11th Annual Scientific Conference

(11th ASCON)

4-6 March 2007

Sasakawa Auditorium,
ICDDR,B, Dhaka, Bangladesh

Abstracts Book

"Partnerships in Achieving the Millennium Development Goals"

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KNOWLEDGE FOR
GLOBAL LIFESAVING SOLUTIONS

Government of the People's
Republic of Bangladesh

Mainstreaming
Nutrition
Initiative
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DANIDA

ABSTRACTS BOOK

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PREFACE

The Centre annually organizes a scientific conference (ASCON) to share its research findings with stakeholders at home and abroad. Dedicated to saving lives through research and treatment, the Centre addresses some of the most critical health concerns facing the world today from improving neonatal survival to HIV/AIDS. As our new tagline rightly describes, our activities to develop and share knowledge for global lifesaving solutions have been broadened beyond dissemination of ICDDR,B research to also provide a venue for national and regional researchers to share their results, thereby increasing the interchange between scientists and public-health professionals at the Centre and elsewhere.

The theme for this year's conference is "Partnerships in Achieving the Millennium Development Goals" is very significant for Bangladesh and the region since it will focus on some of the activities under the Millennium Development Goals. These have been grouped according to the major programme areas, many of which are cross-cutting and are the collective priorities of the Centre. Hopefully, the results will help achieve the Millennium Development Goals to reduce hunger and improve the health of women and children. The presentations will also explore new experimental interventions that will help many mothers and children, especially the poor, who continue to suffer from ill health.

I would like to thank all the Committees that have helped organize this conference, especially the Scientific Committee, led by Dr. Alejandro Cravioto. I especially want to thank those organizations and businesses which have assisted with the financial support for the Conference. I hope that the lessons learnt can be applied to research into the diseases and health challenges facing developing countries worldwide.

David A. Sack, M.D.
Chair, Organizing Committee
11th ASCON
and Executive Director
ICDDR,B
Dhaka, Bangladesh

ACKNOWLEDGEMENTS

ICDDR,B is pleased to acknowledge with gratitude the financial support of the Government of Bangladesh; The Royal Danish Embassy, Dhaka; Mainstreaming Nutrition Initiative funded by World Bank for holding the 11th Annual Scientific Conference (11th ASCON). The Centre's core and project activities are supported by countries and agencies which share its concern for the health and population problems of developing countries.

11th Annual Scientific Conference

4-6 March 2007

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PROGRAMME SUMMARY

3 March 2007—4:00 pm–8:00 pm
Inaugural Ceremony
Venue: Radisson Water Garden Hotel, Airport Road, Dhaka

Technical Sessions
DAY 1: Sunday, 4 March 2007—8:45 am-5:00 pm
Plenary 1: MDG 1 (Eradicate Extreme Poverty and Hunger)

Scientific Session 1: MDG 4 (Reduce Child Mortality)
Child Health and Survival: Findings from Intervention Studies

Scientific Session 2: MDG 1 (Eradicate Extreme Poverty and Hunger)
Methodological Issues

Scientific Session 3: MDG 5 (Improve Maternal Health)
Maternal Mortality and Morbidity

Plenary 2: MDG 4 (Reduce Child Mortality)

Scientific Session 4: MDG 4 (Reduce Child Mortality)
Child Health and Survival: Assessment of Disease Burden

Scientific Session 5: MDG 1 (Eradicate Extreme Poverty and Hunger)
Programmes and Interventions

Scientific Session 6: MDG 6 (Combat HIV/AIDS, Malaria and Other Diseases)
Infectious Diseases

DAY 2: Monday, 5 March 2007—8:45 am-5:00 pm
Plenary 3: MDG 5—Improve Maternal Health

Scientific Session 7: MDG 4 (Reduce Child Mortality)
Child Health and Survival: Risk Factors

Scientific Session 8: MDG 5 (Improve Maternal Health)
Determinants and Use of Maternal Health Services

Scientific Session 9: MDG 3 (Promote Gender Equality and Empowerment of Women)

Plenary 4: MDG 6 (Combat HIV/AIDS, Malaria and Other Diseases)

Scientific Session 10: MDG 4 (Reduce Child Mortality)
Child Health and Survival: Interventions

Scientific Session 11: MDG 5 (Improve Maternal Health)
Interventions for Reducing Maternal Mortality and Morbidity

Scientific Session 12: MDG 6 (Combat HIV/AIDS, Malaria and Other Diseases)
HIV/AIDS and Tuberculosis

DAY 3: Tuesday, 6 March 2007
Special Session: Arsenic in the Environment: Consequences and Mitigations

Plenary on Gender Issues

Closing Session

Poster Sessions

DAY 1: Sunday, 4 March 2007

Poster Session 1
MDG 1 (Eradicate Extreme Poverty and Hunger)
Methodological Issues
Programmes and Interventions

MDG 3 (Promote Gender Equality and Empowerment of Women)

MDG 4 (Reduce Child Mortality 1)
Interventions and Programmes 1
Assessment of Disease Burden 1

Poster Session 2
MDG 4 (Reduce Child Mortality 2)
Risk Factors 1
Basic Science 1

MDG 5 (Improve Maternal Health 1)
Maternal Mortality and Morbidity
Determinants and Use of Maternal Health Services 1
Interventions for Reducing Maternal Mortality and Morbidity

MDG 6 (Combat HIV/AIDS, Malaria and Other Diseases 1)
Infectious Diseases 1
HIV/AIDS and Tuberculosis 1

DAY 2: Monday, 5 March 2007

Poster Session 3
MDG 4 (Reduce Child Mortality 3)
Interventions and Programmes 2

Risk Factors 2
Poster Session 4
MDG 4 (Reduce Child Mortality 4)
Assessment of Disease Burden 2
Basic Science 2

MDG 5 (Improve Maternal Health 2)
Determinants and Use of Maternal Health Services 2
MDG 6 (Combat HIV/AIDS, Malaria and Other Diseases 2)
Infectious Diseases 2
HIV/AIDS and Tuberculosis 2

PROGRAMME DETAILS

3 March 2007–4:00 pm–8:00 pm
Inaugural Ceremony
Venue: Radisson Water Garden Hotel, Airport Road, Dhaka

Keynote Speech
W. Henry Mosley. Transforming health systems to facilitate the household production of health in developing countries (Page 11)

Technical Sessions

DAY 1: Sunday, 4 March 2007

8:45 am–10:30 am
Venue: Sasakawa Auditorium
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Chair: Dr. A. Mushtaque R. Chowdhury, Dean, James P. Grant School of Public Health,
BRAC University and Deputy Executive Director, BRAC, Dhaka
Co-Chair: Dr. M.A. Salam, ICDDR,B
Introduction: Professor David A. Sack, Executive Director, ICDDR,B

Speakers
Michael Thieren, Medical Scientist, Statistical Department,World Health Organization, Geneva—Monitoring and tracking progress on the MDG health indicators (Page 16)
Tahmeed Ahmed, Head, Nutrition Programme, ICDDR,B—Malnutrition in Bangladesh: how far are we from achieving MDG 1? (Page 17)

10:31 am Tea Break

11:00 am–12:00 noon
Venue: Sasakawa Auditorium
Scientific Session 1 (MDG 4—Reduce Child Mortality)
Child Health and Survival: Findings from Intervention Studies
Chair: Professor M. Shahidullah, Bangabandhu Sheikh Mujib Medical University, Dhaka
Co-Chair: Dr. K. Zahid Hassan, ICDDR,B

Charles P. Larson, Dilruba Nasrin, Firdausi Qadri, Amit Saha, and Mohiul Chowdhury. Zinc supplementation following zinc treatment for acute childhood diarrhoea: a randomized, double-blind field trial (Page 19)

Ishtiaq Mannan, Syed Moshfiqur Rahman, Ayesha Sania, M. Habibur R. Seraji, Shams El Arifeen, Arif Mahmud, Nazma Begum, Peter J. Winch, Gary L. Darmstadt, Saifuddin Ahmed, Abdullah H. Baqui, and Bangladesh Projahnmo Study Group. Can home-visits by trained community health workers improve breastfeeding of newborns in rural Bangladesh? (Page 20)

Abdullah H. Baqui, Shams El Arifeen, Gary L. Darmstadt, Saifuddin Ahmed, M. Habibur R. Seraji , Ishtiaq Mannan, Moshfiqur Rahman, Samir K. Saha, Peter J. Winch, Mathuram Santosham, Robert E. Black, and Bangladesh Projahnmo Study Group. Community-based effectiveness trial of newborn interventions: Sylhet, Bangladesh (Page 21)

Vani Sethi, S. Kashyap, S. Agarwal, R.M. Pandey, and D. Kondal. Positive deviance collective community action model improves Breastfeeding and growth in rural Uttar Pradesh (Page 22)

11:00 am–12:00 noon
Venue: Seminar Room
Scientific Session 2 (MDG 1—Eradicate Extreme Poverty and Hunger)
Methodological Issues
Chair: Professor Sushil Ranjan Howlader, Institute of Health Economics, University of Dhaka, Dhaka
Co-Chair: Dr. Peter Kim Streatfield, ICDDR,B

K.K. Saha, E.A. Frongillo, D.S. Alam, S.E. Arifeen, and K.M. Rasmussen. Usefulness of new WHO standards for describing growth of breastfed Bangladeshi infants and young children (Page 23)

K.K. Saha, E.A. Frongillo, D.S. Alam, S.E. Arifeen, and K.M. Rasmussen. Infant-feeding practices predicted weight gain but not length gain of infants and young children in rural Bangladesh (Page 24)

Frances E. Aboud, Anna C. Moore, and Sadika Akhter. Responsive feeding intervention in a rural Bangladeshi community (Page 25)

Jena D. Hamadani, Fahmida Tofail, Afroza Hilaly, Fardina Mehrin, Sakila Yesmin, Syed N. Huda, and Sally M. Grantham-McGregor. Validating family care indicators in Bangladesh (Page 26)

11:00 am–12:00 noon
Venue: CSD Conference Room
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Maternal Mortality and Morbidity
Chair: Professor Sameena Chowdhury, Head, Department of Gynaecology and Obstetrics, Institute of Child and Mother Health, Dhaka
Co-Chair: Dr. Iqbal Anwar, ICDDR,B

M.E. Chowdhury, M.A. Koblinsky, R. Botlero, A. Ahmed, S. Saha, G. Dieltiens, and C. Ronsmans. Trends and determinants of pregnancy-related mortality in Matlab, Bangladesh (Page 27)

Romana Akter, N. Akhter, S. Shafique, F.A. Bhuyan, C. Witten, and S. de Pee. Early marriage and early childbearing among women in rural Bangladesh (Page 28)

Samina Sultana and Charles P. Larson. Chronic obstetric morbidities and validation of self-reports by women (Page 29)

Alfredo Fort, Monica Kothari, and Noureddine Abderrahim. Postpartum care in developing countries: low levels, late timing, and unequal care are contributing to maternal mortality (Page 30)

12:15 pm Lunch

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Venue: Sasakawa Auditorium
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Chair: Dr. M.R. Khan, National Professor and Director, ICH and Shishu Sasthya Foundation Hospital, Dhaka
Co-Chair: Dr. Shams El Arifeen, ICDDR,B

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Dr. Abdulah H. Baqui, Associate Professor, Department of International Health, Johns Hopkins Bloomberg School of Public Health, USA—Achieving Millennium Development Goal for child survival: what will it take to succeed? (Page 31)

M.Q.-K. Talukder, Chairperson, Centre for Women and Child Health and Bangladesh Breastfeeding Foundation, Dhaka—Child survival: the Bangladesh perspective (Page 33)

3:30 pm–5:00 pm
Venue: Sasakawa Auditorium
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Child Health and Survival: Assessment of Disease Burden
Chair: Professor Samir K. Saha, Professor of Microbiology, Department of MIcrobiology, Dhaka Shishu (Children's) Hospital, Dhaka
Co-Chair: Dr. Rubhana Raqib, ICDDR,B

W. Abdullah Brooks, Robert F. Breiman, Doli Goswami, Anowar Hossain, Khorshed Alam, Samir K. Saha, Kamrun Nahar, Dilruba Nasrin, Md. Noor Ahmed, Shams El Arifeen, Aliya Naheed, David A. Sack, and Stephen P. Luby. Invasive pneumococcal disease burden, seasonality, and antimicrobial resistance patterns, and implications for vaccine policy in urban Bangladesh (Page 36)

W. Abdullah Brooks, Tasnim Azim, Doli Goswami, Erin Murray, Alexander Klimov, Henrietta Hall, Dean Erdman, Joseph Bresee, Nancy Cox, Nadia Iftekhar Uddin, Goutam Poddar, Khorshed Alam, Kamrun Nahar, Robert F. Breiman, and Stephen P. Luby. Influenza burden, seasonality, and serotype distribution patterns, and implications for pneumonia control policies in urban Bangladesh (Page 37)

Samir K. Saha, Gary L. Darmstadt, Abdullah H. Baqui, Derrick W. Crook, A.S.M. Nawshad U. Ahmed, Maksuda Islam, Kaniz Fatima, M. Habibur R. Seraji, Ishtiaq Mannan, K. Zahid Hasan, Sanwarul Bari, Syed Moshfiqur Rahman, Mathuram Santosham, Robert E. Black, Shams El Arifeen, and Bangladesh Projahnmo Study Group. Aetiology of community-acquired neonatal infections in Bangladesh (Page 38)

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W. Abdullah Brooks, Dean Erdman, Pauline Terebuh, Alexander Klimov, Doli Goswami, Amina Tahia Sharmeen, Tasnim Azim, Stephen P. Luby, Carolyn Bridges, and Robert F. Breiman. Human metapneumovirus infection among children in Kamalapur, an urban slum in Dhaka: a pilot study (Page 41)

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Programmes and Interventions
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Co-Chair: Dr. Md. Yunus, ICDDR,B

Shamsul Huda Patwary, Nina S. Dodd, Golam Mothabbir Miah, Mohammad Ashequr Rahman, and Syed Izaz Rasul. Experience in changing behaviour for improved nutrition of young children aged less than 2 years in selected urban slums of Bangladesh (Page 42)

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Dinesh Mondal, Rashidul Haque, R. Bradley Sack, Beth D. Kirkpatrick, and William A. Petri, Jr. Attribution of malnutrition to specific diarrhoeal illness: evidence from a prospective study on preschool children in Mirpur, Dhaka, Bangladesh (Page 44)

Mihir Kanti Majumder and Abdul Mannan. Scouts in promoting community health and nutrition (Page 45)

Golam Mothabbir Miah, Mohammad Ashequr Rahman, Nina S. Dodd, Syed Izaz Rasul, Nazrul Islam Bulbul, Nikunja Deb Nath, Shantanu Shekhar Roy, and Shamsul Huda Patwary. Household food security initiative: a solution for sustainable improved nutritional status among Bangladeshi children in urban slums (Page 46)

Niaz Makhdum Muhammad. Poverty alleviation through ICT: the Bangladesh perspective (Page 47)

3:01 pm Tea Break

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Venue: CSD Conference Room
Scientific Session 6 (MDG 6—Combat HIV/AIDS, Malaria and Other Diseases)
Infectious Diseases
Chair: Professor Naiyyum Chowdhury, Coordinator, Biotechnology, BRAC University, Dhaka
Co-Chair: Dr. Firdausi Qadri, ICDDR,B
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DAY 2: Monday, 5 March 2007

Time: 8:45 am–10:30 am
Venue: Sasakawa Auditorium
Plennary 3 (MDG 5—Improve Maternal Health)
Chair: Professor T.A. Chowdhury, Department of Gynaecology and Obstetrics, BIRDEM, Dhaka
Co-Chair: Dr. Marge Koblinsky, ICDDR,B
Welcome Address by Professor Terence H. Hull, Chair, Board of Trustees, ICDDR,B

Speakers
Dr. Halida Hanum Akhter, Director General, Family Planning Association of Bangladesh, Dhaka—MDG 5: achievements and challenges in Bangladesh (Page 54)
Dr. Carine C.A. Ronsmans, UK—The Lancet Maternal Survival Series advocates key strategic choices by power structure (Page 56)

11:00 am–12:00 noon
Venue: Sasawaka Auditorium
Scientific Session 7 (MDG 4—Reduce Child Mortality)
Child Health and Survival: Risk Factors
Chair: Professor Nazmun Nahar, Department of Paediatrics, BIRDEM, Dhaka
Co-Chair: Dr. Iqbal Kabir, ICDDR,B

Haruko Takeuchi, K. Zaman, Mohammad Yunus, Hafizul R. Chowdhury, Shams EL Arifeen, Abdullah H. Baqui, Tsutomu Iwata. Episodes of pneumonia were increasingly associated with bronchial asthma symptoms in 5-year-old rural Bangladeshi children (Page 57)

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Fahmida Tofail, L.Å. Persson, M. Vahter, S.N. Huda, J.D. Hamadani, M. Rahman, Shams El Arifeen, and S.M. Grantham-McGregor. Effect of arsenic exposure during pregnancy on cognitive development of infants in rural Bangladesh (Page 59)

D.S. Alam, S.E. Arifeen, M. Yunus, A.M.W. Hoque, E.C. Ekström, L.A. Persson, and K.M. Rasmussen. Pattern of gestational weight gain and birth-weight in rural Bangladesh (Page 60)

11:00 am–12:00 noon
Venue: Seminar Room
Scientific Session 8 (MDG 5—Improve Maternal Health)
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Chair: Professor Abdul Bayes Bhuiyan, Professor (Retd.) of Gynaecology and Obstetrics, Dhaka Medical Cillege; Ex-Presiedent, Obstetrics and Gynaecological Society of Bangladesh; and Focal Point, EOC Training Program, Government of Bangladesh
Co-Chair: Dr. Allisyn C. Moran, ICDDR,B

Allisyn C. Moran, Peter J. Winch, Nighat Sultana, Nahid Kalim, Kazi Monira Afzal, Marge Koblinsky, Shams El Arifeen, M. Habibur R. Seraji, Ishtiaq Mannan, Syed Moshfiqur Rahman, Gary L. Darmstadt, Abdullah H. Baqui, and Bangladesh Projahnmo Maternal Morbidity Study Team. Care-seeking for maternal complications in Sylhet district, Bangladesh (Page 61)

Iqbal Anwar, M. Sami, N Akhtar, M.E. Chowdhury, U. Salma, M. Rahman, M. Koblinsky. Use patterns of maternal healthcare services and their sociodemographic determinants: evidence from 2 NGO service areas in Bangladesh (Page 63)

Anisur Rahman, Marge Koblinsky, Allisyn C. Moran, Md. Yunus, Peter Kim Streatfield, and Lars-Ake Persson. Sociodemographic determinants of induced abortions in Matlab, Bangladesh (Page 64)

K.L. Prenger, P.K. Talukdar, J.C. Roy, and S.L. Saha. Referral behaviour during pregnancy care (Page 65)

11:00 am–12:00 noon
Venue: CSD Conference Room
Scientific Session 9 (MDG 3—Promote Gender Equality and Empowerment of Women)
Chair: Ms Simeen Mahmud, Research Director, Bangladesh Institute of Development Studies, Dhaka
Co-Chair: Dr. Ruchira Tabassum Naved, ICDDR,B

Ruchira Tabassum Naved, S. Arman, and Sadia Chowdhury. Communication and negotiation around first conception and contraceptive use in rural Bangladesh (Page 66)

Ruchira Tabassum Naved and L.Å. Persson. Dowry and spousal physical violence against women in Bangladesh: is payment and/or patriarchy the main issue? (Page 67)

Sidney Ruth Schuler and Farzana Islam. Do women really condone wife-beating? (Page 68)

C.T. van Mels. Increasing effect of gender preference on fertility (Page 69)

12:15 pm Lunch
1:30 pm–3:00 pm
Venue: Sasakawa Auditorium
Plenary 4 (MDG 6—Combat HIV/AIDS, Malaria and Other Diseases)
Chair: Prof. (Dr.) Mahmudur Rahman, Director, IEDCR, Dhaka
Co-Chair: Dr. G.B. Nair, ICDDR,B

Speakers
Dr. Faruque Ahmed, Director, BRAC Health Programme, Dhaka—Control of tuberculosis in Bangladesh: current interventions to achieve Millennium Development Goals (Page 70)
Dr. Tasnim Azim, Head, HIV/AIDS Programme, Laboratory Sciences Division, ICDDR,B—HIV-AIDS in Bangladesh (Page 71)

3:30 pm–5:00 pm
Venue: Sasakawa Auditorium
Scientific Session 10 (MDG 4—Reduce Child Mortality)
Child Health and Survival: Interventions
Chair: Dr. Md. Shukuruddin Mridha, Director, PHC and Line Director, ESD, Directorate General of Health Services, Dhaka
Co-Chair: Dr. Elizabeth Oliveras, ICDDR,B

Golam Mothabbir Miah, Mohammad Ashequr Rahman, Nina S. Dodd, Syed Izaz Rasul, and Shamsul Huda Patwary. Experience in reduction of malnutrition during pregnancy in urban slums of Bangladesh (Page 73)

Enayet K. Chowdhury, Shams El Arifeen, Muntasirur Rahman, D.M. Emdadul Hoque, M. Altaf Hossain, Khadija Begum, Rasheda Khan, Lauren S. Blum, Ashraf U. Siddique, Nazma Begum, Tasnima Akter, Twaha M. Haque, Z.A. Motin Al-Helal, Abdullah H. Baqui, Jennifer Bryce, and Robert E. Black. Expanded first-level facility care for severe pneumonia is safe and effective among children in Bangladesh: a report from the MCE-Bangladesh (Page 74)

Jasim Uddin, Charles P. Larson, Elizabeth Oliveras, A.I. Khan, M.A. Quaiyum, Iqbal Ansary Khan, Nirod Chandra Saha, and Faaiz Ahmed. Child immunization coverage in hard-to-reach haor areas of Bangladesh: feasibility of alternative strategies (Page 75)

Ali Ashraf, M.A. Quaiyum, Rasheda Khanum, and Nirod Chandra Saha. Treatment-seeking and mortality in diarrhoea and acute respiratory infection among children in Bangladesh (Page 76)

M. Nakatsuji, S. Saha, Felicity Mussell, and C. Edwards. Poor perinatal outcome after 'outside' treatment and vaginal examinations during labour at comprehensive in rural Bangladesh (Page 77)

Abdullah H. Baqui, Ishtiaq Mannan, Shams El Arifeen, M. Habibur R. Seraji, Syed Moshfiqur Rahman, Peter J. Winch, Gary L. Darmstadt, and Bangladesh Projahnmo Study Group. Home-based management of newborn infections: lessons from Sylhet: implications for programmes (Page 78)

3:30 pm–5:00 pm
Venue: Seminar Room
Scientific Session 11 (MDG 5—Improve Maternal Health)
Interventions for Reducing Maternal Mortality and Morbidity
Chair: Dr. Kaosar Afsana, Programme Coordinator, BRAC Health Programme, Dhaka
Co-Chair: Dr. Marge Koblinsky, ICDDR,B

R.T. Naved, Rumana Jesmin Khan, L.Å. Persson, L. Ekström. Violence against women and compliance of pregnant women to food supplementation in rural Bangladesh (Page 79)

Kalyan B. Saha, Neeru Singh, Uma C. Saha, and Arvind Pandey. Intervention of IEC to improve male involvement in reproductive health: lessons learnt from tribal population of Central India (Page 80)

Kasmin Khan, Anthony Costello, Sarah Barnett, Shampa Barua, Arati Roselyn Rego, Dorothy Flatman, Kishwar Azad, Abul Kalam Azad Khan. Towards MDG 4 and 5: experience with Women's Groups in community mobilization in Bangladesh (Page 82)

I. Anwar, J. Ferdous , N. Akhtar, N. Kalim, M. Elahi, E. Hoque, M. Koblinsky. Evaluation of two home-based skilled birth attendant programme in Bangladesh (Page 83)

Christine H. Edwards, W.P. Cave, K. Greene, A. Bojarska, S. Saha, B. Mondol, and P.R. Strom. Non-physician anaesthetists—an appropriate use of personnel for delivery of comprehensive emergency obstetric care (Page 84)

Christine H. Edwards, M. Jinks, and F. Mussell. Use of uterine balloon catheter for lifesaving management of postpartum haemorrhage—experience in a comprehensive emergency obstetric care facility in rural Bangladesh (Page 85)

3:01 pm Tea Break

3:30 pm–5:00 pm
Venue: CSD Conference Room
Scientific Session 12 (MDG 6—Combat HIV/AIDS, Malaria and Other Diseases)
HIV/AIDS and Tuberculosis
Chair: Mr. Dan Odallo, UNAIDS Country Coordinator, Dhaka
Co-chair: Dr. Sharful Islam Khan, ICDDR,B

K. Zaman, S. Hossain, Md. Yunus, S.E. Arifeen, Abdullah Mahmud, V. Begum, Akramul Islam, A.H. Baqui, and S.P. Luby. Tuberculosis in Bangladesh: a 40-year review (Page 86)

Sharful Islam Khan, Kamal Pasa, Gorkey Gourab, A.M. Rumayan Hasan, Sheikh Shah Tanvir Kaukab, and Ariful Islam. Living with risks and vulnerabilities to STIs/HIV: a qualitative assessment of indigenous populations at the northwestern belt in Bangladesh (Page 87)

Nazmul Alam, Malay K. Mridha, Mahbub Elahi Choudhury, Sushil K. Dasgupta, Sharful Islam Khan, Julia Ahmed, and Peter Kim Streatfiled. Understanding barriers to condom use among commercial sex workers in Bangladesh (Page 88)

Rukhsana Gazi, Tasnim Azim, Alec Mercer, Humayun Kabir, Nirod Chandra Saha. Risk behaviour network and vulnerability to HIV infection of boatmen in Teknaf, Bangladesh (Page 89)

Julia Ahmed, H. Chaklader, Dil Afroze, Md. Moshtaq Parvez, Tasnim Azim, and M. Kabir. Integration of voluntary counseling and testing at brothel-based sex workers package in partnership with Jagori-ICDDR,B (Page 90)

Khairun Nessa, A. Alam, F.A.H. Chawdhury, M. Huq, S. Nahar, G. Salauddin, S. Khursheed, S. Rahman, E. Gurley, R.F. Breiman, and M. Rahman. Field evaluation of simple rapid tests in diagnosis of syphilis (Page 91)

DAY 3: Tuesday, 6 March 2007

9:00 am–9:45 am
Venue: Sasakawa Auditorium
Special Session: Arsenic in the Environment: Consequences and Mitigations
Chair: Dr. Mahfuzar Rahman, Associate Research Scientist, Department of Epidemiology, Mailman School of Public Health, Columbia University, USA
Co-Chair: Dr. Rukhsana Gazi, ICDDR,B

M.A. Kabir and Richard Johnston. Performance of arsenic-removal filters used in rural Bangladesh (Page 92)

Marie Vahter, B. Fangstrom, J. Hamadani, B. Nermell, S. Moore, M. Grandér, B. Palm, L.Å. Persson, E.C. Ekström, Shams El Arifeen, and the MINIMat Team. Arsenic exposure and metabolism in early childhood (Page 94)

Ali S-Amiri, Elma Morsheda, and M.A.I. Kazi. Effect of water-quality parameters on the performance of arsenic-removal technologies: preliminary results from the Environmental Technology Verification: Arsenic Mitigation Project (Page 95)

9:46 am **Tea Break**

Closing Ceremony
10:15 am–12:15 pm
Venue: Sasakawa Auditorium
Chair: Professor David A. Sack, Executive Director, ICDDR,B
Co-Chair: Professor Alejandro Cravioto, Deputy Executive Director, ICDDR,B

10:15 am–11:00 am
Plenary on Gender Issues

Speaker
Dr. Sajeda Amin, Senior Associate, Program on Poverty, Gender and Youth, Population Council, USA—Can research and policy promote equity and empower women? A review of the experience of Bangladesh (Page 96)

12:30 pm **Lunch**

Saturday, 3 March 2007 001* (203†)
4:15 pm-4:45 pm (Venue: Radisson Water Garden Hotel)
Keynote Speech

Transforming Health Systems to Facilitate the Household Production of Health in Developing Countries

W. Henry Mosley (hmosley@jhsph.edu)

Professor, Department of Population, Family and Reproductive Health
Johns Hopkins Bloomberg School of Public Health
Baltimore, MA, USA

Key Issues

The three key issues confronting the production of health in developing countries are:

1. How can we make our investments in health interventions more effective and efficient?
2. How can we ensure greater equity in access to the knowledge, skills, and technologies that facilitate the production of health?
3. How can we assure sustainable health outcomes?

Over the past decade, my Hopkins colleague Ben Lozare and I have developed and conducted a series of International Strategic Leadership Seminars guided by the vision of nurturing health leaders who could initiate the transformational changes that would address these 3 issues. As the seminars evolved, we came to a critical insight. We have the right questions, but our initial answers may have been incorrect because we were operating under an outmoded health system paradigm. Increased health investments can yield some results but we cannot expect breakthroughs until recognition of a health system paradigm that better reflects the realities on the ground.

What Works Better?

To achieve greater effectiveness, efficiency, equity, and sustainability from investments in international health programmes, we need the following :

- **Shift the paradigm.** Recognize that households and communities are the primary producers of health---not hospitals, clinics, and the Ministry of Health. Just as farmers are the primary producers of food and not the Ministry of Agriculture, it is people who are the primary producers of health. And households (especially mothers) are dependent on many resources, not just material, like medical services and technologies, but non-material resources, like time, values, knowledge, practices, gender relations, and social networks, to try to prevent and treat diseases and maintain health.
- **Redesign the health system to link learning to action.** The mental model of governments 'producing health' through investing in services and technologies may not be correct and can even be counterproductive. Putting in more investments in a fundamentally-flawed system may even lead to entrenchment of current errors. We need to redesign the health sys-

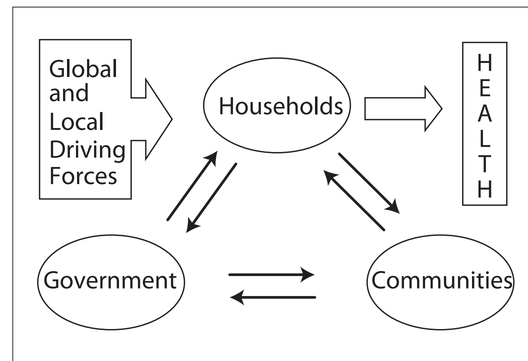
*Indicates the sequential number of entries in this book
†Indicates the number orginally assigned to the paper/abstract

tem to effectively link the household and community producers of health with the technical experts and managers so that decisions about resource allocation can actually benefit the primary producers of health.

- **Change our metrics.** We need new units of measurement of health system performance that shift the focus from organizational operations and biomedical technologies to the critical non-material components of household productivity.
- **Nurture a learning health system which engages households, communities, and government.** Current levels of expenditure on research, monitoring, and evaluation are huge. Unfortunately, learning from these activities does not go down to household and community levels where health production actually happens. Even among local policy-makers and programme managers, learning from research, monitoring, and evaluation is usually minimal in many settings.
- Nurture leadership at all levels, not just at the top. The most crucial leadership development is at local levels where the need is greater. Many programmes suffer from poor implementation because leadership capabilities at lower levels are weak.

A New Paradigm for Health System Transformation

The key components of the Household Production of Health paradigm are depicted in the figure.



This paradigm of the health system recognizes that doctors, nurses, hospitals, health centres, etc. do not *produce* health; households do, especially mothers in the case of maternal and child health. Households live in the context of communities with their social arrangements (social capital), and these are organized nationally under government institutions. There are also local and global driving forces—political, economic, social, technological, and environmental—that can impact profoundly on household health production.

Household health productivity, like the productivity of every institution in society, depends upon 3 basic capabilities—*values, practices*, and *resources*. Values and practices are *non-material*, but so are many of the most important household resources. These *non-material* resources are things, like time, knowledge/beliefs, skills, language, ethnicity, literacy, gender, status/caste, and social networks that can facilitate or constrain the production of health. The interactions of values, practices, and resources can be considered the household's/community's 'culture'.

From this perspective, the health system is like the agricultural system—it is highly decentralized, it has a self-sustaining 'culture' of production, and the primary producers are the households. Consequently, to im-

prove health productivity in a society, every household needs to have an understanding of the changes needed in values, practices, and material and non-material resources required for better health outcomes and the motivation to make these changes.

Responding to this new paradigm of the health production system requires major transformations in the current operating principles of Ministries of Health, other government agencies, and the international donor community. This requires *learning* to: understand deeply how health is produced at the household level; develop practical indicators of all aspects of household health productivity; and restructure agencies and organizations to be able to measure and monitor household health productivity and facilitate the changes needed to improve the performance of the health production system.

The Role of Leadership

The 21st century will be the century of change—change driven by major forces globally and locally—political, social, economic, technological, and environmental. These will profoundly affect the capabilities of households and communities to produce and maintain health and general well-being. The challenge is to consider these forces as an opportunity for positive change rather than a threat to the *status quo*.

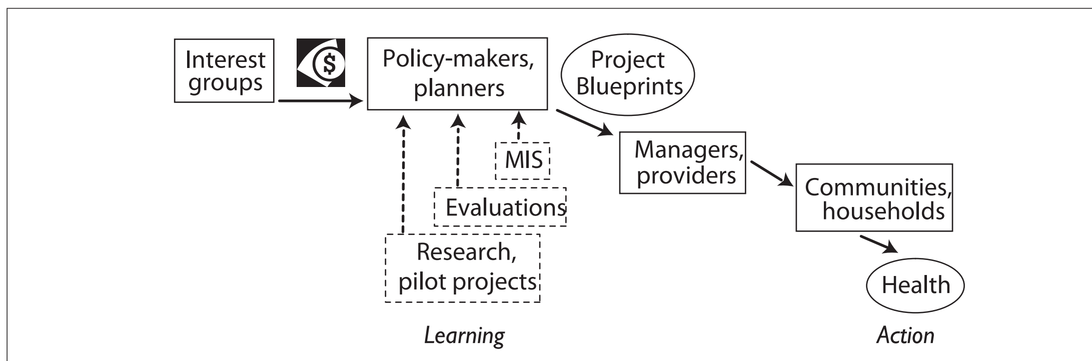
To assist households more effectively and efficiently in producing health in the presence of these rapidly-changing forces, governments and long-established community institutions will need to change, and new institutions will need to be created. Whether one is creating a new institution or changing an old one, leadership is required. However, for leaders to be effective in developing and sustaining the organizational creativity, innovation, and flexibility required in the changing world, they need to establish *learning organizations*.

Improving the Production of Health—The Action-Learning Process

Before describing the action-learning approach to increase the productivity of the health system, it is important to briefly review the traditional top-down, or 'blueprint' approach most commonly in use. This will clarify how the action-learning approach relates to existing institutional structures, while at the same time, building on the new household health production paradigm.

a. Top-down or 'blueprint' approach to health interventions

The top-down or 'blueprint' strategy commonly used in introducing health improvements in less-developed countries is depicted in the figure below:

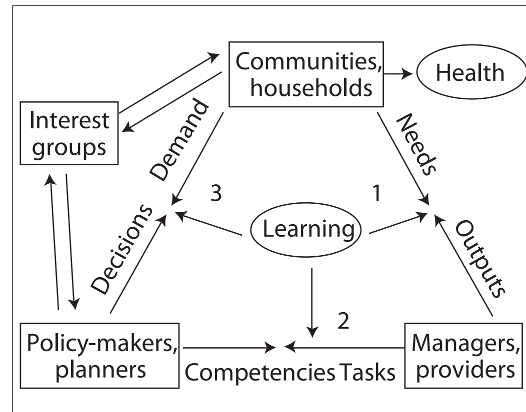


Typically-powerful interest groups (donors, foundations, NGOs, universities, etc.) come with a new health initiative and funding. This is presented to national policy-makers and planners who develop strategies and programmes (blueprints) for national implementation. These are sent to the local-level organizations for service-delivery. Ultimately, it is the household that accepts (or rejects) the intervention and produces (or fails to produce) the desired health outcome. The Management Information System (MIS) collects routine data, and specialists collect research and evaluation data from time to time, all of which are sent back to the top for analysis and interpretation.

This approach has several deficiencies. Two of the most serious are: (1) there is the underlying assumption that the institutions, personnel, and services in Ministries of Health are the producers of health so that more investments in these facilities and operations will improve the productivity of the health system; and (2) the primary producers of health in the households (where the action is taking place) are disconnected from the information about what works or fails to work and, therefore, no learning is taking place. And with no learning, there may be no fundamental improvements in household productivity. Not surprisingly, projects and programmes using this approach often produce inequitable outcomes and do not show sustainable health gains after the external inputs are removed.

b. The action-learning approach

The 'action-learning' or 'learning process' approach involves the same organizations/ institutions depicted above, but changes the institutional relationships to facilitate communication and link actions at every level to learning. This is illustrated in the figure.



The key stakeholders in the action-learning organization represent the households and communities, the managers, and technical experts involved in a specific programme or enterprise, and representatives of relevant government agencies. The 'interest groups' shown may represent external donors, NGOs, or other groups. This model, coming from the community development literature, depicts 3 areas for action-learning depicted in the figure by the numbers 1, 2, and 3. These are the following :

1. Understanding the household and community needs to improve health productivity, and learning how to effectively connect the programme outputs to the needs.

2. Understanding the tasks required to produce the desired outputs, and how to build the organizational competencies to perform these tasks.

3. Understanding how to effectively engage the households and communities in the decision processes so that there will be real 'ownership' of the policies, strategies, and programmes.

Leadership Principles and Practices

Leaders of transformational change at every

level in the health system have 3 key roles:

- Generating a shared vision of a health future people want to create
- Catalyzing learning organizations
- Enabling others to act

Leaders act as a catalytic force in bringing together an action-learning team involving these diverse stakeholders. Over time, as trust and confidence grows, this team should be characterized by:

- a shared vision of a better future
- a commitment to see the current reality as it is
- an openness to new ideas
- a willingness to a challenge long-standing assumptions
- an encouragement of innovation and experimentation
- acceptance of mistakes as learning opportunities
- a shared responsibility for both successes and failures
- a readiness to change old ways as new evidence emerges

Two elements essential to make this action learning process work are: (a) continuous accountability for performance at every level and (b) flexibility to make changes whenever deficiencies are detected. Epidemiologists encompass this process in the term 'surveillance', managers often use the expression 'embrace error'. From this perspective, it should be clear why it is essential to develop leadership at every level in the health system, but particularly at the lowest levels among the 'front-line' workers.

The Way Forward

This paradigm of the Household Production of Health system is a novel idea for most healthcare professionals in developing countries, and for the institutions and agencies that support them—both nationally and internationally. The underlying principles of leadership and learning at every level, however, have been well-established in major organizations and institutions, both private and public, around the globe. The challenges for the future are:

1. to disseminate these concepts and principles more broadly to national and international organizations and academic institutions concerned with health improvement in less-developed countries so they can test and learn how to adapt, implement, and then institutionalize them in their own situations
2. to continuously gather, interpret, and disseminate the lessons learnt by these groups, both successes and failures, for the purpose of generating new knowledge on how to improve and sustain health productivity and health outcomes in less-developed countries.

Day 1: Sunday, 4 March 2007 002 (199)
9:00 am-10:30 am (Venue: Sasakawa Auditorium)
MDG 1: Eradicate Extreme Poverty and Hunger
Plenary 1

Monitoring and Tracking Progress on the MDG Health Iindicators

Michael Thieren (thierenm@who.int)

Medical Scientist, Statistical Department, World Health Organization,
Avenue Appia 20, 1211 Geneva 27, Switzerland

The presentation will focus on how the World Health Organization (WHO) is monitoring and tracking progress on the MDG health indicators. It will include 3 parts: (a) What is being measured: the list of health goals, targets, and indicators: how they relate and how prominent is health in the MDG Road Map (implementation of the Millennium Declaration); (b) What the difficulties and limitations are to MDG measurement; and (c) How WHO addresses these measurement challenges. The presentation concludes stressing the importance of MDG measurement in the broader context of measuring the performance of health systems.

003 (201)

Malnutrition in Bangladesh: How Far Are We from Achieving MDG 1?

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ICDDR,B, GPO Box 128, Dhaka 1000, Bangladesh

About 70 million children are currently suffering from severe malnutrition in developing countries. The consequence of malnutrition is manifold, such as increased susceptibility and incidence of infections, impaired mental development, increased case fatality, and a huge loss on national productivity. Severe wasting, defined as a weight-for-height z-score <-3, contributes to about 1.7 million of 10.8 million deaths among children aged less than 5 years (under-5 children). Although the prevalence of child malnutrition is decreasing in Asia, countries in South Asia still have both highest rates of malnutrition and largest numbers of malnourished children. Indeed, prevalence rates of malnutrition in India, Bangladesh, Afghanistan, and Pakistan are much higher (38-51%) than those in sub-Saharan Africa (26%). There is, therefore, an urgent need for reducing prevalence of protein-energy malnutrition for combating rampant micronutrient malnutrition and for reducing case fatality of children affected by severe malnutrition. How these can be done is the question faced by countries in Asia and Africa which bear most of the burden of childhood malnutrition and are also heavily constrained.

Bangladesh is one of the few countries that have shown a trend in the improvement of nutritional status of children aged less than 2 years and, indeed, towards achieving the malnutrition-related target of the Millennium Development Goad (MDG) 1. Over the last two decades, there has been an almost 20 percentage-point reduction in the prevalence of stunting and under-weight among under-five children. Despite the good news, the prevalence of under-weight in Bangladesh is almost double that in sub-Saharan Africa. The prevalence of stunting (height-for-age <-2 SD) among children aged 6-23 months as observed in the baseline survey of the National Nutrition Programme in 2004-2005 was 41.7%. Almost 50% of children in this age-group suffered from under-weight (weight-for-age <-2 SD), while 16.4% of the children were wasted (weight-for-height <-2 SD). Stunting and under-weight have a linear trend with increasing age, while wasting is more common after 12 months. Multivariate analysis revealed a monotonic increase in the prevalence of under-weight, stunting, and wasting with increase in age. Maternal education, household food security, and asset index showed an inverse relationship with malnutrition.

Large-scale nutrition programmes focusing on behaviour change have been successful in reducing rates of malnutrition, although how much of the reduction in malnutrition is due to the effect of nutrition interventions or due to contextual factors is not clear. After having achieved an impact, such programmes should be mainstreamed into existing mother and child health systems.

Since mortality among severely-malnourished children is very high, efforts should be made to implement the most effective and sustainable method of managing these children. The guidelines of the World Health Organization for the management of severe malnutrition are effective in reducing case fatality among children with severe malnutrition but getting them to scale is important for achieving the MDG 4 as there are a quarter million severely-wasted children in the country. Although the coverage of vitamin A supplementation among child is satisfactory, there is no such programme for controlling anaemia in children. Iodine deficiency, despite universal salt iodization, is a substantial problem. Zinc deficiency is also believed to be a major problem. Large-scale efforts within the context of the nutrition sub-sector of the Health, Nutrition and Population Sector Programme of the Government of Bangladesh are warranted to control these major micronutrient disorders so that there is a greater impact on child malnutrition in the country.

Day 1: Sunday, 4 March 2007 004 (088)
11:00 am-12:00 noon (Venue: Sasakawa Auditorium)
Scientific Session 1: MDG 4—Reduce Child Mortality
Child Health and Survival: Findings from Interventions Studies

Zinc Supplementation Following Zinc Treatment for Acute Childhood Diarrhoea: A Randomized, Double-blind Field Trial

Charles P. Larson[1,2] (clarson@icddrb.org), Dilruba Nasrin[1], Firdausi Qadri[1], Amit Saha[1], and Mohiul Chowdhury[1]

[1]ICDDR,B, GPO Box 128, Dhaka, 1000, Bangladesh and
[2]Department of Pediatrics, Department of Epidemiology and Biostatistics, McGill University, Montreal, Canada

Background: Over the past decade, several randomized trials have been carried out to determine the efficacy of zinc provided as a daily supplement or as a treatment for childhood diarrhoea. Both the strategies have consistently demonstrated reductions in the occurrence of acute and persistent childhood diarrhoea. **Objective:** To determine whether there is a clinical value added of public-health significance to continuing with zinc supplementation following zinc treatment for an acute childhood diarrhoea (ACD) episode. **Methodology:** A randomized, double-blind field trial was conducted in the urban slum zone of Mirpur, Dhaka, Bangladesh. Children aged 6-23 months with an acute episode of diarrhoea of 24-72 hours duration were randomized to receive 10 days of zinc treatment (20 mg per day) alone or treatment plus 3 months zinc supplementation (10 mg per day). All children were visited weekly for 9 months following treatment to document recurrent episodes of ACD or acute respiratory infections (ARIs). Scientific and ethical approval were obtained from ICDDR,B. **Results:** Over a 12-month period, 770 cases of ACD were identified by a household survey, of which 652 (85%) children fit the study criteria, and their parents consented to participate in the study. Based upon results of stool culture, 353 subjects were selected for random assignment to either zinc supplementation or placebo following treatment. Over the subsequent 9 months of follow-up, 28 (8%) subjects were lost to follow-up, and one death occurred. The incidence of ACD was lowered in the zinc-supplemented group during the initial 3 months of supplementation and over the total 9 months of follow-up, with a 27% (p=0.012) and 21% (p=0.028) reduction in the incidence of ACD respectively. There were no differences in the occurrence of ARIs. The beneficial effect of zinc supplementation on the incidence of ACD over the 3 months when they were receiving supplementation was found to be more than double in males compared to females (36% vs 15% reduction) and greater in children aged over 12 months (31% vs 22% reduction). **Conclusion:** Continuing zinc supplementation among young, urban slum children following treatment confers additional protection against future episodes of ACD that could have an important public-health impact. **Acknowledgements:** The study was supported through a grant from the Bill and Melinda Gates Foundation.

005 (108)

Can Home-visits by Trained Community Health Workers Improve Breastfeeding of Newborns in Rural Bangladesh?

Ishtiaq Mannan[1,2] (ishtiaqm@icddrb.org), Syed Moshfiqur Rahman[2], Ayesha Sania[2], M. Habibur R. Seraji[1,2], Shams El Arifeen[2], Arif Mahmud[2], Nazma Begum[2], Peter J. Winch[1], Gary L. Darmstadt[1], Saifuddin Ahmed[1], Abdullah H. Baqui[1], and Bangladesh Projahnmo Study Group

[1]Department of International Health, Johns Hopkins Bloomberg School of Public Health, 615 N. Wolfe St., Room E-8138, Baltimore, MD 21205, USA, and
[2]ICDDR,B, GPO Box 128, Dhaka 1000, Bangladesh

Background: Promotion of immediate initiation of breastfeeding, avoidance of prelacteal feeds, and exclusivity of breastfeeding during the first 6 months of life are crucial for reduction of neonatal and postneonatal mortality. Since many previous studies have been conducted in hospital settings, evidence for effectiveness of community-based breastfeeding promotion strategies is limited. **Objective:** To understand the technical attributes causing 'feeding problems' and also to examine whether or not postpartum visits by trained health workers help mothers overcome these problems when there was no other associated (neonatal) morbidity. **Methodology:** A cluster-randomized intervention trial in Sylhet district, Bangladesh, evaluated strategies to reduce neonatal mortality. In the Home Care intervention arm, community health workers (CHWs) visited pregnant women twice during the antenatal period to counsel for birth and newborn-care preparedness, including immediate and exclusive breastfeeding, and thrice in the 1st week after delivery. The CHWs were trained to assess mothers immediately after delivery for the breastfeeding techniques and to provide counselling and hands-on support to establish successful breastfeeding, particularly through support for proper positioning and attachment. Data from algorithm-based newborn assessment through history-taking and on-site observation of breastfeeding of 3,495 women delivered during 2003-2005 (livebirths surviving through day 7) were analyzed to examine the effects of early postpartum presence of CHWs within 3 days on overcoming 'feeding problems'. **Results:** Technical problems, like positioning and attachment, were predominant (12%-15%) reasons to have newborns classified as having feeding problems. Mothers who were not visited by a CHW within 3 days and who fed prelacteals were 11.8 times (95% confidence interval [CI]: (7.1-19.8, $p<0.00$) and 2.5 times (95% CI 1.1-5.5, $p<0.05$) more likely to have feeding problems persisting as late as day 6-7 than those who were visited by CHWs within 3 days of life and did not feed prelacteals. **Conclusion:** One-on-one counselling and hands-on support to mothers for proper breastfeeding techniques by trained workers within 3 days of life should be part of any community-based postpartum interventions and should be conducted during the first 3 days postpartum. **Acknowledgements:** The financial support of the United States Agency for International Development, Saving Newborn Lives Initiative of the Save the Children-USA, and several other donors is acknowledged.

006 (109)

Community-based Effectiveness Trial of Newborn Interventions: Sylhet, Bangladesh

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Background: Neonatal deaths account for half of childhood deaths in Bangladesh. Effective community-based interventions are required to reduce neonatal deaths. **Objective:** To evaluate the effectiveness of a package of maternal-newborn-care interventions delivered through 2 different strategies in a community-based randomized trial in Sylhet, Bangladesh. **Methodology:** Twenty-four communities were randomized to one of 2 interventions: home-care or clinic-care (versus comparison). In the home-care arm, female community health workers (CHWs) visited families to counsel and educate on birth-preparedness and care of the mother and baby during and after delivery. The CHWs assessed newborn health on day 1, 3, and 7 and referred newborns with severe disease. If referral failed, the CHWs treated sick newborns with injectable antibiotics. In both home-care and clinic-care arms, community mobilizers provided the same messages through community meetings. There was no home management of sick newborns in the clinic-care arm. In the comparison arm, usual health services were available. A baseline survey was conducted in 2002. Interventions were introduced in July 2003. Evaluation involved review of MIS data, process evaluation, and periodic sample household surveys. An end-of-project survey was conducted in 2006. **Results:** Practices during pregnancy, delivery, and postnatal period improved in both the intervention arms, but more so in the home-care arm. In the home-care arm, there was a steady decline in neonatal mortality. In the last 6 months, after 2 years of implementation, the home-care intervention demonstrated statistically significant (33%) reduction of neonatal mortality in all livebirths and 43% reduction among singletons. There was no reduction of neonatal mortality in the clinic-care arm. **Conclusion:** The study demonstrated that a package of maternal and newborn interventions, when delivered through community-based workers and existing health facilities, is effective in improving pregnancy, delivery, and newborn-care practices and significantly reduces neonatal mortality. The intervention package and delivery system can be scaled up within the existing government and NGO health services after appropriate adaptation. Lack of impact in the clinic-care arm may be due to the fact that a longer period of implementation was required or the inputs were inadequate for an under-served population to achieve a mortality impact.

Acknowledgements: The financial support of the United States Agency for International Development, Saving Newborn Lives Initiative of the Save the Children-USA, and several other donors is acknowledged.

007 (013)

Positive Deviance Collective Community Action Model Improves Breastfeeding and Growth in Rural Uttar Pradesh

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Background: Positive deviants (PDs), through practising specific positive behaviours, manage to rear well-nourished infants despite poverty. This study was undertaken as behaviour promotion by PDs as village health workers (VHWs) is unexplored. **Objective:** To assess the effect of counselling by PDs on breastfeeding practices and growth of infants aged 0-6 month(s) in rural poor communities of Agra district, India. **Methodology:** Three of 7 matched villages were randomly selected as intervention and 4 as control cluster with an average population of 8,000 in each cluster and similar baseline characteristics. In the intervention cluster, poor families (n=67) were identified using the Standard of Living Index, and those poor families whose infant's weight-for-age SD score was >-1 of the National Center for Health Statistics median (n=25) were considered PDs. Factors contributing to positive deviance were identified. In 21 of 25 PD families, grandmothers were facilitators of positive practices and stimulated to become voluntary VHWs. Service providers at grassroots-level, traditional birth attendants, and 3 literate women, partnered in and together, formed one voluntary group to improve maternal-infant health. The VHW: household ratio was 1:20. After capacity-building, 14-month intervention by the VHWs involved early enrollment of pregnancy, counselling through scheduled antenatal and postnatal home-visits, supporting home-delivery, group-meetings, Maternal-Child Health Day, and monthly VHW collective problem-solving meeting based on a pictorial monitoring card. The intervention was evaluated on a birth-cohort of 82 from each cluster born in the first 9 months of the intervention through 8 home-visits by an independent research team (day 0, 7, 30, 60, 90, 120, 150, and 182). On each visit, breastfeeding practices were enquired, and weight and length of the infant were taken using standard methods. The nutritional status was ascertained using the WHO standards (2006). Data were analyzed in Stata (version 9) using GEE with repeated measures. **Results:** There was 16.9% effect-size increase in exclusive breastfeeding. At 6 months, fewer infants in intervention compared to control were under-weight (37.1% vs 50.7%), wasted (17.1% vs 28.4%), and stunted (40% vs 47%). Weight gain in 0-6 month(s) of the intervention infants was 360 g greater than control (95% confidence interval: 40-720 g, p=0.002). **Conclusion:** Promoting indigenous strength of the community and facilitating collective voluntary action improve behaviour adoption and community capacity to improve their health. **Acknowledgements**: This study was supported by a Junior Research Fellowship grant received from University Grants Commission, New Delhi.

Day 1: Sunday, 4 March 2007 008 (020)
11:00 am-12:00 noon (Venue: Seminar Room)
Scientific Session 2: MDG 1—Eradicate Extreme Poverty and Hunger
Methodological Issues

Usefulness of New WHO Standards for Describing Growth of Breastfed Bangladeshi Infants and Young Children

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Background: The National Center for Health Statistics (NCHS) reference of international child growth has been widely used in comparing the growth of infants and children throughout the world. However, several studies suggest that the NCHS reference does not adequately reflect the growth of breastfed infants and children, especially in developing countries. **Objective:** To assess the growth pattern of infants and young children from birth to 24 months of age in a rural area of Bangladesh and to compare this pattern with the new World Health Organization (WHO) Multi-centre Growth Reference Study (MGRS) child growth standard and the NCHS reference. **Methodology:** In total, 1,243 babies were followed in the Maternal and Infant Nutrition Intervention in Matlab (MINIMat) study to assess growth from birth to 24 months of age. Weight and length were measured monthly during infancy and quarterly in the second year of life. Anthropometric indices were derived using the WHO MGRS child growth standard. Growth of MINIMat birth-cohort was compared with both new WHO child growth standard and NCHS reference. **Results:** The mean birth-weight of infants was 2,697±401 g, 30% weighing <2,500 g. Boys were heavier (2,741±411 g vs 2,650±384 g, p<0.001) and longer (48.0±2.1 cm vs 47.5±2.1 cm, p<0.001) than girls at birth, and this difference persisted until 24 months of age. The attained size of MINIMat babies was far below both WHO standard and NCHS reference throughout the first 24 months of life. The growth pattern of the MINIMat birth-cohort, however, more closely tracked the new WHO standard than it did the NCHS reference. Growth faltering of MINIMat babies occurred at 6 months, and no catch-up growth was achieved until 24 months of age. **Conclusion:** This is one of the first attempts to assess growth of infants and young children using the WHO MGRS child growth standard. It is concluded that the new WHO child growth standard adequately describes the growth pattern of these breastfed Bangladeshi infants and young children. As comparison with this new standard makes clear, the attained size of the cohort of young Bangladeshi children is significantly compromised. **Acknowledgements:** The MINIMat study was funded by ICDDR,B, UNICEF, Sida-SAREC, UK Medical Research Council, Swedish Research Council, DFID, CHNRI, Uppsala University, and USAID. This analysis received additional support from the Fogarty NIH Training Grant (No.5 D 43 TW 001271).

