ANNUAL REPORT 2023

icddr,b

Solving public health problems through innovative scientific research

We are grateful to our core donors for their long-term commitment to our work:

Government of the People's Republic of Bangladesh

Canada

Chief Editor
Dr Tahmeed Ahmed

Editor
AKM Tariful Islam Khan
Faria Abdullah

Proofreading
Azizur Rahman Anik
Hamida Akther
Syed Hasibul Hasan

Writer
AKM Tariful Islam Khan

Creative Design and Illustration
Mohammad Inamul Shahriar

Photo credits
© icddr,b
All photographs by Sumon Yusuf, except
Rabiul Hasan (page 4, 60, 61, 62, 63, 67, 68, 69, 70, 71, 73, 76, 77, 78, 79, 80); Shehzad Noorani (page 14,36); USAID's Research for Decision Makers (RDM) Activity (page 26); Azizur Rahman Anik (page 33); Fatima Tuj Johora (page 39); PID (page 49)

icddr,b is committed to the ethical use of photography and obtains permission from photo subjects whenever reasonable and practical.

icddr,b is an international health research institute based in Bangladesh. Policymakers and practitioners utilise our evidence and expertise to improve health outcomes and prevent premature death and disability worldwide. Established more than 60 years ago, we continue to provide life-saving services to the people of Bangladesh and nurture the next generation of global health leaders. Our work has a substantial impact in Bangladesh and worldwide.

VISION

A world in which more people survive and enjoy healthy lives.

MISSION

To solve public health problems through innovative scientific research.

VALUES

EXCELLENCE
We are single-minded in our pursuit of scientific rigour and operational efficiency.

INTEGRITY
We are a responsible and accountable organisation committed to the highest standards of behaviour.

INCLUSIVITY
We work collaboratively throughout the organisation and with our partners.

OUR JOURNEY

In 1960, at the onset of a major cholera pandemic, the then-South East Asian Treaty Organization (SEATO) established a small laboratory in Dhaka named Cholera Research Laboratory to be operated under the National Institutes of Health (NIH), USA. Later in 1978, this became the International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b) through a Government Ordinance, followed by a World Health Organization (WHO) meeting in Geneva in 1979, which was chaired by UNDP and attended by 50 participants of 26 developing and developed countries, and agencies. A memorandum of understanding was signed by eighteen of those countries and agencies endorsing the centre as an international entity.

icddr,b now operates under the icddr,b Act 2022 of the Government of Bangladesh as an autonomous, international, philanthropic, and non-profit centre for research, education, training, and clinical service.

With funds from the Government of Bangladesh, Canada, and others, icddr,b has produced some stunning breakthroughs in scientific innovation, treatment, patient management and disease prevention and helped save millions of lives globally.

Read more:
https://shorturl.at/RDvze

CONTENTS

MESSAGE FROM THE BOARD CHAIR

Dear Colleagues and Supporters,

The year 2023 has marked icddr,b with many notable achievements. I extend my heartfelt thanks to our supporters, donors, collaborators, and partners for your trust and continued support. Your belief in our mission has enabled us to drive positive change, save lives, and help build a healthier, more equitable future for all.

Under the leadership of Dr Tahmeed Ahmed, the Executive Director, icddr,b continued to make a significant contribution to global public health. The Annual Report featured impactful research initiatives that benefited Bangladesh and beyond. It also highlights our promising research and some of the key projects and initiatives. As we concluded year one of our Strategic Plan 2023-27, the Report also included an overview of major activities under its scientific goals as well as those to advance Environmental, Social, and Governance (ESG) objectives.

An example of achieving an impactful outcome was our work in controlling Kala-azar, an infectious disease found in Bangladesh and many other countries. I am proud to note that through icddr,b research the Government of Bangladesh was able to eliminate Kala-azar as a public health threat, making Bangladesh the first country in the world to achieve this status. This milestone reflected over a decade of icddr,b's pioneering research and innovative treatment strategies. It is in our plans to collaborate with other countries that are affected and help them combat this infectious disease.

We also advanced our work in support of humanitarian aid. In 2023, the World Health Organization (WHO) called upon icddr,b for assistance in managing a cholera outbreak. In response, our scientific staff travelled to Lebanon and helped control the outbreak. In addition to operating the largest diarrhoeal hospital in the world at no cost to patients, we further demonstrated our commitment to support vulnerable communities through direct intervention. Our efforts in 2023 included conducting a cholera vaccination campaign for the Rohingya refugee population relocated to Bhasan Char in partnership with the Government of Bangladesh.

We remain thankful to our collaborators, development and funding partners in support of our research work and are most grateful to our core donors – Government of Bangladesh and the Government of Canada – for their ongoing funding support. We also thank our volunteers who dedicated time to assist or advise icddr,b. In particular, I would like to thank members of the Scientific Advisory Group who guided us in shaping our research priorities and activities.

Looking ahead, I am excited about future research opportunities and impactful work to come. I am proud of icddr,b and its meaningful research. With your support, icddr,b will continue to lead in solving public health challenges through innovative scientific research.

Yours faithfully,

Nancy Y. Cheng, FCPA, FCA
Chair, Board of Trustees
July 2024

MESSAGE FROM THE EXECUTIVE DIRECTOR

Dear Friends of icddr,b,

2023 has been a transformative year for icddr,b, with strategic advances in scientific research and public health initiatives targeting global health challenges, particularly focused on low- and middle-income countries.

Our achievements include breakthroughs in vaccines and health interventions, enhancing health outcomes in Bangladesh and beyond. Collaborations with over 175 international institutions, including more than 30 in the Global South, have strengthened our fight against infectious diseases, maternal and child health challenges, and chronic illnesses. Publishing over 450 articles in high-impact journals highlights our research strength.

This year, initiating our 2023-27 strategic plan, we restructured our departments and units to align more closely with our strategic goals, enhancing our response to emerging health challenges. Additionally, raising $100 million by 2038 for icddr,b Endowment Funds remains a priority. This fund will provide sustainable funding for our healthcare initiatives and strengthen our capacity to respond to emerging health challenges.

We maintain a strong commitment to diversity and inclusion, with proactive efforts to recruit staff and interns from varied backgrounds, including those with disabilities and from the transgender community, reflecting our core values of fairness and dignity.

Our Development Unit has successfully broadened our donor base, securing significant partnerships and engaging new global philanthropists. Through innovative campaigns, we reached over 700,000 people worldwide, enhancing our visibility and impact.

We were honoured to host notable figures such as the Minister of International Development of Canada, Mr Harjit S. Sajjan, and Former Prime Minister of New Zealand Rt Hon Helen Clark, who praised our innovative approaches to health challenges. Their endorsements underscore the global impact of our work.

In our spotlight, we highlight the development of the Novel Oral Polio Vaccine 2 (nOPV2) and advancements in mRNA-based vaccines for RSV and dengue, showcasing our pivotal role in global health innovation.

As we continue to advance our mission, I invite you to explore the Annual Report 2023, which details our impactful work and achievements.

Thank you for your continued support.

Dr Tahmeed Ahmed
Executive Director
July 2024

ABBREVIATION

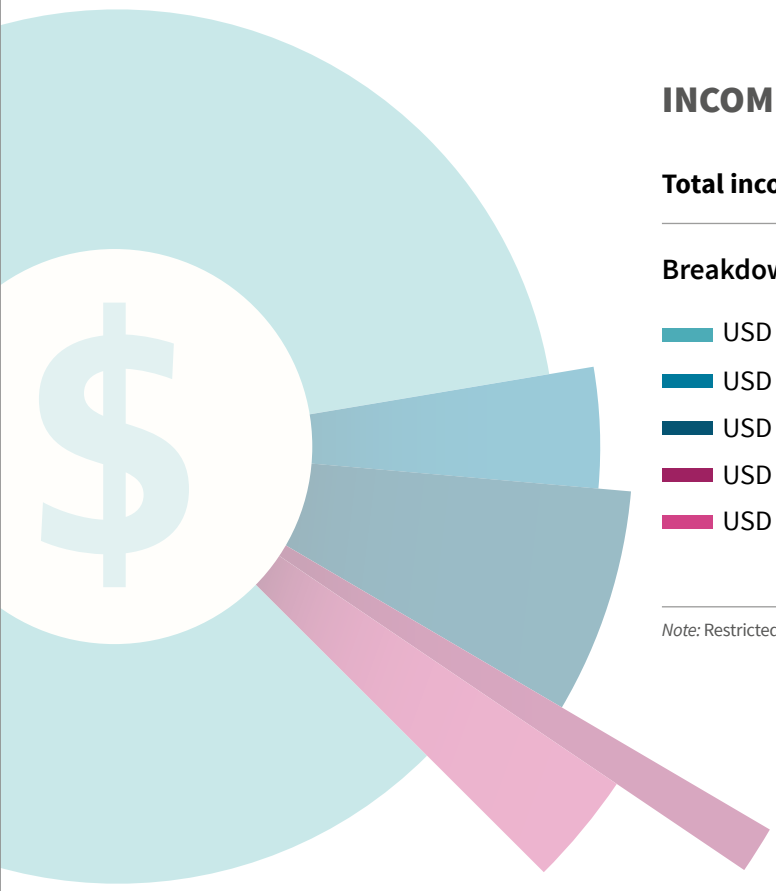
A	ACF	Action contre la Faim
	ACF	Action contre la Faim-France
	ACS	Acute Coronary Syndromes
	ACTB	Alliance for Combating Tuberculosis in Bangladesh
	ADB	Asian Development Bank
	AdSEARCH	Advancing Sexual and Reproductive Health and Rights
	AMCH	Ad-Din Medical College Hospital
	A-PLUS	Azithromycin Prophylaxis in Labor Use Study
B	BAS	Bangladesh Academy of Sciences
	BCSIR	Bangladesh Council of Scientific and Industrial Research
	BKSP	Bangladesh Krira Shikkha Protishtan
	BLA	Biologics License Application
	BMGF	Bill & Melinda Gates Foundation
	BNNC	Bangladesh National Nutrition Council
	BSMMU	Bangabandhu Sheikh Mujib Medical University
	BSMRSTU	Bangabandhu Sheikh Mujibur Rahman Science and Technology University
	BUET	Bangladesh University of Engineering Technology
C	CAP	College of American Pathologists
	CAPGAN	Commonwealth Association of Paediatric Gastroenterology and Nutrition
	CBHC	Community Based Health Care
	CBOs	Community-based Organisations
	CCH	Climate Change and Health
	CCHPS	Climate Change, Health and Population Science
	CDC	Centers for Disease Control and Prevention, USA
	CDS	Clinical and Diagnostic Services
	CEPI	Coalition for Epidemic Preparedness Innovations
	CfDRA	The Centre for Data Research and Analytics
	CHAMPS	Child Health and Mortality Prevention Surveillance
	CIRDAP	Centre on Integrated Rural Development for Asia and the Pacific
	CIRI	International Center for Infectiology Research
	CoD	Cause of Death
	CUGH	Consortium of Universities for Global Health
	CuMCH	Cumilla Medical College Hospital
	cVDPVs	Circulating Vaccine-derived Polioviruses
	CVIA	PATH Center for Vaccine Innovation and Access
	CWCH	Center for Women and Child Health
D	DFATD	Department of Foreign Affairs, Trade, and Development
	DGDA	The Directorate General of Drug Administration
	DGFP	Directorate General of Family Planning
	DGHS	Directorate General of Health Services
	DIDI	Dengue in Dhaka Initiative
	DLS	Department of Livestock Services
	DMCH	Dhaka Medical College and Hospital
	DNCC	Dhaka North City Corporation
	DOE	Department of Environment
	DPHE	Department of Public Health Engineering
	DSCC	Dhaka South City Corporation
	DSHE	Directorate of Secondary and Higher Education
	DWASA	Dhaka Water Supply and Sewerage Authority
E	EMBL	European Molecular Biology Laboratory
	EMPHNET	Global Health Development
	ENT	National Institute of Ear, Nose and Throat

	EPI	Expanded Programme on Immunization
	EPTB	Extra-pulmonary TB
	EQAS	External Quality Assurance System
	ERMS	Eastern Resource Management Services Limited
	ESG	Environmental, Social and Governance
	EUL	Emergency Use Listing
F	FCDO	Foreign, Commonwealth & Development Office
	FDA	Food and Drug Administration
	FDMNs	Forcibly Displaced Myanmar Nationals
	FFR	Fortified Rice
	FIDEC	Fighting Infectious Diseases in Emerging Countries
G	GAC	Global Affairs Canada
	GFATM	The Global Fund to Fight AIDS, Tuberculosis and Malaria
	GKSPL	Greentech Knowledge Solutions Pvt. Ltd.
	GOARN	Global Outbreak Alert and Response Network
	GoB	Government of the People's Republic of Bangladesh
H	HCC	Hepatocellular Carcinoma
	HDSS	Health and Demographic Surveillance System
	HSM	Hospital Services Management (HSM) Unit
I	IAMI	Influenza Vaccine After Myocardial Infarction
	ICGEB	International Centre for Genetic Engineering and Biotechnology
	ICHSH	Institute of Child Health & Dr. M R Khan Shishu Hospital
	ICMH	Institute of Child and Mother Health
	ICTROMI	International Conference on Tropical Medicine and Infectious Diseases
	IEDCR	Institute of Epidemiology, Disease Control and Research
	iGC	icddr,b Genome Centre
	INTL	Immunobiology, Nutrition, and Toxicology Laboratory
	IPH	Institute of Public Health
	IPHN	Institute of Public Health Nutrition
	IPNA	Institute of paediatric Neurodisorder and Autism, BSMMU
	IPV	Intimate Partner Violence
	IPVS	International Papillomavirus Society
	IRC	International Rescue Committee
	IRD	Interactive Research and Development
	ISARIC	International Severe Acute Respiratory and Emerging Infection Consortium
	IVI	International Vaccine Institute
J	JGH	Jessore 250 bed General Hospital
	JHBSPH	Johns Hopkins Bloomberg School of Public Health
	JIMCH	Jahurul Islam Medical College Hospital
	JPGSPH	James P Grant School of Public Health
	JRRMCH	Jalalabad Ragib-Rabeya Medical College Hospital
K	KEMRI	Kenya Medical Research Institute
	KGH	Kurmitola General Hospital
	KMC	Kangaroo Mother Care
L	LARC/PM	Long-acting Reversible Contraceptives or Permanent Methods
	LMICs	Low- and Middle-income Countries
	LSHTM	London School of Hygiene and Tropical Medicine
M	MAM	Moderate Acute Malnutrition
	MARMCH	M Abdur Rahim Medical College Hospital
	MDCF	Microbiota Directed Complementary Food
	MDF	Microbiota Directed Food
	MFSTC	Mohammadpur Fertility Services and Training Centre
	MGH	Massachusetts General Hospital
	MHVS	Maternal Health Voucher Scheme
	MITS	Minimally Invasive Tissue Samples
	ML	Machine Learning
	MMR	Maternal Mortality Ratio
	MNH	Maternal and Newborn Health
	MOEFCC	Ministry of Environment, Forest and Climate Change
	MoEW&OE	Ministry of Expatriates' Welfare and Overseas Employment

	MoNITOR	Mother and Newborn Information for Tracking Outcomes and Results
	MOOC	Massive Open Online Course
N	NCCP	National Cholera Control Plan
	NCDC	Non Communicable Disease Control
	NCDs	Non-communicable Diseases
	NCSRHR	National Conference on Sexual and Reproductive Health and Rights in Bangladesh
	NCTBR	National Centre for Tuberculosis and Research
	NIBSC	National Institute for Biological Standards and Control
	NICVD	National Institute of Cardiovascular Disease
	NIDCH	National Institute of Diseases of Chest and Hospital
	NIH	National Institute of Health, USA
	NINS	National Institute of Neurosciences and Hospital
	NIPORT	National Institute for Population Research and Training
	NiV	Nipah Virus
	NMEP	National Malaria Elimination Program
	nOPV2	Novel Oral Polio Vaccine 2
	NRD	Nutrition Research Division
	NRU	Nutrition Rehabilitation Unit
	NTP	National Tuberculosis Control Programme
	NUH	National University Hospital, Singapore
O	OCV	Oral Cholera Vaccine
	OED	Office of the Executive Director
	OGSB	Obstetrical and Gynecological Society of Bangladesh
	OPVs	Oral Polio Vaccines
	ORS	Oral Rehydration Salts
P	PICU	Paediatric Intensive Care Unit
	PrEP	Pre-exposure Prophylaxis
	PSI	Pandemic Sciences Institute
Q	QMS	Quality Management Services
R	RDH	Respiratory Disease Hospital
	RDM	Research for Decision Makers
	RDMA	Research for Decision Makers Activity
	RGHI	Reckitt Global Hygiene Institute
	RIF	Resistant to Rifampicin
	RMC	Respectful Maternity Care
	RSV	Respiratory Syncytial Virus
	RTA	Right Track Africa
	RTM	Research, Training, and Management (RTM) International
	RUTF	Ready-to-Use Therapeutic Food
S	SAHIC	National Centre for Hearing and Speech for Children
	SAM	Severe Acute Malnutrition
	SARI ITC	Severe Acute Respiratory Infection Isolation and Treatment Centre
	SBMCH	Sher-e-Bangla Medical College Hospital
	Sida	Swedish International Development Agency
	SRHR	Sexual and Reproductive Health and Rights
	SRU	Sample Reception Units
	SSK	Shasthyo Surokhsha Karmasuchi
	SSMC	Shaheed Suhrawardy Medical College
T	TAG-GWG	Technical Advisory Group on Gestational Weight Gain
	TGA	Therapeutic Goods Administration
	TGHN	The Global Health Network
	THF	Teknaf Health Facility
	TMSS	Thengamara Mohila Sabaj Sangha
	tNGS	Targeted Next-generation Sequencing
	TTU	Technical Training Unit
	TWAS	The World Academy of Sciences
U	UCLA	University of California, Los Angeles
	UI	Under-immunized
	UNAS	Universitas Nasional (UNAS)
	UNC	University of North Carolina
	UND	University of Notre Dame
	UNDG	United Nations Development Group
	UNICEF	United Nations Children's Fund
	UPHCP	Urban Primary Healthcare Project
	USAID	United States Agency for International Development
V	VAPP	Vaccine-associated Paralytic Poliomyelitis
	VTC	Vaccine Testing Center
W	WFP	World Food Programme
	WHO	World Health Organization
Z	ZD	Zero-dose

2023 **IN NUMBERS**

A snapshot of icddr,b funding, research, training, and clinical services



INCOME 2023

Total income USD **77.3** million

Breakdown of total income:

- USD **65.2** million restricted grants contributions
- USD **3.4** million unrestricted grants contributions
- USD **5.7** million income from laboratories
- USD **0.7** million other restricted income
- USD **2.3** million other unrestricted income

Note: Restricted (research-specific grants), Unrestricted (operations and development grants)

NUMBER OF STAFF

421
scientific staff

42% **58%**

5,209
total staff

46% **54%**

GRANTS AND PROJECTS

128
new grants

550
ongoing projects

COLLABORATION

109
national collaborations

188
international collaborations

ARTICLES AND CITATION

457
original papers published[1]

59,043
citations in 2019-2022

DIAGNOSTIC SERVICES

760 tests offered

765,312 tests carried out

CONTRIBUTION

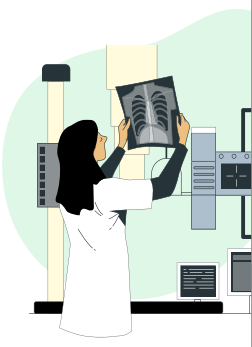
162 national policy review committees with icddr,b representation

242 international policy review committees with icddr,b representation

TUBERCULOSIS DIAGNOSIS

16.7 million individuals were screened
13 mil. adult | **3.7** mil. children

44,632 cases detected
38,860 adult | **5,772** children



CAPACITY BUILDING

612 individuals participated in icddr,b training courses

283 students were hosted by the orientation programme for medical students at icddr,b

361 interns attended field experience/internship programme

4 faculty positions held by icddr,b scientists at the James P Grant School of Public Health

24 icddr,b scientists and staffs contributing to teaching at the James P Grant School of Public Health, BRAC University

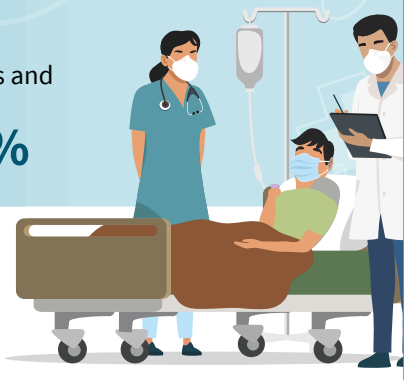
TREATMENT AT DHAKA AND MATLAB HOSPITALS

261,592 patients treated in 2 hospitals

46% | **54%**

Under 5 years of age **63%**

5 years and above **37%**



(further details are provided under Clinical and Laboratory Services section)

TREATMENT AT TEKNAF HEALTH FACILITY

The primary reasons for seeking treatment were respiratory diseases, the common cold, and diarrhoea.

31,005 patients treated including **1,524** Forcibly Displaced Myanmar Nationals (FDMNs)

45% | **55%**

Under 5 years of age **43%**

5 years and above **57%**

[1] with icddr,b scientists as authors

PUBLIC HEALTH IMPACT: BANGLADESH AND BEYOND

This section highlights the impactful initiatives and research that influenced public health in 2023. These efforts have had significant effects both in Bangladesh and internationally.

icddr,b AIDS BANGLADESH IN BECOMING FIRST TO ELIMINATE KALA-AZAR

Kala-azar, or visceral leishmaniasis, has been officially declared eliminated as a public health problem in Bangladesh by WHO in October 2023, making Bangladesh the first country in the world to achieve this status. This milestone reflects over a decade of concerted efforts, with icddr,b playing a critical role through its pioneering research and innovation.

Our partnership with the government has been instrumental in this achievement. icddr,b's generation of robust evidence and development of innovative treatment and prevention strategies provided the foundation for national policy and practical interventions. Notably, our research contributed to the widespread adoption of the Liposomal Amphotericin B, originally an anti-fungal drug, which has shown a 98% cure rate and is now integral to the national kala-azar management strategy.

