance to identify cases of cholera among the 11,823 patients who attended the Bakerganj and Mathbaria Upazila Health Complexes. Ecological changes that occur during the dry season may be responsible for *V. cholerae* epidemics. Through its surveillance efforts, the Unit aims to identify which environmental parameters are responsible.

During this period, 408 patients sought treatment for acute watery diarrhoea (AWD), and 195 of these had to be hospitalized. Overall, about 16% of all hospital admissions were due to AWD. Specimens were taken from 307 patients to test for *V. cholerae* by culturing them. Of these, 44 tested positive for *V. cholerae* strain O1, while 10 were positive for *V. cholerae* O139. Of the 54 cholera patients treated, 41% were under five. The ages of the other 59% ranged from 5 to 44. Most patients (87%) showed signs of dehydration. The distribution throughout the year of cases of AWD and of the two different cholera strains is presented on p.119.

The Unit found that the cholera epidemic that first struck Mathbaria at the end of March 2005 was initially due only to the *V. cholerae* O139 strain. However, the O1 strain was also identified during the later part of the outbreak.

The *V. cholerae* O139 strain was not found in any of the samples taken from the Bakerganj surveillance site. At that site, the majority (68%) of the samples which tested positive for *V. cholerae* O1 were isolated during the post-monsoon period (between September and December 2005). By contrast, cholera-causing bacteria were isolated only during the dry season (March-May 2005) in samples from Mathbaria.

**Monitoring for rotavirus-caused diarrhoea in rural hospitals in Bangladesh**

Since August 2005, the Unit has been monitoring for rotavirus-associated diarrhoea, particularly with regard to rural children. This major new initiative aims to determine what proportion of patients in Bangladesh are hospitalized as a result of rotavirus.

During the August to December surveillance period, 158 patients attended the Bakerganj and Mathbaria health complexes to seek treatment for watery diarrhoea (Fig. 2). Of these, 87 were children under five. Seventy-nine of these children were tested for rotavirus by ICDDR,B’s Virology Laboratory, and 17 (21.5%) were found to be positive.
Of the 36 under-fives who were hospitalized during the study period due to watery diarrhoea, 36% were infected with rotavirus. Overall, most (88%) of the rotavirus-positive patients were under 2 years of age.

Studies on domestic violence and on male sexuality in relation to health interventions

The study entitled ‘Physical violence by husbands: magnitude, associated factors, disclosure and help-seeking behaviour of women in Bangladesh’ is one of a number of studies on the topic of violence against women being conducted in the Unit. Additional information on the study is given under the Poverty and Health Programme report. A study entitled ‘Socialization and sexuality constructions of hijra: implications for STIs/HIV interventions’ is also ongoing.

Assessing the performance of local health facility managers

During 2005, the Unit has developed and tested a tool for monitoring the performance of local-level health facility managers. This will allow programme managers to assess their performance in terms of the day-to-day use of their services by the poor. The study is being conducted in partnership with the Health Economics Unit of the Ministry of Health and Family Welfare and BRAC.

Reproductive health

In 2005, the Unit’s reproductive health-related activities included work to test whether skilled community-based birth attendants could be used to provide safe motherhood services. To this end, Chakaria Community Health Project physicians taught 11 community health workers from the Bangladeshi NGO Gonoshasthya Kendra how to provide safe delivery services through village health posts. During 2005, a large number of women in Chakaria were given antenatal and postnatal check-ups by these trained midwives.

Bangladesh Health Equity Watch Secretariat

The Social and Behavioural Sciences Unit hosts the Secretariat of the Bangladesh Health Equity Watch (BHEW), a member of the Equity Gauge Alliance. BHEW is the result of collaboration among BRAC, Bangladesh Bureau of Statistics, and ICDDR,B.

BHEW works to compile data for monitoring health disparities in Bangladesh; it then publishes these through working papers, journal articles, and its bi-monthly newsletter (The Equity Dialogue). The organization also uses advocacy to make policy-makers and programme managers aware of issues of health equity. During 2005, BHEW used four workshops organized by JSI Bangladesh and NICARE as a forum for making the current health equity situation in Bangladesh clear to mid-level policy-makers.

Reproductive Health Unit

Head: Marjorie Koblinsky

The Division’s Reproductive Health Unit (RHU) addresses reproductive-health research issues, focusing on the need to find simple and cost-effective methods of preventing and managing ill health. Major emphasis is placed on making motherhood safe, improving family planning, and preventing and treating sexually transmitted infections in different parts of Bangladesh.
The Unit’s main activities in 2005 are reported in the chapter on the Reproductive Health Programme in this Annual Report. Activities not dealt with there are considered below.

Dissemination of the results of an Unmet Obstetric Need Project

The final dissemination workshop for the Belgian Technical Cooperation-funded Unmet Obstetric Need (UON) Project was held on 7 July at ICDDR,B’s Sasakawa International Auditorium. At this forum, researchers presented the Project’s final results to representatives of the Bangladesh Government, NGOs, donor agencies, and private organizations.

The Project consisted of two major components: (1) validation of the new indicator-Major Obstetric Interventions for Absolute Maternal Indications (MOI-for-AMI) in Matlab, Bangladesh and (2) the piloting, at the district level, of ways of calculating the unmet need for lifesaving obstetric surgeries in a given year using this indicator.

The ‘benchmark’ value of the indicator refers to the incidence of AMI. Examples of such AMI are antepartum (before birth) bleeding, uncontrollable postpartum (after birth) bleeding needing surgical interventions, and transverse/oblique lie (where the baby is not positioned correctly), etc. This ‘benchmark’ value was estimated to be 0.7% of all deliveries in Matlab. The value was used to calculate the total expected number of cases with severe life-threatening obstetric complications (i.e. the total number of AMI in a given year in seven districts of Bangladesh). More information on this project is presented within the Reproductive Health Programme’s part of the Annual Report.

New unmet obstetric need project begun

In June 2005, work started on a new USAID-funded UON Project which is being run in 12 districts of Bangladesh in close collaboration with the Bangladesh Ministry of Health and Family Welfare’s Directorate General of Health Services. One important aim of this study is to stimulate healthcare providers to create initiatives and innovations that will (1) improve maternal healthcare services, (2) increase the amount of appropriate obstetric care provided, especially by identifying under-served areas, and (3) be easy to monitor and evaluate at the local level.

District-based data-collection teams have already been formed in all districts, to collect data from different facilities with comprehensive emergency obstetric care (EOC) services. A quality-assurance team has also been formed in each district under the supervision of the Civil Surgeon. Using a standard checklist, these teams will monitor quality of care periodically in all health facilities providing EOC services. This team includes persons from the Civil Surgeon’s Office (e.g. the Deputy Civil Surgeon and a Medical Officer) and other influential health and family welfare professionals from that district.

Tackling postpartum bleeding—the main killer of mothers worldwide

In order to develop appropriate strategies for reducing maternal mortality, ICDDR,B began a new project entitled “Better understanding of recognition and responses to postpartum haemorrhage” in November 2005.

Run in the Centre’s Matlab HDSS area, the study will work to assess and improve local people’s ability to recognize the signs and symptoms of postpartum bleeding (the biggest cause of maternal death). It will also improve their ability to treat postpartum bleeding appropriately and so save many more mothers’ lives.

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.
The Unit prioritises the following research areas which:

- enhance our understanding of the causes of childhood, perinatal, and neonatal illness and death,
- seek to prevent and manage low birth-weight,
- consider child growth and development, including those which consider caring, care-seeking practices, and nutritional interventions,
- test and evaluate different vaccines designed to reduce childhood illness and death,
- strengthen health systems designed to deliver child health services, and
- seek to understand the causes and distribution (epidemiology) of childhood infections and how to prevent them.

Activities during 2005 are reported in the chapter on the Child Health Programme in this Annual Report.

**PhDs and Masters degrees**

This year, Dr. Sharful Islam Khan obtained a PhD in Sociology/Anthropology from Edith Cowan University, Perth, Australia. His PhD dissertation was based on male sexuality and masculinity and implications for sexually transmitted infections, including HIV, on sexual health interventions in Bangladesh. Five PHSD staff members also completed Masters degrees in various subjects during 2005.

Thirteen staff members are currently working towards their PhDs. A further seven are studying for Masters degrees at various universities overseas.
Executive Director

Director ISD

- Training and Education Unit
- Computer Information Services Unit
- Audiovisuals Unit
- Publications Unit
- Library and Information Services Unit
What does the Division do?

ICDDR,B’s 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 to ensure that knowledge is shared and used to improve the well-being of the poor.

How are we organized?

The Division consists of the Training and Education Unit (TEU), Publications Unit (PUBU), Library and Information Services Unit (LISU), Computer Information Services Unit (CISU), and Audiovisuals Unit (AVU). During the latter part of 2005, the Data Management Unit (DMU) was closed and its staff redistributed among the Finance Department and CISU.

External review of ISD

Every year, an external team of experts led by a member of the Board of Trustees reviews one of the Centre’s divisions. In 2005 it was ISD’s turn for the first time. The review took place during 23-26 May, before the Board of Trustees met on 27-30 May. The review team was chaired by Dr. Terry Hull of the Australian National University (Canberra), a member of ICDDR,B’s Board of Trustees.

The rest of the team consisted of five experts in relevant fields from organizations around the world: WHO, Geneva (library development); BRAC University, Dhaka (training and education); UNICEF, New York (publications, communications, and curriculum development); the National University of Singapore (computer systems); and, McGill University, Montreal (higher degree training). The report that the team presented to the Board included a number of very useful recommendations which the Division has already begun to implement (see box). The team also commended the Division on the quality of the services and support it provided to the Centre’s researchers.