009 (021)

Infant-feeding Practices Predicted Weight Gain but Not Length Gain of Infants and Young Children in Rural Bangladesh

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Background: Appropriate feeding practices during infancy are essential for the optimum growth, development, and survival of infants and children. World Health Organization (WHO) and United Nations Children's Fund (UNICEF) recommend a global strategy for infant and young child feeding for attaining and maintaining proper nutrition and health. **Objective:** To investigate the influence of infant-feeding practices (IFPs) on growth of infants and young children in a rural area of Bangladesh. **Methodology:** In total, 1,243 babies were followed from birth to 24 months of age who were born in the Maternal and Infant Nutrition Intervention in Matlab (MINIMat) study. Infant-feeding scales were created from monthly feeding history from 1 to 12 month(s) of age based on the current WHO/UNICEF infant-feeding recommendations. Weight and length were measured monthly in the first year and quarterly in the second year of life. Anthropometric indices were calculated using the WHO Multi-centre Growth Reference Study child growth standard. Growth trajectories were modelled using a multi-level model for change. A lagged model was used for examining the effects of prior IFPs on later growth. **Results:** The mean birth-weight was 2,697±401 g; 30% weighed <2,500 g. Means of body-weight at 12 months and 24 months were 7.93±1.10 kg and 9.72±1.29 kg respectively. The infant-feeding practices were positively associated ($p<0.05$) with weight gain and weight-for-age z-scores but not with length gain or length-for-age z-scores during 1-24 month(s) of age. Children who were in the 25th percentile of the infant-feeding scales differed ($p<0.05$) in both attained weight and the proportion who were underweight from those who were in the 75th percentile of these scales. **Conclusion:** It is concluded that IFPs were strongly associated with growth in weight but not length in this sample. These findings underscore the importance of following current infant-feeding recommendations to ensure better growth during infancy and early childhood. Growth of this sample remained significantly forfeited even after following current feeding recommendations. **Acknowledgements:** The MINIMat study was funded by ICDDR,B, United Nations Children's Fund, Sida-SAREC, UK Medical Research Council, Swedish Research Council, Department for International Development, UK, Child Health and Nutrition Research Initiative, Uppsala University, and United States Agency for International Development. This analysis received additional support from the Fogarty NIH Training Grant (No. 5 D 43 TW 001271).

010 (136)

Responsive Feeding Intervention in a Rural Bangladesh Community

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Background: Results of observational studies showed that children aged less than 3 years often reject food offered by their mothers despite their malnourished state. This has been related to a maternal style of feeding that is unresponsive to the child's psychomotor abilities and appetite signals. As yet, no intervention to promote responsive feeding has been evaluated. **Objective:** To develop an intervention directed at mothers and children aged 12-24 months and to evaluate the interventions to increase in 2 behaviours, namely child self-feeding and mother's responsiveness, along with the number of mouthfuls eaten and weight gained by the child. **Methodology:** A cluster-randomized field trial was conducted in Gazipur district with 200 mothers and children aged 12-24 months in 36 village clusters. One half received 5-weekly small-group sessions with a peer educator in which mothers encouraged their children to feed themselves a snack and mothers practised responding to the child's signals (intervention group). The other half received several sessions on foods to feed children and deficiency disorders (control). Baseline and post-test observations of a mid-day meal were written in full and later coded for frequencies of mother and child behaviours, mouthfuls eaten, and weight. The study was conducted with Plan International and received scientific and ethical approval from ICDDR,B. **Results:** The control and intervention participants did not differ initially on child's age (means were 17.2 and 17.4 months), weight (means 9.0 and 9.3 kg), self-feeding (means 4.6 and 5.4), mouthfuls eaten (means 13.1 and 13.3), refusals (means 4.1 and 4.4), maternal responsive feeding (means 1.2 and 1.2). Analyses of covariance on post-test outcomes, controlling for the baseline level, examined differences due to the intervention and to child's age (cut at 18 months). The intervention children showed significantly more self-feeding than controls (adjusted means were 8.85 vs 5.31, p=0.006), and more weight (adjusted means were 9.24 vs 9.11, p= 06). However, they did not take more mouthfuls of food, and their mothers were not more responsive. **Conclusion:** The intervention was successful in encouraging more self-feeding among children and more weight gain. However, it was less successful in training mothers how to be more responsive to their child's signals of appetite. **Acknowledgements:** The financial support of the Department for International Development, UK and Plan International is acknowledged.

011 (146)

Validating Family Care Indicators in Bangladesh

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Background: Children's development is partly determined by the quality of stimulation in the home. A working group of United Nations Children's Fund has developed a questionnaire [Family Care Indicators (FCI)] to assess the home environment in large populations. **Objective:** To assess the validity of FCIs and their relationship with child development. **Methodology:** A large nutrition interventional study was conducted on pregnant women in Matlab, Bangladesh. Their offspring were assessed for language comprehension and expression by mothers' report at 12 and 18 months, mental and psychomotor developments using Bayley Scales at 18 months. Caldwell's Home Observation for Measurement of Environment (HOME) and the FCI questionnaire were administered to a sub-sample of mothers of 215 children aged 12 months and 801 aged 18 months. Of these children, 129 were assessed at both the ages. **Results:** The following sub-scales were developed from the FCI and their short-term reliability were moderate to good; reading materials (r=0.997), play materials (r=0.87), play activities (r=0.64), and maternal depression (r=0.51). Reliability over 6 months was moderate for reading materials (r=0.62), play activities (r=0.57), and play materials (r=0.41) and low for depression (r=0.27). The sub-scales were related to several socioeconomic variables, and play materials and play activities were highly related to scores on the HOME. The FCIs were related to the children's mental and motor development and language. The correlations were higher at 18 months than at 12 months. Controlling for social background, gestational age, and birth-weight in multiple regression analyses, FCI's play materials, play activities, possession of magazines, and maternal depression significantly predicted child development, especially the language measures. The children's nutritional status was significantly related to both FCIs and child development. When height-for-age and weight-for-height were controlled for in addition to other socioeconomic variables, the effect of the FCI on child development was reduced. **Conclusion:** The FCI is a valid and reliable measure of the home environment and compares well with the HOME, which is a much longer instrument and is moderately related to child development at 18 months.

Acknowledgements: The financial support of United Nations Children's Fund and logistic support of ICDDR,B in conducting the study is acknowledged.

Day 1: Sunday, 4 March 2007 012 (027)
11:00 am-12:00 noon (Venue: CSD Conference Room)
Scientific Session 3: MDG 5—Improve Maternal Health
Maternal Mortality and Morbidity

Trends and Determinants of Pregnancy-related Mortality in Matlab, Bangladesh

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Background: The Millennium Development Goal 5 (MDG 5) targets reducing maternal mortality by 75% between 1990 and 2015. To monitor progress in achieving this target, there is a need to evaluate existing safe motherhood programmes. **Objective:** To examine the trends and determinants in pregnancy-related mortality in Matlab over 30 years. **Methodology:** Data of the Health and Demographic Surveillance System and special verbal autopsies in the ICDDR,B and government service areas in Matlab were analyzed. The ICDDR,B service area received extensive health and family-planning services since 1977, and in 1987, a skilled birth attendant programme was introduced. The government service area did not receive special services other than those provided by the Government. **Results:** The sample consisted of 215,799 pregnancies and 849 pregnancy-related deaths between 1976 and 2005. In the ICDDR,B service area, pregnancy-related mortality declined from 443 per 100,000 pregnancies in 1976-1980 to 149 in 2001-2005. In the government service area, the corresponding decline was from 497 to 223 per 100,000 pregnancies. This represents a reduction of 66% and 55% in the ICDDR,B and the government service area respectively. Direct obstetric mortality was substantially lower in the ICDDR,B area compared to the government service area (odds ratio [OR]=0.85, 95% confidence interval [CI] 0.74-0.98) but there was no accelerated decline after 1990 in the ICDDR,B service area ($p>0.05$). Abortion-related mortality declined dramatically after 1990 in both the areas. Maternal education was a strong contributor to direct obstetric and abortion mortality. **Conclusion:** The fall in pregnancy-related mortality seen here over 30 years is close to that targeted in the MDG 5. The magnitude of this reduction is remarkable given the low uptake of skilled attendance at birth. Part of the decline is due to a fall in abortion-related mortality, and better access to emergency obstetric care may also have explained some findings. **Acknowledgments:** This research was funded by the Department for International Development, UK. Carine Ronsmans was funded by the Initiative for Maternal Mortality Programme Assessment. The study on verbal autopsy (1990-2001) was funded by the Belgian Directorate General for Development Cooperation.

013 (080)

Early Marriage and Early Childbearing among Women in Rural Bangladesh

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Background: Early marriage and early childbearing remain common, particularly in developing countries. A recent survey on low birth-weight in Bangladesh showed that a large proportion of adolescent girls became pregnant before maturation of their reproductive organs which increase the risks of maternal death and child mortality. **Objective:** To estimate the proportion of women with early marriage (≤18 years) and early childbearing (≤19 years) among rural Bangladeshi women and to explore their relationship with maternal and child nutritional status. **Methodology:** Data on 74,808 rural mothers collected in 2005 by the nationally- and divisionally-representative Nutritional Surveillance Project of Helen Keller International and Institute of Public Health Nutrition, Government of Bangladesh, were analyzed. Anthropometric and sociodemographic information was collected using a pre-coded structured questionnaire. **Results:** The median age at first marriage and first delivery of rural Bangladeshi women was 16 years and 19 years respectively. Most (89.8%) women were married, and 66.8% had their first baby born before the age of 20 years. The median age at marriage and first delivery increased as the household socioeconomic status increased. Among the poorest expenditure quintile, the median age of first delivery was lowest (18 years), while it was highest among the richest quintile (19 years). A higher proportion of women who had first delivery at the age of <20 years was malnourished (body mass index <18.5 kg/m^2: 37.3% vs 31.1%) and had a higher proportion of under-weight and stunted children (46.8% vs 37.7% and 40.2% vs 31.6% respectively) compared to women who gave first birth at the age of ≥20 years. Over the 1967-2005 period, the median age at marriage and delivery gradually increased (15 to17 years and 17 to19 years respectively). **Conclusion:** In rural Bangladesh, the majority of women were married, and a large proportion gave birth during the adolescence period. Adolescent mothers are malnourished, and childbearing in this period is associated with under-weight children. Delaying the age of marriage and delivery and improving pre-pregnancy nutrition are, therefore, important to reduce the burden of high child and maternal mortality and breaking the inter-generational cycle of malnutrition. **Acknowledgements:** The authors acknowledge the Royal Embassy of the Netherlands for funding the Nutritional Surveillance Project.

014 (141)

Chronic Obstetric Morbidities and Validation of Self-reports by Women

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Background: Chronic obstetric morbidities (COM) are long-term sequelae of obstetric origin, which include genital prolapse, genital fistulas, old perineal tears, haemorrhoids, dyspareunia, and urinary incontinence. In most developing countries, the only feasible technique for estimating the prevalence or incidence of obstetric morbidities is by self-reports. Studies report that women may either under- or over-report morbidities. A study conducted by BIRPERHT has shown the prevalence of self-reported COM in Bangladesh, but did not mention anything whether the reports of morbidities were assessed by observation or examination to identify morbidities. **Objective:** To describe the pattern of self-reported COM and validate the accuracy of self-reports. **Methodology:** This cross-sectional study was conducted in the urban slum of Mirpur, Dhaka, Bangladesh. The source population was women whose infants or young children were enrolled in an ongoing study of ICDDR,B. One hundred and ninety-six women who had delivered between 12 and 24 months prior to the date of interview were identified; of these, 183 were examined for confirmation of morbidity status. **Results:** Eighty-nine (48.6%) of the respondents reported at least one COM during the interview. The reported morbidities included genital prolapse (3.8%), old perineal tear (1.6%), stress incontinence (13.7%), and dyspareunia (14.4%). Twenty (14.8%) respondents reported more than one morbidity. The physical examination identified at least one COM in 105 (57.4%) women; these included genital prolapse (12%), old perineal tear (13.7%), stress incontinence (2.7%), dyspareunia (9.8%), and multiple morbidities (19.1%). Genital fistula was neither reported by the respondents nor identified on physical examination. Sensitivity, specificity, positive predictive value, and negative predictive value for COM were 63%, 70%, 74%, and 41% respectively. No significant differences were observed in identifying morbidities by the respondents in relation to their age, education, occupation, socioeconomic status, education of husband, and occupation of husband. The multipara respondents could identify their status of presence of COM significantly more than primipara ($p<0.05$). **Conclusion:** The results suggest that there are substantial amount of COM among the study population. Estimating the prevalence of chronic obstetric morbidities by self-reports is not a reliable method. **Acknowledgements:** The financial support of Swiss Agency for Development and Cooperation is acknowledged.

015 (055)

Postpartum Care in Developing Countries: Low Levels, Late Timing, and Unequal Care Are Contributing to Maternal Mortality

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Background: Maternal mortality continues to be high in many developing countries. Although there is a better understanding of conditions contributing to deaths such as postpartum haemorrhage, which occurs shortly after birth, there is little information on a wide scale about the occurrence and timing of postpartum care. Early postpartum care can help identify and treat some of these major killers. **Objective:** To find out the levels, timing, and determinants of occurrence of postpartum care among women of reproductive age in developing countries. **Methodology:** This study used demographic and health survey data from 30 developing countries for 1999 to 2004. Analyses focused on the postpartum period, i.e. up to 6 weeks after delivery. The study included data on occurrence and timing of postpartum care and selected characteristics of women and their households. **Results:** About one-half of all births in these countries continued to occur outside health institutions, and 7 in 10 of these births did not receive postpartum care. Timing of first care was 2-3 days after birth (% of women cumulative). Women who lived in wealthier households were more likely to receive postpartum care, had received previous antenatal care, were educated beyond primary level, lived in urban areas, and had had more media exposure. Some relationships were less clear or reverse for postpartum care performed by traditional birth attendants or other non-skilled attendants. **Conclusion:** Postpartum care is still scarcely provided, especially where deliveries at home are predominant. Even where available, postpartum care is generally late to prevent deaths from postpartum haemorrhages. Increased and promptly attendance at delivery or within the first few hours—at a health institution or at home—by a trained attendant is advocated to ensure appropriate and timely provision of this important service.

Day 1: Sunday, 4 March 2007 016 (202)
1:30 pm-3:00 pm (Venue: Sasakawa Auditorium)
MDG 4: Reduce Child Motality
Plenary 2

Achieving Millennium Development Goal for Child Survival: What Will It Take to Succeed?

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About 10 million children, aged less than 5 years (under-5 children), including 4 million neonates, die each year throughout the world. The Millennium Development Goal 4 (MDG 4) calls for reduction of mortality of under-5 children by two-thirds between 1990 and 2015. The Lancet child-survival series published in 2003 estimated that 6 of 10 million deaths in under-5 children could be averted each year through universal access to 23 proven interventions. A later Lancet series on newborn survival made similar predictions for reduction of neonatal mortality. However, universal access to proven interventions has yet to be achieved in the countries with the highest burden of child mortality.

The purpose of this paper is to present an assessment of what it will take to achieve the Millennium Development Goal of reducing child mortality. The paper is based on review of both published and unpublished data. It presents an assessment of the current state of coverage with the child-survival interventions, the cost and feasibility of universal coverage in countries with high mortality and limited resources, and the evidence of impact and delineates the factors that are impeding further progress.

Among 60 countries that account for more than 90% of child deaths, only 7 are on target to meet MDG 4. Another 39 countries are making some progress but insufficient to meet MDG for child survival. Finally, 14 countries are cause for serious concerns. An additional US$ 5.1 billion in resources is needed annually to save 6 million lives, which represents US$ 1.23 per capita per year. Lack of effectiveness and cost data are barrier to progress.

Despite difficulties, many resource-poor countries achieved significant improvements in infant and child mortality rates in recent decades. However, the neonatal mortality rates (NMR) stagnated and remained unacceptably high in many of these countries. The neonatal period is increasingly recognized as a brief, critical period requiring focused programmes to reach the MDG 4 goal. However, of 16 identified neonatal interventions, only 3 have effectiveness evidence. Although community-based trials of neonatal interventions have shown to reduce neonatal mortality, the evidence of impact of these interventions from large-scale implementation is absent. As a result, data on the cost of implementing these interventions have also been largely unavailable.

Achieving the MDG for child survival is feasible and affordable. Successful scaling up of proven interventions, including those for the neonates, through the health systems to realize high coverage without losing the quality of the interventions is the most important challenge. The application of built-in operational research, careful monitoring and evaluation, attention to results, and creation of the enabling policy environment are needed to overcome the barriers to successful large-scale implementation. The lack of adequate funds is another challenge that can be a limiting factor in achieving MDG for child survival.

017 (206)

Child Survival: The Bangladesh Perspective

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Background: This year (2007), about 300,000 children aged less than 5 years will die in Bangladesh, of whom about 75% will die within one year of age, and 50% will die in the neonatal period. Most deaths will occur from the poorest families, but the truth is that most of these deaths are preventable with low-cost interventions that are available in the country.

Millennium Development Goal (MDG) 4: MDG 4 targets to reduce under-5 mortality in Bangladesh by two-thirds from 144 per 1,000 livebirths in 1990 to 49 in 2015. The other indicators of MDG 4 are infant mortality rate per 1,000 livebirths and percentage of children aged less than 12 months immunized against measles. Despite the predictions that Bangladesh is on track to achieve the MDG 4 by 2015 when we look at the 19 tracking parameters enumerated at the countdown to the 2015 child-survival conference in London in 2015, there remains little room for complacence.

Methodology: Review of child survival-related literature was done, and collation of information on the tracking parameters in the country was made.

Subject presentation: In this paper, attempts have been made to provide the overview of the status of 19 tracking parameters for Bangladesh, along with the areas of concern, such as under-nutrition, vaccination, prevention, newborn health, and case management. Several recommendations have been made, which should help overcome the gaps.

(1) Exclusive breastfeeding up to 6 months: Data from the Bangladesh Demographic and Health Survey (BDHS) 2004 showed exclusive breastfeeding rate up to 6 months at 44%. The breastfeeding surveillance study by the Institute of Child and Mother Health and funded by the Bangladesh Breastfeeding Foundation (BBF) in 2005 and 2006 showed exclusive breastfeeding rates as 55% and 62% respectively. In 11 National Nutrition Programme upazilas, the BBF observed that the average exclusive breastfeeding rates within 6 months was found at 87%. The breastfeeding programme covering all communities, revising the breast milk substitute marketing code and its compliance by the milk companies, and participation of health professionals in the protection, promotion, and support of breastfeeding should contribute to achieving the MDG 4.

(2) Breastfeeding and appropriate complementary feeding at 6-9 months: Timely complementary feeding is around 60% but whether it is appropriate is questionable, as malnutrition (under-weight and wasting) is almost double in Bangladeshi children after 6 months.

(3) Continued breastfeeding rate at 20-23 months: This is currently 90% and has

an immense potential for Bangladesh. This implies that these children have achieved a feeding practice, which will provide them protection from obesity and potentially chronic disease in the adult and older age. The only proviso is that, by this time (the end of the second year), we have perhaps lost in infant deaths all those children who were not exclusively breastfed and who were given appropriate complementary feeding at the right time.

II. Vaccination

(4) Measles immunization coverage: The coverage of measles immunization is 81%.

(5) DPT3 coverage: The coverage of DPT3 is 88%.

(6) Hib immunization coverage: Vaccine for Hib is not included in EPI in Bangladesh but it needs to be because a recent study concludes, "Hib is the most predominant cause of meningitis in young Bangladeshi children. Resistance to ampicillin and chloramphenicol and the high cost of third-generation cephalosporin highlight the importance of disease prevention through vaccination against Hib."

III. Prevention

(7) Vitamin A supplementation coverage with at least one dose in the last 6 months: The coverage of 6-monthly vitamin A in rural Bangladesh is 81%.

(8) Access to safe drinking-water: Currently, 72% of the rural and 82% of the urban people have sustainable access to an improved water source—arsenic is posing a threat to 45-50 million people across the country.

(9) Access to sanitation facilities: Currently, 29% of the rural and 56% of the urban people have access to improved sanitation.

(10) Use of an insecticide-treated net for prevention of malaria: Around 10 million people live in malaria-endemic areas in Bangladesh.

IV. Newborns

(11) Skilled attendance at delivery: Currently, it is only 13%. The Government has given up TBA training, although new work from a neighbouring country is showing reduced mortality because of trained TBAs.

(12) Tetanus toxoid protection at birth: 98% of children born in 2000-2005 were protected against tetanus by vaccination of their mothers with tetanus toxoid.

(13) Timely initiation of breastfeeding (within 1 hour): This only happens in 24% of newborns in the country, whereas just this intervention alone in 99% of mothers will bring down neonatal morality by 32%.

(14) Postnatal visit within 3 days after delivery: It happens in only 12% for newborns.

(15) Prevention of parent-to-child transmission (PTCT) of HIV: 11,000 people are estimated to be living with HIV, and 7.1% of injecting drug users (IDUs) are HIV-positive with great danger of spread to the general population. No studies have yet been undertaken on PTCT.

V. Case management

(16) Care-seeking for pneumonia: 20% at health facilities/doctors, 18% at pharmacies, and 25% from traditional healers.

(17) Antibiotic treatment of pneumonia: No accurate community data on this, but an-

tibiotic use is rampant with no rationale.

(18) Oral rehydration therapy and continued feeding received: 83% of under-5 children with diarrhoea received oral rehydration fluid of some sort, and 63% received the same or more food than usual.

(19) Anti-malarial treatment: Increasing chloroquine resistance is seen.

Other concerns: Besides the above, there are other areas of concern; for example, 60% of infants die in the newborn period; 50% of newborn deaths occur on the first day; 80% of deaths occur in the first week. However, very little has been done to address these potentially-preventable deaths within the present healthcare system. Other areas of concern are availability of negligible numbers of skilled birth attendants, exclusive breastfeeding rates, postnatal visit rates, threats of the HIV/AIDS epidemic, and the slow progress in scaling up of nutrition activities with poor sense of programme direction.

Recommendations: I recommend that a task force be immediately formed to provide guidance and tract progress of the child-survival programmes. The National Steering Committee on IMCI should incorporate the missing child-survival programmes, e.g. infant and young child feeding (IYCF), injury-prevention programmes, and others within its activities as necessary and then coordinate, supervise, and monitor the programmes. I also recommend that optimal breastfeeding and complementary feeding should be taken as the gold standard programme intervention for child survival as these will contribute beyond child survival by preventing many life-time morbidities and deaths from diet-related chronic diseases.

Day 1: Sunday, 4 March 2007 018 (078)
3:30 pm-5:00 pm (Venue: Sasakawa Auditorium)
Scientific Session 4: MDG 4—Reduce Child Mortality
Child Health and Survival: Assessment of Disease Burden

Invasive Pneumococcal Disease Burden, Seasonality, and Antimicrobial Resistance Patterns and Implications for Vaccine Policy in Urban Bangladesh

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Background: Pneumonia is the leading cause of childhood death in Bangladesh; the contribution of invasive pneumococcal disease (IPD) to this burden is unknown. **Objective:** To determine the incidence of IPD, circulating serotypes, and antimicrobial resistance patterns by undertaking an active surveillance among children aged less than 5 years **Methodology:** Approximately, 5,000 children in Kamalapur, an urban slum of Dhaka, were selected by stratified cluster-randomization. Weekly visits were conducted to screen for signs associated with IPD. Children with suspected IPD had blood cultures done and data collected in cliniC. Blood culture was done with a BACTEC apparatus, and all isolates were serotyped and checked for antimicrobial resistance patterns. **Results:** During 1 April 2004–31 March 2006, 3,840 cases of clinical pneumonia were found during 7,600.2 child-years of observation (incidence 510 episodes/1,000 child-years) and 5 cases of meningitis (incidence 0.7 e/1,000 child-years). There were 33 pneumococcal isolates associated with 7 cases of pneumonia (21%), 21 cases (64%) of upper respiratory infection, and 5 (15%) with febrile syndromes. The total IPD and 13-valent serotype-related IPD incidences were 4.3 e/1000 child-years and 2.5 e/1000 child-years respectively. 9- and 13-valent pneumococcal vaccines would cover 56.2% and 59.4% of all IPD. The peak incidence of IPD occurred during peak pneumonia seasons. Penicillin, co-trimoxazole, chloramphenicol, and ciprofloxacin resistance was 3.0%, 84.8%, 15.2%, and 24.1% respectively. **Conclusion**: IPD is a substantial contributor to total childhood and burden of pneumonia in urban Bangladesh. Current conjugate vaccines formulations could substantially reduce childhood pneumonia. **Acknowledgements:** The support of the PneumoADIP Project, Johns Hopkins University, and ICDDR,B is acknowledged.

019 (079)

Influenza Burden, Seasonality, and Serotype Distribution Patterns, and Implications for Pneumonia Control Policies in Urban Bangladesh

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Background: Pneumonia is the leading cause of death among children aged less than 5 years in Bangladesh and is a major cause of morbidity, particularly in urban areas. The contribution of influenza virus to this disease burden is unknown. **Objective:** To determine the incidence, circulating types, and clinical presentation of influenza virus in the Kamalapur urban fieldsite of ICDDR,B through an active surveillance among children aged less than 5 years. **Methodology:** Approximately, 5,000 children in Kamalapur, an urban slum of Dhaka, were selected by stratified cluster randomization. Weekly visits were conducted to screen for signs associated with febrile and respiratory illnesses. Children meeting standardized criteria for fever, upper or lower respiratory tract infections, had blood cultures, and one in 5 had a nasopharyngeal wash for tissue-culture isolation of influenza virus collected in cliniC. The nasal wash was inoculated into a monolayer MDCK cell line and incubated at 33 oC for up to 5 days and checked for cytopathic effect (CPE). If CPE was observed, the tissue-culture supernatant was tested by haemagglutination inhibition (HI)—the standard WHO-kit, and the haemagglutination (HA) titre and haemagglutination inhibition (HAI) titre compared to reference antigens in the kit. Virus typing was based on the HAI titre. **Results:** During 1 April 2004–31 October 2006, 4,984 cases of clinical pneumonia were found during 8,858.2 child-years of observation (incidence 562.6 episodes per 1,000 child-years). There were 146 influenza isolates for an incidence of 82.4 episodes per 1,000 child-years. Influenza was isolated each month, with two distinct seasonal peaks—one pre-monsoon with influenza A H3N2 and the other during the monsoon with influenza A H1N1. Influenza B Hong Kong circulates in March-September, whereas Influenza B Shanghai circulates year-round. Clinically, 28% of the isolates were associated with pneumonia, 58% with upper respiratory infection, and 5% with otitis media. **Conclusion:** Influenza is a substantial contributor to total childhood and pneumonia burden, including severe pneumonia, in urban Bangladesh. Year-round circulation increases the opportunity for recombination with influenza viruses, including avian influenza. **Acknowledgements**: The support of Centers for Disease Control and Prevention via Cooperative Agreement, Department of Health and Human Services, USA, is acknowledged.

020 (103)

Aetiology of Community-acquired Neonatal Infections in Bangladesh

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Background: An estimated 36% of 4 million annual neonatal deaths are due to serious infections, and 50-70% occur in the first week of life. **Objective:** To detect bacterial aetiology causing neonatal sepsis in a rural community of Bangladesh. **Methodology:** A prospective, population-based sepsis surveillance was conducted in a rural community of 146,000 in Mirzapur sub-district, Bangladesh. The community health workers (CHWs), each of whom covered a population of approximately 4,000, provided antenatal health education in the home regarding essential newborn care, including recognition of danger signs and care-seeking by families for neonatal illness. The CHWs also visited the home on postnatal day 0, 3, 6, and 9 and used an algorithm adapted from Integrated Management of Childhood Illness (IMCI) to identify sick newborns and refer them for tertiary-level care to the Kumudini Hospital. A microbiology laboratory was established at the Kumudini Hospital, and newborns with suspected sepsis were cultured on arrival. **Results:** Of 5,093 infants enrolled during February 2004–September 2005, 20% (n=1,043) were referred by the CHWs or self-referred for suspected serious neonatal illness, Ten percent (n=496) were admitted, and 6% (n=312) had blood cultures done for suspected sepsis. A pathogen was isolated from 18 blood cultures (6% of cultures done), 8 (44%) in the early neonatal period [0-6 day(s)], and 4 (22%) from the very early neonatal period [0-3 day(s)]. The most common isolates were *Staphylococcus aureus* (n=9), *Klebsiella pneumoniae* (n=2), and *Pseudomonas aeruginosa* (n=2). Skin infection was prominent in 4 (22%) of these neonates, and another had omphalitis. **Conclusion:** The population-based surveillance in a poor rural community of Bangladesh showed that *S. aureus* was the major pathogen in cases of community-acquired sepsis. The viral aetiology of suspected sepsis cases is now being investigated. The aim is to identify previously-undetected bacterial genome in preserved specimens and to investigate whether the same organisms that cause skin infections also resulted in sepsis. **Acknowledgements:** The support of the Wellcome Trust–Burroughs Wellcome Fund, UK, United States Agency for International Development, and Department for International Development, UK, is acknowledged.

021 (107)

A Community-based Surveillance to Estimate Burden of Typhoid Fever in Rural Bangladeshi Children

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Background: Results of several recent studies suggest that typhoid fever is common among pre-school children, and the resistance among *Salmonella* Typhi isolates to commonly-used antibiotics has been increasing. **Objective:** To measure the rate of incidence of typhoid fever in Bangladeshi children, aged less than 5 years (under-5 children), at the community level and to monitor the antibiotic resistance patterns of *S.* Typhi strains. **Methodology:** Data for this study were drawn from a community-based surveillance of under-5 children from a rural community of Mirzapur sub-district of Tangail, Bangladesh. During 12 November 2005–29 September 2006, trained village health workers visited ~13,000 under-5 children in the study area once a week to detect febrile cases. Children with reported fever and a recorded body temperature of 38 0C or higher were referred to the Kumudini Hospital, Mirzapur, where the study physicians assessed them and obtained blood samples from them with recorded body temperature of 38 ^{0}C or higher. Children with blood culture-positive *S.* Typhi were treated with first-line antibiotics (co-trimoxazole, amoxicillin, or chloramphenicol). **Results:** Assuming weekly visits as equivalent to 7 days of observation, there were 9,673 child-years of observation. Blood culture of 2,218 febrile episodes grew *S.* Typhi in 19 (0.85%) cases. Of these, 3 (16%) were in children aged 12-23 months, 5 (26%), in children aged 24-35 months, 5 (26%) in children aged 36-47 months, and 6 (32%) in children aged 48-59 months. The rate of incidence of typhoid fever per 100,000 child-years of observation was 156, 246, 246, and 292 at ages 12-23 months, 24-35 months, 36-47 months, and 48-59 months respectively. Eight of the 19 *S.* Typhi isolates (42%) were resistant to co-trimoxazole, amoxicillin, and chloramphenicol, while 9 (47.3%) were resistant to nalidixic acid, and one (5.2%) was resistant to ciprofloxacin. **Conclusion:** Typhoid is a common and significant cause of morbidity in children aged 1-4 year(s). This study highlights the need for a typhoid vaccine to be introduced in the routine infant immunization schedule that would be affordable and effective in pre-school children.

Acknowledgements: The financial support of the United States Agency for International Development /National Vaccine Programme Office is acknowledged.

022 (170)

Application of Real-time PCR for Diagnosis of *Shigella* from Diarrhoeal Patients in Bangladesh

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Background: Bacillary dysentery caused by *Shigella* species is a serious public-health problem in both developing and industrialized countries, outbreaks due to *Shigella*-associated infection are difficult to control because of their low infectious dose. *Shigella* spp. are exquisitely fastidious Gram-negative organisms which can easily escape detection by the traditional culture methods. **Objective:** To determine the actual burden of *Shigella*–associated infection using real-time PCR for the detection of *Shigella* in stool samples from diarrhoeal patients in Bangladesh and to compare results with the conventional PCR and traditional culture method. **Methodology:** In total, 317 stool samples were collected from patients with acute diarrhoea attending the Dhaka Hospital of ICDDR,B during March-October 2005. The stool samples were analyzed to detect the invasion plasmid antigen H gene (*ipa*H) by real-time PCR and conventional PCR and were compared with the culture method. **Results:** In the 317 stool specimens, 20 (6.3%) *Shigella* strains were isolated and identified by the traditional culture method. Using conventional PCR, 79 (25%) samples were identified as positive for *Shigella* confirmed by the presence of *ipa*H gene, of which 60 (19%) were culture-negative. In the case of real-time PCR, 109 (34.4%) samples were detected as positive for *Shigella*, of which only 20 (6.3%) and 77 (24.3%) samples were previously detected as positive by traditional culture and conventional PCR respectively. The number of PCR cycles for real-time PCR assay was highest (the mean number of cycles to detection, 32.2) for culture and conventional PCR-negative diarrhoeal specimens to detect the PCR product and was lowest for culture-positive diarrhoeal specimens (the mean number of cycles, 24.9) ($p<0.001$). **Conclusion:** The culture-based identification of *Shigella* in diarrhoeal patients may underestimate the actual burden of *Shigella*-associated infection in Bangladesh and in other parts of the world, and introduction of the real-time PCR technique in the identification scheme can improve this estimation significantly. **Acknowledgements:** The study was funded in part by Bill and Melinda Gates Foundation-Government of Bangladesh Fund of ICDDR,B.

023 (179)

Human Metapneumovirus Infection among Children in Kamalapur, an Urban Slum in Dhaka: A Pilot Study

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Background: Pneumonia is a leading cause of child mortality in the impoverished urban settings. The contribution of viral infection is unknown, but is likely under-estimated. Human metapneumovirus (HMPV), the newest member of the family Paramyxoviridae, has been described elsewhere, but not in Bangladesh, as a cause of respiratory infection in all ages. **Objective:** To determine whether HMPV was a major cause of febrile and respiratory illness among children in Kamalapur, where there are high rates of pneumonia and febrile illnesses. **Methodology:** Samples from stored sera collected during the active dengue surveillance in Kamalapur from 2001 to 2002 were retrospectively selected. Specimens were selected to test for respiratory viruses if fever was ≥38.5 °C, cough >one day but ≤4 days, age <13 years, and paired serum samples that tested negative for dengue by MAC ELISA. Sera were sent to the Centers for Disease Control and Prevention for testing by haemagglutination inhibition for influenza and enzyme immunoassay for respiratory syncytial virus, para-influenza type 1, 2, and 3, adenovirus, and HMPV. A positive acute HMPV infection was defined as a 4-fold or greater rise in titre between acute and convalescent sera. **Results:** Of 107 paired sera tested, 60 (56.1%) showed acute viral infections, of which 20 (33.3%) were HMPV, the largest single group after influenza (although more than either influenza A or B alone). HMPV was detected from January to end-June. No demographic differences between children with acute HMPV infection and non-infected children were found. However, acute HMPV infection was 3.5 times more likely (95% confidence interval [CI] 1.02-11.24) to be associated clinical pneumonia in all children, and 4.8 times more likely (95% CI 0.90-23.86) to be associated with altered mental status in children aged less than 5 years than was non-HMPV infection. **Conclusion:** HMPV is associated with substantial febrile and respiratory disease and appears to contribute to the burden of pneumonia in these urban children. These pilot data suggest that HMPU occurs during the pneumonia peak season. However, a longitudinal surveillance is needed to better assess its epidemiology. **Acknowledgements:** The support of the National Institutes of Health (ICIDR Fund), Bethesda, MD, USA, Centers for Disease Control and Prevention via Cooperative Agreement, Department of Health and Human Services, USA, and ICDDR,B is acknowledged.

Day 1: Sunday, 4 March 2007 024 (044)
3:30 pm-5:00 pm (Venue: Seminar Room)
Scientific Session 5: MDG 1—Eradicate Extreme Poverty and Hunger
Programmes and Interventions

Experience in Changing Behaviour for Improved Nutrition of Young Children Aged Less than 2 Years in Selected Urban Slums of Bangladesh

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Background: Appropriate feeding contributes directly to achievement of Millennium Development Goal (MDG) 1 (eradicate extreme poverty and hunger) and MDG 4 (reduce child mortality). In Bangladesh, inappropriate infant and young child-feeding practices are among the most serious obstacles to maintaining adequate nutritional status and contribute to levels of malnutrition that are amongst the highest in the world. Malnutrition is responsible, directly or indirectly, for about half of deaths that occur annually among children aged less than 5 years in Bangladesh, and most of these deaths can be prevented by appropriate feeding practices. **Objective:** To improve infant and young child-feeding and care practices of mothers/caretakers of children aged less than 2 years in selected urban slums of Bangladesh. **Methodology:** Community nutrition promoters (CNPs) targeted all children aged less than 2 years for growth monitoring and promotion (GMP), which was used for demonstrating to mothers how correct feeding and childcare practices can impact on the child's nutritional status over time. Particular attention was given on the "Nutritional Negotiation" process between CNP and mothers. The key behaviours and messages to be conveyed were based on formative research, and, where necessary, focus-group discussions (FGDs) were conducted to identify barriers to the adoption of key behaviours. **Results:** An increase in the number of children enrolled for GMP sessions was seen. A higher proportion of mothers could interpret the growth curve and initiate action on the basis of growth curve findings; of 2,504 mothers, 92-94% understood the reason why their children required to attend SFP (supplementary feeding programme). Early graduation from SFP and lower relapse rate after graduation from SFP were observed. Improvement in duration of exclusive breastfeeding, complementary feeding, and nutritional status was observed. When necessary, mother/caretaker was advised to seek care from an appropriate healthcare provider. **Conclusion:** Nutrition counselling targeted through growth monitoring for the promotion of child growth is a cornerstone of any effort to reduce and prevent childhood malnutrition. In most families, moderate malnutrition can be eliminated or controlled through simple changes in dietary and food-hygiene practices that are amenable to change through behaviour change for infants/young children.

025 (057)

Fifteen-year Trends in Under-nutrition among Bangladeshi Children: Substantial Inter-regional, Socioeconomic and Gender Differences

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Background: Both in number and proportions, the burden of under-nutrition is much higher in South Asia compared to Africa and other regions of the world and Bangladesh is one of the worst-off countries in this regard. **Objective:** To determine the trends in under-nutrition among Bangladeshi children, to explore reduction rates, and to identify areas that need emphasis for achieving the Millennium Development Goals (MDGs). **Methodology:** Nationally-representative data on rural Bangladeshi children, aged 0-59 months (n=909,178), collected by the Nutritional Surveillance Project (NSP) of Helen Keller International, in collaboration with the Institute of Public Health Nutrition, Government of Bangladesh, during 1990-2005, were analyzed. Ethical clearance was granted by Bangladesh Medical Research Council. Results: During 1990-2005, the prevalence of under-weight reduced by 25.2 percentage-points (from 70.9% to 45.7%, p<0.001) and stunting by 29.1 percentage-points (from 68.3% to 39.2%, p<0.001). The rates of reduction were 1.7% and 1.9% per year for under-weight and stunting respectively. During the 15-year period, the mean weight-for-age z-score and height-for-age z-score increased from -2.4 to -1.8 and -2.5 to -1.7 respectively (p<0.001, for both). When the national reduction rates in under-nutrition were disaggregated, it was apparent that Barisal and Rajshahi divisions had the slowest reduction. Moreover, girls and children aged less than 2 years continued to carry the heaviest burden of malnutrition. During 1998-2005, while the prevalence of under-weight was reduced by 14.2% in the poorest expenditure quintile, the reduction was greater among children in the wealthiest quintile (18.1%) (p<0.001). This highlights the inequality in reduction as the gap between the poorest and the wealthiest is widening in terms of undernutrition rates. **Conclusion:** Although the trends in under-nutrition showed a steady decline, the current prevalence of under-weight is still well above the threshold of 'very high' prevalence. There are differences in reduction rates across regions, income-groups, age, and gender. Efforts to achieve the MDGs by the Government of Bangladesh and its many partners, should include extension of the coverage of proven essential nutrition actions to reduce hunger and prevent under-nutrition in priority regions and vulnerable groups of the population. Acknowledgements: The financial support of the Royal Embassy of the Netherlands is acknowledged.

026 (059)

Attribution of Malnutrition to Specific Diarrhoeal Illness: Evidence from a Prospective Study on Pre-school Children in Mirpur, Dhaka, Bangladesh

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Background: The bi-directional association between malnutrition and diarrhoeal morbidity has been recognized for decades. However, it is unclear whether malnutrition-attributed diarrhoeal illness is enetropathogen-specific or not. Determining whether the malnutrition-related risk of diarrhoeal illness varies for different enteric pathogens has implications for the implementation and evaluation of programmes designed to improve child health from diarrhoeal diseases. If malnutrition does not increase the risk of diarrhoea from all causes equally, intervention programmes that improve nutritional status may not have the same potential for reducing children's diarrhoeal morbidity in areas with different diarrhoeal disease profiles. **Objective:** To investigate whether the malnutrition-attributed risk for diarrhoeal diseases is or is not equal for all diarrhoeagenic enteropathogens. **Methodology:** Subjects of the present study were 289 pre-school children from Mirpur, an urban slum in Dhaka. Trained research assistants measured weight and height of the children at baseline and at a 4-monthly interval for 3 years. Diarrhoeal stool specimens were collected during acute diarrhoeal episodes and were examined for common pathogenic bacteria, viruses, and protozoa. Relative risk and attributable risk were calculated by Confidence interval analysis (version 2.0.0) and Win Episcope software. **Results:** All children contributed 299,616 person-days. However, *Escherichia coli* and viruses were studied for the first 141,601 person-days. The incidence rates of diarrhoea (episode/100 child-year) were *Campylobacter jejuni* (3.05), Plesiomonas shigelloides (4.39), *Shigella flexneri* (4.14.), *Aeromonas* sp. (10.11), *Aeromonas hydrophilia* (2.44), A. sobria (2.44), *A. caviae* (2.56), enterotoxigenic *E. coli* (ETEC) (2.31), rotavirus (1.34), *Entamoeba histolytica* (8.41), *Cryprosporidium* (9.14), and *Giardia* (12.06). Relative risk for diarrhoeal illness was significantly higher in malnourished children, particularly for ETEC, *E. histolytica*, and *Cryptosporidium*. Average (95% confidence interval) malnutrition-attributed risks were 40% (3-70%) for ETEC, 25% (6-44%) for *E. histolytica*, and 20% (3-38%) for *Cryptosporidium* species. Malnutrition-attributed risk for rotavius and Giardia was, respectively, 23% (-14% to 58%) and 14% (-2% to 30%). The attributed risk among malnourished children for ETEC, *E. histolytica*, and *Cryptosporidium* was, respectively, 63%, 47%, and 40%. **Conclusion:** Malnutrition-attributed risk is not equal for enteric pathogens associated with diarrhoeal illness. Malnutrition particularly increases the risk for diarrhoea caused by ETEC, *E. histolytica*, and *Cryptosporidium*.
Acknowledgements: The work was supported by Public Health Service Grant No. AI-043956 and No. U54 AI57168 from the National Institute of Allergy and Infectious Diseases, National Institutes of Health, USA.

027 (065)

Scouts in Promoting Community Health and Nutrition

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Background: Behaviour change communication (BCC), through young people, plays a definite role as the young people can promote better health and nutrition at school and family and in the community through the child-to-child and child-to-community approach. **Objective:** To evaluate the contribution of scouts to improving community health and nutrition through the child-to-child and child-to-community approach. **Methodology:** This intervention study was designed as the prospective and experimental one. Scouts and non-scout students were involved in disseminating related message and demonstrating skills to improve the nutritional knowledge and skills in the intervention group. The control group, having a similar background, was not exposed to scout intervention. However, they might be exposed to the routine message of the Government, NGOs, and other private or informal sources. The young people carried follow-up activities after 3 months, and data were collected after 6 months of the intervention. **Results:** A significant improvement relating to mothers' knowledge on infant feeding, benefit of foetal health, level of malnutrition, and feeding habits of pregnant women was registered among the intervention group ($p<0.001$). The related changes among the control group were insignificant. The practice of child-feeding, caring practices relating to the last child, and healthy practice of pregnant mothers during their last pregnancy were significant in the intervention group. The majority (56%) of the respondents among the intervention group preferred to receive health and nutrition information through scouts. Conclusion: The scouts and non-scout young people made significant changes in promoting community nutrition through the child-to-child and child-to-community approach. This approach deserves more attention in promoting better health and nutrition in the community.
Acknowledgements: The financial support of the Ministry of Science, Information and Communication Technology, Government of Bangladesh, in conducting the study is acknowledged.

028 (069)

Household Food Security Initiative: A Solution for Sustainable Improved Nutritional Status among Bangladeshi Children in Urban Slums

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Background: Concern Worldwide Bangladesh has implemented different approaches, such as supplementary feeding programme and behaviour change activities, for addressing malnutrition among children, aged less than 5 years, of extremely poor families living in selected urban slums. Based on experiences, the household food security initiative was introduced in Dhaka project site to bring sustainable changes in the nutritional status of children. Despite having adequate knowledge on nutrition, low purchasing power, and food behaviour were identified as key factors for household food insecurity in the target areas. **Objective:** To improve dietary practices and sustain improved nutritional status of children, aged less than 5 years, of extreme poor families through improving family-income and access into local economic resources. **Methodology:** The project organized entrepreneurial skills development and special skills development training and provided loan through microfinance initiative, partnering with two local non-governmental organizations. Nutrition counselling and home-economics planning sessions were also organized at the community level. In the first year of the programme, 140 extremely poor families with women and children suffering from different grades of malnutrition were registered; observation is completed up to the first 6 months. The major indicators were changes in nutritional status in children, aged less than 5 years, and mothers, dietary diversification at the individual (<2 years old children) and household levels, income change, and expenditure on food and healthcare. **Results:** Data compared with baseline from mid-term showed that the mean change in the nutritional status positive (z-score: 0.1-0.9) in 5 children aged less than 5 years. However, the nutritional status of women remained unchanged. The dietary diversity score changed both at individual (from 2.02 to 2.57) and at household level (from 4.13 to 5.32). The total kcal intake also increased in children (from 484 to 811 in children aged less than 2 years and from 711 to 1,150 in 5 children aged less than 5 years) and in adults (from 1,660 to 2,191). The programme participants showed 23% positive change in the income status. Although expenditure on food increased (from Tk 1,536 to 1,808), that for healthcare remained almost unchanged. **Conclusion:** Household food security initiative is a key element in bringing sustainable improvement in the nutrition status of children. An effective nutrition programme should include household food-security component for prolonged and sustainable impact. **Acknowledgements:** The support of Rural Advancement Non-government Organization and Association for Socio Economic Advancement of Bangladesh is acknowledged.

029 (133)

Poverty Alleviation through ICT: The Bangladesh Perspective

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Background: Of all the Millennium Development Goals, halving poverty by 2015 is the most important and challenging one. This challenging job can be done quite successfully if the information and communication technology (ICT) can be integrated in the Government and civil society initiatives towards alleviating poverty. This paper discusses the significance of ICT revolution in the context of reducing poverty in Bangladesh. **Objective:** To find out various measures towards alleviating poverty in Bangladesh through applying the tools and techniques of ICT efficiently. **Methodology:** Primary data were collected through interviewing 53 ICT consultants, poverty specialists, university teachers, and development practitioners using a structured questionnaire. Moreover, a significant amount of data was collected from different books, journals, newspaper articles, and Internet. **Results:** Some important ways in which ICT can be used for alleviating poverty in Bangladesh are: (a) Farmers and small businessmen can have information about market prices and competition through radio, TV, phones, and websites. In this way, they can take more informed decisions about which markets to sell to, avoiding middlemen, or they can have more bargaining power if they ultimately sell their goods to these middlemen; (b) Different rules and regulations of doing business and the overall investment climate in Bangladesh can be easily presented in an accessible format through websites. Therefore, business confidence will be increased, and it will pave the way for more investment (both local and foreign), leading towards an increased level of employment. It will surely have a positive impact on poverty; (c) People can have information about employment opportunities abroad through the Internet. This will lead towards reduction in domestic unemployment and help earning of foreign currency; (d) Using the facilities of telemedicine, rural patients and village doctors can consult with specialist doctors in cities. This may ensure the improved health services to the poverty-stricken rural people living. Moreover, information about health hazards, hygiene, nutrition, etc. can also be disseminated through radio, TV, and websites; and (e) No poverty-alleviation strategy can be successful without ensuring quality education for the poor and marginalised people. To reach standard education to every nook and corner of the country, the ICT can play an important role. Using the virtual education system, the poor will be able to get world-class education with minimum cost. The distance-learning approach can also be useful in this regard. **Conclusion:** In this age of ICT, concerted efforts are needed from the Government, NGOs, and all concerned for the investigation, design, and implementation of necessary measures towards alleviating intense poverty in Bangladesh through the use of ICT.

Day 1: Sunday, 4 March 2007 030 (060)
3:30 pm-5:00 pm (Venue: CSD Conference Room)
Scientific Session 6: MDG 6—Combat HIV/AIDS, Malaria and Other Diseases
Infectious Diseases

Association of Common Enteric Protozoan Parasites with Acute Diarrhoeal Illness: A Prospective Case-Control Study

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Background: *Entamoeba histolytica*, *Giardia intestinalis*, and *Cryptosporidium* species are common intestinal protozoan parasites associated with diarrhoeal disease. Diagnosis of these parasites has historically been performed by microscopy, but unlike parasite antigen detection or PCR, microscopy is unable to distinguish the invasive parasite *E. histolytica* from the commensal parasites, such as *E. dispar* and *E. moshmovskii*. Microscopy is also less sensitive for detection of *G. intestinalis* and *Cryptosordium* species, and highly-sensitive antigen detection tests have additionally been developed for diagnosis of these pathogens. A case-control study was conducted to understand the association of these parasites with diarrhoeal disease using the antigen detection tests of these parasites. **Objective:** To investigate the association of common enteric protozoan parasites with diarrhoeal disease in all ages, using antigen detection tests as a diagnostic tool. **Methodology:** The present study is a prospective unmatched case-control study. In total, 3,646 acute diarrhoeal patients from the hospital surveillance system of the Dhaka Hospital of ICDDR,B and 2,575 healthy controls from the Bangabandhu Sheikh Mujib Medical University, of all ages, were enrolled from May 2004 to April 2006 in this study. Stool samples from patients and controls were examined by commercially-available antigen detection kits from TechLab, Inc., Blacksburg, Virginia. Comparison between proportions was carried out by chi-square test with Fisher's exact correction. Results: E. histolytica and *Cryptosporidium* were significantly more prevalent in patients with acute diarrhoea than controls (2.1% vs 1.4%, p=0.039 for E. histolytica and 2.8% vs 1.9%, p=0.027 for *Cryptosporidium*). Interestingly, the prevalence of *G. intestinalis* was significantly higher in controls than inpatients with acute diarrhoea 17.1% vs 5.6%, p<0.0001. The prevalence of *E. histolytica* was significantly higher in patients than in controls only for the 0-12-month age-group (2.3% in patients vs 0.4% in controls, p=0.016). Similarly, *Cryptosporidium* was also significantly more common in acute diarrhoeal patients than in controls for the 0-12-month age-group. Infection rates by *G. intestinalis* did not differ significantly between patients and control in infants. None of these 3 enteric protozoan parasites showed any association with gender of patient. Isolation rates of all 3 enteric protozoa were less from January to March. **Conclusion:** *E. histolytica* and *Cryptosporidium*, but not G. intestinalis, are associated with diarrhoeal illness in younger children. **Acknowledgements:** The work was supported by the Public Health Service Grant No. AI-056872 from the National Institute of Allergy and Infectious Diseases, National Institutes of Health, USA.

031 (073)

Effect of Zinc Supplementation on Stool Loss and Biochemical Changes of Trace Elements during Persistent Diarrhoea

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Background: The efficacy of diet and zinc supplementation has proven beyond doubt in the management of malnourished children with persistent diarrhoea. The amount of loss of other trace elements in persistent diarrhoea or the effect of zinc on their biochemical changes has not been reported. **Objective:** To estimate the effect of zinc supplementation on loss and biochemical changes of dietary trace elements, such as zinc, copper, iron, and magnesium, during persistent diarrhoea. **Methodology:** A randomized, double-blind, placebo-controlled trial was conducted at the Dhaka Hospital of ICDDR,B. Fifty-two moderately-malnourished male children, aged 6-24 months, with persistent diarrhoea were supplemented with 20-mg elemental zinc per day for 2 weeks. Children were randomly allocated to 3 groups: (a) rice-based diet + zinc, (b) chicken diet + zinc, and (c) rice-based diet + placebo. Concentrations of zinc, iron, copper, and magnesium were analyzed in serum and stool by an atomic absorption spectrophometer. The paired t-test was done on admission and after 14 days of supplementation. The Ethical Review Committee of ICCDR,B approved the study. **Results:** Endogenous loss of zinc in stool was 84% lower from admission to post-supplementation at day 15 in zinc-supplemented children receiving rice-based diet, while it was 71% lower among children receiving chicken-based diet with zinc. Exogenous loss of zinc in stool was 88% lower from admission to day 15 during convalescence in supplemented children receiving rice- based diet with zinc, while it was 79% lower in chicken-diet with the zinc group. The loss of copper and magnesium was not different on admission and after discharge among the groups. Concentrations of zinc in serum increased 92% more among children receiving rice-based diet with zinc (0.73 to 1.04 mg/mL, p=0.01) and 27% more among children receiving chicken-diet with zinc (0.71 to 0.90 mg/mL, p=0.02) during convalescence. Ferritin level improved by 22% more in rice-based diet with the zinc group (18.16 to 22.25 mg/L, p=0.03) and 11% more in chicken-diet with the zinc group (8.0 to 9.0 mg/L, p=0.01). Concentrations of magnesium in serum increased in children receiving chicken-diet with zinc (21.99 to 23.69 mg/L, p=0.04), while it was not different in other 2 groups during convalescence. **Conclusion:** Supplementation of zinc reduced the endogenous and exogenous loss of zinc and improved serum zinc, ferritin, and magnesium level during convalescence in patients with persistent diarrhoea. **Acknowledgements:** The financial support of the United States Agency for International Development and ICDDR,B is acknowledged.

