



ANNUAL REPORT 2022

Solving public health
problems through innovative
scientific research

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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.

WE ARE GRATEFUL TO OUR CORE DONORS FOR THEIR LONG-TERM COMMITMENT TO OUR WORK:



Government of the People's
Republic of Bangladesh

Canada



ABBREVIATION

A	ACF	Active Case Finding
	ADB	Asian Development Bank
	AdSEARCH	Advancing Sexual and Reproductive Health and Rights
	AFI	Acute Febrile Illness
	AFRIMS	Armed Forces Research Institute of Medical Science, Bangladesh
	AHRI	Armauer Hansen Research Institute, Ethiopia
	AMCH	Ad-Din Medical College Hospital
	AMR	Antimicrobial Resistance
	ANC	Antenatal Care
	ARF	Animal Resources Facility
	AWLA	AAAB Women Leadership Award
B	BAS	Bangladesh Academy of Science
	BCPAP	Bubble CPAP
	BGD e-GOV CIRT	Bangladesh Government's e-Government Computer Incident Response Team
	BLRI	Bangladesh Livestock Research Institute
	BNNC	Bangladesh National Nutrition Council
	bOPV	Bivalent Oral Poliovirus Vaccine
	BoT	Board of Trustees
	BSMMU	Bangabandhu Sheikh Mujib Medical University
	BSO	Biosafety Office
C	CC	Central Committee
	CDC	Communicable Disease Control
	CDC	Centers for Disease Control and Prevention, USA
	CDU	Child Development Unit
	CEPI	Coalition for Epidemic Preparedness Innovations
	CHAMPS	Child Health and Mortality Prevention Surveillance
	CIRDAP	Centre on Integrated Rural Development for Asia and the Pacific, Bangladesh
	CLS	Clinical Laboratory Services
	CM	Child Marriage
	CMS	Central Management Services
	CO	Carbon Monoxide
	CPC	Mycobacteriology Laboratory, Centre Pasteur du Cameroun
	c-Section	Caesarean Section
	CWCH	Centre for Women and Child Health
D	DeCoDe	Determination of Causes of Death
	DFATD	Department of Foreign Affairs, Trade, and Development
	DGFP	Directorate General of Family Planning, Bangladesh
	DGHS	Directorate General of Health Services
	DH	District Hospital
	DLS	Department of Livestock Services, Bangladesh
	DMCH	Dhaka Medical College and Hospital, Bangladesh
	DNCC	Dhaka North City Corporation
	DPDT	Department of Patent, Design, and Trademark
	DR-TB	Drug-resistant Tuberculosis
	DSCC	Dhaka South City Corporation
	DST	Drug Susceptibility Testing

E	EAN	Experimental Autoimmune Neuritis	
	ECD	Early Child Development	
	EMBL	European Molecular Biology Laboratory, Germany	
	ENT	National Institute of Ear, Nose and Throat, Bangladesh	
	EPHFs	Essential Public Health Functions	
	EPI	Expanded Programme on Immunization	
	ERP	Enterprise Resource Planning	
	ETEC	Enterotoxigenic <i>Escherichia coli</i>	
	EV71	<i>Enterovirus 71</i>	
	F	FAO	Food and Agricultural Organization, Bangladesh
FCDO		Foreign, Commonwealth & Development Office	
FDMN		Forcibly Displaced Myanmar Nationals	
G	GAC	Global Affairs Canada	
	GBS	Guillain-Barré Syndrome	
	GFATM	The Global Fund to Fight AIDS, Tuberculosis and Malaria	
	GFPWID	Global Fund Programme for People Who Inject Drugs, Bangladesh	
	GKSPL	Greentech Knowledge Solutions Pvt. Ltd., India	
	GMT	Geometric Mean Titer	
	GOARN	Global Outbreak Alert and Response Network	
H	GoB	Government of the People's Republic of Bangladesh	
	HAP	Household Air Pollution	
	HCWS	Healthcare Workers	
	HDSS	Health and Demographic Surveillance System	
	HDSS	Health and Demographic Surveillance Sites	
	HFMD	Hand, Foot, and Mouth Disease	
	HR	Human Resources	
	I	IAEA	International Atomic Energy Agency, Austria
		ICCH	Initiative for Climate Change and Health
		icddr,b	International Centre for Diarrhoeal Disease Research, Bangladesh
ICGEB		International Centre for Genetic Engineering and Biotechnology, India	
ICHSH		Institute of Child Health & Dr M R Khan Shishu Hospital, Bangladesh	
ICMH		Institute of Child and Mother Health, Bangladesh	
ideSHi		Institute for developing Science & Health initiatives, Bangladesh	
IDS		Institute of Development Studies	
IEDCR		Institute of Epidemiology, Disease Control and Research	
IFA		Iron-folic Acid	
IFPRI		International Food Policy Research Institute, Bangladesh	
iGC		icddr,b Genomics Centre	
ILI		Influenza-Like Illness	
IMCI		Integrated Management of Childhood Illness	
IP		Intellectual Property	
IPC		Infection Prevention and Control	
IPH		Institute of Public Health, Bangladesh	
IPHN	Institute of Public Health Nutrition, Bangladesh		
IRB	Institutional Review Board		
IRD	Interactive Research and Development, Pakistan		

	IT	Information Technology
	IVI	International Vaccine Institute, Korea (South)
	IYCF	Infant and Young Child Feeding
J	JHU	Johns Hopkins University
K	KMC	Kangaroo Mother Care
	KPIs	Key Performance Indicators
L	LBM	Live Bird Markets
	LIS	Library and Information Services
	LMICs	Low-and-middle-income Countries
	LON	Local Organizations Network
	LPG	Liquefied Petroleum Gas
	LSHTM	London School of Hygiene and Tropical Medicine
	LSSD	Laboratory Sciences and Services Division
M	MCCH	Maternal, Child and Community Health Division, USA
	MCWC	Mother and Child Welfare Centre
	MDROs	Multidrug-resistant Organisms
	MDR-TB	Multidrug-resistant TB
	MGH	Massachusetts General Hospital
	MIS	Management Information System
	MNP	Multiple Micronutrient Powder
	MSCS	Marie Stopes Clinic Society, Bangladesh
	MSH	Management Sciences for Health
	MSM	Males having Sex with Males
	MW	Medical Waste
N	NCDs	Non-Communicable Diseases
	NCTBR	National Centre for Tuberculosis and Research, Bangladesh
	NHU	National University Hospital, Singapore
	NI	Nutrition International
	NIAID	National Institute of Allergy and Infectious Diseases
	NIBSC	National Institute for Biological Standards and Control
	NICVD	National Institute of Cardiovascular Disease, Bangladesh
	NIDCH	National Institute of Diseases of Chest and Hospital, Bangladesh
	NIH	National Institutes of Health, USA
	NINS	National Institute of Neurosciences and Hospital, Bangladesh
	NIPSOM	National Institute of Preventive and Social Medicine
	NiV	Nipah Virus Infection
	NMEP	National Malaria Elimination Program, Bangladesh
	NRU	Nutritional Counselling at the Rehabilitation Unit
	NSF	Newborn Signal Functions
	NTP	National Tuberculosis Control Programme
O	OCV	Oral Cholera Vaccine
	OGSB	Obstetrical and Gynecological Society of Bangladesh
	OOP	Out-of-pocket
	ORS	Oral Rehydration Solution
	OST	Opioid Substitution Therapy
P	PC	Programme Committee
	PCC	Programme Coordination Committee
	PCS	Post-COVID Syndrome

	PHV	Public Health Vaccines
	PNA	Pseudovirus Neutralization Assay
	PoC	Point of Care
	PPM	Public-Private Mix
	PrEP	Pre-exposure Prophylaxis
	PTC	Policy Translation Cell
	PVS	PATH Vaccine Solutions
	PWID	People Who Inject Drugs
R	R&LA	Regulatory and Legal Affairs
	RA	Research Administration
	RDM	Research for Decision Makers
	RSV	Respiratory Syncytial Virus
S	SAG	Scientific Advisory Group
	SAHIC	National Centre for Hearing and Speech for Children, Bangladesh
	SAM	Severe Acute Malnutrition
	SAR	Secondary Attack Rate
	SARI	Severe Acute Respiratory Infections
	SARI ITC	Severe Acute Respiratory Infection Isolation and Treatment Centre
	SCM	Supply Chain Management
	SEARO	WHO Regional Office for South-East Asia
	SES	Socioeconomic Status
	SLT	Senior Leadership Team
	SMC	Social Marketing Company
	SRHR	Sexual and Reproductive Health and Rights
	SSK	Shasthyo Suroksha Karmasuchi
	SSMC	Shaheed Suhrawardy Medical College, Bangladesh
	STI	Sexually Transmitted Infection
T	TAT	Turn Around Time
	TBM	Tuberculous Meningitis
	TBSTC	TB Screening and Treatment Centres
	TGHN	The Global Health Network
	tNGS	Targeted Next Generation Sequencing
	TTU	Technical Training Unit
U	UCLA	University of California, Los Angeles
	UHC	Universal Health Coverage
	UNC	University of North Carolina
	UND	University of Notre Dame
	UNDG	United Nations Development Group
	UNFPA	United Nations Population Fund, Bangladesh
	UNICEF	United Nations Children’s Fund, Bangladesh
	UPHCP	Urban Primary Health Care Project
	USAID	United States Agency for International Development
	USAID’s ACTB	USAID’s Alliance for Combating Tuberculosis in Bangladesh
W	WASA	Water Supply and Sewerage Authority
	WASH	Water, Sanitation, and Hygiene
	WHNRC	Western Human Nutrition Research Center
	WHO	World Health Organization

CONTENTS

8 MESSAGE FROM THE BOARD CHAIR

9 MESSAGE FROM THE EXECUTIVE DIRECTOR

10 icddr,b IN NUMBERS 2022

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

12 RECOGNISING PHILANTHROPIC CONTRIBUTIONS

13 SPOTLIGHT

The following stories highlight six areas – our response to a massive diarrhoeal disease outbreak in Dhaka; our work on medical oxygen, which triggered global dialogues; efforts in combating tuberculosis; innovating to address sexual and reproductive health and rights; HIV and AIDS care and prevention – where we have a national and international impact.

21 RESEARCH HIGHLIGHTS

In 2022, we published findings of national, regional, and international significance.

27 PROGRAMME SUMMARIES

- REDUCING MATERNAL, NEONATAL AND CHILD MORTALITY AND IMPROVING THE WELL-BEING OF WOMEN, CHILDREN AND ADOLESCENTS
- PREVENTING AND TREATING MATERNAL AND CHILDHOOD MALNUTRITION
- CONTROLLING ENTERIC AND RESPIRATORY INFECTIONS
- DETECTING AND CONTROLLING EMERGING AND RE-EMERGING INFECTIONS
- ACHIEVING UNIVERSAL HEALTH COVERAGE
- ACHIEVING GENDER EQUALITY AND PROMOTING SEXUAL AND REPRODUCTIVE HEALTH AND RIGHTS
- EXAMINING THE HEALTH CONSEQUENCES OF AND ADAPTATION TO CLIMATE CHANGE
- PREVENTING AND TREATING NON-COMMUNICABLE DISEASES

52 CLINICAL SERVICES

Our hospitals in Dhaka and Matlab offer free care and serve as platforms for extensive clinical research and training. Furthermore, our SARI ITC provides respiratory illness and COVID-19 care to Forcibly Displaced Myanmar Nationals (FDMN) and Host Communities in Teknaf, Cox's Bazar.

54 LABORATORY SCIENCES AND SERVICES

The Laboratory Sciences and Services Division provides diagnostic and other laboratory services to icddr,b, and external clients. In addition, it contributes to icddr,b research in microbial genetics, genomics, environmental health, and gut-brain signalling.

56

TECHNICAL TRAINING UNIT

icddr,b provides a wealth of training opportunities for researchers, practitioners, policymakers, and others, from Bangladesh and globally.

58

PUBLICATIONS IN 2022

We are committed to the rapid and full publication of research findings in international high-impact peer-reviewed journals.

60

SELECTED AWARDS AND ACHIEVEMENTS

Selected awards and achievements.

62

KEY VISITORS IN 2022

Key visitors (national and international visitors) who visited icddr,b's hospital and facilities in Dhaka and Cox's Bazar in 2022.

66

COLLABORATIONS

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

70

CENTRAL MANAGEMENT SERVICES

Central Management Services (CMS) has continually improved and efficiently increased its support for research. We have strengthened the capacity of the departments and increased effectiveness by adopting policies and procedures to improve overall governance, accountability and transparency.