Moreover, icddr,b established the Surya Kanta Kala-Azar Research Centre in Mymensing in 2012, the country's only research centre dedicated to this disease. This facility has been pivotal in advancing our understanding and control of the disease. Understanding the transmission of kala-azar is crucial, as the disease is spread by the bite of infected sand-flies. Our vector control research, particularly the study on the existing bed-net impregnation with insecticide, significantly reduced the incidence of kala-azar by over 66% across multiple villages, showcasing the impact of controlling the sand-fly vector. India and Nepal have also adopted numerous findings from icddr,b's research to enhance their kala-azar elimination programmes.

As Bangladesh continues its post-elimination surveillance to prevent re-emergence and aim for zero transmission by 2030, icddr,b's innovative use of dried blood spots for diagnostic testing stands out. This method provides a less invasive, easily transportable sample collection that maintains high diagnostic agreement with traditional methods and is ideal for resource-limited settings.

The success of these initiatives underscores the importance of our strong partnerships with government and international bodies. The tools developed and implemented by icddr,b not only support ongoing surveillance and management in Bangladesh but also provide scalable solutions for other countries endemic with kala-azar, including Brazil, Ethiopia, Kenya, Somalia, South Sudan, India, and Sudan. This ongoing commitment highlights icddr,b's pivotal role in global efforts to control and eventually eradicate this deadly disease.

Our collective achievements were made possible through excellent collaboration and substantial financial support from several esteemed partners including TDR and NTD at WHO, the Bill & Melinda Gates Foundation, UK Aid, JICA, CDC USA, and many others.

Mondal D, Jorge Alvar, Md. Golam Hasnain, Md. Shakhawat Hossain, Debashis Ghosh, M Mamun Huda, Shah Golam Nabi, Shyam Sundar, Greg Matlashewski, and Byron Arana. Efficacy and safety of single-dose liposomal amphotericin B for visceral leishmaniasis in a rural public hospital in Bangladesh: a feasibility study. Lancet Global Health (www.thelancet.com/lancetgh Published online December 5, 2013 http://dx.doi.org/10.1016/S2214-109X(13)70118-9)

Mondal D, Huda MM, Karmoker MK, Ghosh D, Matlashewski G, Nabi SG, Kroeger A. Reducing visceral leishmaniasis by insecticide impregnation of bed-nets,Bangladesh. Emerg Infect Dis. 2013 Jul;19(7):1131-4. doi: 10.3201/eid1907.120932.

Ghosh P, Chowdhury R, Rahat MA, Hossain F, Arpha NE, Kristan M, Higgins M, El Wahed AA, Goto Y, Islam MMT, Campino S, Cameron M, Duthie MS, Haque R, Mondal D. Dried Blood Spots (DBS): A suitable alternative to using whole blood samples for diagnostic testing of visceral leishmaniasis in the post-elimination era. PLoS Negl Trop Dis. 2023 Oct 20;17(10):e0011680. doi: 10.1371/journal.pntd.0011680. PMID: 37862287; PMCID: PMC10588855.

PROMISE IS REALISED THROUGH AN INEXPENSIVE CHOLERA VACCINE

Cholera is a severe diarrhoeal disease that can be lethal if untreated. Oral Rehydration Salts (ORS), discovered by icddr,b in the 1960s, have significantly improved outcomes. However, developing an effective cholera vaccine was a key goal during the 1970s and 1980s. Early injectable vaccines

had questionable efficacy. In 1970, a trial in Matlab showed minimal protection from injectable vaccines, leading WHO to stop recommending them for travellers, saving resources.

In 1985, icddr,b conducted a trial in Matlab that led to the first oral cholera vaccine (OCV) Dukoral, now licensed in over 60 countries. In 2015, icddr,b demonstrated the feasibility of delivering low-cost OCV Shanchol in urban settings, shaping national strategies. A New York Times report titled "Promise Is Seen in an Inexpensive Cholera Vaccine" highlighted the potential of this breakthrough. Since then, the promise has been realised, with more than 100 million doses distributed to over 19 cholera-endemic countries from the global stockpile.

Delivering OCV to poor urban populations has helped policymakers in Bangladesh formulate strategies to reduce severe cholera cases. From 2017 to 2019, pre-emptive vaccination with OCV in the Rohingya refugee camps averted a major epidemic. Nationwide surveillance supports targeting cholera hotspots, incorporated into the National Cholera Control Plan (NCCP), recently endorsed by the Ministry of Health and Family Welfare and submitted to the GTFCC, WHO.

In February 2020, about 1.2 million doses were administered in six thanas of Dhaka city, but the second dose couldn't be completed due to COVID-19. In early 2022, following a cholera outbreak, 2.4 million doses were approved by GTFCC for a reactive demonstration campaign in urban Dhaka. In 2023, icddr,b conducted successful campaigns in Bhasan Char and the Bandar area of Chattogram, exemplifying the government's commitment to ending cholera in Bangladesh. The continued success and expansion of these campaigns highlight the realised promise of the inexpensive cholera vaccine in combating this deadly disease.

Read more: https://shorturl.at/ZnCX9

icddr,b ADVANCES DEVELOPMENT AND LICENSING OF SUPERIOR POLIO VACCINE

The Novel Oral Polio Vaccine 2 (nOPV2) represents a significant advancement in combating polio outbreaks. Traditional oral polio vaccines (OPVs) contain a weakened live poliovirus, which can rarely mutate. This mutation can cause vaccine-associated paralytic poliomyelitis (VAPP) and circulating vaccine-derived polioviruses (cVDPVs) among recipients and their close contacts, particularly in areas with low immunisation coverage. To address these challenges, nOPV2, a more stable vaccine, has been developed.

A pivotal study conducted by icddr,b scientists involving 330 newborns at Matlab demonstrated nOPV2's safety and effectiveness. Published in "The Lancet" in 2023, the research showed that nOPV2 was well-tolerated and immunogenic when administered in two doses—at birth and at four weeks—resulting in nearly 99% of infants developing protective neutralising antibodies.

The study also highlighted that nOPV2's use in newborns did not result in excessive faecal excretion of live virus, minimising the risk of contributing to cVDPV outbreaks.

This is particularly important as the highest-risk groups in these outbreaks are often unvaccinated newborns and very young infants.

Following comprehensive clinical evaluations, WHO authorised the emergency use of nOPV2, marking it as the first vaccine deployed under the Emergency Use Listing (EUL) process for polio. Over 1 billion doses have been distributed globally (35 countries), effectively used in outbreak responses across all age groups without excluding newborns. This robust evidence supports policymakers, regulators, and healthcare providers in endorsing nOPV2 for the most vulnerable age groups during polio outbreaks.

Zaman K, Bandyopadhyay AS, Hoque M, Gast C, Yunus M, Jamil KM, Mainou BA, Konopka-Anstadt JL, Hendley WS, Vincent A, Clemens R, Clemens SAC, Ross AG, Clemens JD, Tritama E. Evaluation of the safety, immunogenicity, and faecal shedding of novel oral polio vaccine type 2 in healthy newborn infants in Bangladesh: a randomised, controlled, phase 2 clinical trial. Lancet. 2023 Jan 14;401(10371):131-139. doi: 10.1016/S0140-6736(22)02397-2.

THE IAMI TRIAL AND icddr,b's CONTRIBUTION TO GLOBAL HEALTH POLICY

The Influenza Vaccine After Myocardial Infarction (IAMI) trial was a significant multinational study assessing the efficacy of influenza vaccinations in preventing myocardial infarction colloquially known as heart attack, and other severe cardiovascular events. This research stemmed from earlier studies suggesting that influenza infections, which increase the risk of cardiovascular events, could be mitigated by vaccination.

Conducted across several countries including Europe, Australia, and Bangladesh, the IAMI trial provided robust data to substantiate the protective effects of influenza vaccines. In Bangladesh, icddr,b led the trial in collaboration with the National Institute of Cardio-Vascular Diseases (NICVD) and Örebro University, Sweden.

Prior to IAMI, icddr,b's FluMI study in collaboration with UNSW Sydney, examined acute respiratory illnesses in myocardial infarction patients at NICVD, setting the groundwork for the IAMI trial.

The trial's results were significant, showing that influenza vaccination during hospitalisation for myocardial infarction could prevent subsequent severe cardiovascular events (by up to 40%). Influenced by these findings, the European Society of Cardiology upgraded its recommendation for influenza vaccination in cardiovascular patient management from Class 1B to Class 1A. The updated guideline states: 'Influenza vaccination is recommended for all Acute Coronary Syndromes (ACS) patients and should be given preferentially during index hospitalisation during influenza season for those not protected by a seasonal influenza vaccination'. Similar guidelines are under consideration in Canada. The IAMI trial highlights icddr,b's critical role in influencing global health policies through impactful research.

Fröbert O, Götberg M, Erlinge D, Akhtar Z, Christiansen EH, MacIntyre CR, Oldroyd KG, Motovska Z, Erglis A, Moer R, Hlinomaz O, Jakobsen L, Engstrøm T, Jensen LO, Fallesen CO, Jensen SE, Angerås O, Calais F, Kåregren A, Lauermann J, Mokhtari A, Nilsson J, Persson J, Stalby P, Islam AKMM, Rahman A, Malik F, Choudhury S, Collier T, Pocock SJ, Pernow J. Influenza Vaccination After Myocardial Infarction: A Randomized, Double-Blind, Placebo-Controlled, Multicenter Trial. Circulation. 2021 Nov 2;144(18):1476-1484. doi: 10.1161/CIRCULATIONAHA.121.057042.

Akhtar Z, Götberg M, Erlinge D, Christiansen EH, Oldroyd KG, Motovska Z, Erglis A, Hlinomaz O, Jakobsen L, Engstrøm T, Jensen LO, Fallesen CO, Jensen SE, Angerås O, Calais F, Kåregren A, Lauermann J, Mokhtari A, Nilsson J, Persson J, Islam AKMM, Rahman A, Malik F, Choudhury S, Collier T, Pocock SJ, Pernow J, MacIntyre CR, Fröbert O. Optimal timing of influenza vaccination among patients with acute myocardial infarction - Findings from the IAMI trial. Vaccine. 2023 Nov 22;41(48):7159-7165. doi: 10.1016/j.vaccine.2023.10.028.

Byrne RA, Rossello X, Coughlan JJ, Barbato E, Berry C, Chieffo A, Claeys MJ, Dan G-A, Dweck MR, Galbraith M, Gilard M, Hinterbuchner L, Jankowska EA, Jüni P, Kimura T, Kunadian V, Leosdottir M, Lorusso R, Pedretti RFE, Rigopoulos AG, Rubini Gimenez M, Thiele H, Vranckx P, Wassmann S, Wenger NK, Ibanez B, Group ESD. 2023 ESC Guidelines for the management of acute coronary syndromes: Developed by the task force on the management of acute coronary syndromes of the European Society of Cardiology (ESC). Eur Heart J. 2023;44(38):3720-826. doi: 10.1093/eurheartj/ehad191

** De Wals P, Desjardins M. Influenza vaccines may protect against cardiovascular diseases: The evidence is mounting and should be known by the Canadian public health community. Can Commun Dis Rep. 2023 Oct 1;49(10):433-438. doi: 10.14745/ccdr.v49i10a04.

icddr,b's RESEARCH SHAPES GENEXPERT ULTRA USE FOR TB DETECTION GLOBALLY

Between 2014 and 2015, icddr,b's TB Research Group identified discrepancies in the Xpert MTB/RIF assay (a rapid test revolutionising TB and drug resistance diagnosis) results among TB samples with low bacterial loads, particularly those resistant to rifampicin (RIF). Many samples initially detected as RIF-resistant by Xpert were found to be RIF-sensitive upon retesting with unused remnants or newly collected specimens. These findings revealed that discordant results were predominant in samples with low bacterial burdens.

This discovery led to a broader review and subsequent publications by various global research groups, advocating for repeat testing to confirm RIF susceptibility. This issue was highlighted further in a 2021 editorial in the International Journal of Tuberculosis and Lung Diseases. Responding to these findings, in 2023, CEPHEID, the manufacturer of GeneXpert machines, updated its user guidelines to recommend retesting samples with low bacterial loads using alternative methods.

This update was significantly influenced by research from icddr,b and similar studies conducted in Haiti, Uganda, Rwanda, India, and China.

CEPHEID also globally communicated the switch to GeneXpert Ultra, specifically addressing the issue of low-load discrepancies, incorporating summaries of icddr,b's research.

These updates have been disseminated widely, including to the WHO and Bangladesh's National Tuberculosis Control Programme (NTP), enhancing diagnostic accuracy and treatment efficacy for TB worldwide. Through these efforts, icddr,b has played a pivotal role in shaping global policy and practice in the diagnosis and management of drug-resistant TB.

A specimen of a TB patient's sputum is being processed.

REDUCING BRICK KILN POLLUTION IN BANGLADESH

Millions of people in Bangladesh face worsening air quality. Traditional brick manufacturing, vital to the growing economy, is a key contributor to air pollution, significantly harming the environment and public health.

Despite efficient, less-polluting kiln technologies being available, their high costs have hindered large scale adoption.

Researchers from icddr,b, Stanford University, BUET, and Green Tech Solution India collaborated to modify existing brick-making practices. Focusing on traditional methods, their intervention, Zigzag 2.0, encourages brick kiln owners and operators to adopt low cost changes in kiln operation and management.

There are about 7,000 brick kilns in Bangladesh, which generate 11% of the country's particulate matter, 22% of black carbon, and 17% of total annual CO_2 emissions. We have developed an intervention, Zigzag 2.0, which encourages brick kiln owners and operators to adopt low cost changes in kiln operation and management. We deployed this intervention in a randomised controlled trial among 300 zigzag kilns in Khulna Division in the 2022-2023 brick kiln season. 65% of the kilns that were offered the intervention adopted the two most important components of the intervention. Kilns that adopted the intervention used 22% less coal per 100,000 bricks produced, generated 21% less carbon dioxide emissions and 21% lower PM 2.5 emissions and a 19% increase in Class 1 brick production, while reducing wastage from inferior classes by 56%.

These findings have been endorsed by the Ministry of Environment, Forest and Climate Change (MOEFCC) and the Department of Environment (DOE). Approval has been granted to expand these efforts to the Dhaka Division and other regions. A team from the Ministry, DOE, and icddr,b are in the process of developing and implementing a plan to further reduce air pollution from brick kilns across Bangladesh.

SPOTLIGHT MAJOR ACHIEVEMENTS AND INNOVATIONS

This section highlights a selection of our ongoing research initiatives. Each of these projects holds the potential to significantly advance global health.

ADVANCING GLOBAL NUTRITION WITH MICROBIOTA DIRECTED FOOD

More than 30 million children under five worldwide, especially in Asia and Africa, suffer from moderate acute malnutrition (MAM), a condition with limited effective treatments and an incomplete understanding of its pathogenesis. Additionally, about 18 million children suffer from severe acute malnutrition (SAM), a serious public health concern because it can lead to high mortality rates and long-term health issues. Children with SAM are nine times more likely to die than well-nourished children.

These global health challenges not only impair ponderal and linear growth (wasting and stunting) but also lead to immune and metabolic dysfunction, and altered development of the central nervous system, among other abnormalities. To address this, icddr,b, in collaboration with Washington University in St. Louis, has developed an innovative solution called Microbiota Directed Complementary Food (MDCF). This affordable formula, crafted from locally sourced ingredients (green bananas, chickpeas, soybean, and peanut flour), aims to correct the disturbed development of gut microbiota associated with childhood malnutrition. Initial trials in Bangladesh have shown promising results, with MDCF improving gut health and promoting growth in children suffering from MAM, as detailed in the New England Journal of Medicine.

Building on this success, the formula is being adapted to meet the unique nutritional needs of children with severe acute malnutrition (SAM), aligning with CODEX guidelines for Ready-to-Use Therapeutic Food (RUTF). CODEX Alimentarius provides international food standards, guidelines, and codes of practice that contribute to the safety and quality of food. These standards help to protect consumer health and ensure fair practices in the international food trade. The CODEX Alimentarius Commission (CAC) is a joint body of FAO and WHO that develops international food standards and guidelines. In collaboration with UNICEF, icddr,b researchers have refined the Microbiota Directed Food (MDF) to meet these rigorous standards. MDF has been designed to target both SAM and MAM children.

To assess the efficacy of MDF, large-scale randomised controlled trials have been scheduled in Niger, Burkina Faso, and in Mirpur and Kurigram of Bangladesh.

The trials will require significant quantities of MDF sachets, with projections of 710,589 packets for Niger and 600,600 for Burkina Faso, totalling 121 metric tons. Supported by a new grant from the Bill & Melinda Gates Foundation, icddr,b is overseeing the industrial production of these sachets by a local manufacturer, followed by quality testing and international shipment.

This initiative marks a significant milestone as the first nutritional innovation from Bangladesh to be used in overseas clinical trials, demonstrating icddr,b's pivotal role in addressing global public health challenges through scientific innovation.

Chen RY, Mostafa I, Hibberd MC, Das S, Mahfuz M, Naila NN, Islam MM, Huq S, Alam MA, Zaman MU, Raman AS, Webber D, Zhou C, Sundaresan V, Ahsan K, Meier MF, Barratt MJ, Ahmed T, Gordon JI. A Microbiota-Directed Food Intervention for Undernourished Children. N Engl J Med. 2021 Apr 22;384(16):1517-1528. doi: 10.1056/NEJMoa2023294.

icddr,b FINDS PROMISE IN mRNA-BASED RSV VACCINE FOR OLDER ADULTS

Respiratory syncytial virus (RSV) is a major cause of serious respiratory illness in older adults and individuals with chronic lung and heart diseases. Despite its significant global burden, which includes substantial morbidity and mortality among older adults, there are currently no licensed vaccines to prevent RSV-associated disease, and treatment options are limited to supportive care.

icddr,b scientists conducted a Phase 3, randomised, placebo-controlled multi-country study to evaluate the safety, efficacy, and immunogenicity of an mRNA-based RSV vaccine. This study targeted adults aged 60 years and older, enrolling 2,421 participants across various sites in Bangladesh, including the icddr,b Matlab HDSS, icddr,b Kamalapur study site, Projahnmo Zakiganj, and Sylhet.

Interim analysis revealed a vaccine efficacy of 83.7%, meaning out of 100 vaccinated people, about 84 are protected from RSV-associated lower respiratory tract infections (bronchitis, bronchiolitis, pneumonia, etc.) with at least two signs or symptoms. Published in The New England Journal of Medicine in 2023, the findings showed that administering a single dose of the mRNA RSV vaccine presented no safety concerns and significantly reduced the incidence of RSV-associated lower respiratory tract disease and acute respiratory distress in older adults compared to the placebo.

These results represent a significant advancement in addressing the unmet need for effective RSV prevention in high-risk populations, demonstrating the potential of mRNA vaccines in tackling global health challenges.

Moderna has submitted marketing authorisation applications for this mRNA based RSV vaccine to the European Medicines Agency (EMA), Swissmedic in Switzerland, and the Therapeutic Goods Administration (TGA) in Australia. Additionally, it has begun the rolling submission process for a Biologics License Application to the U.S. Food and Drug Administration (FDA).

Wilson E, Goswami J, Baqui AH, Doreski PA, Perez-Marc G, Zaman K, Monroy J, Duncan CJA, Ujiie M, Rämet M, Pérez-Breva L, Falsey AR, Walsh EE, Dhar R, Wilson L, Du J, Ghaswalla P, Kapoor A, Lan L, Mehta S, Mithani R, Panozzo CA, Simorellis AK, Kuter BJ, Schödel F, Huang W, Reuter C, Slobod K, Stoszek SK, Shaw CA, Miller JM, Das R, Chen GL; ConquerRSV Study Group. Efficacy and safety of an mRNA-based-RSV PreF vaccine in older adults. N Engl J Med. 2023 Dec 14;389(24):2233-2244. doi: 10.1056/NEJMoa2307079.

icddr,b CONTRIBUTES TO EFFECTIVE DENGUE VACCINE DEVELOPMENT

Dengue fever has become a significant public health challenge in Bangladesh since 2000, spreading from metropolitan areas to rural regions. The 2023 outbreak, the largest in country's history, resulted in over 300,000 hospitalisations and more than 1,700 deaths. Other South Asian countries also face escalating dengue outbreaks. Despite advancements in symptom management, effective treatments for dengue remain unavailable, highlighting the urgent need for a vaccine targeting all four dengue serotypes.

In 2015, icddr,b, in collaboration with the Vaccine Testing Center (VTC) of the University of Vermont, USA, launched the "Dengue in Dhaka Initiative (DiDI)" to advance vaccine development. This initiative established clinical trials and laboratory infrastructure

at icddr,b, focusing on the NIH-developed single-dose tetravalent dengue vaccine candidate TV005.

Conducted between 2016 and 2019 a Phase II randomised, placebo-controlled trial assessed the safety, immunogenicity, and three-year durability of TV005. It involved 192 participants across four age groups (ages 1-49). The trial demonstrated that TV005 was well-tolerated, with most vaccinated individuals developing antibodies to all four dengue serotypes. Those previously infected with dengue showed higher antibody levels. Although the study was not designed to evaluate efficacy, no dengue cases were detected in vaccinated volunteers until 2020 during the follow-up period.

These findings, published in Lancet Infectious Diseases, significantly advanced the global understanding of an effective dengue vaccine. Ongoing studies aim to assess the vaccine's long-term efficacy and immune response, with further trials planned in Brazil and India. The DiDI team in Dhaka is preparing for a Phase IIb trial, continuing their critical work towards global dengue control.

Currently, two other tetravalent dengue vaccines by Sanofi and Takeda have completed Phase III trials and are available commercially. The three-dose Sanofi vaccine is limited to children over nine with past dengue exposure, while the two-dose Takeda vaccine best targets serotype 2. These limitations underscore the NIH vaccine's promise for all four serotypes.

Walsh MR, Alam MS, Pierce KK, Carmolli M, Alam M, Dickson DM, Bak DM, Afreen S, Nazib F, Golam K, Qadri F, Diehl SA, Durbin AP, Whitehead SS, Haque R, Kirkpatrick BD. Safety and durable immunogenicity of the TV005 tetravalent dengue vaccine, across serotypes and age groups, in dengue-endemic Bangladesh: a randomised, controlled trial. Lancet Infect Dis. 2024;24(2):150-160. doi:10.1016/S1473-3099(23)00520-0

SINGLE DOSE OF AZITHROMYCIN REDUCES MATERNAL SEPSIS AND DEATH BY ONE-THIRD

A significant breakthrough has emerged from the Azithromycin Prophylaxis in Labor Use Study (A-PLUS), a multicountry trial involving icddr,b. The study found that a single two-gram oral dose of azithromycin during normal delivery can reduce maternal sepsis and deaths by 33%. Maternal sepsis, a severe infection response, can lead to organ failure and death.