Carrying the Centre into a best-practice digital environment

In September, ISD’s senior staff attended a retreat at the BRAC training centre at Rajendrapur, just north of Dhaka. Here they translated the external review team’s recommendations into project objectives and developed an accompanying logical framework matrix. This response to the report met with unanimous approval when it was presented to the Board in November.

“The fundamental cure for poverty is not money but knowledge”

--Sir William Arthur Lewis (1915-1991), British economist, Nobel Laureate 1979
Eight project objectives were developed based on the review team’s recommendations:

Project 1—Achieve universal computer literacy in ICDDR,B by 2007

Project 2—Develop a secure, world-class IT environment

Project 3—Establish a central repository for the Centre’s data, information, and research publications, which a global or controlled audience can access through the Centre’s website

Project 4—Share, through technical training and education, the Centre’s knowledge and expertise in areas where it has a comparative advantage

Project 5—Transform LISU into a regionally-recognized digital information resources centre

Project 6—Increase the visibility of Centre publications and enhance their use

Project 7—Bring the design, preparation and distribution of the Centre’s printed and digital communications up to international standards

Project 8—Enhance the professional capacity of ISD staff, particularly with regard to information and communication technology and the digital environment, to allow them to respond more effectively to client needs

The Division has formed working groups for each project which, in most cases, include staff from outside the Division. These groups are currently developing timelines and costings for each project, and will report back to the Board in 2006. In some cases, however, more concrete work can begin before then—an institutional repository is already being developed and archival material scanned, for example.

Collaborating with local academic institutions

In February 2005, BRAC University’s James P. Grant School of Public Health (Dhaka) welcomed its first batch of Master in Public Health (MPH) students. The group consisted of 25 students (13 female), 15 of whom were from Bangladesh. The other 10 were from eight other countries around the world. Fifteen of the group were medical doctors, while the rest were from other health-related disciplines.

The Centre is actively working to develop this postgraduate programme, which was conceived in partnership with several universities in North America and Europe. A number of the Centre’s research staff are part of the school’s faculty, for example. Since August 2005, their second semester, the students have also been housed and taught within the Centre.

From August to November, students benefited from intensive one- or two-week courses provided using the facilities of ICDDR,B’s Training and Education Unit. These covered a variety of public-health topics, ranging from the laboratory aspects of public health to maternal and infant nutrition. To ensure that they felt at home in the Centre, students were enrolled in the library, given access to computer and recreational facilities, and welcomed to the Centre’s regular scientific presentations. Similar arrangements will be made for the second batch of MPH students during 2006.

Improving access to full-text journals online

For several years now the library, and many of the Centre’s researchers, have been using two information portals: HINARI (Health InterNetwork Access to Research Initiative) and AGORA (Access to Global Online Research in Agriculture). These provide researchers in developing countries with free full-text access to more than 4,000 scientific journals, allowing them to stay up-to-date with the latest scientific findings.

The initiatives are the result of an unusual degree of cooperation between WHO and FAO and the major commercial journal publishers. In May, the Centre arranged several seminars and workshops at which experts from WHO and FAO demonstrated the benefits of the systems. These were
attended by Centre researchers, as well as by groups of research managers and librarians from various research institutions in Dhaka.

**Expanding the use of the Centre’s publications**

Full-text versions of all ICDDR,B’s recent publications are available on its website. However, the Centre is also always working to find other ways of ensuring its findings are available to a wider public.

During 2005, therefore, the Centre began supplying articles from the Journal of Health, Population and Nutrition (JHPN) to Bioline International. This not-for-profit electronic publishing service is committed to providing open access to quality research journals published in developing countries. JHPN articles will now be available to internet users across the world on the Bioline website (www.bioline.org.br).

For several years now, Centre publications have also been available through the Population Reference Bureau’s Population and Health InfoShare website (www.phishare.org). This is a public library of electronic documents supplied by partner organizations working on reproductive and child health, HIV/AIDS, and population.

The Division is also working to make the Centre’s major publications available through additional portals such as PubMed Central. Using different methods to allow access to the Centre’s publications will increase the visibility and accessibility of ICDDR,B’s work.

**Training and Education Unit**

**Head: A.N. Alam**

In 2005, the Training and Education Unit (TEU) conducted 10 courses and workshops (Table). These aimed to (1) increase research capacity in developing countries, (2) provide hands-on training on diarrhoeal disease and nutritional problems, and (3) improve responses to new and emerging issues in health and population sciences.

The courses were organized in collaboration with the Centre’s scientific divisions and, in some cases, in partnership with national and international organizations. Most of the training programmes were supported by the Japan Interna-
Participants included 467 scientists, physicians, trainers, health administrators, and other health personnel from 7 countries around the world. Another 1,040 people received orientation training on different aspects of diarrhoeal diseases, nutrition, and reproductive health.

**Global Medicine Course for students from Uppsala University, Sweden**

One particularly important course held this year was the 10-day Global Medicine Course attended by 19 medical and nursing students from the Uppsala University in Sweden.

| Table. Details of ICDDR,B’s fellowship programmes and training courses and workshops conducted in 2005 |
|-------------------------------------------------|---------------------------------|---------------------------------|
| **Title of course, workshop, or programme**     | **No. of participants**        | **Countries represented**       |
| **International**                               | **(total=467)**                | **(total=7)**                   |
| Global Medicine Course (for students from Uppsala University) | 19 | Sweden |
| Emerging and Re-emerging Pathogens              | 6 | Japan |
| **National**                                    |                                |                                 |
| A. Health Research Training                     |                                |                                 |
| Introductory Course on Epidemiology             | 38 | Bangladesh |
| and Biostatistics                               |                                |                                 |
| B. Other Training Courses/Workshops             |                                |                                 |
| Public Policy and the Private Health Sector:    | 43 | Bangladesh |
| Enhancing the Contribution of Private Service   |                                |                                 |
| Providers                                       |                                |                                 |
| Management of Severely-malnourished Children    | 14 | Bangladesh |
| (for doctors and nurses of Chittagong and Khuna |                                |                                 |
| Medical Colleges)                               |                                |                                 |
| Research Methods for FCPS/MD (Paediatrics)      | 23 | Bangladesh |
| (for doctors of Dhaka Medical College)          |                                |                                 |
| Flood-related Health Problems (for Terre des     | 15 | Bangladesh |
| Hommes Foundation)                              |                                |                                 |
| Short Course on Flood-related Health Problems   | 200 | Bangladesh |
| (for NGOs)                                      |                                |                                 |
| Clinical Management of Diarrhoeal Diseases (for  | 18 | Bangladesh |
| FCGP students)                                  |                                |                                 |
| Training Course on Epidemiology,                | 32 | Bangladesh |
| Clinical Management and Prevention of Diarrhoal  |                                |                                 |
| Diseases                                        |                                |                                 |
| **Fellowship Programmes**                       |                                |                                 |
| International and National Fellows (elective    | 40 | Australia (1), Bangladesh (27), France (1), Japan (2), Sweden (2), UK (2), and USA (5) |
| training)                                       |                                |                                 |
| Clinical Fellows                                | 9 | Bangladesh |
| Nurse Fellows                                   | 10 | Bangladesh |

1Fellowship of the College of Physicians and Surgeons; 2Fellowship of the College of General Practitioners
Participants spent their first week in Dhaka, attending classes and benefiting from hands-on bedside training in ICDDR,B’s hospital. This part of the course focused on clinical issues. The course then moved to Matlab, where students spent more time dealing with public-health issues and visiting the sub-centres and villages linked to the Matlab Health Research Centre. Students participated in clinical rounds at both sites.

Fellowship Programmes

In 2005, the Centre also introduced a Fellowship Programme on poverty and health research designed to boost the research capacity of promising young scientists in developing countries. Specifically, it aims to improve participants’ understanding of the health problems of the poor and of the interactions between poverty and ill health. It will also help them to identify policy- and programme-related options for reducing poverty in developing countries like Bangladesh and improving people’s health, particularly that of the poor.

In the first phase of the programme, six young Bangladeshi researchers were recruited for a one-year fellowship in 2005. In addition, one international fellowship was offered to a researcher from the Pakistan Institute of Development Economics.

International fellowships are offered to young researchers who show the commitment and potential needed to reduce poverty in the country. Outstanding graduates of medicine and specific social sciences fluent in both English and Bangla are considered for these fellowships. The Unit also played a key role in coordinating other fellowship programmes at the Centre (Table).

Publications produced and distributed

In 2005, the Unit organized, edited, and produced ICDDR,B’s 2004 Annual Report, four issues of Glimpse (a quarterly magazine in English), and an illustrated souvenir for the Centre’s Alumni Association. It also produced four issues of the Journal of Health, Population and Nutrition, 10,000 copies of a brochure promoting the journal, and three issues of Shasthya Sanglap, ICDDR,B’s quarterly magazine in Bangla.

Importantly, this year the number of copies of Shasthya Sanglap produced rose sharply—from 40,000 to 60,000 per issue. This will mean that all grassroots-level health workers have access to a copy of this magazine, which 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 distributed 140,000 copies of different publications to readers in over 120 countries. To further promote the Centre, it also arranged the display and distribution of publications at various important meetings, workshops, and conferences. The Unit has been working to update the 9,500 or so addresses that make up its publications mailing list.

Journal of Health, Population and Nutrition

To further improve the running of the Journal of Health, Population and Nutrition, both its editorial board and its international editorial advisory board were reorganized this year. A new section on ‘Water and Sanitation’ was also added to the Journal—this will be edited by Dr. Steve Luby from ICDDR,B. In addition, Dr. Gary L. Darmstadt of the Johns Hopkins University, USA,
INFORMATION SCIENCES DIVISION

The Journal received 198 manuscripts from 47 countries in 2005. Fifty-two articles were published in the year’s four issues. In addition, staff also compiled two Special Issues of the Journal this year, one on arsenic contamination and health in developing countries and the other on reproductive and newborn health. These will be published in 2006. In all, 84 manuscripts were rejected in 2005.