032 (097)

Therapeutic Failures of Imported *Plasmodium falciparum* Infections in Kuwait: Role of 'Sentinel' Immigrant Population Groups

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Background: Although there is no transmission of malaria in Kuwait, imported malaria infection poses a great concern for health authorities as the majority of its expatriate population makes up to 41% of the total population. They come from areas where malaria is endemic. Each year >800 malaria cases are detected among >500,000 immigrants who enter Kuwait to work or to reside. **Objective:** To detect therapeutic failures of imported *Plasmodium falciparum*-associated infections in Kuwait in different migrant population groups. **Methodology:** The malaria cases were studied between January 2003 and July 2005. The malaria cases were diagnosed by examining 5% Giemsa-stained blood films at the Malaria Laboratory, Medical Centre for Labour Examination, Ministry of Health and at the Mubarek Al-Kabeer Teaching Hospital, Faculty of Medicine, Kuwait University. The micro in-vitro drug sensitivity tests of *P. falciparum* isolates for chloroquine and mefloquine were done on pre-dosed plates from WHO following standard procedures. **Results:** The majority of the immigrants came from the Asian countries, i.e. India, Pakistan, Sri Lanka, and Bangladesh. In all, 278 (26%) of 1,055 *P. falciparum* isolates were successfully cultured—143 isolates for chloroquine sensitivity and 135 for mefloquine sensitivity. Eighty-three of the 143 isolates (58%) were resistant to chloroquine, MIC >0.8 x10-6 mol/litre of blood, and 13 isolates of 135 (10%) were resistant to mefloquine, MIC >6.4 x10-6 mol/litre of blood. All mefloquine-resistant isolates detected were also resistant to chloroquine. 74% of the drug-resistant isolates were detected among immigrants from the Asian countries. The majority of malaria cases were detected among migrants from India, Sri Lanka, Bangladash, and Pakistan. The individuals from these countries form the major bulk (>45%) of the total expatriate population in Kuwait. Egyptians form the biggest immigrant group (>20%) in Kuwait; however, less than 0.5% of malaria cases were seen among Egyptians, and no drug-resistant isolate was detected. Indian immigrants form the second biggest group (>19%), followed by Bangladesh, Sri Lanka (>10% each), and Pakistan (>8%). **Conclusion:** This study is expected to form 'sentinel' population of different immigrant population groups in Kuwait for the surveillance of drug-resistant *falciparum* malaria in their respective home countries and, thus, help formulate anti-malarial drug policy for immigrants to avoid therapeutic failures. **Acknowledgements:** The financial support of the Kuwait University (MI 109) is acknowledged.

033 (122)

Risk of *Giardia*-associated Infection at Early Childhood Centres in New Zealand

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Background: The prevalence of giardiasis among children attending early childhood education centres (ECECs) is between 6% and 20% in developed countries. One-quarter remains asymptomatic and becomes potential sources of infection in the community. The true prevalence of giardiasis among children attending the ECECs has not been studied in New Zealand to date. **Objective:** To document the rate of prevalence of giardiasis among children aged less than 5 years attending the ECECs and to identify the modifiable risk factors of the disease. **Methodology:** This cross-sectional study collected stool specimens from 526 children, selected from 44 ECECs in Auckland, to test for Giardia-associated infection. Information on exposures was documented. Based on their infection status, the study subjects were grouped into cases and non-cases to calculate the potential modifiable risk factors of the disease. **Results:** Children attending the ECECs in West Auckland had a significantly higher risk of infection compared to other regions in Auckland. Rates of infection increased with age, and the risk significantly increased among Maori children compared to others. Rates of infection varied inversely with the socioeconomic status (SES) of parents/caregivers. Risk of infection also increased significantly for children with unemployed parents/caregivers compared to employed parents/caregivers. A direct and significant association was observed with the number of household members and with children who had contact with other infected cases at home. Over 90% of cases was asymptomatic. No co-relationship was observed with drinking-water or animal contacts. **Conclusion:** A high rates of infection among Maori has highlighted an increased burden of disease among this group which has been under-estimated in previous surveillance data. Quantification of household size as a risk factor for infection for children attending the ECECs is a new finding in New Zealand. A high proportion of asymptomatic cases may be a persistent source of infection in the community. Further research was advocated to understand the dynamics of the disease and to formulate better methods of control. **Acknowledgements:** The study was funded by the Health Research Council of New Zealand.

034 (149)

Pre-core/Core Promoter Mutant Hepatitis B Virus Produces More Severe Histologic Liver Disease than Wild-type Hepatitis B Virus

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Background: Viral hepatitis is commonly encountered in Bangladesh occurring sporadically round the year. Hepatits B virus (HBV) is quite common here. Patients with acute viral B hepatitis, chronic viral B hepatitis, HBV-related cirrhosis of liver and its complications, and hepatocellular carcinoma due to HBV are frequently encountered in clinical practice. It has been estimated that HBV is responsible for 10-35% of acute viral hepatitis cases, 35.7% of acute liver failure cases, 33.3-40.5% of chronic hepatitis cases, and 46.8% of hepatocellular carcinoma cases in Bangladesh. **Objective:** To compare Knodell and HAI scores in patients with wild-type and pre-core/core promoter mutant CHB to see if there is any difference in the severity of liver injury between these 2 types of HBV. **Methodology:** Percutaneous liver biopsies of 155 CHB patients were done. Of them, 102 (65.8%) were infected with wild-type HBV, and the remaining 53 (34.2%) were infected with pre-core/core promoter mutant CHB. **Results:** Eleven (20.8%) of the 53 patients with pre-core/core promoter mutant CHB had moderate to severe CH (HAI score 8-18). In contrast, moderate to severe CH was observed in 19 (18.6%) of 102 patients with wild-type CHB. The fibrosis score was >2 in 15 (28.3%) of 53 pre-core/core promoter mutant CHB opposed to 20 (19.6%) of the 102 patients with wild-type CHB. **Conclusion:** The study has shown that pre-core/core promoter mutant HBV produces more severe histologic liver disease compared to wild-type HBV.

035 (192)

Ecology and Molecular Traits of *Vibrio cholerae* Serogroup O1 and O139 Causing Cholera in Coastal Villages of Bay of Bengal

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Background: Since *Vibrio cholerae* O139 first appeared in 1992, both O1 El Tor and O139 have been recognized as the epidemic serogroups, although their endemicity, geographic distribution, molecular traits, and reservoir are not fully understood. **Objective:** To understand the endemicity, ecology, and molecular traits of *V. cholerae* causing cholera in the coastal villages of Bay of Bengal. **Methodology:** Rectal swabs from presumptive cholera patients were transported in Cary-Blair medium for enrichment culture. Water and plankton samples, collected from 7 ponds and 1 river in Bakerganj, and from 6 ponds in Mathbaria, were analyzed employing direct and enrichment culture, colony blot hybridization, and DFA methods. *V. cholerae* O1 and O139 strains were subjected to genetic screening targeting 11 clusters of virulence and related genes by simplex and multiplex-PCR, sequencing and analysis of ctxB subunit, and finally by pulsed-field gel electrophoresis (PFGE). **Results:** Updated data (January 2004–October 2006) showed that cholera was endemic in both areas and that *V. cholerae* causing cholera was autochthonous to the aquatic environments and survived forming biofilms. Serogroups of *V. cholerae* were isolated and detected from aquatic environments of both the areas; however, noteworthy was the higher frequency of isolation of O139 in Mathbaria, where seasonal cholera was caused mostly by O1. Although cholera in Bakerganj was solely due to O1, O139 initiated a significant outbreak in Mathbaria in March 2005. In April 2005, O1 initiated cholera in Mathbaria and continued by subsiding O139. All *V. cholerae* O1 strains were El Tor but possessed classical ctx and that all were homogenous, irrespective of source and origin, in virulence and related gene profiles. PFGE showed environmental O1 to be diverse clonally, whereas the clinical O1 strains were homogenous. *V. cholerae* O139 strains were homogenous in virulence and related gene profiles and also phylogenetically. **Conclusion:** *V. cholerae*, causing endemic cholera in Bakerganj and Mathbaria, is an environmental bacterium. Although O1 El Tor and O139 co-exist in the coastal aquatic environments, appearance of El Tor or O139 in seasonal cholera varies between seasons/months and also regionally. Although O1 El Tor existing in the aquatic environments is diverse clonally, what determines a clone in an epidemic is yet to be unveiled. In situ evidence showed that biofilm and viable but non-culturable state constitute most important sessile part *V. cholerae* in aquatic environments. **Acknowledgements:** This research was funded by the National Institutes of Health, Research Grant No. AI39129, under sub-agreement between the Johns Hopkins Bloomberg School of Public Health and ICDDR,B. The authors gratefully acknowledge the donors to ICDDR,B for their support and commitment to Centre's research efforts.

Day 2: Monday, 5 March 2007 036 (208)
9:00 am-10:30 am (Venue: Sasakawa Auditorium)
MDG 5: Improve Maternal Health
Plenary 3

MDG 5: Achievements and Challenges in Bangladesh

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The Millennium Development Goal (MDG) 5—Improve Maternal Health—includes the global target 6 stated as: reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio. The two indicators for this goal—indicator 16 and 17—include maternal mortality ratio and proportion of births attended by skilled health personnel.

To achieve the MDG 5, Bangladesh must reduce maternal mortality from 574 deaths per 100,000 livebirths in 1990 to 143 by 2015; the Bangladesh Maternal Health Strategy 2001, articulated as national goals, which is related to this goal includes: to increase the proportion of births attended by skilled personnel to 50% and to reduce the total fertility rate to 2.2 per woman by 2010.

In addition to the above, the target for Bangladesh is reproductive health services for all as this is closely linked with maternal mortality and morbidity. The indicators for reproductive health are maternal malnutrition and median age at marriage. The target is to reduce maternal malnutrition from 45% in 2000 to less than 20% by 2015 and to increase the median age of girls at first marriage from 18 years to 20 years.

Each year, more than 98% of more than half a million women, who die during pregnancy, childbirth, or during the immediate postpartum period, are from developing countries. The highest proportion of the burden of women's ill health is related to their reproductive role.

Universal access to reproductive healthcare, including family planning, care in pregnancy during and after childbirth, and emergency obstetric care, would reduce unwanted pregnancy, unsafe abortion and maternal death, saving lives, and lives of their children. Promotion of delayed marriage reducess the risks associated with too-early childbearing. Enabling women to have fewer pregnancies reduces the lifetime risk of maternal death and illness. Women's empowerment will enable women to address the social conditions that endanger their health and lives.

The situation analysis reflects that nearly half of adolescent girls aged 15-19 years are married, 57% of them become mothers before the age of 19 years, and half of these adolescent mothers are acutely malnourished. Thus, the maternal mortality rate among mothers is 30-50% higher than the national rate.

Considering births attended by skilled health personnel, the situation in Bangladesh reflects that the percentage has increased from 5% in 1990 to 12% in 2000. Although the Government has initiated skilled birth attendant training, it will take time to meet the need to the country as the majority of

pregnant women still do not receive such services. The total fertility rate in Bangladesh has declined significantly—from 6.6 in the 1970s to 3 in 2004 with some urban-rural variations. Due to a very high adolescence fertility, despite the rates of high contraceptive prevalence, the total fertility rate has remained in plateau.

There are multiple challenges to attain the targets for the MDG 5 which include—reducing the total fertility rates. To further reduce the total fertility rate, studies must be conducted to analyze the causes of its current stagnation. Advocacy programmes must be introduced on population stabilization.

Achieving reduction in the maternal mortality ratio to 143 per 100,000 livebirths by 2015 may require increasing access to quality health facilities through public, private and NGO initiatives, specifically targeting the poor for reproductive health interventions. As maternal mortality and morbidity is highest in the lower-income groups, increasing financial investments in the health sector, including skills development, is essential.

To meet the challenges for rapidly increasing the proportion of births attended by skilled health personnel, there must be a rapid increase in the rate of growth of births attended by skilled health personnel. Increasing the median age at marriage of girls by 2 years can significantly lower adolescence fertility, reduce the maternal mortality rate, slow the rate of population growth, and improve the nutritional level of young mothers and children. This can be achieved by providing greater access to higher education for adolescent girls through scholarship and stipend programmes. Such interventions must by accompanied by advocacy and awareness-raising campaigns on safe motherhood to promote changes in attitudinal and cultural behaviour.

Violence against women is a major concern for health, productivity, dignity, and maternal mortality in Bangladesh. It is estimated that 14% of maternal deaths are caused by violence. Inclusion of this indicator when monitoring the MDGs will help raise awareness of this national problem. It will also promote quantitative methods of monitoring the progress towards the elimination of violence against women.

We cannot achieve these targets without discourse to sexual and reproductive healthcare and promoting rights and gender perspective for providing reproductive services to all by 2015.

037 (205)

The *Lancet* Maternal Survival Series Advocates Key Strategic Choices by Power Structure

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The five papers that make up the series address the deaths of pregnant and recently pregnant women, who die from causes related to their pregnancy. The publications reveal that only a few key strategic choices need to be made by those with the real power to act—the politicians, donors, UN agencies, and professional bodies—to save the lives of the 529,000 women who die during pregnancy or childbirth each year.

Day 2: Monday, 5 March 2007 038 (087)
11:00 am-12:00 noon (Venue: Sasakawa Auditorium)
Scientific Session 7: MDG-4—Reduce Child Mortality
Child Health and Survival: Risk Factors

Episodes of Pneumonia Was Increasingly Associated with Bronchial Asthma Symptoms in 5-year-old Rural Bangladeshi Children

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Background: Although atopy is one of the strongest predisposing factors of asthma, respiratory infections, such as respiratory syncitial virus (RSV), and rhino virus infections also contribute to the development of asthma. Recently, the number of children who recover from pneumonia is increasing in Bangladesh due to the improvement in treatment. However, the effect of these infections on the development of asthma is still unclear. **Objective:** To examine the effect of lower respiratory tract infections on symptoms of asthma in 5-year-old rural Bangladeshi children. **Methodology:** All 1,705 children, who lived in randomly-selected 51 of 67 villages in Matlab, Chandpur, were included in the study. Data for episodes of pneumonia and diarrhoea since birth were obtained from the records maintained by ICDDR,B. Symptoms of asthma were defined as in the questionnaire of International Study of Asthma and Allergies in Childhood (ISAAC). Information about socioenvironmental factors was also recorded. A sub-sample of 219 children who reported wheezing during the previous 12 months identified by the ISAAC questionnaire and 183 randomly-selected children who did not was tested for additional total serum and specific IgEs and helminthic infections. **Results:** The risk for current wheezing among the 1,580 participants was associated with history of pneumonia at the age of 0-3 year(s) with odds ratios (ORs) per 1 episode, 1.50 [95% confidence interval [CI] 1.05-2.12], 1.60 (95% CI 1.08-2.39), 2.93 (95% CI 1.82-4.72), and 3.58 (95% CI 1.53-8.36) respectively. The ORs were adjusted for gender, parental asthma, and use of dry leaves as fuel. The ORs per episode of pneumonia at the age of 0-2 year(s) among the sub-population were 1.67 (95% CI 1.17-2.39), 1.82 (95% CI 1.22-2.70), and 3.09 (95% CI 1.50-6.34) respectively, with the additional adjustment for IgEs and helminthic infection. **Conclusion:** Childhood pneumonia may explain the increasing prevalence of asthma symptoms among rural children. Prevention of pneumonia would be important. **Acknowledgements:** The financial support of Nissan Science Foundation, Japan, and Heiwa Nakajima Foundation, Japan, is acknowledged.

039 (092)

Risk Factor for Mortality in Severely-malnourished Children with Diarrhoea

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Background: Severely-malnourished children with diarrhoea have high rates of mortality. Only a few case-control studies examined the possible risk factors for diarrhoeal deaths in children aged less than 3 years in developing countries. **Objective:** To identify the risk factors for mortality in severely-malnourished children hospitalized with diarrhoea. **Methodology:** A case-control study was conducted during January 1997–December 1997 among children admitted to the Dhaka Hospital of ICDDR,B. One hundred and three severely-malnourished (weight-for-age <60% of the National Center for Health Statistics standard) hospitalized children aged less than 3 years were selected as cases, and an equal number of hospitalized children who survived was selected as controls. Patients with dehydration were treated with oral rehydration solution and intravenous fluid. Patients with complications, such as electrolyte imbalance, hypoglycaemia, lower respiratory-tract infection, severe protein-energy malnutrition, or septicaemia were admitted to the inpatient wards. A routine check-up was performed on all patients admitted to the inpatients ward, which included a systemic physical examination by a doctor who assessed the status of dehydration and recorded all clinical signs and major complications, made diagnosis, and advised investigations and treatment. A pre-coded questionnaire was used for recording relevant information from hospital records. Appropriate statistical analyses were done. **Results:** The baseline characteristics of cases and controls were comparable, except for age (p=0.05). The mean ages of cases and controls were 6 and 8 months respectively. Dehydration was significantly more among the cases than among the controls (p=0.03). Hyponatraemia (p=0.05), low TCO2 level (p=0.02), hypoglycaemia (p=0.01), leukocytosis (p=0.01), bands (p<0.05), presence of pathogens in blood (p=0.03), clinical pneumonia (p=0.01), clinical septicaemia (p=0.01), low-to-imperceptible pulse volume (p=0.01), hypothermia <36 °C (p=0.01), clinically-diagnosed severe anaemia (p=0.01), and duration of hospitalization (p=0.01) were significantly different between the 2 groups. Children with bronchopneumonia (p=0.01), marasmic-kwashiorkor (p=0.02), and low-to-imperceptible pulse (p<0.01) had a higher risk of mortality. Patients with leukocytosis (>15,000/cmm) and hypoglycaemia had 2.5 and 4 times higher risk of death respectively (p=0.01). **Conclusion:** The risk factors identified in this study can be used as a prognostic guide by physicians treating patients with diarrhoea and severe malnutrition. **Acknowledgements:** The technical support of ICDDR,B is acknowledged.

040 (110)

Effect of Arsenic Exposure during Pregnancy on Cognitive Development of Infants in Rural Bangladesh

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Background: Chronic exposures to arsenic-contaminated drinking-water are reported to cause adverse neurological effects in children and poor pregnancy-outcomes in exposed mothers. No information is available about intrauterine-exposure to arsenic on cognitive development of infants. **Objective:** To assess the association between intrauterine arsenic exposure and mental and motor development of infants. **Methodology:** A longitudinal observational study was conducted on a sub-sample of 1,510 pregnant mothers from a large ongoing experiment in Matlab, Bangladesh. Arsenic concentrations of all functioning tubewells in this region ranged from <1 to 3,644 µg/L with 70% exceeding the World Health Organization cut-off of 10 µg/L and 63% exceeding the national cut-off of 50 µg/L for Bangladesh. Drinking-water consumed by the mothers during their pregnancy was assessed for arsenic concentration using atomic absorption spectroscopy. Two problem-solving tests (PST)—support and cover—were used for assessing the cognitive function of infants, and Bayley Scales of Infant Development-II was used for measuring their motor development at 7 months of age. A detailed questionnaire concerning socioeconomic and anthropometric measurements of mother-infant pairs were available from the database of the main study. Arsenic levels of water were categorized under 3 groups: <10 µg/L (Group 1), 10-50 µg/L (Group 2), and >50 µg/L (Group 3) for one-way analysis of variance. **Results**: The mean scores for the support and cover tests were 11.96±7.5 and 13.63±6.7 for group 1, 11.68±7.3 and 13.43±6.6 for group 2, and 10.6±7.6 and 12.623±7.1 for group 3 respectively ($p<0.002$ for both the tests). Using the water-arsenic level as a continuum and adjusting for all available sociodemographic covariates, the negative effect of arsenic remained significant for both the problem-solving tests—support ($p=0.008$) and cover ($p=0.035$). Data showed a significant overall linear trend for both cover ($p<0.007$) and support tests ($p<0.002$) with declining scores from the lowest to the highest exposed group. No effect on motor development of infants was observed. **Conclusion:** The results indicated a statistically significant lower neurobehavioural scores in infants with higher exposure in a dose-response fashion, suggesting that intrauterine exposure of arsenic might produce a detrimental effect during early neural development of the foetuses. However, its clinical importance and long-term implications need to be determined. **Acknowledgements:** The MINIMat study was funded by ICDDR,B, UNICEF, Sida-SAREC, Medical Research Council of UK, Swedish Research Council, DFID, UK, Child Health Nutrition Research Initiative, Uppsala University, and USAID.

041 (164)

Pattern of Gestational Weight Gain and Birth-weight in Rural Bangladesh

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Background: The pattern and total amount of gestational weight gain (GWG) have been reported to be important in predicting birth-weight (BW), but little is known about this in populations where total GWG is relatively low. **Objective:** To examine the pattern and total GWG in relation to BW and the prevalence of low BW. **Methodology:** Data on GWG were analyzed from 904 women who participated in a food and micronutrient supplementation trial in rural Bangladesh and delivered in the clinic for immediate determination of BW. Total GWG and that in 3 intervals (9-19 weeks, 20-30 weeks, and 30-week delivery were calculated. GWG above the median for the particular interval was defined as adequate. **Results:** The mean GWG was 7.2±3.1 kg (mean±SD), and BW was 2,744±376 g. After adjusting for potential confounding factors, adequate weight gain in the 3 intervals was associated with respectively 63 ($p<0.01$), 67 ($p<0.01$, and 131 ($p<0.01$) g higher BW than inadequate gain at these times. Adequate GWG in all intervals was associated with the highest and inadequate GWG in all three intervals with the lowest BW (2886±421g vs 2565±420 g, $p<0.01$). Regardless of the adequacy of GWG in earlier periods, adequate GWG in the last interval was associated with higher BW and a lower proportion of low BW infants than inadequate GWG at this time. **Conclusion:** Even in circumstances in which total GWG is relatively low, adequate GWG after 30 weeks gestational age is not only associated with an increase in BW but also with a substantial reduction in low BW. **Acknowledgements:** DSA was supported by Fogarty training Grant No. D43 TW001271 to KMR, and data-collection was supported by United Nations Children's Fund and other donors.

Day 2: Monday, 5 March 2007 042 (036)
11:00 am-12:00 noon (Venue: Seminar Room)
Scientific Session 8: MDG 5—Improve Maternal Health
Determinants and Use of Maternal Health Services

Care-seeking for Maternal Complications in Sylhet District, Bangladesh

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Background: Maternal morbidity and mortality remain high in Bangladesh, where use of medically-trained providers at birth is low (13%). To achieve the Millennium Development Goal 5 (MDG 5), it is necessary to understand women's perceptions of complications and care-seeking behaviours. **Objective:** To explore care-seeking patterns for complications perceived to be serious by women in 3 sub-districts in Sylhet, Bangladesh. **Methodology:** Semi-structured interviews were conducted with 24 recently-delivered women in 2005. Care-seeking patterns elicited from these interviews were further explored in a cross-sectional quantitative survey with 1,490 women with a live or stillbirth 2 to 16 weeks of the interview. Qualitative data were analyzed through manual coding and constant comparative analysis, while quantitative data were analyzed by cross-tabulations for care-seeking patterns adjusted for clustering. Ethical approval was granted by Johns Hopkins University and ICDDR,B. **Results:** Four distinct care-seeking patterns emerged from the qualitative interviews: (a) receiving traditional remedies, (b) purchasing treatment to be administered at home, (c) bringing a provider to the home, and (d) seeking care in a facility or provider's office/home. In the quantitative survey, 769 women reported at least one 'serious' complication. Most (86%) of these women reported seeking treatment or care, with 28% seeking multiple sources of care. The majority (68%) brought treatment to the home, such as tablet/capsule (66%), homeopathic remedies (10%), and saline injections (10%). Twenty percent brought a provider to the home, mostly village doctors (36%). One-third of the women sought care outside the home (30%), with about half (56%) going to a medically-trained provider. **Conclusion:** The majority of care takes place inside the home, even for complications perceived to be serious. These findings have important implications for safe motherhood programmes. Local definitions of care-seeking differ considerably from definitions used by programmes, making it difficult to plan interventions that promote care-seeking and to accurately measure the impact of these interventions. These definitions need to be incorporated in the design of household surveys to track progress towards achieving the MDG 5 and taken into account in the de-

sign of interventions to promote care-seeking. **Acknowledgements:** The Projahnmo Project was funded by the United Stages Agency for International Development's Global Health Bureau and Bangladesh Mission and by the Saving Newborn Lives Initiative of Save the Children Fund-USA, through a grant from the Bill and Melinda Gates Foundation. Funding for the maternal morbidity sub-study of the Projahnmo Project was made possible through support provided by the Office of Health, Infectious Diseases, and Nutrition, Global Health Bureau, USAIDS, under the terms of Award No. GHS-A-00-03-00019-00, Global Research Activity Cooperative Agreement.

043 (115)

Use Patterns of Maternal Healthcare Services and Their Sociodemographic Determinants: Evidence from 2 NGO Service Areas in Bangladesh

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Background: Bangladesh is committed to achieving the Millennium Development Goals (MDGs). Among them, the MDG 5 is important for maternal health that clearly specifies a 75% reduction of maternal mortality rate by 2015 from 1990. To achieve this goal, the target is to increase the use of skilled birth attendants from 14% in 2004 to 50% by 2010. Hence, there is a need to better understand the use patterns for maternal healthcare services and their determinants. **Objective:** To explore the use patterns of maternal healthcare services and their sociodemographic determinants in 2 NGO service areas of Bangladesh. **Methodology:** A cross-sectional community survey was conducted in 10 districts of Bangladesh during February-April 2006 among women who delivered within the last one year. A 2-stage cluster-sampling methodology was followed to locate women. An asset approach was followed to measure the socioeconomic status. Cross-tabulations and logistic regression were used for analysis. **Results:** In total, 2,164 women were interviewed; of them, 35.1% delivered their last child with a skilled birth attendant, 22.8% delivered in the health facilities, and population-based caesarean section rates were 10.8%. Untrained TBAs were present during 54.1% of deliveries and trained TBAs in 10.2% of deliveries, while presence of relatives was almost universal (82.9%). Of those who delivered at facilities, the majority went to private facilities (12.9%), while 9.1% delivered in the government facilities, and only 0.8% delivered in the NGO facilities. Of all the caesarean sections, 72.5% took place at the for-profit private facilities, 14.5% in the government facilities, and 3% in the NGO facilities. Results of logistic regression analysis showed that high-parity and lower age-group women were less likely to use facility-based delivery services. Another important finding was that women with low educational level, those residing in remote and rural areas, and those with lower socio-economic status were less likely to use facility-based delivery services. **Conclusion:** The target for the MDG 5 is achievable but inequity in use of maternal healthcare services is a persistent concern. Demand-side interventions are recommended to ensure equity. The private sector is becoming the prime caregivers for maternal health, especially for caesarean sections. Hence, there is a need to monitor their performance. **Acknowledgements:** The financial support of the United States Agency for International Development, Dhaka, is acknowledged.

044 (129)

Sociodemographic Determinants of Induced Abortions in Matlab, Bangladesh

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Background: About 46 million women induce abortions each year. Of these abortions, about 20 millions are unsafe and, subsequently, may contribute to maternal morbidity and mortality. **Objective:** To evaluate the sociodemographic indicators of induced abortions, including seasonal variations, in Matlab, Bangladesh. **Methodology:** Pregnancies were identified through the Health and Demographic Surveillance System (HDSS) in Matlab, Bangladesh, during 1990-2000. The HDDS is divided into 2 areas: an ICDDR,B service area with intensive maternal and family-planning services and a government service area where women receive services from the government facilities similar to other parts of the country. Pregnancy-outcome data, including induced abortions, were collected by monthly household-visits of community health workers. In total, 44,191 pregnancies had sociodemographic information, i.e. education of women, asset score in quintiles, age, gravidity, area of service received, seasonality, and year of outcome. The association between induced abortion and covariate was determined by bivariate analysis and multiple logistic regression models. **Results:** Overall, the proportion of induced abortions was 40 per 1,000 pregnancies. There was a significant increasing trend of induced abortions over the years ($p<0.05$). In an adjusted analysis, gravidity, education, asset quintiles, and the season were associated with higher frequency of abortions. **Conclusion**: The occurrence of induced abortions differs between social strata, and this needs to be considered when improving family-planning services. **Acknowledgements:** This study was funded by ICDDR,B and its donors who provide unrestricted support to the Centre.

045 (183)

Referral Behaviour during Pregnancy Care

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Background: Linking household and community clinic-based pregnancy care with referral hospital-based obstetric services is complicated by many factors, including communication gaps and varied expectations of service providers and service users. **Objective:** To compare the attitudes and actions of compliers and non-compliers with referral advice to assess the impact of integrated community and hospital services. **Methodology:** The study identified patients referred to a hospital—either LAMB or the closest one—from antenatal or perinatal community pregnancy-care sites in 11 LAMB target unions in North-West Bangladesh in late 2006 and early 2007. A random selection of these patients were asked to complete mixed qualitative and quantitative doer/non-doer and satisfaction surveys. Results were compiled and analyzed using simple Excel spreadsheets and framework analysis. **Results:** Respondents (n=126, 25% non-doer) reported some predictable reasons for not following referral advice, such as cost factors, or decision-makers being absent. However, high trust in referral services being available influenced referral patients to attend hospitals. Related to previous research about folk spiritual concerns relating to health, a sense of positive power at work reduced fear of hospitals. **Conclusion:** Health personnel often emphasize patient satisfaction with services as the most important determining factor in health-seeking behaviour, but this study revealed more complex factors. Mechanisms to address these factors require targeted adaptation of clinical and social messages. **Acknowledgements:** The previous research by Dr. Summer Williams and K.L.P. relating to folk spiritual beliefs guided development of some survey questions is acknowledged.

Day 2: Monday, 5 March 2007 046 (048)
11:00 am-12:00 noon (CSD Conference Room)
Scientific Session 9: MDG 3—Promote Gender Equality and Empowerment of Women

Communication and Negotiation Around First Conception and Contraceptive Use in Rural Bangladesh

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Background: Plateauing of contraceptive prevalence and total fertility rates in Bangladesh has posed a major challenge for population and development. Delaying first conception is important in addressing the issue. A large proportion of females in Bangladesh marries in adolescence. Thus, delaying first conception bears as well major public-health implications for both mother and child. Literature on Bangladesh suggests a context where young brides are pressurized to conceive immediately after marriage. Lack of couple communication is another potential barrier in delaying first conception. **Objective:** To explore: the experiences of rural women in communicating and negotiating first conception and contraceptive use; who desire a delay or the reverse and why; and who is the final decision-maker. **Methodology:** Data came from a qualitative study conducted by ICDDR,B in rural Matlab and Mirzapur. Data were collected during December 2004–September 2005. This analysis includes 60 in-depth interviews with young women married less than 5 years. Data were coded using Atlas/ti. SPSS was used for generating descriptive statistics. **Results:** In most (84%) cases, there was some discussion about timing of first conception and contraception (76%). However, the nature of communication varied considerably from genuine discussion to threat and abuse. Contrary to the general notion, genuine discussion took place in 61% of the cases. Husbands and mothers-in-law were most frequently mentioned as desiring first conception to take place within a year. Women (40%) themselves were most frequently mentioned as desiring delayed first conception. Regardless of whether or what discussion took place, mostly the final decision-maker was the husband. Interestingly, in 5 cases, the women made the final decision. Whether consistently or not, contraception was used before first conception in more than 50% of the cases. **Conclusion:** There is a variation in the experience of women in communicating and negotiating first conception and contraceptive use and the outcome of such communication. Genuine discussion is taking place in many cases. Women are active agents of change. Men are at times partners in this change. Male involvement needs to be increased for bringing forth greater positive change in this area. **Acknowledgements:** The financial and technical support of the International Center for Research on Women, USA, is acknowledged.

047 (049)

Dowry and Spousal Physical Violence against Women in Bangladesh: Is Payment and/or Patriarchy the Main Issue?

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Background: Studies in South Asia found a positive association between dowry and physical abuse of wives. Some researchers contend that it is linked to perceived inadequacy of dowry. Others argue that women who bring a dowry feel more entitled and are more assertive and, thus, provoke a violent response. In stark contrast to these stands the bequest theory according to which dowry enhances welfare of women. **Objective:** To explore whether payment issues or presence of dowry demand reflecting patriarchal attitudes at the family level lies at the core of the positive relationship between dowry and wife abuse. **Methodology:** Data came from a population-based survey of women of reproductive age conducted by ICDDR,B-Naripokkho in urban and rural Bangladesh as part of the WHO multi-country study on women's health and domestic violence against women. All ever-married women covered by the survey (n=2,702) conducted in 2001 under this study were included in the current analysis. The association between physical abuse of wife (i.e. lifetime physical violence, frequency, and severity of it) and absence/presence of dowry demand and the level compliance to dowry demand was explored using logistic regression models. **Results:** Regression results showed that, in rural area, the likelihood of violence was low in absence of dowry demand in marriage. In both the sites, women married without dowry demand were less frequently abused compared to women who fulfilled dowry demands. In the rural area, the likelihood of experiencing severe physical violence was less when dowry was not demanded in marriage. **Conclusion:** The existing literature shows that perceived inadequacy of dowry can lead to violence The findings of this study demonstrate that dowry demand reflecting patriarchal attitude at the family level is a better predictor of abuse of wife compared to payment of dowry. These results also refute the bequest theory in the context of Bangladesh demonstrating that dowry does not enhance bridal welfare.

048 (061)

Do Women Really Condone Wife-beating?

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Background: While violence against women by husbands and male partners occurs throughout the world, the proportions of women who report experiencing such violence and the proportions of men and women who say it is sometimes justified vary substantially among societies and sub-populations—or, more precisely, the proportions who say so in surveys vary. The purpose of this study was to provide a stronger empirical basis for refining interventions already being undertaken by Bangladeshi NGOs and advocacy groups and for developing additional strategies to address the problem of gender-based violence. The study is part of a larger collaborative research project addressing gender inequality and women's empowerment and health, which has been ongoing since 1991, a partnership between the Academy for Educational Development's Empowerment of Women Research Program and a team of Bangladeshi researchers. **Objective:** To explore the psycho-social underpinnings of survey results indicating that an extremely high proportion (84%) of women believe that it is acceptable for their husbands to use violence against them under various circumstances. **Methodology:** The researchers conducted structured surveys with 1,212 married women and 320 men in 2002 in villages where the research team has been working since 1991. The surveys included a module on intimate partner violence (IPV). The qualitative data on IPV consisted of 110 in-depth interviews (3 with men and 107 with women) and 16 small group discussions (13 married women, 1 school girl, 1 each of both woman and man, and 1 man). The interviews explored the social and economic processes underlying early marriage, gender inequality, and IPV. **Results:** The results of the survey suggest that gender-based violence (GBV) is widely condoned, but qualitative data provide evidence that many women feel that it is wrong and should be punished. Women in the study who had resigned themselves to accept GBV nonetheless saw it as a violation of their human rights. The authors' survey was intended to elicit individual attitudes, but the qualitative findings suggest that, when women responded to structured survey questions, they may have been expressing their perceptions of prevailing norms rather than articulating their own attitudes. **Conclusion:** The findings raise questions regarding the meaning of responses to commonly-used questions intended to measure attitudes of women regarding GBV. The high percentage of women in the authors' survey who reported being subjected to GBV, women's openness to engage in group discussions about it, their strong sense that such violence is wrong, and their conviction that perpetrators should be punished, suggests that anti-violence interventions would be well-received in these communities.
Acknowledgements: The authors thank and acknowledge the United States Agency for International Development, Bangladesh, for funding this research under Associate Award No. 338-A-00-00133-00 to the Academy for Educational Development, and for the additional financial support provided by the William and Flora Hewlett Foundation, the Summit Foundation, the Moriah Fund, and the Bureau for Global Health Interagency Gender Working Group.

049 (157)

Increasing Effect of Gender Preference on Fertility

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Background: Couples in Bangladesh have a strong son preference. With the rise of family planning, fertility reduction of women who have only daughters is ever more lagging behind, although there are no indications of sex-selective induced abortions yet. The latter may increase the maternal risk if they come within reach of pregnant women, while higher fertility is both a maternal risk and a cause of poverty. **Objective:** To determine the changes in the effect of gender preference on fertility as a result of rising rates of contraceptive prevalence during the eighties, nineties, and the present decennium. **Methodology:** Earlier studies have shown that, in the nineties, women with only daughters had a greater chance of having at least one additional livebirth than women with at least one son. This study tests the hypothesis that this difference between fertility of women with only daughters and women with at least one son tends to increase over time as a result of a more-widespread use of contraception. It looks at women from the rural ICDDR,B demographic surveillance sites, with 2 or 3 children in 1983 (9,905), 1995 (15,685), and 2001 (19,967) and determines the proportions that have another child within the next 4 years, depending on the sex distribution of their children. Special attention has been given to possible consequences of this trend. **Results:** Over time, with a rise in contraceptive use, the fertility of women with only daughters has increased considerably in relation to the fertility of women with at least one son. This phenomenon was found in the areas both with relatively high and relatively low fertility. This indicates a strong preference of couples to have at least one son. As ways to determine the sex of unborn children become cheaper and more widely available, this may cause women with only daughters to choose for, or be pressured by in-laws to undergo, abortion if their pregnancy will result in another daughter. This practice is already widespread in many states of neighbouring India. As the determination of the sex of the unborn child will often only be made after the period in which menstrual regulation is allowed, this may result in more illegal abortions, which have a much higher risk of maternal morbidity and mortality. **Conclusion:** Son preference should be discouraged through education and mass media and through strict maintenance of the prohibition on dowry payments. **Acknowledgements:** The ICDDR,B demographic surveillance sites are supported through ICDDR,B core funds by the Department for International Development of the United Kingdom, and, previously, by United States Agency for International Development.

Day 2: Monday, 5 March 2007 050 (204)
1:30 pm-3:00 pm (Venue: Sasakawa Auditorium)
MDG 6: Combat HIV/AIDS, Malaria and Other Diseases
Plenary 4

Control of Tuberculosis in Bangladesh: Current Interventions to Achieve Millennium Development Goals

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Bangladesh ranks 6th among 22 countries with high burden of tuberculosis (TB). According to the World Health Organization's Surveillance Report 2006, the estimated annual incidence of all cases and new smear-positive cases are 229 and 103 per 100,000 people respectively. The prevalence of all cases and mortality are 435 and 51 per 100,000 people. The WHO declared global emergency for TB in 1993, and since then the National Tuberculosis Control Programme started implementation of the DOTS strategy. The vision, mission, goals, and objectives set by the National Tuberculosis Control Programme are in line with the Millennium Development Goals (MDGs). The Goal 6, Target 8 of Millennium Development Goals states: "To have halted by 2015, and begun to reverse the spread (incidence) of priority communicable diseases, including TB". Indicator 23 and 24 are also linked with TB.

Like many resource-constraint countries, Bangladesh faced considerable difficulties in providing TB services till 1980s. To address the problem, BRAC initiated a pilot community-based TB-control programme in 1984 in one sub-district of Manikganj. The scenario started to change for the better after NGOs came forward in 1994. BRAC was the first NGO to sign a Memorandum of Understanding with the Government of Bangladesh in 1994 and expanded the Government-NGO collaboration in TB control. The countrywide DOTS coverage has been established, case-detection rate reached 61% in 2005 compared to 29% in 1993, and cure rate increased to 89% among cases detected in 2004 compared to 80% in 1993. Through this well-established partnership, Bangladesh was able to mobilize a significant amount of grant in 2004 and 2006 from the Global Fund to fight AIDS, TB and Malaria (GFATM) which gave momentum to the TB-control programme. Sustained political commitment, participatory planning and resource mobilization, health system strengthening and capacity-building, community-based service provision, advocacy communication, and social mobilization contributed to the current achievement.

DOTS services in urban, private and corporate sectors, quality of laboratory, and extension of DOT services to workplace (e.g. garments factories), and to special situation (e.g. prisons, hard-to-reach areas) need to be enhanced. Increasing threat of multi-drug-resistant TB and linkage with HIV/AIDS are the challenges. With continued commitment at all levels, sustained funding and augmented technical capacity, research, and monitoring will help continue the current momentum and achieve the MDGs set for 2015.

051 (200)

HIV/AIDS in Bangladesh

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Bangladesh has recently moved from being a low-prevalence nation for HIV to one with a concentrated epidemic among injecting drug users (IDUs) in one city. Data from the HIV surveillance conducted in the country since 1998 among most-at-risk populations showed that the overall HIV prevalence is below 1%, but rates have risen significantly in male IDUs from central city-A to reach 7% in the Seventh Round conducted in 2006. However, as in the previous years, most (10.5%) HIV-positive IDUs were localized in one neighbourhood, while in the remaining neighbourhoods, only 1% were positive, suggesting that this neighbourhood may be the epicentre of the epidemic.

Risky behaviours (injection sharing and unprotected sex) are common among IDUs. Female IDUs are at high risk of acquiring and transmitting HIV, as approximately two-thirds of those sampled were also sex workers.

All other most-at-risk population groups—sex workers, males having sex with males, transgenders, mobile men—have low levels of HIV. Fortunately, female sex workers in many areas are showing declining syphilis rates. Different studies have shown high rates of other sexually transmitted infections (STIs), including *Neisseria gonorrhoeae and Chlamydia trachomatis*. The national Behavioural Surveillance Survey (BSS) and research studies have reported low condom use by sex workers (females, males, and Hijras).

Clients of sex workers are largely derived from the general community of men. Data showed that approximately 10% of men bought sex from female sex workers, and condom use was not common. Condom use is not popular for different reasons, often for low risk perception or believing that condoms reduce pleasure. Sexually transmitted infections in the general adult male population are low, except for those from an urban slum where active syphilis rates were above 9%.

Mobile men and migrants are of particular concern as, while they are away from their families, they often practise riskier behaviours. Migration for work abroad is very common in Bangladesh, and of the HIV-positive people identified at the ICDDR,B's VCT Unit (Jagori), 45% were returnee migrants. Prevention programmes for outgoing migrants and returnee migrants are almost non-existent.

Young people have also been found to be sexually active, and different studies have shown that the age at first sex in a substantial proportion of boys is below 14 years. However, community readiness to make condoms available and to talk about premarital sex is low.

The HIV epidemic in Bangladesh is poised to take off, and the urgent and immediate need is to enhance programmes in IDUs. However, in the longer term, the epidemic is likely

to be sustained through sexual transmission and, therefore, alongside programmes for IDUs, prevention programmes with sex workers and their clients have to be made stronger and must have wider coverage. HIV epidemic modelling that has been generated for Dhaka also supports these assumptions. Finally, care and support services for people who are HIV-positive are in their infancy. A coordinated and ethical response to the needs of infected and affected people is urgently required.

Day 2: Monday, 5 March 2007 052 (070)
3:30 pm-5:00 pm (Venue: Sasakawa Auditorium)
Scientific Session 10: MDG 4—Reduce Child Mortality
Child Health and Survival: Interventions

Experience in Reduction of Malnutrition during Pregnancy in Urban Slums of Bangladesh

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Background: Poor maternal nutrition leads to high incidence of low birth-weight, which affects the health and survival of newborns. The condition also threatens the health and survival of women because it increases their susceptibility to life-threatening illness and increases the risk of their deaths during childbirth. As the Urban Nutrition Project of Concern Worldwide Bangladesh focuses on holistic approaches to tackle malnutrition, part of it is targeted to reduce malnutrition of pregnant women and, thereby, reduce the incidence of low-birth-weight babies. **Objective:** To increase the proportion of pregnant women who gain weight ≥9 kg during pregnancy and, thereby, to reduce the incidence of low birth-weight in selected urban slum areas of Bangladesh. **Methodology:** Monthly growth monitoring, targeted supplementary feeding, supplementation of iron/folic acid, counselling on pregnancy care, and referral (antenatal care, any medical condition) were provided during 2002-2005 to 10,154 pregnant women living in selected urban slums of Dhaka, Chittagong, and Khulna. Of them, women whose body mass index (BMI) was <18.5 also received 4 packets of supplementary food (*pushti* packet) daily containing 600 kilocalories. The food supplementation was started from the 4th month of pregnancy and continued until 2 months after delivery. Moreover, supplementation of iron/folic acid and high potency vitamin A capsule were provided to women within 2 weeks of delivery, irrespective of their nutritional status. The number of maternal and infant deaths was recorded. **Results:** The proportion of pregnant women with BMI <18.5 decreased by 16%, 15%, and 13% in the Khulna, Chittagong, and Dhaka project areas respectively which resulted in a gradual decline (Chittagong-13%, Dhaka-18%, and Khulna-15%) in the enrollment of pregnant women in the supplementary feeding programme. The incidence of low birth-weight reduced from 41% to 28% during 2002-2005. Among the pregnant women who received supplementary food, pregnancy weight gain (≥9 kg) changed from 21.2% to 39.9% during the period. In addition, regular antenatal care visits and an increased number of deliveries by trained personnel were also observed in the selected working areas which ultimately lead to 26% reduction in infant deaths and decrease in maternal deaths (no maternal death in 2005). **Conclusion:** Malnutrition during pregnancy can be reduced by decreasing the incidence of low birth-weight through integration of the supplementary feeding programme, including intensive pregnancy-care counseling for chronic energy-deficient pregnant women in regular maternal healthcare services.

053 (113)

Expanded First-level Facility Care for Severe Pneumonia Is Safe and Effective among Children in Bangladesh: A Report from MCE-Bangladesh

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Background: The Integrated Management of Childhood Illness (IMCI) guidelines were developed to reduce mortality among children aged less than 5 years. The highly-sensitive and moderately-specific referral guidelines result in over-referrals and low-referral compliance. A significant portion of referred children are classified as having severe pneumonia without danger signs or other signs or symptoms requiring referral. Following consultation with the Government of Bangladesh, the IMCI guidelines were modified to recommended treatment of such cases at the first-level facilities. **Objective:** To assess the safety and effect of the modified clinical management guidelines among children with severe pneumonia aged 2 months to 5 years presenting to the first-level facilities. **Methodology:** All cases, aged 2 months to 5 years, presenting with severe pneumonia to the study intervention facilities, during May 2003–August 2005, were enrolled. Information on illness characteristics, referral and adherence to referral was abstracted. Surveyors visited case households and collected information on care-seeking for the episode, treatments received by the child, and final outcome. Analyses compared 2 periods each of 12 months: before the modified guidelines were implemented (May 2003–April 2004) and after the full implementation of the modified guidelines (September 2004–August 2005). **Results:** Introduction of the modified guidelines was associated with significant reductions in the proportions of severe pneumonia cases who were referred for higher-level care from the local first-level intervention facilities (from 94% to 8%, $p<0.0001$). Among cases with severe pneumonia, significantly more cases received correct management for their illness under the modified guidelines than before (90% vs 36%, $p<0.0001$). Case-fatality rates among severe pneumonia cases presenting for care at the first-level facilities in the study area were 1.1% before the guidelines were modified and 0.6% afterwards. **Conclusion:** The adaptation of the guidelines to allow local treatment for selected children with severe pneumonia resulted in a higher proportion receiving correct care, with no evidence of increase in adverse effects. The study shows that local adaptation of the global guidelines, with appropriate training and supervision, can be safe and can make important changes in their effectiveness. **Acknowledgements:** The study was done with support from the Bill and Melinda Gates Foundation through a grant to the Department of Child and Adolescent Health, World Health Organization, Geneva and with additional support from the United States Agency for International Development and the Government of Bangladesh.

054 (135)

Child Immunization Coverage in Hard-to-Reach Haor Areas of Bangladesh: Feasibility of Alternative Strategies

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Background: Immunization is essential for achieving the Millennium Development Goal of reducing child mortality substantially. Although evidence suggests low child immunization coverage in hard-to-reach areas of Bangladesh, alternative strategies for improving coverage in those areas have not been assessed. **Objective:** To assess the status of childhood immunization coverage in hard-to-reach haor (low-lying) areas and explore the feasibility of strategies for improving coverage. **Methodology:** This feasibility study was carried out in a randomly-selected remote hard-to-reach haor upazila (Jamalgonj) during September-November 2006. To estimate coverage, a survey was conducted using the World Health Organization-recommended 30-cluster sampling methodology. Additional data were collected through in-depth interviews, focus-group discussions, and observations. The study population was the mothers of children aged 12-23 months and healthcare providers. Chi-square tests were performed to compare the coverage in the study area with national level. Univariate and bivariate analyses were performed to ascertain the status of child immunization coverage by socioeconomic status. Qualitative data were analyzed using content analysis. The Ethical Review Committee of ICDDR,B approved the study. **Results:** Complete immunization coverage among 12-23-month old children was much lower in the study area than the national average (59% vs 64%) and the drop-out rate was significantly higher. Rates of invalid doses and abscesses were also high. As expected, children of more-educated parents were more likely to have complete immunization. Complete immunization was also more common among children whose mothers had lower parity. The low immunization coverage was attributed to: irregular/cancelled EPI sessions, less time spent in EPI spots by field staff, absence of alternative strategies, invalid doses, poor knowledge of mothers about benefits of complete vaccination and limited supervision. Although the existing service-delivery strategy is not sufficient to improve coverage in hard-to-reach areas, some alternative strategies, such as modified EPI service schedules, organizing EPI days, EPI support groups, use of a screening tool, and elimination of geographical barriers were considered feasible and effective by the study participants in improving the coverage. **Conclusion:** The child immunization coverage in hard-to-reach haor areas is low, and a number of alternative strategies are feasible for improving the coverage there. **Acknowledgements:** The financial support was provided by the Improving Health for the Poor Project of the Government of Bangladesh.

055 (140)

Treatment-seeking and Mortality in Diarrhoea and Acute Respiratory Infection among Children in Bangladesh

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Background: Disease-specific case management is an increasing focus of efforts to meet the Millennium Development Goal (MDG) of reducing deaths among children aged less than 5 years. **Objective:** To assess the changes in prevalence and treatment-seeking for diarrhoea and acute respiratory infection (ARI), hospital admission for treatment, and medical consultation patterns prior to death among children aged less than 5 years. **Methodology:** Focusing on 2 divisions of Bangladesh—Khulna and Chittagong—data from multiple sources were used for comparing changes in prevalence and changes in treatment-seeking. Data on the prevalence and reported care-seeking were obtained from the Bangladesh Demographic and Health Surveys (BDHS) 1993-2004. Hospital admission records from 2000 to 2003 were collected. Medical consultations prior to death for diarrhoea and ARI were obtained from surveillance data from 1998 to 2003 in Abhoynagar and Mirsarai sub-district. **Results:** The prevalence of diarrhoea among children aged less than 5 years declined from 14% in 1993 to 8% in 2004 in both the divisions. The estimated number of children seeking treatment for diarrhoea in Abhoynagar was similar to the prevalence estimate for Khulna division, with 14% of 2,402 children admitted. In Mirsarai of Chittagong division, just over half the number of prevalent cases sought care, and 15% were admitted. The prevalence of ARI remained unchanged in both the divisions over the period, and only one-sixth of the estimated ARI cases sought care. A far higher proportion of deaths were due to ARI (22% and 31% in each division) than due to diarrhoea (3% and 5%). No consultation and consultation with unqualified practitioners prior to death were high for both diarrhoea and ARI in Abhoynagar and Mirsarai. **Conclusion:** While treatment-seeking for diarrhoea has increased and appears to have resulted in a decrease in childhood deaths, the same is not the case for ARI. Given the complexity of identifying ARI and its related mortality, limited access to qualified consultation is likely to influence treatment-seeking patterns for the management of ARI. This, together with no or unqualified consultation, is likely to hinder the MDG of reducing child mortality in the next 7 years.
Acknowledgements: The funding support of the United States Agency for International Development for maintaining the health and demographic surveillance system is acknowledged.

056 (186)

Poor Perinatal Outcome after 'Outside' Treatment and Vaginal Examinations during Labour at Comprehensive in Rural Bangladesh

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Background: Many women in rural Bangladesh deliver at home or at birth-centres that do not follow aseptic technique and appropriate drug regimens. Unclean vaginal examinations may lead to chorioamnionitis and neonatal sepsis. Inappropriate use of drugs (e.g. syntocinon) may produce prolonged uterine contractions and foetal hypoxia and uterine rupture. These complications can be associated with perinatal and maternal death. **Objective:** To determine the extent of increased obstetric complications in high-risk group. **Methodology:** All patients presenting in labour at a comprehensive emergency obstetric care (EOC) facility (LAMB Hospital, Parpatipur, Dinajpur, Bangladesh) over a 3-month period in 2005 were screened by history-taking for prior 'outside' treatment and vaginal examinations. The outcomes of those second positive were compared with average hospital data during this period. Variables were correlated to look for predictors of poor outcome. **Results:** Of 698 women who delivered during the 3-month period, 99 (15%) had received previous 'outside' treatment or had vaginal examinations done. The outside treatments received included oxytocin, saline, and other unknown treatments. The 'outside treatment' group, compared to average hospital data, had lower rates of antenatal care (52% compared to 78%). The outside treatment group also had higher rates of neonatal admission, clinical neonatal sepsis, hypoxic ischaemic encephalopathy, and perinatal death (Table). The perinatal outcomes were inversely correlated with the number of outside vaginal examinations and their timing in relation to rupture of membranes.

Outcome	'Outside' treatment (%)	Average hospital data (%)
No antenatal care taken	48	22
Caesarean section rate	28	22
Vacuum delivery rate	13	7
Neonatal death rate	8	2
Baby alive at discharge	89	92

There were no maternal deaths or uterine rupture in the outside treatment group. The hospital maternal mortality ratio in hospital during the 3-month period was 600 per 100,000 deliveries. The maternal morbidity in the outside treatment group included chorioamnionits, urinary tract infection, and puerperal sepsis. **Conclusion:** There is an urgent need for health education and training to address risk-taking behaviour of 'outside' treatment with oxytocin and unclean vaginal examinations during labour to prevent adverse outcome for the baby and mother. This may contribute to MDG 4—'Reduction in newborn deaths' and MDG 5—'Reduction in maternal mortality ratio'.

057 (198)

Home-based Management of Newborn Infections: Lessons from Sylhet: Implications for Programmes

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Background: Data on causes and timing of neonatal illness and death are important to devise evidence-based interventions to improve newborn health and survival. **Objective:** To analyze neonatal morbidity and mortality by timing and causes of death and by management modalities to recommend strategies for community-based management of neonatal illness. **Methodology:** A community-based health-intervention project in Sylhet district of Bangladesh identified and managed newborn illness through post-partum home-visits by community health workers (CHWs) trained to use an IMCI-type algorithm. The CHWs referred neonates with possible serious infections, but were trained to treat them with injectable antibiotics if referral failed. Verbal autopsy determined causes and timing of neonatal deaths. **Results:** About two-thirds of newborn deaths occurred during the first week of life. About half were attributed to infections, another fifth were due to asphyxia. Among 8,474 babies assessed, feeding problems were most common (71%), predominantly in the first 2 days of life. About 6% of the babies had signs of very severe disease (VSD), and another 11% had signs of possible very severe disease (PVSD). Case-fatality among neonates with VSD and PVSD was 13% and 2% respectively. Case-fatality among VSD cases treated by the CHWs was 4% against 14% among those who complied with referral and 32% who received other care. **Conclusion:** Most neonatal illness and mortality occur early. Infection is the single most important cause of neonatal mortality. All newborn infections may not need injectable antibiotics. With appropriate training and support, CHWs are able to assess, identify, and manage neonates in the community with potentially serious illness, and they were accepted by the community. In settings with weak health systems and poor care-seeking, home-based management of neonatal infections may be an effective option. **Acknowledgements:** The financial support of the United States Agency for International Development, Saving Newborn Lives Initiative of the Save the Children-USA, and several other donors is acknowledged.