Between September 2020 and August 2022, over 29,000 women in Bangladesh, the Democratic Republic of the Congo, Guatemala, India, Kenya, Pakistan, and Zambia participated in the study. Results showed that only 1.6% of women who received azithromycin during labour developed sepsis or died within six weeks after delivery, compared to 2.4% of those who received a placebo. Additionally, women receiving azithromycin had significantly fewer infections, including endometritis, wound infections, and urinary infections. They also experienced fewer hospital readmissions and unscheduled healthcare visits.

The study highlights the potential of azithromycin to save lives, particularly in low- and middle-income countries. While

azithromycin did not reduce the risk of stillbirth, newborn sepsis, or newborn death, its impact on maternal health is profound.

It offers a safe, effective, and low-cost approach to reducing maternal sepsis and deaths globally, providing a new strategy to improve maternal health outcomes.

Tita ATN, Carlo WA, McClure EM, Mwenechanya M, Chomba E, Hemingway-Foday JJ, Kavi A, Metgud MC, Goudar SS, Derman R, Lokangaka A, Tshefu A, Bauserman M, Bose C, Shivkumar P, Waikar M, Patel A, Hibberd PL, Nyongesa P, Esamai F, Ekhaguere OA, Bucher S, Jessani S, Tikmani SS, Saleem S, Goldenberg RL, Billah SM, Lennox R, Haque R, Petri W, Figueroa L, Mazariegos M, Krebs NF, Moore JL, Nolen TL, Koso-Thomas M; A-PLUS Trial Group. Azithromycin to prevent sepsis or death in women planning a vaginal birth. N Engl J Med. 2023 Mar 30;388(13):1161-1170. doi: 10.1056/NEJMoa2212111.

BREAKTHROUGH HIGH-THROUGHPUT TEST FOR EARLY DETECTION OF LIVER CANCER

icddr,b, HKG Epitherapeutics Ltd.; and Bangabandhu Sheikh Mujib Medical University have developed a transformative high-throughput assay for early detection of Hepatocellular Carcinoma (HCC), the most common type of liver cancer. This innovative test identifies HCC through distinctive DNA methylation signatures, potentially revolutionising detection in high-risk populations, such as those with liver diseases.

HCC is often detected at advanced stages, leading to treatment challenges and reduced survival rates. The new assay uses advanced sequencing techniques to differentiate HCC samples from normal tissues and non-HCC tumours, overcoming traditional diagnostic limitations.

Evaluated on 554 participants, including HCC patients, non-HCC cancer patients, individuals with chronic hepatitis B, and healthy controls, the assay demonstrated an HCC detection sensitivity of 84.5% at 95% specificity. This highlights its promising potential for early detection.

This breakthrough in cancer diagnostics significantly contributes to early HCC detection, with the potential to transform patient outcomes and reduce the burden of liver cancer. Plans are underway to launch this test in Bangladesh to improve public health and reduce HCC-related morbidity and mortality.

Cheishvili D, Wong C, Karim MM, Kibria MG, Jahan N, Das PC, Yousuf MAK, Islam MA, Das DC, Noor-E-Alam SM, Szyf M, Alam S, Khan WA, Al Mahtab M. A high-throughput test enables specific detection of hepatocellular carcinoma. Nat Commun. 2023 Jun 7;14(1):3306. doi: 10.1038/s41467-023-39055-7.

UNDERSTANDING THE CAUSES OF STILLBIRTHS AND CHILD MORTALITY

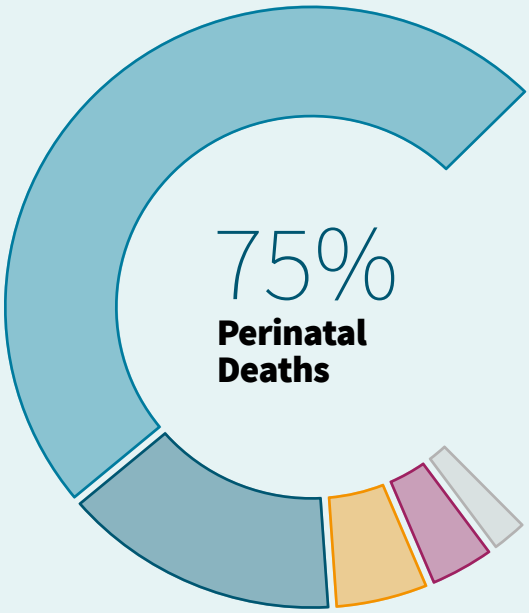
The Child Health and Mortality Prevention Surveillance (CHAMPS) is a global initiative supported by the BMGF, aimed at pinpointing the precise causes of stillbirths and under-5 deaths through community engagement, surveillance, diagnostics, and laboratory innovations.

In Bangladesh, CHAMPS activities are implemented by icddr,b, in collaboration with the Institute of Epidemiology, Disease Control and Research (IEDCR) and the Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka. The health and demographic surveillance system (HDSS) has been established since March 2017 in Baliakandi Upazila, a rural sub-district of Rajbari district, in the west-central part of the country. It covers a population of 235,497. Additionally, the hospital-based surveillance started in September 2017, focusing on stillbirths and

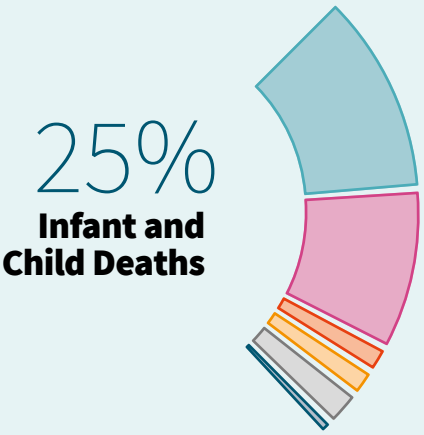
under five children deaths from Baliakandi and six nearby upazilas, in three surveillance facilities. Upon death notification, teams seek for parental consent and collect minimally invasive tissue samples (MITS) within 24 hours of death to determine the cause of death (CoD). Samples undergo microbial cultures, TaqMan assays, haemoglobin tests, and next-generation sequencing.

An expert panel called DeCoDe consists of obstetricians, paediatricians, neonatologists, pathologists, microbiologists and epidemiologist assigns CoDs and prevention recommendations. The panel reviewed 806 cases from 2017 to 2023, including 750 perinatal deaths. Major causes of death (CoD) were perinatal asphyxia or failure to establish breathing (65%), preterm birth complications (20%), infections (7%), and birth defects (5%), undetermined (3%). Among late neonates and infants, primary causes were preterm complications (45%), infections (36%), birth asphyxia (5%), and malnutrition (5%), others (7%), undetermined (2%). Notably, 94% of these deaths were deemed preventable.

Leading Causes of Childhood Mortality



65%	Asphyxia
20%	Preterm Complications
7%	Infections
5%	Birth Defects
3%	Undetermined



45%	Preterm Complications
36%	Infections
5%	Asphyxia
5%	Malnutrition
7%	Others
2%	Undetermined

The study also revealed a high frequency of antibiotic-resistant gram-negative bacteria, underscoring the urgent need for maternal vaccination against *Klebsiella pneumoniae*. Unique cases, such as Listeria-associated stillbirth and the world's youngest Nipah virus case, were identified. In another instance, laboratory investigations helped to identify an *Acinetobacter baumannii* outbreak within a CHAMPS surveillance facility. The CHAMPS team organised training on infection prevention and control in that facility, and the authority complied it through structural and behavioural adjustments. We observed that CHAMPS findings led to changes to existing practices, including the adoption of disposable suction tubes and improved infection control measures.

The impact of these findings is profound, driving significant policy changes and highlighting the crucial role of precise scientific investigation and community engagement in reducing child mortality and improving public health outcomes.

Madrid L, et al. CHAMPS Consortium. Neural tube defects as a cause of death among stillbirths, infants, and children younger than 5 years in sub-Saharan Africa and southeast Asia: an analysis of the CHAMPS network. Lancet Glob Health. 2023 Jul;11(7):e1041-e1052. https://doi.org/10.1016/S2214-109X(23)00191-2.

Mahtab S, et al. CHAMPS Consortium. Causes of death identified in neonates enrolled through Child Health and Mortality Prevention Surveillance (CHAMPS), December 2016 -December 2021. PLOS Glob Public Health 2023 Mar 20;3(3):e0001612. https://doi.org/10.1371/journal.pgph.0001612.

DIGITAL SOLUTIONS
FOR COMBATING NON-COMMUNICABLE DISEASES (NCDs)

Recognising the burden of NCDs, the Non Communicable Disease Control (NCDC) programme of DGHS has developed the "National Guidelines for Hypertension & Diabetes Mellitus Management in Primary Health Care", and implemented treatment protocols for major NCDs in >250 Upazilas for supporting 7 healthcare providers to diagnose, manage, and follow up these conditions in high-risk populations in primary healthcare settings.

Primary healthcare settings in both urban and rural areas in Bangladesh face numerous challenges in managing NCDs due to inadequate infrastructure and low patient awareness. To address these gaps, icddr,b, at the request of Government's NCDC programme, developed an android-based digital system to automate the national NCD management model. The digital system caters to community high-risk individuals in screening, adequate referral to higher facilities, referral scheduling, follow-up, diagnosis and management for hypertension and diabetes according to the national guideline. The digital system was piloted in Baraigram, Kotchadpur, and Saturia Upazilas with extensive support of icddr,b and later implemented in 21 more Upazilas with support of the NCDC and development partners. Till December 2023, 109,227 beneficiaries were enrolled in the system with significant screening and diagnosis rates for hypertension and diabetes.

In rural primary healthcare in Matlab, Chandpur, another study aimed to strengthen hypertension and diabetes care by integrating digital health service. The digital health services include app based screening of hypertension and diabetes at community clinic and referral to UHC by Community Health Care Provider (CHCP) in order to facilitate doctors providing algorithm based treatment for hypertension and diabetes using a digital health platform. This digital service was found to be feasible and acceptable, significantly reducing blood pressure and glucose levels. Following a successful pilot, this model has been adopted for larger-scale implementation in two coastal sub-districts of Khulna and Sathkhira districts.

The digital platform, designed by icddr,b, is interoperable with the national HMIS via DHIS-2, allowing data integration to aid national policy and decision-making. This initiative exemplifies the government's commitment to improving NCD management through innovative digital solutions and collaboration with icddr,b and other key stakeholders.

INCREASED POST-COVID RISKS HIGHLIGHT NEED FOR LONG-TERM CARE

A USAID-funded study has found that individuals hospitalised with COVID-19 face increased risks of diabetes, respiratory, and cardiovascular complications in the weeks following recovery. Conducted by icddr,b and Bangabandhu Sheikh Mujib Medical University (BSMMU) in Dhaka, Bangladesh, the study enrolled 362 clinically recovered COVID-19 patients and followed them over five months to assess long-term effects.

Key findings revealed that survivors over 60 years old are twice as likely to develop cardiovascular and neurological complications compared to those under 40.

Women were found to have a 1.5 to 4 times higher prevalence of post-COVID complications than men. Hospitalised patients, particularly those needing intensive care, were 2-3 times more likely to suffer long-term effects.

The study also showed that hospitalised survivors with pre-existing diabetes had a 9 to 11 times higher risk of uncontrolled blood sugar levels, often requiring insulin therapy. New occurrences of diabetes and renal impairment were notably higher among hospitalised patients.

While most complications decreased over time, issues like shortness of breath, fast pulse rate, PTSD, anxiety, and depression persisted in non-hospitalised groups even after five months. These findings underscore the need for ongoing follow-up and care for COVID-19 survivors, particularly older and hospitalised patients, to monitor and address cardiovascular and metabolic complications.

Afroze F, Arafat SM, Ahmed CM, Alam B, Banu S, Islam MZ, Mahfuz M, Parvin I, Ackhter MM, Shormi I, Islam F, Sultana M, Chowdhury AN, Ur Rahaman MF, Khan AH, Hasan MN, Ahmed S, Chisti MJ, Ahmed T. Features and risk factors of post-COVID-19 syndrome: findings from a longitudinal study in Bangladesh. Lancet Reg Health Southeast Asia. 2023 Apr;11:100134. doi: 10.1016/j.lansea.2022.100134.

USAID'S RDM ACTIVITY – ADVANCING HEALTH SECTOR EXCELLENCE

USAID's Research for Decision Makers Activity (RDMA) has been crucial in supporting Bangladesh's 4th health sector programme, aiming to enhance health sector performance through meticulous implementation research. From May 2017 to October 2023, RDM conducted 27 studies, including assessments, evaluations, and surveys, generating valuable insights. Additionally, RDMA engaged in 24 activities, providing technical assistance, secondary analysis, and situation analyses, and facilitated nine capacity-building initiatives, impacting over 2,300 health policymakers, programme planners, and health professionals.

RDMA's contributions have been instrumental in refining the ongoing 4th health sector programme and shaping the forthcoming 5th health sector programme (2024-29). In collaboration with DGHS, DGFP, and other partners, icddr,b established the national Newborn Signal Functions, now a key indicator in the 5th health sector programme. Findings from the study on licensing private health facilities led to enhancements in the DGHS licensing web portal. RDMA also introduced a standardised register for managing inpatient care for newborns and sick children, which DGHS plans to scale up nationwide.

Further, RDM's automation of the NCD management model through the NCD-eMIS system is being gradually scaled up by DGHS. The successful implementation of the digital EmONC register in all Upazila Health Complexes, with hands-on training for healthcare providers, is

icddr,b holds the closing ceremony of the successful Research for Decision Makers Activity (RDMA) funded by USAID, on October 3, 2023.

another notable achievement. The inclusion of Xpert Ultra for diagnosing pulmonary tuberculosis in children using stool specimens in the national TB guidelines is a testament to RDMA's impact. Additionally, RDMA developed a comprehensive Climate Change and Health (CCH) webpage, compiling vital information on climate change and health.

RDMA's influence is evident in its extensive publication record, including 27 journal articles, 39 technical reports, 11 policy briefs, and 11 media articles. Considering RDMA's remarkable achievements, continued support for similar initiatives could sustain and amplify health sector advancements, contributing to better public health outcomes.

Read more: http://rdm.icddrb.org

Our field worker collecting Health and Demographic Surveillance System data in Matlab, Chandpur.

KEY PROJECTS AND INITIATIVES

This section highlights icddr,b's critical projects addressing tuberculosis, HIV and AIDS, and sexual and reproductive health and innovations.

COMBATING TUBERCULOSIS IN BANGLADESH

USAID's Alliance for Combating Tuberculosis in Bangladesh (ACTB) Activity, led by icddr,b, is one of icddr,b's flagship projects. It supports the National Tuberculosis Control Programme (NTP) to improve TB case detection through health systems strengthening. This project aims to enhance TB service delivery by bridging gaps, introducing new tools and technology, and involving private sectors and civil society. Initiated in March 2020 with a USD 30 million grant, the project received a three-year extension until March 2027 with a total of USD 74.9 million as funding for both the phases.

To achieve its goals, USAID's ACTB focuses on increasing TB case detection among children, drug-resistant TB patients, and high-risk groups. It also facilitates TB Preventive Treatment, engages the private sector, adopts a multisectoral approach, and conducts operational research to inform policies and ensure sustainability.

Enhancing TB diagnosis with AI

In 2023, USAID's ACTB introduced ultra-portable X-ray machines with AI in remote areas to enhance TB diagnosis. These machines, powered by rechargeable batteries and solar panels, provide rapid results and reduce the burden on human readers. Field operations began in January 2023 and, by December 2023, 47,845 individuals were screened, diagnosing 2,526 TB cases.

Advancements in drug-resistant TB diagnosis

ACTB also introduced targeted next-generation sequencing (tNGS) for rapid and accurate drug-resistant TB diagnosis. This method shortens diagnosis time to 3-4 days and was included in the National Strategic Plan (2024-2030). Additionally, policy advocacy led to the adoption of GeneXpert Ultra for better detection of rifampicin resistance.

Addressing isoniazid-resistant TB

A study found a 6.7% resistance rate to isoniazid among TB patients, highlighting the need for rapid molecular testing. For extra-pulmonary TB (EPTB), ACTB

An icddr,b staff member is carrying an AI-based ultra-portable X-ray machine to remote areas to enhance TB diagnosis.

provided free Xpert Ultra testing at icddr,b centres, diagnosing 681 cases in 2023.

TB Screening among diabetics

The initiative also increased diagnosis and treatment of TB among diabetics, screening 1,401,864 patients and diagnosing 3,943 TB cases.

Community awareness and engagement

USAID's ACTB launched a 360-degree awareness campaign, reaching over 57,000 people through local performances and media engagement. This campaign, along with partnerships and research initiatives, has significantly contributed to TB control efforts in Bangladesh.

Looking ahead

Given the exemplary performance and substantial impact of USAID's ACTB, continued support and investment in similar initiatives could further enhance health sector advancements and contribute to improved public health outcomes in Bangladesh.

COMBATING HIV AND AIDS IN BANGLADESH

Bangladesh has maintained a low national HIV prevalence (<0.1%) since its first case in 1989. However, the HIV situation among key populations (KPs) such as female sex workers (FSW), hijra (transgender women), male sex workers (MSW), males having sex with males (MSM), and people who inject drugs (PWID) is alarming. In 2023, the National AIDS/STD Programme (NASP) reported 1,276 new HIV cases nationally, with 42.5% among key populations (KPs), up from 33.0% in 2019—a 28.7% increase over five years, and the prevalence has tripled over the past two decades.

The Programme for HIV and AIDS at icddr,b conducts pioneering research to design evidence-based, people-centred interventions, strengthening the national HIV and AIDS response. The programme addresses the needs of vulnerable and marginalised groups, focusing on overall welfare. It also enhances the capacity of community-based organisations (CBOs) to ensure sustainable impact.

Pre-exposure prophylaxis (PrEP) intervention

In 2023, icddr,b continued its PrEP pilot, a biomedical intervention involving a pill containing two antiretroviral (ARV) drugs that can prevent HIV infections. By December 2023, a total of 232 clients had initiated PrEP. Baseline assessments revealed high-risk behaviours, but follow-ups showed high PrEP retention rates, improved better condom use patterns, and better mental health. No new HIV infections were detected from the cohort who initiated and maintained PrEP during the 22 months of intervention period.

Virtual interventions for healthcare access

In 2023, icddr,b's virtual intervention leveraged social media to provide HIV and STI prevention services to marginalised populations. Initially targeting 5,000 participants, it scaled up to 10,000 following its success. The intervention included health product distribution, behaviour change communication, HIV self-testing, mental health counselling, and linkage to PrEP and anti-retroviral therapy (ART). This approach expanded HIV testing coverage and provided a safe space for participants to disclose their concerns.

Mobilising CBOs to empower marginalised populations

icddr,b collaborates with community-based organisations (CBOs) such as Badhan Hijra Sangha, Sustha Jibon, Socheton Shilpy Sangha, and Sada Kalo. These organisations are mobilised and capacitated to assume ownership of the empowerment initiatives, ensuring sustainability beyond donor-funded interventions. These organisations have also played an instrumental role in a multifaceted empowerment project piloted and scaled up by icddr,b to improve the health, social and economic situation of marginalised populations.

Ways forward beyond conventional HIV interventions

The Programme for HIV and AIDS at icddr,b continues to address the needs of marginalised populations through innovative, evidence-based interventions. By capacitating community-based service providers and developing national SOPs, icddr,b aims to ensure sustainable impact and empower vulnerable groups to exercise their health rights.

INNOVATING TO ADDRESS SEXUAL AND REPRODUCTIVE HEALTH AND RIGHTS

The Advancing Sexual and Reproductive Health and Rights (AdSEARCH) project by icddr,b and supported by the Department of Foreign Affairs, Trade, and Development (DFATD) is a multi-year initiative aimed at advancing knowledge, generating evidence, and influencing policies for diverse demographic groups in Bangladesh. This programme is addressing SRHR burdens, diseases, care-seeking practices, and gender equity through community and facility-based studies.

AdSEARCH has initiated multiple cohort studies, including with adolescents, pregnant women, newly married couples, and female garment workers, who comprise 5% of the total female population aged 15-49 in the country. It has established the country's first surveillance system for key populations, such as transgender individuals and sex workers. The programme is exploring issues like infertility, climate change's impact on SRHR, and mental health among female sex workers.

Facility-based studies are assessing the quality of SRH services through nationwide surveys and qualitative explorations, aiming to strengthen SRH services and improve documentation of neglected health issues.

AdSEARCH is promoting regional and national innovation by developing and testing over 20 novel products and approaches. Innovations include a mobile app for adolescent health education, a Massive Open Online Course (MOOC) for physical education, an HPV self-sampling approach, and a chatbot for menstrual and menopausal issues. Additionally, AdSEARCH has introduced tools like the Pocket Colposcope for cervical cancer screening and a birthing mat to prevent postpartum haemorrhage.

The evidence generated by AdSEARCH has significantly influenced the development of Operational Plans for the 5th Health Sector Programme. Initiatives such as Essential Gynaecological Skills training and mental health services have been proposed for scaling up in multiple districts, reflecting the programme's impact on national health strategies.

National Conference 2023: SRHR in Bangladesh

On 3 May 2023, AdSEARCH hosted the inaugural National Conference on Sexual and Reproductive Health and Rights in Bangladesh (NCSRHR2023). The conference, held at the InterContinental Dhaka, brought together over 400 participants to discuss critical SRHR issues. NCSRHR2023 recognised the lifetime contributions of Professor TA Chowdhury and Dr Halida Hanum Akter with the Excellence in SRHR Award 2023. The event also awarded the three best abstracts and innovations presented, with seven abstracts and nine innovations selected for grants from the 157 abstracts and 112 innovations submitted nationwide.

STRATEGIC OVERVIEW: ALIGNING WITH OUR SCIENTIFIC GOALS

An overview section that maps out the year's key achievements and activities against each strategic goal outlined in the new strategic plan.

GOAL 2.1

ADDRESS HEALTH RISKS RELATED TO CLIMATE CHANGE

Climate change significantly impacts health in LMICs like Bangladesh. Rising temperatures, extreme weather, and sea-level rise threaten food security and livelihoods, especially in coastal and densely populated areas. Bangladesh faces increased health risks, including heat stress, water salinity, and environmentally driven migration.