External review performance

The Publications Unit was highly praised during this year’s external review of the Division and commended for the quality of the publications produced by the Centre. When presenting the review’s findings to the Board of Trustees, for example, the Chair of the review team stated that the Journal of Health, Population and Nutrition “is the Lancet of the East.”

Publications support for an international congress

The Unit’s staff also provided extensive support during the preparations for the 8th Commonwealth Congress on Diarrhoea and Malnutrition—held at ICDDR,B on 6-8 February 2006. The Unit produced the book of abstracts for the Congress, a process which involved sending out the abstracts to reviewers and communicating with authors. It also produced a souvenir programme for the Congress.

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

Some important publications of ICDDR,B during 2005

joined the editorial board as section editor for reproductive and neonatal (newborn) health.
knowledge of subjects such as digital librarianship, ethical issues in publication, and the use of, and access to, electronic information resources.

**Library and Information Services Unit**

**Acting Head: Peter Thorpe**

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.

In 2005, the total collection reached over 41,800 books, project protocols, and bound journals, as well as 14,650 reprints and other documents. 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’s 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 24,117 books and journals from its collection and was visited by 21,445 readers. The library’s photocopying service provided 31,596 pages of photocopies, around two-thirds of which were for external users.

**Library services improved**

To further improve its services, the library issued 930 new bar-coded library cards to ICDDR,B staff and other library members this year. It also upgraded its computer facilities by providing internet connections. These facilities were used by 3,250 users in 2005. In addition to the two existing resource centres—one on Poverty and Health and another on Family Health initiated in 2001—a similar one on Gender Issues started functioning in mid-2005.

**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 National Health Library and Documentation Centre, and the libraries of the Bangladesh Institute of Development Studies and the Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders. During the year, 1,165 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’s staff. As in previous years, the British Medical Association’s Nuffield Library continued to provide photocopied journal articles free of charge. ICDDR,B’s library also donated a total of 349 items (including CDs, books, and duplicate journal issues) to the following Bangladeshi institutions: the National Health Library and Documentation Centre, the Central Public Library, the Moulana Bhasani Medical College Library, and the Centre for the Rehabilitation of the Paralysed Library.

Through its New Acquisition List, the library also ensured that the Centre’s scientists were kept informed of incoming learning resources. During 2005, the library produced 18 lists, containing 290 citations to books and CDs, and 705 citations to journal articles.

**Training courses and staff development**

As part of its information literacy programme, the library conducted a three-hour training programme on web-based literature searches. The course was held four times, and was attended by about 49 people in all—25 of them from the Centre. Six students from the Department of Information Science and Library Management, University of Dhaka, also completed a 10-week hands-on training course in the Unit in 2005.

Under the staff-development programme, senior library staff also attended several national and international training programmes, workshops, and conferences in 2005 to increase their knowledge of digital library environments.

**Audiovisuals Unit**

**Head: Asem Ansari**

ICDDR,B’s Audiovisuals Unit (AVU) prepares graphics for the Centre’s scientists, as well as posters and other display materials. It also provides design and layout services for some of ICDDR,B’s publications, takes and archives important photographs, and records all major events.
INFORMATION SCIENCES DIVISION

Year’s activities reviewed

In 2005, the AVU prepared and printed 2,278 graphics, and formatted the 2004 Annual Report and all of the 2005 issues of Glimpse. Staff also designed and produced the 2006 Calendar and Year Planner, and helped other units to produce another 50 documents for the Centre. The Unit took, printed, and archived 3,959 photographs.

Using up-to-date techniques, staff prepared research-related microphotography images, and pictures of electrophoresis gels and animal dissections. It also provided 204 hours of multimedia projection, and recorded various important meetings, seminars, symposia, and conferences organized by the Centre.

Major renovation of Audiovisuals Unit offices

This year, the Unit completed a major renovation of its offices inside the library building. This included converting the photographic dark room into an archive for audiovisual materials, as advances in photography meant that the room was no longer needed. To increase efficiency, the Unit also upgraded both the hardware and software of its Apple Macintosh computer system.

Computer Information Services Unit

Head: M. Farhad Hussain

The Computer Information Services Unit (CISU) provides state-of-the-art computing and communication facilities to ICDDR,B. It backs these up with centralized, high-quality support services for hardware and software. The Unit also develops the Centre's research and communication technology policies, standards, and guidelines. In this way, it supports the Centre's research and management programmes by ensuring that ICDDR,B benefits from efficient and cost-effective information and communication services. The Unit has a staff of 11.

In 2005, CISU continued to maintain and improve the Centre's cutting-edge computer network (described in last year's Annual Report). Connected to the Internet via satellite and microwave links, this network of around 700 computers provides staff with Internet, e-mail, and data-transmission facilities that can be accessed from around the world.

To ensure that external users can access the Centre’s website quickly, the site is now replicated in real-time on a remote web-server located in Singapore. The CISU also maintains an Internet kiosk that gives the Centre’s staff free browsing facilities.

New software applications developed to improve research and management

The CISU has recently developed several new pieces of software to improve research and management within ICDDR,B. These include a laboratory management system for the Nutritional Biochemistry Laboratory, an inventory management system for the RTI/STI Laboratory, and a web-enabled patient- and cost-management system for the Staff Clinic. The Unit also produced a new online job application system.

The Unit has also worked hard this year to put in place the new integrated laboratory information management system developed for the Clinical Laboratories Services. This system uses Oracle 8i as the back-end database, while the front-end (the area users actually see) was developed using Oracle Developer 6i.

New contacts management system developed to improve communication

The Unit has also developed an integrated web-enabled contacts management system for the Centre. This will make it easy for users to add, edit, and view contact information—making it much simpler for people to contact others via e-mail.

People will also be able to subscribe to publications through the system, and to apply for training courses. To ensure the flow of information, both subscribers and course participants will be kept up-to-date by automatic replies generated by the system. The system is also designed to allow the Centre to maintain and update information gathered about participants attending the various conferences it organizes.

The database of contacts used by the system can be searched according to different criteria to find specific records or sets of records. These can then
be used to create a mail shot in Microsoft Word. E-mails, hard-copy mailing labels, lists of clients, and a range of customized reports, can easily be generated in this way.

**Improving the Centre’s library management system**

The Unit has recently developed an online library catalogue for ICDDR,B. This interfaces with the Centre’s Web Server and the Alice Library Management System used by the library and maintained by CISU. The Unit is also working (1) to develop a digital repository of ICDDR,B publications and (2) to help the Clinical Sciences Division develop a web-based patient- and cost-management system for its Dhaka hospital.
EXECUTIVE DIRECTOR’S DIVISION

What does the Division do?

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

How are we organised?

The Division is made up of the following departments: Human Resources, Finance Department, the Staff Development Office, the External Relations and Institutional Development (ERID) Office, and Grants and Contracts Administration.

Human Resources

Director: Ann Gauvin Walton

ICDDR,B’s Human Resources (HR) provides quality HR management services in the following areas: recruitment, contract administration, compensation and benefits, gender, staff training and development, performance management, succession planning, and employee counselling. It also provides logistical support to various activities of the Centre through the Transport, General Services, and Cafeteria Services and operates a Staff Clinic for Centre staff and their dependants.

ICDDR,B adopts UNICEF’s core value system

In 2005, ICDDR,B adopted a set of core values adapted from those used by UNICEF. It is felt that, in order to be effective employees, all staff members should possess these values in addition to specific skills and qualifications.

These core values are reflected in the Centre’s new performance management system: Performance 2010. This was designed and developed in 2005 and will be piloted by ICDDR,B’s senior management in 2006. A successful performance management system is seen as one way of ensuring that staff, including managers, are aware of their own contribution to the organization and have the opportunity to formally discuss their strengths, weaknesses, and development needs.

ICDDR,B’s core values for staff

∑ Commitment: staff should passionately and enthusiastically demonstrate responsibility and dedication to ICDDR,B and its vision and mission. They should align their conduct with ICDDR,B’s goals and commit themselves to building a culture that embodies these ideals.

∑ Integrity: staff should display uncompromising ethics and honesty, both professionally and personally, at all times and in all situations.

∑ Teamwork: staff should cooperate and work effectively with others in the pursuit of common Centre goals.

∑ Embracing diversity: staff should value differences in gender and culture, and people’s opinions, values, perspective, ideas, skills, knowledge, and experience. Managing diversity effectively will maximize ICDDR,B’s effectiveness.
Recruitment policy enhanced

In 2005, the Centre’s recruitment policy was enhanced in several ways in order to reflect current best practice and incorporate recommendations from last year’s Gender Organizational Review. Selection interviews, for example, are now conducted by a selection committee with at least one female representative. Human Resources also improved the system by introducing online applications and ensuring that job postings were more widely circulated—to enhance the applicant pool.

Regulations governing staff updated and improved

A major undertaking for Human Resources in 2005 was the updating of the Staff Rules and Regulations. These embody the conditions of service, and the rights, duties, and obligations of ICDDR,B staff, and are the foundations of the Centre’s human resources policy.

New policy adopted to prevent sexual harassment at work

The Centre is committed (1) to establishing and maintaining gender equality at all levels of the organization and (2) to creating a gender-sensitive working environment for women and men. In line with this, ICDDR,B’s Directorate this year adopted the ICDDR,B Policy on Sexual Harassment.