76

SENIOR LEADERSHIP TEAM

Our staff of over 4,800 are led by Executive Director Dr Tahmeed Ahmed and the Senior Leadership Team (SLT).

78

BOARD OF TRUSTEES

icddr,b's Board of Trustees comprises of 15 health professionals and researchers from developed and developing countries.

80

FINANCE

icddr,b's overall revenue for 2022 amounted to USD 79.7 million compared to a total expenditure of USD 78.4 million, generating a net surplus of USD 1.37 million for the year ending 31st December, 2022.

83

RECOGNISING OUR SUPPORTERS

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



Message BOARD CHAIR

Dear Colleagues and Supporters,

As Chair of the Board of Trustees, I am pleased to present the Annual Report 2022 of icddr,b. I express profound admiration for the resilience and dedication demonstrated by the icddr,b team. Despite considerable challenges, our commitment to scientific discovery and health improvement has remained strong and unyielding.

Our robust governance framework and strategic oversight have enabled us to make crucial decisions in a demanding environment, including the unique challenges presented by COVID-19. We have demonstrated agility in our response, ensuring the seamless provision of essential services.

Notably in 2022, we made substantial progress in our research endeavours addressing COVID-19, Antimicrobial Resistance, Nipah Virus Infection, Disease Surveillance, Vaccine Research, and many interesting works led by more than 350 scientific staff and supported by our global collaboration. Furthermore, our continued emphasis on response to emergency outbreaks and humanitarian crises has contributed significantly to the betterment of health in vulnerable communities.

A significant milestone this year was the passing of 'The International Centre for Diarrhoeal Disease Research, Bangladesh Act, 2022' by the Government of Bangladesh. We extend our heartfelt thanks to the Government of Bangladesh, the Ministry of Health and Family Welfare and the Directorate General of Health Services of Bangladesh for their support.

In our quest to advance global health, we at icddr,b have developed a progressive Strategic Plan for 2023-2027. This plan focuses on leveraging our expertise for nurturing innovative solutions, deepening impactful collaborations, and disseminating pivotal research insights to inform health policies over the next five years. This journey underscores our ongoing determination to create a healthier future for all.

I am pleased to report that icddr,b has received significant support from our partners and donors. I would like to express my heartfelt gratitude to each and every one of them for their generous contributions, which have been instrumental in our success. In particular, I extend my deepest appreciation to American novelist and philanthropist Ms MacKenzie Scott, and an Asian philanthropist Mr Muhammed Aziz Khan, Chairman of the Summit Group, whose visionary support have empowered us to expand our research capabilities and enhance healthcare services.

On behalf of the Board of Trustees, I would like to express my deepest gratitude to icddr,b leadership and our passionate employees, whose dedication and tireless work ethics contributed to yet another successful year at icddr,b. We are grateful to the esteemed members of our Scientific Advisory Group. Your guidance, expertise, and commitment have been invaluable in shaping icddr,b's achievements in 2022.

To our supporters, donors, and partners, I extend my heartfelt thanks for your trust, belief, and continued support. Together, we will continue to drive positive change, save lives, and build a healthier and more equitable future for all.

Warm regards,

Nancy Y. Cheng, FCPA, FCA
Chair, Board of Trustees
June 2023



Message EXECUTIVE DIRECTOR

Dear Friends of icddr,b

I am delighted to present icddr,b's Annual Report 2022, showcasing our impactful work in advancing global health. This report highlights our achievements, dedication to excellence, and the generous contributions that make it all possible.

Throughout the year, icddr,b has responded to critical health challenges with experience and innovation. We have successfully responded to Dhaka's unprecedented diarrhoeal disease outbreak and conducted oral cholera vaccination campaigns involving about 2.4 million residents to prevent and control cholera in high-risk communities. Our research on medical oxygen has sparked global discussions on this vital resource's life-saving impact. In response to the ongoing COVID-19 pandemic, our researchers have been at the forefront of investigating the long-term effects of the virus and developing strategies to support those experiencing prolonged symptoms.

A significant development in 2022 was the enactment of 'The International Centre for Diarrhoeal Disease Research, Bangladesh Act, 2022', which fortified our status as an autonomous, international, philanthropic, and non-profit centre. We're deeply grateful to the Government of Bangladesh, and especially to the Honourable Health Minister, Minister of Health and Family Welfare, Mr Zahid Maleque MP for his instrumental role in passing this law.

Looking ahead, we are inspired by the opportunities that lie before us. The challenges we face in the ever-evolving landscape of global health call for bold and innovative solutions. At icddr,b, we are committed to seizing these opportunities and driving positive change. Accordingly, we have developed our new Strategic Plan for 2023-2027. This plan, shaped through extensive internal and external consultations, represents our collective vision for the future. It identifies new challenges, aligns with our overarching strategic directions, and emphasizes innovation, impact, collaboration, reputation, and branding.

I extend my deepest gratitude to our dedicated team, partners, donors, and supporters for their firm commitment. Your belief in our mission has enabled us to make ground-breaking discoveries and positively impact millions of lives. I would also like to give special thanks to Ms MacKenzie Scott, Mr Muhammed Aziz Khan, Chairman of the Summit Group, Echotex Ltd., and others for their support, which empowers us to expand our research capabilities, enhance healthcare services, and drive meaningful change in global health.

Our goal of raising \$100 million for icddr,b Hospital Endowment Fund remains a priority. This fund will provide sustainable funding for our healthcare initiatives and strengthen our capacity to respond to emerging health challenges.

Finally, I invite you to explore the Annual Report 2022, which encapsulates the breadth and depth of our impactful work. Together, let us continue driving positive change, advancing global health, and creating a brighter future.

Thank you for your continued support.

Dr Tahmeed Ahmed

Executive Director

June 2023

icddr,b 2022 IN NUMBERS

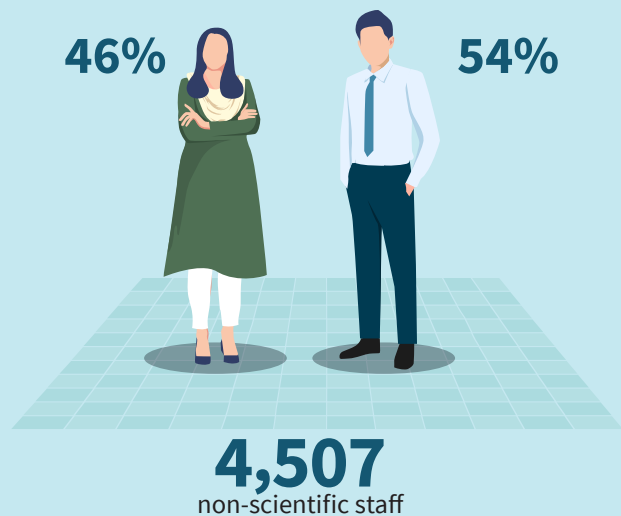
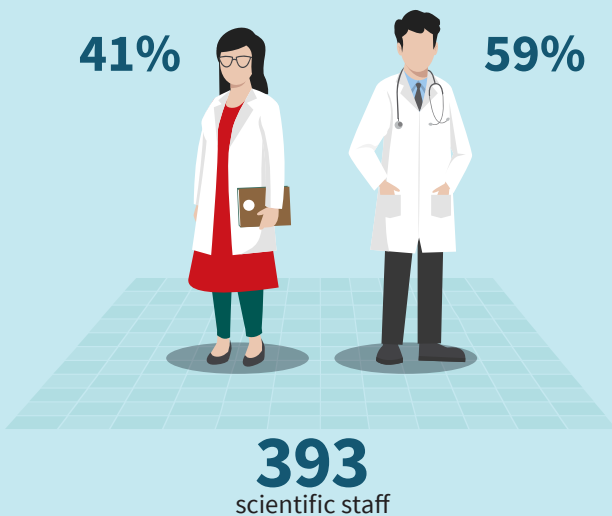
A snapshot of icddr,b funding, research, training, and clinical services



BREAKDOWN OF TOTAL INCOME

- USD **67.1** million restricted grants contributions
- USD **0.8** million other restricted income
- USD **4.6** million unrestricted grants contributions
- USD **7.2** million income from labs and other unrestricted income

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



GRANTS AND PROJECTS

144 new grants **600** ongoing projects



COLLABORATION

91 national collaborations **165** international collaborations



ARTICLES AND CITATION

509 original papers published^[1]



46,160 citations in 2018-2021



DIARRHOEAL DISEASE TREATMENT

296,799

patients treated in 2 hospitals

46%
female



54%
male



DIAGNOSTIC CENTRE

760

tests offered



690,391

tests carried out



COVID-19 DIAGNOSIS

25,840

tests done at icddr,b Virology Lab

18,464

tests done at icddr,b Diagnostic Centre



COVID-19 TREATMENT

23

outpatient care

6

inpatient care

1

patients requiring oxygen

● COVID-19 care in Dhaka

In 2022, **890** staff and **300** family members tested positive.

● COVID-19 care by SARI ITC^[2] in Teknaf, Cox's Bazar

1,396

COVID-19 positive patients

379

patients treated in SARI ITC



TUBERCULOSIS DIAGNOSIS

9.89 million

individuals were screened

8.24 mil. adults | **1.65 mil. children**



36,890

cases detected

33,312 adults

3,578 children



CONTRIBUTION

186

national policy review committees with icddr,b representation



244

international committees with icddr,b representation



CAPACITY BUILDING

296

individuals participated in icddr,b training courses



290

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

262

interns attended field experience/internship programme



5

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

17

icddr,b staff contributing to teaching at the James P Grant School of Public Health

(James P Grant School of Public Health is a joint venture initiative with BRAC and BRAC University)

[1] with icddr,b scientists as authors

[2] Severe Acute Respiratory Infection Isolation and Treatment Centre (SARI ITC)

RECOGNISING PHILANTHROPIC CONTRIBUTIONS

icddr,b successfully reached out and engaged with philanthropies both locally and internationally, driving generous support that has bolstered our research initiatives and humanitarian services.

In an unprecedented act of philanthropy, icddr,b received a generous gift of \$20 million from American novelist and philanthropist, Ms MacKenzie Scott. This monumental contribution, the largest in icddr,b's history, will significantly enhance our ability to continue our mission. This landmark gesture has set a new precedent and we express our deepest gratitude to Ms Scott.

Similarly, Mr Muhammed Aziz Khan, Chairman of the Summit Group, demonstrated his commitment to our cause by donating \$1 Million. Mr Khan donated \$0.5 million from Summit Corporation, along with his wife, a matching fund from the Anjuman & Aziz Charitable Trust to icddr,b hospital endowment fund. This is the largest donation ever from a Bangladeshi national, and it illustrates the increasing support from our local community for our services, particularly at our Dhaka and Matlab Hospitals.

Further contributing to our Hospital Endowment Fund, Professor Sufia Islam, a former colleague, extended her support for icddr,b's goals. Her donation of USD 188,000

underlines the valuable role of our extended icddr,b family in our pursuit of hospital self-sustainability.

Demonstrating corporate support for our mission, the state-owned Rupali Bank Limited and Agrani Bank Limited, along with Standard Chartered Bank, a leading international banking group, made significant donations. Another local corporate, Palmal Group of Industries Limited also made several donations to support our hospitals during 2022. These contributions are essential in bolstering our humanitarian efforts. Echotex Ltd., a noteworthy Bangladeshi company, joined the list of contributors with a donation of USD 59,000 to our Hospital Endowment Fund.

With a goal of raising our total Endowment Funds to US\$100 million, we continue to seek the support of individuals, philanthropists, and organisations worldwide, as we work relentlessly to address funding challenges and further our mission.

We extend our heartfelt gratitude to all our donors. Their belief in our work allows us to continue making significant strides in health research and services. Your support lights the way for a brighter future for icddr,b, and the communities we serve.