The Climate Change, Health and Population Science (CCHPS) initiative at icddr,b addresses these health impacts by studying data from health and demographic surveillance system (HDSS) sites and other vulnerable areas. We have examined the links between climate variables and health outcomes, such as high blood pressure associated with water salinity and temperature associations with birth outcomes. CCHPS prioritises identifying health impacts and testing interventions such as jutin houses (built with a robust, durable, bio-acceptable, and recyclable replacement for tin roofs, made from jute fibre and resin), addressing gender issues, enhancing community resilience through adaptation models, and assessing effects on food systems and migration.

CCHPS is an active member of several global organisations including the "EnHealth-Bob" network in the Bay of Bengal to link public health and climate change data, promoting policy action plans for climate resilience and better health outcomes in vulnerable populations.

icddr,b STUDY EXPLORES RISING TEMPERATURES AND MISCARRIAGE RISK IN COASTAL BANGLADESH

Limited research in developing regions prompted a study in Chakaria (2012-2020) analysing over 23,000 pregnancies. Pregnant women exposed to temperatures between 28°C and 32°C had a 25% increased risk of miscarriage compared to those experiencing cooler temperatures (16-21°C). This finding is concerning as Bangladesh's average temperature has risen by 0.16°C per decade since 1971, with projections indicating further increases. By mid-century, the number of extremely hot days in Bangladesh is projected to rise significantly. Climate models predict that by 2050, temperatures exceeding 40°C will become much more frequent, especially during April to July. Timely adaptation strategies to prevent miscarriage in high-heat areas like coastal Bangladesh are crucial, especially for densely populated regions.

Das S, Sagar S, Chowdhury S, Akter K, Haq MZ, Hanifi SM. The risk of miscarriage is associated with ambient temperature: evidence from coastal Bangladesh. Fron Public Health. 2023 Nov 3;11:1238275. doi: 10.3389/fpubh.2023.1238275

BANGLADESH-SPECIFIC CLIMATE CHANGE AND HEALTH RESOURCE WEBSITE

icddr,b, with support from USAID's Research for Decision Makers (RDM) activity, has launched a comprehensive climate change and health website: https://cch.icddrb.org/.

This platform provides real-time and up-to-date data, research findings, and information on climate change impacts on health, serving as a valuable resource for researchers, policymakers, and the public.

GOAL 2.2

ACHIEVING GENDER EQUALITY AND PROMOTING SRHR

Patriarchal structures and rigid gender norms disadvantage gender diverse populations, leading to health disparities. In line with our commitment to address health risks related to gender and sexual and reproductive health and rights (SRHR) we study: (1) violence against women and children; (2) child marriage; (3) key populations; and (4) SRHR.

Three in four women in Bangladesh experience intimate partner violence. In 2023, we developed the Economic Coercion Scale-20 (ECS-20) to measure economic violence. We assessed women's experiences of violence over time and explored its intersection with violence against children. We are assessing the implementation of the 2018 ban on the two-finger test for rape evidence collection.

Bangladesh has one of the highest child marriage rates, with one in two girls marrying before 18. We evaluated the Tipping Point programme, which significantly reduced child marriage rates.

We are mapping SRHR service facilities for the key populations (e.g., males having sex with men, male and female sex workers and hijras) in Dhaka and Jessore. Under AdSEARCH, we are testing over 20 innovative approaches to SRHR programming.

IMPROVING THE ADOPTION OF RESPECTFUL MATERNITY CARE IN BANGLADESH, GHANA AND TANZANIA

Respectful maternity care (RMC) refers to the humane and dignified treatment of a childbearing woman throughout her pregnancy, birth, and the period following childbirth, is often inaccessible for many women. We assessed the impact of implementing maternal and newborn health (MNH) quality standards in 43 healthcare facilities across Bangladesh, Ghana, and Tanzania. Using interviews and observations, we detected: (1) an increase in RMC training and a significant reduction in physical abuse in Bangladesh; (2) better communication and a reduction in verbal and physical abuse in Ghana; and (3) enhanced privacy in Tanzania. Institutionalising MNH care standards is feasible in low- and middle-income countries, facilitating the adoption of RMC.

Manu A, Pingray V, Billah SM, Williams J, Kilima S, Yeji F, Gohar F, Wobil P, Karim F, Muganyizi P, Mogela D, El Arifeen S, Vandenent M, Matin Z, Janda I, Zaka N, Hailegebriel TD. Implementing maternal and newborn health quality of care standards in healthcare facilities to improve the adoption of respectful maternity care in Bangladesh, Ghana and Tanzania: a controlled before and after study. BMJ Glob Health 2023;8:e012673. doi:10.1136/bmjgh-2023-012673

IMPACT OF CHILD MARRIAGE ON OBSTETRIC COMPLICATIONS AND PERINATAL DEATH

Child marriage drives adolescent pregnancies, increasing obstetric complications and perinatal mortality in South Asia. An analysis of 56,155 married adolescents in Baliakandi from 1990-2019 revealed child marriages declined from 71% to 53%, but adolescent pregnancies still pose significant risks. Girls aged 13–15 face a 36% higher risk of complications and 2.23 times more stillbirths than adults. Preventing child marriage can enhance maternal and child health.

Lee KH, Chowdhury AI, Rahman QS, Cunningham SA, Parveen S, Bari S, El Arifeen S, Gurley ES. Child marriage in rural Bangladesh and impact on obstetric complications and perinatal death: Findings from a health and demographic surveillance system. PLoS One. 2023 Jul 19;18(7): e0288746. https://doi.org/10.1371/journal.pone.0288746

EXPLORING CHEMSEX AMONG YOUNG AND ADOLESCENT MSM

This study explored the contexts and implications of chemsex (sexual activity, mostly between men, while under the influence of drugs) on a group of young and adolescent self-identified MSM. Data from qualitative research and ongoing pilot interventions revealed key motivations, including peer influence, curiosity, and the desire for enhanced sexual performance. Methamphetamine use increased sexual stamina but also led to higher sexual violence risk and reduced condom use. This shows that, chemsex, driven by socio-sexual contexts, perpetuates risky sexual behaviours and compromises sexual health. Harm reduction interventions must consider these socio-sexual dynamics and age-specific needs.

Irfan SD, Sarwar G, Emran J, Khan SI. An uncharted territory of sexualized drug use: exploring the dynamics of chemsex among young and adolescent MSM including self-identified gay men in urban Dhaka, Bangladesh. Front. Psychol. 2023 Jun 22; 14:1124971. doi: 10.3389/fpsyg.2023.1124971

GOAL 2.3

PREVENT AND CONTROL NON-COMMUNICABLE DISEASES (NCDs)

The Non-communicable Disease Unit at icddr,b has been actively identifying significant solutions for the prevention and control of NCDs across different stages of the life cycle, both in Bangladesh and beyond. Our innovative and cost-effective multi-component intervention for the control of hypertension in rural communities has been accepted by all levels of stakeholders and has supported the NCD Control Programme of the DGHS in developing a national guideline for the treatment of hypertension and diabetes in Bangladesh.

Our current work focuses on generating research-driven evidence and adopting already identified best practices in Bangladesh and the Global South to strengthen services at primary care facilities. We are generating new evidence and knowledge from existing datasets on NCDs, along with the impact of other cross-cutting issues such as infectious diseases, nutrition, environmental change, genomics, and mental health. This is aimed at building the capacity of local-level health managers for decision-making about health emergencies, particularly during the global pandemic, and supporting the quality of NCD care in Bangladesh.

Through our strong collaborations with the Government of Bangladesh and many reputed research institutions in the Global South, we are committed to finding low-cost solutions for the early detection of major NCDs through a life course approach. We aim to develop pragmatic, sustainable strategies to control the severity of NCDs and prevent premature deaths globally.

BURDEN OF DEMENTIA IN BANGLADESH

icddr,b scientists found that the overall prevalence of dementia among individuals aged 60 years or older was 8.0%. The prevalence varied significantly across different sociodemographic characteristics, with higher rates observed among females, older age groups, and those with no education. There were no significant differences in prevalence between urban and rural areas or across different socioeconomic statuses. Addressing this rising burden requires targeted interventions for risk reduction, awareness, early detection, and accessible care to ensure individual and societal well-being.

Naheed A, Hakim M, Islam MS, Islam MB, Tang EYH, Prodhan AA, Amin MR, Stephan BCM, Mohammad QD . Prevalence of dementia among older age people and variation across different sociodemographic characteristics: a cross-sectional study in Bangladesh. Lancet Reg Health Southeast Asia. 2023 Aug 24;17:100257. doi: 10.1016/j.lansea.2023.100257.

EMPOWERING HEALTH INNOVATION IN ASIA

icddr,b scientists helped strengthen research capacities in Nepal through The Global Health Network (TGHN) Asia. TGHN Nepal launched in December 2023, expanding data science and capacity-building efforts. With over 7,000 participants from 20 countries, TGHN Asia's initiatives, including the Data Club and Data Clinic, advance health research and data-driven solutions across the region.

EXPLORING LINK BETWEEN BREASTFEEDING AND NCDs

Evidence indicates chronic diseases in adulthood often originate in early life, influenced by infant feeding practices. The Nutrition Research Division's study investigates the link between breastfeeding in early infancy and non-communicable disease (NCD) indicators in adolescence, using the MAL-ED birth cohort. Participants, now aged 13-15, will be assessed for various chronic disease markers, including blood pressure, body composition, fasting insulin, insulin resistance, glucose levels, HbA1C, lipid profile, PCSK9, and protein C. The study also examines the impact of breastfeeding on cognitive development and long-term health.

GOAL 2.4

IMPROVE HEALTHCARE IN URBAN POPULATIONS AND ACHIEVE UNIVERSAL HEALTH COVERAGE

Scientists across all four of icddr,b's divisions are working to improve health and increase access to healthcare among urban populations. Urban environments bring particular health risks, particularly for new migrants, the poor and those living in informal settlements. Furthermore, compared to rural areas of Bangladesh, government healthcare provision is patchy in urban centres and many city dwellers rely on the unregulated private sector. High out-of-pocket expenses and inequities hinder access for the disadvantaged. Inefficient human resource management and poor governance are major issues.

icddr,b is maintaining an Urban Health and Demographic Surveillance System (UHDSS) in over 40,000 households at informal settlements of Dhaka, Gazipur and Narayanganj city corporations, as well as developed a data collection systems for monitoring and evaluations. These research platforms enable us to understand the patterns of health and associated risk factors and to develop and test novel interventions and service delivery models.

Razzaque A, Chowdhury MR, Mustafa AHMG, Mahmood SS, Iqbal M, Hanifi SMA, Islam MZ, Chin B, Adams AM, Bhuiya A, & Reidpath DD 2023. Cohort Profile: Urban Health and Demographic Surveillance System in slums of Dhaka (North and South) and Gazipur City Corporations, Bangladesh. International journal of epidemiology, 52(5), e283–e291. https://doi.org/10.1093/ije/dyad080

NUTRITION SERVICES MODEL IN DHAKA SLUMS

With the aim of developing a sustainable nutrition service model, icddr,b launched a project titled "Nutrition for Children, Adolescent Girls, and Pregnant Women (Nutri-CAP)" in the Bauniabadh slum of Mirpur, Dhaka. This model trains local women as counsellors to provide home and community-based group counselling. The project focuses on optimising pregnancy weight gain, enhancing dietary diversity in adolescent girls, and promoting proper growth in young children. It also aims to improve water, sanitation, and hygiene (WASH) practices.

EXPLORING MICROBIOTA-DIRECTED BALANCED ENERGY PROTEIN (MD-BEP)

The Maternal Environmental Enteric Dysfunction (EED) study explores whether small intestinal microbiota contributes to enteropathy and malnutrition in young Bangladeshi women. Pregnant and non-pregnant low-BMI women receive MD-BEP supplements, as recommended by WHO for undernourished pregnant women, to address intergenerational undernutrition. MD-BEP, offering 500 Kcal, 14g protein, essential micronutrients, and substrates for beneficial microbiota, is provided daily in aluminium foil pouches.

Developed in 2023, the product is now in the enrolment and feeding phase.

EVALUATING THE UNICEF AALO CLINIC MODEL OF URBAN PRIMARY HEALTHCARE

In order to improve the health status of urban people, especially the poor, UNICEF/ Sida has established Aalo Clinics (model clinic) in 2021 to provide comprehensive primary healthcare services. For monitoring and evaluation of the healthcare services, UNICEF/Sida is also supporting the Urban Health and Demographic Surveillance System (UHDSS). The UHDSS provides community-based information on the demographic, health and health service indicators including socioeconomic data to understand the access and utilisation of services in relation to population dynamics, migration, socio-cultural, and financial barriers. The UHDSS reports periodic results in the health outcomes related to sexual and reproductive health, maternal-child health and health care services, infant-young and child feeding practices, child immunisation, and medical and social causes of deaths.

PANDEMIC PREPAREDNESS AMONG URBAN SLUM DWELLERS

Drawing on learning from the Covid-19 pandemic that revealed the vulnerability of poor urban women to both direct infection, and indirect impoverishment, during the pandemic, icddr,b scientists, in collaboration with IEDCR, have initiated a study on pandemic preparedness among the urban poor, focusing on women and factory workers.

EVALUATING SHASTHYO SUROKHSHA KARMASUCHI

Our UHC research team evaluated the government-sponsored health protection scheme, Shasthyo Surokhsha Karmasuchi (SSK), in Tangail district. The study, including 2,315 below-poverty-line households, found SSK had impact in reduction of out-of-pocket healthcare expenses and identified challenges like exclusion, selection biases, and low service utilisation, aiding its redesign and expansion to seven districts.

ENGAGING THE PRIVATE SECTOR FOR FAMILY PLANNING

Bangladesh's total fertility rate is stagnant at 2.3 births per woman, with only 8% using long-acting reversible contraceptives or permanent methods (LARC/ PM). icddr,b scientists found that engaging private health facilities significantly increased LARC/ PM use among postpartum women. Dedicated antenatal care counselling boosted LARC/PM uptake. Scaling these interventions across more areas supports national family planning goals and reduces unwanted pregnancy risks.

IMMUNISATION EQUITY HUB

To support Gavi 5.0 (Strategy for 2021–2025), Bangladesh's Zero-dose (ZD) Country Learning Hub identified missed communities with ZD and under-immunised (UI) children. Assessments revealed ZD/UI children are in regions like haor, hilly, coastal, and urban slums. Innovative interventions such as EPI e-Tracker, use of e-screening check list, modified EPI service schedule, advocacy with community leaders are being implemented in six areas to improve vaccination equity and reach underserved populations.

CERVICAL CANCER SCREENING

The PRESCRIP-TEC project (https://prescriptec.org/) aimed to assess the WHO strategy to eradicate cervical cancer in low- and middle-income countries via screening programmes. It used women-friendly, cost-effective Human papillomavirus (HPV) self-sampling tests and treatments, enhancing participation in Europe, Bangladesh, India, Uganda, and the Slovak Republic. The EU-funded three-year project (Feb 2021-Jan 2024) enrolled 32,000 women across four countries.

In Bangladesh, icddr,b led the research, while Friendship, a needs-driven NGO, managed field activities in Kurigram, Gaibandha, and Sathkhira districts, enrolling 8,000 women aged 30-60.

Interim findings showed HPV prevalence rates of 2.1% in Bangladesh, 23.2% in Uganda, 6.4% in India, and 5.8% in Slovakia, with self-swab acceptance rates of 99.8% in Uganda, 99.1% in Bangladesh, 73.4% in India, and 82.1% in Slovakia.

GOAL 2.5

PREVENTING AND CONTROLLING **INFECTIOUS DISEASES**

We are committed to preventing and controlling infectious diseases by understanding infections, risk factors, and transmission dynamics. Our research explores mortality and morbidity causes in humans and animals, the role of the microbiome, genome, antibiotic resistance, and environmental contaminants. We will study vaccines, therapeutics, diagnostics, and interventions for endemic and pandemic threats, and respond to pandemics, emergencies, and disasters.

Bangladesh remains burdened with pneumonia, respiratory infections, tuberculosis, diarrhoea, and enteric fever, which cause nearly one in five deaths. Rapid urbanisation has increased populations in slums, hotspots for infectious diseases due to poor conditions. Dengue, Nipah virus, and COVID-19 are significant threats, with multidrug-resistant tuberculosis also critical.

Our expertise in laboratory, clinical, and population-based research enables us to track infections and respond to outbreaks. We focus on disadvantaged populations, combining vaccination and treatment to halt disease transmission.

Our priorities include assessing infection burden and transmission, identifying vulnerable populations, and investigating causes of morbidity and mortality. We will monitor antimicrobial resistance, develop prevention strategies, and scale up vaccines, therapeutics, diagnostics, and interventions to address both endemic and pandemic threats. Through these efforts, we aim to meet Sustainable Development Goals 3, 6, and 11.

NEW H5N1 CLADE FOUND

icddr,b's One Health Lab, with US CDC funding, developed a nanopore Next-generation sequencing (NGS) method for rapid subtyping and whole genome sequencing of avian influenza. This enabled the detection of the rare H5N1 clade 2.3.4.4b in a duck in Tanguar Haor, Bangladesh, and 16 other subtypes. These novel findings promise improved early detection and prevention of AIV spillover into domestic poultry through regular winter sampling of migratory birds.

MALARIA ELIMINATION STRATEGY

icddr,b developed a private sector engagement strategy for Bangladesh's National Malaria Elimination Programme. Supported by WHO, the strategy revealed significant unreported contributions from private health facilities and strong interest in collaboration. A successful pilot in Alikadam Upazila led to 98.4% of malaria cases being reported. The strategy will expand in Bandarban district, promising enhanced malaria control and aiming for elimination by 2030.

COMBATING NIPAH VIRUS INFECTION

In 2023, icddr,b, IEDCR, and CDC continued their pioneering Nipah virus (NiV) surveillance in Bangladesh, identifying 14 cases, the highest in a decade. This effort, the world's longest-running human NiV surveillance, guided national policies, resulting in a dedicated Nipah hospital. International presentations highlighted icddr,b's crucial role in global health.

NIPAH IMMUNITY TRANSFERRED TO NEWBORN

Our scientists have confirmed, for the first time, the maternal transfer of immunity against Nipah virus (NiV) to newborns. This discovery offers potential for protecting infants and guiding vaccine recommendations for pregnant women. A mother who contracted NiV in 2019 and became pregnant in 2021, passed on anti-IgG antibodies to her child. This suggests that immunity can be transferred from mother to baby before birth. The preliminary evidence, consistent with similar events involving other viruses, calls for further assessment of NiV-specific immune properties in newborns. Given NiV's high mortality rate, avoiding raw date palm sap remains crucial to prevent infections.

Satter SM, Nazneen A, Aquib WR, Sultana S, Rahman MZ, Klena JD, Montgomery JM, Shirin T. Vertical transfer of humoral immunity against Nipah virus: A novel evidence from Bangladesh. Trop Med Infect Dis. 2022 Dec 27;8(1):16. doi: 10.3390/tropicalmed8010016.

GOAL 2.6

IMPROVING MATERNAL, NEWBORN AND CHILD HEALTH THROUGH IMPROVED UNDERSTANDING, ESPECIALLY OF NEGLECTED ISSUES, AND INNOVATIONS

We are committed to improving maternal, newborn, child, and adolescent health by addressing newborn deaths and researching early childhood development. Our goal is to enhance outcomes by identifying high-risk pregnancies and developing innovative management strategies. We will investigate risk factors for major health conditions, including mental health, affecting women, children, and adolescents.

Globally, a woman dies every two minutes from pregnancy-related complications, and 5.2 million children under five die annually. Despite progress, Bangladesh faces high maternal and newborn mortality rates, with over 50% of women delivering at home without skilled birth attendants.

Our track record includes scaling up interventions like family planning, magnesium sulphate for pre-eclampsia, and zinc for diarrhoea. We influenced policies on chlorhexidine for umbilical cord care and early home visits after childbirth.

We are prioritising the reduction of inequities, focus on high-risk pregnancies, and develop interventions for early childhood stimulation and adolescent health, aligning with SDGs 3 and 5.

SAVING NEWBORNS AND ACHIEVING SDG

Neonatal mortality remains high in Bangladesh, with 20 deaths per 1,000 live births in 2022. The Special Care Newborn Units (SCANU) established by UNICEF, USAID, and Save the Children in 59 facilities aim to reduce neonatal deaths. icddr,b conducted a retrospective longitudinal study of neonates who were admitted to the SCANU at Faridpur Medical College Hospital in the district of Faridpur during 2018, and found a 39% neonatal death rate in that hospital, highlighting the need to address early discharge and improve care quality. icddr,b through another study showed that effective interventions like Kangaroo Mother Care (KMC) is indeed promising but has implementation challenges. Researchers suggest strengthening the involvement of other family members to overcome the challenges.

Enhancing newborn care at SCANUs and supporting KMC practices can help Bangladesh achieve its SDGs. Addressing these issues comprehensively will significantly improve neonatal survival rates.

Kumar AA, Lee KH, Pervez AF, Bari S, Deb C, Arifeen SE, Islam F, Gurley ES. Factors associated with Neonatal Survival in a Special Care Newborn Unit in a Tertiary Care Hospital in Bangladesh. Am J Trop Med HYG. 2023 Apr;108(4):844. doi: 10.4269/ajtmh.22-0302

Sjömar J, Ottesen H, Banik G, Rahman AE, Thernström Blomqvist Y, Rahman SM, Målqvist M. Exploring caregivers' experiences of Kangaroo Mother Care in Bangladesh: A descriptive qualitative study. Plos one. 2023 Jan 23;18(1):e0280254. doi: 10.1371/journal.pone.0280254.

IMPROVING MATERNAL HEALTHCARE

Maternal healthcare utilisation in Bangladesh shows significant inequities. The BDHS 2022 highlighted disparities between urban and rural areas: compared to urban areas, women in rural areas are less likely to receive quality ANC (33% versus 17%) and have their deliveries assisted by medically trained providers (82% versus 65%). Interventions implemented by icddr,b in rural areas supported in reducing these gaps. A maternal and newborn health service package consisting of birth and newborn care preparedness counselling, updated safe delivery-kit, management of postpartum haemorrhage and eclampsia, home-based essential newborn care by CSBAs, formation of community support groups and sensitisation of mothers in

Sirajganj improved skilled ANC, birth attendance, and Postnatal care-PNC utilisation ratios. Another study measuring the effect of the Friendship integrated interventions on utilisation of maternal health services in riverine areas saw mothers three times more likely to receive skilled ANC, birth attendance, and PNC services. These findings promise improved coverage of maternal health services in underserved areas.