The Centre’s policy is designed to ensure a working environment free from all forms of discrimination, including sexual harassment. Workshops and training are two methods being used to ensure this. Over 900 staff members, at Centre headquarters and field sites, have now participated in the Gender Awareness Workshop. A new initiative is also being piloted at two field sites and in one division. In this initiative, selected staff are chosen to act as ‘gender focal points’, by being a point of contact for gender-related issues. Once the pilot initiative has been evaluated, the Centre intends to establish such gender focal points at all its field sites.

Renovation of Staff Clinic

As part of its continued efforts to provide both curative and preventative healthcare, ICDDR,B has recently renovated its Staff Clinic in order to accommodate a new physician and assistant staff nurse. With these extra staff, the Clinic can now operate six days a week. To contain healthcare costs, the Centre has also successfully negotiated agreements for services provided by several hospitals, clinics, and diagnostic centres.

New international staff

Dr. Alejandro Cravioto, a Mexican national, joined ICDDR,B as its Deputy Executive Director on 1 July 2005.

Staff Development

Under the staff development programme, 107 members of staff received financial support during 2005. These funds were granted by the Staff Development Fund and various ICDDR,B projects and through fellowships provided by several agencies.
Training abroad

In 2005, 55 staff attended courses/study programmes in 15 countries: Australia, Belgium, Canada, Denmark, France, Germany, India, Japan, New Zealand, the Netherlands, Sweden, Switzerland, Thailand, the UK, and the USA. Of the 28 who completed their studies and training this year, 4 received PhDs, 4 completed the partial requirement for their doctoral studies, 8 obtained Masters degrees, 1 a diploma, and another 11 (including 3 postdoctoral researchers) completed non-degree training in various disciplines. A further 27 staff members (20 male and 7 female) left to begin higher-degree studies or training abroad. At the end of the year, 27 members of staff (17 male and 10 female) were studying abroad—17 for PhDs, 1 for postdoctoral training, 2 for other training, and 7 for Masters degrees.

In-country training

Twenty staff members received in-country training in various disciplines. Of them, one was sent for long-term study for a Masters degree in Business Administration (MBA), two were sent for Masters degrees in Computer Science, one for a Masters degree in Public Health, and two for a postgraduate diploma in Information Technology and Business Management. During the year, four acquired MBA degrees, one completed a short course on English language, and six completed short courses on message development, AutoCAD software, and statistics and data analysis using the SPSS program.

In-house training

Under the in-house training programme, five staff attended an Introductory Course on Epidemiology this year.

Finance Department

Director: Aniruddha Neogi

The Finance Department has the overall responsibility of all functions relating to financial operations, procurement along with inventory control and management of fixed assets. The procurement functions include purchase of sophisticated scientific equipment, perishable and non-perishable chemicals and reagents, drugs and medicines, consumables, services, etc. from overseas and local markets.

The financial operations also include: cash management and custodianship of all funds, management of staff compensation, preparation of the annual budget, recording of all financial transactions and commitments, preparation of financial reports for the Board of Trustees, management, and donors. The Finance Department is also responsible for facilitating the audits and financial reviews.

Following are the financial highlights for 2005:

∑ Total contribution from donors was US$18,011,000 [inclusive of US$200,000 from Hospital Endowment Fund], an increase of 3% over the previous year.

∑ Core contribution decreased by US$1,236,000 (22%) compared to the last year.

∑ Project contribution increased by US$1,913,000 (17%) compared to the last year.

∑ Total expenditure was increased by US$762,000 (4%) over the previous year.

∑ Operating surplus for the year decreased by US$40,000 (19%) from US$206,000 to US$165,000.

∑ Cumulative deficit on operating account also decreased by US$200,000 (US$165,000 Operating Surplus and US$35,000 from Reserved Fund) from US$2,414,000 to US$2,214,000

∑ Personnel cost for national and international staff was 63% of total expenditure, which was similar to that of the last year.

∑ Procurement of consumables and capital items was worth US$2,695,000, which was less by US$132,000 compared to the last year.

Year-end market value of endowment funds increased by US$573,000 (6%) over the previous year from US$9,738,000 to US$10,311,000.

[Fig.1. Donors’ contributions 2005—US$18,011,000 (inclusive of Hospital Endowment Fund)]
During 2005, US$200,000 (10% of yearly patient-care cost) was used from Hospital Endowment Fund for the patient-care activities. This comprises salaries and benefits (US$90,000), hospital supplies and medicines (US$40,000), laboratory tests for patients (US$56,000), patients’ food (US$2,000), and utilities (US$12,000).

The Finance Department oversees the functions of Engineering and Travel and Estate Units since September 2004.

Engineering Units play an important role in developing and sustaining the Centre's 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 electrical, sophisticated laboratory equipment, generator and telecommunication systems, and initiates electrical renovation work.

Travel and Estate Unit provides travel-related services to staff members, visitors, trainees, and members of the Board of Trustees. This unit liaises with concerned ministries, departments, and different high commissions/embassies for obtaining visa and clearances. The Unit also maintains the Centre's Guest House and facilitates contracts relating to utilities.
AUDITORS’ REPORT
TO THE BOARD OF TRUSTEES OF
INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE
RESEARCH, BANGLADESH

1) We have audited the financial statements of INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH, BANGLADESH (ICDDR,B) for the year ended December 31, 2005, from which these abridged financial statements were derived.

2) We report that:

2.1) Expenditure of US$160,000 for implementation and customization of enterprise resource planning (ERP) software incurred in a prior year had been considered as deferred expenditure and charged off in equal installments over the previous and current year. This is not in compliance with ICDDR,B's accounting policies on capital expenditure that requires all such expenses to be charged off in the year in which it is incurred. Had the above costs been fully expensed in the previous year in accordance with the stated policies, net surplus before depreciation for the year would have been higher by US$160,000.

2.2) Non-recognition of “ICDDR,B Employees Separation Payment Fund” balance as at December 31, 2005 of US$13,805,580 and corresponding investments with Generali Worldwide Insurance Company Limited of Guernsey, Channel Islands.

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 observations in Paragraph 2.1 and 2.2 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.

Hoda Vasi Chowdhury & Co
Chartered Accountants

Dhaka 17 April 2006

KPMG

Gurgaon 13 April 2006
INTERNSATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH, BANGLADESH
STATEMENT OF FINANCIAL POSITION AS AT DECEMBER 31, 2005 (US $ 000) - ABRIDGED

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Assets</strong></td>
<td>23,972</td>
<td>22,130</td>
</tr>
<tr>
<td><strong>Assets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash and bank</td>
<td>6,144</td>
<td>4,875</td>
</tr>
<tr>
<td>Accounts receivable</td>
<td>3,838</td>
<td>3,438</td>
</tr>
<tr>
<td>Hospital Endowment Fund Investments</td>
<td>5,685</td>
<td>5,330</td>
</tr>
<tr>
<td>Centre Endowment Fund Investments</td>
<td>3,846</td>
<td>3,803</td>
</tr>
<tr>
<td>Inventories</td>
<td>515</td>
<td>396</td>
</tr>
<tr>
<td>Fixed assets</td>
<td>3,944</td>
<td>4,128</td>
</tr>
<tr>
<td>Deferred Expenditure</td>
<td></td>
<td>160</td>
</tr>
<tr>
<td><strong>Total Liabilities and Fund Balances</strong></td>
<td>23,972</td>
<td>22,130</td>
</tr>
<tr>
<td><strong>Current Liabilities</strong></td>
<td>10,707</td>
<td>9,278</td>
</tr>
<tr>
<td><strong>Fund Balances</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed Assets Fund</td>
<td>3,944</td>
<td>4,128</td>
</tr>
<tr>
<td>Hospital Endowment Fund</td>
<td>5,685</td>
<td>5,330</td>
</tr>
<tr>
<td>Centre Endowment Fund</td>
<td>3,846</td>
<td>3,803</td>
</tr>
<tr>
<td>Reserve Fund</td>
<td>2,004</td>
<td>2,005</td>
</tr>
<tr>
<td>Operating Fund</td>
<td>(2,214)</td>
<td>(2,414)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Income</strong></td>
<td>19,089</td>
<td>18,367</td>
</tr>
<tr>
<td>Contributions</td>
<td>17,811</td>
<td>17,133</td>
</tr>
<tr>
<td>Contributions from Hospital Endowment Fund</td>
<td>200</td>
<td>400</td>
</tr>
<tr>
<td>Other items</td>
<td>1,078</td>
<td>834</td>
</tr>
<tr>
<td><strong>Expenditure</strong></td>
<td>18,923</td>
<td>18,161</td>
</tr>
<tr>
<td>Salaries and benefits</td>
<td>11,893</td>
<td>10,971</td>
</tr>
<tr>
<td>Supplies and materials</td>
<td>1,980</td>
<td>2,273</td>
</tr>
<tr>
<td>Capital expenditure</td>
<td>714</td>
<td>552</td>
</tr>
<tr>
<td>Other items</td>
<td>4,336</td>
<td>4,365</td>
</tr>
<tr>
<td><strong>Surplus for the year before depreciation</strong></td>
<td>166</td>
<td>206</td>
</tr>
<tr>
<td>Depreciation (without effect on Operating Fund)</td>
<td>(898)</td>
<td>(943)</td>
</tr>
<tr>
<td>(Deficit) for the year after depreciation</td>
<td>(732)</td>
<td>(737)</td>
</tr>
</tbody>
</table>