Photo: REUTERS/Danny Moloshok



Ms MacKenzie Scott

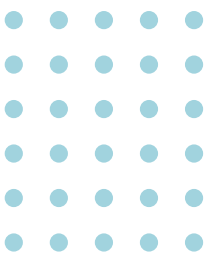
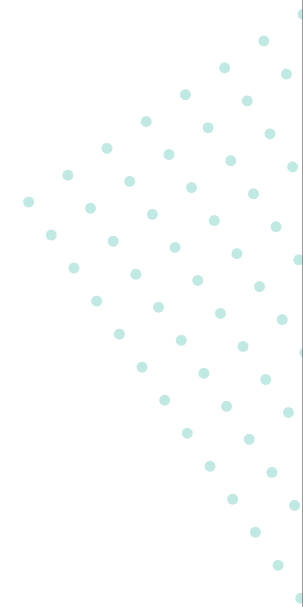
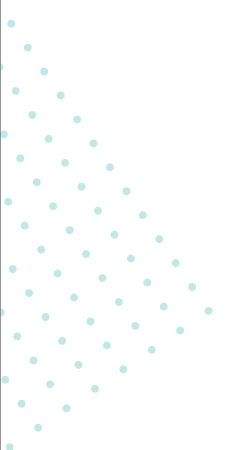


Muhammed Aziz Khan, Chairman of Summit Group, along with his wife Anjuman Aziz Khan and daughter Azeeza Aziz Khan ACCA, both directors of the group, visited icddr,b on March 27, 2022



SPOTLIGHT

The following stories highlight our significant national and international contributions across six key areas. They showcase our response to a major diarrhoeal disease outbreak in Dhaka, our pioneering work on medical oxygen that sparked global conversations, our efforts in combatting tuberculosis, our innovative approaches to address sexual and reproductive health and rights, and our comprehensive initiatives for HIV and AIDS care and prevention.



icddr,b TACKLES UNPRECEDENTED DIARRHOEA OUTBREAK IN DHAKA

We faced an unprecedented acute watery diarrhoea outbreak, presenting significant challenges and requiring a robust response in 2022. Our Dhaka Hospital, renowned as the world's largest diarrhoeal disease hospital, and Matlab Hospital witnessed an alarming surge in patients throughout the year. Despite this extraordinary situation, our dedicated team remained committed to providing high-quality care, treating over 77,000 patients at Dhaka Hospital and over 18,700 patients at Matlab Hospital, all free of charge as part of our charitable commitment.

To effectively handle the overwhelming patient load, icddr,b implemented emergency response measures and strengthened its capacity. The dedicated healthcare professionals worked tirelessly to treat patients suffering from severe dehydration, ensuring timely administration of intravenous fluids and necessary care. Temporary tents were set up, expanding Dhaka Hospital's capacity to accommodate up to 1,400 patients daily. Additional medical personnel were recruited, and logistics were

enhanced to support the increased demand for services.

Understanding the causes of the outbreak was crucial for an effective response. Through our surveillance efforts, we identified *Vibrio cholerae*, Enterotoxigenic *Escherichia coli* (ETEC), Rotavirus, and *Campylobacter* as the key pathogens responsible. Factors such as poor water and food quality, inadequate hygiene practices, and rising environmental temperatures were found to contribute to the outbreak.

Addressing water quality emerged as a critical aspect of our response. Collaborating with the Dhaka Water Supply and Sewerage Authority (WASA), icddr,b facilitated the implementation of measures to strengthen water quality, including increased chlorination and other necessary interventions. Additionally, we partnered with Communicable Disease Control (CDC) to improve the clinical management of diarrhoea in public hospitals through training courses for physicians in the region.

Engagement with local government institutions played a pivotal role in combating the outbreak. Chief Health Officers of the Dhaka North City Corporation (DNCC) and Dhaka South City Corporation (DSCC) visited the hospital and launched

awareness campaigns on diarrhoea prevention. The media also played a vital role in raising public awareness through news reports, features, and interviews with healthcare professionals.

A reactive oral cholera vaccination campaign was conducted in high-prevalence areas of Dhaka city to control the outbreak. The campaign targeted 2.4 million individuals in five areas of Dhaka city, utilising GIS technology for precise planning and implementation. With proper cold chain systems in place, the campaign reached an impressive coverage of 99% in the first round and 86.3% in the second round. Thanks to CDC, DGHS, GAVI and WHO for making this happen.

Community outreach efforts were also undertaken to provide support and promote preventive measures. Collaborating with local water purification tablet manufacturers, icddr,b distributed over 150,000 tablets among patients with compromised water sources during the time of discharge from the hospital, improving access to clean drinking water. Informational leaflets on diarrhoeal disease prevention and the use of oral rehydration solution (ORS) were widely distributed.

The success of the oral cholera vaccination campaign serves



Triage at icddr,b's Dhaka Hospital during the outbreak in March-May 2022

as a model for future outbreak responses, demonstrating our ability to adapt and effectively address public health challenges.

.....

OXYGEN SECURITY

icddr,b's research on hypoxemia catalyses global action for medical oxygen security in LMICs

Achieving the UN Sustainable Development Goal of reducing the under-five mortality rate to no more than 25 per 1,000 live births by 2030 requires effective prevention and treatment of pneumonia, responsible for 15% of child fatalities in low-and-middle-income countries (LMICs). Hypoxaemia, or low arterial blood oxygen saturation (SpO₂ <90%), is a significant mortality predictor for these children.

The prevalence of hypoxaemia in children with pneumonia in LMICs remains under-researched. To address this, icddr,b conducted a systematic review and meta-analysis funded by the UK National Institute for Health Research, Global Health Research Unit on Respiratory Health [RESPIRE] and UK aid. The study, published in *The Lancet Global Health*, highlighted the need for oxygen security in LMICs' health systems to reduce pneumonia-related mortality.

Findings emphasised the significant prevalence of hypoxaemia in children with severe pneumonia and underscored the importance of innovative diagnostics, such as pulse oximetry, for children with non-severe pneumonia. This necessitates urgent referral for rapid therapy.

The paper spurred a global discussion on the need for quality estimates of hypoxaemia burden in



LMICs, medical oxygen, and related therapies. Every Breath Counts Coalition, comprising over 25 academic institutions, INGOs, and donors, developed a proposal for a Lancet Global Health Commission on Medical Oxygen Security based on the high hypoxaemia burden reported. This commission aims to address major gaps in oxygen research, mobilise a broad coalition, and accelerate the impact on hypoxaemia-related deaths across LMICs.

The commission is co-hosted by icddr,b, Makerere University (Uganda), and the University of Melbourne (Australia). As a partner organisation and organiser, icddr,b is committed to reducing preventable deaths among newborns and children under five.

Rahman AE, Hossain AT, Nair H, Chisti MJ, Dockrell D, Arifeen SE, Campbell H. Prevalence of hypoxaemia in children with pneumonia in low-income and middle-income countries: a systematic review and meta-analysis. *Lancet Glob Health* 2022 Mar;10(3):e348-e359. doi: 10.1016/S2214-109X(21)00586-6

Low-Cost Pulse Oximetry Integration Promises to Save Young Lives

Pulse oximetry, a non-invasive and accurate method for measuring hypoxaemia, has

been recommended by the WHO for pneumonia assessment in outpatient settings. However, evidence regarding the feasibility of implementing pulse oximetry in LMICs including Bangladesh remains scarce. We conducted implementation research to address this gap, publishing three articles covering stakeholder engagement, pre-implementation testing, and the demonstration phase of the updated Integrated Management of Childhood Illness (IMCI) package in a district setting.

This study is the first to report most of the WHO's implementation outcome variables and has contributed to the conceptualisation of implementation research based on WHO's framework. It addresses the key evidence gap, informing national policymakers in Bangladesh about evidence-based scale-up of pulse oximetry.

The extensive stakeholder engagement process ensured country ownership, government leadership, and multi-partner involvement from programme planning to implementation, required to integrate pulse oximetry into routine IMCI service in Bangladesh. The National Child Health Strategy now includes pulse oximetry recommendations, and



Sampling complete, a bat is released back into the wild.

the Government of Bangladesh has updated the National IMCI Implementation Package, incorporating information related to pulse oximetry and hypoxaemia management in all programme implementation documents.

The Management Information System (MIS) department of the DGHS has added hypoxaemia among children with pneumonia receiving IMCI services as a dedicated variable in the national dataset and dashboard. The National Newborn Health and IMCI Program has updated its plan to include procurement of pulse oximeters for the IMCI corners in the next health sector programme. Furthermore, development partners such as UNICEF and WHO have committed to supporting the Government of Bangladesh's national scale-up effort by introducing pulse oximetry in their supported districts.

Rahman AE, Ameen S, Hossain AT, Perkins J, Jabeen S, Majid T, Uddin AFMA, Shaikh MZH, Islam MS, Islam MJ, Ashrafee S, Alam MSH, Saber A, Ahmed S, Banik G, Kabir ANME, Ahmed A, Chisti MJ, Cunningham S, Dockrell DH, Nair H, Arifeen SE, Campbell H. Introducing pulse oximetry for outpatient management of childhood pneumonia: an implementation research adopting a district implementation model in selected rural facilities in Bangladesh.

eClinicalMedicine 2022 Jun 29;50:101511. doi: <https://doi.org/10.1016/j.eclinm.2022.101511>.

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NIPAH VIRUS (NiV) INFECTION

Nipah virus infection (NiV) has been a persistent threat in Bangladesh since 2001, with a fatality rate exceeding 70%. Recognising the potential for large outbreaks and pandemics, WHO named NiV a priority pathogen in 2017.

Keeping Track of Nipah Virus in Bangladesh: A Decade-Long Surveillance

Since 2006, we in partnership with the IEDCR and US CDC, Atlanta, have been conducting an extensive NiV surveillance initiative, the longest-running of its kind globally. In 2022, an “enhanced surveillance” component was added, which is currently active at 402 governmental and private healthcare facilities nationwide during the Nipah season (December to April). This comprehensive surveillance approach has provided groundbreaking insights, including the discovery that mothers who previously survived NiV infection

can pass specific immune properties to their newborns. The continuous monitoring of NiV in Bangladesh remains a vital resource for understanding and managing this public health threat.

Satter, S.M.; Nazneen, A.; Aquib, W.R.; et al. Vertical Transfer of Humoral Immunity against Nipah Virus: A Novel Evidence from Bangladesh. *Trop. Med. Infect. Dis.* 2023, 8, 16. <https://doi.org/10.3390/tropicalmed8010016>

Pioneering Global Research: Long-term Immune Response and Clinical Impact of Nipah Virus Infection

In a significant global initiative, we collaborated with CEPI, US-CDC, Stanford University, and NIBSC to study the long-term impact of Nipah Virus (NiV) infection and to establish a valuable blood bank from survivors. Over 50 survivors from 34 districts in Bangladesh were enrolled, providing essential blood samples to examine the immune response to NiV over time. This blood bank is a precious resource for the global research community, aiding in the development of diagnostic tools, treatments, and vaccines. As part of this project, icddr,b successfully developed an in-house ELISA for three Nipah antigens (proteins G, N,

and F), bolstering research capacity. Furthermore, the National Institute for Biological Standards and Control (NIBSC) crafted a standard antibody assay for future vaccine trials, now under review for WHO approval. This initiative marks a significant contribution to global efforts to understand and combat this deadly infection.

Nipah Trial Vaccine Acceptance Assessment

Currently, only supportive treatment exists for the treatment of NiV, underlining the urgency for vaccine development. Public Health Vaccines (PHV) is addressing this through a Phase I trial of a Nipah vaccine candidate, with Phase II trials planned for Bangladesh.

In preparation for Phase II trials, we partnered with the CEPI, Stanford University, and Johns Hopkins University to conduct a study. The study assessed public knowledge, attitudes, perceptions, and willingness to receive a trial vaccine. The study findings will inform the revision of the consent form for the Phase II trial and guide the creation of a communication strategy to limit misinformation. Additionally, it will help stakeholders and partners

make informed decisions about the use of a trial and approved Nipah vaccine.

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COMBATTING TUBERCULOSIS

USAID's Alliance for Combating Tuberculosis in Bangladesh (ACTB), led by icddr,b supports the National Tuberculosis Control Programme (NTP) to improve TB case detection via health systems strengthening. The project aims to enhance service delivery for all forms of TB by bridging existing gaps, introducing new tools and technology, and involving private sectors and civil society. Initiated in 2020, the TB Local Organizations Network (LON) project is led by icddr,b, with SMC, BADAS, and HEED Bangladesh as consortium members, and FHI360 and Stop TB Partnership as technical partners.

Enhanced Detection of Childhood TB via Integrated Approach

In high TB-burden countries, such as Bangladesh, it's estimated

that 10-20% of all TB cases occur in children. However, between 2019 and 2021, only 4% of all TB cases in Bangladesh were children. In response, USAID's ACTB implemented a multi-faceted strategy to increase the detection of childhood TB, developed in close collaboration with the NTP. This approach, which includes active screening at community and facility levels, capacity building, use of WHO-recommended tests, and community outreach campaigns, has led to increased detection rates.