Ahmed A, Rahman F, Sayeed A, Tanwi TS, Siddique AB, Hossain AT, Ether ST, Akter E, Tahsina T, Rahman SM, Arifeen SE. Effect of an integrated maternal and neonatal health intervention on maternal healthcare utilisation addressing inequity in Rural Bangladesh. Arch Public Health. 2023 Aug 22;81(1):153. doi: 10.1186/s13690-023-01155-7.

Huq NL, Ahmed A, Islam TT, Rahman F, Hanson M, Sayeed A, Nusrat N, Mazumder T, Rasul KG, Turza MR, Siddique RA. Community-based integrated intervention for skilled maternal health care utilization in riverine remote areas, Bangladesh. Sex Reprod Healthc. 2023 Sep 1;37:100892. doi: 10.1016/j.srhc.2023.100892

GAPS IN MATERNAL DEATHS AND WAYS TO ADDRESS

A team of researchers at icddr,b analysed data from the 2016 Bangladesh Maternal Mortality and Health Care Survey and published four articles addressing maternal mortality in Bangladesh. The analyses revealed a maternal mortality ratio (MMR) of 196 per 100,000 live births. Major causes included haemorrhage (31%), eclampsia (23%), and indirect causes mainly stroke, cancer, heart disease and asthma (21%). Most maternal deaths occurred within 24 hours post-delivery. The findings highlight gaps in maternal health strategies and the need for the '3Es': early identification, early diagnosis, and early treatment. Improved referral systems and emergency transportation can prevent in-transit deaths, promising better maternal health outcomes.

Hossain AT, Siddique AB, Jabeen S, Khan S, Haider MM, Ameen S, Tahsina T, Chakraborty N, Nahar Q, Jamil K, Arifeen SE, Rahman AE. Maternal mortality in Bangladesh: Who, when, why, and where? A national survey-based analysis. J Glob Health. 2023 Jun 2;13:07002. doi: 10.7189/jogh.13.07002

Jabeen S, Siddique AB, Hossain AT, Khan S, Haider MM, Tahsina T, Ahmed A, Ameen S, Chakraborty N, Nahar Q, Jamil K, Arifeen SE, Rahman AE. Haemorrhage-related maternal mortality in Bangladesh: Levels, trends, time of death, and care-seeking practices based on nationally representative population-based surveys. J Glob Health. 2023 Apr 7;13: 07001. doi: 10.7189/jogh.13.07001

Khan S, Siddique AB, Rahman AE, Jabeen S, Hossain AT, Haider MM, Zohora FT, Rahman

A newborn is receiving Kangaroo Mother Care treatment.

MM, Arifeen SE, Jamil K. Preeclampsia and eclampsia-specific maternal mortality in Bangladesh: Levels, trends, timing, and care-seeking practices. J Glob Health. 2023 Jul 14;13: 07003 doi: 10.7189/jogh.13.07003

Haider MM, Siddique AB, Jabeen S, Hossain AT, Khan S, Rahman MM, Zohora FT, Chakraborty N, Nahar Q, Rahman AE, Jamil K. Arifeen SE. Levels, trends, causes, place and time of, care-seeking for, and barriers in preventing indirect maternal deaths in Bangladesh: An analysis of national-level household surveys. J Glob Health. 2023 Apr 28;13: 04019. doi: 10.7189/jogh.13.04019

PROTECTING ADOLESCENT GIRLS FROM VIOLENCE

An icddr,b study analysing data from the 2019–2020 Bangladesh Adolescent Health and Wellbeing Survey found that adolescent girls with higher education and wealth, and those living with parents or in-laws, are protected against intimate partner violence (IPV). Girls were three times more likely to hold egalitarian views on gender roles than boys. Encouraging gender-equitable attitudes and raising the marriage age can reduce IPV and improve health outcomes. These findings promise significant advancements in protecting adolescent girls in Bangladesh.

Streatfield AJ, Rahman MM, Khan S, Haider MM, Rahman M, Nahar Q, Jamil K. What shapes attitudes on gender roles among adolescents in Bangladesh. Front Public Health. 2023 Mar 28;11:1121858. doi: 10.3389/fpubh.2023.1121858

Rahman M, Jamil K, Nahar Q, Chakraborty N, Haider MM, Khan S. Factors that provide protection against intimate partner physical violence among married adolescents in Bangladesh. Front Public health. 2023 Apr 3;11:1125056. doi: 10.3389/fpubh.2023.1125056.

COMBATING ANAEMIA IN INFANTS AND PREGNANT WOMEN

In Narayanganj, 38% and 24% of pregnant women suffer from anaemia or iron-deficiency anaemia respectively. An ongoing icddr,b study addresses anaemia in pregnant women in rural Bangladesh through a randomised controlled trial. The EDIVA trial- comparing intravenous and oral iron for treating moderate-severe anaemia, with promising outcomes for birthweight and infant development and a standalone demonstration project to validate the safe delivery of intravenous iron for treating maternal anaemia in primary healthcare settings. The same research group earlier conducted the BRISC trial (2017-2020) supplementing infants at 8 months of age with iron or iron-containing multiple micronutrient powder. The study showed iron supplementation reduced anaemia without adverse effects, though cognitive scores remained unchanged, while neural indices of habituation using auditory event-related brain potentials did not improve nor was there sustained brain activity measures using resting electroencephalography (EEG) at the 9-month follow-up. Current research reassesses long-term effects on growth and behaviour. These findings promise improved maternal and child health outcomes.

Larson LM, Feuerriegel D, Hasan MI, Braat S, Jin J, Tipu SMMU, Shiraji S, Tofail F, Biggs B-A, Hamadani JD, Johnson KA, Bode S, Pasricha S-R. Effects of iron supplementation on neural indices of habituation in Bangladeshi children. Am J Clin Nutr. 2023 Jan;117(1):73-82. doi: 10.1016/j.ajcnut.2022.11.023.

A field worker is conducting a session with local mothers in Matlab, Chandpur, to raise awareness about iron deficiency.

GOAL 2.7

REDUCE MATERNAL, ADOLESCENT AND CHILDHOOD MALNUTRITION

We are dedicated to addressing maternal, adolescent, and childhood malnutrition, aligning our efforts with Sustainable Development Goals 2 and 3. Approximately two billion individuals worldwide suffer from malnutrition, causing 45% of annual deaths among children under five. In Bangladesh, malnutrition affects over half of the population, with 350,000 children experiencing severe acute malnutrition and over one million children suffering from moderate acute malnutrition. Additionally, 24% of children under five are stunted, 12% of women are underweight, and around 15% are of short stature.

Our comprehensive research, spanning fundamental laboratory investigations to assessments of preventive and treatment programmes, aims to inform policy development and create scalable solutions for malnutrition. Our key priorities include preventing and treating childhood malnutrition, achieving food security, enhancing adolescent nutrition, and improving maternal nutrition. We leverage multi-omics technology and data science to understand and address nutritional challenges. Through cross-departmental collaborations, we also tackle related areas such as water, sanitation, hygiene, and maternal health. Our goal is to generate impactful interventions and contribute to achieving global nutrition targets by 2027.

EXPLORING MACHINE LEARNING TO PREDICT CHILD SURVIVAL

icddr,b scientists used hospital data and Machine Learning (ML) models to predict mortality in children under 5 admitted to the Paediatric Intensive Care Unit (PICU) and forecast weight gain in children with severe acute malnutrition. Analysing data from over 5,000 children, they found that random forest models accurately predicted mortality, while key predictors for weight gain included admission measurements, age, and formula feeding. These findings highlight the importance of ML in patient management and risk stratification.

GREEN BANANA DIET FOR DIARRHOEA

Diarrhoea causes 480,000 young deaths globally each year, with 7% of under-five deaths in Bangladesh in 2019. Persistent diarrhoea remains a concern in low and middle-income nations. A trial at icddr,b's Dhaka Hospital found that a green banana mixed rice suji diet significantly improved recovery rates (58%) and reduced relapse rates (7%) compared to standard rice suji (31% recovery, 24% relapse). This effective diet is now part of icddr,b's persistent diarrhoea management protocol.

Sarmin M, Hossain MI, Islam SB, Shikha SS, Alam MNH, Sarker MSA, et al. Green Banana Mixed Diet is Beneficial in the Management of Childhood Persistent Diarrhea: An Open, Randomized-Controlled Trial. Acta Paediatrica. 2023. https://doi.org/10.1111/apa.16810.

RURAL ADOLESCENT GIRLS' FOOD INSECURITY

Our study examined micronutrient status in 387 adolescent girls in food-insecure, disaster-prone northern Bangladesh. Supported by the Mujib 100 Research Grants for Women, we conducted surveys in wet and dry seasons. Over four-fifths of households faced food insecurity, with increased dietary diversity in the wet season. High prevalence rates of iodine deficiency (especially during the wet season) and anaemia were observed. These findings highlight the urgent need for targeted interventions to address food insecurity and micronutrient deficiencies in this region.

FORTIFIED RICE REDUCES ANAEMIA AND ZINC DEFICIENCY

Micronutrient deficiency is a major public health concern in Bangladesh, with over half of reproductive-aged women affected. A year-long study in five districts showed that fortified rice (FFR) significantly reduced anaemia by 4.8% and zinc deficiency by 6% among vulnerable women. In

contrast, anaemia increased by 6.7% in the non-FFR group. Higher FFR consumption was linked to fewer anaemia cases. These findings led to the inclusion of rice fortification in the "National Strategy for Prevention and Control of Micronutrient Deficiencies in Bangladesh 2015-2024," underscoring its importance in combating micronutrient deficiencies.

Ara G, Khanam M, Rahman AS, Islam Z, Farhad S, Sanin KI, et al. (2019) Effectiveness of micronutrient-fortified rice consumption on anaemia and zinc status among vulnerable women in Bangladesh. PLoS ONE 14(1): e0210501. https://doi.org/10.1371/journal.pone.0210501

INSIGHTS FROM SUCHANA PROGRAMME IN ADDRESSING STUNTING

The Suchana Programme, the longest intervention trial for stunting, aimed to reduce stunting by 6% in three years among children under two in Sylhet and Moulvibazar. The baseline survey showed 52.7% stunting, dropping to 50.0% at endline. Key factors influencing stunting included lack of hygienic latrines, fewer than four antenatal care visits, low maternal education, large household size, and child's age and gender. The model's sensitivity was 61%, specificity 56%, and correctly classified rate 59%. Future interventions should target adolescent mothers, integrating nutrition-sensitive and nutrition-specific activities to improve outcomes.

Humphrey JH and Prendergast AJ, Population-level linear growth faltering in low-income and middle-income countries. Lancet Glob Health, 2017. 5(12): p. e1168-e1169.

Haque MA, et al., A predictive modelling approach to illustrate factors correlating with stunting among children aged 12-23 months: a cluster randomised pre-post study. BMJ Open, 2023. 13(4): p. e067961.

GOAL 2.8

ENHANCE LABORATORY SERVICES AND SUPPORT GENOMICS RESEARCH

We are committed to enhancing laboratory services and supporting genomics research by continuously developing our research infrastructure. Our state-of-the-art laboratories for human, animal, and microbial research are among the best equipped in the region. Accredited for 177 test parameters under ISO 15189 and ISO 15190 standards, the diagnostic labs support both icddr,b research and external clients, with proceeds funding humanitarian projects. In 2023, laboratory services supported 46 research projects across icddr,b and published seven original research papers.

We invest in cutting-edge equipment and staff training to maintain high-quality operations and expand services. Our field sites, integral to our research, support large-scale clinical trials and demographic surveillance. The Matlab site, the longest-running in the Global South, exemplifies our capability in health and demographic surveillance.

The icddr,b Genome Centre (iGC) strengthened its resources, completing over 1,200 genomic sequences for internal and external projects in 2023. Successful national and international collaborations, including with the CDC and Wellcome Sanger Institute, enhanced our genomic research capabilities. The introduction of the Oxford Nanopore MinION platform expanded our research scope to include various viruses and human genomics, securing substantial funding and achieving financial viability with $300,000 in revenue. These efforts solidify our leadership in laboratory diagnostics and genomics research.

PROMISING PHAGE THERAPY FOR AMR

AMR in bacteria is a global health emergency. icddr,b scientists report a lytic bacteriophage from the Stephanstirmvirinae family targeting AMR *Escherichia coli* (ST2089). The 148,445 bp Escherichia phage iGC_PHA_EC001 encodes 269 proteins, 10 tRNAs, and two lytic proteins with phage_lysozyme and cell wall hydrolase_2 domains. This discovery promises a new therapeutic option for combatting AMR *Escherichia coli*, advancing phage therapy and addressing the global health crisis.

Khan T, Haider A, Rahman S, Moon SB, Mahamud I, Mondal SI, Begum A, Biswas SK, Jubair M, Rahman M. Complete genome sequence of Escherichia phage iGC_PHA_EC001. Microbiol Resour Announc. 2024 Jan 17;13(1):e0084223. doi: 10.1128/MRA.00842-23

GOAL 2.9

IMPROVE HOSPITAL SERVICES AND CLINICAL RESEARCH

We are committed to improving the clinical services provided by icddr,b-operated hospitals and laboratories, and enhancing patient outcomes through research-informed care. Detailed information on these activities is provided in the following sections of this report.

Patients are lining up at the triage of the icddr,b Dhaka Hospital.

CLINICAL AND LABORATORY SERVICES

Our hospitals in Dhaka, Matlab, and Teknaf Health Facilities provide free care and support extensive clinical research and training. Since 1990 the Diagnostic Services enhance public health with world-class disease diagnostics and quality lab services, supporting both research and patient care.

DHAKA HOSPITAL

Established in 1962, the Dhaka Hospital of icddr,b has grown to become the world's largest diarrhoeal disease hospital. Our highly dedicated team consists of 41 doctors, 80 nurses, and 150 support staff, offering free-of-cost treatment to all patients. Services range from treating diarrhoeal diseases and associated malnutrition to providing free vaccination services in partnership with EPI. We also offer free breastfeeding counselling services, nutritional counselling at the rehabilitation unit (NRU), and low-cost Bubble CPAP treatment for children suffering from pneumonia and hypoxemia.

Each year, the hospital successfully handles two seasonal diarrhoeal outbreaks, even accommodating up to 1,400 patients daily during unprecedented surges, as experienced in 2022.

Our team is always ready to extend their expert services globally during diarrhoeal epidemics upon requests from the World Health Organization (WHO) and the Global Outbreak Alert and Response Network (GOARN). In February 2023, Lebanon faced its first cholera outbreak in nearly 30 years, compounded by an economic crisis. The WHO enlisted icddr,b's resources and expertise in managing diarrhoeal diseases. icddr,b sent an expert to train healthcare professionals, update treatment protocols, and suggest community awareness programmes. This mission leveraged icddr,b's extensive experience to help control the outbreak.

Treatment:
Diarrhoea, Malnutrition, Pneumonia, EPI vaccination, SRHR counselling, Breast feeding counselling

184,794
individuals received treatment

79,031
female (42.8%)

105,763
male (57.2%)

118,879
are under five children
(64.1% of total patients)

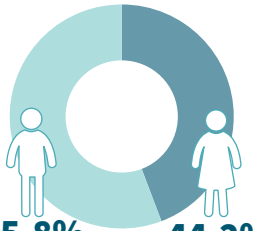
MATLAB HOSPITAL

Established in December 1963, icddr,b-run Matlab Hospital, with its 120 bed capacity operated by 9 doctors, 15 nurses, and 28 support personnel, stands as a pillar of public health intervention and innovations, having contributed to pivotal trials such as ORS, zinc use, and cholera and rotavirus vaccines. Annually, around 80,000 people receive free clinical care for diarrhoeal diseases and maternal and child health services. The hospital also offers vaccination services in partnership with Bangladesh's Expanded Programme on Immunization (EPI). The Kangaroo Mother Care (KMC) project demonstrates the hospital's innovative spirit and last year managed 227 preterm and low birth babies efficiently. Of them, 8 babies survived with birth weight less than 1200 gm only. In essence, Matlab Hospital blends life-saving treatment with ground breaking research, impacting both immediate community health and future public health developments.

Treatment:
Diarrhoea, Malnutrition, Pneumonia, Maternal and Child Health Care

76,798
patients received treatment

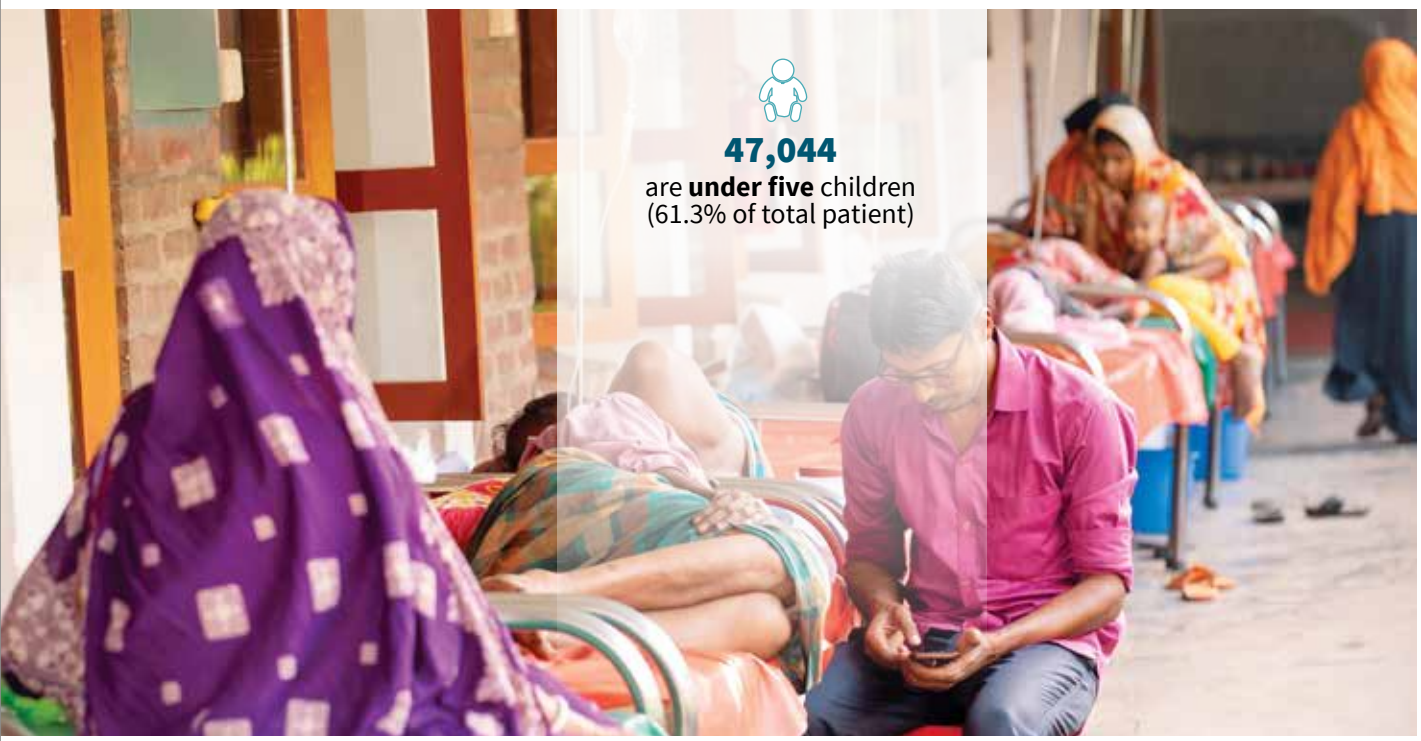
58,903
cases of **diarrhoeal diseases** treated



55.8% male
44.2% female

17,895
individuals received **maternal and child health care**

15.5% male
84.5% female



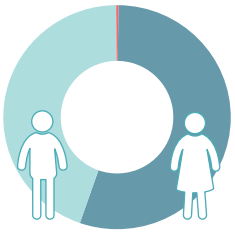
47,044
are **under five** children
(61.3% of total patient)

TEKNAF HEALTH FACILITY

icddr,b, with support from UNICEF, launched the operation of a 75-bed Severe Acute Respiratory Infection Isolation and Treatment Centre (SARI ITC) at Teknaf, Cox's Bazar to provide COVID-19 care to affected FDMNs and local communities on 31 August 2020. Since November 2022, icddr,b has transitioned the SARI ITC into a 65-bed Respiratory Disease Hospital (RDH), supported by UNICEF and the Asian Development Bank (ADB). This facility now offers free treatment for COVID-19, respiratory illnesses, diarrhoea, and malnutrition. In November 2023, RDH was further transformed into the Teknaf Health Facility (THF) with additional support from ADB and IOM, expanding its services. On 11 November 2023, Prime Minister Sheikh Hasina inaugurated the foundation of the 'Multipurpose Disaster Resilient Shelter Isolation Centre cum Hospital Complex' at Teknaf. Funded by ADB, this project will include an outpatient department, in-patient department, emergency services, laboratory, radiology, and support facilities, and is expected to be completed by March 2025.

Treatment:
Diarrhoea, Malnutrition, Respiratory Diseases

31,005
patients received treatment



13,869 male (44.7%)

17,134 female (55.3%)

2 third gender (0.006%)

1,524 **Rohingyas or FDMNs** (5% of total patients)

13,329 are **under five** children (43% of total patient)

The Honourable Prime Minister Sheikh Hasina of the Government of the People's Republic of Bangladesh is inaugurating the 'Multipurpose Disaster-Resilient Shelter Isolation Centre cum Hospital Complex' at the Teknaf campus of icddr,b on 11 November 2023.

DIAGNOSTIC SERVICES
LABORATORIES

Founded in 1990, the Diagnostic Services Laboratories are an essential part of the Clinical and Diagnostic Services (CDS) at icddr,b. These laboratories develop innovative tools and methods to enhance public health and provide quality lab services for research and daily needs. Revenue from public services significantly supports patient care at the hospital.

A SELF-SUSTAINING UNIT

The Diagnostic Services Laboratories consist of multiple clinical service labs, Media Lab, Quality Management Unit, and Sample Reception Units. In 2023, they served 223,124 customers, ensuring their health and well-being while generating US$ 2.47 million from 765,312 tests performed. Funds from diagnostic services support free treatment for 292,597 patients at icddr,b's hospitals.