STATEMENT OF CASH FLOWS (US$ 000) – ABRIDGED

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash flows from operating activities</td>
<td>1,837</td>
<td>(357)</td>
</tr>
<tr>
<td>Cash used in investing activities</td>
<td>(466)</td>
<td>(369)</td>
</tr>
<tr>
<td>Cash flow from financing activities</td>
<td>(102)</td>
<td>507</td>
</tr>
<tr>
<td>Net Increase/(decrease) in cash and cash equivalents</td>
<td>1,269</td>
<td>(219)</td>
</tr>
<tr>
<td><strong>Cash and cash equivalents at beginning of the year</strong></td>
<td>4,875</td>
<td>5,094</td>
</tr>
<tr>
<td><strong>Cash and cash equivalents at end of the year</strong></td>
<td>6,144</td>
<td>4,875</td>
</tr>
</tbody>
</table>

Executive Director, ICDDR,B
Dhaka, March 22 2006

Member, Board of Trustees
Basel, March 24 2006

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

Hoda Vasi Chowdhury & Co
Chartered Accountants
Dhaka, 17 April 2006

Hoda Vasi Chowdhury & Co
Chartered Accountants
Dhaka, 17 April 2006

KPMG
Chartered Accountants
Gurgoan, 13 April 2006
### INTERNATIONAL CENTRE FOR DIARRHOEAL DISEASE RESEARCH, BANGLADESH

#### DONORS CONTRIBUTIONS (US$ 000) - ABRIDGED

<table>
<thead>
<tr>
<th>Contributions</th>
<th>2005</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia - AusAID</td>
<td>247</td>
<td>367</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>2,956</td>
<td>949</td>
</tr>
<tr>
<td>Canada - CIDA</td>
<td>1,006</td>
<td>1,479</td>
</tr>
<tr>
<td>CDC-Atlanta</td>
<td>426</td>
<td>415</td>
</tr>
<tr>
<td>European Union</td>
<td>-</td>
<td>39</td>
</tr>
<tr>
<td>Gates-GoB Award</td>
<td>234</td>
<td>509</td>
</tr>
<tr>
<td>Gates Foundation</td>
<td>852</td>
<td>1,295</td>
</tr>
<tr>
<td>Howard Hughes Medical Institute</td>
<td>42</td>
<td>36</td>
</tr>
<tr>
<td>International Vaccine Instt. (IVI)</td>
<td>141</td>
<td>226</td>
</tr>
<tr>
<td>Japan-JICWELS &amp; Others</td>
<td>178</td>
<td>73</td>
</tr>
<tr>
<td>MGH-Harvard University</td>
<td>258</td>
<td>122</td>
</tr>
<tr>
<td>Netherlands</td>
<td>1,495</td>
<td>1,533</td>
</tr>
<tr>
<td>New England Medical Center (NEMC)</td>
<td>-</td>
<td>93</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>-</td>
<td>51</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Sweden - SIDA/SAREC</td>
<td>968</td>
<td>1,216</td>
</tr>
<tr>
<td>Swiss Red Cross</td>
<td>49</td>
<td>80</td>
</tr>
<tr>
<td>Switzerland - SDC</td>
<td>1,000</td>
<td>1,000</td>
</tr>
<tr>
<td>The Johns Hopkins University (a)</td>
<td>359</td>
<td>277</td>
</tr>
<tr>
<td>Thrasher Research Fund</td>
<td>125</td>
<td>77</td>
</tr>
<tr>
<td>UNICEF</td>
<td>173</td>
<td>58</td>
</tr>
<tr>
<td>United Kingdom - DFID</td>
<td>2,132</td>
<td>2,568</td>
</tr>
<tr>
<td>United States – AID</td>
<td>2,921</td>
<td>2,158</td>
</tr>
<tr>
<td>USA - NIH</td>
<td>685</td>
<td>715</td>
</tr>
<tr>
<td>University of Virginia (NIH) (a)</td>
<td>179</td>
<td>156</td>
</tr>
<tr>
<td>WHO</td>
<td>370</td>
<td>248</td>
</tr>
<tr>
<td>World Bank</td>
<td>55</td>
<td></td>
</tr>
<tr>
<td>Disaster Fund (UNOCAL, Shell, Cairn, Others)</td>
<td>113</td>
<td>22</td>
</tr>
<tr>
<td>Endowment Fund – Centre</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>Flood Relief-2004</td>
<td>2</td>
<td>526</td>
</tr>
<tr>
<td>Others (b)</td>
<td>830</td>
<td>837</td>
</tr>
</tbody>
</table>

*a) Includes subcontracts from the National Institute of Health (NIH), USA


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**Executive Director, ICDDR,B**  
Dhaka, March 22, 2006

**Member, Board of Trustees**  
Basel, March 24, 2006
Contributors to Endowment Funds 2005

Hospital Endowment Fund
Tullow Bangladesh Ltd.
Dhaka Hospital Employees Welfare Co-operative Society
Scobie and Claire Mackinnon Trust, Australia
ICDDR,B Employees’ Multipurpose Co-operative Society Ltd.
Dhaka Chinese Student Fellowship Group
Khaliduzzaman
Students of Uppsala University
Charles E. Llewellyn III
Carolyn Caldwell
A. K. Chowdhury
M/S Print Link Printers
Kazuo Cugane
Motojuki Matsuguchi
Thomas Tanner
Faisal Hossain
Paul and Kiely Law
Mizanur Rahman
David B. Sachar
S.F.Z. Begum
David A. Sack and Jean Sack
Terence H. Hull
Ricardo Uuay Dagach
Barbara Aronson
Nora Godwin
Joyce Pickering
Regina C. LaRocque
Theodore H. Thomas
Laura Osborne
Centre Endowment Fund
Andrew L. Dannenberg
Daniel M. Metz
Edward T. Ryan
Robert C. Terry
Circle-around-the-Centre Fund
Terrence Budden

Committees

Programme Coordination Committee

Chairperson: Prof. 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 and health departments or institutions of the Government of Bangladesh, universities, and non-government organizations involved in health, nutrition, education, population studies, and development programmes in Bangladesh.

Research Review Committee

Chairperson: Prof. David A. Sack,
Executive Director (until September 2005)
Prof. Alejandro Cravioto,
Deputy Executive Director
(from October 2005)

ICDDR,B attaches great importance to the development of high-standard research proposals by its scientists and collaborating institutions. To achieve this, research proposals submitted for approval of the Research Review Committee (RRC) are subjected to rigorous review to ensure quality. The Committee evaluates the scientific merit, relevance to the objectives, priorities, and Strategic Plan of the Centre, and competence of principal investigators.

The Committee, in its 14 meetings in 2005, considered 39 new research protocols, re-validated one research protocol, and also considered 24 proposals for addenda to, and modifications of, proposals for extension of time for a number of already-approved protocols. In addition, through expedited review mechanisms, 4 research protocols and 13 proposals for addenda to, and modifications of, already-approved research protocols were reviewed.

The Committee approved 40 research protocols and all addenda/modification proposals. Extension of time for 41 research protocols was approved to enable the PIs to complete the activities.

The Committee approved the procedure of submitting proposals for addenda to, and modifications of, the already-approved research protocols; the document includes clear guidelines for
researchers about which proposal would be eligible. The Committee also revised the existing "Procedures for Preparation of Research Proposals and the Review Process by Research Review Committee of ICDDR,B", and the revised version of the guidelines is under review and approval of the Executive Director. The Committee also initiated the development of guidelines for a DNA bank for the Centre. The draft copy of the guidelines was being reviewed by a sub-committee constituted by RRC.

During the year, 4 members: Prof. David A. Sack, Dr. Azharul Islam, Dr. Lauren S. Blum, Dr. G.H. Rabbani, and Mr. Rafael Cortez of the World Bank, Dhaka retired from the Committee. Mr. Cortez left Bangladesh to take up his new assignment at the World Bank Headquarters. Prof. Alejandro Cravioto, Deputy Executive Director of ICDDR,B joined the Committee, and Prof. Sack relinquished the responsibility of the RRC Chairperson to Prof. Alejandro Cravioto.

**Ethical Review Committee**

Chairperson:
Prof. A. K. M. Nurul Anwar
Co-Chairperson: Dr. Halida H. Akhter

The Ethical Review Committee (ERC) met 14 times during 2005 and considered 35 research protocols and 31 proposals for addenda to, and modifications of, already-approved research protocols. In addition, through expedited mechanism, 3 research protocols and 6 proposals for addenda to and modifications of, already-approved research protocols were reviewed and received approval upon satisfactory progress expected by the Committee.

Each research protocol submitted for consideration of the Committee is referred to an ERC member of appropriate discipline for primary review. The primary reviewers examine the ethical issues but, nevertheless, scientific and technical soundness of the research protocols is not ignored since the international ethical guidelines proclaim that "unsound research is unethical."

While reviewing the research protocols and proposals for addenda to, and modifications 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 ensuring the welfare and rights of the study participants. The Committee kept in view that "In research on humans, the interests of science should never take precedence over considerations related to the well-being and human rights of the subjects."

The Centre has been listed as Data Supplier in the Protocol Registration System, and a number of clinical trials/studies were registered at the www.clinicaltrials.gov to fulfill the requirement of the International Committee of Medical Journal Editors (ICMJE).

The ERC obtained yearly reports of ongoing research protocols to monitor their implementation and to know whether there were any Adverse Events (AEs) or Serious Adverse Events (SAEs) in any research protocol that could warrant the change in the Committee's decisions on these research protocols. Annual review did not reveal any SAE in any of these research protocols, and studies were conducted following the 'Principles of Good Research Practice' and as per the ERC-approved research protocols.

During the year, 5 Data Safety Monitoring Boards (DSMBs) were constituted for overseeing the implementation of the approved research protocols. The DSMBs constituted in 2005 and earlier had meetings from time to time. The primary responsibilities of the DSMB were to: (a) periodically review and evaluate the accumulated study data for participants' safety, study progress, and when appropriate, efficacy and (b) make recommendations to the ERC concerning continuation, modification, or termination of the study. The DSMBs considered study-specific data and relevant background knowledge about the disease, test agent, or participants under study.