In 2022 alone, the strategy led to the screening of over 1.65 million children for TB, with nearly 3,000 positive diagnoses. Notably, the Rajshahi and Sylhet divisions saw significant improvements in detection rates, increasing from an 3.4% (Rajshahi) and 3.6% (Sylhet) in 2021 to an average of 5.2% in 2022, after ACTB intervention.

Engaging Private Healthcare with Public-Private Mix Approach

USAID's ACTB adopted a Public-Private Mix (PPM) approach to further control TB in Bangladesh. Working with the Social Marketing



Company (SMC), the PPM approach leverages their expansive network of informal healthcare providers to enhance TB detection and service quality. In 2022, over 2.78 million TB presumptive were screened, with over 4,000 diagnoses. This approach also incorporates the establishment of ten TB Screening and Treatment Centres (TBSTC) in partnership with icddr,b, facilitating increased detection of TB cases from the private sector.

Enhanced Detection through Active Case Finding

In 2021, 18% of total TB cases in Bangladesh were unnotified or undiagnosed. To address this, USAID's ACTB implemented an Active Case Finding (ACF) approach, screening over 3.5 million presumptive individuals and identifying over 12,000 TB cases in 2022. This approach specifically targets at-risk communities, including tea garden and punji communities in Sylhet division, diabetics across the country, and the slum population in Dhaka.

Inauguration of Bangladesh's First TB Parliamentary Caucus

USAID's ACTB facilitated the establishment of Bangladesh's first Parliamentary caucus on TB in 2022. This initiative seeks to increase political commitment and social accountability for TB in Bangladesh through engagement with parliamentarians, key populations, and other strategic stakeholders.

Promoting TB Research through Fellowships

USAID's ACTB partnered with Bangabandhu Sheikh Mujib Medical University (BSMMU) and the National Institute of Preventive and Social Medicine (NIPSOM) to offer research fellowships to postgraduate doctors and students conducting TB research. The fellowship offers

valuable grassroots experiences and insights for policymakers and programme implementers. The first batch of fellows presented their research findings in August 2022, covering diverse topics including TB prevalence among MDR-TB patients' household contacts, the impact of COVID-19 on TB control services, and barriers to childhood TB detection.

Media Fellowship for TB Reporting

Recognising the potential of mass media in disseminating crucial TB prevention and treatment messages, USAID's ACTB initiated the "Media Fellowship for Reporting on TB 2022". This fellowship offers journalists the opportunity to learn from leading experts, gain valuable field experience, and contribute significantly to the development of TB interventions.

Revolutionising Drug-Resistant Tuberculosis Detection

The rise of drug-resistant tuberculosis (DR-TB), particularly multidrug-resistant TB (MDR-TB), worldwide necessitates more effective detection methods. Through a study on the application of Targeted Next Generation Sequencing (tNGS), we have made significant strides in addressing this challenge. tNGS, especially the WHO-endorsed Deeplex Myc-TB assay, allows for comprehensive genotypic drug susceptibility testing (DST), aiding in the detection of resistance to 15 anti-TB drugs. Our preliminary findings indicate a strong correlation between phenotypic DST and tNGS in DR-TB detection. This has led to the Joint Monitoring Mission's recommendation of implementing tNGS in tertiary hospitals for DR-TB clinical management. The data generated by tNGS is invaluable, offering insights into drug resistance profiles, bacterial

species identification, and potential mixed infections, thereby informing treatment decisions and surveillance patterns.

Innovations in Tuberculous Meningitis Diagnosis

Tuberculous meningitis (TBM), a severe form of tuberculosis, remains a significant health challenge due to difficulties in diagnosis. Our study, funded by the Swedish International Development Cooperation Agency, evaluated the Xpert MTB/RIF Ultra assay's (Xpert Ultra) performance for TBM diagnosis in adults and children. The study, conducted from October 2019 to March 2022, demonstrated that Xpert Ultra significantly improved the detection of TB meningitis in cerebrospinal fluid specimens, yielding a detection rate of 31% in adults and 22% in children. In light of these findings, USAID's ACTB plans to scale up the Xpert Ultra method nationwide to enhance the rapid and accurate detection of TBM patients.

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INNOVATING TO ADDRESS SEXUAL AND REPRODUCTIVE HEALTH AND RIGHTS

The Advancing Sexual and Reproductive Health and Rights (AdSEARCH), an initiative by icddr,b and supported by the Department of Foreign Affairs, Trade, and Development (DFATD), Canada is working to enhance sexual and reproductive health and rights (SRHR) in Bangladesh. It aims to improve SRH outcomes and realise rights for diverse population groups, such as adolescents, young people, newly-wed couples, pregnant women, ready-made garment workers, and people with diverse gender and sexual orientations.

Focusing on innovation, AdSEARCH develops and tests novel products, systems, apps, and analytics, becoming one of the largest innovation hubs in the country. In 2022, the initiative invited young researchers to submit innovative ideas, awarding nine exceptional projects from a pool of 51 submissions. These innovations include the HopeBox for orphan adolescent girls; wellbeing corners for young pregnant girls and mothers; the iKnow initiative for addressing gender equity and rights among icddr,b staff; menstrual cups for female garment workers; a peer-based electronic platform for school-based adolescent programmes; a study on stress, performance quality, and sleep patterns of adolescent female athletes during menstruation, and three additional projects addressing SRH needs for key populations.

AdSEARCH is also developing and testing other innovations, such as ‘Balika bodhu: addressing denial of SRHR to married adolescent girls’; a low-cost colposcope for early cervical cancer detection; an integrated package for essential gynaecological services; a thermal jacket for low-birthweight infants, and an ICT-based risk assessment tool for HIV and AIDS, connecting high-risk individuals to service providers.

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HIV CARE AND BEYOND: HIGHLIGHTS OF icddr,b’s PROGRAMME FOR HIV AND AIDS

The Programme for HIV and AIDS at icddr,b has consistently been at the forefront of evidence-based innovations, contributing significantly to the HIV prevention strategy. These marginalised interventions, grounded in research and tailored to the specific needs

of vulnerable populations, have played a crucial role in reducing HIV and sexually transmitted infection (STI) risk behaviours. The program primarily focuses on males having sex with males (MSM) including male sex workers (MSW), transgender women (hijra), and people who inject drugs (PWID) enrolled in Opioid Substitution Therapy (OST) clinics.

Empowering Communities: A Holistic Approach

The Programme for HIV and AIDS recognises the broader humanitarian needs of these vulnerable marginalised groups, extending its interventions beyond healthcare. A community empowerment project was piloted, funded by German Doctors, integrating health, economic, and social empowerment components. Initiated in October 2021, this intervention has positively impacted 136 marginalised

community members (e.g. MSW, OST clients, and hijra) by enhancing their financial independence, self-esteem, and promoting healthier behaviours. Encouraged by its success, the project is set to scale up to reach 400 participants.

Blending Biomedical and Behavioural Prevention: The Case of PrEP

Clinical trials have underscored pre-exposure prophylaxis (PrEP) as a potent best-practice biomedical intervention for preventing HIV infection among high-risk populations. The Program pioneered this approach in March 2022, enrolling 206 MSM and transgender women, providing ongoing adherence counselling and routine patient follow-up. Despite some challenges, nearly 90% adherence rate was maintained, and no HIV-positive case was identified among the participants.



Reaching Hidden, hard-to-reach MSM: Virtual Outreach Initiatives

In a bid to reach MSM groups, particularly self-identified gay and bisexual men from advantageous socioeconomic backgrounds, that often remain out of coverage, the programme piloted a virtual outreach initiative using social-media platforms in Dhaka city and is currently under the scale-up phase for 5,000 target populations in four divisional cities. From October 2021 to January 2023, this intervention reached 209 gay groups consisting of 3,254 self-identified gay members, providing them with HIV prevention services. The programme identified 11 HIV-positive cases from 908 tests through self-testing and linked them to ART.

Enhancing Biomedical Interventions for PWID: The OST Program

The OST programme, pioneered by icddr,b, has been instrumental in curbing injection drug use and

preventing HIV and HCV. This program is continually evolving to meet OST clients' needs more effectively. Notably, take-home dose provisions and telemedicine services were introduced during the COVID-19 pandemic and have now been institutionalised due to their popularity. To simplify and decentralise HCV treatment among PWID, the programme plans to introduce single-visit “test and treat” modalities, including confirmatory point of care (PoC) finger prick HCV RNA testing using GeneXpert machines located at the community level.

Breaking Barriers: Healthcare Access for Transgender Women

In collaboration with the Health Economics Unit, Government of Bangladesh; icddr,b executed a study on healthcare access barriers for hijras. The study underlined the necessity for a gender-inclusive healthcare environment, calling for separate infrastructural provisions and sensitised healthcare providers. Discussions with stakeholders

are ongoing to implement these recommendations in mainstream healthcare settings.

Focusing on SRHR of Key Populations Through Establishing a Surveillance System

While HIV and STIs have been the primary focus for key populations, other sexual and reproductive health and rights (SRHR) issues have been neglected. These include human papillomavirus, reproductive tract cancers, unintended pregnancies, and gender dysphoria. To address these, systematic research and surveillance are necessary to explore the SRHR burden and unmet needs. As a response, the Programme for HIV and AIDS has initiated the first SRHR surveillance in Bangladesh, part of the “Advancing Sexual and Reproductive Health and Rights” (AdSEARCH) project. This surveillance aims to create a comprehensive SRHR database to guide future interventions.

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RESEARCH HIGHLIGHTS

In 2022, we published findings of national, regional, and international significance. icddr,b researchers and their national and international collaborators made important contributions across our focus areas, influencing national, regional, and international policy and practice.

Our research addresses many key health concerns affecting Bangladesh and other countries in the global South.

REVERSING THE CONSEQUENCES OF MALNUTRITION IN CHILDREN: PROBIOTIC OFFERS NEW HOPE

Malnutrition has severe consequences for children, contributing to 45% of global under-five deaths. Survivors often suffer from impaired physical and mental development, compromised immunity, and non-communicable diseases later in life. Severe acute malnutrition (SAM) affects around 13.6 million children under five years, with one-third under six months. SAM causes 1-2 million deaths annually, highlighting the need for effective strategies to manage it.

Researchers found that children with SAM suffer from “dysbiosis,” a depletion of gut microbiota members. Gut microbiota immaturity has also been linked to childhood malnutrition. *Bifidobacterium infantis*, a beneficial gut bacterium specialised for processing breast milk carbohydrates, is scarce in Bangladeshi infants with SAM. These beneficial microorganisms, known as “probiotics,” confer health benefits to the host’s physiology when used

as live food ingredients. “Prebiotics” are milk oligosaccharides and similar substances that help probiotics survive and thrive in the human host.

A pilot clinical trial assessed the engraftment of *B. infantis* in the malnourished intestine, with 67 severely malnourished Bangladeshi infants aged 2-6 months receiving probiotic (US donor-derived *B. infantis* strain EVC001) with/without prebiotic (LNnT) for 28 days, followed by four weeks of monitoring. The intervention increased the relative abundance of fecal *B. infantis*, suggesting successful engraftment in the malnourished intestine. Supplementation also improved infants’ weight gain and reduced intestinal inflammatory markers.

Researchers evaluated Bangladeshi *B. infantis* strains in silico and in vitro, finding variable LNT transporter presence in different strains. They compared the in vivo fitness of Bangladeshi *B. infantis*

strains in gnotobiotic mice fed a typical diet for 6-month-old Bangladeshi infants. One strain, Bg_2D9, expressed uptake and consumption of N-glycans and plant-derived polysaccharides and showed better fitness than US donor-derived *B. infantis* (EVC001). In a mother-to-infant gut microbiota transmission gnotobiotic mouse model, Bg_2D9 demonstrated a fitness advantage over EVC001.

Further clinical testing is underway to determine whether the Bangladeshi *Bifidobacterium infantis* Bg_2D9 strain is superior to the US strain for managing malnourished partially or non-breastfed infants.

Barratt MJ, Nuzhat S, Ahsan K, Frese SA, Arzamasov AA, Sarker SA, Islam MM, Palit P, Islam MR, Hibberd MC, Nakshatri S. *Bifidobacterium infantis* treatment promotes weight gain in Bangladeshi infants with severe acute malnutrition. *Science translational medicine*. 2022 Apr 13;14(640):eabk1107.