MYCOLOGY LABORATORY

The Clinical Mycology Laboratory, in collaboration with the CDC's Fungal project, recently introduced diagnostic services for outpatients. It identifies the deadly *Candida auris* from blood, urine, and skin swabs and conducts antifungal susceptibility testing using the Vitek 2 system.

QUALITY MANAGEMENT SYSTEM (QMS) AND GLOBAL ACCREDITATION

The Quality Assurance (QA) unit has expanded implementation of QMS in the research laboratories in addition to the diagnostic services. Achieving ISO 15189 and ISO 15190 accreditation is unprecedented in Bangladesh, with CDS's diagnostic labs being the first to achieve this. The diagnostic services have secured consecutive sixth accreditation status which is valid till 2025. This accreditation generates surplus revenue, supporting icddr,b's humanitarian projects, including its hospitals.

RESEARCH AND SUPPORT

The Diagnostic Services Laboratories support clinical trials, basic and epidemiological research, and flagship diagnostic services. In 2023, they supported 46 research projects across icddr,b and published seven original research papers.

HIGHLIGHTS OF 2023

- Customer Service: Served 223,124 individuals, generating US$ 2.47 million from 765,312 tests.
- Research Support: Supported 46 research projects and published seven original research papers.
- Accreditation: Continued ISO 15189 and ISO 15190 accreditation for 177 test parameters until 2025.
- Quality Assurance: Participated in 49 External Quality Assurance System (EQAS) panels by the College of American Pathologists (CAP). Conducted 22 in-house QMS training sessions for 462 participants.
- Media Lab Production: Supplied 215,762 solid media plates and 214,350 broth media tubes. Managed the sterilisation and decontamination of lab-generated infected wares and biohazard materials, autoclaving 19,376 kg of fresh materials and decontaminating 18,611 kg of biohazard waste.
- New Initiatives: Opened a new sample collection centre at Mirpur, adding to existing centres and booths at Mohakhali, Dhanmondi, Uttara, Niketan, Baridhara, and Gulshan.


OLYMPUS

ENVIRONMENTAL, SOCIAL, AND GOVERNANCE (ESG)

For the first time, we are reporting our ESG initiatives, which focus on sustainable environmental practices, social responsibility, and governance to ensure long-term positive impacts on our communities and the environment.

EMPOWERING VULNERABLE COMMUNITIES

In 2023, icddr,b, supported by BMZ, Germany, scaled up an empowerment intervention for 400 participants across four districts. This initiative integrated life skills training, vocational training, financial literacy, health education, and routine checkups. Community-based organisations (CBOs) were crucial in connecting target groups. As a result, 94% of participants transitioned into socially accepted work, and healthcare-seeking behaviours increased from 17.6% to 73%. By capacitating CBOs, icddr,b ensures sustainability beyond donor-funded interventions.

NIPAH VIRUS AWARENESS AND PREVENTION

The Nipah virus poses a significant threat to young people in Bangladesh, with 38% of cases in children aged 5-20 and 36% in students in 2023. Recognising the urgency, icddr,b launched an awareness programme during the Nipah virus pre-season (October-December 2023). This initiative educated high-risk groups, engaging nearly 9,000 students in-person and indirectly reaching 35,000 community members through a live-streamed session with 3,600 viewers.

INITIATIVES TO REDUCE CARBON FOOTPRINT

icddr,b has implemented several initiatives to reduce its carbon footprint:

- Green Appliances: Purchasing energy-efficient appliances like air conditioners and freezers using R600a gas.
- Efficient Lighting: Replacing fluorescent tube lights with LED lights.
- Motion Sensor Lights: Installing motion sensors to reduce energy consumption.
- Paperless Culture: Promoting digital documentation and reducing paper use.
- Waste Recycling: Encouraging proper waste sorting and recycling.
- Reusable Items: Replacing single-use items with reusable options.
- Rechargeable Batteries: Using rechargeable batteries for office devices.
- Tap Water Filters: Promoting filtered tap water over plastic bottled water.
- Greener Travel: Encouraging biking, carpooling, and virtual meetings to reduce travel-related emissions.

ENVIRONMENTAL SUSTAINABILITY INITIATIVES

icddr,b integrates sustainability into infrastructure development, focusing on reducing carbon footprint, enhancing energy efficiency, and managing waste:

- Energy-efficient materials: Using ACC blocks and dry partition walls.
- Innovative technologies: Implementing low-carbon alternatives in projects.
- Reuse of construction materials: Repurposing materials in renovations.
- Safe disposal: Recycling vehicle batteries and lubricating oil.
- Mass transport: Operating 26 staff buses for daily commutes, reducing individual car usage.

WASTE MANAGEMENT AND RECYCLING PROGRAMMES

icddr,b prioritises recycling and reuse:

- Construction Waste: Recycling materials like aluminium, glass, concrete, steel, and bricks.
- On-site Sorting: Facilitating material recovery and repurposing waste.
- Circular Economy: Collaborating with recycling facilities to minimise impact.

ECO-FRIENDLY PRACTICES

Facilities Management promotes sustainable office practices:

- Paperless Documentation: Using digital systems to reduce paper use.
- Energy-efficient Appliances: Optimising energy use with eco-friendly appliances.
- Eco-friendly Procurement: Sourcing environmentally friendly products.
- Employee Engagement: Conducting sustainability training to foster environmental awareness.

FUTURE PLANNING

icddr,b is planning to install an energy-efficient HVAC system to replace over 100 air conditioners, significantly reducing power consumption. Additionally, icddr,b is assessing the feasibility of installing a solar power system on its roof to generate 15,000 KWH monthly, further supporting its commitment to sustainable energy use.

COLLABORATIONS

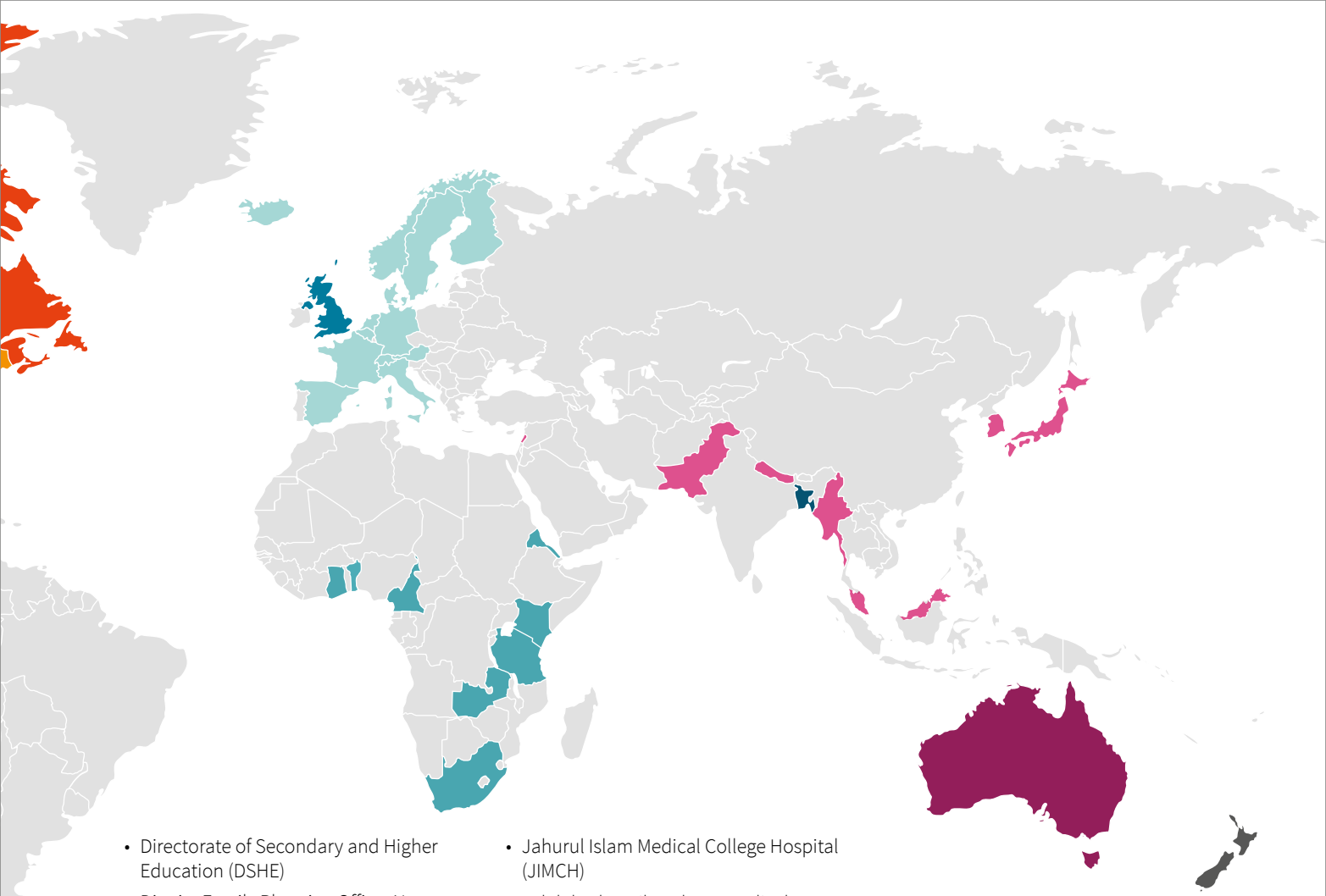
Collaborations are central to our work. We work with multiple governments, academic and NGO partners in Bangladesh, ensuring a strong focus on local health issues, and have long-standing ties with scientific collaborators in leading research institutions worldwide.

We are also members of a range of regional networks and work closely with partners across South Asia and the Global South.

COLLABORATING INSTITUTIONS

BANGLADESH

- 500 Bed Mugda General Hospital
- a2i
- Ad-Din Medical College Hospital (AMCH)
- Ahsania Mission Cancer & General Hospital
- Asgar Ali Hospital
- Bangabandhu Sheikh Mujibur Rahman Science and Technology University
- Bangabandhu Sheikh Mujib Medical University and Hospital
- Bangladesh Agricultural University
- Bangladesh Atomic Energy commission
- Bangladesh Cancer Society Hospital and Welfare Home
- Bangladesh Council of Scientific and Industrial Research (BCSIR)
- Bangladesh Forest Department
- Bangladesh Institute of Child Health (Dhaka Shishu Hospital)
- Bangladesh Institute of Research and Rehabilitation in Diabetes
- Bangladesh Jute Mill Corporation
- Bangladesh Krira Shikkha Protishtan (BKSP)
- Bangladesh Lung Foundation
- Bangladesh Midwifery Forum
- Bangladesh National Nutrition Council (BNNC)
- Bangladesh Neonatal Forum
- Bangladesh Specialized Hospital
- Bangladesh University of Engineering Technology (BUET)
- BRAC
- Center for Women and Child Health (CWCH)
- Centre on Integrated Rural Development for Asia and the Pacific (CIRDAP)
- Child Health Research Foundation
- Chittagong Medical College and Hospital
- Chittagong Veterinary and Animal Sciences University
- Civil Surgeon Office, Natore
- Colonel Malek Medical College, Manikganj
- Community Based Health Care (CBHC)
- Communicable Disease Control
- Cumilla Medical College Hospital (CuMCH)
- Damien Foundation Bangladesh
- Dcastalia Limited
- Department of Fisheries
- Department of Livestock Services (DLS)
- Department of Pharmaceutical Sciences, College of Pharmacy
- Department of Public Health Engineering (DPHE)
- Department of Social Service
- Dhaka Medical College and Hospital (DMCH)
- Dhaka North City Corporation (DNCC)
- Dhaka South City corporation (DSCC)
- Dhaka Mohanogor Shishu Hospital
- Dhaka Shishu Hospital
- Dhaka Water Supply and Sewerage Authority (DWASA)
- Directorate General of Family Planning (DGFP)
- Directorate General of Health Services (DGHS)



- Directorate of Secondary and Higher Education (DSHE)
- District Family Planning Office, Natore
- DocTime Limited
- Eastern Resource Management Services Limited (ERMS)
- Enam Medical College & Hospital, Bangladesh
- EPI Headquarter
- Global Health Development (EMPHNET)
- Hospital Services Management (HSM) Unit
- ideSHi (Institute for Developing Science & Health Initiatives)
- Incepta Pharmaceuticals
- Institute of Child and Mother Health (ICMH)
- Institute of Child Health & Dr. M R Khan Shishu Hospital (ICHSH)
- Institute of Epidemiology Disease Control and Research (IEDCR)
- Institute of paediatric Neurodisorder and Autism (IPNA), BSMMU
- Institute of Public Health (IPH)
- Institute of Public Health Nutrition (IPHN)
- Ipas, Bangladesh
- Jahurul Islam Medical College Hospital (JIMCH)
- Jalalabad Ragib-Rabeya Medical College Hospital (JRRMCH)
- James P Grant School of Public Health (JPGSPH)
- Jessore 250 bed General Hospital (JGH)
- Khulna Medical College Hospital
- Kurmitola General Hospital (KGH)
- LAMB Hospital
- M Abdur Rahim Medical College Hospital (MARMCH)
- Mohammadpur Fertility Services and Training Centre (MFSTC)
- Ministry of Expatriates' Welfare and Overseas Employment (MoEW&OE)
- Mugda Medical College Hospital
- National Centre for Hearing and Speech for Children (SAHIC)
- National Centre for Tuberculosis and Research (NCTBR)
- National Heart Foundation and Research Institute
- National Institute for Population Research and Training (NIPORT)
- National Institute of Cardiovascular Disease (NICVD)
- National Institute of Diseases of Chest and Hospital (NIDCH)
- National Institute of Ear, Nose and Throat (ENT)
- National Institute of Neurosciences and Hospital (NINS)
- National Malaria Elimination Program (NMEP)
- National Tuberculosis Control Programme (NTP)
- Noakhali Science and Technology University
- Non Communicable Disease Control (NCDC)
- North South University
- Obstetrical and Gynecological Society of Bangladesh (OGSB)
- Patwary General Hospital Pvt Ltd
- Projahnmo Research Foundation
- Rajshahi Medical College and Hospital
- Research, Training, and Management (RTM) International
- Shaheed Suhrawardy Medical College (SSMC)
- Shahjalal University of Science and Technology
- Sheikh Russel Gastroliver Institute and Hospital

- Sher-e-Bangla Medical College Hospital (SBMCH)
- SHIMANTIK
- Sir Salimullah Medical College and Hospital
- Surjer Hashi Network
- Telepsychiatry Research & Innovation Network Ltd., Bangladesh
- The Directorate General of Drug Administration (DGDA)
- The JiVitA Project
- Thengamara Mohila Sabaj Sangha (TMSS), Bangladesh
- UH&FPO
- University of Dhaka
- Urban Primary Healthcare Project (UPHCP)
- Village Education Resource Center

AFRICA

- Action contre la Faim (ACF)-France
- African Population & Health Research Centre
- Center for Infectious Disease Research, Zambia
- Centre Pasteur du Cameroun, Cameroon
- Institut Pasteur de Dakar, Senegal
- Kenya Medical Research Institute (KEMRI)
- KEMRI-Wellcome Trust Research Programme
- Makerere University
- Malaria Research Centre, Agogo Presbyterian Hospital
- Right Track Africa (RTA), Kenya
- UNZA School of Medicine, University Teaching Hospital Lusaka

ASIA

- Aga Khan University
- Bio Farma, Indonesia
- Center for Public Health Kinetics, India
- Chinese Center for Disease Control and Prevention, China
- Christian Medical College, Vellore
- Duke-NUS Graduate Medical School Singapore
- Greentech Knowledge Solutions Pvt. Ltd. (GKSPL)
- Institute of Child Health
- International Centre for Genetic Engineering and Biotechnology (ICGEB)
- Interactive Research and Development
- International Vaccine Institute (IVI)
- Korea Environment Corporation
- Lebanese University
- National Institute of Infectious Diseases
- National University Hospital (NUH)
- National University of Singapore
- Oxford University Clinical Research Unit, Nepal
- PATH Center for Vaccine Innovation and Access (CVIA)
- Postgraduate Institute of Medical Education and Research
- Serum Institute of India Ltd
- Sinovac Biotech Co
- Universitas Nasional (UNAS)
- University of the Ryukyus
- University of Tsukuba
- XIAMEN Innovax BIOTECH CO.Ltd

AUSTRALIA

- Coalition for Epidemic Preparedness Innovations
- Griffith University
- George Institute for Global Health
- Menzies School of Health Research
- University of Auckland, New Zealand
- University of Melbourne
- University of Notre Dame (UND)
- University of Sydney
- University of Technology Sydney
- University of Western Australia
- Walter and Eliza Hall Institute of Medical Research

USA

- Barnard College
- Bill & Melinda Gates Foundation
- Biomedical Advanced Research & Development Authority
- Boston University School of Public Health
- Centers for Disease Control and Prevention (CDC), Atlanta
- Cornell University
- Columbia University
- Cummings School of Veterinary Medicine
- Duke University Medical Center
- EcoHealth Alliance
- Einstein College Albert of Medicine
- Emory University
- Envivo Bio Inc.
- Fighting Infectious Diseases in Emerging Countries (FIDEC)
- Frederick National Laboratory for Cancer Research, Leidos Biomedical Research In
- Harvard Medical School
- Harvard TH Chan School of Public Health
- International Rescue Committee (IRC)
- Johns Hopkins Bloomberg School of Public Health (JHBSPH)
- Johns Hopkins University School of Medicine
- John Snow Research & Training Institute, Inc
- La Jolla Institute of Immunology
- Mailman School of Public Health, Columbia University
- Massachusetts General Hospital (MGH)
- Moderna TX Inc 200 Technology Square
- Muhimbili University of Health and Allied Sciences
- New York University
- PATH
- Pennsylvania State University
- Pure Earth
- Rollins School of Public Health
- RTI International
- Sam Houston State University
- Save the Children
- Scripps Research
- Stanford University School of Medicine
- Stanford University
- The Emmes Company, LLC
- The Consortium for Conservation Medicine
- Tufts University School of Medicine
- Tufts University

- U.S. National Poultry Research Center
- UChicago Research Bangladesh
- United Nations Children's Fund (UNICEF)
- University at Albany
- University at Buffalo
- University of Arkanasas Medical School
- University of California, Berkeley
- University of California, Davis
- University of California, Los Angeles (UCLA)
- University of California, San Diego
- University of California
- University of Chicago
- University of Colorado School of Medicine
- University of Florida
- University of Georgia
- University of Illinois
- University of Kentucky College of Medicine
- University of Leeds
- University of Maryland
- University of Maryland School of Medicine
- University of Michigan
- University of North Carolina (UNC)
- North Carolina State University
- University of Texas Health Sciences Center
- University of Utah
- University of Vermont
- University of Virginia
- University of Virginia Health System
- University of Washington
- Vanderbilt University
- Vital Strategies
- Wageningen University
- Warren Alpert Medical School of Brown University
- Washington State University
- Washington University School of Medicine

CANADA

- BC Centre for Disease Control
- Dalhousie University
- McGill University
- Scik Kids Peter Gilan Centre for Research and Learning
- St. Michael's Hospital
- The Hospital for Sick Children
- University of Alberta
- University of Toronto

UK

- Bangor University
- Eclipse Experiences Ltd.
- GSK Medicines Research Centre
- Harvard University
- Imperial College London
- Liverpool School of Tropical Medicine
- London School of Economics
- London School of Hygiene and Tropical Medicine (LSHTM)
- National Institute for Biological Standards and Control (NIBSC)
- Oxfam, GB
- Peoticgem International Ltd
- Queen Margaret University
- University College London
- University of Aberdeen
- University of Birmingham
- University of British Columbia
- University of Cambridge
- University of Glasgow, Scotland
- University of Nottingham
- University of Oxford
- University of Warwick
- Virginia Commonwealth University

EUROPE

- Erasmus MC University Medical Ctr Rotterdam
- European Molecular Biology Laboratory (EMBL)
- European Vaccine Initiative
- EveliQure Biotechnologies GmbH
- Finnish Institute for Health and Welfare THL, Finland
- Fondation Mérieux
- Gent University
- GlaxoSmithKline Pharmaceutical
- Goteborg University
- Hunazine Biotech S.L.
- IHE Delft Institute for Water Education
- International Center for Infectiology Research (CIRI)
- Karolinska Institute
- Max Planck Institute for Evolutionary Anthropology
- Norwegian Institue of Public Health
- Norwegian University of Science and Technology
- Pompeu Fabra University
- Radboud University Medical Center
- San Raffaele Scientific Institute
- Statens Serum Institut
- Stockholm University
- TDR, WHO
- The Centre for Data Research and Analytics (CfDRA)
- Technical University Berlin (Technische Universität Berlin)
- University of Amsterdam
- University of Bergen
- University Clinic Saarland
- University of Basel
- University of Heidelberg
- University of Leipzig
- Uppsala
- Vrije Universiteit Amsterdam
- World Health Organization (WHO)

OTHERS

- The University of the West Indies

PUBLICATIONS

We are committed to the rapid and full publication of research findings in international peer-reviewed journals. Publication in the peer-reviewed scientific literature is a key indicator of quality and an important step in disseminating information to scientific, practitioner, policy and programme communities.

HIGH-PROFILE PUBLICATIONS IN 2023

Throughout 2023, icddr,b researchers made notable scholarly contributions, producing 457 original publications and contributing to 110 additional works, including letters, editorials, book reviews, and abstracts. Their research graced the pages of top-tier journals, including the New England Journal of Medicine, The Lancet, Lancet Global Health, Lancet Infectious Diseases, PLoS One, PLoS Global Public Health, PLoS Genetics, PLoS Neglected Tropical Diseases, and Vaccine. This body of work not only represents the individual efforts of our researchers but also the result of fruitful collaborations with both national and international colleagues, underlining icddr,b's commitment to global scientific advancement.