The proposal for modification of the ERC Guidelines was suggested to formalize mechanism for expedited review of research protocols and proposals for addenda to, and modifications of, already-approved research protocols having minimal risk through the expedited review procedure. The proposal will be submitted for approval of the Board of Trustees.

The Centre is committed to providing the ERC members with opportunities to update themselves with the latest developments in bioethics made elsewhere in the world. As part of this effort, the Centre, in 2005, sent two members to attend workshop/course in bioethics. Prof. K.Z. Mamun was sent for attending the international course on Research Ethics during 5-9 September 2005 at Thammasat University, Pathumtani, Thailand, while Dr. Aliya Naheed attended the Sixth Annual Ethical Issues in International Health Research Workshop at Harvard School of Public Health, USA, during 13-17 June 2005. In addition, literature/documents relating to bioethics were circulated among the members to update them in the field. The Centre is also planning to organize a training course/workshop on bioethics for the ERC members and Centre's scientists in collaboration with the Harvard School of Public Health, USA.
Two members on individual capacity: Prof. Hamida Akhter Begum and Prof. Md. Abdul Baqi retired after completing two 3-year terms. Another member Prof. J. Ashraful Haq retired before completing full term as he left Bangladesh taking an assignment in Malaysia. Prof. Hajera Mahtab, a nominee of Bangladesh Medical Research Council (BMRC), Dhaka, retired after completing two terms. The BMRC nominated Prof. Syed Atiqul Haq, Professor, Department of Medicine, Bangabandhu Sheikh Mujib Medical University, to replace Prof. Mahtab. Another institutional member of the World Health Organization (WHO), Brig. Gen. (Retd.) Q.M.S. Hafiz, retired from services of the WHO, and then WHO nominated Dr. Ranjit K. Dey to replace him. Prof. Dilruba Afrose of the University of Dhaka and Prof. K.Z. Mamun, Professor and Head, Department of Virology, Dhaka Medical College, replaced Prof. Begum and Prof. Haq respectively. The Committee will soon fill up the vacancy (theology discipline) resulted from retirement of Prof. A.H Baqi.

Animal Experimentation Ethics Committee

Chairperson: Dr. Mirza A. Jalil

The Animal Experimentation Ethics Committee (AEEC), in its two meetings in 2005, reviewed the draft chapter titled 'Non-human Primate Macaca Mulatta' of the "Manual for Care and Use of Laboratory Animals" and also reviewed the progress of ongoing research protocols involving research animals. The AEEC received recognition of the PHS Animal Welfare Assurance from the Office of Laboratory Animal Welfare, National Institutes of Health, USA.

External Relations and Institutional Development Office

Head: Ishtiaque Zaman

The External Relations and Institutional Development (ERID) Office focuses upon generating resources for the Centre’s work. These efforts include helping the Centre’s Executive Director to negotiate with donors. To raise the profile of the Centre and improve its funding, the Office also works hard to improve communication between ICDDR,B and its development partners, the Government of Bangladesh, NGOs, the business community, and different institutions throughout the world. The ERID Office continued to lead efforts to expand the Centre Endowment Fund and the ICDDR,B Hospital Endowment Fund campaigns.

Staff Welfare Association

President: Md. Shahadat Hossain

During 2005, the Staff Welfare Association (SWA) arranged the Inter-division Cricket Tournament and awarded trophy to the Champion (Laboratory Sciences Division) and also trophies to the 2nd and the 3rd position-holders and Man of the Match. SWA awarded stipends to the school-going children of low-paid staff members of the Centre. The Association also arranged indoor games for both male and female staff members and family get-togethers. The Executive Committee attended the Gender Awareness Workshop and encouraged all staff members to undergo gender equity and equality training programme organized by the Gender Specialist of the Centre. The Executive Committee held several meetings with the Patron-in-Chief and Executive Director of the Centre to communicate the common problems of the staff members, especially to increase the salary and other benefits for the staff.

ICDDR,B wins Independence Day Award

In 2005, ICDDR,B received the Government of Bangladesh’s Independence Day Award—the most prestigious national award in Bangladesh. Importantly, winning the award resulted in widespread media coverage of the Centre’s scientific and humanitarian activities.

In recognition of the award, Bangladesh’s Hon’ble Prime Minister Begum Khaleda Zia handed over a gold medal, a citation, and Tk 100,000.00 in cash to the Centre’s Executive Director, Professor David A. Sack, at a formal ceremony. While receiving the Award on behalf of the Centre, Professor Sack thanked both former and current staff for their tireless efforts to promote ICDDR,B and its work.

Securing bilateral funds from development partners

Over several months in 2005, the ERID Office negotiated with several Ministries of the Bangladesh Government to secure the release of nearly US$9.3 million. This comprised US$7.5 million from Japan’s Debt Relief Grant’s Counterpart Fund and US$1.8 million of ‘PL 480’ funds from the US Department of Agriculture (the proceeds of wheat sales).

Pool financing through the Health, Nutrition, and Population Sector Programme

The Government of Bangladesh and ICDDR,B’s development partners are taking a new approach to the health, nutrition, and population sector and have spelled out a Strategic Investment Plan (SIP) for it. The activities covered by the Plan are...
closely related to the goals set in Bangladesh’s Poverty Reduction Strategy Paper (PRSP) and are also closely aligned with the Millennium Development Goals.

Under the pool financing mechanism, the Government of Bangladesh must agree before targeted Health, Nutrition, and Population Sector Programme (HNPSP) funds can be released. Thirty-eight operational plans exist under the HNPSP and donor funding to this sector will be coordinated through these plans over the next 5 years. In 2005, the Centre submitted a multi-year project to the Government of Bangladesh for consideration. The ERID Office is currently negotiating with relevant government offices to secure approval for the project.

**Capital development funds**

In order to complete the construction of the final five floors of ICDDR,B’s eight-storey main building, the ERID Office has approached the Government of Bangladesh with a view to accessing capital development funds available through the HNPSP’s pool financing mechanism. Negotiations are ongoing to persuade the Ministry of Health and Family Welfare to approve the release of these funds. The ERID Office is also negotiating with other development partners in order to secure the remainder of the funding necessary for this project.

**Preparation of project proposals**

The ERID Office has submitted various project proposals seeking annual contributions from the multilateral funding pot held by development partners. Project proposals were submitted to Sida (Sweden) for core and project support for the 2005-2009 period, and to the Royal Kingdom of Saudi Arabia for core support between 2005 and 2009.

The Office also responded to a call for expressions of interest (EOIs) circulated by the UN’s Disaster and Emergency Response (DER) and DFID (UK) for organizations interested in becoming short-listed partners for responses to future emergencies. The Office also submitted a proposal to WHO intended to extend its status as a WHO Collaborating Centre. It also facilitated the submission of various EOIs to the Ministry of Health and Family Welfare.

**Fundraising initiative in Bangladesh**

The ERID Office worked with ICDDR,B’s Events Committee to organize the Centre’s annual fundraising dinner—the Black & White Ball. Held at the Sonargaon Hotel in March 2005, the event raised over US$30,000 through ticket sales, raffles, and the generous contributions made by individuals and corporations. The fundraising dinner was underwritten by the local American Express Bank.

**Development Partners Group**

Chaired by Dr. Iyorlumun Uhaa of UNICEF Bangladesh, the Development Partners Group (DPG) met twice this year, in May and November. These meetings ensure open lines of communication with development partners, providing the Centre with an opportunity to explain its programme and make partners aware of important findings and funding needs. The meetings also gave partners the opportunity to meet senior members of the Centre’s management team, as well as scientists and trustees.

**Global fundraising groups**

At this year’s meeting of the Fund Development Committee, ICDDR,B’s Board of Trustees approved
the formation of global fundraising groups. These
will allow the Centre to raise its profile both
in Bangladesh and abroad. The ERID Office has
approached a number of individuals willing to act
as spokespersons and fundraisers for the Centre.
Significant progress has already been made in
forming these groups in Bangladesh, the UK, and
Japan.

An association called ‘Friends of ICDDR,B in Japan’
was established in November 2005

Grants monitoring

To ensure fair partnerships and to protect the
work of the Centre’s scientists, the ERID Office’s
Grants Management Office worked with the
Grants and Contract Office to routinely review
the terms and conditions associated with grants
made to the Centre in 2005. The Office also
worked with ICDDR,B’s Finance Department to
ensure that each project’s funds were entirely and
appropriately spent.

A multimillion-dollar project titled ‘Improved Health
for the Poor’ began with the tripartite agreement
among ICDDR,B, Government of Bangladesh, and the
Government of Japan

Retreat on the Improved Health for
the Poor

In 2005, the ERID Office also worked closely
with ICDDR,B’s Health Systems and Infectious
Diseases Division to organize a retreat for the
multi-year Government of Bangladesh-funded
Improved Health for the Poor project. Held at
BRAC’s Training Centre in Rajendrapur in July,
the retreat was attended by government policymakers and several ICDDR,B scientists.

Communication activities

Dissemination
In 2005, the Office responded to press enquiries and publicized the Centre’s many achievements at scientific forums. It also arranged press releases to disseminate breaking news, organized media coverage, and wrote scripts for special radio and TV programmes. The Office also organized four information dissemination seminars on reproductive health, drowning, HIV/AIDS, and arsenic, and gave presentations on the Centre’s activities at both local and international venues.

Brochures
The ERID Office produces fundraising materials that are culturally and geographically appropriate. It also generates other materials, such as brochures, designed to raise the Centre’s profile nationally and internationally.