POST-COVID RISK FACTORS: A FIRST OF ITS KIND STUDY IN ASIA



icddr,b, in collaboration with the BSMMU, conducted a prospective longitudinal study from December 2020 to October 2021 to assess the prevalence, incidence rate, evolution, and risk factors of the post-COVID syndrome (PCS) among hospitalised and non-hospitalised COVID-19 survivors in Dhaka, Bangladesh. The study involved 362 participants who underwent comprehensive in-person follow-ups at one, three, and five-month post-recovery intervals to evaluate PCS symptoms, including neurological, cardiac, respiratory outcomes, and mental health. The study will continue for 24 months.

Key findings show that COVID-19 survivors over 60 years old are twice as likely to develop cardiovascular and neurological complications compared to those younger than 40. Additionally, females are more likely to develop post-COVID complications than

males. Hospitalised patients and those needing intensive care are more likely to experience long-term complications than non-hospitalised patients. Hospitalised survivors with pre-existing diabetes had a higher possibility of having uncontrolled blood sugar with regular medication and thus required more frequent insulin therapy compared to non-hospitalised patients. The new occurrence of diabetes was significantly higher among hospitalised patients, adding to the diabetes burden in the country. Most complications decreased over time in both groups; however, issues such as shortness of breath, fast pulse rate, post-traumatic stress disorder, anxiety, and depression did not decline significantly in the non-hospitalised group even five months after recovery.

Considering these findings, continuous follow-up and care

for COVID-19 survivors, especially older and hospitalised patients, are essential due to their increased risk of cardiovascular complications. Routine monitoring of the novel incidence of diabetes mellitus among hospitalised COVID-19 survivors is crucial to address the growing diabetes burden in the country.

The study resulted in a clinical management guideline for Long-COVID which will aid physicians in identifying, acting upon, and maximising patient rehabilitation for long COVID complications.

It was funded by the United States Agency for International Development (USAID) Alliance for Combating TB (ACTB) in Bangladesh activity.

Afroze F, Arafat SM, Ahmed CM, Alam B, Banu S, Islam MZ, et al. Features and risk factors of post-COVID-19 syndrome: findings from a longitudinal study in Bangladesh. *Lancet Reg Health Southeast Asia*. 2022:100134.

INTEGRATING EARLY LIFE PSYCHOSOCIAL STIMULATION PROGRAMMES INTO THE GOVERNMENT HEALTH SYSTEM

The first 1,000 days of a child’s life are critical for brain development, with experiences during this period affecting mental and behavioural status. Between 1999 and 2013, the child development team of MCHD conducted several small-scale studies to test the efficacy of an early child development (ECD) programme of psychosocial stimulation, adapted from Jamaica, on the development and behaviour of disadvantaged children in Bangladesh. In 2014, the team introduced two sister studies that scaled up psychosocial stimulation into the government health system. Frontline health workers provided ECD sessions to pairs and groups of malnourished children and their caregivers at community clinics, leading to significant improvements

in children’s development and behaviour.

Encouraged by these results, the team conducted a formative study to assess whether the training and supervision of the programme could be delivered by health and family planning inspectors, who supervise frontline health workers. Despite low supervision levels, the intervention significantly benefitted home stimulation.

Currently, researchers are scaling up ECD programmes in four districts through a cascade training model, involving government health staff at district, sub-district, union, and village levels, in partnership with the MoHFW. The goal is to expand the programme to all districts nationwide. Additionally, UNICEF has funded the training of primary

healthcare workers in two other districts, with the MoHFW also fully involved.

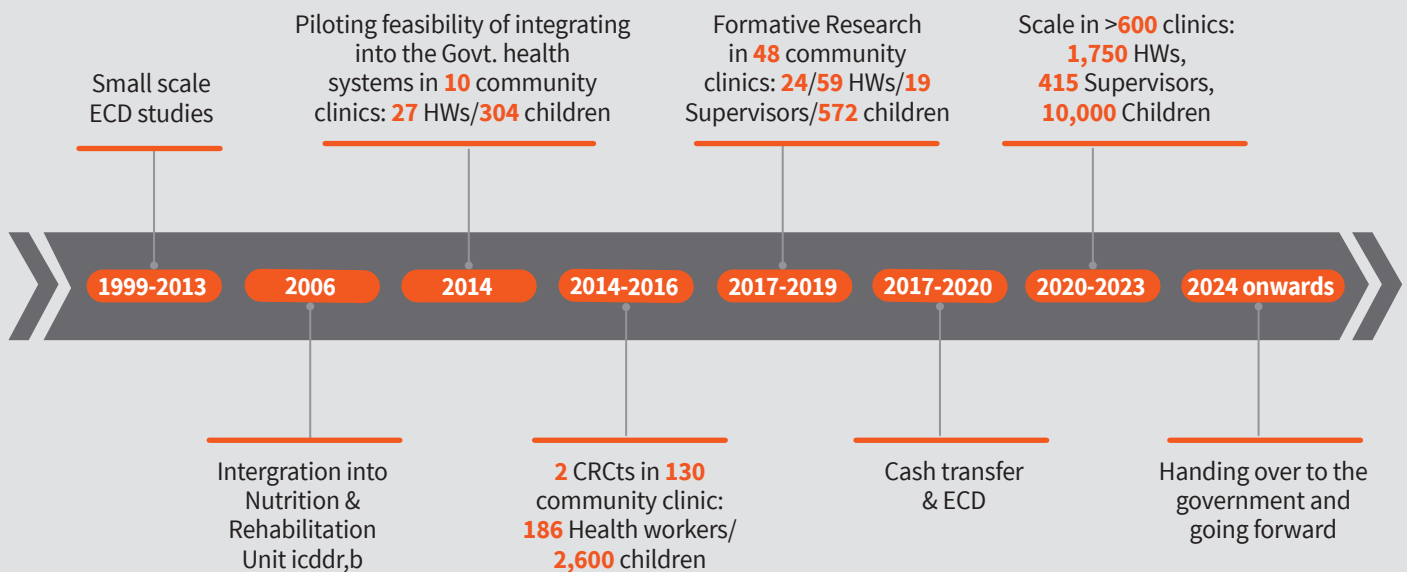
Hamadani JD, Mehrin SF, Tofail F, Hasan MI, Huda SN, Baker-Henningham H, Ridout DA, Grantham-McGregor SM. Integrating an early childhood development programme into the Bangladeshi Primary Health Care Services: A cluster randomised trial. February 2019. *Lancet Glob Health* 2019; 7: e366–75. DOI: 10.1016/S2214-109X(18)30535-7.

Mehrin SF, Hasan MI, Tofail F, Shiraji S, Ridout D, Grantham-McGregor S, Hamadani JD, Baker-Henningham H. Integrating a Group-Based, Early Childhood Parenting Intervention into Primary Health Care Services in Rural Bangladesh: A Cluster-Randomised Controlled Trial. *Front Pediatr* 2022 Jun; 10:886542. doi: 10.3389/fped.2022.886542.

Mehrin SF, Salveen NE, Kawsir M, Grantham-McGregor S, Hamadani JD, Baker-Henningham H. Scaling-up an early childhood parenting intervention by integrating into government health care services in rural Bangladesh: A cluster-randomised controlled trial. *Child Care Health Dev.* 2022 Dec 13. doi: 10.1111/cch.13089. Epub ahead of print.

Our journey to the present Pathway of ECD Scale-up Intervention in Bangladesh

From 1999 till date



EVALUATING SEROPREVALENCE AND FEATURES OF HAND, FOOT, AND MOUTH DISEASE

Hand, Foot, and Mouth Disease (HFMD), a non-polio enterovirus infection primarily affecting children under 10, has emerged as a health concern in Asia, with severe cases potentially leading to neurological illnesses. We conducted a cross-sectional study from March 2019 to March 2020, involving 1,210 children from both urban and rural regions in Bangladesh. Our study aimed to determine the seroprevalence of neutralising antibodies of *Enterovirus 71* (EV71), a major strain of HFMD.

We found that 67.6% (n=817) of the participants were seropositive

for EV71. The urban population showed a higher seropositivity rate at 91.9% (n=558) with a geometric mean titer (GMT) of 30.4, compared to the rural population at 43% (n=259) with a GMT of 15.0. The only confirmed predictor for EV71 seropositivity was the location of the toilet in the univariate analysis (OR 0.52, 95% CI 0.29 - 0.93, P = 0.003).

Simultaneously, we observed the clinical and epidemiological characteristics of children with HFMD in a Dhaka tertiary hospital. We collected 104 samples from suspected HFMD cases, 89% (n=92) of which were confirmed

enterovirus positive, with Coxsackie A6 being the most prevalent enterovirus strain.

Sporadic HFMD incidences and outbreaks, along with recent media coverage of HFMD outbreaks in Dhaka, highlight the presence of non-polio enterovirus-caused HFMD in Bangladesh, indicating vulnerability to future outbreaks. This research contributes to evidence-based decision-making for potential therapeutic and prophylactic intervention strategies, including vaccination implementation, to control HFMD in the long run.

ADDRESSING ANTIMICROBIAL RESISTANCE (AMR)

Embracing a multidisciplinary approach, icddr,b spearheads various research initiatives spanning laboratory-based studies to human and poultry investigations, all aimed at enhancing our understanding and mitigation strategies of AMR.

Survey on Antimicrobial Use in Tertiary Hospitals

In 2022, icddr,b, in alliance with the Directorate General of Health Services (DGHS) and the Fleming Fund, conducted a point prevalence survey in tertiary-level hospitals to understand antimicrobial use. The study revealed a high degree of irrational antibiotic use among admitted patients, with 75% receiving at least one antibiotic. The results were disseminated in national forums and will be shared internationally, helping to shape

policies for rational antimicrobial use and resistance containment.

Candida auris in Intensive Care Units

A collaborative investigation with the CDC-DGHS and US-CDC explored the prevalence of *Candida auris*, a multi-drug resistant yeast, among ICU patients in two tertiary care hospitals in Dhaka. The study findings, shared with hospital authorities and CDC-DGHS, highlighted the need for clinicians to consider fungal infections in treatment plans and for hospitals to enhance infection prevention and control (IPC) measures.

Antimicrobial Resistance in Communities and Hospitals

In a project with IEDCR and US-CDC, we studied the prevalence of multidrug-resistant organisms

(MDROs) among hospitalised patients and community individuals. The findings revealed a high presence of AMR pathogens in both groups. The data collected is currently being analysed through whole-genome sequencing to further characterise resistance and virulence genes, providing valuable insights into the genomic relationship between MDROs in communities and hospitals.

Infection Control and Antibiotic Stewardship in Tertiary Hospitals

This initiative, conducted with the DGHS, focused on strengthening IPC intervention in 11 tertiary care hospitals, forming IPC monitoring teams, and conducting training programmes for healthcare workers. The project also supported COVID-19 vaccination efforts and promoted vaccination against

common hospital-acquired infections among healthcare providers, underscoring the importance of comprehensive strategies in combating antimicrobial resistance.

Harmonising Antibiotic Identification for Improved Usage in Low-Income Communities

Recognising the role of antibiotic misuse in escalating resistance,

especially in low- and lower-middle-income countries, we conducted a community-based study in Matlab, Bangladesh, in 2022. Through 32 in-depth interviews and 18 focus group discussions with community members and drug dispensers, we aimed to explore the impact of standardising the appearance of oral antibiotics. While dispensers showed better awareness of resistance, community members

mostly relied on brand reputation and dispensers' advice to identify antibiotics. A noteworthy outcome was the suggestion to use an AB symbol and QR code for easier antibiotic identification, with the red line on the packaging, serving as an aid for illiterate individuals. This study is a crucial step towards reducing inappropriate antibiotic consumption and increasing community awareness.





PROGRAMME SUMMARIES

REDUCING MATERNAL, NEONATAL AND CHILD MORTALITY AND IMPROVING THE WELL-BEING OF WOMEN, CHILDREN AND ADOLESCENTS



Programme Lead

DR SHAMS EL ARIFEEN
Senior Director

We develop and evaluate new interventions and carry out implementation research to enhance the coverage, quality and equity of interventions to reduce the physical and mental health burden on women, infants, children and adolescents.

Our work spans the full spectrum of research, including epidemiological and social science studies, basic upstream research, clinical trials (e.g. on new interventions), health systems research, and implementation research. We take a life-course approach, encompassing maternal and neonatal health, child health and development as well as adolescent health and well-being.