Day 2: Monday, 5 March 2007 058 (050)
3:30 pm-5:00 pm (Venue: Seminar Room)
Scientific Session 11: MDG 5—Improve Maternal Health
Intervention for Reducing Maternal Mortality and Morbidity

Violence against Women and Compliance of Pregnant Women to Food Supplementation in Rural Bangladesh

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Background: Prenatal food supplementation is used as one of the strategies to improve foetal and maternal health. Studies have shown that such programmes improve the nutritional status of both mothers and children. However, participation and compliance are important factors in defining the level of success of such programmes. Literature shows that violence against women can lead to negative healthcare-seeking behaviour during pregnancy, such as delayed entry into prenatal care. Violence against women can potentially affect participation in food-supplementation programmes. **Objective:** To explore and test pathways through which different forms of violence against women could affect compliance of pregnant women to food supplementation in a rural area of Bangladesh. **Methodology:** Data came from an ICDDR,B study, known as Maternal and Infant Nutrition Interventions in Matlab (MINIMat). The sample analyzed included 3,137 pregnant women. The conceptual framework tested represents a pathway through which different forms of violence (i.e. physical, sexual, emotional abuse, and controlling behaviour) can adversely affect compliance of a pregnant woman to food supplementation. Several structural equation models were used for testing the conceptual model and for examining the direct and indirect effects of different forms of violence. **Results:** No effect was found of any act of physical violence, severe physical violence, sexual, or emotional violence on compliance. However, controlling behaviour had a significant direct effect on compliance. It also had an indirect effect on compliance mediated through mental distress leading to increased morbidity of women. This model explained 23% variance in compliance. The model obtained a very good fit (x^2=24.6, p=0.26, NFI=0.99). **Conclusion:** Controlling behaviour needs to be addressed for improving compliance of pregnant women to food supplementation. Most studies on consequences of violence against women are focused on physical or sexual violence. This study demonstrates the need to go beyond these forms of violence to fully comprehend the consequences of violence against women and to open up windows of opportunity for addressing important public-health issues.

059 (041)

Intervention of IEC to Improve Male Involvement in Reproductive Health: Lessons Learnt from Tribal Population of Central India

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Background: Reproductive health generally has been considered to be synonymous with women's health and, hence, reproductive health of men has received little attention. The International Conference on Population and Development (ICPD) held in Cairo in 1994 and the Women Conference in China in 1995 also strongly addressed this issue. Although the Government of India has endorsed the ICPD agenda, and some attempts have been made to carry forward these agenda, involvement of male in reproductive health is still a new concept for planners. Looking into the poor reproductive health among the Scheduled tribe with no specific programme or statistics on reproductive health of men prompted the authors to undertake this study and design information, education, and communication (IEC) and its intervention to correct the deficiency. **Objective:** To generate baseline data on knowledge, attitudes, and extent of participation of men in reproductive health to design a need-based men-oriented IEC accordingly, to make intervention of the same, and to evaluate its impact. **Methodology:** A door-to-door survey by canvassing a pre-designed interview schedule was undertaken among 400 currently-married males of primitive Baiga tribe distributed in 18 remote villages in Dindori district of Madhya Pradesh in Central India. Besides these, the study also included designing of a need-based men-oriented IEC materials and made intervention in the study area. The impact of intervention was assessed by undertaking a re-survey in the study area by adopting a quasi-experimental design—before and after—with control design. Ethical clearance for the study was obtained from the Institute's ethical committee, and a consent form for respondents was attached with all the interview schedule. **Results:** There was a significant improvement in awareness about reproductive tract infection in the intervention group (47%) compared to the control group (19%). For sexually transmitted infection, it was 51% in the intervention group compared to 16% in the control group, and for HIV/AIDS, it was 70% in the intervention group compared to 19% in the control group. There was a preference for higher fertility, and the main reason for such a preference was attributed to higher infant and child mortality among them, as 44% of the respondents had experienced under-5 mortality of one or more child(ren). There were less concern about the use of family planning, particularly the spacing methods. The estimated net intervention effect showed that IEC material could improve the awareness about modern family planning by 5%. The current use of family planning also improved by 5%. There was a significant improvement in the awareness about antenatal care services among the intervention group (65%) compared to the control group (38%).

About 62% of the respondents also expressed a felt need for reproductive health services for the problem they suffered. The use of the government health services had also improved significantly among the intervention group (49%) compared to the control group (34%). **Conclusion:** The baseline data revealed that Baiga men are less concerned about reproductive health. The IEC strategy adopted in the study do have an effect in improving the knowledge, attitudes, and use/participation of male in reproductive health and can be replicated. **Acknowledgements:** The authors sincerely acknowledge the Indian Council of Medical Research, New Delhi, for funding the study. The authors also acknowledge the Regional Medical Research Centre for Tribals (ICMR), Jabalpur, Madhya Pradesh, for providing the facility.

060 (101)

Towards Millennium Development Goal 4 and 5: Experience with Women's Groups in Community Mobilization in Bangladesh

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Background: Community-based participatory intervention has been shown to help reduce deaths among mothers and newborns. In the community mobilization process, the community can play many possible roles to help reduce maternal and newborn deaths. The Perinatal Care Project (PCP) encouraged Women's Groups to move through a cycle of active participation and to identify maternal and newborn health problems, prioritize these problems and develop, implement, and evaluate realistic strategies which aimed at helping to reduce the deaths of mothers and newborns. The Women's Group works alongside women in the community to involve them in the decision-making process and to try to make the best use of available resources. **Objective:** To describe the maternal and newborn health problems identified and prioritized by the PCP Women's Groups and to describe the strategies selected for implementation through community participation. **Methodology:** A randomized controlled trial is underway to explore the effectiveness of a community-based participatory intervention through Women's Groups. Within each of the 3 districts (Bogra, Faridpur, and Moulavi Bazar), 2 upazilas were selected, and within each upazila, 3 unions were selected. These 18 unions were randomly allocated as intervention (9) or control (9) sites. One hundred sixty-two Women's Groups, each comprising 10-15 members, were formed in the intervention areas. The Women's Groups cover 8.7% of married women of reproductive age. A facilitator leads each Women's Group's meeting on a monthly basis. **Results:** The Women's Groups initially identified numerous problems which they later prioritized on the basis of frequency, severity and feasible to address. The majority of the Women's Groups prioritized 3 maternal problems, such as bleeding, convulsion, and abdominal pain. Jaundice, pneumonia, and skin-rash were prioritized as neonatal illnesses. Although the strategies identified differed from place to place, raising awareness about maternal and neonatal problems, emergency funds, emergency transport, and establishing linkages with health service providers were the most common strategies that were selected through community participation by the Women's Groups to help reduce deaths of mothers and newborns. **Conclusion:** Women's Groups can be an effective means of raising awareness in poor rural communities about maternal and newborn health problems and in implementing realistic strategies to improve maternal and newborn health in the community. These groups have been well-received by group members, the community, and health officials. **Acknowledgements:** The support of Women and Children First, UK and the Centre for International Health and Development (formerly International Perinatal Unit), Institute of Child Health, University College London, London, UK, is acknowledged.

061 (142)

Evaluation of Two Home-based Skilled Birth Attendant Programmes in Bangladesh

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Background: In Bangladesh, deliveries at home are almost universal (86%), and unskilled providers attend the majority of deliveries. The Government of Bangladesh is committed to achieving the Millennium Development Goals (MDGs), and the target for MDG 5 is to increase skilled attendance at birth to 50% by 2010. Increasing deliveries at home by skilled birth attendants (SBAs) is one of the strategies adopted by Bangladesh. The Bangladesh Association of Voluntary Sterilization (BAVS) and the NGOs Service Delivery Program (NSDP) are 2 NGOs which piloted home-based SBA programmes in different parts of Bangladesh. However, knowledge and skills of SBAs have never been assessed. **Objective:** To explore and compare the level of knowledge, skills, and confidence of NSDP and BAVS home-based SBAs according to the WHO/FIGO/ICM criteria for an SBA. **Methodology:** The Integrated Management of Pregnancy and Childbirth guidelines of WHO served as the competency standard. Evaluation included a written knowledge test with 50 multiple-choice questions, 2 case studies (postpartum haemorrhage [PPH] and manual removal of placenta), and 4 evidence-based skills where SBAs demonstrated procedures on dummy models. Knowledge, skills, and competencies of all home-based SBAs currently available and providing services (23 in NSDP and 21 in BAVS) were tested. **Results:** Scores for knowledge test were 41% and 68% for SBAs of BAVS and NSDP respectively, while scores for skills test were 56% and 65% respectively. Competencies were poor on key lifesaving techniques, such as the use of partograph (BAVS 11%, NSDP 52%), management of PPH (BAVS 50%, NSDP 56%), eclampsia (BAVS 45%, NSDP 54%), postpartum infection (BAVS 36%, NSDP 68%), manual removal of placenta (BAVS 00%, NSDP 05%), and newborn resuscitation (BAVS 46%, NSDP 52%). The SBAs of BAVS did not have skills on active management of the third stage of labour, but 90% of the SBAs of NSDP practised it. Competencies were relatively better in areas, such as antenatal care (BAVS 65%, NSDP 84%), postnatal care (BAVS 66%, NSDP 76%), and conduction of normal deliveries (BAVS 78%, NSDP 83%). **Conclusion:** Skills and knowledge of home-based SBAs are inadequate compared to the WHO standards. A wide gap exists between the current evidence-based standards and the competence of providers. A national-level consensus is suggested to determine the minimum level of skills and knowledge for home-based SBAs. Refresher training is urgently needed, particularly for the BAVS group. **Acknowledgements:** The financial support of the United States Agency for International Development, Dhaka, is acknowledged.

062 (187)

Non-physician Anaesthetists—An Appropriate Use of Personnel for Delivery of Comprehensive Emergency Obstetric Care

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Background: Lack of access to lifesaving operative interventions—caesarean section, laparotomy for ruptured uterus, manual removal of placenta, and evacuation of retained products of conception—is a major contributor to high maternal and perinatal morbidity and mortality in under-resourced countries. The availability of anaesthesia is often the limiting factor. The LAMB Hospital has 20 years of experience of using trained non-physician anaesthetic assistants to deliver local, regional, and general anaesthesia. **Objective:** To review the anaesthetic obstetric mortality for deliveries at a rural comprehensive emergency obstetric care facility (LAMB Hospital, Parbatipur, Dinajpur, Bangladesh). **Methodology:** Maternal deaths were identified for the January 2001–December 2006 period, using the perinatal death audit process. The case notes were reviewed for anaesthetic causes of death. The total number of deliveries and caesarean sections was obtained from the delivery register. **Results:** During the 6 years (January 2001–December 2006), 16,334 deliveries were undertaken, and 3,316 (20%) of these were by caesarean section. During this period, there were 58 deaths of women who laboured at the LAMB Hospital, a maternal mortality ratio of 368 per 100,000 livebirths. None of these were anaesthetic deaths. **Conclusion:** Trained non-physician anaesthetic assistants can make a safe and invaluable contribution to the provision of accessible and available comprehensive emergency obstetric care, furthering Millennium Development Goal 4 and 5.

063 (184)

Use of Uterine Balloon Catheter for Lifesaving Management of Postpartum Haemorrhage—Experience in a Comprehensive Emergency Obstetric Care Facility in Rural Bangladesh

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Background: Postpartum haemorrhage is a leading cause of maternal mortality in the world and the most common life-threatening emergency faced by comprehensive emergency obstetric care (EOC) facilities. Appropriate timely management can save a mother's life. The uterine balloon catheter is a simple, low-cost device that can be inserted into, with minimal training, the uterus to tamponade bleeding. **Objective:** To review the outcome with use of the uterine balloon catheter for women with life-threatening massive obstetric haemorrhage. **Methodology**: Women delivering at a comprehensive EOC facility (LAMB Hospital, Parbatipur, Dinajpur, Bangladesh), who had complication of significant postpartum haemorrhage, were identified from the delivery register during a 6-year period (January 2000 to December 2005). The case-notes of the postpartum haemorrhage patients were reviewed to identify those managed with the uterine balloon catheter. In addition, any maternal deaths during these 6 years were identified through the ongoing perinatal death audit process were checked to identify whether these had been managed with a balloon catheter. **Results:** During the 6 years, 279 women were identified as having significant postpartum haemorrhage. Seventeen women had an intrauterine balloon catheter inserted for lifesaving management of massive postpartum haemorrhage. In this group, estimated blood loss per patient was 1,000-3,200 mL. Six of these 17 women had been delivered by caesarean section, and 4 had placenta praevia. Blood units transfused per patient was 0-9 unit(s). For all the 17 women, the balloon catheter successfully controlled the postpartum haemorrhage without needing to resort to hysterectomy. There were no maternal deaths in this group. Perinatal deaths were 4 of 17. **Conclusion:** Uterine balloon catheter is a simple, low-cost intervention could potentially save many women's lives that in the hands of skilled birth attendants and, thus, contributing to MDG 5—reduction in maternal mortality ratio.

Day 2: Monday, 5 March 2007
3:30 pm-5:00 pm (Venue: CSD Conference Room)
Scientific Session 12: MDG 6—Combat HIV/AIDS, Malaria and Other Diseases
HIV/AIDS and Tuberculosis

064 (081)

Tuberculosis in Bangladesh: A 40-year Review

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Background: Tuberculosis (TB) remains a major cause of morbidity and mortality in Bangladesh. The country ranks sixth in terms of burden of TB, having an estimated 300,000 new cases and 70,000 deaths annually. **Objective:** To review the epidemiology of TB in terms of incidence, prevalence, care-seeking patterns, case detection and treatment success rates, drug resistance patterns, and mortality during 1966-2006. **Methodology:** Both published and unpublished reports based on studies conducted by different organizations, including National TB Control Programme of the Government of Bangladesh, NGOs, and other research organizations were reviewed. The studies included population-based prospective and retrospective studies from selected areas and nationwide TB surveys. Sputum microscopy was done to detect a case of smear-positive TB. **Results:** The 1964-1966 and 1987-1988 nationwide surveys documented sputum-positive TB prevalence rates of 318 and 870 per 100,000 people respectively. Recent estimates ranged from 24 to 150 per 100,000 people. The case-detection rate under directly-observed treatment-short course (DOTS) increased from 29.2% in 1993 to 61% in 2005. The DOTS expansion also increased throughout the country, which was 90% in 1999 and 99% in 2004. The treatment success in TB was 81% in 1993 and reached 89% in 2004. There was a marked gender difference in TB with men being more commonly detected than women with a female-male ratio that ranged from 0.24 to 0.39. Resistance to any anti-TB drug ranged from 18.6% to 48.4%, and multi-drug-resistant TB (MDR-TB) was from 2.0% to 5.5% (1998-2005). More than 80% of clinical care in suspected TB cases was provided initially by the private sector. Deaths due to TB comprised 3.6% of all deaths among persons aged ≥15 years, and the age-standardized TB mortality rates ranged from 19.15 to 46.05 per 100,000 people among males and from 2.19 to 23.72 among females (1988-2003). **Conclusion:** Since the adoption of DOTS in 1993, Bangladesh has achieved many of its TB-control goals. However, major challenges remain to further improve case detection, development of rapid diagnostic methods, and diagnosis and management of childhood TB and MDR-TB cases to save hundreds of thousands of lives in Bangladesh. Given the high density of population, extreme poverty, malnutrition, and impending threat of HIV epidemic pose an increased risk of TB in Bangladesh which warrants concerted efforts for effective control. **Acknowledgements:** The financial support of the United States Agency for International Development, Department for International Development, UK, Global Fund to Fight AIDS, Tuberculosis and Malaria, and ICDDR,B is acknowledged.

065 (083)

Living with Risks and Vulnerabilities to STIs/HIV: A Qualitative Assessment of Indigenous Populations at the Northwestern Belt in Bangladesh

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Background: Indigenous populations in Bangladesh are neglected in many aspects of lives, including health. Their vulnerabilities to sexually transmitted infections (STIs)/HIV are particularly unexplored causing complacence. Studies from other countries have demonstrated high rates of STIs among indigenous populations. **Objective:** To explore and describe the pattern and contexts of the risks and vulnerabilities to STIs/HIV and sexual health of the indigenous population. **Methodology:** An anthropological assessment was undertaken in the rural areas of a district in the northwestern belt of Bangladesh. Fifty-five in-depth interviews, several informal interviews, 10 key-informant interviewers, 7 focus-group discussions (FGDs), and several comprehensive observations were conducted. Data were transcribed and manually analyzed in the theoretical framework of social constructionism. **Results:** The findings revealed various patterns of risks and vulnerabilities to STIs/HIV infections that are implanted in the sociocultural and socioeconomic contexts, such as living and occupational arrangement, marital culture, and drinking tradition at rituals of the indigenous populations. These factors have profoundly affected their sexual life in terms of practising unprotected sex with multiple partners. The indigenous females are sexually exploited and abused by Bangalee males due to their lower ethnic socioeconomic status. Incidents of sexual harassments were also reported as the consequences of being involved in the traditional wine-selling business. They were deprived of acquiring adequate information because of the limited access to print and electronic media, non-existence of STIs/HIV interventions, limited mobility and interactions with the mainstream society, and unavailability of healthcare professionals. They possessed culturally-imbedded beliefs about sexual health, intermingled with misconceptions regarding transmission of STIs. Condoms had no position in their cognition, neither in terms of STIs/HIV protection, nor for the purpose of family planning. Rather than STIs/HIV, they were more concerned about the cultural bound syndrome, such as semen loss of men and white discharge of women which were rooted into their sense of masculine and feminine sexuality. **Conclusion:** Societal contexts, along with sexual exploitations of the mainstream Bangalee society, have contributed to construct the risks and vulnerabilities to STIs/HIV. Beyond a disease framework, comprehensive structural and indigenous peoples' need-based interventions have to be operated to safeguard this neglected population of Bangladesh.
Acknowledgments: The financial support of Department for International Development, UK and the field support from Dustho Manobatar Sheba Songstha, Jaipurhat, are acknowledged.

066 (089)

Understanding Barriers to Condom Use among Commercial Sex Workers in Bangladesh

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Background: Condoms for male are widely available, effective, and a recognized means of preventing sexually transmitted infections (STIs), including HIV. However, rates of consistent condom use during commercial sexual encounters in Bangladesh remain low even after years of targeted intervention to improve condom use among sex workers. **Objective:** To explore the barriers that hinder condom use in commercial sexual encounters in brothels, hotels, and street settings in Bangladesh. **Methodology:** A cross-sectional survey was conducted among sex workers in selected brothels, hotels, and street settings using a structured questionnaire. Study samples were randomly recruited from a list of subjects enumerated prior to the study by a mapping exercise in selected brothels, hotels, and street settings in Bangladesh. Data were collected from 1,395 sex workers: 439 brothel-based sex workers (BBSWs), 514 street-based sex workers (SBSWs), and 442 hotel-based sex workers (HBSWs). **Results:** The mean number of clients that a sex worker entertained per week was 25 (0-216): 24 (0-84) for BBSWs, 15 (0-105) for SBSWs, and 36 (0-216) for HBSWs. During the last one week of interview, only 13.5% of the sex workers reported condom use in all vaginal sex acts, whereas 72.8% used sometimes, and 5.5% never used. Among barriers to using condoms, 46.8% reported their clients' objection, 38.7% reported condom to delay ejaculation, 36.9% thought condoms contain less lubricant, 23.1% reported unavailability of condoms, and 22.4% reported that condom use indicates lack of trust with partners. Results of multivariable regression analyses revealed that the BBSWs and SBSWs were less likely to use condom in the last sex compared to the HBSWs (odds ratio [OR=0.68, 95% confidence interval [CI] 0.50-0.93) and OR=0.28, 95% CI 0.21-0.37 respectively]. Having knowledge on STIs and discussion on health with NGO workers in the last 6 months were significantly related to higher condom use in the last sex [(OR=1.82, 95% CI 1.12-2.95) and (OR=2.05, 95% CI 1.50-2.80) respectively]. **Conclusion:** Client's objection, delay in ejaculation, less lubricant, and condom unavailability were reported mostly as barriers to condom use. Having knowledge on STIs and exposure to health intervention had a positive impact on condom use. **Acknowledgements:** The study was funded by Australian Aid for International Development.

067 (126)

Risk Behaviour Network and Vulnerability to HIV Infection of Boatmen in Teknaf, Bangladesh

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Background: Migrant fishermen and boatmen of Bangladesh are considered vulnerable to HIV infection like other mobile population groups. Boatmen in Teknaf, Bangladesh, may be especially vulnerable to HIV infection because of Teknaf's proximity to Myanmar that is experiencing a generalized HIV epidemic and also because of the frequent traffic of people between the 2 countries across the river Naf. **Objective:** To provide information on whether boatmen in Teknaf are part of a sexual network that is considered risky making the boatmen themselves and the general community in Teknaf more vulnerable to HIV infection. **Methodology:** Data were collected through mapping, in-depth interview with key-informants, such as boatmen association leaders, NGO officials, journalists, and members from selected vulnerable groups, including injecting drug users, sex workers, transport workers, and spouses of boatmen, who were purposively selected, and a cross-sectional survey among 433 boatmen in Teknaf, Bangladesh. **Results:** Qualitative and quantitative data showed that boatmen in Teknaf are part of risk behaviour network between Myanmar and Teknaf. The boatmen have non-marital and marital partners both in Teknaf and Myanmar. Some of their non-marital partners work as commercial sex workers who have clients, such as transport workers, tourists, and injecting drug users with high mobility to Myanmar. Girls migrate from Myanmar to Teknaf for better job opportunities, higher wages, and better prospects of marriage and usually are preferred in the sex trade because they are good looking. Having multiple sexual partners perceived by the boatmen as symbolic of 'strong masculinity', and referred as a means of rejuvenating 'energy'. The boatmen did not perceive themselves at risk of having HIV/AIDS because nobody is known to them who has been suffering from this sort of problem. Existence of cross-border families made it easier for boatmen to stay overnight with relatives and friends in Myanmar. The survey data showed that 42% of the boatmen visited Myanmar, of which 17% visited sex workers, and only 3 used condoms. The mean number of nights stayed was 3. A significant association was found between the duration of stay and sex with sex workers in Myanmar. **Conclusion:** There is an urgent need for designing interventions targeting boatmen in Teknaf to combat an impending epidemic of HIV among this group. **Acknowledgements:** The financial support of the Department for International Development, UK, is acknowledged.

068 (053)

Integration of Voluntary Counselling and Testing at Brothel-based Sex Workers Package in Partnership with Jagori–ICDDR,B

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Background: Voluntary counselling and testing (VCT) is identified as a priority area for prevention of HIV/AIDS. Bangladesh Women's Health Coalition (BWHC) has piloted a VCT intervention at the Tangail brothel in partnership with Jagori–ICDDR,B. The purpose of this intervention is to generate specific information to understand the context, process, and systems of VCT service-delivery aiming at designing and implementing an evidence-based HIV/AIDS continuum-of-care project. In total, 24 sex workers availed of VCT service from the Jagori centre from July 2005 to June 2006. As a part of this intervention, a qualitative study was conducted to gain an in-depth understanding of the use of VCT services in the brothel-setting. This will help take further measures so that intervention is effective, and the full potential of this intervention is achieved. **Objective:** To understand knowledge, attitudes, and practices on the demand for VCT use among brothel-based sex workers. **Methodology:** A descriptive cross-sectional survey was conducted from December 2005 to May 2006 at the Tangail brothel. In total, 150 sex workers, who were randomly selected, participated in the study. A semi-structured questionnaire with outcome variables, including knowledge, attitudes, and practices, was pre-tested prior to administering it in the study. This was followed by 12 in-depth interviews using a questionnaire with both close and open-ended questions. Five focus-group discussions (FDGs) were conducted with sex workers and brothel power structure, including land lords and 'Madams', using a standard FGD guideline. In total, 35 participants took part in FDGs. Notes were taken during interviews and FGDs, which were coded and entered into the computer. Data were analyzed using the SPSS (version 11.5). SPSS was used for analysis of survey data, and FGD findings were analyzed manually. **Results:** The knowledge on VCT was low in comparison to basic facts of HIV/AIDS. Fear of stigma from positive result deterred seeking this service. From the qualitative part of this study, it revealed that lack of information was the main barrier to overcome the perception on stigma. It further revealed that information on VCT service was not adequately available in the community; if it was available, they would have sought this service more The study participants also expressed the provision of need-based information service flow at different tiers of VCT service-delivery. **Conclusion:** VCT is a good entry point for the assessment of individual risk and taking risk-reduction efforts. This partnership approach is uniquely positioned to identify strategies, tools, and methods that can generate demand for VCT service and make accessible timely information service for the brothel community. **Acknowledgements:** The study was conducted with the financial support from the HAPP: Brothel-based Package, BWHC Consortium.

069 (156)

Field Evaluation of Simple Rapid Tests in Diagnosis of Syphilis

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Background: Syphilis is one of the most common sexually transmitted infections in developing countries. In Bangladesh, rates of syphilis infection range from 1-6% in the general population to 8-33% among high-risk groups. Currently, some primary health-care clinics use the rapid plasma reagin test to screen for syphilis, although this test has proved to be unreliable in this setting. Therefore, there is a need for simpler treponemal specific rapid diagnostic testing, which could be more easily performed by low-skilled staff in non-laboratory settings, to guide clinical decision-making. **Objective:** To compare the sensitivity and specificity of different rapid diagnostic tests (immunochromatographic strip test, rapid test device, and rapid plasma reagin test) when performed by low-skilled staff in field and by high-skilled staff in laboratory with the standard tests of the World Health Organization (WHO) (rapid plasma reagin and *Treponema pallidum* haemagglutination assay) in the reference laboratory for the diagnosis of syphilis. **Methodology:** A cross-sectional study was conducted among female sex workers in Dhaka, Bangladesh, during August 2004–August 2005. Blood specimens collected from the enrolled subjects were tested using the immunochromatographic strip test, rapid test device, and rapid plasma reagin test by low-skilled staff in the field and the immunochromatographic strip test, rapid test device, rapid plasma reagin, and *Treponema pallidum* haemagglutination assay by high skilled staff in the laboratory. All the technicians were blinded to the results of other tests performed. The sensitivity and specificity of the rapid tests were compared with the standard of rapid plasma reagin and *Treponema pallidum* haemagglutination assay positive when performed in the laboratory. The results obtained with the rapid tests were also compared between high-skilled and low-skilled staff. **Results:** The prevalence of syphilis among female sex workers was 20.8%, and active syphilis (rapid plasma reagin >1:8) was 6.4%. The immunochromatographic strip test performed well in the primary healthcare setting with high sensitivity (94%), specificity (93%), positive predictive value (77%), and negative predictive value (98%), and there was no significant difference between results obtained by the high-skilled staff in the laboratory. **Conclusion:** The immunochromatographic strip test could fulfill the need for an inexpensive (TK 22 or US $ 0.31), invasive, rapid, and reliable syphilis screening test in primary healthcare clinics in Bangladesh. **Acknowledgments:** The study was made possible through support provided by the United States. Agency for International Development (USAID), Dhaka, Bangladesh Mission under the terms of the Cooperative Agreement No. 388-A-00-97-00032-00 with ICDDR, B. ICCDR,B acknowledges with gratitude the commitment of USAID to the Centre's research efforts.

Day 3: Tuesday, 6 March 2007
9:00 am-9:45 am (Venue: Sasakawa Auditorium)
Special Session: Arsenic in the Environment: Consequences and Mitigations

070 (145)

Performance of Arsenic-removal Filters Used in Rural Bangladesh

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Background: Bangladesh is in danger of missing MDG Target 10, i.e. reducing, within 2015, to half the proportion of people without sustainable access to safe drinking-water because of arsenic contamination. In 2004, the Government of Bangladesh granted Provisional Verification to 4 commercially-available arsenic-removal filters: the community-based SIDKO plant and 3 household filters (ALCAN, READ-F, and SONO). Hundreds of these filters have been distributed in arsenic-affected communities in recent years. **Objective:** To assess the current status of a number of each of the 4 provisionally-approved filters, which have been in use for at least one year in field conditions. **Methodology:** Previously distributed filters (n=12-34) were selected randomly from the lists provided by the United Nations Children's Fund. All selected filters had been distributed at least 12 months before the survey. Field-visits were conducted from October 2006 to January 2007. During field-visits, the current functional status of the filters was assessed, a user-satisfaction interview was conducted, and water-quality tests (for arsenic, iron, phosphate, pH, and thermotolerant coliforms) were performed using field test-kits. **Results:** The majority of SIDKO (78%), ALCAN (67%), and SONO (58%) filters were found to be in regular use by owners/caretakers. In contrast, only 10% of READ-F filters were found in use: owners complained of odour and foam in the treated water, and the inconvenience involved as the filters do not include a reservoir or tap. The filters in use were, in most cases, producing water which met the Bangladesh drinking-water standard for arsenic of 50 ppb: 15% of SIDKO, 22% of ALCAN, and 15% of SONO filters exceeded this level with a maximum of 200 ppb in filtered water. No significant pair-wise correlations were found between raw water-quality parameters and arsenic concentration in filtered water, or with arsenic breakthrough at either the 10 or 50 ppb threshold. Raw water phosphate levels showed a positive but insignificant correlation with filter arsenic level ($p=0.065$), but not with breakthrough at either threshold. Filtered water phosphate correlated positively with filtered water arsenic ($p=0.013$) and with raw water phosphate ($p=0.006$). Microbiologic quality of raw and filtered waters was comparable and moderate to good, with approximately 20% filters having low levels of thermotolerant coliforms (max=18 cfu/100 mL) in treated water. User-satisfaction was high for the SIDKO (81%), ALCAN (89%), and SONO (67%) filters. **Conclusion:** The SIDKO, ALCAN and SONO filters were found to be working relatively well and appreciated by owners and caretakers. The main cause of non-use was improper maintenance leading to poor water quality or filter failure. A significant number of functional filters had experienced arsenic breakthrough;

however, users were unaware of this due to a lack of monitoring. The READ-F filters were not very acceptable to owners because of deficiencies in aesthetic water quality and user-friendliness. **Acknowledgements:** The financial support of the Canadian International Development Agency and the technical support from the Department of Public Health Engineering, Government of Bangladesh, are acknowledged.

071 (152)

Arsenic Exposure and Metabolism in Early Childhood

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Background: Arsenic, a potent environmental toxicant, is frequently present in groundwater and readily passes through the placenta. Results of recent studies indicate adverse effects on pregnancy outcome and child development. The few available reports on arsenic in breastmilk are contradictory, and there is little information on the fate of children exposed to arsenic. Arsenic is metabolized by reduction and methylation reactions, which are known to modify the susceptibility. **Objective:** To assess arsenic exposure in early childhood via breastmilk and tubewell water and to evaluate child metabolism of arsenic. **Methodology:** Ongoing research concerning effects of arsenic on child health and development were nested into a randomized community-based food and micronutrient supplementation trial (MINIMat) in pregnancy in Matlab, Bangladesh, where 70% of tubewells were found to exceed 10 µg/L, the WHO guideline value, and more than 60% to exceed 50 µg/L, the Bangladesh drinking-water standard. Arsenic metabolites in maternal urine were measured in gestational week 30, in child urine at 3 months (n=98) in connection with a validation of exclusive breastfeeding, and in child urine at 18 months (n=2,400) in connection with child development testing. Urinary arsenic metabolites were analyzed by HPLC online with hydride generation and ICP-MS. **Results:** Maternal exposure, assessed by arsenic in urine in late pregnancy, was 83 µg/L on average (90-percentile 415 µg/L, n=1,944). The median arsenic concentrations in urine at 3 and 18 months were 1.1 µg/L L (90-percentile 7.8 µg/L) and 34 µg/L (90-percentile 160 µg/L) respectively. Arsenic metabolites in urine of the 18-month old children consisted of 13% inorganic arsenic, 10% methylarsonic acid (MMA) and 77% dimethylarsinic acid (DMA). **Conclusion:** Exposure of infants to arsenic via breastmilk was very low, despite the marked maternal arsenic exposure. Although arsenic in breast milk remains to be analyzed, it can be concluded that breastfeeding protects the child against arsenic exposure. However, following weaning the child is again exposed to arsenic via drinking-water and food. Despite prevalent malnutrition in the study area, the children showed remarkably efficient methylation of arsenic, with high percentage of DMA and low percentage of MMA in urine. The potential modifying effects of limited arsenic exposure during breastfeeding and efficient metabolism on arsenic toxicity remain to be elucidated. **Acknowledgements:** The financial support of Sida/SAREC, the Swedish Research Council, the Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning, and the Karolinska Institutet is acknowledged.

072 (161)

Effect of Water-quality Parameters on the Performance of Arsenic-removal Technologies: Preliminary Results from the Environmental Technology Verification-Arsenic Mitigation Project

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Background: Groundwater in Bangladesh is contaminated with varying levels of arsenic, a poisonous and carcinogenic inorganic element and a severe health hazard to about 35 million of Bangladeshi since groundwater is their only source of potable water. Arsenic dissolved in water can be removed by various processes, including coagulation/ flocculation, adsorption on metal oxide surface, etc. **Objective:** To assess the effect of waterquality parameters on the performance of environmental technology verification (ETV). The arsenic mitigation component of the ETV Project is aimed at selecting perspective arsenic-removal technologies (ARTs) for field-testing and performance verification. **Methodology:** Five promising ARTs (MAGC/ Alcan, Read-F, SONO 45-25, SIDKO, and Tetrahedron) have been selected for field-testing and performance verification. Each ART has been field-tested on 5 wells with 5 different water matrices in 5 hydrogeologically-different regions of Bangladesh. Fresh groundwater contaminated with varying concentrations of arsenic, iron, phosphate, alkalinity, etc. was passed through each technology at prescribed flow-rates. Samples of raw and treated water were taken at regular intervals and were analyzed for concentrations of arsenic, iron, phosphate, silicate, etc. by independent analytical laboratories. **Results:** The technologies that have been field-tested removed arsenic by either adsorption, or by co-adsorption and co-precipitation, or by ion-exchange processes. The field data showed that all technologies had a limited capacity for adsorption of arsenic, and the volume of arsenic-safe water, i.e. As ≤50 μg/L, which these technologies can produce depended on influent water-quality parameters. For example, Alcan's household unit capacity for production of arsenic-safe water was reduced by a factor of 0.66 when arsenic concentrations in groundwater was increased from 335 μg/L to about 570 μg/L and by a factor of 3.5 when phosphate concentration was increased from about to 2.2 μg/L to about 9.8 μg/L. **Conclusion:** All ARTs could produce arsenic-safe water; however, most did not meet the proponent performance claim, perhaps the proponents were too ambitious in their choice of ranges of water-quality parameters and did not want to impose any restrictions on their technologies.

Day 3: Tuesday, 6 March 2007 073 (207)
10:15 am-11:00 am (Venue: Sasakawa Auditorium)
Plenary for Gender Issues

Can Research and Policy Promote Gender Equity and Empower Women? A Review of the Experience of Bangladesh

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The third of the eight Millennium Development Goals (MDGs) is to promote gender equality and empower women. When the MDGs were first articulated in 2000 as targets to be achieved at the national level, Bangladesh was one of only 2 countries in Asia to be close to achieving health and education targets set under the MDGs. In fact, several international comparisons noted Bangladesh for achieving remarkable progress in education and health-related indicators, despite a relatively low level of overall economic development. A recent review conducted by the World Bank shows that, despite this progress, there are significant concerns. First, although the national average reflects success, there is a significant variation within the country so that there are portions of the country that lag behind in these achievements. Ensuring that goals are achieved equally across the country will require an understanding of the sources of the significant regional variations and then identifying appropriately-targeted policies for achieving these goals. Policy-relevant research can play an important part mapping areas of vulnerability and in identifying appropriate strategies.

Second, although the one stated target under MDG 3—gender equality in education at the primary and secondary levels—has been achieved, there are several indicators that show women to be lagging behind men. In particular, opportunities of women to seek gainful employment are significantly less than those of men. Early marriage and childbearing are barriers for women to achieving equality in access to economic resources. Even as women and men reach parity in education, women leave school to marry, while men leave school to enter gainful employment and marry considerably later. Responsibilities of women at home and in childcare prevent them from engaging in the labour market in the same ways as men do. Another indicator—ability of women to own and inherit property—is hindered by unequal inheritance laws that disfavour women. An important barrier for women to exercising control over the property that they do legally inherit is the tradition of patrilocal residence. Women have to give up control because they are not able to cultivate or otherwise make productive use of land. Finally, the MDG process identifies equality in political participation as an indicator of gender equality and empowerment. Despite a system of reservations and women's political participation as party leaders, in general, women play only a marginal role in the country's politics. Finally, another indicator that the MDGs do not specify but that nevertheless plays an important part is violence against women. Gender-based violence is all

too a common indicator of women's poor status in the country. Until society can offer some semblance of protection in public and private spheres, women cannot assume the same status as men in society. Thus, the goal of gender equity policies needs to prioritize 4 issues: improve opportunities of women for gainful employment, remove barriers to women's equal inheritance of property, ensure greater and more effective political participation at all levels of legislature, and target gender-based violence. Approaches need to be multi-sectoral with a strong contribution of social movements but research can play an effective role in both identifying the nature of inequality in these parameters and advancing an agendum of evidence-based policy-making.

Day 1: Sunday, 4 March 2007 074 (124)
12:15 pm-1:30 pm (Venue: Corridor Café)
Poster Session 1
MDG 1: Eradicate Extreme Poverty and Hunger
Methodological Issues

Father's Out-migration and Child Nutrition in Matlab, Bangladesh

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Background: Studies have found that many migrants maintain ties not only with their sites of origin, but also play crucial roles in promoting the development and welfare of the communities that stay behind and, thus, likely to affect the health and survival of stayers. **Objective:** To examine the effects of father's out-migration on child nutrition and whether level of nutrition varies by sex of the child. **Methodology:** Data for the study were drawn from the Matlab Health and Socioeconomic Survey (MHSS) 1996, a multi-stage, multi-sample survey of social networks and health. The MHSS was conducted in Matlab, where ICDDR,B has maintained a demographic surveillance system since 1966. Matlab is also an area of extensive out-migration, both to domestic and international destinations. Of children aged less than 15 years under the survey, 10% had a father living outside the district, with half of those abroad. The MHSS child modules incorporate detailed reported and observed measures of health and cognitive function. Reports by a responsible adult (nearly always the mother) include data on morbidity, medical treatment, and hospitalization. Of greatest interest for the current study are observed data on child nutrition (height and weight used for constructing measures of wasting, stunting, and weight-for-age). **Results:** Child nutrition was better if father out-migrated (in-country or overseas) compared to if father was present in the household. A female child was more malnourished than a male child. The childhood nutrition status was better if the family had a younger child but worse if it had an older child. High household-income, education of mother, and economic contribution of mother to the household improved child nutrition. **Conclusion:** As out-migration (in-country and overseas) is increasing in rural Matlab, it is likely that childhood nutrition would improve as a consequence. **Acknowledgements:** The support of ICDDR,B, University of Colorado, USA, and University of Denver, USA, is acknowledged.

075 (137)

Individual Contribution to Household Economy and Intra-household Resource Allocation for Healthcare in Matlab, Bangladesh

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Background: Studies in developing countries indicate that personal economic contribution to the household plays a significant role in intra-household resource allocation. Concerns have been expressed for the well-being of household members, such as women and elderly who contribute less economically to the household. This issue is not well-examined for 2 reasons: individual-level income data were rarely available for developing countries and economic contribution for which an individual does not receive personal income is rarely measured. **Objective:** To study the effect of individual income or economic contribution on the use of curative healthcare for acute illness, with special reference to the elderly and women. **Methodology:** Data for the study came from the 1996 Health and Socioeconomic Survey at Matlab, a rural area of Bangladesh, where ICDDR,B has maintained an ongoing demographic surveillance system since 1966. This study includes 11,034 individuals aged 15+ years randomly selected from the Matlab DSS area using a multi-stage sampling framework. The survey collected detailed information on income earned and participation in productive activities, both at individual and household level, during the 12 months preceding the interview. This information was used in constructing both income and economic contribution measures for the study. The main outcome variable of the study is whether a person had sought any healthcare if s/he had an acute illness in the 4 weeks preceding the survey. The analysis used a standard probit model and Heckman's 2-step probit model. The Heckman model was used in correcting for selection bias. **Results:** The effect of individual economic contribution was highly significant. Household members who contributed less received less healthcare for an acute illness. Elderly (60+ years), and females was less likely to receive healthcare when sick, even after controlling for personal income, economic contribution, and other important variables. **Conclusion:** The household is not altruistic in allocating resources for healthcare of its members. It allocates less to less-productive members. In addition, age and gender-bias in resource allocation discriminate against the elderly and women. Since the elderly and women also contribute less economically, they are doubly discriminated against. **Acknowledgements:** The support of Institute of Behavioral Sciences, University of Colorado at Boulder, USA, ICDDR,B, and National Institute on Aging, USA, is acknowledged.

Programmes and Interventions 076 (023)

Growth of Infants with Cow's Milk Allergy through Complementary Feeding Period: A Randomized Trial Comparing Three Special Formulae

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Background: Observational studies have shown that infants with cow's milk allergy (CMA), irrespective of the type of diet, show various degrees of growth depression in the first year of life. **Objective:** To investigate whether the type of milk in the complementary feeding period (6-12 months of age) is associated with differences in the increase of standardized growth indices: weight-for-age, length-for-age, and weight-for-length, z-scores in infants with CMA. **Methodology:** Infants with CMA, breastfed at least 4 months and progressively weaned in the 5-6-month period, were randomly assigned to 3 special formulae, a soy-formula (n=32), a casein hydrolysate (n=31), and a rice hydrolysate (n=30). Atopic infants still breast-fed up to 12 months (n=32) were assumed as controls. Groups were compared for weight-for-age, length-for-age, and weight-for-length z-scores at 6, 9, and 12 months of age. **Results:** All CMA groups showed negative weight-for-age and length-for-age z-scores at 6 months of age. Infants fed hydrolyzed products showed slightly better weight-for-age z-score increments in the 6-12-month period. **Conclusion:** The CMA status is a major determinant of the quality of growth in the first year of age, irrespective of the dietary regimen. The choice of a formula might be firstly based on the individual sensitivity, but hydrolyzed products seem to offer some nutritional advantage compared to soy.

077 (066)

Scouts for Promoting Community Health and Nutrition through Bangladesh-Japan Joint Primary Health Care and Nature Conservation Project

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Background: Solution to health problems emphasizes on creation of leadership and development of active people at the community level. Active people earn scientific knowledge and skills, pass on the same to others, and contribute towards solving the problems. Scouts as young and promising citizens contribute towards solving the health and nutritional issues. **Objective:** To document the efforts of scouts of Bangladesh and Japan in creating awareness among the community people on different components of primary healthcare (PHC) and to improve their knowledge and practice on health, sanitation, nutrition, environment, and related issues. **Methodology:** This evaluation attempted to find out the achievements of scouts in the past 3 work-camps by conducting an experimental study. Baseline data were collected before work-camp and post-intervention data after 6 months. The samples were selected from the households of each work-camp area through simple random sampling, and the sample size was 143 in baseline and 194 in end-evaluation. **Results:** The knowledge relating to infant feeding, health, and nutrition of pregnant mothers, management of diarrhoea, and intake of vitamin A and iodine showed a significant improvement ($p<0.001$). The scout intervention registered significant progress ($p<0.001$) in improving the sanitation and hygiene practices, child-feeding practices, except exclusive breastfeeding, healthy practices, and care for pregnant mothers. The practice of exclusive breastfeeding remained unchanged. **Conclusion:** The Bangladeshi and Japanese scouts and non-scout young people made a significant improvement in promoting community health and nutrition in the intervention villages. **Acknowledgements:** The support of Bangladesh Scouts and Scout Association of Japan for taking up the project is acknowledged.

078 (155)

Nutrition Intervention Programmes in Bangladesh

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Background: The nutritional status of the people of Bangladesh is considered to be one of the worst in Asian countries, and Bangladesh ranks 57th in relation to children aged less than 5 years, and the rate of mortality as stated in the State of World Children 2007. Despite the rapid growth in income and food production, the nutritional status of people has remained low with a considerable impact on health. According to the Bangladesh Demographic and Health Survey (BDHS) 2004, stunting of children was reduced from 65.5 in 1989-1990 to 43 in 2004, and rate of exclusive breastfeeding from 46% to 42% in respective years. To achieve the Millennium Development Goals (MDGs), the Government and different NGOs have taken nutrition interventions in different parts of Bangladesh. **Objective:** To describe the nutrition-intervention programmes initiated by the Ministry of Health and Family Welfare (MoHFP) and NGOs in Bangladesh and to assess the prospective outcome of these interventions. **Methodology:** Monitoring and evaluation reports of 5 NGOs programmes, such as Save the Children-USA, Plan Bangladesh, Save the Children UK, Concern Worldwide [Urban Nutrition and Household Food Security Project (UNHHFSP)], and CARE Bangladesh and the baseline survey of the National Nutrition Project (NNP) were reviewed. **Results:** Despite the improvement in basic nutritional knowledge, most organizations have been implementing nutrition programmes in the northern and southern regions of Bangladesh through collaborating with different MoHFW programmes, such as Expanded Programme on Immunization (EPI), National Day of Vitamin A (NDA), programmes on iron, iodine, and reproductive health services, etc. The NNP covered 105 upazilas, whereas intervention programmes of the NGOs covered 3-11 upazilas. The NNP and UNHHFSP have been providing food supplementation to children and pregnant women along with other knowledge and skills-development interventions in the areas of health, agriculture, disaster management, poultry, home-gardening, fisheries, etc. Results of the surveys showed that rates of nutritional (7% wasting, 41% stunting, and 37% under-weight in the INP and 13% wasting, 43% stunting, and 48% under-weight in the NNP) status and initial breastfeeding were (35% INP and 30.2% NNP) more or less similar to the rates in the BDHS 2004. Moreover, high rates of over-weight women were also found in the INP (15% in rural Dinajpur and 29% in urban slum by BMI >23) and BDHS 2004 (9% in rural areas by BMI >25). **Conclusion:** Nutritional status in most rural areas of Bangladesh is similar, and the food supplementation intervention methods of NNP and UNHHFSP are needed to be justified in keeping with other intervention methods and expected outcomes.

079 (185)

Ownership of, and Influence Over, Community Health Services by Microcredit Women's Groups

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Background: Participation in savings and loan schemes, where women 'learn by doing,' helps overcome exclusion from resources and power. Better understanding is needed to link community development and health facilitating community participation. **Objective:** To determine the impact of microcredit women's groups investing some of their pooled funds directly into health services on ownership and perceptions of influence over those services. **Methodology:** The study was conducted at the LAMB Integrated Rural Health and Development Project in North-West Bangladesh. Focus-group discussions were held with randomly-selected members of the women's savings and loan group in 5 LAMB target unions where those groups donate funds to the LAMB clinics. Leadership committees in those 5 unions were also questioned regarding the impact of women on the healthcare centres. Textual information was transcribed, translated, and analyzed according to a thematic framework. **Results:** Regularly-receiving reports on clinical services (community clinic usage, health status), together with personal knowledge, resulted in increased ownership: 'this place is like my bari [home].' While not providing all the wants of the patients, there were perceptions of giving direction to clinical services (women/children's health prioritized). Leadership was concerned about a risk financial resources would be unjustly used. **Conclusion:** Financial incentives are a strong mediator of behaviour, and a direct link between the resources of women's group and the clinic activities supports a model where microcredit can be a source of not just community enterprise and livelihoods, but health improvement as well. **Acknowledgements:** A Tear Fund project evaluation (April 2006) supported the innovative benefit of microfinance groups supporting health clinics.

MDG 3: Promote Gender Equality and Empowerment of Women 080 (056)

Assessing Levels and Trends of Women's Empowerment in a Province of Thailand

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Background: The study measured the socioeconomic characteristics of the population by stratum and sex in the context of women's development in Kanchanaburi province, Thailand. **Objective:** To understand women's empowerment in the study population, comparing data from Round 4 (2003) with data from Round 3 (2002). **Methodology:** The study area was divided into 5 strata. These are: (a) urban/semi-urban (industrialized), (b) rice-producing, (c) plantation, (d) uplands areas, and (e) mixed economy. The villages/blocks for the Kanchanaburi province were selected using a stratified systemic design. The study units are 100 villages/blocks distributed throughout the province. Structured interviews were conducted with males and females in households to collect data. In this survey, there were 12,356 enumerated households. The Round 4 (2003) census included 42,816 persons (20,350 males and 22,466 females) in the study area. The questions on occupation and level of education were asked to both males and females aged 7 years and over. Here, persons 15 years and above have been shown as working age-group. Occupation of persons aged below 15 years, i.e. both males and females aged 7-15 years, is not shown or discussed. In education, the result has been shown for both males and females aged 7 years and above. **Results:** Forty-one percent of the women were employed in the agricultural sector, although as with men, there has been a decrease in this proportion across the census rounds. The second most frequently-stated occupation of women was sales; more than one-tenth of women aged 15 years and over were in this category, which represents an increase of 1 percentage point over 2003. This was followed by crafts and labour (7%), which also increased from Round 3. The percentage of women in business, service sector, and administrative jobs increased from Round 3 to Round 4. In education, the gender gap was smallest in the urban/semi-urban stratum, while it was largest in the plantation and rice strata. Women had lower levels of education than men. Compared to men, the proportion of women with no education was higher. However, the primary level of education of women was higher than that of men. **Conclusion:** The gender gap in education is least evident in the urban/semi-urban stratum and most evident in the plantation and rice strata. Men are educationally advantaged compared to women. Nevertheless, strata differentials and gender differentials in occupational structure are observed.
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081 (082)

Spousal Violence and Suicidal Ideation among Women in Bangladesh

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Background: Suicidal tendencies although rarely studied have been associated with intimate partner violence. With the exception of Papua New Guinea, little is known about the relationship between these two in the developing world. In Bangladesh, the rates of violence and suicide are quite high. Thus, a study of relationship between the two and other determinants of suicidal ideation is important for policy and intervention. **Objective:** To explore suicidal ideation among ever-married women of reproductive age in Bangladesh and the factors associated with it with a special focus on different forms of spousal violence. **Methodology:** Data came from a population-based survey of women of reproductive age conducted in rural and urban Bangladesh in 2001 by ICDDR,B-Naripokkho as part of the WHO multi-country study on domestic violence against women. All ever-married women (n=2,702) covered by the survey were included in the current analysis. **Results:** About 11% of the ever-married women of reproductive age in the rural area and 14% of them in the urban area reported ever contemplating suicide. About 5-6% of the women reported having suicidal thoughts over the last 4 weeks. Of women who contemplated suicide, 9% in the rural and 26% in the urban site reported actually attempting suicide. Results of logistic regression showed that, in both rural and urban sites, physical and psychological abuses were positively related to suicidal ideation. Higher-aged women, women reporting perceived natal family support in crisis, and women with higher score for spousal communication were less likely to have suicidal ideation in the urban area. On the other hand, women whose fathers physically abused their mothers were more likely to have such ideation. In the rural area, better spousal communication was negatively associated with suicidal ideation. Sexual violence was not associated with suicidal thoughts in any of the sites. The variables not associated with suicidal ideation were education, household income, and women's income-earning status. **Conclusion:** The prevalence of suicidal ideation among ever-married women of reproductive age in Bangladesh is high. Both physical and psychological spousal violence against women contribute to contemplation of suicide. To address the issue of suicide, these forms of violence against women need to be addressed. **Acknowledgements:** The Urban Primary Health Care Project and Asian Development Bank are acknowledged for financial support. The World Health Organization is acknowledged for sharing the methodology.

082 (118)

Consequences of Early Marriage

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Background: Marriage before the age of 18 years is a reality for many young women in Bangladesh. Worldwide, early female marriage is associated with a number of poor social and physical outcomes for young women and their children. On average, girls who marry as adolescents attain lower schooling levels, have lower social status in their husbands' families, report less reproductive control, and suffer higher rates of maternal mortality and domestic violence. In addition, these individual outcomes suggest a number of larger social consequences, including higher population growth, greater spread of disease, and a higher incidence of orphans. With this view, early marriage is an issue of significant concern to policy-makers and human rights activists. Bangladesh provides an appropriate setting for studying early marriage as the rate of child marriage in Bangladesh is one of the highest in the world. **Objective:** To investigate the socioeconomic and physical consequences of early marriage for females in rural Bangladesh. **Methodology:** Using the surveillance data of 2005 from Mirsarai and Abhoynagar—2 rural sites of Bangladesh—the study explored the consequences of early marriage. The analyses focused on 2 areas: reproductive outcomes of early marriage and educational outcome of early marriage. **Results:** The results indicated that marriage age mattered. Each additional year that marriage was delayed was associated with reduction in pregnancies. Delayed marriage was also associated with a significant increase in female schooling and adult literacy. **Conclusion:** In the context of competitive marriage markets, the results can be used for obtaining estimates of the change in equilibrium in female education that would arise from introducing a minimum legal age at marriage. The analysis implies that, under reasonable assumptions, enforcing universal age of consent laws would have a strong positive impact on female schooling and fertility.

083 (153)

Mainstreaming Gender and Reaching the Poor: Experience of the Environmental Sanitation, Hygiene and Water Supply Project

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Background: In Bangladesh, waterborne diseases constitute major causes of morbidity and mortality. The coverage of sanitation has increased but poor households still have limited access. To address these, the Government of Bangladesh and United Nations Children's Fund developed 'Environmental Sanitation, Hygiene and Water Supply in Rural Areas' (ESHWRA) Project. The development phase (pilot) of the Project is completed, and the implementation phase is about to be rolled off. This presentation highlights a part of the comprehensive study by Barkat *et al*.* **Objective**: To examine the extent to which ESHWRA Project of UNICEF has reached the poor and mainstreamed gender. **Methodology:** The study was designed to analyze distributional impact of the Project on water, environment, and sanitation-related well-being of comparable stakeholder groups: (a) women and men, (b) poor and non-poor. Relevant social and economic analysis tools and methods were used in the study. **Results:** There existed missing links of poverty and gender between the guidelines and their practices. The overall knowledge coefficient of water and environmental sanitation (WES) for the poor and non-poor was 0.81 and 0.84, and for male and female it was 0.77 and 0.85 respectively. ESHWRA activities as sources of knowledge were reported 7 percentage-points less by the poor compared to the non-poor; and male-female differential varies by 22 percentage-points. The poor had seemingly attained a net gain on access to safe/clean and arsenic-free water of about 72 percentage-points, while the same for non-poor households was 78 percentage-points. Similarly, 90% of the poor and 97% of the non-poor households reported access to a sanitary/hygienic latrine, and 91% of the poor and 100% of the non-poor had access to water and environmental sanitation-related information. Any and/or all members in 10% of the poor and 3% of the non-poor households at present reportedly defaecate in open space, while the same before was 85% and 84% respectively. On the whole, the incidence of diseases associated with lack of WES services declined remarkably among both poor and non-poor due to increased access attributable to the ESHWRA Project. Composite gender mainstreaming score depicted that, on the whole, women were lagging behind nearly twice (1.76 times) compared to males (score: 2.8 vs 4.9). The highly-pronounced gender-gap areas were in the spheres of field-level management, planning, and implementation of the ESHWRA Project. Estimates of reaching the poor composite index, based on 25 pertinent indicators covering the most intervention areas

showed that, while the average index value was 0.44, it was 0.31 for the poor and 0.53 for the non-poor. **Conclusion:** To further accelerate the process of reaching the poor and mainstreaming gender, among others, the related suggestions include: revision of the guiding principles, allocation of higher share of resources targeted to the poor and women, incorporation of gender needs, and introduction of poverty and gender-related indicators in monitoring and evaluation. **Acknowledgements:** The financial support from Department for International Development, UK, is acknowledged.