Book Chapters
11

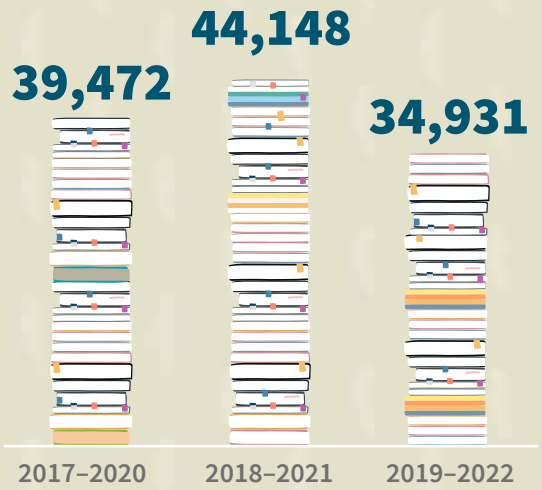
Original Papers
457

Abstracts in conference proceedings
24

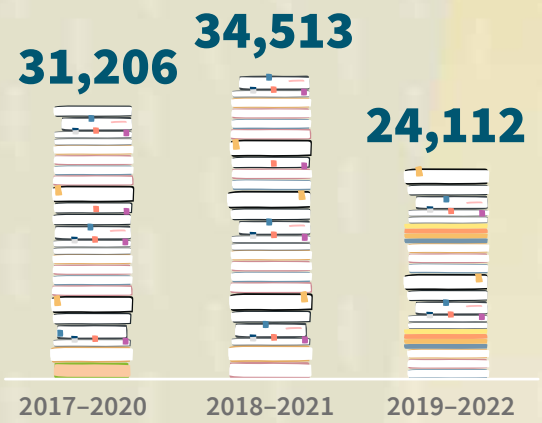
Reports/ Monographs
1

Letters, Editorials, etc.
74

CITATIONS I: ALL PAPERS



CITATIONS II: PAPERS IN HIGH-IMPACT JOURNALS (Impact factor 5 and above)



AWARDS AND ACHIEVEMENTS

This section highlights notable awards and achievements of our esteemed researchers, scientists, and staff, showcasing their contributions to research, innovation, and excellence in their respective fields. These accolades reflect their dedication to advancing knowledge and making a significant impact globally.

DR FIRDAUSI QADRI

Dr Firdausi Qadri, Senior Director of IDD, received Bangladesh's highest state honour, the Independence Award (Swadhinata Padak) 2023. This prestigious award was presented by the Honourable Prime Minister Sheikh Hasina at a ceremony in the Osmani Memorial Auditorium on 23 March 2023, recognising Dr Qadri's exceptional contributions to research and training.

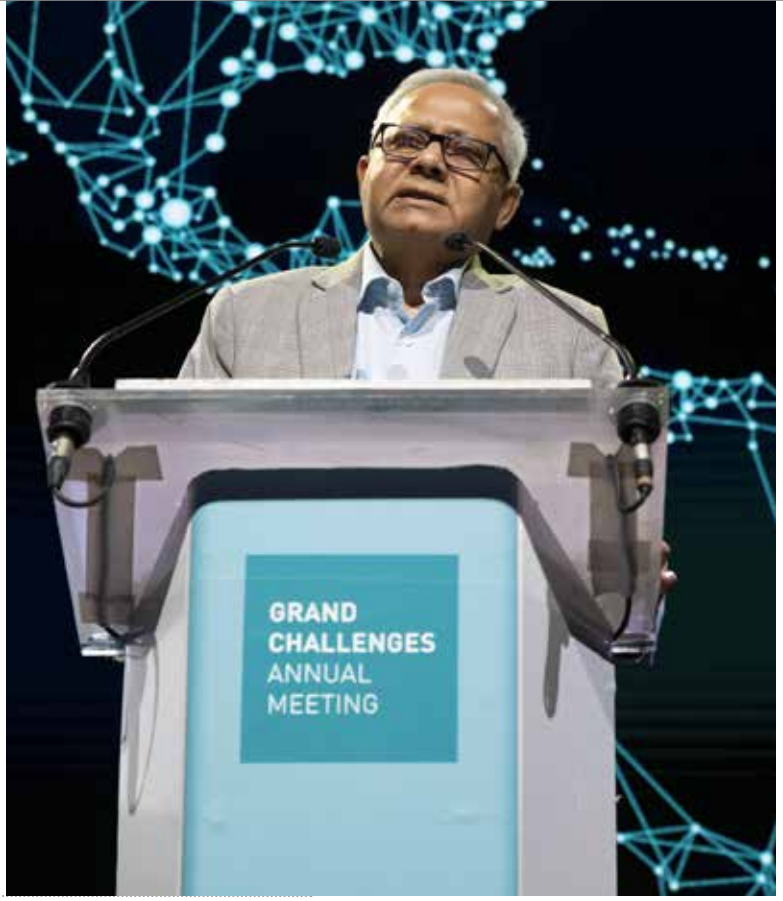
On 17 May 2023, icddr,b celebrated the exceptional achievements of Dr Qadri. The event, held at icddr,b Sasakawa Auditorium, featured esteemed guests, including the Honourable Education Minister Dr Dipu Moni, MP, and concluded with a cultural programme performed by icddr,b staff.

Alongside this distinguished accolade, Dr Qadri has been selected as one of the 12 global co-leads for the Global Declaration to Eliminate Cervical Cancer.

DR TAHMEED AHMED

Dr Tahmeed Ahmed, Executive Director attended the 2023 Consortium of Universities for Global Health (CUGH), an annual conference hosted by the Fogarty International Center at NIH in Washington, USA.

Dr Tahmeed Ahmed, Executive Director was invited to give the Spotlight talk on Microbiota Directed Food at the Grand Challenges Conference held in Dakar, Senegal in October 2023.



DR AHMED EHSANUR RAHMAN

Dr Ahmed Ehsanur Rahman, Scientist at MCHD, has been selected as a member of the Mother and Newborn Information for Tracking Outcomes and Results (MoNITOR) advisory group, a technical arm of the WHO.

DR TAFSIR HASAN

Dr S. M. Tafsir Hasan, Associate Scientist in the Nutrition Research Division, has been selected by WHO to serve as a member of the Technical Advisory Group on Gestational Weight Gain (TAG-GWG).

SHEIKH JAMAL HOSSAIN

Sheikh Jamal Hossain, Associate Scientist, MCHD, has been selected as a member of Global Advisory Group for the "Strengthening Primary Health Care to promote optimal development of young children" guideline!

DR QUAMRUN NAHAR

Dr Quamrun Nahar, Head of Research at MCHD, has been selected as a country ambassador for the International Papillomavirus Society (IPVS) for a two-year term from April 2023 to April 2025.

DR SAYERA BANU

Dr Sayera Banu, Senior Scientist and Head of PEI at IDD, has been awarded prestigious fellowships from the Bangladesh Academy of Sciences (BAS) for 2022 and The World Academy of Sciences (TWAS) for 2024, recognising her outstanding contributions to science.

DR EVANA AKHTAR

Dr Evana Akhtar, Assistant Scientist at the Immunobiology, Nutrition, and Toxicology Laboratory (INTL) of the Nutrition Research Division (NRD), has been selected as a TWAS Young Affiliate for a six-year term from 2023 to 2028.

DR REHNUMA HAQUE

Dr Rehnuma Haque, Assistant Scientist at the Environmental Interventions Unit, has been awarded a 3-year fellowship from the Reckitt Global Hygiene Institute (RGHI).

DR SHARFUL ISLAM KHAN

Dr Sharful Islam Khan, Head of the Programme for HIV and AIDS, has been appointed as an Adjunct Professor in the Interdisciplinary Social Research graduate program at Trent University, Ontario, Canada, effective from 1 January 2023 to 1 January 2028.

DR ALIYA NAHEED

Dr Aliya Naheed, Scientist, Non-Communicable Diseases has been elected a Fellow of the Bangladesh Academy of Sciences (BAS) for her outstanding contributions in science.

MD. NAIMUL ISLAM FAYSAL

Md. Naimul Islam Faysal, Research Officer at the Genome Centre, IDD, delivered an oral presentation titled “Candida auris Genomic Surveillance: Emergence of a Novel Clade VI from Bangladesh” at the 4th International Conference on Tropical Medicine and Infectious Diseases (ICTROMI) 2023, securing the “1st Winner Oral Presentation for Postgraduate” award.

SAMIRA DILRUBA ALI

Samira Dilruba Ali, Data Management Officer, NRD, has been awarded the Peter B. Sullivan Prize for the Best Oral Presentation in Nutrition at the 18th Commonwealth Association of Paediatric Gastroenterology and Nutrition (CAPGAN) Conference 2023.

ASADUZZAMAN ASAD

Asaduzzaman Asad, Senior Research Officer, Gut-Brain Axis Laboratory, IDD has been awarded the Bhupinder Sandhu Prize for the Best Oral Presentation in Gastroenterology at the 18th CAPGAN Conference 2023.

MD SHAHRIAR BIN ELAHI

Md Shahriar Bin Elahi, Senior Manager of Business Intelligence and Analytics in Clinical and Diagnostic Services, has received the International Visitor Leadership Program fellowship on Global Public Health Challenges, sponsored by the US State Department.

S M ARIFUL ISLAM CHOWDHURY

S M Ariful Islam Chowdhury, Senior Manager, Quality Assurance at the Clinical and Diagnostic Services, has received the competitive 'Outreach Scholarship Award' from Society of Quality Assurance (SQA), USA and participated in the 7th Global QA Conference held on 12-17 March 2023 in Maryland, USA.

OUR VIDEO DOCUMENTARY RECEIVED AN AWARD IN THE PULITZER VIDEO COMPETITION

Our video documentary 'Human Health and Environmental Costs and Benefits of Liquefied Petroleum Gas,' based on a study by icddr,b's Environmental Interventions Unit and Stanford University, won an award at the 2023 Global Health Video Competition at the Consortium of Universities for Global Health (CUGH) conference.

FINANCE

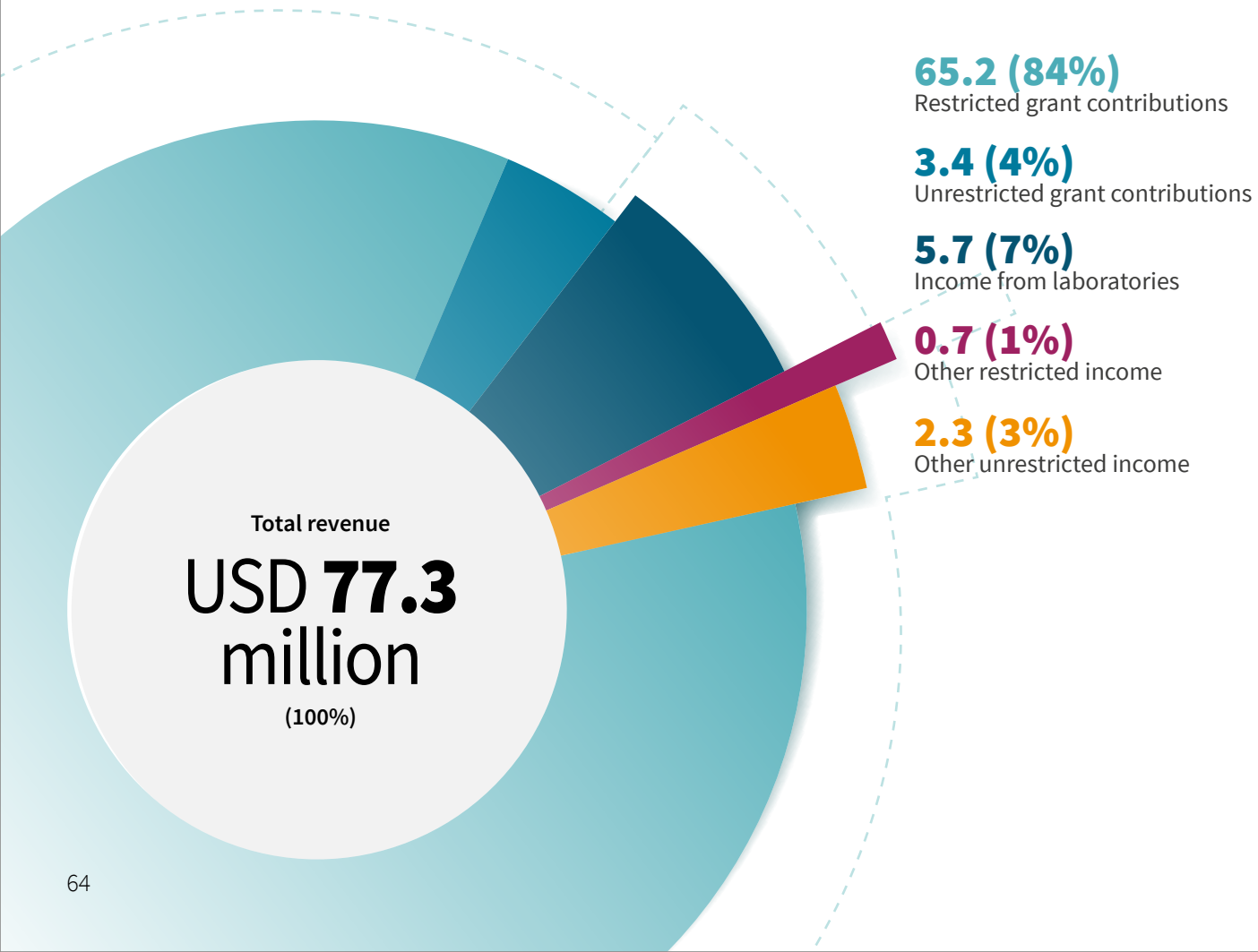
icddr,b's overall revenue for 2023 amounted to USD 77.3 million compared with a total expenditure of USD 73.3 million, generating a net surplus for the year of USD 4 million.

REVENUE

Our overall revenue for 2023 of USD 77.3 million (see below) only marginally reduced by 3% amounting to USD 2.4m compared with 2022. Research grant income for 2023 decreased by 2.5% percent amounting to USD 1.7 million vs. 2022, this was mainly due to the slightly decreased revenue for Bill & Melinda Gates, UNDG, and Sida - Sweden funded project. Unrestricted lab income increased by USD 0.1 million mainly due to increased demand.

BREAKDOWN OF REVENUES 2022

(in USD millions)



EXPENDITURE

- Overall expenditure for 2023 was USD 73.3 million, representing a decrease of 6.5% per cent equivalent to USD 5m compared with 2022.
- The bulk of total expenditure, i.e. 58%, relates to staff salaries and benefits. Other key costs are; supplies and materials 14%, collaborative partnership costs 5%, travel and vehicle hire charges 6%, rent, communication and utilities 2% and training, dissemination and staff development 2%.

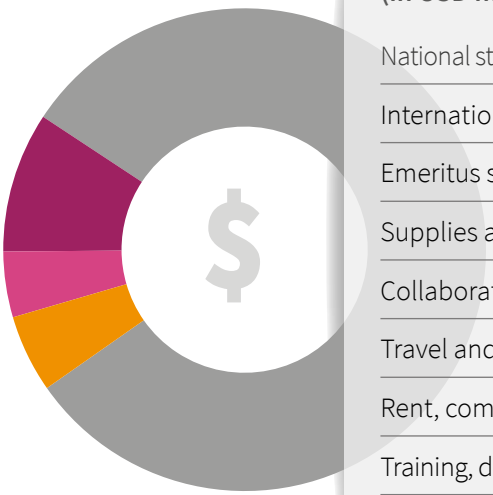
BREAKDOWN OF EXPENDITURE FOR 2023
(in USD millions)

81.0%
Programme costs

9.3%
Management and administration costs

4.5%
Laboratory costs

5.2%
Hospital costs



DETAILED EXPENDITURE FOR 2023:
(in USD millions)

National staff	USD 37.2
International staff	USD 3.7
Emeritus staff	USD 1.3
Supplies and materials	USD 10.4
Collaborative partnership costs	USD 3.8
Travel and vehicle hire charges	USD 4.6
Rent, communication and utilities	USD 1.5
Training, dissemination and staff development	USD 1.7
Other operational costs	USD 9.1

ABBREVIATED STATEMENT OF FINANCIAL POSITION
(in USD millions)

	31 December 2023 USD ('000)	31 December 2022 USD ('000)
Assets		
Total non-current assets	54,054	49,938
Total current assets	75,339	66,335
Total assets	**129,394**	**116,272**
Liabilities and Funds		
Non-current liability	3,448	5,193
Total current liabilities	53,453	47,725
Total liabilities	**56,901**	**52,918**
Total funds	72,493	63,355
Total funds and liabilities	**129,394**	**116,272**

OTHER KEY FINANCIAL STATISTICS FOR 2023

1. At the end of the year, icddr,b had USD 72.5 million in net assets which increased by USD 9.1 million equivalent to 14%, as a result of increasing investments by 8%, growth in cash balances by 24% and, a decrease in the end of service benefits liability by 38%.
2. Cash and cash equivalents amounted to USD 63.2 million at the end of the year.
3. Accounts receivables (debtors) decreased by 22% percent. This was mainly due to collecting long outstanding debts through an improved follow-up process.
4. Accounts payables increased by 32% due to an increase in the payable of supplies and materials.
5. The current ratio (liquidity) is 1.41 increased by 1.4% compared with 2022.
6. Investments in the Endowment Funds increased by 8%, primarily due to market value increases and, to a lesser extent donations.
7. Loans and advances decreased by 14% due to the significant reduction in supplier-related advances, as a result of improved controls.

icddr,b received an unqualified (healthy) audit opinion of its financial statements for 2023 from A. Qasem & Co. Chartered Accountants.

We are deeply indebted to our donors including governments, foundations, institutions, corporations, development agencies, NGOs and multilateral bodies that support our work.

The Honourable Minister of International Development of Canada, Mr Harjit S. Sajjan, is examining an X-ray film of a child suffering from pneumonia during his visit to icddr,b on 25 February 2023.

BOARD OF TRUSTEES

icddr,b's Board of Trustees consists of 13 professionals and researchers from both developed and developing countries.

As of December 2023

The icddr,b Act 2022 established the Board of Trustees, building upon the framework laid out in the previous icddr,b ordinance. Four members are appointed by the Government of Bangladesh, with the World Health Organization and UNICEF each nominating one member. icddr,b's Executive Director serves as the Member-Secretary.

The Board operates under the icddr,b Act 2022 and follows the Rules of Procedure. The Board of Trustees' roles and responsibilities include fund oversight; approving and monitoring the budget; setting broad institution-wide policies, as well as monitoring adherence to the Strategic Plan; employing, evaluating and supporting the Executive Director; maintaining the line between governance and management; and evaluating the Board's own performance.

CHAIR

MS NANCY Y CHENG
Chair, Board of Trustees
Former Assistant Auditor General, Canada

MEMBER SECRETARY:

DR TAHMEED AHMED
Executive Director
icddr,b

NOMINATED BY THE GOVERNMENT OF BANGLADESH

SHARIFA KHAN
Secretary, Economic Relations Division, Ministry of Finance
(until Nov 2023)

DR MD. ANWAR HOSSAIN HOWLADER
Secretary, Health Services Division
Ministry of Health and Family Welfare
(until Oct 2023)

MD. HUMAYUN KABIR
Team Leader
Preparation of PIP for 5th HPNSP
Ministry of Health and Family Welfare
(from Nov 2023)

NOMINATED BY UNICEF

DR PETER HARVEY
Adviser (Water, Sanitation, and Hygiene), UNICEF Regional Office for South Asia

NOMINATED BY WHO

DR SUMAN RIJAL
Director, Communicable Diseases
WHO Regional Office for South-East Asia (SEARO)

INDEPENDENT MEMBERS

AMOL KHISTY
Expert, Finance & Accounting Services

DR SISWANTO
Former Senior Adviser Science Research and Innovation
WHO-SEARO, New Delhi, India

ANDREA J LUCARD
Executive Vice President, External Relations, Medicine for Malaria Venture, Geneva, Switzerland

DR OGUTU BERNHARDS RAGAMA
Chief Research Officer, Kenya Medical Research Institute

DR FRED BINKA
Professor of Clinical Epidemiology, University of Health and Allied Sciences, Ho, Ghana

PROF. ROSALIND LOUISE SMYTH
Vice Dean (Research), UCL Faculty of Population Health Sciences
Professor of Child Health, UCL Great Ormond St Institute of Child Health
United Kingdom

DR HANNA MARIA NOHYNEK
Chief Physician
Infectious Diseases Control and Vaccines
Department of Health Security at the Finnish Institute for Health and Welfare, Finland

SENIOR LEADERSHIP TEAM

Our staff of over 5,200 is led by Executive Director Dr Tahmeed Ahmed and the Senior Leadership Team. Together they are responsible for the day-to-day running of the organisation and are accountable to the Board of Trustees.