The main causes of maternal, neonatal, and child mortality and morbidity are now well understood, and in many cases, effective interventions have been developed. A key challenge is to promote the implementation of evidence-based approaches to improve maternal, neonatal and child health. Factors affecting adolescent health and well-being need to be better understood, and there is a growing recognition of the need to safeguard mental health in this population and in women. We also actively participate in the development of national policy and rapid translation of research findings into programmes while continuing to seek opportunities to apply the learning gained in Bangladesh to other low- and lower-middle-income countries. Reducing inequities is an overarching principle guiding all our work.

USAID'S RESEARCH FOR DECISION MAKERS ACTIVITY: ENHANCING EVIDENCE-BASED HEALTH POLICY AND DECISION-MAKING IN BANGLADESH

Launched in May 2017, the USAID's Research for Decision Makers (RDM) Activity is now in its final year of implementation. RDM is an implementation research project that aims to increase the use of evidence-based research and policy analysis for health planning and decision-making.

Over the past five years, RDM has conducted 26 implementation research

studies in maternal, neonatal and child health, family planning and reproductive health, tuberculosis, and nutrition. The project has promoted evidence-based policymaking and programming through policy dialogues, advisory services, technical assistance, and stakeholder engagement. RDM has also supported capacity building for junior researchers and provided training in epidemiology, biostatistics, and data science for health professionals.

Several RDM studies have contributed to the development and refinement of government health programmes. For example, RDM collaborated with DGHS and other development partners to

establish Newborn Signal Functions (NSF), which have been included in the updated National Neonatal Health Strategy. Based on RDM's assessment of private health facility licensing, DGHS made changes to the Hospital Service Management online portal. Additionally, RDM supported the development of an automated non-communicable disease (NCD) eMIS model, which is gradually being scaled up by the NCDC Programme of the DGHS.

In 2022, RDM developed a climate change and health resource website (<http://cch.icddrb.org>), which contains up-to-date data, scientific publications, and real-time environmental information. This valuable resource assists programme managers and policymakers in making strategic decisions, resource allocation, and designing programmes.

STUDY REVEALS GAPS IN NEONATAL INFECTION MANAGEMENT: CALLS FOR STANDARDISED CARE

Researchers at icddr,b, in collaboration with the London School of Hygiene & Tropical Medicine, analysed data from the EN-BIRTH study to identify gaps in coverage, quality, and documentation of supportive care for managing neonatal infection in five hospitals in Bangladesh, Nepal, and Tanzania.

The study found sub-optimal documentation practices for supportive care components and significant gaps in care practices across hospitals. Women's exit surveys consistently underestimated the coverage of supportive care components for infection management, while the assessment showed low sensitivity for reported

management of hypoxaemia and hyperbilirubinemia. A lack of necessary bedside diagnostics was also observed.

Researchers recommended against incorporating supportive care indicators in national surveys due to low sensitivities. They suggested implementing a standardised ward register for inpatient small and sick newborn care and conducting further research to assess the feasibility, utility, and acceptability of a standardised inpatient register before national scale-up.

Hossain AT, Ameen S, Salim N, Ashish KC, Ruysen H, Tahsina T, Ahmed A, Rahman MH, Mhajabin S, Jabeen S, Peven K, Kong S, Day LT, Nisar YB, Assenga E, Qazi SA, Rahman QS, Arifeen SE, Rahman AE, Lawn JE; EN-BIRTH Study Group. Measuring coverage and quality of supportive care for inpatient neonatal infections: EN-BIRTH multi-country validation study. *J Glob Health* 2022 Apr 30;12:04029. doi: 10.7189/jogh.12.04029.



IMPROVING ANC IN BANGLADESH: FACTORS AND STRATEGIES

Ensuring quality nutrition services during antenatal care (ANC) is crucial for the health of both the mother and the child. However, a recent cross-sectional survey in 21 districts of Bangladesh found that only 15% of pregnant women received all four essential nutrition services during ANC, which include maternal weight measurement, anaemia assessment, nutrition counselling and iron-folic acid (IFA) supplement provision. The most commonly provided service was weight measurement, followed by IFA provision, anaemia assessment, and nutrition counselling.

The study identified several supply-side factors that significantly influenced the quality of these services, such as good logistical readiness, consultation by paramedics and CHCPs, providers' knowledge on maternal nutrition, better provider-client communication, and use of visual aid/ANC cards. However, training and external supervision for providers showed limited association with nutrition service quality.

Stakeholders such as public health nutrition programmers need to address these factors to improve the quality of ANC-based nutrition services. By doing so, they can help ensure that pregnant women receive the essential nutrition services they need for a healthy pregnancy and birth.

Billah SM, Ali NB, Khan ANS, Raynes-Greenow C, Kelly PJ, et al. (2022) Factors influencing quality nutrition service provision at antenatal care contacts: Findings from a public health facility-based observational study in 21 districts of Bangladesh. *PLOS ONE* 17(1): e0262867.

UNCOVERING C-SECTION TRENDS IN RURAL BANGLADESH: PRIORITISING WOMEN'S VOICES

Caesarean section (c-section) rates have surged globally, including in Bangladesh, where it increased alarmingly from 12% in 2010 to 45% in 2022. Despite its importance for preventing childbirth-related mortality and morbidity, c-section is an invasive procedure with iatrogenic risks, and its unnecessary use raises concerns.

icddr,b researchers conducted a cross-sectional study to explore women's experiences and decision-making around c-sections in rural Bangladesh. Among the women surveyed, 54% underwent a c-section, with 75% reporting that physicians first proposed the procedure. Half of the women said the decision was made on the day of birth, primarily for medical reasons like malpresentation, prolonged labour, and obstructed labour. One-third cited convenience or avoiding labour pain as reasons for choosing a c-section.

The study suggests the need for increased support for physiologic vaginal birth and prioritising women's voices, needs, and desires in maternity care reform. Addressing pain management and providing pre-birth counselling for all women could help avoid last-minute decisions. Promoting a culture of participation enables informed decision-making, and these findings call for policy responses to better regulate caesarean services in both public and private health facilities.

Rahman AE, Perkins J, Hossain AT, Banik G, Jabeen S, Wall S, Arifeen SE. Unpacking cesarean in rural Bangladesh: who, what, when, and where. *Birth* 2022 Dec;49(4):709-718. doi: 10.1111/birt.12636. Epub ahead of print.

OBSTETRIC FISTULA PREVALENCE: A NATIONAL SURVEY WITH CLINICAL VALIDATION CORRECTION

Obstetric fistula, resulting from prolonged or obstructed labour, is preventable and treatable. However, its true prevalence remains unknown, particularly in low- and middle-income countries. With the aim to estimate the prevalence and burden of obstetric fistula in Bangladesh, researchers conducted a two-step study, beginning with a validation study among 65,740 women in Sylhet to assess the accuracy of survey questions. Clinical examinations of suspected cases and controls confirmed diagnoses. Then, the team adjusted the reported prevalence in the nationally representative Bangladesh Maternal Mortality and Health Care Survey 2016 for unbiased estimation.

The study estimated an adjusted obstetric fistula prevalence rate of 38 per 100,000 women aged 15-49 years in Bangladesh, with approximately 13,376 women of reproductive age living with the condition. An estimated 4,081 women aged 50-64 years also live with obstetric fistula. In total, about 17,457 women aged 15-64 years in Bangladesh have obstetric fistula.

Given the significant burden, prevention and surgical treatment will require coordinated efforts, resource allocation, and surgeon training to address obstetric fistula in Bangladesh.

Ahmed S, Curtis SL, Jamil K, Nahar Q, Rahman M, Huda SN, Mannan II, Khan S, Alam A, Weaver EH, El Arifeen S. Obstetric fistula in Bangladesh: estimates from a national survey with clinical validation correction. *Lancet Glob Health*. 2022 Sep;10(9):e1347-e1354. doi: 10.1016/S2214-109X(22)00276-5.

PREVENTING AND TREATING MATERNAL AND CHILDHOOD MALNUTRITION



Programme Lead

DR TAHMEED AHMED

Executive Director
icddr,b

We study biological and non-biological mechanisms underpinning maternal and childhood malnutrition. We develop innovative interventions to prevent and treat these conditions and evaluate the efficacy, feasibility and scalability of new interventions.

We undertake a wide range of research, from basic laboratory studies to evaluations of preventive and treatment programme implementation to support policy development. We focus on the main challenges facing Bangladesh and the global South, pursuing research and innovations to produce credible solutions.

Our research has already highlighted the factors responsible for and causes of undernutrition among children and women. Collecting inputs from needs-based clinical, basic and community research, we are generating evidence to develop solutions that can be implemented at scale and disseminating information to policymakers and other stakeholders.

Our current area of concern is undernutrition, but we work collaboratively with our non-communicable disease initiative, recognising that poor and unhealthy diets have created a dual problem of malnutrition and obesity. We benefit from cross-departmental collaboration on joint projects on water, sanitation, hygiene and nutrition; maternal nutrition; and treatment of pneumonia in public healthcare facilities.

Specific priorities include the development and evaluation of interventions for women and adolescent girls to prevent low birth weight, as well as studies to shape the design of new interventions to prevent and treat childhood wasting and stunting.

CALCIUM-BOOSTING RICE: A SOLUTION FOR WOMEN'S HEALTH IN BANGLADESH

Calcium deficiency in the Bangladeshi population's diet leads to health issues such as hypertension and eclampsia during pregnancy. WHO recommends calcium supplementation in calcium-deficient populations, but the high cost of calcium tablets and calcium-rich foods makes this difficult in Bangladesh. Fortifying the staple cereal, rice, with slaked lime has emerged as an attractive alternative. A 2007 study showed 90% radiographic improvement in rachitic children consuming slaked lime-fortified rice, indicating its potential in improving

calcium nutriture. After conducting an experimental study on its acceptability among women and children, researchers recently completed a calcium absorption study using dual tracer stable isotopes. They found that consuming 200 grams of slaked lime-fortified rice three times a day can meet 20% of the daily calcium requirement, offering a cost-effective solution for improving calcium status in women.

Naila NN, Das S, Mim Khandaker A, Alam R, Westcott J, Long J, Krebs NF, Islam MM, Ahmed T. Improving calcium status of women: results of a study of bio-availability of calcium from slaked lime fortified rice. *Food Nutr Bull* 2022 Dec;43(4):429-438. doi: 10.1177/03795721221117624.



TACKLING VITAMIN D DEFICIENCY IN BANGLADESHI CHILDREN

Vitamin D deficiency, affecting one billion people worldwide, plays a significant role in protecting against infection, inflammation, and neoplastic diseases. Prevalence in preschool children in Dhaka, Bangladesh ranges from 2-84%. A recent study assessed the prevalence and risk factors of vitamin D deficiency in 12-24 month-old children in urban and rural Bangladesh, measuring serum 25-hydroxyvitamin D levels and collecting data on socio-demographics, anthropometrics, dietary intake, sunlight exposure, and gene polymorphisms. The study found 47% of children had a deficiency, with sunlight exposure duration, UV index, and breastfeeding negatively associated with it. Genetic differences in serum vitamin D levels were also observed. The findings suggest promoting safe sun exposure and outdoor activities, as well as further longitudinal research and genome-wide association studies to understand the full scope of vitamin D deficiency across generations.

Das S, Hasan MM, Mohsin M, George DH, Rasul MG, Khan AR, Gazi MA, Ahmed

T. Sunlight, dietary habits, genetic polymorphisms and vitamin D deficiency in urban and rural infants of Bangladesh. *Sci Rep.* 2022 Mar 7;12(1):3623. doi: 10.1038/s41598-022-07661-y.

INTERVENTION PACKAGE BOOSTS LINEAR GROWTH IN RURAL BANGLADESHI CHILDREN: CLUSTER RCT

Stunting affects around one-third of under-five children in developing countries. A one-year community-based cluster randomised control trial aimed to improve linear growth and dietary diversity in 6 to 12-month-old children by providing a comprehensive intervention package, including egg/milk-based snacks. 412 mother-infant pairs were assigned to receive either monthly food vouchers (for eggs, milk, semolina, sugar, oil), multiple micronutrient powder (MNP), counselling on child feeding and handwashing, or regular government health communication alone. The study found a significant increase in children's LAZ score by 0.37 (CI 0.24, 0.51, $p < 0.001$) after 12 months, reducing stunting risk by 73%. This intervention package effectively improved growth and dietary diversity in impoverished Bangladeshi households,

suggesting that scaling up this approach in resource-limited contexts could help address stunting in vulnerable communities.