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*Barkat A, Poddar A, Rahman M, Majid M, MohiuddinG, Ara R, Mohiuddin H, Hoque S, Mohib K, Osman A, Khan S, Hossain I. Study on mainstreaming gender and reaching poor in the Environmental Sanitation, Hygiene and Water Supply in Rural Areas (ESHWRA) Project, HDRC, prepared for UNICEF, Dhaka, 2007

MDG 4: Reduce Child Mortality 1
Interventions and Programmes 1

084 (001)

Healthcare-seeking Behaviours and Their Relationship with Use of Health Services in Northern Areas of Pakistan

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Background: Policy, programmes, and reforms in healthcare systems should be based on information unfolding determinants of healthcare-seeking and use behaviours. **Objective:** To determine use patterns, perceptions on quality of care, costs, accessibility, and gender sensitivity of various healthcare services. **Methodology:** Interviews with healthcare providers, key-informants, exit clients, and households were conducted. Focus-group discussions with community members were also carried out. Registers of health facilities were reviewed, where available. **Results:** Aga Khan Health Services Pakistan (AKHSP) was the most frequently-used service, followed by government facilities, private formal services, and non-formal services. For children, the government services were used more. Women consulted AKHSP more frequently compared to men. All income-groups used the government services equally. However, high-income group used private healthcare services, including AKHSP, relatively more. Tendency to shop around for healthcare was evident. There was an average delay of 3 days before first consultation. Not prioritizing one's illness, economic reasons, and treating oneself with medicines available at home or with neighbours were the common reasons for a delayed consultation. Private-sector healthcare was consulted more because of the quality of care and higher rates of satisfaction. Government service-users quoted economic reasons and proximity. Inadequate public transport, difficult terrain, and non-affordability compelled the majority to travel by foot to reach the nearest healthcare facility, mostly a non-formal/traditional healer or a government dispenser. General perception about the private sector was that healthcare services provided were just appropriate. Women restricted social mobilization even for healthcare-seeking and emergencies; however, AKHSP was culturally-acceptable healthcare because of the availability of female staff in the facility. An average amount of Rs 200.00 was spent on one round trip to a health provider. People were willing to pay provided they get quality of care, female staff, range of services, extended hours of clinic, and empathetic attitude of the facility staff. **Conclusion:** The findings of this research may assist in designing a more acceptable healthcare in both public and private sectors. It informs policy-makers for increased investment and prioritization in ongoing reforms in the health systems, such as user-fee, health insurance, and public-private partnership. It provides an opportunity for advocacy on appropriate and timely healthcare-seeking, adaptation of services according to needs of clients, and a client-centred approach.
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085 (007)

Government-NGO Collaboration: Is Maternal and Child Health Reaching the Urban Poor in Bangladesh?

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Background: In Bangladesh, half (nearly 20 million people) of the urban population reside in municipalities, where over 25% of children live in households with absolute poverty. While public-health services are the safety-nets for the poor, bounty of studies clearly indicate that such services usually favour the better-off. The Lancet's Child Survival Series identifies equitable maternal and child health services as an essential factor to impact the Millennium Development Goal 4 and 5. Concern Worldwide is passionate to improve the urban health system in Bangladesh in a sustainable and equitable manner, supporting the local government initiatives. **Objective:** To compare results of service coverage and health practices among the poorest mothers with young children of intervention areas residing in Saidpur and Parbatipur municipalities and 7 surrounding municipalities (new operation areas) on selected child-survival indicators. **Methodology:** The study was integrated into the design of the intervention area's final evaluation (2004) and new area baseline (2005) knowledge, practice and coverage surveys. Respondents included 912 and 2,962 mothers with children aged less than 2 years in the intervention and new area respectively with comparable social, economic and demographic characteristics. The survey design was based on simple random sampling of 38 mothers per administrative ward using updated household registers. **Results:** Findings indicated significant improved odds ratios of coverage and practices among the respondents in the lowest asset-quintile from the original operational areas. Specifically, the poorest mothers were 2.72 times more likely to have been assisted by a skilled delivery attendant than those in the new area (1.59<OR<4.66). They were 5.96 times more likely to receive postpartum vitamin A supplementation (3.40<OR<10.46). Children, aged 6-24 months, of the poorest mothers were 4.22 times more likely to have received vitamin A supplement in the past 6 months (2.55<OR<7.99). Children, aged 6-24 months, of the poorest mothers were 4.22 times more likely to be fully vaccinated (1.43<OR<6.22). **Conclusion:** The data demonstrate that the asset-poorest mothers and children have considerably better health practices and coverage of essential services in the intervention area than the new operation areas. However, in both the areas, the health practice and coverage indicators are consistently better for those in the highest asset groups than the lowest asset groups. Use of the asset index is a powerful and low-cost analytical method that sheds light on equity and the reach of child-survival programmes to all socioeconomic situations.

086 (010)

Effectiveness of a Low-tech Approach to the Management of Feeding Difficulties in Children with Cerebral Palsy in Bangladesh

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Background: The majority of children with cerebral palsy (CP) have feeding difficulties, which result in chronic secondary malnutrition, poor health, respiratory disease (the commonest cause of death), aggressive feeding practices of caregivers, reduced quality of life for caregiver (CG) and child, and early child mortality. In well-resourced countries, high- and low-tech interventions, ranging from gastrostomy tube-feeding to parent training, are available. In Bangladesh, the former is not viable, and the latter is both scarce and its effectiveness not fully evaluated. **Objective:** To design and evaluate a training programme for caregivers of children with CP aimed at teaching CG feeding practices that would positively impact on children's nutrition and fluid intake, aspiration levels during mealtimes, and distress experienced during feeding, thereby improving overall morbidity and quality of life. **Methodology:** This prospective intervention study was conducted in the Child Development and Neurology Unit of Dhaka Shishu (Children's) Hospital and in participants' homes in 3 areas of Dhaka (April 2005–August 2006); 37 CGs and their children with CP were enrolled and divided into 2 cohorts. Participants underwent a baseline assessment (medical examinations, CG interviews, feeding observations, and anthropometric measurements) and received basic initial feeding advice (for ethical reasons). The first cohort immediately underwent 6 fortnightly group-training sessions. The second cohort underwent a period of non-intervention prior to attending training groups to provide some measure(s) of within-child control. All the participants were reviewed following training (immediately and after 3-5 months) to evaluate CG compliance and outcomes. The study was approved by the Ethical Review Committees of the Institute of Child Health, London, and the Bangladesh Institute of Child Health. **Results:** Preliminary results comparing non-group intervention vs group intervention are particularly significant in the areas of CG's compliance, children's chest health, and signs of aspiration during feeding, and CG and child distress in relation to feeding. Although the quality of the children's diets generally improved, significant weight gain was observed in only a few individuals. **Conclusion:** A low-tech approach to the management of feeding difficulties involving intensive caregiver training is highly effective in promoting responsive CG's feeding practices, reducing the risks of aspiration pneumonia and improving the overall experience of mealtimes both for child and CG. Further research is needed to develop appropriate food supplements for these children. The special needs of this population in relation to feeding must be actively addressed in national policies on health and nutrition.

087 (011)

Community Capacity-building and Provider-linkage Approach Improve Maternal-Newborn Health in Slums of Indore

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Background: The urban health programme of the Urban Health Resource Centre (UHRC) is functional in Indore, Madhya Pradesh, India, since April 2003. It aims at demand generation by building social infrastructure and linking slum communities with public and private maternal, neonatal and child health services using a partnership approach of non-governmental organizations (NGOs), community-based organization (CBO) consortia, State Department of Health, and Municipal Corporation to reach over 150,000 people in 79 slums. **Objective:** To improve maternal-newborn health (MNH) practices in under-served slums through the community capacity-building and linkage approach. **Methodology:** The programme approach evolved through stakeholder consultations, situation analysis, and assessment of slum health vulnerability. Of 605 slums of Indore, interventions targeted 79 vulnerable slums. In 79 slums, 90 CBOs with 800 members have been promoted and strengthened that implement programme activities with support from 5 NGOs and 9 leading CBOs (which are more experienced with better capacities; 1 per 5-7 slums). NGOs do advocacy and capacity-building of CBOs. Leading CBOs build capacity of the slum-level CBOs, undertake community-based monitoring and coordinate among the public and private service providers for outreach and outpatient department services and referral linkages. Slum-level CBOs, which usually involve slum-based birth attendants, enhance demand, and promote behaviours at family level through community MNH sessions, and antenatal and postnatal home-visits. **Results:** There has been an increase in tetanus toxoid immunization from 22.6% to 88.9%; increase in home-delivery by trained birth attendants from 41.4% to 72.9%; increase in initiation of breastfeeding within one hour from 10% to 55%; and increase in clean delivery practices, such as new blade, clean thread, and no cord-application from 49.6%, 43.9%, and 14.8% to 79.16%, 100%, and 49.3% respectively. CBOs negotiated with hospitals to access emergency obstetric and neonatal care. CBOs also addressed unforeseen health expenditure through microcredit activities and health funds. **Conclusion**: The Programme focuses on strengthening social infrastructure in slums by stabilizing community-level institutions and linking them with the government's city-level Reproductive and Child Health Programme. It serves as a learning university through (a) dissemination of lessons and evidence-based best practices to inform District, State, and National Urban Health Programme strategies and (b) study tours for programme implementers.
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088 (012)

Learning Local Wisdom of Rural Communities for Community-based Breastfeeding Behaviour Promotion

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Background: Although optimal breastfeeding (BF) behaviours leading to improved nutritional status are known, less is known why some poor rural families practise optimal BF, while others do not. **Objective:** To develop a BF behaviour-promotion strategy in poor rural communities of Agra district, Uttar Pradesh, India, using local wisdom of community members who practise optimal BF. **Methodology:** Two hundred mothers of infants, aged less than 6 months, from 7 socioeconomically-backward villages in Agra were interviewed. BF practices and factors facilitating optimal BF were enquired. Based on findings, a behaviour-promotion strategy was devised for 3 of 7 villages. Three villages were serving as intervention and 4 as control. **Results:** The findings revealed that 16% of the mothers initiated BF timely, 30% avoided prelacteals, 32.5% fed hind milk, 45.5% breastfed atleast 8 times in 24 hours, and 11.5% of infants who were aged 0-3 month(s) were exclusively breastfed. Perception of grandmothers, family support, some traditional practices, doctor's advice, and family's perceived benefit of the practice influenced BF. The emerged strategies for promotion of BF were: (a) Developing a pictorial home-counselling aid with messages promoted using local community logic, like (i) initiate BF timely so that baby never forgets suckling, and mother does not face problem of 'breast-insufficiency', (ii) avoid prelacteals to prevent diarrheoa, (iii) on each feed, breastfeed for atleast for 10-15 minutes with baby controlling nipple removal so that the baby's thirst is quenched and optimal nutrition. This also makes the baby sleep longer giving mother more time to complete chores, (iv) breastfeed atleast 8 times in 24 hours as baby's cry are satisfied only by BF, (v) babies exclusively breastfed in the first 6 months postpartum are more healthy and feeding supplements cause diarrheoa; (b) Counselling all mothers and all influencers through home-visits and community meetings; and (c) training and mentoring grandmothers as they emerged key influencers of positive behaviours to work as maternal-infant care behaviour promoters in the intervention villages. **Conclusion:** Understanding the community's own reasons for optimal BF practices can help adapt messages/behaviour-promotion strategies and promote BF in a culturally-compatible and more effective manner. **Acknowledgements:** This study was supported by a Junior Research Fellowship grant received from University Grant Commission, New Delhi.

089 (016)

Neonatal Hypothermia in Urban Poor Newborns: A Slum-community-based Study

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Background: Hypothermia is now recognized as causal factor for neonatal deaths. It is, hence, important to study hypothermia using a simple method that can be used by community health workers and mothers at home. **Objective:** To examine the relevance of human touch assessment as a programmatically-feasible method of assessing neonatal hypothermia. **Methodology:** The study was carried out in 11 slums of Indore, India. Body temperature of 152 babies born during December 2004–February 2006 was assessed by trained field investigators in slum homes using the World Health Organization-recommended method. Axillary temperature was measured with digital thermometer (accuracy 0.1 °C). Newborns were classified as warm, cold-stressed, and hypothermic if axillary temperature was between 36.5-37.5 °C, 36-36.4 °C and <36 °C respectively. Investigators used dorsum of hands to assess skin temperature at abdomen and soles of feet of newborns. Newborns were classified as warm, cold-stressed, and hypothermic if both abdomen and sole were warm, abdomen warm and sole cold, both abdomen and soles were cold respectively. Other important danger signs indicating neonatal illness, such as poor suckling, lethargy, and increased respiration rate (>60 beats per minute), were observed. Methods for assessing hypothermia were compared, and the newborn's body temperature was compared with other danger signs using statistical methods. **Results:** By the touch method, 55.3%, 38.8%, and 5.9% of the newborns were assessed as warm, cold-stressed, and hypothermic. The proportion of newborns adjudged warm, cold-stressed, and moderately hypothermic by the axillary method was 69.1%, 21.7%, and 9.2% respectively. More newborns were assessed as cold-stressed by human touch method compared to axillary method. Assessment by human touch method showed that 88.5% hypothermia was contributed by cold stress. Further, 65% cold-stressed and 83.3% of hypothermic newborns also had one or more other danger sign(s) of neonatal illness. **Conclusion:** Training slum-based health volunteers in identifying cold-stress and other danger signs during postnatal visits can help in early recognition of neonatal illness. Simple home-based practices for providing extra warmth to sick newborns can be lifesaving. For wider programme applicability, more community-based research is required to validate human touch method for assessing hypothermia. **Acknowledgements:** The financial support of the United States Agency for International Development is acknowledged.

090 (029)

Improving Child Survival Through Improved Infant and Young Child Nutrition—Lessons Learnt from Urban Slums of Bangladesh

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Background: Bangladesh is becoming increasingly urban, and the growth of urban population has been most pronounced in Dhaka, Chittagong, and Khulna. Urban poverty is high, and household food security situation and under-nutrition are far worse than in any rural areas in Bangladesh The prevalence of under-nutrition is extremely high, and reports suggest that 33-66% of children, aged 0-23 month(s), in urban slums are under-weight. This scale of under-nutrition experienced by urban slum dwellers across the country demands a multi-sectoral approach to reduce its underlying effects on the development of Bangladesh. **Objective:** To achieve a significant improvement in feeding practices for infants and young children and to reduce moderate and severe under-nutrition in children aged less than 2 years for improved child survival. **Methodology:** Concern Worldwide Bangladesh used the National Nutrition Project (NNP) approach for improving the nutritional status of 13,384 children from selected urban slums in Chittagong, Dhaka, and Khulna. Nutrition-related activities, such as special care for low-birth-weight infants, growth monitoring and promotion (GMP), targeted targeted supplementary feeding, were carried out, with strong community participation to ensure that the project has the desired impact. **Results:** The improvements seen in nutrition indicators: improved infant-feeding practices (higher rate of exclusive breastfeeding and timely initiation of complementary feeding), decrease in moderate (by 3.3-12.9%t) and severe under-nutrition (by 9.5-13.9%), decrease in enrollment in supplementary feeding (by 28.4-51.8%), and decrease in infant mortality (by 45-81%), were some major achievements of the urban nutrition project from 2002 to 2005. GMP activities and targeted supplementary feeding of children with growth default/severe under-nutrition helped in increasing the proportion of children with normal nutrition by 7.4-18.6% and mild by 3.9-6.3%. Ninety-nine percent of the children received vitamin A supplementation. Improved childcare practices (improved care of low-birth-weight infant/feeding sick child/improved health-seeking behaviours) were observed among caretakers of children, aged less than 2 years, who were the main targets of nutrition education. **Conclusion:** The results of the urban nutrition project have demonstrated the possibility of improving nutritional status and child survival through improved infant-feeding and care practices within a relatively short time (4 years) using an integrated NNP approach.

091 (030)

Partnering for Successful Introduction of Japanese Encephalitis Vaccine in India

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Background: Japanese encephalitis (JE) is a vector-borne flavivirus endemic in many Asian countries. It continues to spread to new areas in the region. In India, it has caused overwhelming seasonal outbreaks, killing thousands. The disease primarily affects children aged less than 15 years, killing one-third of cases and leaving another third with permanent disabilities. The only way to effectively control JE is through vaccination. **Objective:** To introduce Japanese encephalitis vaccine in mass immunization campaigns for children aged 1-15 year(s) in selected districts in India. **Methodology:** Following a massive outbreak of JE in northern India in 2005, which claimed over 1,500 lives, the Government of India, with support from partners, such as PATH, WHO, and UNICEF, launched an unprecedented JE immunization campaign during May-July 2006 to vaccinate 10.5 million children aged 1-15 year(s) in 11 of India's districts with highest risk for JE. Overcoming many challenges, the Government of India decided on a phased introduction of JE vaccine in all 101 at-risk districts over a 5-year period (2006-2010). The PATH's JE project contributed significant disease-specific knowledge to facilitate the making of an informed decision on introduction of JE vaccine. In addition, PATH negotiated an affordable public-sector price with the vaccine manufacturer in China—a pivotal factor in the Government of India's decision to introduce JE vaccine. All partner agencies (PATH, WHO, UNICEF) served as resources to national/local governments and collaborated with other stakeholders to provide technical assistance in all aspects of planning and implementation of the programme, including training and monitoring and evaluation. **Results:** National and international expert consultations recommended the live, attenuated SA14-14-2 JE vaccine manufactured in China as a safe, efficacious, and affordable vaccine for use in India. The vaccine was subsequently registered and licensed in India with plans for concurrent post-marketing studies. During the 2006 campaign, 9.3 million children (88% coverage) were vaccinated with a single dose in 11 districts. Intensified surveillance reported a small number of serious AEFIs (0.7 per 100,000 immunized); an independent expert review committee concluded that there was no causal association with the vaccine. **Conclusion:** The successful introduction of JE vaccine in India was the culmination of considerable collaborative preparatory work, information-sharing, and political commitment. The WHO's recommended strategy of campaign followed by integration into routine immunization will eventually protect over 100 million children in India over the next 5 years. **Acknowledgements:** The PATH's Japanese encephalitis project is funded by the Bill and Melinda Gates Foundation.

092 (032)

Community-based Experience of a Multi-professional Team in Working with Neurodevelopment of Children Aged Less Than 2 Years

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Background: Early child development programmes in Bangladesh do not encompass children of <2 years age-group, and local cultural norms often tend to ignore important facets of the developmental potential of these children. **Objective:** To assess the psychosocial, cultural and developmental norms, and attitudes which families display of children aged less than 2 years. **Methodology:** A door-to- door screening of 3-month to 2-year old children was conducted in the Mirpur Municipality in Dhaka city and 4 villages in Savar upazila. One hundred children per site were screened for their neurodevelopment with the Bayley Infant Neurodevelopmental Screener CBR workers. Most children were re-assessed at a central point by a multi-disciplinary team comprising physicians, therapists, and college graduates. Anecdotal experiences of all team members regarding family compliance, attitudes, positive and negative nurturing, etc. were collected. **Results:** Most mothers and families lacked knowledge or strategies to address the earliest developmental potential of their children, especially noticeable in the fields of 'speech', 'language', and 'communication'. Rural children were noticeably less competent in 'cognitive' skills. The majority of children had poor nutritional status. As the study progressed, community attitude towards their children's development changed from a 'medical' paradigm to a 'psychosocial' paradigm. **Conclusion:** Developmental and health needs of children aged 0-2 year(s) remain unvoiced in Bangladesh. Family-based strategies for optimum growth and development are needed, if the maximum potential is to be realized. Formal service providers, however, need to adapt strategies to build positive 'parent-professional partnerships', instead of being didactic. **Acknowledgements:** The support of the Saving Newborn Lives, USA, is acknowledged.

Assessment of Disease Burden 1 093 (002)

Parasitic and Viral Infections in Infants and Young Children with Acute Gastroenteritis in Gaza, Palestine

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Background: Acute gastroenteritis (infectious diarrhoea) is one of the leading causes of illness and death in infants and children throughout the world; the main causes of acute gastroenteritis are viral and parasitic infections. **Objective:** To investigate the importance of rotavirus and parasites in childhood diarrhoea in Gaza, Palestine. **Methodology:** Faecal samples from 150 children with age ranging from one month to 5 years, living in Gaza, who presented with episodes of acute diarrhoea, were analyzed. The analysis was carried out using an immunochromatography-based diagnostic kit (The RotaStick One-Step test, Novamed Ltd., Jerusalem) for rotavirus testing, and parasites were examined microscopically. The study was conducted during the peak diarrhoea season (May-August) of 2005. **Results:** Rotavirus was detected in 28% (42/150) of faecal specimens examined, and 90% of patients (38/42), who were positive for the virus, were aged 1-24 month(s), and the infection rate decreased with increasing age. By microscopic examination, *Entamoeba histolytica/dispar* was found in 15.3% (23/150), *Giardia intestinalis* in 1.33% (2/150), and *Strongyloides stercoralis* in 0.7% (1/150) of the samples. **Conclusion:** The findings demonstrate the importance of rotavirus and parasitic infections (*E. histolytica/dispar*) in infants with diarrhoea in Gaza, Palestine. **Acknowledgements:** The partial financial support received from Mr. Tarek Omar Aggad, Chairman and CEO of Arab Palestinian Investment Co. Ltd. and the staff of the Medical Supplies and Services Co., Gaza, Palestine, for the project is acknowledged.

094 (038)

Rapid Epidemiological Screening for Childhood Disability In Rural Bangladesh

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Background: The ten questions (TQs) two-stage epidemiological survey method for determining childhood disability has been accepted internationally as a tool, which is valid across sites, cultures, and countries. It uses high-school graduates for community-based screening, followed by a professional evaluation of all screened-positive and a percentage of screened-negative controls. The method has been shown to be sensitive for identifying motor, cognitive and seizure disabilities and less sensitive for vision and hearing disabilities. **Objective:** To refine the screening method of the two-stage survey by instituting the direct testing of vision and hearing, in addition to the TQs and ascertain their validity. **Methodology:** In total, 4,005 rural Bangladeshi children, aged 2-9 years, were screened in door-to-door surveys for disabilities relating to motor, hearing, speech, cognition, seizures, and behaviour by community workers. TQs, direct field audiometry, and the HOVT chart were administered. In a sub-set of children, which included children aged 0-2 year(s), direct hearing tests were done using the otoacoustic emission (OAE) screener. **Results:** Seventeen percent of the children screened positive in the TQs, who were at risk for disability. Field audiometry and HOVT charts could be used on older children (≥5 years) whose sensitivity and specificity were high. Younger children could not be administered these tests due to shyness and uncooperativeness. The OAE screener could be validly administered starting from the neonatal age. **Conclusion:** The TQs still remain a sensitive instrument to screen for childhood disability within communities by trained field workers. Direct testing for vision and hearing are valid for older children only, except for the OAE screener which could be administered to children of all ages. **Acknowledgements:** The support of the Centers for Disease Control and Prevention, Atlanta, GA, USA, for the Bangladesh Protibondhi Foundation is acknowledged.

095 (046)

Nutritional Status of Children of Mothers Working in Garments Factories With and Without Daycare Centres

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Background: With greater participation of women in the workforce, mothers face great difficulty in terms of accessing childcare services and are mostly compelled to leave their children in dwellings that may be unsafe for development of their children. The World Health Organization considers daycare centres to be an auxiliary aid for families, which should offer care to children during work-hours of their parents and provide appropriate conditions for their full growth and development. In situations of poverty, daycare centres have been used in many countries for promoting health among children. The primary focus of this research was on garments factories where approximately 1.5 million people are employed and, of whom 90% are females. **Objective:** To find out the difference in nutritional status of children of mothers working in garments factories with and without daycare centres. **Methodology:** The study was conducted in 6 garments factories with and without daycare centres during March-June 2005. The factories were randomly selected, and all children meeting the criteria were included in the study. Ninety-three children aged 12-36 months were included in this descriptive study, and the anthropometrical measurements of height, weight, and mid-upper arm circumference (MUAC) were performed on each subject using appropriate tools to assess their nutritional status. Sociodemographic, feeding, immunization and illness histories were collected using the interviewer-administered questionnaire from 93 mothers. All the data were edited by checking for consistency and were analyzed by SPSS software (version 14). **Results:** There was a significant difference in the mean height-for-age z-score (-0.79±0.90 vs -1.72±0.95, $p<0.01$), weight-for-age z-score (-1.59±0.68 vs -2.65±0.69, $p<0.01$), weight-for-height z-score (-1.46±0.76 vs -2.17±0.75, $p<0.01$), and MUAC (14.3±0.63 vs 13.18±0.50, $p<0.01$) among attendees and non-attendees aged 12-24 months. The weight-for-age z-score (-1.58±0.70 vs -2±0.66, $p=0.05$) and MUAC (14.3±0.66 vs 13.9±0.47, $p<0.05$) was just significant in children aged 25-36 months. The illness history revealed that 23% of the children not staying at the daycare centre had history of diarrhoea ($\chi^2=9.32$, df=1, $p<0.01$) in the last 2 weeks compared to 2% of attendees with a mean duration of illness (2.23±2.1 vs 1.15±2 days, $p=0.01$); 76% of attendees and 43% of non-attendees were currently breastfeeding ($\chi^2=10.8$, df=1, $p<0.01$). Demographic and socioeconomic characteristics were almost similar, except for the mean family size (3.65±1 vs 5.29±2 members, $p<0.05$). **Conclusion:** Although this type of study design does not allow to confirm a causal relationship between the daycare centres and the nutritional status, it highlights the potential of daycare centres to improve child nutrition in least-developed countries. Therefore, follow-up studies should be conducted among children to see the impact of daycare centres on the nutritional status of children. **Acknowledgements:** The support of Compliance unit, Tex-Ebo International Pte Ltd., is acknowledged.

096 (063)

Shigella-associated Infection in Hospitalized Neonates of an Urban Diarrhoeal Treatment Facility in Bangladesh: 1990-2004

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Background: Information on *Shigella*-associated infection in neonates is not sufficient. Year-wise monitoring of *Shigella*-associated infection by different species and different serotypes in neonates will create awareness among physicians. **Objective:** To observe year-wise frequency of infection by *Shigella* spp. in neonates hospitalized in an urban diarrhoeal treatment facility of Bangladesh. **Methodology:** Electronic laboratory records of neonates hospitalized in the Dhaka Hospital of ICDDR,B during 1990-2004 were analyzed. On admission, rectal swabs or stool specimens of the neonates were collected and sent to the laboratory where they were plated directly onto taurocholate tellurite gelatin agar (TTGA), *Salmonella*-*Shigella* (SS) agar and MacConkey's agar for culture of *Vibrio cholerae*, *Shigella*, and *Salmonella* spp. **Results:** Stool specimens of 2,574 neonates of either sex admitted during the study period were cultured, and *Shigella* spp. were detected in 99 (3.8%) neonates. The identified *Shigella* spp. were as follows: *Shigella flexneri* (n=55), *S. boydii* 1-6 (n=22), *S. boydii* 7-11 (n=1), *S. boydii* 12-15 (n=3), *S. boydii* 16-18 (n=1), S. *sonnei* (n=7), *S. dysenteriae* 1 (n=4), *S. dysenteriae* 2 (n=2), *S. dysenteriae* 3-12 (n=4). Year-wise frequency of *Shigella*-associated infection in neonates was 1.5 % in 1990, followed by 5.4 %, 2.7%, 5.1 %, 4.0 %, 5.2 %, 4.6%, 3 %, 4.6%, 4.1%, 3.1 %, 4.3 %, 4 %, 4.7%, and 2.9% till 2004. **Conclusion:** This baseline information suggests that *Shigella*e of all species with all serotypes can cause neonatal diarrhoea. This possibility would be important to consider while managing neonates with invasive diarrhoea. **Acknowledgements:** This research was supported by ICDDR,B which is supported by countries and agencies that share its concern for the health problems of developing countries.

097 (064)

Aeromonas and *Plesiomonas*-associated Diarrhoea Observed in Hospitalized Neonates in an Urban Diarrhoea Treatment Facility of Bangladesh During 1990-2004

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Background: *Aeromonas* and *Plesiomonas shigelloides* both are members of the *Vibrionaceae* family. Based on case reports, epidemiological studies of outbreaks, and microbiological studies, they are now considered to be diarrhoeagenic pathogens, usually with a low virulence potential, although sometimes may be variable. Information on *Aeromonas* and *P. shigelloides*-associated neonatal diarrhoea is not sufficiently available. **Objective:** To observe year-wise frequency of *Aeromonas* and *P. shigelloides*-asssocited diarrhoea in neonates admitted to an urban diarrhoea treatment facility of Bangladesh. **Methodology:** Laboratory-based electronic records of neonates admitted to the Dhaka Hospital of ICDDR,B during 1990-2004 were reviewed. Rectal swabs or stool specimens of the neonates were collected on admission and sent to the laboratory where they were plated directly onto taurocholate tellurite gelatin agar (TTGA), *Salmonella-Shigella* (SS) agar, and MacConkey's agar for culture of *Vibrio cholerae, Shigella*, and *Salmonella* spp. **Results:** In total, 2,574 neonates of either sex, admitted to the hospital during the study period, had stool specimens cultured. *Aeromonas shigelloides* were detected in 224 (8.7 %) neonates, and *P. shigelloides* were detected in 17 (0.7 %) subjects. The identified *Aeromonas* spp. were as follows: *A. hydrophila* (n=50), A. sobria (n= 68), and *A. caviae* (n=62), and *Aeromonas* spp. not classified (n=44). Year-wise frequency of *Aeromonas*-associated infection in neonates was 3.2 % in 1990, followed by 10.8%, 12.0%, 14.7 %, 8.0 %, 6.3%, 6.3%, 6.0 %, 4.6%, 19.4%, 10.3%, 7.6 %, 6.3 %, 2.8 %, and 0.0% till 2004. Similarly, year-wise frequency of infection due to *Plesiomonas* in neonates was 0.0% in 1990, followed by 0.0%, 0.5 %, 0.5 %, 1.5 %, 0.5 %, 0.6 %, 0.8%, 0.5 %, 0.6 %, 0.0 %, 1.6 % , 0.6%, 0.9%, and 1.0 % till 2004. **Conclusion:** The preliminary findings may be of public-health importance because it is likely to create awareness among physicians about management strategy of *Aeromonas* and *Plesiomonas*-associated diarrhoea in neonates. Further studies are needed to establish all possible mechanisms of enteric pathogenicity in newborns. **Acknowledgements:** This research was supported by ICDDR,B which is supported by countries and agencies that share its concern for the health problems of developing countries.

098 (068)

Hearing Level of Children Aged 60-144 Months: A Study of 1,000 Cases

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Background: Hearing impairment of children in Bangladesh has not been studied well which could be used as reference data. This disability can remain hidden apparently giving an impression that the child is normal in all respects. Only after assessing the hearing level of such a child, it would be possible to find out the cause of learning and mental disability in many such children. **Objective:** To find out the frequency and severity of hearing impairment in apparently-normal school-age children and also to establish a reference guideline of hearing level of children aged 60-144 months. **Methodology:** This descriptive cross-sectional study was conducted at a sound-proof room, Sabira Yameen Hearing Impairment Centre at Dhaka Shishu (Children's) Hospital. Trained nurses collected normal sibs of attending patients at the outpatient department of Dhaka Shishu (Children's) Hospital and children from schools and the community. Many such children came from different parts of Bangladesh accompanying the patients attending the outpatient department of the Hospital. Pure tone audiometry (PTA) was conducted in all the cases. **Results:** Of 1,000 apparently-normal children aged 60-144 months, 647 children had no history of precipitating factors, such as upper respiratory tract and ear infections, and 353 children had a history of precipitating factors. Of the 647 children, 69 (10.66%) had mild, and 16 (2.47%) had moderate hearing impairment whereas, of the 353 children, 129 (36.5%) had mild and 28 (7.9%) had moderate hearing impairment, i.e.196 (55.5%) of this group had normal hearing level. Irrespective of having a history of any precipitating factor which may cause hearing impairment, 758 (75.8%) of the children had normal hearing and 242 (24.2%) had hearing impairment (i.e. 19.8% had mild and 4.4% had moderate hearing impairment). About one-sixth (16.9%) of the low-income group had hearing impairment compared to 10.1% of children from the middle- and high-income group ($p<0.05$). Preponderance for hearing impairment was from 72 to 83 months (23.6%), 132 to 144 months (16.4%), and 60 to 71 months (16%) comprising 66.5%. **Conclusion:** Reference value of hearing impairment may be considered as 24.2% in apparently-normal children. The figure becomes much higher (44.5%) when hearing level is assessed in children with positive history of precipitating factors.

099 (091)

Nutritional Status of Under-five Children from Food-insecured Households in Northern Bangladesh

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Background: The Government of Bangladesh has been implementing the Food Security for Vulnerable Group Development (FSVGD) project with the objective of improving household food security of ultra-poor women and their dependants. The nutritional status of beneficiary women and their dependants was assessed for monitoring and evaluation of the project. Children, aged less than 5 years (under-5 children), are well-identified vulnerable dependants in households. **Objective:** To assess the nutritional status of under-5 children of FSVGD women. **Methodology:** In total, 490 under-5 children of FSVGD women from the 2005-2006 cycle were selected following a multi-stage stratified cluster-sampling design. An equal number of sampling units (unions by PPS and FSVGD women with under-five children in random) were included from each of the 7 project districts to obtain district-level estimates and precision. Data were collected on anthropometrical measurements, such as weight, height/length, and mid-upper arm circumference (MUAC), and blood haemoglobin concentration following the standard techniques and dietary consumption by the 24-hour recall method. **Results:** Children included in the survey belonged to mothers aged 18-49 years; most of them had no agricultural land, had a low and irregular household income, had poor educational status, and had very poor household food security. The frequency of average daily meal (full) was 2.4 in the normal and 1.5 in the lean period. As adequacy of certain nutrient intakes by the children was assessed, 98%, 75%, 86%, and 87% of them did not meet their RDI for energy, protein, iron, and vitamin A respectively. There were differences in the mean intake between boys and girls; boys had higher intake than girls. Over half (55%) of the children were underweight, 42% stunted, 16% wasted, and 76% were anaemic. **Conclusion:** Along with increasing household food security, nutritional intervention should be aimed at reducing under-nutrition among children of the ultra-poor rural households. **Acknowledgements:** The financial support of the European Commission is acknowledged.

100 (095)

Emergence of Optochin-resistant *Streptococcus pneumoniae*: Implications for Diagnosis and Management of Pneumococcal Diseases

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Background: The optochin susceptibility test remains the primary and, in some cases, the only method in clinical microbiology laboratories to differentiate *S. pneumoniae* from α-haemolytic-viridians streptococci. However, emergence of optochin-resistance in *S. pneumoniae* results in misidentification of pneumococci, lowering their isolation rate that jeopardizes the diagnosis, treatment, and prevention of pnemococcal diseases. **Objective:** To identify and characterize optochin-resistant *S. pneumoniae* isolates. **Methodology:** *S. pneumoniae* was isolated from nasopharyngeal swabs of mothers and infants enrolled in the study. They were identified by colony morphology, optochin, and bile solubility tests and confirmed by *lyt*A (autolysin) PCR. **Results:** In total, 111 optochin-resistant α-haemolytic-streptococci strains were detected by testing 1,500 α-haemolytic-streptococci. When they were subjected to bile solubility test—a confirmatory test of *S. pneumoniae*—37 (33.3%) optochin-resistant but bile-soluble *S. pneumoniae* were obtained, as other α-haemolytic-streptococci were not bile-soluble. A *S. pneumoniae*-specific lytA gene PCR was positive in all 37 isolates reconfirming their identification. Thus, the optochin susceptibility test failed to differtiate *S. pneumoniae* from other streptococcal species, showing its decreasing sensitivity and specificity. Optochin-resistant *S. pneumoniae* had significant co-resistance to other antimicrobial agents (64.86% were resistant to penicillin, 78.37% to co-trimoxazole, 78.37% to ciprofloxacin, 45.95% to tetracycline, and 27.03% to azithromycin/erythromycin) and multi-drug-resistance (resistant to ≥3 drugs, 64.86%). **Conclusion:** Emergence of optochin resistance in *S. pneumoniae* will minimize diagnosis, therapy, and prevention of pnemococcal diseases because of failure to detect *S. pneumoniae*. For correct identification of *S. pneumoniae* and, consequently, for correct treatment, α-haemolytic-streptococci with a typical colony morphology of *S. pneumoniae* but resistant to optochin should be checked by the bile solubility test or PCR for *S. pneumoniae* before being identified as viridians streptococci. Or the bile solubility test should be routinely used for identifying *S. pneumoniae*. **Acknowledgements:** The financial support of the United States Agency for International Development is acknowledged.

Day 1: Sunday, 4 March 2007 101 (014)
12:15 pm-1:30 pm (Venue: Executive Director's Wing)
Poster Session 2
MDG 4: Reduce Child Mortality 2
Risk Factors 1

Positive Deviance in Household Caring of Low-birth-weight Newborns in Slums of

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Background: Low birth-weight (LBW) contributes to three-fourths of neonatal mortality. The incidence of LBW is substantially higher in poor communities. However, there are also a few poor families whose specific indigenous practices enable them to rehabilitate and ensure optimal growth of their LBW newborns. This phenomenon of success, despite resource constraints, often termed as positive deviance, is worth learning from and promoting these indigenous practices to others. **Objective:** To examine home-based management and care-seeking practices of LBW newborns by families which led to their rehabilitation. **Methodology:** In 11 slums of Indore city, Madhya Pradesh, India, case studies of 15 families of LBW babies who were surviving well were prepared. The families were probed on how they identified that their LBW babies required extra care, what extra care they provided at home, and in which instances they sought referral and social support that contributed to rehabilitation. **Results:** The families identified newborns with birth-weight of <2 kg, visibly skinny or premature newborns as needing extra care, since, at birth, they were listless and cold, had a weak cry, suckled poorly, and were prone to morbidity. Extra care provided to these newborns at home included: (a) warmth (wrapping, proximity, oil-massage, and traditional warming methods); (b) breastfeeding (on demand, frequent feeds, with patience, and supporting chin); (c) infection prevention (not taking baby out in open, keeping baby dry and clean, avoiding outsiders or children pick up baby, and covering baby's face with thin muslin cloth to prevent flies and mosquitoes from touching the baby). Danger signs prompting the families for seeking referral were: baby crying continuously, refusal to take food, lying listless, chest in-drawing, and loose watery stools every 5-10 minutes. Mother's self-confidence that she can improve the health of her baby and family's supportive, encouraging, and forwarding attitude to adopt/reinforce positive practices facilitated rehabilitation. **Conclusion:** Such simple household practices used by poor slum families in identifying and managing LBW newborns can be promoted by community health volunteers and positive deviants themselves (through their personal experiences) during postnatal visits. Emphasis needs to be laid on building self-confidence of mothers with LBW babies and encouraging family members' supportive attitude. **Acknowledgements:** The financial support of the United States Agency for International Development is acknowledged.

102 (040)

Feeding Practices and Gastroenteritis among Infants

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Background: Gastroenteritis is a cause of infant morbidity and mortality all around the world, especially in developing countries. Many measures have been taken, but still about 11.27% of children, aged less than 5 years, suffer from gastroentritis. **Objective:** To find out the feeding practices of infants and influence of feeding on occurrence of gastroenteritis among infants. **Methodology:** This descriptive type of cross-sectional study was conducted among all 122 infants who completed 1 year of age living in Phultala upazilla under Khulna district from 1 to 31 May 2006. Respondents were mothers of the infants. They were interviewed using a pre-tested questionnaire. Frequency distribution was seen, and chi-square tests were done to find out the influence of feeding practices on gastroenteritis. **Results:** Twenty-four percent of the infants (n=122) were given prelacteal food as the first food after birth; 99% of the mothers initiated breastfeeding just after birth, but it was 90% at 1 year; 43% of the mothers exclusively breastfed their babies. Nearly two-thirds (62%) of the mothers started complementary feeding at the age of completed six months. Three-quarters (77%) of the infants suffered from gastroenteritis. Although no significant association was found between gastroenteritis and infant-feeding practices, it was observed that occurrence of gastroenteritis was higher (χ^2=20.11, df=3, p<0.001) in infants whose family members were more than 3 compared to those having less than 3. The disease occurred mostly among infants residing in families with *kuccha* latrine (χ^2=12.547, df=2, p=0.002). The occurrence of gastroenteritis was very high when infant's stool was discarded in open space, while it was less common in infants whose mothers put the stool in sanitary latrine (χ^2=23.440, df=2, p<0.001). **Conclusion:** The prevalence of exclusive breastfeeding and introduction of complementary feeding at proper age was high compared to the national record. However, surprisingly, the proportion of gastroenteritis among infants was also high. By improving feeding practices of infants, hygiene practices by mothers, and improving the sociodemographic condition with the help of the government, non-government and private organizations, this condition can be improved.

103 (045)

Socioeconomic Development and Mortality Trends and Patterns in a Province of Thailand

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Background: The study measured the mortality trends and patterns, and causes of deaths in Kanchanaburi province of Thailand in the context of socioeconomic development. **Objective:** To compare the findings in the 5 strata of Kanchanaburi province with those from previous surveys and in the general population. **Methodology:** The study area was divided into 5 strata: (a) urban/ semi-urban (industrialized), (b) rice-producing, (c) plantation, (d) upland areas, and (e) mixed economy. The villages/blocks for the Kanchanaburi province were selected using a stratified systemic design. The study units are 100 villages/blocks distributed throughout the province. Structured interviews were conducted to collect data. In this survey, there were 12,356 enumerated households; 274 of these households had at least one member who died during the 12-month period prior to the survey (1 July 2002–30 June 2003). **Results:** The total number of deaths was 280. Of this total, there was only one household where 3 members died, while 2 deaths were recorded in each of 4 households, and 269 households had one member died. The mortality pattern, as indicated by age, sex, and death rates, was similar for the general population of Thailand. However, the infant mortality was high, and then gradually decreased until the infants were aged 10-14 years, which had the lowest mortality rate. A rapid rate of increase was clearly seen after the age of 55 years for males and 70 years for females. Both males and females had the same mortality pattern. The mortality level for females was lower than for males in almost all age-groups. However, the mortality rate of females aged 90 years and over was higher than for males. About half of all deaths, or 44%, occurred due to non-infectious diseases. The second main cause was infectious disease (21%). Deaths caused by senility accounted for the next highest percentage of death (18%). **Conclusion:** The mortality pattern in infant was not smooth. The infant mortality was more in uplands than in any other strata. The female infant mortality was higher than that of male. Mortality rate of females aged 90 years and over was higher than for males. **Acknowledgements:** The support of the Institute for Population and Social Research, Nakhonpathom, and Wellcome Trust, UK, is acknowledged.

104 (125)

Socioeconomic Differentials of Childhood Obesity among School Children in the Context of Affluent Society of Dhaka City

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Background: Obesity has become a global epidemic and is increasing in both industrialized and developing countries. In a recent review, the rapidly-increasing prevalence of overweight and obesity among pre-school children in developing countries was reported. **Objective:** To examine the socioeconomic differentials of childhood obesity among school children in urban Dhaka, Bangladesh. **Methodology:** This cross-sectional descriptive type of study was conducted in 4 kindergarten schools and 209 randomly-selected children aged 6-10 years, corresponding to primary school grade 1, 2, 3, and 4 during August 2005–July 2006. Anthropometric measurements of standing height and weight were taken for all subjects. Childhood obesity has been defined as a sex- and age-specific body mass index (BMI) at or above the 95th percentile of the CDC growth chart. A trained interviewer measured weight and height using a portable scale and tape. Maternal BMI was calculated from self-reported height and weight. Data were analyzed using the SPSS software (version 11.5). **Results:** The large majority (73.2%) of the children were in the obese category, and the rest were overweight (16.3%) and healthy (10.5%). More than 60% of mothers (n=209) were graduate and beyond, the rest (38.3%) were in different categories below graduate-level. The association between educational status of maternal and childhood obesity was also significant ($\chi^2(1)=5.71$, $p<0.05$). The children of the more-educated (graduate) mothers were less obese than of the less-educated mothers. Almost 64.6% of the mothers were non-working (housewife), and 35.4% were in different working categories; although there was no significant association with childhood obesity. Almost three-fourths (75.1%) of the mothers were either overweight or obese, and only one-fourth (24.9%) were healthy. There was no significant relationship between maternal and childhood obesity. **Conclusion:** This study found that the level of childhood obesity among school children of the affluent society of Dhaka is very high. Measures should be taken to combat this emerging problem.

Basic Science 1

105 (058)

Characteristics of Diarrhoeagenic Strains of *Hafnia alvei*, Now Designated as *Escherichia albertii*, Isolated from Hospitalized Diarrhoea Cases in Bangladesh

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Background: The taxonomic position of previously-reported *Hafnia alvei* isolates, recovered from diarrhoeal stools of children at the Dhaka Hospital of ICDDR,B, showed more phenotypic and genotypic resemblance to member of genus *Escherichia* for which the name *Escherichia albertii* sp. nov. (*E. albertii*) is proposed. **Objective:** To conduct phenotypic and genotypic characterization of *E. albertii* isolated at the Dhaka Hospital of ICDDR,B during 1990-2004 and to determine its relationship with enteropathogenic *E. coli* (EPEC) and *Hafnia alvei*. **Methodology:** The isolates (n=158) were characterized by O-antigenic serogrouping, tissue culture assay in Hep-2 cells, fluorescence actin staining test (FAST), PCR for *eae* and other virulence genes, random amplified polymorphic DNA (RAPD), and biochemical fingerprinting (PhP, the phene plate system). **Results:** None of the 158 strains of newly-designated *E. albertii*, isolated during 1990-2005, reacted with any of the antisera to 50 different O-serogroups of *E. coli* reported so far (Denka Seiken, Japan). All *E. albertii* strains and EPEC reference strains were positive for attaching-effacing factor (AE), eae gene, and localized adherence (LA) in Hep-2 cell. All *Hafnia alvei* strains, isolated from Bangladesh and Finland, were negative for AE, eae gene, and adherence to Hep-2 cell. In PhP typing, *E. albertii* strains, isolated during 1990-1998, produced a major common type with 2 sub-types, which are completely different from EPEC reference and Finland strains. All strains of serogroup *E. albertii* belonged to the same PhP/RAPD type, whereas *H. alvei* strains belonged to the different PhP/RAPD types. The reference strain of EPEC also belonged to the different PhP/RAPD types. All strains of *E. albertii* were negative for cholera toxin (CT), heat-labile (LT) and heat-stable (ST) toxin of ETEC, cytotoxin, haemolysin, protease, haemagglutination, Shiga-like toxin (SLT), and invasion either in Hep-2 cell or by Sereny test. Agglutinin absorption test indicated that all *E. albertii* strains belong to a single serotype by tube agglutination method. **Conclusion:** A major clonal group comprising 2 sub-groups could be identified among *E. albertii* strains, isolated in Bangladesh, that differ completely from *Hafnia alvei* isolated in Bangladesh and Finland, indicating its new taxonomic position belonging to different ancestors. All *E. albertii* strains are diarrhoeagenic and need further study to understand its potential role in producing diarrhoea in humans.
Acknowledgements: The financial support of the Laboratory Sciences Division's project development fund allocated from ICDDR,B core fund is acknowledged.

Transcutaneous Immunization with *Vibrio cholerae* Antigens Including the Toxin-coregulated Pilin A (TcpA)-induced Systemic and Mucosal Cellular and Humoral Immune Responses in Mice

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Background: A detailed mechanism of the immune response elicited by the trancutaneous route of immunization against virulence antigens of *Vibrio cholerae* is needed to determine the appropriateness of alternative paths of vaccination. **Objective:** To determine the cellular and humoral immune responses to *V. cholerae*-specific antigens using the transcutaneous route of immunization. **Methodology:** The study was carried out in sets of Balb/c mice aged 4-6 weeks using the key *V. cholerae* virulence antigens, toxin-coregulated pilus (TcpA), and cholera toxin (CT). The oral (ORI) and sub-cutaneous (SCI) routes of immunization were compared with the transcutaneous (TCI) route. The study focused on determining the immune responses using (a) flow cytometric analyses for assessing the phenotypic changes of the mucosal and systemic immune cells and (b) humoral immune responses to determine the magnitude of response and isotype patterns. **Results:** Increased migration of the immune cells from the skin-associated lymphoid tissue (SALT) to the gut was observed in the TCI group, whereas gut-homing receptor was elevated in the ORI group. The induction of the immune response to TcpA needed co-stimulation by CT. Expression of CD3, CD4, and CD19+ B cells was seen in the TCI group of mice compared to the control mice ($p<0.05$). Increased CD19+ B cells in blood and lamina propria and CD4+ cells in the lamina propria were detected. Significant elevations of costimulatory marker CD40 in CD19 population and CD28 and CD154 in the CD4 population were observed in spleen and lamina propria. Increased cutaneous lymphocyte antigen (CLA), a marker for SALT, was increased in the TCI group. Antigen-specific B cells co-expressing CD19+ß7+ and CD19+CLA+ were observed in the blood spleen and lamina propria. The TcpA- and CT-specific antibody responses were elevated in the IgG isotypes in blood in mice immunized via the TCI route while responses in the IgG and IgA isotype was seen in the orally-immunized mice. **Conclusion:** The transcutaneous route of antigen administration elicits both cellular and humoral responses. These results suggest that, in addition to the ORI procedures, the newer needle-free TCI route is also suitable for inducing cellular immune responses in the systemic and mucosal compartments. Further studies are needed to understand the implications of this in protection from *V. cholerae*-associated infections in humans.
Acknowledgements: The study was supported by the National Institutes of Health (NIH) funds to Massachusetts General Hospital, Harvard Medical School and ICDDR,B.

107 (171)

Ciprofloxacin Resistance in *Campylobacter jejuni* Strains Isolated in Bangladesh Is Associated with Mutation in the *gyr*A Gene

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Background: *Campylobacter* spp. are a common cause of gastroenteritis in humans. While most cases of Campylobacteriosis do not require antimicrobial therapy, treatment may be essential for vulnerable patients and for the management of invasive disease. Fluoroquinolones have been widely used for the treatment of *Campylobacter*-associated infections, but the incidence of resistance to this drug among *Campylobacter jejuni* strains isolated from humans increased significantly throughout the world. **Objective:** To understand the molecular mechanism of ciprofloxacin resistance in *C. jejuni* strains recently isolated from humans in Bangladesh. **Methodology:** In total, 40 *C. jejuni* strains were isolated during a systemic surveillance conducted in 2003 in ICDDR,B using the standard microbiological and biochemical methods. Antibiotic susceptibility pattern and MIC of the isolates were examined following the recommendations of Clinical and Laboratory Standards Institute (CLSI) using disk-diffusion and E-test method respectively. Mutation analysis of quinolone resistance-determining region (QRDR) of the *gyr*A and *gyr*B genes were performed by sequencing. **Results:** Of the 40 *C. jejuni* strains, 26 were resistant, and 2 showed reduced susceptibility to ciprofloxacin. Among these, 9 representative strains comprising 2 sensitive strains (MIC ≤1 mg/L), one reduced-susceptible strain (MIC=1.5 mg/L), and 6 resistant strains (MIC ≥4 mg/L) to ciprofloxacin were included in this study to investigate the presence of any possible mutation in the QRDR's (Quinolone Resistance Determining Region) of *gyr*A and *gyr*B genes. The QRDR's of the *gyr*A from all ciprofloxacin-resistant and reduced-susceptible strains contained a single point mutation at codon 86 (ACA→A), resulting in the incorporation of isoleucine instead of threonine. In addition, some silent mutations in the *gyr*A QRDR were also observed. Silent mutations in the QRDR of *gyr*B were seen in all the isolates tested irrespective of their sensitivity or resistance to ciprofloxacin. **Conclusion:** A single missence point mutation in the QRDR of *gyr*A leading to the substitution of Thr86→Ile was found in all the ciprofloxacin-resistant and reduced-susceptible *C. jejuni* strains. No substitutions were identified in the *gyr*B, suggesting that this sub-unit is not involved in ciprofloxacin resistance in *C. jejuni*. **Acknowledgements:** This work was funded in part by Bill and Melinda Gates Foundation-Government of Bangladesh Fund of ICDDR,B.

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Role of the Environment in Propagation of *Enterotoxigenic Escherichia coli*-associated Infections in Bangladesh: Presence of ETEC in Household Water Sources and in Biofilms

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Background: Although enterotoxigenic *Escherichia coli* (ETEC) is the most common pathogen causing diarrhoea in children in early childhood and is known to be propagated by the faecal-oral-route, the role of water in this transmission has not been carefully studied. To better understand the mechanism, drinking-water reservoirs in homes of children living in a highly ETEC prevalent areas in Mirpur, Dhaka, were analyzed. **Objective:** To detect the presence of ETEC in stored water reservoirs and in stools of children in household and to detect ETEC from water samples and biofilm specimens. **Methodology:** Water used for drinking, washing, and cleaning purposes in homes in the urban slum of Mirpur were collected at regular intervals and processed for detection of toxin types of ETEC by muliplex PCR, GMI ELISA, and dot-blot assay methods. Samples were also analyzed by real-time PCR for LT (heat-labile toxin) and ST (heat-stable toxin). Glass slides left in the water reservoirs for different time periods were tested for formation of biofilm using gram-staining and for ETEC using the above methods. Isolated ETEC strains were characterized for colonization factors and serogrouped. **Results:** Microscopic observation of slides showed microbial biofilms which were mainly gram-negative in characteristics. About 24% (4/17) of the samples were ETEC-positive by real-time PCR and were of the LT (n=1), ST (n=2), and LT/ST (n=1) toxin types. ETEC could not be detected from biofilms by multiplex PCR. Lactose-fermenting *E. coli* colonies cultured from biofilm specimens (n=24) were tested by GM1 ELISA which showed that 25% were positive for ETEC. Two of the samples positive by real-time PCR were also positive by culture. The toxin types of isolates were LT (n=4), ST (n=1), and LT/ST (n=1) types. Using commercially-available antisera, O antigenic serogroups detected were 015 (n=2) and 018 (n=1), whereas 2 strains could not be typed. Water from these reservoirs was tested for ETEC at the time the glass slides were analyzed. Of 19 specimens tested, 3 were positive for ETEC by GMI ELISA; of 3 positive samples, 2 were concomitantly positive by real-time PCR. A seasonality was observed in the formation of microbial biofilms and the presence of ETEC. Dot-blot analyses showed that the isolates from biofilms and water specimens did not express any of the 13 colonization factors tested for. More biofilms and ETEC-positive samples were isolated during the spring and warmer months than during the winter. **Conclusion:** This study has shown that ETEC is prevalent in the stored water samples in a highly ETEC-endemic area in Dhaka city and can form biofims for survival in the environment. **Acknowledgements:** This research was supported by the Swedish Agency for International Development and Cooperation (Sida-SAREC) and ICDDR,B.