Departures and arrivals
Ms Hannah Lemon, a Senior Associate, left both
the ERID Office and Bangladesh in April after
working here for nearly two years. The Office has
recently recruited Ms Sheila Ryan as Senior Associate, Mr. M. Shafiqul Karim as Technical Cooperation Officer, and Ms Sohani Nasir as an Administrative Assistant.

Grants and Contracts
Administration

Grants and Contracts Administrator: Vanessa Brooks

New contracts and agreements
During 2005, the Centre entered into 30 agree-
ments with foreign universities and research insti-
tutions, 22 agreements with local NGOs largely
providing services components to research initia-
tives, 15 agreements with foreign international
organizations, six agreements with UN agencies,
and one agreement with the Government of
Bangladesh. In addition, six confidential agree-
ments and 10 Memoranda of Understanding were
signed for collaborative research work.
The following were also accomplished:

∑ The Centre entered into clinical research agreements with Salix Pharma, PATH-GSK, and Unilever Research and Development (the Netherlands).

∑ A zinc study patent license agreement was signed with NUTRISET, France; and ACME Laboratories Ltd.

∑ The Government of Bangladesh approved a project on Health, Nutrition and Population for Improved Health for the Poor and an HIV Sero-surveillance, Round VII.

∑ ICDDR,B agreed to work with the Government of Bhutan on the surveillance, monitoring and evaluation of HIV/AIDS and an STI prevention project.

∑ The Centers for Disease Control grant for addressing emerging infectious diseases in Bangladesh was continued into 2005.

∑ ICDDR,B’s Grants and Contracts Administrator gave a presentation at the WHO Global Health Research meeting in November dealing with the establishment of global standards for research contracts with developing countries.

∑ US National Institutes for Health (NIH) funding was continued to Dr. Firdausi Qadri, Dr. S.M. Faruque and Dr. Rashidul Haque.

∑ A grant was received from Sida/SAREC (Sweden).

∑ USAID/OFDA training grants were received.

∑ A flood grant was received from the Embassy of Japan.

Visitors in 2005

The ERID Office arranged comprehensive visits for ambassadors/high commissioners, senior civil servants, policy-makers, academicians, and researchers from home and abroad. The visits included tours to the Centre’s Mohakhali campus and rural Matlab and urban field sites in Mirpur and Kamalapur.

The ERID Office organized 4 separate trips for the leading national and international journalists to its field sites in Sylhet and Matlab.

Dignitaries who visited the Centre in 2005 included: Dr. Khandaker Mosharraf Hossain, Hon’ble Minister for Health and Family Welfare (MoHFW), Government of Bangladesh; Mr. Mizanur Rahman Sinha, Hon’ble State Minister, MoHFW; His Excellency Mr. C.S.M. Beemsterboer, Ambassador of the Netherlands to Bangladesh; H.E. Ms Dora Rapold, Ambassador of Switzerland to Bangladesh; H.E. Mr. Matsushiro Horiguchi, Ambassador of Japan to Bangladesh; Ms Lorraoine Barker, Australian High Commissioner in Bangladesh; Mr. Abu Md. Maniruzzaman Khan, Secretary, MoHFW; Her Royal Highness Crown Princess Victoria of Sweden; Queen’s Baton Relay Team for the 2006 Commonwealth Games; Bill and Melinda Gates, and many others as follows:

Her Royal Highness Crown Princess Victoria of Sweden visiting the Dhaka hospital of ICDDR,B

Dr. John Glenn Morris, University of Maryland School of Medicine, USA; Dr. Anthony Bryceson, London School of Hygiene & Tropical Medicine, UK; Dr. Diane Lightfoot, Department of Microbiology and Immunology, University of Melbourne, Australia; Dr. Ir. Leon G.J. Frenken, Cardiovascular Health Platform and Dr. Martin Jäkel of Unilever Health Institute, Unilever Research Vlaardingen, The Netherlands; Dr. Bart C. Jacobs, Department
EXECUTIVE DIRECTOR’S DIVISION

of Neurology and Dr. Hubert Ph Endtz, Department of Medical Microbiology & Infectious Diseases, Erasmus University Medical Center, Rotterdam, The Netherlands.

Professor Klaus E. Gyr, University Hospital, Basel, Switzerland; Mr. Edward George Whittle and Ms Karen Julie Cooper, Safety & Environmental Assurance Centre, UK; Prof. K.H. Brown, University of California-Davis, USA; Dr. Prashant N. Chhajed, Pulmonary Medicine, University Hospital, Basel, Switzerland; Dr. Daniel Muhm, US Embassy in Bangladesh; Dr. James Maguire, University of Maryland School of Medicine, Baltimore,

Bill and Melinda Gates keenly observing a young patient and her mother at the ICDDR,B’s Dhaka hospital

USA; Dr. Caryn Bern, Dr. Natasha Hochberg, Dr. Pavani Kalluri, Dr. Sundeep Gupta, Dr. Brendan Flannery, Dr. Martha Iwamoto, Dr. Cynthia Whitney, and Dr. James Sejvar, Centers for

The Queen’s Baton Relay team for the Melbourne Commonwealth Games 2006 passed through ICDDR,B in late 2005
Disease Control and Prevention (CDC), Atlanta, USA; Dr. Robert Breiman and Dr. Danny Feikin, International Emerging Infections Program, CDC, Nairobi, Kenya; Mr. Andrew Nyamete, Social Science Task Force, DOMI Programme, International Vaccine Institute, Seoul, South Korea; Dr. S.K. Bhattacharya, and Dr. T. Ramamurthy, NICED, Kolkata, India; Dr. Seyed E. Hasnain, Centre for DNA Fingerprinting & Diagnostics, Hyderabad, India; Dr. Nasreen Zafar Ehtesham, National Institute of Nutrition, Hyderabad, India; Prof. Sandip K. Basu, National Institute of Immunology, New Delhi, India; Prof. J.-P. Butzler, Professor Emeritus, Free University of Brussels, Belgium; Dr. Haru Watanabe, National Institute of Infectious Diseases, Tokyo, Japan; Prof. Yukiko Wågatsuma and Dr. Meiko Noguchi, Department of Epidemiology, University of Tsukuba; Japan; Ms Yuka Sugitani, AIESEC, Nagoya City University; Japan; Dr. Joseph O. Oundo, Kenya Medical Research Institute, Nairobi, Kenya.

Dr. Ana I Gil, Instituto de Investigación Nutricional, Lima, Peru; Professor Ann-Mari Svennerholm, and Dr. Matilda Nicklasson, Department of Medical Microbiology, University of Göteborg, Sweden; Ms Nattaya Ruamsap, Ms Kaewkanya Nakjarung, Ms Oralak Serichantalergs, and Mr. Boonchai Wongswiniwawong, Armed Forces Research Institute of Medical Sciences, Bangkok, Thailand; Dr. Marius Mollersand and Dr. Adriander GM van der Zanden, Gelre Hospitals, Apeldoorn, The Netherlands, Dr. Enne de Boer, Food & Consumer Product Safety Authority, The Hague, The Netherlands; Prof. R. Bradley Sack, Johns Hopkins University, Baltimore, USA; Prof. W.A. Petri, Jr., University of Virginia, Charlottesville, USA; Dr. Anwarul Huq and Dr. Afsar Ali, University of Maryland Biotechnology Institute, Rockville, USA; Dr. Brian Schwartz, Department of International Medicine, Massachusetts General Hospital, Boston, USA;

Dr. Jason Harris and Dr. Regina LaRocque, Boston University, USA; Dr. Omar Oyarzabal, Auburn University, USA; Prof. Stephen B. Calderwood and Dr. Edward T. Ryan, Massachusetts General Hospital, Boston, USA; Dr. Riad Mahmud, NSDP, Dhaka, Bangladesh; Dr. Justin Yarrow, Design That Matters, Cambridge, USA; Dr. Michael Emch, The Earth Institute at Columbia University, New York, USA; Dr. Theodore Tsai, Wyeth Pharmaceuticals, USA.

Dr. Thomas Cherian, WHO, Geneva, Switzerland; Dr. Anne von Gottberg, NICD, South Africa; Dr. Enne de Boe, Food and Product Safety Authority, The Netherlands; Mr. David Wood, DFID Bangladesh, Dhaka; Dr. Hinotsugan Kano, Tokyo, Japan; Dr. Anna Kaniaschek and, Dr. Carmela Cordero, Engender Health, New York, USA; Dr. Su-Ley Ueda, Japan; Dr. Hanako Takahashi, Japan; Dr. Hemeo Iriya, Maternal & Child Health, WHO-Tanzania, Dar es Salaam; Mr. Emmanuel D’Harcourt, International Rescue Committee, New York, USA; Ms Kamden Hoffmann, USAID/Washington, USA; Dr. Deoki Nandan, S.N. Medical College, Agra, India; Ms Amnesty Le Fevre, Johns Hopkins University, Baltimore, USA; Dr. Michael Darsley, Vaccine Development, Cambridge Biostability, UK.