Ara G, Sanin KI, Khanam M, Sarker MS, Tofail F, Nahar B, Chowdhury IA, Boitchi AB, Gibson S, Afsana K, Askari S. A comprehensive intervention package improves the linear growth of children under 2-years-old in rural Bangladesh: a community-based cluster randomized controlled trial. *Sci Rep.* 2022 Dec 19;12(1):21962. doi: 10.1038/s41598-022-26269-w.

SUCCESSFUL FEASIBILITY TEST OF BUBBLE CPAP (BCPAP) OXYGEN THERAPY IN ETHIOPIA

A feasibility and acceptability test of icddr,b's lifesaving bubble CPAP oxygen therapy was successfully conducted in two tertiary and two secondary hospitals in Ethiopia, in preparation for a pragmatic effectiveness trial. Main operational challenges included the lack of well-functioning pulse oximeters, oxygen concentrators, flow meters, and the need for frequent monitoring by nurses and doctors. Despite these challenges, hospital staff and patients' parents were highly satisfied with the therapy's

performance. The feasibility study greatly assisted investigators in designing the effectiveness trial, addressing operational challenges, and completing the trial, with results expected to be reported this year.

Gebre M, Uddin MF, Duke T, Haile K, Faruk MT, Kamal M, Kabir MF, Genetu A, Kebede RA, Demtse A, Weldetsadik AY, Demisse AG, Haile BW, Abdissa A, Elfu T, Tesfaye B, Balcha TT, Semeles M, Ahmed T, Clemens JD, Chisti MJ. Perception and experience of clinicians and caregivers in treating childhood severe pneumonia and hypoxemia using bubble continuous positive airway pressure in Ethiopian tertiary and general hospitals. *PLoS One*. 2022 Oct 31;17(10):e0275952. doi: 10.1371/journal.pone.0275952

LONG-TERM AFLATOXIN EXPOSURE AFFECTS COGNITIVE AND LANGUAGE DEVELOPMENT IN CHILDREN

Dietary aflatoxin exposure is a significant public health issue linked to liver cancer and possibly growth faltering in children. The toxin can cross the blood-brain barrier, potentially damaging brain tissues and impairing human brain development. This study analysed blood samples from children at 15, 24, and 36 months of age to assess aflatoxin exposure and compared it to cognitive, motor, and language functions evaluated at the same time points using the Bayley Scales of Infant and Toddler Development-III. The multivariable analysis revealed that chronic aflatoxin exposure was significantly associated with reduced cognitive, expressive, and receptive language scores in the children. Further research in different settings is needed to confirm this finding.

Mahfuz M, Hossain MS, Alam MA, Gazi MA, Fahim SM, Nahar B, Ahmed T. Chronic

Aflatoxin Exposure and Cognitive and Language Development in Young Children of Bangladesh: A Longitudinal Study. *Toxins (Basel)*. 2022 Dec 3;14(12):855. doi: 10.3390/toxins14120855.

EDUCATED MOTHERS BOOST INFANT AND CHILD FEEDING PRACTICES IN SOUTH ASIA

A study by icddr,b explored the relationship between a mother's education and Infant and Young Child Feeding (IYCF) Practices across six South Asian countries using nationally representative Demographic and Health Survey data. Analysing 120,830 mother-child dyads, the study found that mothers with at least secondary education were significantly

more likely to follow the World Health Organization's core IYCF indicators, such as early initiation of breastfeeding, exclusive breastfeeding, timely introduction of solid or soft foods, minimum dietary diversity, minimum meal frequency, minimum acceptable diet, and consumption of iron-rich or iron-fortified foods. Strengthening national policies to educate women up to at least secondary level in South Asian countries is recommended as a cost-effective intervention to improve IYCF practices.

Tariqujjaman M, Hasan MM, Mahfuz M, Hossain M, Ahmed T. Association between Mother's Education and Infant and Young Child Feeding Practices in South Asia. *Nutrients*. 2022 Apr 5;14(7):1514. doi: 10.3390/nu14071514.



CONTROLLING ENTERIC AND RESPIRATORY INFECTIONS



Programme Lead

DR RUBHANA RAQIB

Senior Scientist

We inspire to gain deeper knowledge on disease burden, transmission dynamics, risk factors and disease pathogenesis of key enteric and respiratory infections, associated host immune response and environmental factors in order to develop and evaluate low-cost potentially scalable diagnostics, vaccines and therapeutic interventions.

Our outstanding research spanning from clinical, epidemiological and surveillance studies to basic laboratory sciences in collaboration with national and international partners, has aided us to make major contributions to the research areas of enteric and respiratory infections, and infectious diseases in general. We also translate our research to policy development and implementation.

Our well-established urban and rural field sites and collaboration with national health facilities enabled us to carry out clinical studies ranging from phase I to phase IV vaccine trials (e.g. vaccines for *Vibrio cholerae*, *Shigella*, enterotoxigenic *E. coli*, *Salmonella*, *Neisseria meningitidis*, rotavirus, hepatitis E and B viruses, human papillomavirus, respiratory syncytial virus (RSV), rabies and influenza viruses), as well as therapeutic intervention trials. Since the beginning of the COVID-19 pandemic, we have put substantial efforts in tracking, testing, and understanding the disease burden and immune responses to natural infection and vaccination. We also study impact of environmental pollutants on diseases and evaluate interventions to reduce exposure.

We are expanding our research portfolio on assessing the burden of antimicrobial resistance (AMR), investigating the mechanism of AMR and approaches to control and prevent it. We are also focusing on integrated control strategies, e.g. integration of WASH and nutrition with vaccination and treatment specially in disadvantaged populations (e.g. internally displaced people, FDMN), where the burden of infectious disease is the greatest. Additionally, we are pursuing to enhance our capacity to characterise causative agents of pandemic potential.

PARTNERING IN CEPI'S GLOBAL LABORATORY NETWORK: EVALUATING IMMUNE RESPONSES TO COVID-19 VACCINES

icddr,b was selected by the Coalition for Epidemic Preparedness Innovations (CEPI) to join the centralised laboratory network, measuring and comparing immunological responses to COVID-19 vaccine candidates in clinical trials and beyond. After rigorous

evaluation, icddr,b adopted three assays from the host laboratory, Nexelis: 1) ELISA assays for SARS-CoV-2-specific IgG, 2) Double-Color IFN- γ and IL-5 EliSpot Assays for Spike-specific T cell responses, and 3) SARS-CoV-2 Pseudovirus Neutralization Assay (PNA).

Following the successful tech-transfer process, icddr,b is currently assessing immune responses against two COVID-19 vaccine candidates through CEPI with



Victoria Biomedical Research Institute (Kenya) and International Vaccine Institute (South Korea). 13,650 serum samples are being evaluated using S-ELISA and PNA assays, around 3,300 nasal swab samples for measuring mucosal IgA, and about 540 PBMC samples by ELISPOT assay. These samples are collected in a phase 2b trial across Kenya, Democratic Republic of Congo, and Rwanda.

TRACKING VACCINE-PREVENTABLE DISEASES PATHOGENS THROUGH ENVIRONMENTAL SURVEILLANCE

icddr,b researchers are utilising environmental surveillance to track four vaccine-preventable pathogens, including SARS-CoV-2, *Salmonella typhi*, *Vibrio cholerae*, and Rotavirus. Wastewater samples are collected from specific sites in Dhaka and Rohingya camps to enhance the existing clinical data and provide early warning signals for public health emergencies.

The project is a collaborative effort involving several local and international organisations like the Institute of Epidemiology, Disease Control and Research, Dhaka North

City Corporation, Dhaka Water Supply and Sewerage Authority, Refugee, Relief and Repatriation Commissioner, and the Center for Global Safe Water, Sanitation and Hygiene at Emory University, USA, with funding from the Rockefeller Foundation, USA.

Successful detection of all target pathogens has been achieved, with preliminary results shared with key stakeholders. icddr,b continues to work closely with partners to share data and support informed government decision-making processes.

NATIONAL ASSESSMENT OF WASH ACCESSIBILITY FOR PEOPLE WITH DISABILITIES

In September 2022, icddr,b initiated a nation-wide study focusing on the Water, Sanitation, and Hygiene (WASH) situation, incontinence, menstrual hygiene management, and healthcare accessibility for people with disabilities and older individuals in Bangladesh. The population-based cross-sectional study, spanning all eight administrative divisions and 32 districts, aims to offer a representative overview and identify challenges faced by these

individuals and their caregivers. This data will be pivotal for informing interventions and policy decisions.

The Honourable State Minister, Ministry of Social Welfare, Government of Bangladesh, graced the inauguration, with the project led by Dr Md. Mahbubur Rahman of icddr,b's Environmental Interventions Unit. The assessment is part of a larger multi-country study, including Kenya, Indonesia, Zambia, and Sierra Leone, funded and supported by the London School of Hygiene & Tropical Medicine and Foreign, Commonwealth & Development Office. It's being implemented locally by B-SCAN with icddr,b's technical assistance.

ASSESSING COVID-19 VACCINE EFFECTIVENESS

From May to December 2021, the Delta variant surged in Bangladesh, with multiple vaccines being deployed. A prospective, test-negative case-control study in five Dhaka hospitals evaluated vaccine effectiveness against this variant. The study assessed Moderna, Sinopharm, and Serum Institute of India vaccines, and matched 313 cases with 1,196 controls by

hospital, date, and age groups. Genotyping revealed that 99.6% of the SARS-CoV-2 isolates were the Delta variant.

Receiving any of the vaccines offered 12% protection against all SARS-CoV-2 infections, though only Moderna provided significant protection at 64%. Protection against severe disease by any vaccine was 85%, with individual vaccine protection estimates ranging from 75% to 100%. Overall, vaccine protection against COVID-19 of any severity was modest, with Moderna showing the most significant results among the three evaluable vaccines.

Khanam F, Islam MT, Ahmmed F, Ahmed SU, Hossen MI, Rajib MH, Haque S, Biswas PK, Tauheed I, Zaman K, Alam AN, Billah MM, Monalisa, Ashrafi SAA, Rahman MZ, Bin Manjur OH, Afrad MH, Shamsuzzaman SM, Saleh AA, Sumon MA, Rashed A, Bhuiyan MTR, Chowdhury F, Khan AI, Flora MS, Shirin T, Clemens JD, Qadri F. Measuring the Effectiveness of COVID-19 Vaccines Used during a Surge of the Delta Variant of SARS-CoV-2 in Bangladesh: A Test-Negative Design Evaluation. *Vaccines*. 2022; 10(12):2069. <https://doi.org/10.3390/vaccines10122069>

ANTIBODY- AND CELL-MEDIATED IMMUNE RESPONSE TO SARS-COV-2

A study examined the immune responses to four COVID-19 vaccines (Pfizer-BioNTech, Moderna Spikevax, AstraZeneca, and Sinopharm) in the Bangladeshi population. The results showed that mRNA vaccines (Moderna and Pfizer-BioNTech) induced significantly higher antibody titers and more abundant neutralising antibodies and IFN- γ -secreting lymphocytes compared to the adenovector (AstraZeneca) and inactivated (Sinopharm) vaccines. Differential cellular responses were observed, with AstraZeneca recipients showing more memory B cells, total CD8+T cells, CD4+ central

memory cells, and T-regulatory cells. In contrast, mRNA vaccine recipients had more plasmablasts, B-regulatory cells, and CD4+ effector cells. Participants with previous SARS-CoV-2 infections exhibited stronger post-vaccine immune responses.

The study highlights the importance of considering both cellular and humoral responses in monitoring the effectiveness of different types of COVID-19 vaccines.

Sarker P, Akhtar E, Kuddusi RU, Alam MM, Haq MA, Hosen MB, Chanda BC, Haque F, Alam M, Razzaque A, Rahman M, Ahmed F, Kibria MG, Islam MZ, Ahmed S, Raqib R. Comparison of the Immune Responses to COVID-19 Vaccines in Bangladeshi Population. *Vaccines (Basel)*. 2022 Sep 8;10(9):1498. doi: 10.3390/vaccines10091498.

FEASIBILITY OF COMBINED OPV AND OCV VACCINATION IN CHILDREN

In an open-label, randomised trial in Dhaka, we explored the immunogenicity and safety of co-administering Oral Cholera Vaccine (OCV) and bivalent Oral Poliovirus Vaccine (bOPV) to children aged 1-3 years. 579 children were assigned into three groups: bOPV-alone, OCV-alone, or combined bOPV+OCV, receiving vaccines initially and after 28 days. We observed blood samples at enrolment, day 28, and day 56. Adverse events were minimal and equivalent across groups. Poliovirus-specific neutralising antibody responses in bOPV-alone and combined bOPV and OCV groups were comparable, as were vibriocidal antibody responses in the OCV-alone group and the combined group. The findings suggest that co-administration of bOPV and OCV is feasible and safe, maintaining effectiveness, in children over 1 year.