MDG 5: Improve Maternal Health I
Maternal Mortality and Morbidity

109 (006)

Teenage Pregnancy and Its Outcome in Bangladesh: Has the Situation Improved?

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Background: Teenage pregnancy is a problem in both developed and developing countries. Pregnancy in adolescence has an increased risk of developing both maternal and foetal complications. In Bangladesh, early pregnancy exposes mothers to acute health-risks during pregnancy and childbirth. **Objective:** To estimate the proportion of teenage pregnancy among hospitalized pregnant women and its complications and compare them between early and late adolescence periods. **Methodology:** This cross-sectional study was conducted at the obstetric departments of two tertiary-level institutions—Dhaka Medical College Hospital and Bangabandhu Sheikh Mujib Medical University in Dhaka during March-May 2005. All admitted pregnant girls, aged 13-19 years, were included in the study. The subjects were selected by the random-sampling technique. Socioeconomic information was obtained either from the patients or from their attendants. Pregnancy-related maternal and foetal outcomes were recorded from record-files of the patients. **Results:** During the study period, 50 teenage pregnant mothers (5.6% of total pregnancy) were enrolled, of whom 42 (84%) were aged 17-19 years. Use of any contraceptive methods, either by the wives or by their husbands, was found in only 24% of the cases. Routine antenatal check-up was done in only 24% of the cases. Anaemia was the commonest (50%) form of maternal complication, followed by pregnancy-induced hypertension (26%), postpartum haemorrhage (30%), preterm labour (18%), prolonged labour (14%), obstructed labour (12%), and failure of or inadequate lactation (10%). Among the foetal complications, low birth-weight was the most common one (48%). This was followed by birth asphyxia (18%), perinatal death (16%), and intrauterine growth retardation (8%). Forty-four percent had caesarean section. There were no maternal deaths among the study group during the study period. There was no statistically significant difference in faeto-maternal complications between the two adolescent periods, although most of them were found in higher proportion during the early adolescence, i.e. below 17 years of age. Overall, the proportion of teenage pregnancy was lower compared to that as has been observed in other studies. However, the pregnancy-related maternal and foetal complications in most cases were observed in a higher proportion when compared with those found in other studies in developing countries. **Conclusion:** More emphasis should be given on further reduction of teenage pregnancy either by delaying the age of marriage or by increasing the use of any contraceptive methods and in case when there is a pregnancy during the adolescent age, there should be regular antenatal check-up so that the major complications can be adequately dealt with. **Acknowledgements:** We acknowledge our gratitude to all concerned personnel who extended their full cooperation in conducting the study.

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Household Food Security and Nutritional Status of Vulnerable Women in Northern Area of Bangladesh

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Background: As a component of the nationwide Vulnerable Group Development programme, the Food Security for Vulnerable Group Development (FSVGD) project, executed by the Government of Bangladesh in partnership with the World Food Programme, strives to contribute to the overall development goal of improving the socio-economic and nutritional status of the ultra-poor in Bangladesh by improving the food security situation of poor women of child-bearing age and their dependants. **Objective:** To assess the household food-security situation and nutritional status of vulnerable women targeted by the FSVGD project at the beginning of the cycle 2005-2006. **Methodology:** In total, 980 women from 7 northern districts were chosen following a multi-stage stratified cluster-sampling design. An equal number of sampling units (unions selected by the probability proportional to size method) and FSVGD households with ever-married women aged 18-49 years) was randomly selected from each district to obtain district-level estimates and precision. Women were assessed for their nutritional status that included anthropometric measurements, such as weight, height, mid-upper-arm circumference (MUAC), haemoglobin, and dietary consumption. **Results:** About 70% of the women never attended school, and 85% had no agricultural land and lived with a monthly household income less than Tk.1,122. Except vegetables, the estimated per-capita availability of main food groups was lower compared to the food balance sheet of the Food and Agriculture Organization (FAO) and consumption of average poor in Bangladesh (Bangladesh Bureau of Statistics). In a normal period, 44% of FSVGD households consumed 3 meals a day, and the rest consumed 1-2 meal(s), while 50% of households could not have more than one meal a day during the lean period. Twenty-four-hour dietary recall suggested that 62% and 77% of the FSVGD women consumed protein and energy less than the recommended dietary intakes (RDI) (WHO/FAO/UNU) respectively, and 80-90% did not meet micronutrient requirements (iron, zinc, and vitamin A). The mean body mass index (BMI) (kg/m^2) was 19.2 ±2.3, 38% of whom had BMI below 18.5. However, 7.8% of the women were observed to be over-weight or at risk (BMI ≥23). Seventy-four percent of women were anaemic (Hb <12.5 g/dL). Year-long food security in terms of ≥2 full meals per day consumption in both lean and normal periods and meeting energy needs (RDI) had a significantly positive association ($p<0.05$) with the nutritional status of the FSVGD women. **Conclusion:** The strategy for sustainable livelihood food-security should be strengthened to improve the nutritional outcome of ultra-poor rural women. **Acknowledgements:** The financial support of the European Commission is acknowledged.

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Pattern of Obstetric Morbidity and Its Correlates in Bihar, India

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Background: In India, the component of maternal and child health (MCH) services was integrated with the family welfare programme during the Fourth Five Year Plan (1969-1974). Since 1974, developments took place in the MCH programme. Despite all such developments, the use of MCH services by eligible women seems to be at a moderate-to-low level only. The National Population Policy, adopted by the Government of India in 2000, reiterates the Government's commitments to safe motherhood programme within the wider context of reproductive health. The demographic burden of the growing number of women and deliveries that are expected in the next 20 years will create heavy demand for provision of maternal health services. It would pose serious challenges for the healthcare delivery system. Both efforts and resources have to be enhanced to increase the coverage and improve the quality of maternal health services. The objective of the National Population Policy of 2000 and the National Rural Health Mission of 2005 will be achieved only when the MCH package is fully and effectively implemented throughout India, particularly in the northern states where sociocultural and economic conditions are not conducive for widespread acceptance of modern fertility values and behaviour. **Objective:** To examine the pattern and association of reported morbidity and care-seeking behaviours in different regions of Bihar and to identify the regions of the state with high reported prevalence of obstetric morbidity. **Methodology:** The present study is based on the DLHS-RCH (2002-2004) data. The analysis pertains to 18,177 currently-married women, aged 15-44 years, who had given livebirths or stillbirths during the 3 years preceding the survey. Bivatiate and multivariate techniques were used. **Results:** Reported complications were found to be associated with women's education, parity, birth-interval, standard of living, religion, and region. About one-third of the women reported paleness, along with swelling of hands and feet and visual disturbance. More than half of the women reported obstructed labour with prolonged labour and excessive bleeding, while two-thirds reported fever with abdominal vaginal discharge and 50% reported fever with severe headache during the postpartum period. Reported complications were associated with women's education, parity, birth-interval, standard of living, religion, and region. Most women who had a complication did not consult anyone, and when multiple complications developed, the proportion that sought treatment increased. Only one-third of the women sought treatment with one pregnancy complication, and it increased up to 50% when 3 or more complications had developed. The proportion of use of the public sector is performing poor as 60% of the women preferred the private sector, while only 10% went to the public sector. **Conclusion:** As the report of facility survey indicates that only 9%, 11%, and 17% of infrastructure, supply, and staff respectively are available at the PHC level in Bihar, it may be one of the reasons to impede the public sector. The findings indicate that there is a strong need for awareness-raising efforts in the community about the complications of pregnancy, childbirth, and the postpartum period, and seeking medical help for obstetric complications is essential.

Determinants and Use of Maternal Health Services 1 112 (017)

Birth Practices in Under-served Urban Slum Dwellings of Indore, India

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Background: Over 50% of births in slums occur at home, mostly in poor hygienic conditions and under untrained assistance. Hence, understanding home birth-practices in slums and their influencing factors is crucial for implementing contextual programmes to improve care at birth, which is known to prevent over one-third of neonatal deaths. **Objective:** To identify barriers to and options for improving home birth-practices in slums of Indore city, Madhya Pradesh, India. **Methodology:** In 11 under-served slums, 312 mothers of infants aged 2-4 months were interviewed on the 5 cleanings (clean delivery surface, clean hands, clean cord-tie, clean blade, and clean cord-stump) during delivery, thermal protection at birth, and timely initiation and exclusive breastfeeding. Reasons were assessed through group discussions in each slum. **Results:** Of all deliveries, 72.1% were conducted at home. Of these, 56.4% were conducted in slum-homes and 15.7% in native villages. Of slum-home births, 77.3% were conducted by slum-based traditional birth attendants (TBAs) and the remaining by family members/neighbours. Only 40.5% of TBAs had received training in the preceding year. Further, clean delivery surface, clean hands, clean cord-tie, clean blade, and clean cord-stump were practised by 46%, 14.7%, 34%, 30.7%, and 50% respectively. Warming of birth-room, appropriately wrapping the newborn until cord-tying, and postponing bathing (for 24 hours), were practised in 38%, 54%, and 37.5% of families respectively. Breastfeeding was initiated within an hour of birth and pre-lacteals avoided by 48.9%. Home-births were preferred owing to mother's fear of being alone during hospital delivery, confidence in TBAs, economic and transportation constraints, and lack of preparedness of family to escort woman in labour to a health facility. Home birth-practices were influenced by tradition and beliefs reinforced by mothers-in-law and TBAs. Mothers feared that if they did not follow the norm in the community, their newborns could be harmed. **Conclusion:** Options that emerge from this study for improving maternal-neonatal care at birth in slums include: (a) early identification of pregnancy followed by regular counselling by trained slum-based health volunteers; (b) reinforcement of messages by early adopters during group meetings of mothers; (c) periodic competency-based training of TBAs; and (d) strengthening community linkage and partnership with nearby/affordable health facility and helping them understand procedures for availing obstetric services.
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Effective Communication: The Foundation for Effective Partnership in Healthcare

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Background: As the value of a holistic approach to healthcare, involving a range of carers, becomes better-appreciated and medical research and knowledge becomes more global, the need for more efficient and effective means of communication within and across the whole spectrum—local, national, and international—of healthcare communities becomes increasingly important. **Objective:** To describe the SNOMED clinical terminology (CT) system and its role in providing an effective and efficient means of communication to support partnerships in holistic healthcare delivery and global medical research. **SNOMED CT:** The SNOMED CT system has been developed over the last decade jointly by the US College of American Pathologists (CAP) and the UK National Health Service (NHS), which own the intellectual property rights and license the system for use elsewhere. It is an amalgamation and development of several classification systems, including the World Health Organization's (WHO's) International Classification of Diseases—the origins of which go back to the early 1970s and is now in its 10th iteration (ICD-10)—and the more recent READ Codes developed for General Practitioners in the UK. SNOMED CT creates and defines a structured coding system which allows the entire range of medical conditions to be classified and related in a coherent way to facilitate recall and analysis. However, unlike systems such as the WHO ICD-10, in which the codes are defined in a very technical and unfamiliar way, the emphasis on SNOMED CT is to focus on the terms that doctors and carers would use in everyday speech to describe clinical conditions. As a result, there are already almost a million clinical terms in SNOMED CT—many of them common synonyms where carers use different terms to describe the same condition--and the number is constantly growing. That is why SNOMED CT is called a clinical terminology system rather than a clinical coding system. **SNOMED–Promoting Partnership in Healthcare:** The use of SNOMED CT to facilitate holistic healthcare brings many direct benefits to the patient. SNOMED CT-standardized and structured clinical terminology means that the various professionals involved in the patient-care can document and share their particular involvement more quickly, reliably, and unambiguously. This promotes seamless, integrated healthcare, reducing unnecessary delays in providing treatment and the potential for the misunderstanding and omissions which can result in the patient receiving less than optimal care, or in extreme cases, even cause unintentional harm to patients. The carers, too, benefit significantly. Quicker access to more reliable data reduces the time spent looking for patient's information and, particularly, in seeking validation of data which are ambiguous or incomplete, releasing time that can be better spent in direct patient-care. The standardized and structured nature of SNOMED CT also makes data on patients much more accessible and reliable for clinical audit, enabling professional carers to undertake ongoing monitoring of the

effectiveness of the care that they are providing and validating it against local, national, or even international best-practice. This facilitates best evidence-based practice, both providing carers with quality feedback on the effectiveness of their care and ensuring that patients receive optimized care appropriate to their individual condition and circumstances. **SNOMED CT–Promoting Partnership in Clinical Research:** The systematic, structured nature of SNOMED CT makes it ideal as the medium of choice for the publication and sharing of clinical research. The coherence and unambiguity of SNOMED CT promotes clarity and conciseness in the reporting of research methodology and findings and the structure of SNOMED Ct greatly facilitates the systematic analysis of data. A particular feature of SNOMED CT is that it can be 'translated' into different languages. **Conclusion:** The creation and implementation of the SNOMED clinical terming standard marks an important step forward in facilitating partnership in effective best-practice healthcare delivery and research at all levels, from local community care to international scientific research.

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Perceptions and Practices on Antenatal Care, Childbirth, and Postnatal Care of Mothers in a Slum Area of Dhaka City

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Background: Rate of maternal mortality in Bangladesh (3.2 per 1,000 livebirths) is still one of the highest rates in the world. This reflects inadequate maternal healthcare services and poor awareness. Improvement of maternal health and reducing child mortality are important Millenium Development Goals (MDGs). **Objective:** To explore the perceptions and practices of slum women towards antenatal care, childbirth, and postnatal care. **Methodology:** This cross-sectional survey was carried out on a representative sample of 423 slum mothers having children aged 0-12 month(s). Data were collected during March-April 2006 in 4 slums located in 2 wards of Dhaka City Corporation under the administrative Zone 8. Cross-tabulation and univariate statistical techniques were applied in data analysis. Perceptions and practices towards antenatal care, safe delivery, and postnatal care were the main outcome variables. **Results:** The knowledge of the mothers on necessities of consultation of antenatal care was 98%. Nearly 94% of the mothers had received antenatal visits from healthcare facilities of their locality. But only half of the mothers received antenatal visits up to the WHO standard (i.e. minimum 4 antenatal visits for all countries). Although more than half (55.3%) of the mothers preferred delivery at hospital, the study found a gap between their preference and practice as 87% of the mothers had delivery at home in their last pregnancy. Moreover, in the urban slum, a large proportion (70%) of the mothers still delivered their babies by *dai*. For treatment of delivery-related complications, 87% of the women preferred hospital care but practically they did not do so. The study revealed that 95% of the women knew the cause of maternal death, and aged mothers (>30 years) had a relatively higher knowledge. Only one-fourth of the mothers perceived that delivery by skilled birth attendants can save mothers' lives. **Conclusion:** The study explored the perception and practice on antenatal care, safe delivery, and postnatal care of slum mothers. The findings are indicative of the necessity for special interventions focusing towards slum mothers, and the findings would be helpful to develop strategies to improve maternal and child health services and to prepare information, education, and communication materials to create awareness of women regarding safe motherhood. **Acknowledgements:** The financial support of the Bangladesh Social Science Research Council under Ministry of Planning, Government of Bangladesh, is acknowledged.

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Counselling Women for Postpartum Family Planning for Preventing Unsafe Abortions: Experiences from Karachi, Pakistan

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Background: Globally, many women opt for termination of pregnancy if faced with closely-spaced pregnancies. This becomes a serious issue where termination is illegal, and unsafe abortion is then the choice. The provision of quality family-planning services during the postpartum period (PPP) contributes to reducing maternal mortality and morbidity through preventing unsafe abortions. The family-planning programme in Pakistan has neglected family-planning needs of new mothers. **Objective:** To evaluate the effect of counselling mothers who recently delivered on use of modern contraceptives and preventing unsafe abortions. **Methodology:** The study was conducted in a squatter settlement of Karachi during January-December 2005. Five hundred women who recently delivered, residing in the catchment area with livebirths, were selected from 5 hospitals. An interviewer visited each woman within 24 hours of delivery and assessed, through a questionnaire, knowledge, attitudes, and practices (KAP) about postpartum contraception, past experiences of unwanted pregnancies, and intentions for future pregnancies. The names and complete addresses of these women were noted. These women were then equally divided into two groups—A and B. The 250 women in Group A had 3 counselling sessions for postpartum family planning at 1, 3, and 6 months after childbirth in their homes by the counsellor using IEC material. The women in Group B did not receive any counselling. All 500 women were re-visited at 11-12 months postpartum to assess the change in KAP about postpartum contraception and their experiences of unwanted pregnancies, if any. **Results:** 68% and 65% of women from Group A and B respectively did not want more children, while 32% and 35% preferred spacing of 2-3 years. The large majority (86.8%) planned to rely on breast-feeding as a contraceptive. At 12 months of PPP, 69% of women from the Group A and 22% from the Group B were using a modern contraceptive method. Nearly 22% and 24% women from the Group A and the Group B respectively reported unwanted pregnancies within 2 years of the index birth with 20% of women in each group reporting an attempt of termination; 2% and 21% women from the Group A and the Group B respectively reported a conception. Two-thirds of the women from the Group B, but none from the Group A, terminated their pregnancies through unsafe abortion. One maternal death was also reported due to unsafe termination. **Conclusion:** Short birth-spacing is one of the reasons for opting for unsafe abortions. Counselling women in immediate PPP results in a marked improvement in contraceptive use resulting in fewer unsafe abortions and maternal deaths and morbidity. **Acknowledgements:** The authors acknowledge the International Institute of Education, USA, for funding the study.

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'Enabling Environment' for Home-based Skilled Birth Attendants: Evidence from 2 NGO Programmes in Bangladesh

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Background: Bangladesh followed the emergency obstetric care (EmOC) strategy to improve maternal health and to reduce maternal mortality. Providing EmOC is one of the strategies adopted by the Government of Bangladesh to reduce maternal mortality. Recently, the Government has determined that efforts to increase the use of EmOC must continue but be complemented by a home-based strategy for maternal and neonatal care. The NGO Service Delivery Program and the Bangladesh Association for Voluntary Sterilization are 2 NGOs which piloted home-based skilled birth attendants programme in different rural and peri-urban areas of Bangladesh. **Objective:** To examine the 'enabling environment' of home-based skilled birth attendants in Bangladesh and to explore the constraints they faced, the support they received, the referral mechanism for complicated cases, and the cost and the quality of services provided. **Methodology:** A qualitative study was conducted during February-June 2006. Research methods included informal discussions and key-informant and semi-structured interviews with service providers, programme managers, community members, and mothers and their family members. **Results:** The major problems faced by home-based SBAs were unavailability of transports, a sense of insecurity during night calls, lack of a proper delivery environment in home-settings, and poor referral linkages with EmOC facilities. The most difficult aspect of the strategy was the opposition from the existing traditional birth attendants (TBAs), who are the prime delivery caregivers in the community. Often referrals to higher-level facilities became difficult due to interference of the TBAs and influential family members. The community members acknowledged the contributions of the SBAs and highlighted the advantages of deliveries at home by them. They perceived services of SBAs as better than those of TBAs and demanded higher training and logistics so that the SBAs can better manage obstetric complications in home-settings. On the contrary, the service providers preferred delivery-huts to provide more services with less difficulties and demanded more training and organizational support to sustain their services. The SBAs of BAVS from the same locality are continuing their services as private professionals even 8 years after closure of the programme. However, the service cost of SBAs was higher than that of TBAs, and the coverage was low. **Conclusion:** More qualified SBAs with adequate training are required. The home-based skilled attendance strategy is sustainable if the providers have the right characteristics.
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Levels and Determinants of Micronutrient Status of Pregnant Women Receiving Nutrition Interventions in Bangladesh

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Background: Micronutrient deficiencies, particularly anaemia and iodine deficiency, are widespread among women in Bangladesh. The National Nutrition Programme (NNP) of the Government of Bangladesh targets pregnant women for nutrition interventions to reduce anaemia and iodine- deficiency disorders. **Objective:** To examine the levels and determinants of micronutrient status of pregnant women. **Methodology:** The baseline survey of the NNP in 2004 interviewed and measured the micronutrient status of 360 pregnant women from the NNP, Bangladesh Integrated Nutrition Project (BINP), and comparison areas. The BINP existed 18 months before the NNP baseline survey. The subjects were asked about their education, household durable assets, food security, intake of iron supplements, and health and nutrition knowledge. Blood haemoglobin concentration of the pregnant women was estimated by the HemoCue method in the field. The iodine status was determined by measuring iodine excretion in urine samples using the microplate method of Ohashi *et al*. Iodine content of table-salt samples was measured by the iodometric titration method. **Results:** The mean haemoglobin level of the pregnant women was 11.1 g/dL. Overall, 45% of them had anaemia, defined as a haemoglobin level less than 11 g/dL. The prevalence of anaemia was significantly lower in the BINP (36%) areas compared to the NNP (51%) and comparison areas (60%). The median iodine-excretion level was 132.90 mg/L. Four (40%) in 10 of the women had sub-clinical iodine deficiency, defined as a urine iodine level less than 100 mg/L. Almost 39% of households of the pregnant women were consuming table salt with inadequate iodine levels (less than 15 ppm). The odds ratios of receiving iron supplements and use of iodized salt increased with higher education of women and asset index. Food deficit negatively correlated with use of iodized salts. Intake of iron supplementation and use of iodized salts were significantly higher in the BINP areas compared to the NNP areas. **Conclusion:** The magnitude of both anaemia and sub-clinical iodine deficiency is substantially high during pregnancy. Education level, asset index, food security, and BINP services are important determinants of micronutrient status. **Acknowledgements:** The financial support of the World Bank and CIDA through the NNP of Ministry of Health and Family Welfare, Government of Bangladesh and the technical support of the Institute of Population Research and Training, Institute of Nutrition and Food Science, and Mitra and Associates are acknowledged.

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Audit of Maternal and Neonatal Health Services in Perinatal Care Project Areas

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Background: The Perinatal Care Project (PCP), a joint collaboration between the Diabetic Association of Bangladesh (DAB) and Women and Children First, UK, is working towards achieving Millennium Development Goal (MDG) 4 and 5 in 18 unions of 6 upazilas in 3 districts (Bogra, Faridpur, and Moulavibazar) of Bangladesh. It is aimed at improving maternal and newborn health of the rural poor. The total population covered is 480,425. The PCP aims to achieve its goals by strengthening of health services and community mobilization through women's groups. Maternal and newborn deaths are audited on a regular basis. It is done approximately after 45 days of delivery. Audit of maternal death is performed by interviewing relatives and for newborn death, audit is conducted by interviewing mothers. **Objective:** To audit the availability of maternal and newborn health services in the government health facilities in the PCP areas with the aim to improve these facilities within the project areas. **Methodology:** An audit of maternal and neonatal health services was carried out in 27 health facilities before starting activities relating to strengthening of health services. The facilities included 3 district hospitals (DHs), 4 Maternal and Child Welfare Centres (MCWCs), 5 Upazila Health Complexes (UHCs), and 15 Union Health and Family Welfare Centres (UHFWCs). A questionnaire developed by the Institute of Child Health, London, was field-tested prior to its use. Trained field workers collected data during October 2003–March 2006. Respondents (93) included doctors, nurses, Family Welfare Visitors, and Sub-Assistant Clinical Medical Officers (SACMOs). **Results:** Only 5 of the facilities (one DH, one MCWC, and 3 UHCs) provided all 11 components of antenatal services. One DH did not measure height, and one did not give tetanus toxoid. None of the UHFWCs measured haemoglobin, and only one of 15 tested urine for albumin or sugar. Bag and mask ventilation was not available for neonatal resuscitation in 85% of the facilities. Staff at all DHs, UHCs, and all but one MCWC had received training in mouth-to-mouth resuscitation, but only 2 of the UHFWCs had. Four of 27 health facilities kept records of referrals. Eleven (92%) of the 12 DH and upazila facilities reported lack of manpower as a problem at their facility, while 8 (67%) reported that they had an insufficient supply of medicines. **Conclusion:** Audit of health services can help identify the caveats in the quality and availability of services provided to care-seekers. **Acknowledgements:** Funding was provided by Women and Children First, UK, Centre for International Health and Development (formerly International Perinatal Care Unit), Institute of Child Health, University College London, London, UK.

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Effect of Anthelmintics with Iron Folate in Pregnancy on Maternal Haemoglobin Level: A Randomized Controlled Trial

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Objective: To evaluate the effectiveness of anthelminthic and iron-folate supplementation on haemoglobin level of pregnant women. **Methodology:** A double-blind randomized placebo-controlled trial was conducted at the Institute of Child and Mother Health, Dhaka, Bangladesh. In total, 1,179 pregnant women of 20-28 weeks of pregnancy were included in the study. Information on sociodemographic, health and anthropometric parameters was collected through a structured questionnaire immediately after enrollment. Haemoglobin level was measured at booking. Of all enrolled women, 588 were randomly assigned to take albendazole and 589 to take placebo. All women were provided with iron and folic acid supplement. Haemoglobin level at term was compared with deworming and placebo groups. **Results:** The proportion of mild anaemia increased to 10.3% in the placebo group from baseline which was 3.7% in the treatment group. However, the proportion of moderate anaemia among pregnant women in the placebo group decreased 46.7% at term from baseline, which was 77.1% among those in the treatment group. This shows the significant 30% more reduction of moderate anaemia in the treatment group compared to the placebo group. The proportion of non-anaemia (haemoglobin level >11.5 g/dL) increased 16.7% and 25.1% in the placebo group and the treatment group respectively from baseline. This reflects a significant 10% higher increase of non-anaemia in the treatment group than the placebo group. **Conclusion:** Anthelmintics with iron and folate after the first trimester significantly reduce anaemia in pregnant women. **Acknowledgements:** The financial support of Bangladesh Medical and Research Council is acknowledged.

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Infectious Diseases 1

120 (031)

Shigella and *Salmonella* strains Isolated from Children in Gaza, Palestine and Their Antibiotic Susceptibility Patterns from 1999 to 2006

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Background: Diarrhoeal disease and enteric infections are major causes of morbidity and mortality in the developing world, resulting in over a quarter of all childhood deaths. Globally, *Salmonella* and *Shigella* remain major contributors to acute enteric infections. **Objective:** To study the frequency of *Salmonella* and *Shigella* isolates in patients with diarrhoea in Gaza and the susceptibility of isolated *Salmonella* and *Shigella* strains to antimicrobial drugs, and to help practitioners to choose an adequate antimicrobial drug to start empirical therapy in a patient with severe diarrhoea without knowledge of a specific pathogen. **Methodology:** During January 1999–September 2006, 3,570 stool samples were collected from children with diarrhoea, who were admitted to the El Nasser Pediatric Hospital, the largest paediatric hospital in Palestine in Gaza, from January 1999 to September 2006. Bacterial strains had been identified by culturing in selective media and by biochemical and serological testing, and their antimicrobial susceptibility patterns were tested by the disk-diffusion method for 11 of the most commonly-used antimicrobial agents. **Results:** The frequency of isolation was 0.8% (28/3,570) for *Shigella* spp. and 1.8% (65/3,570) for *Salmonella* spp. *Shigella flexneri* was the most-frequently isolated *Shigella* species (57.0%), followed by *S. sonnei* (25.0%), *S. boydii*, (14.0%), and *S. dysenteriae* (4.0%). Most *Shigella* isolates were resistant to trimethoprim-sulphamethoxazole (89%), ampicillin (79%), and chloramphenicol (46%), and most *Salmonella* isolates showed resistance to ampicillin (62%), trimethoprim-sulphamethoxazole (35%), chloramphenicol (35%), and cephalexin (26%). **Conclusion:** Multidrug-resistant *Salmonella* and *Shigella*-associated infections have emerged as an increasing problem in paediatric hospital, being responsible for many deaths. Analysis of risk factors and susceptibility patterns will help understand epidemiology of this organism in a hospital set-up. These data are useful for practitioners, and they reinforce the need for continuous monitoring of microbiological and antimicrobial surveillance. In Palestine, self-medication and purchase of drugs without a prescription are commonly practised. Thus, there is a greater possibility of development of resistant strains due to overuse and misuse of antibiotics. The results of the present study suggest that ampicillin, trimethoprim-sulphamethoxazole, and chloramphenicol should not be used as empirical treatment of diarrhoea in children.

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Energy-deficit from Recommended Dietary Allowance can Predict Clinical Outcome from Acute Diarrhoea in Children

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Background: Diarrhoea and malnutrition remain major health problems among children of developing countries. During diarrhoea, patient's food intake and absorption of nutrients are reduced but nutritional requirements are increased. **Objective:** To assess the impact of food intake on nutritional status and clinical recovery of malnourished children with acute diarrhoea during hospital stay. **Methodology:** A hospital-based longitudinal study was conducted among 118 patients with acute diarrhoea, aged 6-59 months, who required treatment for at least 3 days in inpatient wards in the Dhaka Hospital of ICDDR,B. Daily food intake and anthropometric measurements of weight and height were taken for assessing nutritional status. Daily stool weight was also measured. Data were analyzed using SPSS/PC+ (version 10) and EPI STAT (version 3.2.2). **Results:** Higher energy-deficit (>50% from recommended dietary allowance (RDA) patients had 50% increased duration (day) of diarrhoea compared to the lower energy-deficit (<50% from RDA) group (6 vs 4, p=0.000). Higher energy-deficit patients had 22% more stool output (mL/kg of body weight) compared to the lower energy-deficit group (122.65 vs 100.37, p=0.04). During hospitalization, weight-for-age z-score at discharge was higher among patients of higher energy-deficit than at admission (-3.53±1.25 vs -3.67±1.31, p=0.001) compared to no difference in lower energy-deficit. Weight-for-height z-score among patients of higher energy-deficit was also higher in discharge than at admission (-1.95±1.23 vs -2.14±1.22, p=0.001) compared to no difference in lower energy-deficit. Kaplan-Meier survival function showed that 71% of lower energy-deficit children compared to 27% of higher energy-deficit children recovered by 4th day of treatment (p=0.000). Multiple regressions showed the positive relationships among the period of recovery, the total energy intake (p=0.000), and stool output per kg of body weight per day (p=0.000), whereas mid-upper arm circumference showed a significant negative relationship with recovery (p=0.004). **Conclusion:** Acute diarrhoeal patients with higher energy-deficit from RDA had delayed clinical recovery and high stool output. Higher energy-deficit from RDA also reduces the nutritional status of patients. **Acknowledgements:** The technical support of ICDDR,B and College of Home Economics is acknowledged.

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Role of Serum Zinc and Retinol on Intestinal Permeability in Children with Rotavirus-associated Acute Diarrhoea

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Background: Acute watery diarrhoea remains a major public-health problem in the world. Rotavirus-associated diarrhoea is most common in children aged 6 months to 2 years, and its highest prevalence has been observed during the winter months. Rotavirus, a leading cause of infantile diarrhoea worldwide, is responsible for approximately 20% of diarrhoea-associated deaths in children aged less than 5 years. **Objective:** To determine the effect of serum zinc and retinol levels of children on intestinal permeability with rotavirus-infected acute diarrhoea. **Methodology:** A cross-sectional study was conducted among 50 children, with rotavirus-associated diarrhoea, aged 4-24 months, to determine the role of serum zinc and retinol on intestinal permeability. Intestinal permeability was assessed on admission by lactulose and mannitol excretion in urine of children, classified according to serum zinc, serum retinol, and diarrhoeal pathogens. **Results:** Serum zinc level was significantly ($p<0.037$) associated with excretion of lactulose. However, zinc had no association with excretion of mannitol and L/M ratio. Serum retinol was significantly associated with mannitol excretion ($p<0.02$) after controlling for other variables. The nutritional status of the children was not associated with any permeability probes. **Conclusion:** The results suggest that serum zinc and retinol levels are significantly associated with lactulose and mannitol excretion in rotavirus-associated acute diarrhoea. **Acknowledgements:** The study was funded by the Wellcome Trust, UK and ICDDR,B. ICDDR,B is supported by countries and agencies which share its concern for the health problems of developing countries.

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Risk Factors for Severity of Pneumonia and Hospital Duration of Diarrhoeal Children Aged Less than 5 Years

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Background: Pneumonia and diarrhoea cause much morbidity and mortality in children aged less than 5 years (under-5 children). Most deaths occur during infancy and in developing countries. In Bangladesh, the incidence of pneumonia and diarrhoea is almost equal, and these conditions are also the major causes for hospitalization. **Objective:** To identify the risk factors that determine the severity of pneumonia and duration of hospitalization with diarrhoeal diseases. **Methodology:** A hospital-based cross-sectional study was conducted among 308 children, aged 0-59 month(s), with diarrhoea and pneumonia, attending the Dhaka Hospital of ICDDR,B. Children attending the General Ward or Special Care Unit were screened for diarrhoea, pneumonia, with a main caretaker present. All patients had an X-ray to ensure pneumonia, and key signs as chest in-drawing were used for determining the severity using the guidelines of the World Health Organization. Anthropometry was determined by measuring weight, height, and age. Total white blood cell count, sodium, neutrophils, lymphocyte, and oxygen saturation were analyzed from serum. Data were analyzed using SPSS/PC+ (version 10) and EPI STAT (version 3.2.2). **Results:** The duration of diarrhoea was significantly longer among moderately-wasted and moderately-under-weight children compared to non-wasted ($p=0.02$) and better-weight children ($p=0.001$). Patients with cyanosis had 1.5 times higher ($p=0.02$) and patients with sepsis had 1.7 times higher risk of having severe pneumonia ($p=0.000$). Chest in-drawing and oedema increased the risk almost 1.5 times ($p<0.05$), and abnormal respiration had a 1.3-times higher risk of having very severe pneumonia ($p=0.03$). Total white blood cell count, low sodium, and low oxygen saturation were higher among children with very severe pneumonia compared to non-severe pneumonia ($p<0.04$), whereas low neutrophils were lower among children with very severe pneumonia compared to non-severe pneumonia ($p=0.01$). There was a negative correlation between lymphocyte proportion and duration of diarrhoea ($p=0.01$). **Conclusion:** Cyanosis, sepsis, chest in-drawing, abnormal respiration, oedema, total white blood cell count, low sodium, lymphocyte, neutrophils, and oxygen saturation are the major risk factors for the severity of pneumonia during hospitalization. **Acknowledgements:** The technical support of ICDDR,B is acknowledged.

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Factors Associated with 2005 Outbreaks of Cholera in Dhaka, Bangladesh

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Background: In Dhaka, patients with severe cholera generally attend the Dhaka Hospital of ICDDR,B. Cholera occurs in Bangladesh throughout the year with 2 well-defined seasonal peaks in summer and following monsoon. A large number of diarrhoeal patients visit the Hospital during and in the aftermath of floods around the Dhaka city. **Objective:** To identify the factors that are significantly associated with increased patient-visits at the Dhaka Hospital due to *Vibrio cholerae* O1-associated infections. **Methodology:** During 8 March–30 June 2005, 856 patients were enrolled in the Diarrhoeal Disease Surveillance System that systematically samples 2% of all patients. Case-control analyses were performed based on relevant information excerpted from the electronic database of the system. **Results:** During the study period, 42,875 patients had attended the hospital, and 856 were enrolled in the surveillance system. *V. cholerae* O1 was isolated from faecal cultures of 321 (38%) of these patients (cases), and stool specimens of the remaining 535 patients did not grow *V. cholerae* O1 (controls). Sixty percent of the cases and 35% of the controls were aged over 15 years, and males constituted 56% of the cholera patients. All the cholera patients used tap or tubewell water for drinking, and 46% of them used sanitary toilets. Nearly, all (99%) patients had watery diarrhoea, 92% had clinical (some or severe) dehydration, 81% required intravenous fluid, 52% were discharged within 24 hours, and none died. The distribution of sex, level of education and family size, and the indicators of socioeconomic status were similar among the cases and the controls. Results of bivariate analysis showed that cases were more likely to have drunk untreated water (74% vs 65%, odds ratio [OR]=1.5, confidence interval [CI] 1.1-2.1, p=0.01) and collected drinking-water from a distance more than 100 feet (6.0% vs 2.0%, OR=3.0, CI 1.3-6.7, p=0.006). In logistic regression, controlling for the family size, these 2 factors remained significant (OR=1.4, 95% CI 1.1-2.0, p=0.020; and OR=2.7, 95% CI 1.3–5.8, p=0.010 respectively). **Conclusion:** The results indicate that a few specific but simple interventions, such as health education to promote hand-hygiene and use of simple techniques for water purification, would have the potentials for prevention of cholera transmission. **Acknowledgements:** The financial support of the United States Agency for International Development is acknowledged.

HIV/AIDS and Tuberculosis 1 125 (035)

Knowledge on HIV/AIDS among Students of Higher Secondary Colleges in Urban and Rural Bangladesh

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Background: It is well-known that adolescence is one of the fascinating and, perhaps, most complex stages in life when young people take on new responsibilities and experiment with independence. An estimated 11.8 million young people worldwide (7.3 million young women and 4.5 million young men), aged 15-24 years, are living with HIV/AIDS. AIDS has killed more than 25 million people in the world since it was first recognized in 1981, making it one of the most destructive epidemics in recorded history. The UNAIDS Report 2004, Bangladesh section showed that, at the end of 2003, the estimated number of HIV cases (both adults and children) ranged from 2,500 to 15,000 with an estimated number of deaths during 2003 below 400. **Objective:** To evaluate the present status of knowledge on HIV/AIDS among students of selected higher secondary colleges in Mohammadpur thana, Dhaka city and Kotowali thana, Mymensingh district. **Methodology:** A questionnaire survey was conducted to assess the knowledge on HIV/AIDS among 300 higher secondary students of the study area. The respondent ratio between urban and rural students was 1:1. Students of both the sexes aged 16-20 years were included in the study regardless their socioeconomic status using a systematic random-sampling technique, and interviews were conducted using a semi-structured questionnaire. Ethical issues were addressed following the guidelines of Bangladesh Medical Research Council and the ethical review committee of World Health Organization. **Results:** Most (92.3%) respondents heard about AIDS as a disease, and 81.6% could mention HIV as the causative agent of AIDS. The large majority (77%) of the respondents mentioned that there was no treatment for AIDS, and everybody could be at risk. Adolescents of Bangladesh were not at high risk of AIDS at present situation. Most (96%) students knew about the preventive measures of AIDS (such as blood test before blood transfusion, use of safe/new syringe/needle during blood test, avoidance of illegal physical relationship, stopping breastfeeding from AIDS-affected mothers, use of condoms, educating people about the effects and prevention of AIDS). Television and newspapers were the highest role-playing media in both urban and rural areas for the awareness of HIV/AIDS. Around 75% of the students thought that the adolescents of Bangladesh did not have the proper knowledge about AIDS. Seventy-four percent of the students recommended that peer education would be an effective way to communicate adolescents regarding AIDS-related information. **Conclusion:** A relatively low prevalence of HIV/AIDS exists in the study areas, although some complacencies are still prevailing among general population of different social groups wherein HIV/AIDS is not given serious consideration for action and resource mobilization. Therefore, advocacy and communication efforts should be directed towards improving better awareness and understanding of the epidemic with emphasis on its consequences. The study provided information about the level of knowledge regarding HIV/AIDS among HSC-level adolescents, which will help health policy-makers and planners formulate a plan and a health-education programme.

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Does Selected Knowledge of HIV/AIDS Influence Risky Sexual Behaviour among Married Bangladeshi Male Migrant Workers?

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Background: The effects of knowledge about the transmission and prevention of HIV/AIDS on sexual behaviours are not well-understood. **Objective:** To examine relationship between selected knowledge of HIV/AIDS and risky sexual behaviours of married men who had or had not lived apart from their wives. **Methodology:** Database of a longitudinal Demographic Surveillance System (DSS) of ICDDR,B was used for identifying 874 married men who had returned from living abroad and elsewhere in Bangladesh and men who had lived at home with their wives during the last 5 years. Data were collected from 703 married men through a cross-sectional survey and one-to-one interview using semi-structured questionnaire. Bivariate and multivariate analyses were done to examine the association among different groups. **Results:** Reported extramarital sex was higher (64%) among those who had been living away from their wives compared to those (25%) who had not. Condom use at the last sex among men regardless of migration status ranged from 6% to 12% during the marital sex and from 2% to 13% in extramarital sex. Consistent condom use was very low (30%) during marital or extramarital sex. Overall perception of risk of being infected with HIV/AIDS was low (9-21%) among men. However, perceived risk was significantly higher ($p<0.05$) among men who had lived away compared to non-migrants. Men who knew that condom prevents HIV transmission of HIV were 5 times likely to perceive risk of contracting HIV/AIDS. Those who knew that using condoms protects against HIV were more than 8 times as likely to have used a condom with a sex worker compared to those who did not report. However, men who knew the sexual mode of HIV transmission were 3 times more likely to report extramarital sex (adjusted odds ratio=2.8 [95% confidence interval 1.0-7.38)]. Men who had returned from abroad or from Bangladesh were 4 times more likely to have used a condom with a sex worker if they knew about sexual transmission of HIV. **Conclusion:** Risky sexual behaviours of migrant workers when living away from their spouses pose a potential threat for introduction of HIV/AIDS into Bangladesh. Although knowledge about condom improved its use, knowledge about sexual transmission of HIV did not improve risky sexual behaviours.

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Day 2: Monday, 5 March 2007 127 (076)
12:15 pm-1:30 pm (Venue: Corridor Café)
Poster Session 3
MDG 4: Reduce Child Mortality 3
Interventions and Programmes 2

Impact of Maternal Nutrition Education and Food Supplementation to Infants on Nutritional Status of Children

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Background: It is unclear whether a substantial decline in moderate malnutrition in children of developing countries can be achieved by increasing the availability of food and counselling on nutrition. **Objective:** To assess the effectiveness of nutrition education and food supplementation in improving the physical growth of moderately-malnourished children aged 6-24 months. **Methodology:** In a prospective randomized trial, 282 children aged 6-24 months were randomized to one of the 3 study groups. The intervention was continued for 3 months and followed by a further 3 months. The first group received only nutrition education on food security, disease control, and caring practices twice a week for 3 months; the second group received nutrition education of the same intensity and an additional energy-dense, protein-rich food supplement for 6 days a week during the 3 months of intervention; and the third group received no intervention but the routine Bangladesh Integrated Nutrition Project services. **Results:** During the intervention, 66% more weight gain (1.06 kg vs 0.65 kg, $p<0.00$) and during observation, 34% more weight gain (1.15 kg vs 0.86 kg $p<0.00$) were observed in children receiving education plus supplementation compared to the controls. The education plus supplementation group had comparable weight gain during the intervention (1.06 kg vs 0.91 kg, $p>0.05$) and observation (1.16 kg vs 1.26 kg, $p>0.05$) compared to the only-education group. The height increment improved 59% more during the intervention (3.46 cm vs 2.18 cm, $p<0.00$) and 40% more during the observation period (5.88 cm vs 4.21 cm, $p<0.00$) in the education plus supplementation group compared to the controls. The increments in height gain between the education plus food supplementation group and the only-education groups were 49% during the intervention period (3.46 cm vs 2.33 cm, $p<0.00$) and 17% during the observation period (5.88 cm vs 5.02 cm, $p<0.00$). **Conclusion:** The nutrition education and nutrition education plus food supplementation groups both showed better results in reducing malnutrition, but food supplementation combined with nutrition education improved child's height and weight which nutrition education could not bring alone. **Acknowledgements:** The financial support of the World Bank through BINP (Ministry of Health and Family Welfare) is acknowledged.

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Can Only Counselling Reduce Low Birth-weight in Bangladesh?

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Background: Maternal under-nutrition and poor gestational weight gain are the most important causes of low birth-weight and high rates of mortality for the newborn. It was hypothesized that prenatal nutrition counselling can reduce low birth-weight by improving dietary intake during the third trimester. **Objective:** To assess the effect of prenatal nutrition counselling on birth-weight. **Methodology:** The study was conducted at the Maternal and Child Health Training Institute, Azimpur, Dhaka, during 2005. One hundred fifteen women of low socioeconomic status, whose family-income was less than Tk 5,000 per month and having 5 months of pregnancy, were randomly selected. The intervention group had 57 subjects, and the comparison group had 58 subjects. The intervention group was given detailed nutrition education individually for the last 4 months during pregnancy. An hour-long session was given fortnightly for the first month and then monthly for the last 3 months. The intervention approach was based on food-security, caring practice, and disease control. The comparison group was observed only from 5 to 9 months of pregnancy and, after that, birth-weights were measured within 24 hours. Data were collected through a structured questionnaire and were analyzed using chi-square test, student's *t*-test, repeated measures of ANOVA, and logistic regression in SPSS/PC+ (Window's version 12). **Results:** At the baseline, both the groups were similar in nutrition and socioeconomic status. After 4 months of counselling, total gain in body-weight was 46% more in the intervention group (5.69 kg vs 3.89 kg, p=0.000). The comparison between the intervention and the comparison group showed that cumulative weight gain was higher in the intervention group (p<0.001). Birth-weight increased by 18% in the intervention group (2.86 kg vs 2.42 kg, p=0.000). The proportion of low-birth-weight babies was 10.5% in the intervention group compared to 48.3% in the comparison group which indicates a 78% reduction in low birth-weight in the intervention group (p<0.001). Compared to the comparison group, the pregnant women receiving nutrition education had 81% lower risk of having a low-birth-weight baby (odds ratio=0.206, p=0.022). **Conclusion:** Prenatal nutrition education was effective in improving pregnancy weight gain and in reducing low birth-weight. This nutrition education should be scaled up for all maternity services in Bangladesh. **Acknowledgements:** The financial support of Bangladesh Breastfeeding Foundation and the technical support of ICDDR,B are acknowledged.

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Formative Research on Chlorhexidine Cleansing of Umbilical Stump

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Background: Traditional newborn-care practices relating to care of the umbilical cord-stump may directly contribute to infections, which, in turn, account for a large proportion of estimated 4 million annual neonatal deaths globally. Specific adaptations of current neonatal care practices may reduce exposure of the cord-stump to pathogens and reduce the consequent risk of infection and death. **Objective:** To assess the existing umbilical and skin-care knowledge and practices for neonates in Sylhet, Bangladesh and to identify the most effective and feasible options for ensuring correct practice of dry cord-care or correct application of chlorhexidine at the time of birth and during the first week of life. **Methodology:** Semi-structured interviews (n=60), structured observations, a small household survey (n=410), and 40 rating and ranking exercises were conducted on newborn cord- and skin-care practices to elicit specific behaviours, including hand-washing, skin- and cord-care at the time of birth, persons engaged in cord-care, cord-cutting practices, topical applications to the cord at the time of birth, wrapping/dressing of the cord-stump, and use of skin-to-skin care. **Results:** Ninety percent of (n=410) deliveries took place at home, and in 98% of all the deliveries, cord was cut after the delivery of placenta. In the majority (56%) of the cases, mothers cut the cord themselves. In the majority (64.4%) of the cases, the cutting instrument was not boiled. Applying some substance on the umbilical stump after cutting was common (51.8%), and people mostly applied turmeric (82.7%). Umbilical stump-care revolved around bathing, skin massage with mustard oil, and heat massage on the umbilical stump. Forty-two percent of the newborns were bathed immediately after birth. Mothers were the principal care provider during the neonatal period. Most (91%) did not report any umbilical infections. **Conclusion:** The experience gained from this formative research is being used for further defining feasible, safe, and acceptable methods of cleansing the umbilical cord with or without chlorhexidine. Such interventions should be a major component of efforts to reduce mortality from infections in the neonatal period. **Acknowledgements:** The financial support of the United States Agency for International Development, Dhaka, is acknowledged.

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Improving Mother's Knowledge and Perception by Nutrition Education

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Background: Child nutrition is related to mothers' perception on child-feeding practices and other health-related beliefs, attitudes, knowledge, and caring practices. It is assumed that improved knowledge can also improve behavioural practice for child-feeding. **Objective:** To improve mothers' knowledge and perception by nutrition education. **Methodology:** A intervention study was conducted on children aged 0-59 month(s) in an urban slum area in Dhaka, Bangladesh. An equal number of subjects (n=90) were allocated to the intervention and comparison groups. Mothers of the intervention group were counselled on food security, caring practices, and disease control for children. Nutrition education was delivered with the help of BCC materials to mothers. The intervention was continued for 4 months. **Results:** Sixty-seven percent and 47% of the mothers in the intervention and the comparison group respectively knew the benefits of colostrums-feeding. After the intervention, the proportion improved to 100% and 53% respectively (p<0.000). In the intervention group, the proportion of intake of *khichuri* and giving oil in complementary food improved significantly from 24% to 100% (p<0.001) and from 15.6% to 53.3%, (p<0.002) respectively. The perception on benefit of deworming children at baseline was 4.4% and 26.7% respectively. After the intervention, it increased significantly compared to the comparison group (58% and 31%) (p<0.01). The proportions using boiling water were 18% and 33% at baseline, which improved at the end of intervention (82% and 38%, p<0.000). At baseline, 47% of the intervention and 29% of the comparison group washed their hands before taking foods. After the intervention, the perception of the intervention group improved significantly compared to the comparison group (76% and 38%, p<0.000). **Conclusion:** Intervention with nutrition education changed child-feeding practices, health-related beliefs, attitudes, knowledge, and caring practices of mothers. **Acknowledgements:** The technical support of ICDDR,B is acknowledged.

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Capacity-building on a Microbiology Laboratory at a Resource-poor Setting in Bangladesh: Impact on Child Health Policy in Developing Countries

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Background: The molecular techniques have revolutionized the diagnosis, treatment, and epidemiology of infectious diseases. These techniques, however, are mostly unavailable in areas of the world where the prevalence of infectious diseases is highest. **Objective:** To build the capacity of an exemplary microbiology laboratory in a developing country for good management of child health. **Methodology:** The Microbiology Laboratory of Dhaka Shishu (Children's) Hospital (DSH), established to provide diagnostic services to the Hospital, operates with limited resources. The Microbiology Department established a research programme focused on childhood infectious diseases, which is contributing to the development of treatment and immunization policies in Bangladesh. **Results:** The DSH Laboratory focused initially on paediatric pneumonia, septicaemia, and meningitis, generating data on aetiological agents and their susceptibility patterns, using the improved, affordable, and simple procedures. Building on this foundation, the Laboratory has recently introduced DNA technology to conduct the following studies: (a) Immunochromatographic test (ICT) for pneumococcal antigen in CSF that revealed 100% sensitivity and specificity of the test in diagnosing pyogenic pneumococcal meningitis. The test detected 30% more cases of pneumococcal meningitis compared to culture alone, particularly cases treated with antibiotics prior to presentation. (b) Detection of the genome of *Haemophilus influenzae* and the resistance plasmid by PCR, as long as 5 days after the initiation of antibiotic treatment. These data indicate that PCR technology provides superior diagnostic capabilities compared to antigen detection and can facilitate selection of definitive therapy even when the organism is not isolated. (c) Demonstration of increased sensitivity of blood culture for detecting pneumococcal cases using ICT in instances when the cultures are falsely negative due to autolysis or contamination with fast-growing organisms. **Conclusion:** This extremely resource-poor laboratory has been contributing to health policy for children in the field of infectious diseases in Bangladesh and provides an example for other laboratories of the developing world. The Microbiology Laboratory of DSH, in turn, can transfer this technology to other laboratories of the country and beyond. **Acknowledgements:** The support for the Wellcome Trust–Burroughs Wellcome Fund, UK, and United States Agency for International Development is acknowledged.

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Infant Mortality Rate and Assistance of International Aid Agencies: A Multi-country Evaluation of Accomplishments in South Asia

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Background: Infant mortality rate (IMR) is one of the summary indices used for determining the level of living standard and socioeconomic development of a country. IMR is also used for comparing the health and well-being of populations across and within countries. Poverty, socioeconomic status, literacy, ignorance, lack of access to healthcare, paucity of healthcare facilities, and limited governmental resource for healthcare are some contributing factors for higher IMR. **Objective:** To determine the assistance of international aid agencies to reduce IMR in Southeast Asia. **Methodology:** The study drew evidence from in-depth review of assistance of international aid agencies in reducing IMR. Documentary sources, online resource, and statements of international aid agencies were analyzed. Substantiation of these findings involved triangulation of sources and peer-checking. **Results:** The performance of health systems can typically be judged from the level of provision of services. Over the last 4 decades, the IMR has significantly declined in different countries. Countries of South Asia which are home for almost 23% of the world's population have not shown a great extent of progress. International aid agencies, such as United Nations Children's Fund, World Bank, World Health Organization, Canadian International Development Agency, United States Agency for International Development, and Japan International Cooperation Agency, are playing a key role in this region to improve the heath status to a reasonable level. In some countries of this region, the active role of international aid agencies has made substantial impact in some sectors, such as 100% immunization goal of Bangladesh, National Programme on Girls' Education at the Elementary Level (NPEGEL) in India, by UNICEF. From immunization to women's empowerment programme, there has been direct or indirect input towards reduction of IMR. **Conclusion:** Reducing poverty, elimination of illiteracy, and making needed structural changes to improve living conditions clearly are high priorities for developing countries. Inter-agency and inter-sectoral coordination along with coordination with the Government could bring significantly higher attainment of health goals.

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Effect of Knowledge of Service Providers on Essential Newborn Healthcare: A Study from Rural India

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Background: A child health programme primarily depends upon ground-level service providers of the Department of Health and Integrated Child Development Services, i.e. Auxiliary Nurse Midwife (ANM) and Anganwadi Worker (AWW), in rural India. Results of previous studies showed that knowledge and skills of these service providers varied drastically on scale. However, there is a dearth of study which shows the impact of knowledge of service providers on the adherence of newborn care-seeking practices at the household level. **Objective:** To examine the effect of knowledge level of service providers on the adherence of newborn care-seeking practices at the household level. **Methodology:** Endline data of evaluation research to improve newborn health and survival in the Integrated Nutrition and Health Programme (INHP) II area of CARE/India, colleted by Johns Hopkins Bloomberg School of Public Health, during January-March 2006, from Uttar Pradesh, gives a unique opportunity to examine the above objective. Using a structured questionnaire, 17,248 eligible mothers residing in 59,278 households were interviewed to collect detailed information on maternal and newborn health. Data were also collected from the catchment area of the existing service providers (86 ANMs and 302 AWWs) to know their knowledge, roles, and responsibilities and have been linked to the eligible mother. Logistic regression model has been restored to see the adjusted effect of the knowledge level of the providers. **Results:** After controlling for the socioeconomic and demographic (SED) factors, the knowledge level of the ANMs/AWWs emerged as the most significant factor in practising essential newborn care. For example, likelihood of the initiation of breastfeeding on the first day of life (odds ratio [OR]=2.22, 95% confidence interval [CI] 1.82-2.70) and of thermal care in the first 6 hours (OR=2.44, 95%, CI 1.89-3.16) was more than twice among mothers visited by the ANMs having better knowledge than by the ANMs having poor knowledge. Interestingly, all other SED characteristics emerged as either insignificant or quite less effective. Results of bivariate analysis showed the positive association between the knowledge of the providers and their antenatal or postnatal home-visits. **Conclusion:** Improving the newborn health status in rural settings may be possible by improving the knowledge of health providers. A regular field-based refresher training programme should be launched at scale for ANMs and AWWs to update their knowledge and communication skills. Rigorous efforts are required to improve their antenatal and postnatal home-visits for healthcare-seeking behaviour. **Acknowledgements:** The financial support of the United States Agency for International Development is acknowledged.