SENIOR LEADERSHIP TEAM

As of December 2023

DR TAHMEED AHMED
Executive Director

DR FIRDAUSI QADRI
Senior Director
Infectious Diseases Division

DR SHAMS EL ARIFEEN
Senior Director
Maternal and Child Health Division

DR DINESH MONDAL
Acting Senior Director, Laboratory Sciences and Services Division
(until Jan 2023)

DR S M MANZOOR AHMED HANIFI
Acting Senior Director
Health Systems and Population Studies Division

DR SARAH MARIA SALWAY
Senior Director, Health Systems and Population Studies Division
(from Dec 2023)

DR ZHAHIRUL ISLAM
Acting Senior Director, Laboratory Sciences Division
(Feb-May 2023)

BRIGADIER GENERAL (RETD.) DR MD. FAZLUL KABIR
Head, Clinical and Diagnostics Services
(from Jun 2023)

THOMAS LIAM BARRY
Director, Finance

HUGUES BELLO
Director, Human Resources

ARMANA AHMED
Head, Development and Former Head, Research Administration (until May 2023)

SHIBLEE SAYEED
Senior Manager, Research Administration (from Jun 2023)

BARRISTER MOHAMMAD NAFIU ALAM
Head, Regulatory and Legal Affairs

BRIGADIER GENERAL (RETD.) DEWAN SHAIKH MD SHAHEEDUL ISLAM
Chief Engineer, Facilities Management (from Jul 2023)

SECRETARIAT

Tanzila Ghani
Executive Assistant to Executive Director

OBSERVERS

A K M RAHMAT ULLAH
Head, Bio-medical Engineering Unit & RCO (until Oct 2023)

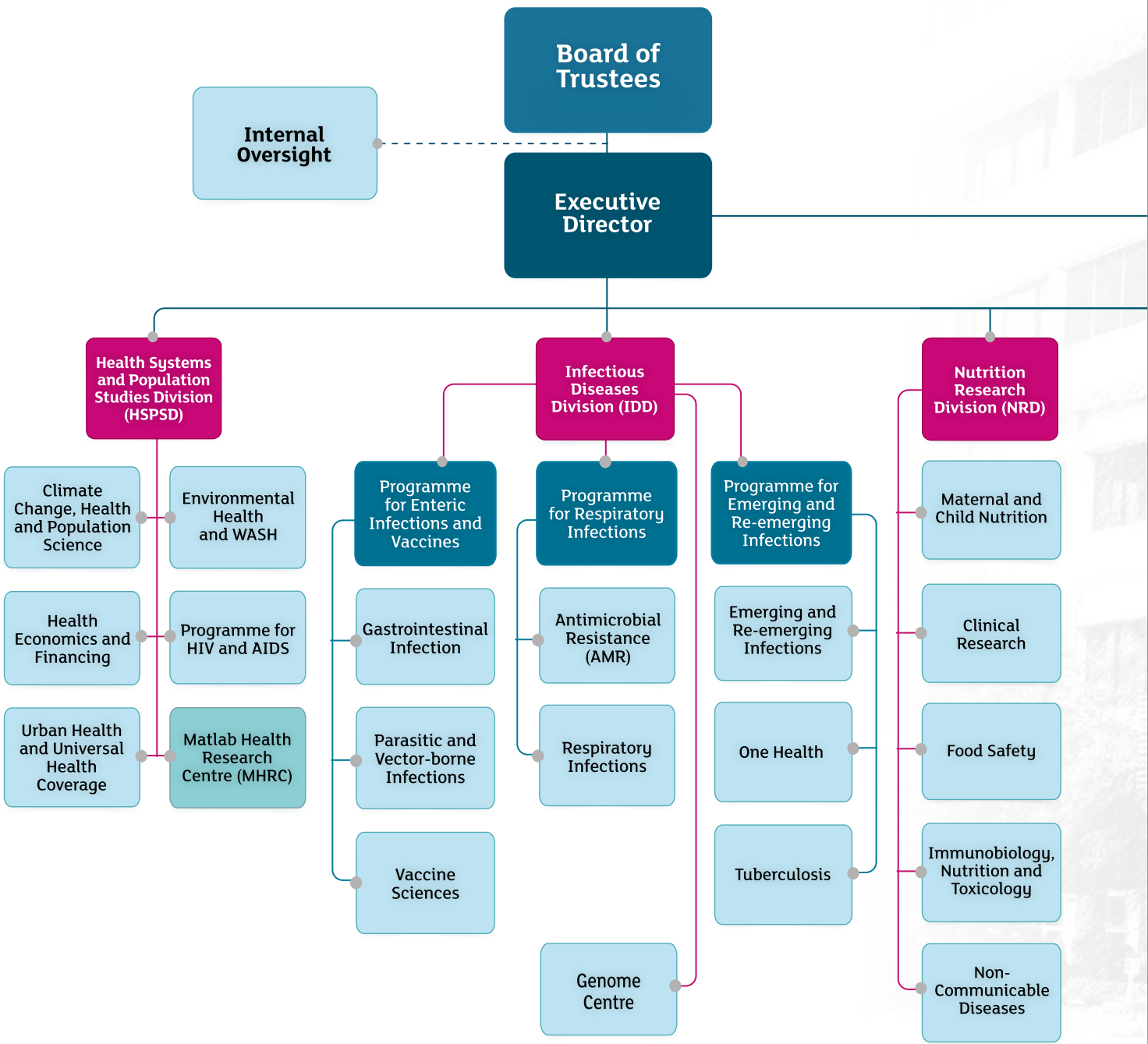
A K M TARIFUL ISLAM KHAN
Senior Manager, Communications

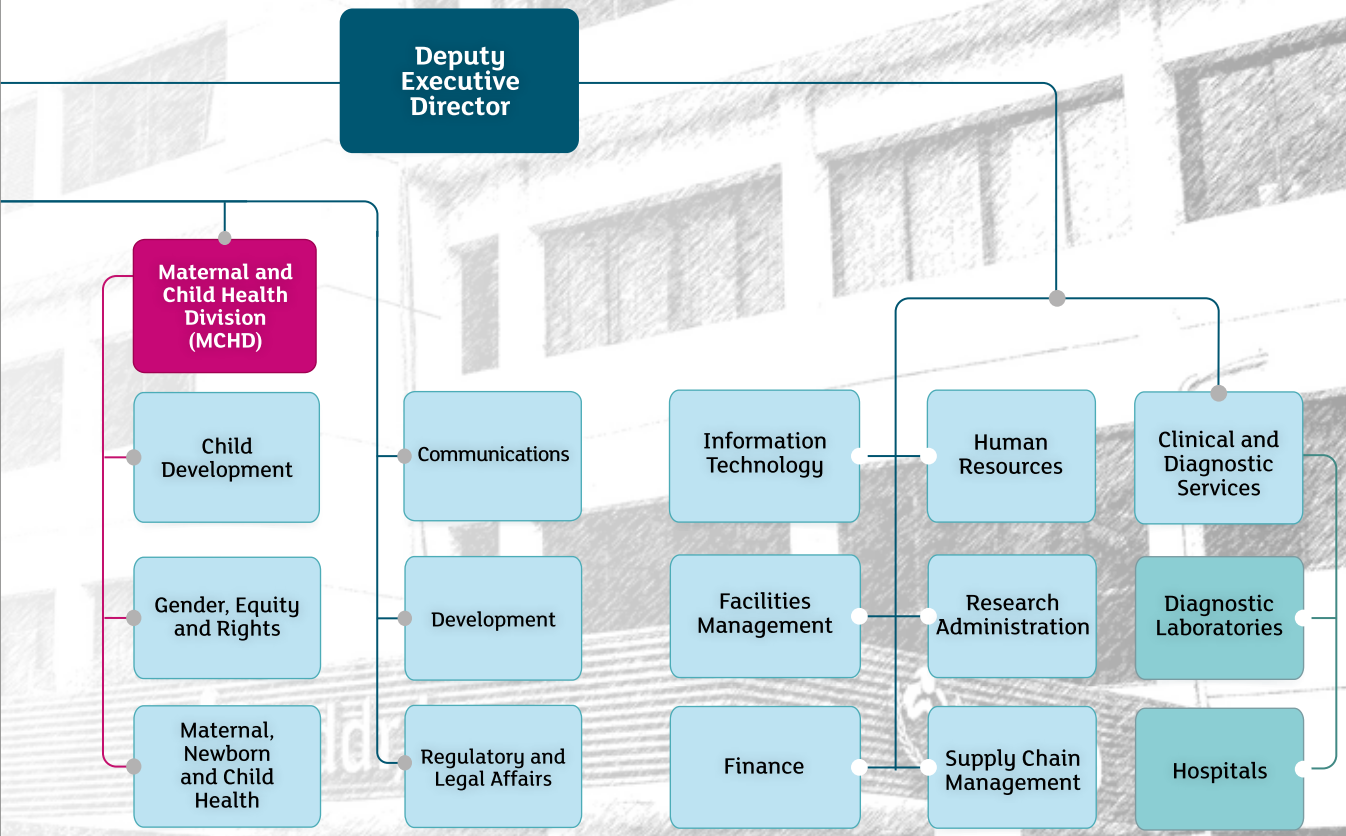
MR NAGARAJAN NAGARAJAN
Director, Internal Oversight

TANVIR AZAD CHOWDHURY
Head, Information Technology

ORGANOGRAM

In alignment with the new strategic plan for 2023-27, we have restructured our institution in consultation with the Board of Trustees and the Scientific Advisory Group. The new organogram is designed to enhance our delivery of strategic goals.




Deputy Executive Director
Maternal and Child Health Division (MCHD)
Child Development
Gender, Equity and Rights
Maternal, Newborn and Child Health
Communications
Development
Regulatory and Legal Affairs
Information Technology
Facilities Management
Finance
Human Resources
Research Administration
Supply Chain Management
Clinical and Diagnostic Services
Diagnostic Laboratories
Hospitals

TECHNICAL TRAINING UNIT

icddr,b offers a wealth of training opportunities for researchers, practitioners, policymakers, and others from Bangladesh and around the world. As a leader in ground breaking research and global life-saving solutions, we foster a nurturing environment for young and enthusiastic researchers to grow professionally and academically.

As part of our mandate, the Technical Training Unit (TTU) aims to build sustainable research capacity and develop future public health leaders worldwide. Since 1978, over 69,000 health professionals from 87 countries have participated in our training programmes. TTU offers a wide range of training programmes, covering theoretical perspectives, study designs, data collection and analysis techniques, research ethics, scientific communication, and result-oriented monitoring. Our programmes bring together researchers, academicians, students, and public health experts for a unique and intensive learning experience. Facilitators and participants exchange knowledge, build networks, and enhance research capacity to make a global impact. Additionally, TTU collaborates with national and international educational institutions and research organisations to strengthen synergies and the public health workforce in line with the Sustainable Development Goals.

In 2023, TTU hosted 1,256 participants (532 males, 724 females; 1,164 nationals, 92 internationals) from 11 countries (Australia, Bangladesh, Canada, China, India, Japan, Nepal, Netherlands, Sweden, UK, and USA) through 17 training events, internship programmes, and four academic orientation programmes.

INTERNAL TRAINING

TTU continuously develops the capacities and efficiencies of icddr,b staff, focusing on young and mid-level researchers. In 2023, TTU hosted a training course with NRD and trained 25 participants (18 males, 7 females). Additionally, TTU arranged a training course for 22 interns (6 males, 16 females) at icddr,b.

OPEN TRAINING

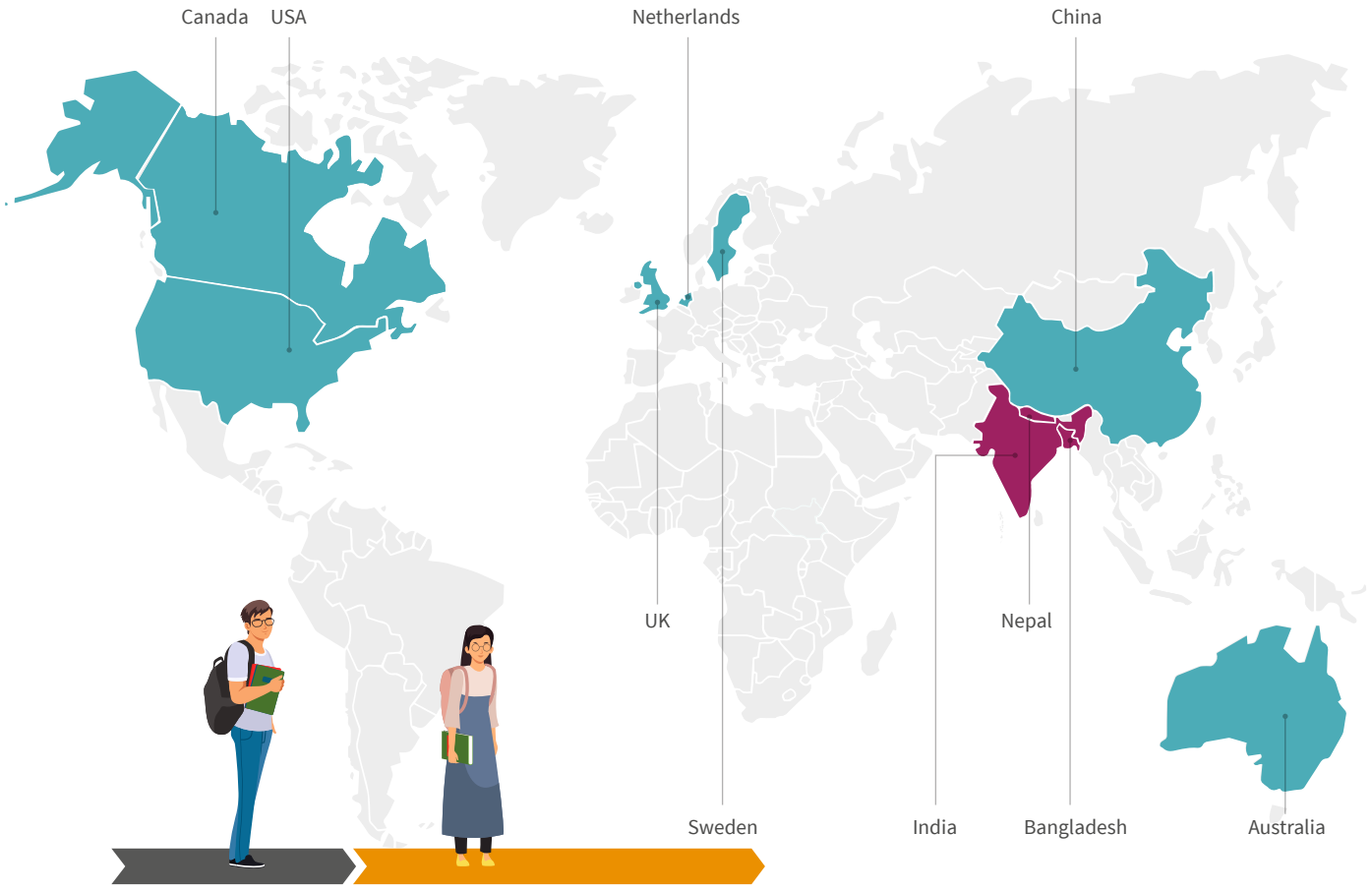
TTU enhances healthcare professionals' capacities by sharing evidence-based public health methodologies. In 2023, TTU hosted 15 training courses (6 face-to-face, 9 blended) with 565 participants (241 males, 324 females; 557 nationals, 8 internationals). Participants came from Australia, Bangladesh, Canada, India, Japan, Nepal, and the UK. Of them, two courses were organised in collaboration with IDD.

STUDENT FIELD EXPERIENCE/INTERNSHIP PROGRAMME

TTU supports students and interns from national and international institutes, providing hands-on experience with icddr,b experts. In 2023, a total of 361 students/ interns (124 males, 237 females) from 91 institutes (60 national, 31 international) participated. Of these, 335 were from Bangladesh and 26 from Australia, Canada, China, India, Netherlands, Sweden, UK, and USA.

ACADEMIC ORIENTATION

Through academic orientation sessions, TTU shares icddr,b's inventions and achievements, including exposure to tropical medicine and malnutrition, with undergraduate and postgraduate students from various medical colleges, universities, and institutes. In 2023, a total of 283 students (143 males, 140 females) from four medical colleges and one medical university attended. Participants included 225 nationals and 58 internationals from Bangladesh, India, and Nepal.



VISITORS AND GUESTS

Here's a selection of esteemed guests who visited icddr,b in 2023, highlighting our global partnerships and impact.

October 25, 2023

JEAN-PIERRE BOSSER, DIRECTOR GENERAL, FONDATION MÉRIEUX

Mr Bosser visited icddr,b to explore ongoing research collaborations in combating diseases like tuberculosis and cholera. "We will continue to work together. Thank you," said Mr Bosser.

September 26, 2023

H.E. MR CHARLES WHITELEY, EUROPEAN UNION AMBASSADOR

He lauded icddr,b's work and commitment to collaboration on future projects. He commented: "Thank you so much for a very insightful visit. Great to see first-hand your incredible work across so many fields. I look forward to further collaboration in the future."

September 25, 2023

MR DOM SCALPELLI, RESIDENT REPRESENTATIVE, WORLD FOOD PROGRAMME (WFP)

Mr Scalpelli visited icddr,b, impressed by groundbreaking innovations and expressing interest in a long-term partnership. He remarked: “Most impressive! We look forward to a long-term partnership together.”

September 17, 2023

H.E. MR PARK YOUNG-SIK, AMBASSADOR, EMBASSY OF THE REPUBLIC OF KOREA

He commended icddr,b’s research and innovations, expressing interest in future collaborations. He said, “I applaud the research initiatives, healthcare services, hospitals, and overall humanitarian efforts. I hope this institute will continue to play a crucial role in combatting various diseases in Bangladesh as well as other countries.”

August 28, 2023

MR SK MD. MONIRUZZAMAN, DIRECTOR GENERAL, NGO AFFAIRS BUREAU

Mr Sheikh Md. Moniruzzaman visited the icddr,b Respiratory Disease Hospital (RDH) at Teknaf, Cox’s Bazar. He was impressed by the services and emphasised the importance of using health cards issued to Forcibly Displaced Myanmar Nationals (FDMNs) for efficient healthcare delivery.

August 22, 2023

MR OH JOON, CHAIR, SAVE THE CHILDREN KOREA

He reaffirmed his appreciation for icddr,b's work and expressed interest in continued collaboration. He stated: "It was great to be back at icddr,b. We from Save the Children truly appreciate the great work of icddr,b and look forward to working with icddr,b in the future as well."

August 13, 2023

MS YEASHA SOBHAN, DIRECTOR, BASHUNDHARA GROUP

Ms Yeasha Sobhan highly praised icddr,b's humanitarian work after touring facilities and learning about research efforts.

July 11, 2023

H.E. MR ANNE VAN LEEUWEN, AMBASSADOR OF THE KINGDOM OF NETHERLANDS

H.E. Leeuwen and his wife visited and were impressed by icddr,b's innovations and patient care during their hospital visit. Ambassador van Leeuwen said: "I am very much impressed by the institution! Keep up the good work!"

May 12, 2023

RT HON HELEN CLARK, FORMER PRIME MINISTER OF NEW ZEALAND

Rt Hon Clark lauded icddr,b's life-saving work, particularly its low-cost innovations like the Bubble-CPAP for treating childhood pneumonia. She said: "The innovations and appropriate solutions for rehydration and oxygen were fascinating. I liked the caring philosophy of icddr,b to work with the young mothers on nutrition for malnourished babies. Much good work is being done here, not only in service provision but also in research, to overcome some of the very basic health challenges that not only Bangladesh face but many countries face."

April 12, 2023

H.E. MR PETER HAAS, US AMBASSADOR

Mr Haas commended icddr,b's research and hospital services, emphasising the importance of its life-saving work.

February 25, 2023

H.E. MR HARJIT S. SAJJAN, HONOURABLE MINISTER OF INTERNATIONAL DEVELOPMENT OF CANADA

H.E. Mr Sajjan visited icddr,b to witness its lifesaving work and longstanding partnership with Canada. He expressed his commitment to continued support, highlighting the institute's impactful innovations: "I am so impressed with what I have witnessed here at icddr,b. The innovations that are taking place here are saving lives. What has impressed me the most is that the scientists and employees are

utilising Canada's investment to turn complex medical issues into very simple solutions that can be used in the most vulnerable places. I am equally impressed that the knowledge they are gaining here is being shared with the rest of the world".

January 8-9, 2023

PROFESSOR SIR PETER HORBY, PROF. DAME SARAH CATHERINE GILBERT AND PROF. PIERO OLLIARO, OXFORD UNIVERSITY

Professor Sir Peter Horby, Director of Emerging Infectious Diseases and Global Health at the Pandemic Sciences Institute (PSI) and the Executive Director of the International Severe Acute Respiratory and Emerging Infection Consortium (ISARIC), along with Professor Dame Sarah Catherine Gilbert, co-inventor of the AstraZeneca COVID-19 vaccine, and Professor Piero Olliaro, Infectious Diseases expert and Director of Science at ISARIC, have visited icddr,b and its study areas to strengthen collaboration on infectious disease research.

RECOGNISING OUR **SUPPORTERS**

We are indebted to the foundations, institutions, corporations, development agencies, NGOs and multilateral bodies that support our work.

TOP 10 DONORS DURING 2023

	Donor partners	Restricted (USD)	Unrestricted (USD)	Total (USD)
1	USG - United States Agency for International Development (USAID)	13,951,715		13,951,715
2	Bill & Melinda Gates Foundation	12,031,709		12,031,709
3	Global Affairs Canada (GAC)	3,735,256	2,006,632	5,741,888
4	USG - Centers for Disease Control and Prevention (CDC)	5,384,356		5,384,356
5	United Nations Development Group (UNDG)	4,714,516		4,714,516
6	USG-National Institute of Health (NIH)	3,954,062		3,954,062
7	USA - Other than USG	3,874,988		3,874,988
8	The Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM)	3,325,336		3,325,336
9	Government of the People's Republic of Bangladesh (GoB)	1,373,359	1,405,561	2,778,920
10	Foreign, Commonwealth & Development Office (FCDO)	557,777		557,777

A complete list of donors is provided in Note 23 to the financial statements:
www.icddrb.org/about-us/reports/financial-reports

CORE DONOR FUNDING

We are grateful for the core support provided by the governments of Bangladesh and Canada.

The core donors provide funding that:

1. Enables us to focus on and pursue strategic research objectives aligned with the new global development agenda, including increased capacity building, advocacy and policy development activities
2. Enhances our financial stability, reducing our vulnerability to changes in the volatile research-funding environment, giving us more independence to prioritise our research agenda and to support worthwhile activities that are not funded by other donors
3. Facilitates our investment in maintaining and improving our infrastructure and research platforms essential to scientific advances, such as disease surveillance networks, state-of-the-art laboratories, and humanitarian services at icddr,b hospitals, which provide care free of charge to the poorest communities
4. Allows us to continue modernising our operations – financial, human resources, communications, supply chain and facilities management, and monitoring and evaluation – to improve our organisational efficiency and cost-effectiveness.

Together, these and future investments will ensure that icddr,b continues to generate high-quality research knowledge.

GLOBAL EMERGENCY RESPONSES
1991 - present

1. **Ecuador** (1991)
2. **Peru** (1991)
3. **Democratic Republic of Congo** (1994)
4. **Tanzania** (2002 and 2013)
5. **Bangladesh** (2009 and 2013)
6. **Nepal** (2009 and 2012)
7. **Papua New Guinea** (2009)
8. **The Philippines** (2009 and 2012)
9. **Uganda** (2009)
10. **Zimbabwe** (2009)
11. **Haiti** (2010)
12. **Pakistan** (2010)
13. **Afghanistan** (2011)
14. **Kenya** (2011 and 2012)
15. **Somalia** (2011 and 2012)
16. **Sierra Leone** (2012)
17. **North Korea** (2013)
18. **Iraq** (2013-2016)
19. **South Sudan** (2014)
20. **Mozambique** (2015)
21. **Syria** (2016)
22. **Ethiopia** (2017)
23. **Sudan** (2017)
24. **Yemen** (2017)
25. **Rohingya Population** (2017-until present)
26. **Lebanon** (2023)

ANNUAL REPORT 2023

icddr,b

68 Shaheed Tajuddin Ahmed Sarani, Mohakhali, Dhaka 1212
T (+88 02) 222277001-10, **F** (+88 02) 222277075, 222277077, **E** info@icddrb.org
Postal address: GPO Box 128, Dhaka 1000, Bangladesh

www.icddrb.org @icddr_b /icddrb icddrb,b