The Dutch Ambassador H.E. Mr. C.S.M. Beemsterboer visiting the Dhaka hospital of ICDDR,B

Dr. Ana I Gil, Instituto de Investigación Nutricional, Lima, Peru; Professor Ann-Mari Svennerholm, and Dr. Matilda Nicklasson, Department of Medical Microbiology, University of Göteborg, Sweden; Ms Nattaya Ruamsap, Ms Kaewkanya Nakjarung, Ms Oralak Serichantalergs, and Mr. Boonchai Wongswiniwawong, Armed Forces Research Institute of Medical Sciences, Bangkok, Thailand; Dr. Marius Mollersand and Dr. Adriander GM van der Zanden, Gelre Hospitals, Apeldoorn, The Netherlands, Dr. Enne de Boer, Food & Consumer Product Safety Authority, The Hague, The Netherlands; Prof. R. Bradley Sack, Johns Hopkins University, Baltimore, USA; Prof. W.A. Petri, Jr., University of Virginia, Charlottesville, USA; Dr. Anwarul Huq and Dr. Afsar Ali, University of Maryland Biotechnology Institute, Rockville, USA; Dr. Brian Schwartz, Department of International Medicine, Massachusetts General Hospital, Boston, USA;
Collins, Disaster and Development Centre, Northumbria University, Newcastle upon Tyne, UK; Dr. Adnan Hyder, Johns Hopkins University, Baltimore, USA; Mr. Dean Byrd and Justin Brown, Thrasher Research Fund, Salt Lake City, USA; Professor John Baron and Dr. Kristen Anton, Dartmouth Medical School, Hanover, USA; Professor Habibul Ahsan, Columbia University, New York, USA; Ms Hayaatun Sillem, DFID, London, UK; Ms Rebecca Pankhurst, DFID, London, UK.

Swiss Ambassador to Bangladesh H.E. Ms Dora Rapold visiting the Centre's Dhaka hospital

Professor Richard Cash, Harvard School of Public Health, Boston, USA; Dr. Jeffrey K. Griffiths, Global Health, Tufts University School of Medicine, Boston, USA; Professor Ian Riley, School of Population Health, University of Queensland, Brisbane, Australia; Professor M. Kabir, Department of Statistics, Jahangirnagar University, Savar, Bangladesh; Professor Marie Vahter, Karolinska Institute, Stockholm, Sweden; Mr. David Fleming, Global Health Strategies, New York, USA; Mr. Daniel Traushaar, and Mr Todd Dennett, Bill and Melinda Gates Foundation, Seattle, USA; Mr. Paul Ingram, General Manager, Hill & Associates, New Delhi, India; Dr. Lynn Sibley, Emory University, Atlanta, USA; Dr. A.J. Faisel, Country Representative, Engender Health, Dhaka, Bangladesh; Professor Lars-Ake Persson, Uppsala University, Sweden; Ms Ann-Louise Martin, Radio Sweden, Stockholm; Professor Wim van Lerberghe, Department of Public Health, Prince Leopold Institute of Tropical Medicine, Antwerp, Belgium; Dr. Lars Eklund and Professor Staffan Lindberg, Swedish South Asian Studies Network (SASNET), Lund University, Sweden.

Institutional Collaborations 2005

International

Action Research & Training for Health, India
Aga Khan University, Pakistan
Applied Science Institute, India
Armed Forces Research Institute of Medical Sciences, Thailand
Australian National University, Australia
B.P. Koirala Institute of Health Sciences, India
Centers for Disease Control and Prevention, USA
Centre for International Child Health, Institute of Child Health, University College London UK
Columbia University, USA
Cornell University, USA
Curtin University, Australia
Dartmouth Medical School, USA
Division of Geographic Medicine and Infectious Diseases, Tufts, New England
Emory University, USA
Family Health International, USA
Food and Consumer Product Safety Authority, The Netherlands
Fukui Medical University, Japan
Global Forum for Health Research, Switzerland
Harvard Medical School, USA
Health Ministry of His Majesty's Government of Nepal
Howard Hughes Medical Institute, USA
INDEPTH, Ghana
Indian Institute of Management-Ahmedabad, India
Institut Pasteur, France
Institute for Tropical Medicine, Belgium
International Atomic Energy Agency, Austria
International Child Health Foundation, USA
International Nutrition Foundation, USA
International Potato Center, Peru
International Rescue Committee, USA
International Task Force on Malnutrition
International Vaccine Institute, South Korea
Johns Hopkins Bloomberg School of Public Health, USA
Jyssen Women’s University, Japan
Karolinska Institute, Sweden
Kenyan Medical Research Institute and CDC, Kenya
Kyoto University, Japan
London School of Hygiene & Tropical Medicine, UK
Mahidol University, Thailand
Massachusetts General Hospital, USA
Michigan State University, USA
Ministry of Health, Mozambique
Monipal Medical College, Nepal
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
Netherlands Interdisciplinary Demographic Institute of the Royal Netherlands’ Academy of Arts and Sciences, The Netherlands
New England Medical Center, USA
Northumbria University, Newcastle, UK
Novartis, Switzerland
Osaka Prefecture University, Japan
Salix Pharmaceuticals, USA
School of Health Sciences, Okayama, Japan
University of Tokushima, Japan
Tribhuvan University, Nepal
National

ACME Pharmaceuticals, Ltd
American International School
APOSH
Ashar Alo
Associates for Community and Population Research
Badhan Hijra Sangha
Bandhu Social Welfare Society
Bangabandhu Sheikh Mujib Medical University
Bangladesh Agricultural University
Bangladesh Association for Voluntary Sterilization
Bangladesh Breastfeeding Foundation
Bangladesh Bureau of Statistics
Bangladesh Center for Communication Programs
Bangladesh Hizra Sangha
Bangladesh Institute of Development Studies
Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM)
Bangladesh Livestock Research Institute
Bangladesh Open University
BRAC
Bangladesh Women’s Health Coalition
Bogra Medical College Hospital
CARE Bangladesh
Central Drug Treatment and Rehabilitation Centre
Central Skin and Social Hygiene Centre
Chittagong Maa Shishu O General Hospital
Chittagong Medical College Hospital
College of Home Economics
College of Nursing
Concern Bangladesh
Dhaka Medical College and Hospital
Dhaka Shishu Hospital
Deliver Bangladesh
Directorate General of Health Services, Government of Bangladesh
Durjoy Nari Sangha
Dustha Manobatar Seba Sangstha
East-West University
Faridpur Medical College Hospital
Field Laboratory at Refugee Camp in Chittagong Hill Tracts
Gonoshastha Kendra
Helen Keller International, Bangladesh
Institute for Child and Mother Health
Institute of Child Health and Shishu Hospital
Institute of Epidemiology, Disease Control and Research
Institute of Nutrition and Food Science, University of Dhaka
Institute of Public Health
Institute of Public Health Nutrition
Jatiya Jubo Sangha
John Snow Inc., Bangladesh
Joypurhat District Hospital
Karmajibi Kallyan Sangha
Khulna Medical College Hospital
Kumudini Hospital
Lamb Hospital
Manikganj District Hospital
Marie Stopes Clinic Society
Meherpur District Hospital
Ministry of Health and Family Welfare, Government of Bangladesh
Mukti Lawrence Foundation
Mukti Mahila Samity
Mymensingh Medical College Hospital
Naogaon District Hospital
Nari Mooltree
Nari Mukti Sangha
NSDP
National Expanded Programme on Immunization
National Food Fortification Alliance, Government of Bangladesh
National Institute of Population Research and Training
National Institute of Preventive and Social Medicine
National Nutrition Programme
National Tuberculosis Control Programme
NOVA Medical Centre
Obstetrics and Gynaecological Society of Bangladesh
Paricharja
PIACT Bangladesh
Plan Bangladesh
Popular Diagnostics
Population Council
Prochesta
Progotti Samaj Kallyan Protisthan
Radda MCH-FP Centre
Rajbari District Hospital
Rajshahi Medical College Hospital
Rangpur Medical College Hospital
Save the Children-USA
Save the Children Fund-Australia
Shishuk
Shishu Sasthya Foundation Hospital
Sir Salimullah Medical College Hospital
State University of Bangladesh
Sylhet M.A.G. Osmani Medical College Hospital
Tangail District Hospital
The Salvation Army
TREE Foundation Ltd.
Tuber Crops Research Centre, Bangladesh Agricultural Research Institute
United Nations Children’s Fund Dhaka
University of Dhaka
United Nations Fund for Population Activities
World Vision
ICDDR,B PUBLICATIONS 2005

A Internal Publication Series

Working papers

Scientific report

Special publications

Periodicals
3. Equity Dialogue V. 1, no. 3-4, 2003; v. 2, no. 1-4, 2004
4. Glimpse V. 26, no. 4, 2004; v. 27, no. 1-3, 2005
5. Shasthya Sanglap V. 13, no. 3, 1411, v. 14, no. 1-2, 1412
6. SUZY News V. 2, no. 1-2, 2005

B Original papers, including review articles and short reports, in journals

*Not listed in previous annual report


40. Hossain MB. Analysing the relationship between family planning workers’ contact and contraceptive switching in rural Bangladesh using multilevel modelling. J Biosoc Sci 2005 Sep;37(5):529-54 (ICDDR,B-Matlab data used)


42. Huq A, Sack RB, Nizam A, Longini IM, Nair GB, Ali A, Morris JG Jr., Khan MNH, Siddique AK, Yunus


47. Khan AM, Sarker SA, Alam NH, Hossain MS, Fuchs GJ, Salam MA. Low osmolar oral rehydration salts solution in the treatment of acute watery diarrhea in neonates and young infants: a randomized controlled clinical trial. J Health Popul Nutr 2005 Mar;23(1):52-7


93. Sinha N. Fertility, child work, and schooling consequences of family planning programs: evidence from an experiment in rural Bangladesh. Econ Dev Cultural Change 2005 Oct;54(1):97-128 (ICDDR,B-Matlab data used)
C Book chapters, papers in conference proceedings, and monographs


15. Yesmin S, Mehrin F, Hilaly A, Irfan LD, Hamadani JD, Huda SN, Tofail I. Association of malnutrition on with mental, motor and behaviour development in Bangladeshi infants. In: Zaman SS, Banu S, Khan NZ,
D Letters, editorial, and abstracts in journals