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Immediate Effect of Training of Nurses on Newborn Care at Birth and Implications for Management of Asphyxia

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Background: Quality of care provided immediately after birth greatly influences outcome of asphyxiated births, the most frequent cause of early neonatal deaths worldwide. Incidence of asphyxia and mortality are high in tertiary hospitals of Bangladesh. **Objective:** To assess the immediate newborn care (INC) practices pertaining to recognition and management of birth asphyxia in delivery room prior to, and following, training of nurses of delivery room. **Methodology:** The study was conducted in a tertiary-level sub-urban hospital in central Bangladesh during November 2005–January 2006. Twenty-one pre-training and 21 post-training evaluations of INC practices were done by direct observation, using the framework outlined in the national essential newborn-care guidelines. All 26 nurses of obstetric unit were trained according to the national curricula. The contents and messages were tailored based on the needs identified during pre-training observations. Semi-structured interviews and case studies before and after training focused on understanding factors shaping the INC practices. **Results:** Nurses without relevant practical training were the key personnel for newborn care. In the pre-training period, lack of trained personnel in the delivery room, inadequate preparedness, and lack of equipment led to delay in identification of the need for resuscitation and initiation of resuscitative actions. There were long-standing practices of routine suction, suspending upside down, and slapping the back of newborns as resuscitative measures. The INC practices did change after training as evidenced by improvements of some parameters of INC, increased preparedness, and reduction of harmful practices. In the pre-training period, 11 babies were suctioned compared to one in the post-training period, and 15 babies were suspended upside down in the pre-training period compared to 3 in the post-training period. Before the training, only 5 babies were assessed to identify the need for resuscitation, whereas 17 babies were assessed during the post-training period. Nurses were able to perform Apgar scoring, which they felt, made them more attentive to the condition of newborns. **Conclusion:** A wide gap existed between the evidence-based standard of immediate newborn care and the actual practices. Need-based training of staff in delivery rooms is needed for timely recognition and management of asphyxiated births in hospital deliveries. **Acknowledgements:** The support of BRAC University, ICDDR,B, and the study hospital is acknowledged.

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Integrated Management of Childhood Illness Can Improve Quality of Child Healthcare in First-level Facilities: Experience from Rural Bangladesh

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Background: The Integrated Management of Childhood Illness (IMCI) strategy includes guidelines for the management of sick children at the first-level facilities. The guidelines are intended to improve the quality of care by ensuring a complete assessment of the child's condition and by providing algorithms that combine presenting symptoms into a set of illness classification for management by trained health workers at the first-level facilities. **Objective:** To assess the improvements in the quality of child healthcare in the first-level health facilities in rural Matlab, Bangladesh, after the implementation of IMCI training and supportive supervision. **Methodology:** Health facility surveys involving observations of case management were carried out before (2000) and, at two points, after (2003 and 2005) the implementation of the facility-based IMCI in 20 first-level facilities that had been randomly assigned to IMCI intervention and comparison groups. Health workers in the IMCI facilities received training in case management and monthly supervision that involved observations of case management and reinforcement of skills. Health workers in comparison districts were trained at the same level of intensity using the existing approaches and were supervised using the Government of Bangladesh (GoB) standards. **Results:** Sick Bangladeshi children taken for care at the IMCI facilities received significantly better care, and improvements in the quality of care were sustained and even increased over the 2-year evaluation period. Workers with 18 months of pre-service training performed at the same level as did the workers with 4 years of paramedical service. **Conclusion:** IMCI training, coupled with regular supportive supervision, can improve and sustain the quality of child healthcare in the first-level health facilities, even among workers with minimal pre-service training. **Acknowledgements:** The study was conducted with support from the Bill and Melinda Gates Foundation through a grant to the Department of Child and Adolescent Health, World Health Organization, Geneva, and with additional support from the United States Agency for International Development and the Government of Bangladesh.

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Social Meaning of Dengue in Bangladesh: Probing into Functionalism

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Background: Dengue, an acute influenza-like fever caused by virus, is most serious in children. Species of *Aedes* mosquitoes transmit the disease. For the last few years, dengue is prevailing in Bangladesh. How the people of the country view the disease is almost unknown. It is necessary to know this to help behaviouristic intervention for its control. **Objective:** To study knowledge, attitudes, and behaviour of different segments of community members—dengue patients and their kin responsible for primary care, and public-sector health workers—who had to deal with issues relating to the occurrence, treatment, social outcome, and control measures of dengue. These members were picked up by snowball sampling. **Methodology:** This was a qualitative probing by group discussions with dengue sufferers (n=11) and/or their near kin (n=13), and health workers (n=8) in the public sector involved in the management of the disease. The study was conducted in Dhaka and Rajshahi during January-June 2005. Both etic and emic interpretations were done on illustratively-analyzed data. Ethical clearance was taken from Ethical Committee of IEDCR before initiating the study. **Results:** None of the 3 categories of the respondents (n=32) could give a complete picture of the essentials of the disease. The near kin of dengue sufferers perceived that the mosquitoes that transmit the disease bite people equally at day and night. Some health workers termed the disease as viral and some as parasitic. All respondents (n=32) were acquainted with the common treatment of uncomplicated disease. Few health workers categorically stated that no blood transfusion is needed at any stage of the treatment. The social outcome observed by the respondents stressed that dengue might create a panic. The control measures suggested by the respondents include building increased awareness. **Conclusion:** The study shows that community members are not well-aware of the biting habit of Aedes mosquito. In reality, the Aedes mosquito bites mostly at daytime. This knowledge gap exists probably because the lay persons are unable to differentiate between the different species of mosquitoes. There is information slit among health workers on the essentials of dengue. Continuing education for health workers is needed. Community-awareness raising measures need to be undertaken. **Acknowledgements:** The support of the World Health Organization is acknowledged.

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Effects of Prenatal Fish-oil or Soy-oil Supplementation on Cognitive Function of Children at 6 Years of Age

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Background: Supplementation of docosahexanoic acid (DHA) in infancy has been reported to improve cognitive functions. However, there are only few reports on the long-term effects of supplementation to pregnant women on the cognitive functions of their children. **Objective:** To assess the effects of DHA supplementation to women during pregnancy on cognition of their children at the age of 6 years. **Methodology:** In this randomized, double-blind, controlled trial, 400 eligible women were supplemented with fish-oil (F) or soy-oil (S) to assess their pregnancy outcomes. Their infants (n=249) were followed at 10 months of age but no difference of F or S supplementation on their development was found, and only 54 children of this cohort could be located for the present study. The Wechsler Preschool and Primary Scale of Intelligence was administered to assess the children's intelligence quotient (IQ) using its verbal, performance, processing speed, and full-scale IQs. The vocabulary, information, and similarity tasks were implemented to assess verbal IQ; block design, matrix reasoning, and picture completion tasks measured performance IQ, and speed of processing was measured using coding. The 3 scales were summed to measure the full-scale IQ. The quality of psychosocial stimulation at home was measured using Caldwell's Middle Childhood Home Inventory. **Results:** The quality of psychosocial stimulation at home did not differ in the 2 groups. Children in the F group had lower scores than those in the S group, but the differences were not statistically significant. The mean (SD) in the verbal, performance, processing speed, and the full-scale IQs in the F and S groups were: 77.2 (9.2) vs 78.9 (9.0), 68.7 (11.2) vs 71.5 (10.1), 60.2 (10.8) vs 61.7 (9.1), and 70.6 (10.8) vs 73.2 (10.3) respectively. **Conclusion:** The loss of sample was enormous, but the findings were similar to those observed at 10 months of age of these children. F supplementation during the last trimester of pregnancy did not show any added benefit over S supplementation on the children's IQ at 6 years of age in this population. **Acknowledgements:** The financial support of the Harvard University and the logistic support of ICDDR,B in conducting the study are acknowledged

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Do Reproductive Healthcare Services Reduce Risk of Neonatal Death among a Religious Minority Group in Matlab, Bangladesh

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Background: Empirical research documented that differential in fertility, mortality, and reproductive healthcare use exists between religious and ethnic minority groups. In Bangladesh, high mortality, especially among neonates, exists among Hindus. **Objective:** To examine whether the use of reproductive health services by Hindus is different from that by the majority religious group Muslims and whether the differential in use of reproductive healthcare services affect neonatal mortality differently between these two religious groups. **Methodology:** The paper used pregnancy history, reproductive health service statistics, and death registration data of 1978-2003 of the Matlab Health and Demographic Surveillance System (HDSS) of ICDDR,B maintained since 1966. In 1977, ICDDR,B has introduced an intensive reproductive healthcare service in half of its area known as ICDDR,B area, and the rest of the area is known as government service area where normal government health and family-planning service is in operation. **Results:** The trends in reproductive healthcare use, especially tetanus immunization (TT), showed that Hindus had a slightly higher rate of TT acceptance than the Muslims, but the difference reduced over time. Neonatal mortality among Hindus was higher than among Muslims in the late seventies and eighties but reduced over time. Results of multivariate analysis with the latest data showed that neonatal mortality between the 2 religious groups (Hindus and Muslims) was similar where there has been ICDDR,B interventions, but mortality was significantly high where there has been no ICDDR,B intervention (government service area). Other factors that elevated the risk of death among neonates in both the areas were breech presentation of baby and baby not cried after delivery. Education of women significantly reduced the risk of neonatal death in both the areas, while women's younger age elevated the risk of neonatal death in the government service area. **Conclusion:** When the use of service is low, neonates of the Hindu community are at a higher risk of death. However, in an intensive intervention, the Hindu community overcomes the adverse situation and improves the survival probability of the neonates. **Acknowledgements:** The support of ICDDR,B is acknowledged.

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Variations in Quality of Care for Sick Children by Village Doctors in Bangladesh

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Background: Several studies have shown that the largest source of care for sick children in Bangladesh is village doctors, but there is concern that their quality of care is low. The Government of Bangladesh and various NGOs are considering interventions to improve the quality of care provided by village doctors. **Objective:** To evaluate the quality of care provided by village doctors for treating children aged less than 5 years (under-five children). **Methodology:** A cross-sectional survey was conducted in 16 upazilas under Dhaka, Chittagong, and Rajshahi divisions of Bangladesh where the NGO Service Delivery Program (NSDP) is implementing the Community-IMCI (Integrated Management of Childhood Illness) package. Mothers or caretakers of under-5 children were interviewed using a baseline household survey questionnaire. A Provider Care and Cost Module (PCCM) was also completed if a child was found to be sick at the time of the interview or within 2 weeks prior to the interview. **Results:** During 10 September 2005–28 September 2005, 1,665 household interviews were completed. In total, 506 PCCMs were completed for visiting different healthcare providers. More than 40% (n=212) of the providers consulted were village doctors, while 20% (n=105) were qualified doctors. Among the different questions asked in the PCCM pertaining to the quality of care of providers, 6 questions were finally retained based on principal components, and a scale of quality was created with acceptable reliability (alpha=0.78). The mean score of the quality scale was 2.8. Among different providers, qualified doctors had the highest score (3.5); however, the mean score for village doctors was only slightly lower with a mean of 3.1. Considering divisions, the mean scores for village doctors of Rajshahi and Dhaka divisions were much lower (2.5 and 2.3 respectively) compared to that of Chittagong division (4.1). While looking at the use of drugs, 25% (n=6), 21% (n=7), and 14% (n=4) of 24, 34, and 29 diarrhoea cases respectively received oral rehydration solution who attended pharmacists, village doctors, and qualified doctors respectively. In the case of reported non-severe pneumonia cases, 20% and 4% of the cases received co-trimoxazole who attended paramedics/family welfare visitors/nurse and village doctors respectively. None of the qualified doctors prescribed co-trimoxazole. **Conclusion:** The findings have significant implications for programmes. First, a minority of providers were prescribing IMCI-recommended treatments for sick children. While there

has been considerable focus on low quality of care from village doctors, the findings showed that the providers with formal training was the same or only marginally better; so efforts to improve the quality of care need to target all providers. Second, there were significant variations from one upazila to another in the quality of care. Identifying districts and divisions where providers have lower quality scores can make spending on intervention to improve the management of sick children more efficient. **Acknowledgements:** The support of NGO Service Delivery Program, Associates for Community and Population Research, and United States Agency for International Development is acknowledged.

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Effect of Health Education on Feeding Practices, Growth, and Morbidity of Infant and Young Urban Children

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Background: Proper feeding is crucial for nutrition, survival, and development of infants and young children. It is hypothesized that health education will improve feeding practices and, therefore, will promote growth and decrease morbidity in infants and young children living in urban Dhaka. **Objective:** To assess the effect of health education on feeding practices, growth, and morbidity in infants and young urban children. **Methodology:** The study was conducted at the Maternal and Child Health Training Institute, Azimpur, Dhaka, Bangladesh, during January-October 2006. Two hundred eleven mothers of infants and young children aged less than 24 months from urban communities in Dhaka city were recruited. Initially, they were stratified into 2 age-groups: below 6 months and 6-24 months. Below 6-month groups were further assigned to 2 different groups: breastfeeding (BF) only (n=32), breastfeeding plus health education (BFHE) (n=80). Children aged 6-24 months were also assigned to complementary feeding (CF) only (n=31) and complementary feeding plus health education (CFHE) (n=68). Health education on promotion of breastfeeding and appropriate complementary feeding, personal hygiene practice, and primary healthcare practice were provided in the group with BFHE and CFHE (intervention groups). Health education was not provided to the other 2 groups (BF and CF) who were treated as control. Demographic and anthropometric data were recorded at baseline and at day 60 of the intervention. **Results:** Compared to the control groups, nutritional status regrading weight-for-age and weight-for-length improved significantly in groups receiving health education in both BFHE and CFHE groups after 2 months of health education (mean±SD; BFHE vs BF; 89±9.0 vs 70.0±12 $p<0.001$ weight-for-age, 101±6.0 vs 93.0±7.0, $p<0.001$ for weight-for-length, CFHE vs CF; 90.0±7.0 vs 78.0±9.0, $p<0.001$ for weight-for age, 99.0±6.0 vs 94±7.0, $p<0.001$ for weight-for-length). Health education also increased the prevalence of exclusive breastfeeding (EBF) in children with breastfeeding at day 60 (BFHE vs BF; 71.30% vs 15.6%, $p<0.001$). Finally, health education also contributed in reducing morbidity rate for diarrhoeal disease and acute respiratory infection (BFHE vs BF; 20% vs 62.5%, $p<0.001$) and (CFHE vs CF; 7.4% vs 67.7%, $p<0.001$). **Conclusion:** Health education is effective in improving nutritional status and feeding practices and reducing morbidity in infants and young urban children in Bangladesh.

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Reduction of Diarrhoeal Diseases Using Siraj Mixture as Point-of-Use Water Treatment Strategy in Bangladesh

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Background: In Bangladesh, 75 million episodes and 110,000 deaths occur due to diarrhoeal diseases every year, and US$ 80 million is spent for treatment alone by the Government of Bangladesh. The main reason for the high incidence of diarrhoeal diseases is mainly contaminated water. **Objective:** To reduce the incidence of diarrhoeal diseases in rural communities in Bangladesh by using Siraj Mixture (a newly-developed water-purifying agent) as point-of-use water treatment strategy. **Methodology:** Siraj Mixture is a combination of alum potash, bleaching powder, and lime. A pilot study was conducted in 10,000 people in Matlab from May to December 2006. Siraj Mixture was provided to 210 households each in study and control population. In the study households, in addition to Siraj Mixture, H2S kit was supplied to test water before and after treatment with the mixture to monitor contamination. The incidence of diarrhoeal diseases in both study and control households was monitored using ICDDR,B hospital records. **Results:** Not a single patient was admitted with diarrhoea in ICDDR,B hospital from the families who used Siraj Mixture during the study period (2006) but, at the same time in 2005, there were 8 cases from the same families. During the same period from May to December (2005), there were 29 cases from the neighbouring households which increased to 50 cases in 2006. On the 20th week of the study, 46 and 29 families of the study and control population respectively shifted from tubewell water to treated surface water for drinking purpose due to arsenic contamination in tubewell water. There was no significant difference in the use of Siraj Mixture ($t=0.4232$, $df=43.5$, $p=0.6742$) between the study and control populations. **Conclusion:** The Government of Bangladesh may save thousands of lives and millions of dollars every year providing Siraj Mixture for treating contaminated water. Indirect costs, including losses in productivity (absenteeism) and loss of productive years of life as a consequence of premature deaths, will also be saved. Therefore, this study will have an impact on achieving Millennium Development Goal (MGD) in Bangladesh. **Acknowledgements:** The financial support of the United States Agency for International Development (USAID) and ICDDR,B is acknowledged.

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Evidence-based Mother and Newborn-care Interventions Package—Is It Achievable in Rural Bangladesh?

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Background: The evidence base for maternal and newborn-care (MNC) interventions that has emerged over recent years has led to a discussion about the essential interventions at the community and facility levels to benefit mothers and babies. These are antenatal, delivery practice, and postnatal interventions. **Objective:** To determine whether evidence-based MNC interventions are achievable by an NGO in rural Bangladesh (LAMB Integrated Rural Health and Development Programme, Parbatipur, Dinajpur, Bangladesh). **Methodology:** This case study describes the LAMB approach for safe delivery which operates across an integrated 3-tier model: (a) Community home-based care–trained traditional birth attendant (TTBA), (b) Community obstetric first-aid facility—12 Safe Delivery Units (SDUs)—with skilled birth attendant (SBA), and (c) Comprehensive EOC referral facility—LAMB Hospital. The proposed international 'minimum' package of MNC interventions is divided into those relevant for community (home-based) delivery and facility-based delivery. These were compared with currently-practised MNC interventions across the LAMB's 3-tier model. Indicators regularly reported or data available about these interventions were collated. **Results:** In 2005, there were 5,982 deliveries: 1,867 at home, 934 in the community facilities, and 3,181 at the LAMB Hospital. For the deliveries at home, 75-83% of 21 proposed MNC interventions have already been implemented. At the facility level, for both obstetric first-aid and comprehensive EOC, 100% of 24 interventions have been implemented. Evidence of good practice is less available: for home-based care 42-75% and for facility-based care chart documentation 40-100%. **Conclusion:** It is possible to implement a considerable proportion (75-100%) of the 'minimum' MNC interventions within an integrated community and facility model that includes ongoing supportive supervision.

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Audit Improves Clinical Practice: Management of Neonatal Jaundice

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Background: Neonatal jaundice is a common neonatal disease. Severe jaundice requires treatment with phototherapy and exchange transfusion to prevent kernicterus with its associated poor outcome (11% mortality). Severe jaundice needs to be identified early for treatment to be effective. **Objective:** To audit the current management of neonatal jaundice in a busy neonatal unit at the LAMB Hospital, Parbatipur, Dinajpur, Bangladesh, using the internationally-accepted standards. **Methodology:** The 'audit cycle' was followed. For the first arm, cases of neonatal jaundice from a 3-month period in 2004 were identified from the hospital database. Case notes were reviewed compared to 8 gold standard practices. The results were disseminated to the medical and nursing staff, a clinical guideline for the management of jaundice was written, and 'serious' jaundice charts were made available at the ward. After 3 months, the audit was repeated (second arm), and the results were compared for evidence of change in management. **Results:** There were 873 livebirths in the first arm group, with 95 (11%) diagnosed with jaundice. In the second arm, there were 659 livebirths with 107 (16%) jaundice diagnoses. Against every gold standard assessed, the second arm results showed that there had been improvement in clinical management, moving nearer to best practice. Achieving the 100% gold standard, practice was achieved in 6 of 8 standards in the second arm compared to only 1 of 8 standards in the first arm. **Conclusion:** The audit cycle is a low-cost intervention that improves clinical practice for management of neonatal jaundice. This may lead to a reduction in neonatal morbidity and mortality from kernicterus, thereby contributing to reduction in newborn death (Millennium Development Goal 4).

	First arm (%)	Second arm (%)
Serum bilirubin (SBR) above line is treated with phototherapy	100	100
Every jaundiced baby has assessment of severity of jaundice	81	100
Every 'seriously'-jaundiced baby has an SBR measured	98	100
Start phototherapy while waiting for results	0	87
Babies under phototherapy receive increased fluid intake	27	100
Jaundice within 24 hours requires investigation to cause	No case	No case
Repeat SBR within 8 hours if SBR above exchange line	21	100
Exchange transfusion done if 2 consecutive SBR above the exchange line	8	100

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A Multi-disciplinary Approach for Child Mental Health Services in Dhaka Shishu (Children's) Hospital

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Background: Emotional and behavioural problems are common presentations at the Child Development Centre (CDC) of Dhaka Shishu (Children's) Hospital (DSH). A multi-disciplinary approach for assessment and diagnosis has been shown to be most effective for the optimum management of various childhood disorders in different countries of the world. A similar approach has been followed in this centre. **Objective:** To describe the types of mental health cases and the multidisciplinary approach used for diagnosis and management of children attending the centre. **Methodology:** Clinical records of 300 children, who attended the Child Mental Health Clinic of CDC of DSH, from April 2004 to October 2006 and received services using a multidisciplinary approach, were analyzed. The multidisciplinary team included a child health physician, a developmental therapist, a child psychologist, a paediatric neurologist, and a social worker/counsellor. The psychiatric conditions were diagnosed using the multi-axial diagnostic guidelines of the Diagnostic and Statistical Manual (DSM-IV) and the International Classification of Diseases (ICD-10). Presenting complaints, child, family and social variables, clinical diagnosis, management, and follow-up visits of these children were compiled and are presented here. **Results:** The majority (65%) of the children comprised boys having the mean age of 7 years. The large majority (79%) of the children came from urban areas and belonged to middle- and higher-income families. The commonest psychiatric condition identified in Axis 1 was hyperkinetic disorders (33%), followed by pervasive developmental disorders (27%). Using the multiaxial guidelines of diagnosis, about 94% of the children were diagnosed in axis 1. A large proportion (62.6%) of children came for more than 5 follow-up visits. **Conclusion:** Better opportunity provided for early intervention in a multidisciplinary approach can result in better parental compliance for treatment of their children. To reduce chronic morbidity and improve the quality of life of children with mental health problems, introduction of the multidisciplinary approach is suggested for child mental health services in every paediatric care facility in the country.

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Successful Sustainable Action in the Achievement of Millennium Development Goal 4 in India

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Background: The study focuses on successful provision of integrated health services to children of Lambadas, a tribal community in the rural areas of Andhra Pradesh, India. The Lambadas are mostly illiterate. Most (80%) deliveries take place at home, 60% of babies born to them are low-birth-weight babies (<2.5 kg). Only 25% of women use hospital facilities during pregnancy and delivery. Rate of infant mortality (102) and rate of mortality of children, aged less than 5 years, are very high (123). Perinatal transmission of HIV is 4%. Against this backdrop, an integrated child health services programme was designed and implemented in this community in 2003 to bring down infant and child mortality and morbidity and improve the health status of their children. **Objective:** To bring down infant and child mortality and morbidity in a tribal community in India and to improve the overall health status of children. **Methodology:** A cluster of 100 villages with a population of about 200,000 consisting predominantly of Lambadas was selected for the programme. The programme was carried out with the help of trained social workers and paramedics at the village level. At the clinic/hospital, paramedics, social workers, and doctors provided different health and supportive services to these tribals. The programme interventions included: (a) Community education and mobilization, (b) Information, education and communication programmes on newborn and child health services, (c) Staging of dramas, (d) Folk media, (e) Distribution of literature on newborn and child health services, (f) Group discussion, (g) Meetings, (h) One-to-one meetings, (i) Involvement of fathers in newborn and child health programmes, (j) Prenatal, natal and postnatal care at the doorstep and at the hospital, (k) Prevention of perinatal transmission of HIV, (l) Applied nutrition programme for infants and children, and (m) Immunization programme for infants and children. **Results:** Because of the impact of the programme in the study area, 11,475 persons used child health services during 2003-2006. The number of persons using child health services has been on the increase year after year. All the children were immunized as per the immunization schedule. The table shows the achievements during 2003-2006. **Conclusion:** The programme interventions are worth replicating in all developing countries, where infant and child morbidity and mortality are high. The programme interventions would help achieve the Millennium Development Goal 4 by 2015.

Parameter	2003	2004	2005	2006
Perinatal transmission of HIV (%)	4	3.7	3	2.8
Infant mortality (%)	102	94	89	62
Under-5 mortality (%)	123	116	109	93
Low-birth-weight babies (%)	70	65	59	42
Under-weight children (0-5 year(s) (%)	60	53	41	32

146 (047)

Essential Nutrition Actions, A Means to Prevent Mortality among Children, Aged Less than 5 Years, in Bangladesh

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Background: Worldwide, more than half of deaths among children aged less than 5 years (under-five children) are associated with malnutrition. Essential nutrition actions (ENAs), a set of highly-effective nutrition interventions targeted at pregnant and breastfeeding women, and children aged less than 2 years, can reduce under-five mortality. This approach has been proven to be effective in scaling up priority behaviours in other countries. **Objective:** To estimate the proportion of children and mothers practising the 7 priority ENA behaviours, such as (a) Exclusive breastfeeding at 0-5 month(s); (b) Complementary feeding from 6 months and continued breastfeeding; (c) Nutritional care during illness; (d) Women's nutrition; (e) Control of vitamin A deficiency; (f) Control of anaemia; and (g) Control of iodine-deficiency disorders) in Bangladesh. **Methodology:** Nationally-representative data collected by the Nutritional Surveillance Project of Helen Keller International (HKI) and the Institute of Public Health Nutrition, Government of Bangladesh (GoB) from 62,998 households and 74,886 under-five children in rural Bangladesh in 2005, were analyzed. **Results:** Of children aged 0-5 month(s), 42.9% were exclusively breastfed in 2005. At six months of age, 81.8% were given predominantly cereal-based foods/liquids. Most (91.4%) children were still breastfed at 18-24 months. During episodes of diarrhoea, the majority of the children had no change in the intake of liquid (69.6%) and food (71.8%). Food intake during pregnancy was similar to pre-pregnancy among 47.7% and reduced among 32.2% of women. Coverage of vitamin A capsules (VAC) was high among 6-59-month old children (81.6%), but only 5.3% of women had received a VAC in their postpartum period. During their last pregnancy, 54.1% of rural Bangladeshi women received iron supplements. Iron supplementation of children is a recent policy and not yet implemented. Of children aged 24-59 months, 74.4% received deworming tablets in the last 6 months. **Conclusion:** The scale at which ENA behaviours are practised varies between behaviours and target groups. To reduce under-five mortality in Bangladesh, ENA interventions should be further promoted to reach universal coverage across the population through partnerships among groups designing and implementing nutrition-related programmes in and outside the health sector. HKI supports the ENA approach and will incorporate it in future HKI/Bangladesh activities. **Acknowledgements:** The financial support of the Royal Embassy of the Netherlands for the Nutritional Surveillance Project is acknowledged.

147 (054)

Inequalities in Child Immunization Coverage: Evidence from the Bangladesh Demographic and Health Survey 2004

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Background: Although there have been improvements in health status of Bangladeshis, the levels of child mortality in Bangladesh remain unacceptably high. In this regard, access to healthcare has received less attention. This presentation is an attempt to review socioeconomic inequalities in access to healthcare, focusing on immunization coverage in Bangladesh. **Objective:** To examine how socioeconomic status and household background characteristics relate to immunization status of children. **Methodology:** Data for this study were drawn from the Bangladesh Demographic and Health Survey (BDHS) 2004 dataset in the Internet. Details of the BDHS 2004 methodology can be found elsewhere. Data were analyzed using the SPSS software (version 11.5). **Results:** Analysis of results revealed that the length of differences of immunization status between the richest and the poorest was significantly high, with an odds ratio of 5.2 (p=0.000). Adjustment of education in the multivariate model evidenced that education is likely one of the most important factors influencing the use of immunization facilities rather than age, sex, size of living children, location of residence, and access to television. Although results of multivariate analysis did not show much influence in the model for variables, such as size of living children, location of residence, and access to television, results of bivariate analysis exposed significant inequalities among them. Sex of child and age of mother had no effect on immunization status. **Conclusion:** Childhood immunizations are free, and one would have thought that this would make it easily accessible in Bangladesh. The data suggest that not everyone has equal access, and use is obviously not equal. Exactly what drives these inequalities needs to be searched out. One possible explanation might be that poverty-prone people prioritize spending time to income-earning opportunities rather than going for immunization. Another possible explanation might be poor healthcare-seeking attitudes and practices for poor households. It may also be the case that certain indirect costs incurred by households make it difficult for some households to use immunization services. Efforts to minimize indirect cost of immunizations may go some way to reduce the inequalities. In terms of inequality reduction, priorities to address people belonging to the poorest and vulnerable group would add better health outcome. **Acknowledgements:** The authors acknowledge the MEASURE DHS, Macro International Inc., USA, for allowing access to their database and use it for further studies.

148 (062)

Staff Education on Hospital Infection-control Programme and Its Impact

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Background: Cross-infection in hospital settings is a growing concern all over the world, and it is more so in the resource-poor settings in developing countries, like Bangladesh. Appropriate staff education is one of the effective ways for safe patient-care practices. So, a staff-education programme on hospital infection-control activities was initiated in the Dhaka Hospital of ICDDR,B. **Objective:** To create awareness among general staff members of the hospital about occupational risks of biological fluid-related infections and preventive measures of nosocomial infections. **Methodology:** During August 2005–July 2006, an education programme was conducted by the Hospital Infection-control Committee. The participants were nurses, health workers, attendants, cooks, clerks, laundry workers, pharmacists, X-ray technicians, dietitians, and house-keeping personnel. A one-hour education session was organized in batches for 15-16 participants. Relevant education materials were developed using multimedia PowerPoint. In addition, the Committee displayed several posters and logos and arranged a weekly campaign for the promotion of hand-hygiene. The key issues, dealt with in the educational session, were: problems and risks of hospital-acquired infections, general measures for preventing nosocomial infections, practice of universal precautions, including promotion of hand-hygiene through hand-washing and using hand-rub, barrier precautions, sharps management, decontamination, and disinfections, hospital wastes management, etc. Pre- and post-tests were carried out using a structured questionnaire to assess the impact of educational session. Also, follow-up compliance was evaluated at the Special Care Unit using an anonymous self-evaluation checklist for nursing staff and by spot-observation. **Results:** In total, 204 hospital staff members participated. Evaluation of a 10% sample of the total participants revealed a mean increase of knowledge by 29%, and the pre- and post-test mean scores were 55.5% and 84.5% respectively. The self-evaluation checklist for compliance at the Special Care Unit showed that approximately 70% of the staff members had the practice of hand-washing, use of hand-rub, and gloves. However, day-to-day observations and qualitative data indicated that those were around 55%, and it was less before training. **Conclusion:** The study indicates that knowledge, practice, and attitude on nosocomial infections and universal precautions improve after staff education. Continuing staff education will be a helpful tool to promote adherence to safe patient-care practices. Expected change in staff behaviour can be accomplished through adequate training. **Acknowledgements:** This research was supported by ICDDR,B which is supported by countries and agencies that share its concern for the health problems of developing countries.

149 (067)

Development of Nutrition Ludu (Game) for Promotion of Health and Nutrition

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Background: Malnutrition is a serious public-health problem mainly among children and young people in Bangladesh. Scouts as young and potential citizens can play a significant role to improve the situation by enriching themselves with nutritional knowledge and passing on the same to other young people and to the community people. Recognizing the huge potentials of scouts and non-scout young people, Bangladesh Scouts developed 'Nutrition Ludu'—an indoor game to promote health and nutrition. **Objective:** To facilitate learning about different aspects and causes of malnutrition and major child diseases and remedies to overcome them. **Methodology:** Nutrition Ludu was first introduced in 2004 by Bangladesh Scouts following the concept of Snake Ludu, a popular indoor game mainly for children and young people. Bangladesh Scouts has developed the game and arranged to play the same by opening Nutrition Corner in the Nutrition Fair of the 14th National Scout Jamboree (scout gathering) at Mouchak in Gazipur district in 2004 participated by 12,000 scouts. All the participants of the Jamboree played the game and collected the tool to play it same at their scout units. The interest and comments of young participants of the jamboree were documented. **Results:** Over the short period, the game gained wide popularity among the scouts and non-scout young people of home and beyond. Most (87.5%) participants of the scout jamboree, described Nutrition Ludu as an interesting and useful tool to learn and communicate nutrition and child health promotional messages. Finding the keen interest of scouts and young people, Bangladesh Scouts published 100,000 Nutrition Ludu in 2006 with the support of the Ministry of Education. Bangladesh Scouts has taken initiatives to develop Nutrition Ludu Badge as per interest and need of young people. **Conclusion:** No specific study was done to evaluate the impact of Nutrition Ludu. However, Nutrition Ludu, an interesting indoor game, has created enthusiasm among scouts to provide enter-education (education through entertainment) for improving health and nutritional knowledge among children and young people. **Acknowledgements:** The support of the Ministry of Education, Government of Bangladesh, to publish the tool is acknowledged.

150 (071)

Culturally-appropriate Nutrition Intervention Prevents Malnutrition among Infants in Rural Bangladesh

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Background: Cultural beliefs in feeding and care-seeking behaviour vary across regions that could be associated with nutritional status of children of growing age. **Objective:** To evaluate the effectiveness of a culturally-appropriate nutrition-education intervention designed to prevent malnutrition among children in different geographical areas of rural Bangladesh. **Methodology:** A community-based randomized controlled trial was carried out in 4 different divisions in rural Bangladesh among 605 normal and mildly-malnourished children aged 6-9 months. At baseline, mothers of 48 groups—6-8 in each group—participated in focus-group discussion on child health, growth, feeding practices, and disease control. Their perceptions, taboos, and behavioural aspects were used in developing a nutrition-education package. Mothers of the intervention group received weekly nutrition education for 6 months, while the control group did not receive any. Both the groups were observed for the next 6 months. Data were collected through a structured questionnaire and were analyzed by SPSS/PC+ (SPSS WIN 12 Inc., USA) and NCHS statistical package. **Results:** There was a significant difference in cultural practices of child-feeding in different regions. After the intervention, feeding practices significantly improved in the intervention group compared to the control group in all the geographical locations and was sustained till the end of observation. The nutritional status of the control group in 4 areas significantly deteriorated throughout the intervention and the observation period ($p<0.001$). No significant difference in body-weight in the intervention group was apparent in 4 different areas (Nikli=9.12; Sherpur=9.13; Chokoria=9.29; Dacope=8.80; $p=0.075$). After bonferroni correction, a significant difference was observed in Dacope with other areas in cumulative weight gain ($p<0.05$), but all were comparable at the end of observation. Prevention of malnutrition in the intervention group in Nikli was the highest compared to other areas (89%), which were 81%, 61%, and 20% in Dacope, Chakaria, and Sherpur respectively. **Conclusion:** Culturally-appropriate nutrition education is highly effective in preventing malnutrition among children in Bangladesh. **Acknowledgements:** The financial support of the World Bank through Bangladesh Integrated Nutrition Project under the Ministry of Health and Family Welfare, Government of Bangladesh, is acknowledged.

151 (072)

Impact and Equality of Childhood Health Programmes on Child Mortality: Evidence from a Quasi-random Experiment in Bangladesh

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Background: Every year, more than 10 million children die of preventable diseases. Addressing the needs of these children adequately is difficult because funding for healthcare of children in developing countries is limited. As a result, governments face difficulty in deciding as to which programmes to fund and who to target with the programmes. Most existing studies estimate the impact of vaccination programmes using child-specific uptake measures rather than programme exposure measures (Koenig *et al*., 1990), posing concerns that programme-effectiveness estimates are biased upward by unobserved individual- or household-level decision-making factors. **Objective:** To compare the impact of 3 different childhood health interventions (measles vaccination; DPT, polio, BCG vaccinations; and control of acute respiratory infections and dysentery) on various indicators of child mortality. To look at the equality of various programme impacts, the effect of the interventions is being examined by sex, economic status of household, and other pertinent socioeconomic variables. **Methodology:** Data were drawn from the Matlab demographic and surveillance site in Bangladesh. In the study area, a treatment group was divided into 4 sub-groups (A, B, C, D) and 2 control groups (E, F). Since the 3 child-health programmes were introduced in some areas and not others, advantage will be then taken of these quasi-random nature of the programme introduction to determine the impact of each programme separately. The sub-group impact of the programme will be determined using interaction variables. Careful attention were paid to selection bias issues, especially for the sub-group analysis, using programme assignment block as an instrument for actual programme uptake. **Results:** The introduction of measles lead to a statistically significant reduction of 10 deaths in 1,000 livebirths in the probability that a child would die between the age of 1 and 4 years, but there was no effect on infant mortality. Since children do not receive the measles vaccination before 9 months of age, there were no further reductions in the probability of mortality for 1 to 4 years old children as a result of the subsequent health interventions. However, there was a reduction of 18 deaths per 1,000 livebirths in the probability of child death under the age of 1 year, due to the introduction of the control of acute respiratory infections and dysentery. **Conclusion:** Other studies, such as Koenig *et al*. (1990), have examined some of the health impacts proposed in the abstract, e.g. the measles intervention. However, their estimates based on associations between individual behaviours and mortality outcomes

may be biased upward by unobserved factors. Employing a quasi-experimental estimation approach, significant effects of key vaccination programmes on infant and child mortality were found, with estimates for the impact of the measles vaccine programme substantially smaller than those found in past studies. Further analysis of competing risks, sub-group variations, and long-term outcomes are needed to understand the health impacts and value of vaccination programmes.

Risk Factors 2 152 (128)

Association of Low Birth-weight with Biological Determinants of Mothers in Bangladesh

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Background: The World Health Organization defined low birth-weight (LBW) as the weight of children born with less than 2.5 kg. Few studies have covered wide population across all administrative divisions of Bangladesh to find the incidence of LBW and its associated factors. **Objective:** To find the incidence of low birth-weight of newborn babies and its association with biological determinants. **Methodology:** The baseline survey of the National Nutrition Programme (NNP) listed households with pregnant women in 708 clusters, each of about 300 households, in 113 upazilas in 6 divisions in 2004. A sample of 1,414 pregnant women in 5-6 months of gestation, covering 279 clusters in 91 upazilas, were selected to record birth-weight within 48 hours after birth and finally came up with birth-weight of 692 newborns. The baseline survey of the NNP recorded background characteristics of pregnant women. **Results:** The data indicated that the incidence of LBW in rural Bangladesh was 20.7% with the mean birth-weight of 2.78 kg (95% confidence interval [CI] 2.75-2.81). Results of multivariate analysis revealed that maternal nutrition and pregnancy-related factors were important predictors of the incidence of LBW. Controlling for the independent effects of other covariates, body mass index (BMI) and maternal height remained as powerful predictors of LBW. Mothers with BMI of 18.5 or more were significantly associated with a lower risk of LBW. Mothers with BMI of 20 had one-quarter risk of delivering an LBW baby compared to mothers who had BMI of <18.5 (thin women). Similarly, mothers with BMI of 18.5-19.9 had 63% lower risk. Short-stature women (height <145 cm) also needed special attention during pregnancy. Compared to them, women with height of 45 had 54% lower risk of having an LBW baby. Compared to the first pregnancy, the second or the third pregnancy had only one-third risk. Similarly, compared to premature birth (37 weeks), risk of LBW was only less than 30% among women who delivered after completion of 40 weeks of pregnancy. **Conclusion:** Maternal malnutrition is the major contributing factor for the incidence of LBW. Secondary or higher maternal education could significantly contribute to reducing the incidence of LBW. **Acknowledgements:** The financial support of World Bank and Canadian International Development Agency through the NNP of Ministry of Health and Family Welfare, Government of Bangladesh and the technical support of Institute of Public Health Nutrition, National Institute of Population Research and Training, Institute of Nutrition and Food Science, and Mitra and Associates, are acknowledged.

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Nutritional Status of Children in Female-headed Households is Better than in Male-headed Households

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Background: Women in Bangladesh typically have a lower social status than men. Malnutrition in mothers and children increases the risk of mortality and morbidity among children aged less than 5 years (under-5 children). Thus, understanding the influence of women's decision-making power on the nutritional status of themselves and their children is crucial to attain MDG 3 and 5. **Objective:** To assess the nutritional status of women and their children in terms of sex of the household head. **Methodology:** Nationally-representative data collected by the Nutritional Surveillance Project of Helen Keller International and the Institute of Public Health Nutrition, Government of Bangladesh, among 62,998 households and 74,886 children in rural Bangladesh in 2005 were analyzed. **Results:** In 2005, 5.3% of the households in rural Bangladesh were headed by women. Female-headed households (FHHs) spent more on food than male-headed households did (MHHs) (median Tk 442.4 vs 329.6, $p<0.001$). For medical care, the FHHs spent double the amount compared to the MHHs (median Tk 34.75 vs 15.00, $p<0.001$). More children, aged less than 6 months, were exclusively breastfed in the FHHs (52.8%) than in the MHHs (48.2%). The proportion of households that had consumed animal-source food for ≥1 days in the last 7 days was higher in the FHHs than in the MHHs (egg 47.5%, 43.1%; chicken 32.4%, 22.1%; meat 28.3.%, 20.7% for FHHs and MHHs respectively, $p<0.001$ for all). The prevalence of stunting among under-five children was significantly ($p<0.001$) lower in the FHHs (36.1%) compared to the MHHs (40.5%). A similar difference was observed for underweight and wasting. Among non-pregnant women, the prevalence of chronic energy-deficiency (body mass index <18.5 kg/m^2) was significantly lower in the FHHs (30.1%) than in the MHHs (36.7%). The association of maternal and child nutritional status with household decision-maker was observed within each expenditure quintile. **Conclusion:** The proportion of FHHs in Bangladesh is very small. Children and women of FHHs have better nutritional status than those of MHHs. To reach MDG 3 and 5, attention must be given to policies and programmes that invest in education and training of girls, and to improve status of women in society so that women are empowered to make decisions that are best for their nutrition and health and their families. **Acknowledgements:** The support of the Royal Embassy of the Netherlands to the Nutritional Surveillance Project is acknowledged.

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Impact of Climate on Attendance of Patients at an Urban Diarrhoeal Treatment Facility of Bangladesh

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Background: There are direct causal connections between climatic factors and human biology. Climatic factors may disturb earth's physical systems and ecosystems; these disturbances, in turn, pose a direct and indirect risk to human health. Climate-related changes in life-cycle dynamics of pathogens may increase or decrease the potential rate of transmission of diarrhoea. So, the distribution and abundance of diarrhoeal pathogens may be determined by various climatic factors, e.g. temperature, humidity, rainfall sunshine, wind, atmospheric pressure, etc. **Objective:** To do a preliminary observation to evaluate the impact of climate over attendance of diarrhoeal patients at hospital. **Methodology:** Daily hospital census of patients attending the Dhaka Hospital of ICDDR,B during 1998-2002 was reviewed. Daily electronic records of climatic data, e.g. temperature, humidity, rainfall, sunshine, wind, and atmospheric pressure, were collected for the 1998-2002 period from the Dhaka meteorological office. Data were entered and analyzed using SPSS PC (version 11.0). **Results:** Year-wise attendance of diarrhoeal patients at the study hospital was 157,441 in 1998, followed by 117,365, 107,474, 93,300, and 100,380 till 2002. The mean temperature and humidity of the corresponding years were 21.9 °C and 78.2%, 22.0 °C and 75.8%, 30.2 °C and 75.5%, 30.4 °C and 74.4%, and 30.3 °C and 74.2%. Linear regression after adjustment of temperature, humidity, rainfall, sunshine, wind and atmospheric pressure showed that rise of temperature was positively associated (p=0.000) with rise in the number of diarrhoeal patients. **Conclusion:** The findings of this limited observation suggest that there may be some relationship between climatic factors and occurrence of diarrhoeal diseases. Further analysis with data of extended period is in progress. Results of these studies are expected to provide useful information in developing a redictive tool to forecast outbreaks/epidemics of diarrhoea using notification data and meteorological records that will help initiate control programmes, including media campaign. **Acknowledgements:** ICDDR,B, which is supported by countries and agencies that share its concern for the health problems of developing countries, supported this research.

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Determinants of Nutritional Status of Children Aged Less than 2 Years in Rural Bangladesh

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Background: Children are easily vulnerable to risk of malnutrition. Once some determinants of good nutrition, such as food security, disease control, and caring practices, are not fulfilled, children start growth-faltering and proceed to malnutrition. However, limited information is available regarding the consequences of socioeconomic status and household food security on the nutritional status of children aged less than 2 years in Bangladesh. **Objective:** To find the association of the nutritional status of children, aged less than 2 years, with their biological and socioeconomic determinants. **Methodology:** The baseline survey of the National Nutrition Programme in 2004 interviewed randomly-selected 8,819 mothers of children, aged less than 2 years, in 113 sub-districts. They were asked about their residence, age of children, sex, maternal education, food insecurity, and household wealth index. Anthropometric measurements of the children were taken to determine their nutritional status. **Results:** Data indicated that about 35% of the children had severe and moderate stunting, and 41% were severely and moderately under-weight. However, 53% of the children were not wasted. Results of multivariate analysis indicated that the prevalence of under-weight, stunting, and wasting among the study children increased with the increase in age of child. Female children were less wasted than male children (OR=0.76, p<0.01). The higher the maternal education the lower was the prevalence of under-weight, stunting, and wasting. The prevalence of food insecurity was much higher among illiterate and poor (indicated by asset index) women (p<0.01). Household food security and asset index showed inverse relationships with the prevalence of under-weight, stunting, and wasting (p<0.01). Taking more rest during pregnancy was related to better nutrition of children. The area (NNP project, NNP comparison, or BINP) showed no relationship with the nutritional status of children. The prevalence of food insecurity was lower in the BINP areas than in the NNP areas (p<0.01). **Conclusion:** Higher maternal education, economic status, and food security should be targeted to reduce the malnutrition of young children. **Acknowledgements:** The financial support of the World Bank and Canadian International Development Agency through the National Nutrition Programme of Ministry of Health and Family Welfare, Government of Bangladesh and the technical support of Institute of Public Health Nutrition, National Institute of Population Research. and Training, Institute of Nutrition and Food Science, and Mitra and Associates are acknowledged.

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Serum Retinol, Severely-malnourished Children Hospitalized for Diarrhoea With and Without Pneumonia

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Background: Serum retinol is an indicator of vitamin A status. Globally, 140-250 million children, aged less than 5 years (under-5 children), are vitamin A-deficient, among whom 5 million are severely deficient. In acute infections with deficiency of retinol-binding protein (RBP), the carrier protein, the unbound, free form of vitamin A is excreted through urine or faeces. High dose of vitamin A to children deficient in RBP might cause pseudotumor cerebri, an important adverse effect of hypervitaminosis A. Thus, safe dose of vitamin A for severely-malnourished children with acute infections, who are likely to be RBP-deficient, may be useful in reducing morbidity and mortality among such children. **Objective:** To assess the serum retinol levels of severely-malnourished under-5 children hospitalized for diarrhoea, with and without pneumonia and to observe maintenance of their serum retinol levels. **Methodology:** This descriptive study, conducted during November 2005–September 2006, collected relevant information from 260 children of either sex, aged 6-59 months, admitted to the Longer Stay Ward of the Dhaka Hospital of ICDDR,B, with diarrhoea with or without cough and cold of 48 hours or shorter. Those with symptoms and/or clinical signs of vitamin A deficiency, or chronic diseases, or measles in the last 8 weeks, and received vitamin A within the last 3 months were excluded. **Results:** All children (51.5% males) had a weight-for-height of <-3 z-score of the National Center for Health Statistics median; 41% and 59% of them were between 6-11 and 12-59 months of age respectively. The mean±SD admission weight-for-age (%), weight-for-height (%), and height-for-age in the pneumonia and the no-pneumonia group were 58.0±8.7, 73.6±7.7 and 89.1±4.8, and 58.8±8.1, 73.0±6.2 and 89.6±4.9 respectively (p=NS). Serum retinol levels were significantly low (median 11 vs median 13.2, p=0.019) in the pneumonia group compared to the non-pneumonia group, and the levels did not vary by sex. Partially-breastfed severely-malnourished children were more likely to have pneumonia than exclusively breastfed peers (odds ratio: 1.98, 95% CI 1.03-3.82, p=0.04). **Conclusion:** Despite receiving mega-dose (200,000 IU) of vitamin A every 6 months, the severely-malnourished children, hospitalized with diarrhoea with or without acute lower respiratory infection, had low serum vitamin A. The effectiveness of an alternative strategy, with daily administration of 5,000 IU of vitamin A for 15 days, for improving the vitamin A status needs to be assessed in future studies. **Acknowledgements:** The financial support of Improved Health for the Poor is acknowledged.

Day 2: Monday, 5 March 2007
12:15 pm-1:30 pm (Venue: Executive Director's Wing)
Poster Session 4
MDG 4: Reduce Child Mortality 4
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Prevalence of Beta-lactamase-positive Ampicillin Resistance in Different Serotypes and Biotypes of *Haemophilus influenzae* Colonized in the Nasopharynx of Children with Pneumonia and Meningitis

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Background: *Haemophilus influenzae*, responsible for a number of human diseases, asymptomatically colonizes the nasopharynx of healthy children and causes systemic disease and mucous membrane infections. **Objective:** To investigate beta-lactamase-mediated ampicillin resistance and multi-drug resistance in different serotypes and biotypes of *H. influenzae* isolates. **Methodology:** By systematic randomization, every seventh of 1,834 children, aged less than 5 years, from 3 hospitals of Dhaka city, with clinical symptoms of pneumonia and meningitis, were studied. Nasopharyngeal specimens were collected and cultured on chocolate agar. *H. influenzae* was isolated and identified by standard laboratory methods. Antimicrobial susceptibility was determined by the Standard Clinical Laboratory Institute (SCLI) guidelines. Each isolate was then serotyped and biotyped. PCR was used for detecting bexA gene specific for serotype *H. influenzae* type b (Hib). Beta-lactamase enzyme was detected cefinase stick test and also by the double-disk synergy technique (DDST). **Results:** In total, 121 (47.5%) isolates of *H. influenzae* were obtained from 255 specimens. Of them, 18 (14.9%) were Hib. The overall resistance rates of ampicillin/amoxicillin, chloramphenicol, azithromycin, and co-trimoxazole were 17.3%, 22%, 1%, and 55% respectively. All strains were susceptible to ciprofloxacin, levofloxacin, moxifloxacin, gatifloxacin, and ceftriaxone. A significant difference in antimicrobial resistance between Hib and non-type b *H. influenzae* was observed for ampicillin (67% vs 8.7%, $p<0.0000001$), chloramphenicol (72.2% vs 12.6%, $p<0.000001$), and co-trimoxazole (88.9% vs 48.5%, $p<0.004$). Of all the *H. influenzae* isolates, 21 (17.4%) were beta-lactamase-mediated ampicillin-resistant, and all ampicillin-resistant strains showed multi-drug resistance (MDR; resistant to ≥3 drugs). Of the 21 ampicillin-resistant *H. influenzae*, 57% (12/21) were Hib, followed by non-typeable strains (28.6%), serotype d (9.5%), and serotype c (4.8%). MDR phenomenon was significantly ($p<0.0000001$) higher among Hib (66.7%) than non-type b (8.7%) strains. Biotype II (38.8%), III (20.7%), and I (18.1%) cumulatively comprised 78% of *H. influenzae* isolates. Most (94.4%) Hib isolates belonged to biotype I, while the non-type b-capsulated

H. influenzae was more common in the rest of the biotypes, especially in biotype II (41%) and biotype III (19%). Most (75%) non-typeable *H. influenzae* isolates were distributed to biotype II (49%) and biotype III (26%). All the ampicillin-resistant *H. influenzae* isolates belonged to the biotype I (52.4%), II (19%), III (19%), and IV (9.6%). **Conclusion:** Monitoring of nasopharyngeal *H. influenzae* as a surrogate marker for invasive and locally-invasive *H. influenzae* is an attractive option. The beta-lactamase-positive ampicillin-Resistant isolates of *H. influenzae* were mostly associated with seorotype b (66.7%) and biotype I (50%), known as the most pathogenic type causing invasive disease. High rate of multi-drug resistance of *H. influenzae* to commonly-used first-line drugs made the treatment of invasive disease very difficult. However, respiratory fluoroquinolone, such as moxifloxacin and gatifloxacin, could be used as empirical therapy. Moreover, immunization with protein-conjugate Hib vaccine could be the best option to prevent Hib colonization and possible invasive Hib diseases in young children. **Acknowledgements:** The financial support of the United States Agency for International Development is acknowledged.

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Characteristics of Young Severely-malnourished Children and Their Catch-up Growth in a Nutrition Rehabilitation Unit in Urban Bangladesh

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Background: Severe childhood malnutrition is a major health problem in countries of South Asia, including Bangladesh. Current management practices for such children require administration of appropriate food and essential micronutrient mix for catch-up growth and treatment for concomitant infections at nutrition centres. **Objective:** To identify socioeconomic, demographic, water-sanitation, feeding and medical characteristics of young children admitted to the Nutrition Rehabilitation Unit (NRU) of ICDDR,B and to observe their daily weight gains in assessing their catch-up growth. **Methodology:** The study was conducted at the NRU of the Dhaka Hospital of ICDDR,B during February 2006–November 2006. In total, 239 severely-malnourished children (weight-for-age <50% or weight-for-length <70% or with bi-pedal oedema), aged 6-36 months, were studied. They received nutritional supplements and standardized hospital care and were discharged when the nutritional status improved to either oedema-free weight-for-age >50% or weight-for-length >80%. Their weight was measured on admission and discharge. Weight gain (g/kg/day) of each study child was calculated. **Results:** All children presented to the Hospital with diarrhoea and were admitted to the NRU after resolution of diarrhoea and other apparent infections, if any; 56% of them were male. The median age of the mothers was 22 (range 15-40) years, and 18% of them had chronic energy deficiency (body mass index [BMI] <18.5). Half of the mothers were illiterate, 24% of them had some form of employment, 45% of the families had a monthly income of <3,000 taka, 16% had no sanitary toilets, and 34% had no access to safe drinking-water. Among the study children, 83% and 82% had received 3 doses of DPT and polio vaccine respectively, 78% had received measles immunization, and 93% had received BCG immunization. About one-third (n=85, 36%) of the children had pedal oedema at admission, 84% were severely under-weight (<-3 z-score), 62% were severely stunted (<-3 z-score), and 19% had severe wasting (<-3 z-score). At discharge from the NRU, 77% were severely under-weight, 62% were severely stunted, and 5% were severely wasted. The mean weight gain of children with non-pedal oedema was 8 g/kg/day; weight gain of the severely-under-weight children was significantly higher than those who were not severely under-weight (8 g/kg vs 5 g/kg/day, p=0.02); severely stunted children had better weight gain than not-severely stunted (9 g/kg vs 5 g/kg/day, p=0.02); and severely wasted children gained better weight than not-severely wasted children (11 g/kg vs 6 g/kg/day, p=0.001). **Conclusion:** The results showed that improvement of nutrition was more marked in severely-malnourished children who are more eligible for nutrition rehabilitation interventions which may be directed towards such population.

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Infant Mortality among Twins and Triplets in Rural Bangladesh in 1975-2002

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Background: Few data are available in low-income countries on the incidence of multiple births (defined here as twins and triplets) and on levels, trends, and determinants of neonatal, post-neonatal and infant mortality among children born as twins or triplets. **Objective:** To assess the incidence of multiple births and factors relating to this incidence and to assess the levels, trends, and determinants of infant, neonatal and postnatal mortality of twins and triplets. **Methodology:** Population-based longitudinal data were used from the Health and Demographic Surveillance System maintained in Matlab, Bangladesh, during 1975-2002. Logistic regression was used for determining the impact of a number of variables on infant mortality in multiple births. **Results:** The multiple rate of births averaged 2% and was much higher among older and multiparous women and for twins and triplets born after a long previous birth interval. Infant mortality in multiple births was more than 5 times higher than among singletons (450 vs 84 per 1000 livebirths in 1975-2002). Mortality in multiple births declined 25% in 1975-2002, which is considerably lower than the 50% decrease in mortality among singletons in the same period. Infant mortality was particularly high among twins and triplets who had young mothers (<20 years), who were the first livebirth, who were born after a short birth interval (<24 months), and for those with mothers without schooling. **Conclusion:** Multiple births constitute only 2% of all livebirths, but contribute 10% to all infant deaths. Various demographic and socio-economic factors explain this higher mortality in twins and triplets. Another important factor was availability and use of high-quality maternity care and care for newborns and infants. **Acknowledgements:** Data collection and analysis were carried out under the auspices of ICDDR,B. ICDDR,B gratefully acknowledges the commitment and support of the donors who provide unrestricted support to its research efforts.

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Prevalence of Helminthiasis in the First 2 Years of Life in a Birth-cohort in Rural Bangladesh

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Background: Helminthic infestation is common in children in developing countries. It contributes to malnutrition, vitamin A deficiency, and anaemia and increases susceptibility to infection with other intestinal pathogens. A common practice is to treat symptomatic but not asymptomatic children. This may lead to spread of helminthiasis in the community. **Objective:** To determine the prevalence of helminthiasis in symptomatic and asymptomatic children aged less than 2 years in rural Bangladesh. **Methodology:** The study subjects were 252 babies born between August 1993 and September 1994 to women followed from their last trimester of pregnancy in rural Mirzapur, Tangail, recruited for aetiological diagnosis of diarrhoea. Trained community health workers (CHWs) conducted household surveillance every fourth day for occurrences of diarrhoeal episodes. The study children also had access to consult the study physician for any illness. Stool samples were collected during diarrhoea and routinely every month. The direct smear technique was used for laboratory identification of helminthic eggs and counts in samples tested positive made. The study physician checked reports on only diarrhoeal stool samples and instituted treatment as necessary. The Ethical Review Committee of ICDDR,B approved the study. **Results:** In total, 1,728 diarrhoeal and 5,707 non-diarrhoeal monthly stool samples were collected. Overall, 9.3% (n=695) of the 7,435 stool samples were positive for helminths—2.7 % (n=208) diarrhoeal and 6.6 % (n=487) non-diarrhoeal. Mixed infestation was uncommon and found in 0.4% (n=31) of the 7,435 specimens. The principal infestations were *Ascaris lumbricoides* 9% (n=670/7, 435), *Trichuris trichiura* 0.6% (n=51/7,435), and hookworm 0.06% (n=5/7,435). Twelve percent (n=208/1,728) of the diarrhoeal specimens tested positive. The median egg counts per g of stool for *A. lumbricoides* was 968 and 884 in non-diarrhoeal and diarrhoeal stool samples respectively. The median age stool tested positive for any helminth was 16±4 and 17±3.7 months in the non-diarrhoeal and diarrhoeal stool samples respectively. Inappropriate disposal of child faeces in open space (95%) and use of open field space for adult defaecation (83%) were practised by families of the study cohort. **Conclusion:** The study documents that helminthic infestation starts early in life and remains predominantly asymtomatic in children. Intervention strategies, such as mass deworming and awareness-building programmes on transmission routes of helmenthic diseases, can reduce the burden of helminthiasis in rural under-privileged children.

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Changing Trends in the Antimicrobial Resistance Pattern of *Vibrio cholerae*

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Background: Resistance to commonly-used antimicrobials is an emerging problem in both developed and developing countries. Resistance has been emerging even to the newer and potent antibiotics. ICDDR,B has been monitoring the antimicrobial resistance pattern of all enteric isolates for a long time. **Objective:** To retrospectively analyze the antibiotic resistance pattern of *Vibrio cholerae* isolated from diarrhoeal patients admitted to the ICDDR,B hospital from January to December 2006. **Methodology:** In total, 13,281 faecal samples were processed for culture in the Clinical Microbiology Laboratory of ICDDR,B for enteric pathogens, including *V. cholerae* following the standard microbiological procedures. The isolates were tested for antimicrobial susceptibility following the guidelines of CLSI (formerly NCCLS) and using the disk-diffusion method against ciprofloxacin, co-trimoxazole, furazolidone, erythromycin, and tetracycline. **Results:** In total, 3,389 (29.0%) specimens yielded enteric pathogens. The majority of the isolates were *Vibrio cholerae* O1 (1,562, 11.76%), followed by *Shigella* (828, 6.23%), *Aeromonas* (450, 3.39%), *Salmonella* (344, 2.58%), *Plesiomonas* (178, 1.34%), and *Campylobacter* were 9.48% (477 of 5031). All isolates of *V. cholerae* O1 were El Tor biotype, and the majority of the strains were Inaba compared to Ogawa (55% vs 45%). All isolates of *V. cholerae* O1 were sensitive to ciprofloxacin and resistant to co-trimoxazole and furazolidone. A good number (13.5%) of strains showed reduced susceptibility to erythromycin, while complete resistance to erythromycin was found in 60.83% of Ogawa strains and in 3.60% of Inaba ($p<0.001$). Resistance of *V. cholerae* to erythromycin decreased from 57% in 2005 to 29% in 2006 and that to tetracycline decreased from 76% in 2005 to 47% in 2006. The strains of Ogawa showed a milder increase in resistance to tetracycline from 96% in 2005 to 98% in 2006 and that of Inaba decreased from 19% in 2005 to 5% in 2006. **Conclusion:** The resistance to tetracycline and erythromycin decreased in 2006 compared to 2005. However, overall increase of El Tor Ogawa isolates and emergence of increasing resistance towards tetracycline and erythromycin is alarming and may have an implication in the selection of therapy for treating cholera cases due to infection with this strain. **Acknowledgements:** The study was supported by ICDDR,B.

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Burden of *Shigella*-associated Infection in an Urban Slum Population of Dhaka, Bangladesh

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Background: Shigellosis continues to be a global public-health problem. The importance of shigellosis is increasingly recognized because of the emergence of resistant *Shigella* strains resulting in treatment failures, complications, and deaths. Information on shigellosis available in Bangladesh is mostly from hospital-based studies or records. Population-based data on shigellosis in urban areas are limited. **Objective:** To determine the incidence and distribution of *Shigella* species in diarrhoeal population of all ages and gender and to examine the antimicrobial resistance pattern of the isolated strains. **Methodology:** A longitudinal case-control surveillance was conducted among 31,621 people in an urban slum of Dhaka. Stool samples and/or rectal swabs (RS) were collected and processed for culture for enteric pathogens, including *Shigella* following the standard method. *Shigella* was identified biochemically and serologically, and sub-serotypes were determined using monoclonal antibody. Antimicrobial susceptibility was determined following the CLSI (formerly NCCLS) guideline using the disk-diffusion method. **Results:** In total, 4,492 patients were enrolled from January 2002 to July 2004. Males and females were 49% and 51% respectively, and 74% of children were aged <5 years. Enteric pathogens were isolated from 16.23% of cases. *Shigella* was isolated from 13.25% of cases; 46% presented with watery diarrhoea, 38% mucoidy, and 11% with bloody diarrhoea. *Shigella flexneri* was 53%, *S. boydii* 22%, *S. sonnei* 10%, and *S. dysenteriae* other than type 1 was 9%. *S. dysenteriae* type 1 was not isolated during the study. *S. flexneri* sub-serotypes 2a and 3a were 27% each. The majority (>70%) of patients, aged 1-4 year(s), had *Shigella*-associated infection. The incidence rates for all ages by the first (2002) and the second year (2003) were 7.12 and 7.74; that for <5 years were 41.37 and 43.63; and for >5 years were 2.19 and 2.56 respectably. Specimens from apparently healthy volunteers yielded 5% *Shigella* with 65% *S. flexneri*, 29% *S. boydii*, and 6% was *S. dysenteriae* other than type 1. No *Shigella* was resistant to ciprofloxacin, and one *S. flexneri* was resistant to mecillinam. *S. flexneri* showed 62% resistance to co-trimoxazole, 51% to ampicillin, 48% to nalidixic acid, and 24% to amoxicillin plus clavulanic acid (amoxiklav). *S. boydii* showed 45% resistance to co-trimoxazole, 27% to ampicillin, 35% to nalidixic acid, 12% to amoxiklav, and 3% to azithromycin. *S. dysenteriae* showed 56% resistance to co-trimoxazole, 16% to ampicillin, 20% to nalidixic acid, 11% to azithromycin, and none to amoxiklav. *S. sonnei* showed 95% resistance to co-trimoxazole, 77% to nalidixic acid, 8% to azithromycin, and none to amoxiklav. **Conclusion:** Since children aged less than 5 years suffer more frequently from *Shigella*-associated infection, an effective *Shigella* vaccine covering S. *flexneri* is likely to reduce the burden of *Shigella*. *Shigella* isolates were substantially resistant to commonly-used antimicrobials, such as ampicillin, co-trimoxazole, and nalidixic acid. Only ciprofloxacin and mecillinam provide near-universal susceptibility having an implication that effective treatment of *Shigella* will be more expensive, difficult, and added urgency for *Shigella* vaccine.
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Are Not We Oblivious of Bronchiolitis in Bangladesh?

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Background: Acute respiratory infection (ARI)/pneumonia has been the leading cause of morbidity and mortality in children aged less than 5 years (under-5 children) for a long time. ARI-control/Integrated Management of Childhood Illness (IMCI) programmes have been in progress in the country for more than a decade. There have been recent reports of outbreak of RSV bronchiolitis in the country. It is needed to know the current situation of this ARI-related mortality and morbidity. **Objective:** To determine the causes of death and morbidity of under-5 children with possible explanations. **Methodology:** A cross-sectional national survey was conducted during January-December 2003. Twelve of the 64 districts were randomly selected. A survey was conducted among 171,366 households having 820,347 people covering 90,357 under-5 children, including 16,193 infants. Data were collected with 3 sets of forms: screening form, verbal diagnosis form, and verbal autopsy form. Consensus was achieved on the diagnosis after analyzing the forms by a group of paediatricians. **Results:** ARI/pneumonia was found to be a leading cause of morbidity and mortality among under-5 children. The death in infancy was found to be highest (70.2%) during the period of 2-6 months of age, which is typically the peak age of bronchiolitis in young children. The deaths of infants mostly (61.5%) occurred during the months of October through February, the period of winter and peri-winter season, the peak season for RSV bronchiolitis. 'Asthma' (3 or more attacks of wheeze) was found to be the tenth commonest cause of infantile morbidity. **Conclusion:** The cases of bronchiolitis are misdiagnosed as pneumonia, and deaths from bronchiolitis have been merged with deaths due to pneumonia giving rise to the bulk of deaths due to ARI/pneumonia. **Acknowledgements:** The financial support of UNICEF Bangladesh is acknowledged.

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Consequences of Childhood Burn Injury in Bangladesh

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Background: Burn is a huge public-health issue in terms of morbidity, long-term disability, and mortality throughout the world, especially in developing countries. In 2000, 238,000 deaths occurred globally due to fire-related burn, most (95%) of which occurred in low- and middle-income countries. Even in developed countries, burn represents the leading cause of unintentional injury-related deaths and morbidity. Consequences of burns may impact mental functions, self-care, mobility, domestic life, relationships, education, and work status. It causes long-term disability and remains as a health, social, and economic burden. **Objective:** To determine the consequences of childhood burn at individual and family levels. **Methodology:** A population-based survey was conducted during January-December 2003 in Bangladesh. Nationally-representative data were collected from 171,366 rural and urban households comprising 819,429 people. Mothers/heads of households were interviewed with a structured instrument. **Results:** In the survey, 1,010 children were found with different degrees of burn morbidity preceding the one year of the survey; of them, 20 children were permanently disabled. About 50% of the total burn victims in the survey were found to be absent in school for more than a week. Three percent of them were absent from school for more than 3 months. The duration of hospital stay was 11.04 days among 0-17-years age-group. The highest duration of hospital stay (25.13 days) was found among 10-14-year age-group. Average expenditure of family as cost of treatment of burn found in this study was Tk 7,061.00 (US$ 111.00). **Conclusion:** Burn is a devastating injury, which causes serious social and economic burden for the nation. Although burn is a leading cause of morbidity and mortality of all age-groups all over the world, it is a major public-health problem in low-income countries, like Bangladesh; it is also an unrecognized and neglected health problem. Policy-makers and health planners are not much aware of the magnitude and impact of the problem. No national injury-control programmes are available in Bangladesh.

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Test-Retest Reliability of Wechsler Preschool and Primary Scale of Intelligence in Bangladesh

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Background: There are very few culturally-appropriate tools to assess mental development of children in Bangladesh. For assessing full-scale IQ of 4-6-year old children, 7 sub-tests of Wechsler Preschool and Primary Scale of Intelligence (WPPSI) were included for use. **Objective:** To assess test-retest reliability of WPPSI. **Methodology:** In Matlab, 20 rural children aged 4-6 years were given the test (WPPSI) twice at an interval of 7 days. **Results:** Pearson's product moment correlation between test and retest measures was conducted for full-scale IQ, its sub-scales, and for each of the sub-tests. Strong-to-moderate relationships were found for the full-scale IQ (r=0.75, p=0.01) and its verbal IQ (r=0.85, p=0.01), performance IQ (r=0.66, p=0.01), and processing speed quotient (PSQ) (r=0.80, p=0.01) sub-scales. The reliabilities for each of the sub-tests were as follows: vocabulary (r=0.79, p=0.01), information (r=0.83, p=0.01), picture completion (r=0.67, p=0.01), comprehension (r=0.65, p=0.01), coding (r=0.83, p=0.01), block design (r=0.40, p=0.08), and matrix reasoning (r=0.30, p=0.9). **Conclusion:** Strong-to-moderate relationships observed in full-scale IQ and its sub-scales suggest that WPPSI is a reliable instrument to assess the cognitive function of Bangladeshi children. **Acknowledgements:** The financial support of Sida/SAREC and the logistic support of ICDDR,B in conducting the study are acknowledged.

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Microbiological Qualities of Pond-sand Filter, River-sand filter, Dugwell, and Deep Tubewell Waters in 3 Districts of Bangladesh

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Background: In Bangladesh, waterborne diseases are mainly related to use of contaminated surface water. Hand tubewells are now declared unsafe in most districts due to arsenic contamination. Therefore, some people are using pond-sand filter (PSF), river-sand filter (RSF), dugwell, and deep tubewell as alternative sources of drinking-water. However, there is little information about the efficiency of these sources to treat water from microbiological point of view. **Objective:** To assess the public-health risk associated with the use of PSF, RSF, dugwell, and deep tubewell as alternative water sources. **Methodology:** The study sources were 18 PSFs, 1 RSF, 18 dugwells, and 10 deep tubewells located in different regions of Comilla, Chandpur, and Brahmanbaria districts. Detection of thermotolerant *Escherichia coli* (TEC), *Clostridium perfringens*, coliphage, and residual chlorine were carried out following the standard procedures. **Results:** Untreated pond-waters contained 100-3,200 cfu, 20-660 cfu, and 0-1,850 pfu per 100 mL of TEC, *C. perfringens*, and coliphage respectively, and after passing through PSF, the counts reduced to 10-1,200 cfu, 5-85 cfu, and 0-1,225 pfu per 100 mL respectively. Of 18 chlorine-treated water of PSF, 5 were free from microbial contamination, 8 contained only *C. perfringens*, 1 contained only TEC, and 4 contained both TEC and *C. perfringens*. In raw river-water, the count of TEC (>2,000 cfu/100 mL) reduced to <500 cfu/100 mL after passing through RSF chambers. After chlorination, no TEC was present. A similar trend was also observed for *C. perfringens* and coliphage. However, contaminations by these microbes were again observed in samples collected from the distribution-points. Of the dugwell samples, 83.3% (10/12) and 25% (3/12) were contaminated with TEC and coliphage respectively. None of the deep tubewell samples yielded any TEC and coliphage. The residual chlorine levels of the treated waters were lower than the acceptable limit (0.2-0.5 mg/L) recommended by the World Health Organization. **Conclusion:** The reduction of microbial contamination by the sand filters depend on the quality of raw surface water. The results also indicate that, when the safe water from the reservoirs of PSF and RSF is distributed, secondary contamination occurred and became unsafe. **Acknowledgements:** The financial support of the Department for International Development, Bangladesh is acknowledged.

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Climate Change and Transmission Dynamics of Cholera

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Background: Cholera is a waterborne disease. The causative agent of cholera—*Vibrio cholerae*—survives in association with blue-green algae in the aquatic environment. Therefore, the climatic variables, such as temperature, humidity, sunshine, and rainfall, can influence the life-cycle of reservoir (blue-green algae) of cholera. Climate change due to global warming might have an influence on the life-cycle of blue-green algae and *V. cholerae* itself. **Objective:** To find out the impact of climate change on the transmission dynamics of cholera. **Methodology:** Climatic data, including temperature, rainfall, sunshine, and humidity, were collected from the Bangladesh Meteorological Department, Dhaka, for the 1989-2005 period. Data on cholera were collected from the ICDDR,B's hospital record book in Matlab for the same period. Statistical analysis was done to find out the relationship with the climatic variables and transmission dynamics of cholera using the analysis of variance (ANOVA) and exploratory data analysis (EDA) techniques. **Results:** An increasing trend of temperature was observed for the last 18 years. There was a shift in temperature twice each year during which cholera epidemics occur. There exists a relationship between cholera cases and environmental variables (sunshine and temperature). **Conclusion:** Preliminary data suggest that the change in local climatic variables due to global warming may have some long run impact on the transmission dynamics of cholera in Bangladesh. **Acknowledgements:** The financial support of the United Nations Office for Project Services and the Department of Environment, Government of Bangladesh, is acknowledged.

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Culture Supernatant Concentrates of Shiga Toxin (Stx_{2d})-producing *Escherichia coli* Provoked Fluid Accumulation in the Rabbit Ileal Loops

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Background: Shiga toxin-producing *Escherichia coli* (STEC) strains are an important cause of human gastrointestinal disease, which may result in life-threatening complications, such as haemolytic-uraemic syndrome. Development of therapeutic and preventative strategies to combat STEC infections requires a thorough understanding of the mechanisms by which STEC-associated organisms colonize the human intestinal tract and cause local and systemic pathological changes. **Objective:** To evaluate the response of the rabbit ileal loop to culture supernatant concentrates of STEC. **Methodology:** One STEC strain positive for stx_{2d} gene was collected from own stock, which was previously isolated from diarrhoeal patients following standard procedure and was used in this study. Culture supernatant was prepared and was concentrated by ammonium precipitation. Fluid accumulation was tested by applying the sup-concentrates in the rabbit ileal loop. Same concentrates were used in the rabbit ileal loop after boiling for 30 minutes. Cytotoxic activity of the same concentrates with and without heat treatment was also tested in HeLa cell line. **Results:** Fluid accumulation in different ranges, accompanied by mucosal haemorrhages, was observed in the ileal loops when exposed to culture supernatant concentrates. The same concentrates after exposing to heat also caused fluid accumulation similar to the non-heated concentrates. Ileal loop segments showed moderate inflammation in mucosa, sub-mucosa, and also sometimes in muscle layer. It also revealed enterocyte necrosis and shearing of tip of villi (Grade-4 inflammation). Villi integrity also showed less maintained structures (Grade-3 inflammation) in the case of *V. cholerae* 569B. Treatment of the concentrates in HeLa cell line had cytotoxic effect, and the DNA fragmentation and chromatin condensation assays produced severe DNA damage and dense condensation of chromatin molecules inside the HeLa cells respectively. **Conclusion:** Culture supernatant concentrates from stx_{2d}-producing *E. coli* strains isolated from diarrhoeal patients in Bangladesh provoked fluid accumulation in the rabbit ileal loop.
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Value of Non-invasive Tests for Determination of *Helicobacter pylori* status in Children

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Background: Time of acquisition of *Helicobacter pylori* in humans is unknown. Infection due to *H. pylori* during childhood has been stipulated as a risk factor for several disorders, including anaemia, persistant diarrhoea, and growth retardation, thus adversely affecting child survival. Colonization occurred mainly during childhood. Therefore, there is a need to determine when *H. pylori* is acquired. Children followed since birth is the ideal study group. **Objective:** To compare 2 non-invasive methods for establishing acquisition of *H. pylori* in a birth cohort. **Methodology:** A cohort of 105 children from Mirzapur, Tangail, Bangladesh, was followed up from birth until the age of 2 years. Serum samples of each child were collected at birth (cord-blood) and every 6 months thereafter. During the same period, stool samples were obtained also every 6 months. ELISA for *H. pylori* and CagA antigen preparations were performed, and Amplified IDEIA HpSTAR-kit was used as stool antigen detection test. **Results:** The table shows the results using either stool antigen detection test or serology as the gold standard. Apparently, when the stool antigen detection test was used as the reference test, a better correlation with serological tests was found. **Conclusion:** The results confirmed that serological tests have an excellent sensitivity but a poor specificity. The results also confirmed that stool antigen detection test is reliable in children. **Acknowledgements:** New York University School of Medicine provided support for the study receiving fund from the Thrasher Foundation.

Table. Comparison in *H. pylori* colonization results in a birth-cohort between stool antigen detection test and serology

H. pylori status	Stool antigen test†		*H. pylori* and CagA ELISA††	
	No.	No. (%)	No.	No. (%)
Never positive	47	6 (12.8)*	47	18 (38.3)*
Transient positive	8	3 (37.5)**	37	17 (45.6)
Persistent positive	50	16 (32.0)	15	15 (71.4)

†Using serology as reference; ††Using stool antigen detection test as reference
*p=0.002 compared with persistent positive, **p=0.05 compared with persistent positive

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Factors Affecting the Choice of Safe Delivery Practices for Pregnant Women in Bangladesh

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Background: Complications during pregnancy and childbirth are the leading causes of premature deaths among women in developing countries like Bangladesh. The level and pattern of maternal mortality are important indicators of the status of maternal health in a community. Bangladesh, a country with annual birth close to 4 million, still has a high maternal mortality ratio, estimated at 320 per 100,000 livebirths. Despite the health reforms of recent years in Bangladesh, inadequate progress has been made to promote health improvement, especially in terms of maternal and child health. **Objective:** To examine the factors that influence the choice of safe delivery practices in terms of place of delivery and assistance during delivery among pregnant women in Bangladesh. **Methodology:** Data from the Bangladesh Maternal Health Services and Maternal Mortality Survey (BMMS) 2001 were used. Multivariate logistic regression analyses were carried out to explore the influence of 13 sociodemographic characteristics in the likelihood of choosing safe delivery practices in terms of place of delivery and assistance during delivery. **Results:** The results of the study showed that, despite the extensive coverage of healthcare infrastructure across the country, healthcare-seeking, especially in terms of delivery of newborns, was alarmingly low. Only 8% of 4,304 pregnant women chose medical facilities, and 29% chose trained birth attendants, such as qualified doctors and nurses, health assistants, family welfare visitor, and assistants, and traditional birth attendants, during delivery. The BMMS 2001 reported that 12% of women were assisted by skilled providers at the last delivery. Young and uneducated pregnant women were at the highest risk of not receiving medical assistance during delivery. Age, religion, type of area of residence, secondary and higher education, and higher socioeconomic status were the significant predictors of choosing safe delivery practices. **Conclusion:** The study throws light on a number of sociodemographic factors behind the under-use of health system in Bangladesh, despite an excellent health system infrastructure among most South Asian countries. The study results indicate that specific programmes, targeted to young women in rural area, will result in safer delivery practices during their pregnancies. The study also demonstrates that mass communication, literacy, and income-generation interventions will significantly reduce unsafe delivery practices.

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Healthcare-seeking Pattern by Women Suffering from Chronic Obstetric Morbidities

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Background: Obstetric morbidities are common among women of reproductive age. Long-term sequelae originating from pregnancy and childbirth include genital prolapse, genital fistulas, old perineal tears, haemorrhoids, dyspareunia, and urinary incontinence. Although these problems may not necessarily be life-threatening, they have a considerable chronic impact on health and well-being. Women with chronic obstetric morbidities often remain silent and do not seek professional healthcare. **Objective:** To explore the healthcare-seeking patterns of women who reported chronic obstetric morbidities. **Methodology:** The study was conducted at Mirpur, an urban slum of Dhaka. In total, 183 non-pregnant married women of reproductive age were interviewed, who had delivered between 12 and 24 months prior to the date of interview. **Results:** Of the respondents who reported a chronic obstetric morbidity, 24% sought healthcare—12.5% (3) from a graduate physician, 12.5% (3) from NGO healthcare providers, 8.3% (2) from homeopaths, 54.1% (13) from drug vendors at pharmacies, and 4.2% (1) from *kabiraj*. None of them visited a government health facility. Sixty-two percent of the respondents discussed their health problems with their husbands. Twenty-nine percent reported that their morbidity created obstacles in performing their regular activities, and of these women, 31% (9) visited some form of healthcare provider. Thirty-nine percent stated that relationship with their husband has been changed due to their morbidity, and only 28% (11) visited some form of healthcare provider. Reasons for not seeking any healthcare were shyness or embarrassment to disclose the health problem to a male doctor, not knowing where to find a female doctor, lack of money, and the belief that chronic obstetric morbidities are natural for parous women for which nothing can be done. **Conclusion:** The use of healthcare for chronic obstetric morbidities was low, and most women sought care from untrained providers. The use of appropriate health services was better among the respondents who had discussed their problem with their husbands. **Acknowledgements:** The financial support of the Swiss Agency for Development and Cooperation is acknowledged.

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Journey Towards Sustainable Maternal Health Services

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Background: Under operational management of a local committee, the Bangladesh Red Crescent Society tested the delivery of expanded maternal and child health (MCH) services with charge by locally-recruited community midwives from 35 centres in 2003. The local committee introduced microcredit programme for beneficiaries as a potential source of generation of revenues for these centres. **Objective:** To compare the use of services and to assess the sustainability level of locally-managed MCH centres. **Methodology:** Data on client flow and the trend in generation of revenues were examined. Semi-structured interviews with programme implementers, managers, and committee members were conducted. **Results:** Although routine services, such as immunization, limited family-planning services, treatment for common diseases, were delivered and pathological investigations were done, there was a decrease in the client flow in most centres. Revenue-generation activities were also not well-managed by the local committee in most centres. However, these centres generated a revenue of Tk 728,773 from January to October 2006. The generated revenue created the opportunity to establish a fund as safety-net for the benefit of the hard-core poor. The programme implementers, managers, and committee members felt that there is potential for further improvement. **Conclusion:** Given the opportunity, the local committee is capable of generating sufficient revenue to administer maternal health service-delivery. Revenue-generation activities have an important role. Refresher training of the community midwives may improve client-flow. The local committee also needs to be fully aware about the MCH programme and needs more support and guidance for achieving sustainable maternal health.
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Overcome Barriers to Repair of Vessico-vaginal Fistula: "We Took Her by the Arm and Brought Her"

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Background: Women's health issues in general are often hidden in Bangladesh society and none more so than vesico-vaginal fistula (VVF), causing leakage of urine from the bladder to vagina. VVF in Bangladesh is a tragic consequence of the lack of access to emergency obstetric care. As the MDG 5 is implemented, the incidence of VVF will reduce, but in the meantime there are many women still suffering. Hospital doctors are trained in repairs but patients are reluctant to seek treatment, thereby exposing their problem. **Objective:** To describe the impact of an integrated community and hospital fistula programme on the life of one rural Bangladeshi woman. **Methodology:** This case study was conducted at the LAMB Integrated Rural Health and Development Project in North-West Bangladesh. The fistula programme at the LAMB Hospital is briefly explained. A particularly difficult VVF patient's case is described from interviews with the patient and multiple staff involved in her case. **Results:** Over the course of several months, during which the patient noted that she would 'rather die like this than have other people know', many staff tried to convince her to seek care at the LAMB Hospital. The members of the LAMB community staff were motivated by their personal knowledge of the quality surgical services at the Hospital. Only when one health worker accompanied her to the Hospital (to avoid shaming the patient's family), did she receive successful repair surgery. **Conclusion:** When strong relationships and persistent efforts lead to transformational change, community members themselves become powerful motivational resources in the community.
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Safe Attendance and Quality of Delivery Care in Hospital and Community Centres

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Background: Use of a 'skilled attendant' (doctor, nurse, midwife) at birth is one of the recognized indicators for measuring progress towards the Millennium Development Goal (MDG) 5, i.e. reduction of maternal mortality ratio. The use of a skilled attendant does not guarantee that the delivery will be conducted with skill and follow generally-recognized standards of care. The Skilled Attendance for Everyone (SAFE) Study Sub-group of Dugald Baird Centre for Research on Women's Health, University of Aberdeen has done research to develop a means of measuring skilled attendance at birth that would be suitable for routine monitoring purposes using health facility data. With various practitioners providing delivery care in Bangladesh, it is important to have a means, such as the SAFE tool, to assess whether women are receiving the level of care they require for a safe and healthy delivery. **Objective:** To assess the quality of delivery care provided at the LAMB Hospital (doctors/midwives) and 2 LAMB-facilitated Community Safe Delivery Units (SDUs) (skilled birth attendant-level trained midwives, by reviewing delivery charts and evaluating these according to the standards of skilled attendance set out by the SAFE study group. **Methodology:** Ethical approval for the study was obtained from the Bangladesh Medical Research Council. The researchers developed the delivery record form by modifying the World Health Organization (WHO) chart review form. Deliveries occurring during January 2001–December 2002 were the population used for sampling. For normal deliveries, the total number of deliveries per month was identified from the delivery register or from the general patient register of each facility, and the normal delivery falling closest to the middle number of deliveries for that month was chosen for review. Information recorded on normal deliveries was analyzed according to the SAFE Study criteria. Each of 32 criteria was analyzed. Data were pooled across deliveries to produce cumulative frequencies and mean and median percentage scores. A 'Skilled Attendance Index' (SAI), was also developed that measured "the proportion of records meeting a certain threshold of criteria, arbitrarily divided into quartiles." **Results:** Of the 32 items assessed, more than 90% of records had recording for 27 items of LAMB Hospital records, 18 items of SDU 1 records, and 10 of SDU 2 records. Items recorded over 90% of the time in all the LAMB facilities included mode of delivery, parity, blood loss, and blood pressure postpartum. The least well-recorded criteria in the 3 LAMB facilities were recent haemoglobin level (0-45.8%) and complications in previous pregnancies and history of complications in index pregnancy (both 9.1-68.8%). A fully-completed partograph was available in 100% of SDU 1 records, 90.8% of LAMB Hospital records and 26.1% of SDU 2 records. For all the facilities, formatted items were more likely to be charted than informa-

tion charted in the narrative form. Using the criteria of the SAI, 100% of the deliveries met 25% of the criteria in all the facilities. The LAMB Hospital and SDU 1 met at least 50% of the criteria for 100% of the deliveries, and the LAMB Hospital met 75% of the criteria for 91.9% of the deliveries. **Conclusion:** Essential care for SAFE attendance of women admitted for labour and delivery and adequate recording of care given are possible at both busy emergency obstetric care-level facilities and community-managed SDUs. Regular chart review for normal deliveries could contribute to further improvement of care at all levels. Review of records from the community-managed facilities needs to involve the managers and staff of those facilities in the process and include a mechanism for disseminating results back to them so that it can impact their future planning.

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Comparative Advantages of Local Community Health Workers Over External Professionals

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Background: Non-physician community healthcare providers (paramedics or safe birth attendants) are a backbone of primary healthcare. However, job satisfaction is affected by community assumptions of low-quality care and concerns about trouble in the event of bad outcomes. **Objective:** To compare the advantages and disadvantages of local (and locally-trained) community health workers as reflected in NGO and government practice, contributing to human resource questions enabling improved service-delivery for poor women and children. **Methodology:** The study was conducted at the LAMB Integrated Rural Health and Development Project in North-West Bangladesh. Personnel records of 34 locally-hired and trained community staff were obtained and compared with those of 11 externally-hired professionals (nurses and medical assistants). Six focus-group discussions with community groups explored perceptions of those staff groups. Interviews were held with 17 random representatives of those 2 groups at their postings in rural community clinics **Results:** Longevity of local staff was measured in years, that of external professionals in months. Some users and local managers of clinics expressed strong preference for local staff due to their 'service attitude'. NGO staff desired 'back-up' by more highly-trained external personnel in the event of negative outcomes at local level damaging the reputation of an organization. **Conclusion:** Resolving sometimes conflicting needs of locally-appropriate, low-cost service providers and back-up in the event of severe cases requires creativity and openness on the part of NGO staff and community people. Often policy-makers also strive for more highly professional cadres, but human resource-development capacity currently does not meet demand. **Acknowledgements:** LAMB's partnership with Plan Bangladesh is appreciated.

Modified Syndromic Approach for Management of RTI/STI at Primary Healthcare Centres in Bangladesh

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Background: Reproductive tract Infection (RTI) is now a major public-health problem world-wide, especially in developing countries. **Objective:** To develop an effective and acceptable syndromic approach for control of RTI at primary healthcare centres in Bangladesh. **Methodology:** A multi-centred randomized controll trial of a modified WHO algorithm developed by the Obstetrical and Gynaecological Society of Bangladesh (OGSB) for the management of vaginal discharge syndrome was conducted in Dhaka city during 2001-2003. In total, 1,235 women of reproductive age complaining of vaginal discharge were enrolled in the study. **Results:** Candidiasis was most prevalent (55.7%), followed by bacterial vaginosis (22.2%), physiological discharge (18.9%), *Chlamydia*–associated infection (18.8%), gonorrhoea (8.9%), trichomoniasis (5.1%), and syphilis (3.7%). For candidiasis, the sensitivity and specificity of the WHO algorithm were 75.1 and 10.4, and the OGSB algorithm were 74.0 and 7.0 respectively, and for cervicitis, the sensitivity was 78.7 and 84.0 and specificity 23.7 and 21.7 respectively. There was no significant difference in the overall cure rate of both the management approaches. **Conclusion:** There is a significant difference in the diagnostic accuracy by using the WHO/OGSB algorithm and laboratory method. The OGSB algorithm minimizes the over-treatment of physiological discharge and is cost-effective and patient-friendly. **Acknowledgements:** The study was funded by the Urban Primary Health Care Project of Asian Development Bank.

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Molecular Characterization of *Salmonella* Group B Strain Isolated during 1998-2004 in Dhaka, Bangladesh

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Background: Infections due to non-typhoid *Salmonella*, resistant to antibiotics, have recently emerged as an important health problem worldwide, especially in Bangladesh. Non-typhoid *Salmonella* is a common cause of bacterial gastroenteritis, which is usually a self-limited illness in normal subjects; it may cause a severe disease in patients with immunedeficiency. Antimicrobial therapy is indicated for invasive non-typhoid *Salmonella*-associated infections. Surveillance is essential to monitor resistant non-typhoid *Salmonella* and identify its sources and modes of transmission. **Objective:** To characterize *Salmonella* group B strains using phenotypic and genotypic traits to understand the molecular epidemiology and clonal relationship between multi-drug resistance and sensitive strains. **Methodology:** During January 1998–June 2004, 897 strains of *Salmonella* group B were isolated at the Clinical Microbiology Laboratory from patients attending the Dhaka Hospital of ICDDR,B and from patients referred from other clinics and hospitals in Dhaka. Of these strains, 196 were characterized extensively using serotyping, antibiotic resistance analysis, plasmid profile analysis, and pulsed-field gel electrophoresis (PFGE). **Results:** All strains were serologically confirmed as *Salmonella* group B using commercially-available antisera-kit. Within the B serogroups, *Salmonella* Typhimurium was the predominant (55%) serotype, followed by S. Gloucester (42%). Of 151 strains, isolated during 1998–2002, 78 (52%) were resistant to all first-line drugs (MDR), whereas all the strains isolated during 2003–2004 were susceptible to all antibiotics tested. The number of MDR strains decreased from 83% in 1998 to 0% in 2004. Plasmid analysis showed that all MDR strains harboured 140-MDa and/or 90-MDa plasmid, whereas most sensitive strains were plasmid less. PCR results showed that the strains harbouring the 140-MDa plasmid belonged to the incompatibility group IncHI1. Conjugation suggested that the 140-MDa plasmid harboured a self-transmissible multiple antibiotic resistance marker. Analysis of genomic DNA from both sensitive and MDR strains by PFGE yielded single type in MDR strains, whereas sensitive strains were heterogenous. **Conclusion:** *Salmonella* group B strains isolated from patients are commonly resistant to multiple antibiotics, including those, such as ceftriaxone, used for treating salmonellosis. Although clonal by PFGE, continued evolution of these strains will be expected to render effective antimicrobial therapy more difficult.
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Audit of Typhoid Treatment and Antibiotic Sensitivities in North West Bangladesh

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Background: LAMB Hospital is concerned to minimize the cost of admission for the poor, and so older, cheaper drugs which retain effectiveness are often used. However, drug-costs in Bangladesh are not static, drugs becoming cheaper when they are mass-produced locally, and reliable data on antibiotic sensitivities can significantly change management strategies. **Objective:** To identify the local antibiotic sensitivities for *Salmonella* spp. and to devise the most cost-effective treatment protocol for enteric fever. **Methodology:** In May 2003, the LAMB Hospital started doing aerobic blood cultures. In December 2004, a retrospective audit of blood culture results and inpatients with a diagnosis of typhoid or enteric fever was performed. Following this, the treatment protocol was reviewed, and a prospective follow-up study was performed. **Results:** Of 246 blood cultures performed during May 2003–November 2004, 12 grew *Salmonella* spp., of which 7 were *Salmonella* Typhi. All *S.* Typhi were resistant to ampicillin, co-trimoxazole, and chloramphenicol and were sensitive to gentamicin, cephalexin, ciprofloxacin, ceftriaxone, ceftazidime. Of 48 patients with a diagnosis of typhoid or enteric fever identified from the hospital records, 47 charts were found. A diagnosis of typhoid was made on admission in 34 cases. Many patients had unnecessary investigations—in addition to a full blood count, 136 other investigations were performed. The median length of admission at the LAMB Hospital was 5 (range 1-27) days. Thirty-one were treated with chloramphenicol, of which 8 received a second or third antibiotic (ciprofloxacin and ceftriaxone). There were no deaths or serious complications. A 'Typhoid Management Protocol' was written, and the first-line antibiotic was changed from chloramphenicol to ciprofloxacin 15 mg/kg in 2 divided doses orally for 7 days if uncomplicated; intravenous initially, then orally if complicated for 10-14 days. The prospective study followed the next 50 patients admitted with typhoid or enteric fever. Fifty research sheets and 47 charts were available for review. Forty-three patients were diagnosed on admission; the median length of admission was 6 (range 1-17) days. In addition to a full blood count, 102 other investigations were performed. Forty-eight patients were treated with ciprofloxacin first-line (intravenous 17, oral 28), and of these, 5 patients received a second-line antibiotic. There were no deaths or serious complications. The average cost per patient of drugs in the first cohort was Tk 753 and Tk 492 in the second cohort; the average cost per patient of investigations, excluding full blood count, was Tk 178 in the first cohort and Tk 77 in the second cohort; giving an average saving of Tk 362 (39%) per inpatient episode. **Conclusion:** Protocol-driven management of patients with enteric fever can increase diagnostic confidence and reduce unnecessary investigations and costs to the patient. Reliable antibiotic sensitivities are important in guiding rational prescribing and can reduce drug costs per course per patient even when using drugs which are more expensive per-dispensed unit. **Acknowledgements:** Some data were presented at the LAMB Dissemination Conference in Dhaka, January 2006.

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Antibiotic Resistance Profiles of *Vibrio cholerae* O1 and O139 Isolated from Coastal Ecosystem of Bangladesh

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Background: Recurrent cholera striking coastal villages, where there is no access to immediate healthcare facilities, results in deaths that can largely be averted by fluid replacement and antibiotic therapy. The choice of effective antibiotic, which may be of lifesaving importance, depends on the current pattern of antibiotic susceptibility of *V. cholerae*, which, however, varies between time and place. **Objective:** To understand the current patterns and the genetic basis of antibiotic resistance of *V. cholerae* O1 and O139 isolated from coastal villages of the Bay of Bengal, since the choice of effective antibiotic is crucial for efficient treatment of cholera. **Methodology:** Rectal swabs from suspected cholera patients attending Bakerganj and Mathbaria hospitals, and the water and plankton samples from these 2 areas were collected biweekly. In total, 179 randomly—selected strains out of 261 *V. cholerae* O1 and 35 *V. cholerae* O139 isolated during January 2004–May 2006 were studied for drug resistance by the standard disk-diffusion methods. Of the 179 strains, 62 including 26 environmental and 36 clinical, were studied for plasmid profile (Birnboim and Doly), resistance and epidemic marker genes by PCR. **Results:** Drug resistance was observed among clinical (n=51) and environmental (n=83) *V. cholerae* O1 strains. Most strains, irrespective of origin, were resistant to furazolidone, vibriostatic compound (VSC), and trimethoprim-sulphamethoxazole (SXT), whereas resistance to tetracycline and erythromycin were observed in 41% (n=34) environmental and 41% (n=21) and 35% (n=18) of clinical strains respectively. Conversely, all *V. cholerae* O139 [clinical (n=10) and environmental (n=35)] were sensitive to all drugs, except that 23% (n=8) of the environmental strains were resistant to VSC and SXT. Year-wise data showed that resistance of *V. cholerae* O1 towards tetracycline and erythromycin, which was 0% in 2004, had increased to 91% in clinical and 64% in environmental strains. Also, the Ogawa serotype, which accounted for 0% in environmental and 42% in clinical strains in 2004, had increased to 100% and 64% in 2006 respectively. The occurrence of the Ogawa serotype was linked to increasing resistance to tetracycline and erythromycin in *V. cholerae* O1. Although none of the resistant strains had plasmid of any size, all the clinical and environmental *V. cholerae* O1 and O139 strains had the important resistance marker *sxt* but lacked intl class I integron. Further molecular analysis

of *V. cholerae* O1 strains revealed that they were not hybrids but typical 7th pandemic El Tor biotype strains. **Conclusion:** None of the 2 first-line drugs—erythromycin and tetracycline—resistance to which was linked to emergence of the Ogawa serotype, can be recommended for treating cholera. The emergence and spread of multi-drug-resistant *V. cholerae* in coastal villages is of great public-health concern. **Acknowledgements:** This research was funded by the National Institutes of Health, Research Grant No. AI39129, under sub-agreement between the Johns Hopkins University Bloomberg School of Public Health and ICDDR,B.

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Street Food Vendors in the Urban Community of Dhaka: Is This A Public-health Concern?

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Background: Street food, an important component of the informal food-distribution sector, is a source of nutrition for people in developing countries, including Bangladesh. An epidemiologic link between street food and enteric infection, such as diarrhoea and typhoid fever, has been established in several studies. There is limited knowledge about street food vendors in Bangladesh. **Objective:** To understand the perceptions of street food vendors about street food safety and to assess the microbial quality of street foods in an impoverished urban community of Dhaka in Bangladesh. **Methodology:** An inventory of street vendors working in Kamalapur was generated, and 5 types of 'popular' street food vendors were identified. In-depth interviews were conducted with 5 vendors under each type, including ice cream, pre-cut fruit, pickle, *matha* (a yogurt-based drink), and juice sellers. Samples of foods and hand-wash from each vendor were obtained for quantitative assessment of faecal coliforms. The Ethical Review Committee of ICDDR,B approved the study. **Results:** The study was conducted during January-December 2005. Of 25 street food vendors, all were male with a median age of 36 (range 14-60) years, 19 never went to school, 14 were involved in the current business for less than 18 months, 18 had street food vending as their primary source of income, and 17 lived in a dorm (mess) with other vendors. The vendors usually prepared the food for vending by themselves and perceived these to be clean. According to them, dirty or stale food might cause stomach problem. Proper cleaning of ingredients and covering food while vending make street food safe. Pickle was considered unsafe by most vendors, including a few pickle sellers. Microbial assessment showed growth of uncountable faecal coliform in the specimens obtained from the vendors, except for pickle. **Conclusion:** Street vendors in Kamalapur have limited understanding about food safety. Street foods sold in this area are highly contaminated by sewerage and bear high risk of transmission of enteric diseases among residents. Further research is required to direct public-heath interventions for street food safety and reduction of transmission of enteric diseases.
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Molecular Traits of Antibiotic Resistance of *Vibrio cholerae* O1 Isolated from Clinical Sources in Bangladesh

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Background: Death due to cholera can largely be averted by administering a drug that toxigenic *Vibrio cholerae*, the cause of cholera, is responsive to. However, genetic changes and emergence of *V. cholerae* with multiple drug resistance (MDR) are among the major hurdles that constraints treatment of cholera, although the genetic bases for emergence of new strains with MDR remain mostly unknown. **Objective:** To understand the genetic basis of emergence of MDR in *V. cholerae* O1, which is crucial for preventive and therapeutic measures. **Methodology:** This study, part of an ongoing epidemiological surveillance at Dhaka and Matlab Hospitals of ICDDR,B, was conducted during September 2004–June 2006. In total, 2,307 *V. cholerae* O1 strains isolated during September 2004–June 2006 were analyzed for antibiotic resistance (by disk-diffusion), plasmid profile (Birnboim and Doly methods), and genes for resistance, virulence, and epidemic markers by PCR. Furthermore, clonal relatedness was examined by ERIC-PCR and PFGE. **Results:** Of 2,307 *V. cholerae* O1 strains tested, antibiotic response revealed 100%, 98%, 58%, and 44% of the strains to be resistant to furazolidone, trimethoprim-sulphamethoxazole, tetracycline, and erythromycin respectively, and 44% of the strains belonged to the MDR category. Thirty-eight percent of the strains belonged to the Inaba serotype and 62% to the Ogawa serotype. Year-wise data revealed Ogawa to increase from 48% in 2004 to 70% in 2005 and 2006, whereas the scenario for Inaba was just the reverse of Ogawa for the same period. In line with the serotypic shift in 2005, respective resistance to tetracycline and erythromycin, which was 7% and 6% in 2004, reached to 76% and 64% in 2005, thereby increasing the prevalence of MDR strains form 0% in 2004 to 85% in 2005. None of the strains possessed plasmid or Intl class I integron, while all, irrespective of drug resistance, amplified primers for *sxt*-encoding resistance to streptomycin, and trimethoprim-sulphamethoxazole. All the strains had the major genes of CTX genetic elements *ctxA*, zot, and ace, except for the NAG-specific gene stn/sto, but possessed structural and regulatory genes *tcpA*, *tcpI*, and *toxR*, adhesin gene *ompU*, and El Tor type *hlyA*. Further molecular analysis showed important epidemic marker genes, namely wbeO1, rstR2, and *tcpA* El Tor, in all strains tested. DNA fingerprinting analysis using ERIC-PCR and PFGE of NotI-digested genomic DNA revealed that all *V. cholerae* O1 belonged to the same clonal lineage and that no genetic clue could be found between MDR and non-MDR strains. **Conclusion:** The study has shown that incidence of MDR

in *V. cholerae* O1 El Tor is correlated to the incidence of Ogawa serotype strains that carry major virulence, structural, regulatory, and epidemic marker genes that are not hybrid of classical and El Tor. Of significance also was the demonstration that MDR is not related to plasmid and that both MDR and non-MDR strains showed a similar fingerprinting pattern. **Acknowledgements:** This research was funded by the National Institutes of Health, Research Grant no. AI39129, under sub-agreement between the Johns Hopkins University Bloomberg School of Public Health and ICDDR,B.

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Molecular Characterization of *Vibrio parahaemolyticus* Strains Isolated from the Coastal Aquatic Environments of Bangladesh

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Background: *Vibrio parahaemolyticus*, a pandemic pathogen causing seafood-related gastroenteritis, is often reported from sporadic cases in the coastal villages of Bangladesh, although the molecular traits and serogroups of the strains occurring in the coastal region are unknown. **Objective:** To investigate the phenotypic and genotypic traits of potentially pathogenic *V. parahaemolyticus* strains isolated from the coastal region of the Bay of Bengal. **Methodology:** *V. parahaemolyticus* strains (n=29), isolated from water of 3 coastal sites, covering a wide area of the Bay of Bengal between June 2005 and March 2006, were subjected to serotyping, antibiogram, and haemolytic activity (Kanagawa phenomenon), followed by PCR for important epidemic marker genes, such as *toxR, tdh, trh, tlh*, group specific (GS), and ORF 8. Analysis of DNA fingerprinting employing RAPD, PFGE, and ERIC-PCR was carried out by the standard procedure to determine the clonal relatedness of *V. parahaemolyticus* strains. **Results:** Serogrouping against 'O' and 'K' antigens revealed O3 and O1, and K21 and K30 to be the prevalent O and K serogroups in this region. Moreover, 5 strains were identified as O1:KUT, which was proven to be genetically related to the pandemic serogroup O3:K6. Nine strains were Kanagawa phenomenon-positive and, thus, pathogenic. Antibiogram of *V. parahaemolyticus* using ciprofloxacin, gentamycin, trimethoprim-sulphamethoxazole, tetracycline, erythromycin, and furazolidon revealed all to be uniformly effective. PCR for species-specific genes—Vp-*toxR* and *tlh*—showed 86% and 90% of the strains to harbour these genes respectively. Four strains containing potential virulence gene *tdh*, all belonging to the serogroup O8:K21, had the haemolytic activity. Conversely, only one strain that had *trh* belonged to the serogroup O1:KUT. However, none of the strains were positive for GS- or ORF8-PCR and, hence, did not belong to the pandemic group. Analysis of DNA fingerprinting using RAPD, ERIC-PCR, and PFGE of NotI-digested genomic DNA revealed the strains to be highly heterogeneous, belonging to diverse clonal lineage and that environmental strains of *V. parahaemolyticus* of this region have the virulence potential but are genetically unrelated to the pandemic clones. **Conclusion:** The most significant finding was the isolation of *V. parahaemolyticus* strains from the aquatic environments with the genetic potential to produce potential virulence genes—*tdh* and *trh*. Also of significance was the demonstration of dominant serogroups of this region and isolation of O1:KUT, which was proven to be genetically related to the pandemic serogroup O3:K6. Although *V. parahaemolyticus*-associated infections are not a major health problem in Bangladesh, the strains with the genetic potential to produce both *tdh* and *trh* may be of significance in this region.
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Not to Stigmatize but to Humanize Sexual Lives of *Hijras*: Condom Chat in the AIDS Era

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Background: Despite the presence of condom promotion since 1999 among *hijras*, unprotected sexual acts are widely practised resulting in a high rate of sexually transmitted infections. **Objective:** To explore and analyze the reasons for unprotected sex and the contextual meanings of the use of condoms in the lives of *hijras*. **Methodology:** In-depth interviews with 30 self-identified *hijras*, 10 key-informants, and 8 focus-group discussion with gatekeepers of the *hijra* community were conducted in an ethically-approved qualitative study of ICDDR,B. Tape-recorded interviews were transcribed, and the findings on condom use were segmented and categorized by Atlas-ti. The analysis was done in the framework of thematic and contextual realms. **Results:** Most *hijras* outside the coverage of HIV interventions did not use condoms. Many *hijras* under HIV interventions were aware of, and they claimed to use, condoms regularly. However, as interviews proceeded with psychosocial space, they generally confessed to involvement in unprotected sex quite frequently. The complex and diverse underlying reasons were positioned beyond the individual's cognitive domain. These included: (a) low self-worth regarding life and survival; (b) economic hardships in a society with enormous unemployment; (c) multi-faceted love relations with multiple 'transient partners' framed by sexual lust and distrust; (d) sexual desire, preferences, and eroticisms concerning anal sex; (e) stigma associated with purchasing condoms and using condoms for *hijra*; (f) quality and inconsistent availability of condoms and lubricants; (g) limitation of fear producing messages on use of condoms; (h) inadequate professional skills and motivational impetus of peer-educators for promotion of condoms; and (i) incompetent management with insufficient and inadequate understanding about the dynamics of condom use. **Conclusion:** In a rigid bi-gendered society, due to adoption of an alternate gendered sexuality, *hijras* encounter enormous psychosocial and economic constraints. By ignoring all these contradictions of everyday life and by disregarding sociocultural and socioeconomic scripts of sexual relationships and eroticism of *hijra*-sexuality, imposing condoms is a mechanistic and deceptive framework of intervention. A paradigm shift is required where condoms enhance the dignity and quality of sexual lives of *hijras* beyond the framework of disgrace, disease, and death. **Acknowledgments:** The financial support of Department for International Development, UK, and the field support from Badhan *Hijra* Shangha, Dhaka, are acknowledged.

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An Assessment of Community Readiness for HIV/AIDS Prevention Interventions in Rural Bangladesh

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Background: It is now widely acknowledged that the HIV/AIDS pandemic has arrived in South Asia. Advocacy for abstinence is widely accepted in Bangladesh and is relatively easy to promote, while public discourse on sexuality is not, and condom promotion is restricted to married couples. Most interested parties agree that beginning preventive activities for youths will require a working partnership with organizations at the community level. Whether communities in Bangladesh are ready to accept and work with HIV/AIDS prevention messages is unknown. **Objective:** To develop a measurement and then to describe the level of community readiness in rural Bangladesh. **Methodology:** The study design was descriptive in nature that used a multi-method, multi-informant approach. Qualitative and quantitative methods were applied to collect information from members of community groups, key-informants, and youths in 3 rural settings of Bangladesh. Stages of readiness measured included awareness of HIV transmission, sense of vulnerability, knowledge of prevention, planning, preparation, and actually taking action. Scientific and ethical approval was granted by ICDDR,B. **Results:** Awareness of the HIV/AIDS epidemic and the estimated vulnerability of Bangladeshi youths were consistently high. This was also the case for knowledge about routes of transmission. Knowledge about HIV prevention was lower. Only Union Parishad members and Imams (religious leaders) had begun to discuss the potential spread of HIV/AIDS in their community. No organizations interviewed had begun serious preparation by taking decisions or identifying resources, and no activities had been initiated. Nearly all groups recognized that condoms would prevent HIV infection and eventually save lives. Nonetheless, condom availability for unmarried youths was uniformly low. Making condoms available was viewed as encouraging pre-marital sex. **Conclusion:** The findings suggest that community groups are generally consistent with respect to their stage of readiness to change in that most are at the pre-planning stage. As a whole, community groups hold similar positive attitudes towards mass-media messages about HIV prevention and similar negative attitudes towards access to condoms by unmarried youths. Nonetheless, considerable heterogeneity of opinion within groups should allow for debate on new ideas. Strategies to overcome barriers to community-wide communication and to prepare them to participate in preventive activities are now needed.
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