Islam MT, Date K, Khan AI, Bhuiyan TR, Khan ZH, Ahmed S, Hossain M, Khaton F, Zaman K, McMillan NAJ, Anand A, An Q, Zhang C, Weldon WC, Yu A, Luby S, Qadri F. Co-administration of Oral Cholera Vaccine With Oral Polio Vaccine Among Bangladeshi Young Children: A Randomized Controlled Open Label Trial to Assess Interference. *Clin Infect Dis*. 2023 Jan 13;76(2):263-270. doi: 10.1093/cid/ciac782.

ENHANCED HEALTH OUTCOMES THROUGH CLEAN FUEL ADOPTION: THE GEOHEALTH STUDY

The study highlights the detrimental health effects of household air pollution (HAP) from biomass fuel combustion, primarily acute respiratory illness and chronic diseases, in low-income countries. In rural Bangladesh, we observed that the use of biomass fuel for cooking impaired cellular and humoral immunity in otherwise healthy, non-smoking women. An intervention trial involving 200 women showed the benefits of using liquefied petroleum gas (LPG) for two years. This intervention significantly reduced exposure to air pollutants, particularly PM_{2.5} and carbon monoxide (CO). The subsequent decrease in HAP led to a recovery of cellular immune homeostasis, with a decrease in inflammatory cells and an improvement in antibody-producing and memory cells. Additionally, sustained reduction of HAP helped prevent further deterioration of lung function, emphasising the health benefits of clean fuel adoption.

Raqib R, Akhtar E, Sultana T, Ahmed S, Chowdhury MAH, Shahriar MH, Kader SB, Eunus M, Haq MA, Sarwar G, Islam T, Alam DS, Parvez F, Begum BA, Ahsan H, Yunus M. Association of household air pollution with cellular and humoral immune responses among women in rural Bangladesh. *Environ Pollut*. 2022 Apr 15;299:118892. doi: 10.1016/j.envpol.2022.118892.

DETECTING AND CONTROLLING EMERGING AND RE-EMERGING INFECTIONS



Programme Lead

DR SAYERA BANU

Senior Scientist

We work with partners in Bangladesh and internationally to detect, characterise and respond to emerging and re-emerging infectious disease threats.

From early detection to intervention, we commit our efforts in various aspects of combating emerging infectious diseases. Our work spans epidemiology, virology, virus ecology, surveillance, risk analysis, prevention, and social and behavioural change. Our long-standing collaboration with the US Centers for Disease Control and Prevention (CDC) provides the opportunity to foster the tracking of infections through hospital-based surveillance and population-based surveys in alliance with the Government of Bangladesh. Our laboratory capacity enabled us to study emerging infections and antimicrobial resistant pathogens. We are in alliance with USAID's programme for combating tuberculosis in Bangladesh. We perpetually respond to infectious disease outbreaks in coalition with the Institute of Epidemiology, Disease Control and Research (IEDCR) of the Bangladesh government and in collaboration with the national One Health initiative. Being a member of the Asia Pacific Malaria Elimination Network, we are contributing to the regional elimination of malaria by 2030.

Our future priorities include diverse initiatives for improved detection and control of tuberculosis, evaluating Nipah virus diagnostics, vaccines and therapeutics, and adopting a multidisciplinary One Health approach to investigate and limit the impact of antimicrobial resistance and infections spanning the human-animal interface, such as avian influenza, Nipah and anthrax. We are expanding our portfolio on multi-drug resistance organisms (MDRO) to understand the burden and guide prevention strategies and initiatives on infection prevention and control (IPC).

CHAMPS INITIATIVE: UNVEILING CAUSES AND PREVENTION STRATEGIES FOR UNDER-5 MORTALITY

In 2022, the Child Health and Mortality Prevention Surveillance (CHAMPS) network, a multinational initiative, carried out 235 minimally invasive tissue sample (MITS) tests, aiming to identify causes of death among stillbirths and children under five. The Determination of Causes of Death (DeCoDe) panel, by reviewing MITS reports, verbal autopsies, and clinical records, identified 'intrauterine hypoxia'

and 'perinatal asphyxia' as leading causes of perinatal deaths.

In response, CHAMPS developed and communicated preventative messages to mothers, pregnant women, and families in the project area, focusing on these primary causes of death. Simultaneously, another set of messages is being developed for healthcare providers at both facility and community levels, with feedback from district and sub-district health managers informing the process.

Moreover, CHAMPS is working with government entities like IEDCR to translate



data into policy briefs that could help reduce stillbirth and under-five mortality. The CHAMPS Technical Committee met in April 2022 to discuss the integration of CHAMPS findings into policy and future directions for the initiative.

NEGLECTED DISEASE: BRUCELLA INFECTIONS DETECTED IN TEKNAF, COX'S BAZAR

A recent examination conducted by icddr,b at Teknaf, Cox's Bazar, identified the presence of the bacterium *Brucella* in the local population. Out of 120 individuals tested from February to July 2022, 5.8% were found to be infected. A subsequent focused survey from October to December 2022 revealed one more *Brucella*-positive case among 33 patients displaying symptoms like persistent fever, muscle aches, headaches, and joint pain. The infected individuals, their families, and their neighbours had a common history of raw milk consumption and livestock exposure. Raw milk consumption was reported by 21% of the surveyed patients, indicating a potential major cause of Brucellosis in the area. These findings highlight the need for targeted interventions to address raw milk consumption

and livestock exposure, reducing the risk of *Brucella* infection in this region.

ADDRESSING NEGLECTED MELIOIDOSIS: IDENTIFYING PREVALENCE AND RISK FACTORS AMONG DIABETIC PATIENTS

From June 2021 to December 2022, icddr,b scientists conducted a hospital-based study to assess the burden of the neglected disease, Melioidosis, among diabetic patients. The study enrolled 440 diabetic patients, of whom 14 confirmed cases of Melioidosis were identified with three fatalities. Most patients were male (100%) and lived in rural areas (54%). Half presented with skin abscesses and urinary tract infections. The study's laboratory results facilitated immediate treatment with appropriate antibiotics. The findings of this study underscore the need to enhance diagnostic capacity and increase awareness of Melioidosis in Bangladesh. This study contributes valuable insights into the disease's prevalence and risk factors, paving the way for future intervention strategies to reduce Melioidosis infections in humans.

ESTABLISHING THE FIRST HEALTHCARE WORKERS COHORT IN BANGLADESH: UNVEILING HEALTH RISKS AND VACCINATION COVERAGE

The first healthcare worker cohort in Bangladesh, established in collaboration with the US CDC and the Communicable Disease Control of the Directorate General of Health Services (DGHS), encompassed around 3,600 high-risk professionals from public and private healthcare facilities across four administrative divisions. This initiative aimed to identify risk factors for communicable diseases like COVID-19, assess mental health status during the pandemic, and evaluate infection prevention and control practices. Of the cohort, 30% tested positive for SARS-CoV-2, with a third requiring hospital support. Vaccination coverage was high, with 94% receiving at least one COVID-19 vaccine dose, though only 54% received a booster. We also noted a 59% hepatitis and 8% influenza vaccine uptake. Work-related anxiety, depression, and moderate stress were reported in 41%, 28%, and 67% of healthcare workers, respectively. Infection prevention and control measures were assessed using the WHO

IPCAF tool. Findings highlight the need for national occupational health programmes for healthcare workers, in accordance with national health and safety policies.

POPULATION DENSITY AND SOCIOECONOMIC FACTORS IN COVID-19 TRANSMISSION IN URBAN BANGLADESH

A descriptive longitudinal study by icddr,b assessed the influence of population density on SARS-CoV-2 transmission in Dhaka, a city characterised by vast socioeconomic and population density disparities. The study also explored risk perceptions and preventative measures. The findings showed a 10% Secondary Attack Rate (SAR) in high-density areas, while individuals of higher socioeconomic status (SES) showed significantly higher levels of IgG antibodies. Interestingly, SARS-CoV-2 seropositivity rates didn't differ based on population density, indicating that SES might influence transmission more than population density. The study also revealed a general reluctance to get tested and a prevailing belief that COVID-19 would not severely impact the Bangladeshi population, highlighting the need for tailored interventions to correct these misconceptions.

Satter SM, Bhuiyan TR, Abdullah Z, et al. Transmission of SARS-CoV-2 in the Population Living in High- and Low-Density Gradient Areas in Dhaka, Bangladesh. *Trop Med Infect Dis.* 2022; 7(4):53. <https://doi.org/10.3390/tropicalmed7040053>

Satter SM, Chowdhury KIA, Tamanna R, et al. COVID-19 Risk Perception and Prevention Practices among High- and Low-Density Populations in Bangladesh: A Mixed-Methods Study. *Trop Med Infect Dis.* 2022; 7(12):447. <https://doi.org/10.3390/tropicalmed7120447>

PATHOGEN PROFILING AND ANTIMICROBIAL USE IN ACUTE FEBRILE ILLNESS IN BANGLADESH

Our Acute Febrile Illness (AFI) study illuminates the disease-causing organisms in Bangladesh, spotlighting less common regional pathogens like rickettsia and melioidosis, and malaria in non-endemic zones. The study enlisted 1,035 patients, identifying 51 leptospirosis and 24 rickettsiosis cases, among other infectious diseases. Preliminary data suggest year-round leptospirosis presence, while rickettsia infections peak in winter. As we disseminate these findings, physicians are including these infections in AFI differential diagnosis. Furthermore, insights into the common causative AFI pathogens will guide clinicians towards disease-specific, rational antimicrobial use, ultimately informing policymaking for antimicrobial stewardship programmes to combat antimicrobial resistance.

INFLUENZA SURVEILLANCE AND SEASONAL PATTERN ANALYSIS

Our hospital-based surveillance of influenza has provided crucial insights into the disease's prevalence and patterns in Bangladesh. The study enrolled 6,643 Severe Acute Respiratory Infections (SARI) patients, showing a 6% influenza positivity rate, and 286 patients with Influenza-Like Illness (ILI), with a 0.3% positivity. This invaluable data, shared with the World Health Organization, contributes to annual vaccine reformulation efforts. Our findings highlight an influenza season typically extending from late April to early September, aiding physicians in patient management. Published

in *The Lancet Global Health*, our retrospective, time-series analysis revealed distinct seasonal peaks and regional variations. In contrast, avian influenza displayed weak seasonality with moderate year-round transmission, peaking out-of-phase with human influenza. This work underscores the importance of considering influenza's seasonality and geographical heterogeneity in health resource planning.

Berry I, Rahman M, Flora MS, et al. Seasonality of influenza and coseasonality with avian influenza in Bangladesh, 2010–19: a retrospective, time-series analysis. *Lancet Glob health* 2022 Aug;10(8): e1150-e1158. doi: 10.1016/S2214-109X(22)00212-1

INFLUENZA VACCINATION UPTAKE: A STUDY AMONG HEALTHCARE WORKERS

In a comprehensive cluster randomised controlled trial, our team assessed influenza vaccine uptake among healthcare workers (HCWs) in Bangladesh's tertiary care hospitals. The study explored motivators and barriers to vaccine acceptance and included 2,935 HCWs in 65 seminars focused on influenza burden, vaccine administration, and side effects. By gauging HCW vaccination rates and gaining insight from policymakers, we've gathered critical data for future policy considerations, emphasising the importance of influenza vaccination among HCWs to safeguard our frontline defenders against this pervasive disease.

Hassan MZ, Shirin T, Rahman M. et al. Seasonal influenza vaccine uptake among healthcare workers in tertiary care hospitals, Bangladesh: Study protocol for influenza vaccine supply and awareness intervention. *BMC Public Health* 2022 Sep 24;22(1):1819. doi: 10.1186/s12889-022-14182-w

AVIAN INFLUENZA TRANSMISSION

Our study examined 12 live bird markets (LBMs) in six Manikganj sub-districts, and surrounding villages, to assess the role of unsold/newly bought backyard poultry in transmitting avian influenza. Approximately 3% of backyard poultry tested positive for influenza A. Two transmission links were identified from rural LBMs to communities. The findings highlight the risk of introducing avian influenza through unsold or newly bought poultry, providing crucial information for the government and public to mitigate the spread.

EXPLORING NOVEL ASPECTS OF ARTEMISININ RESISTANCE IN MALARIA

In the fight against malaria, a recent study provides crucial insights into *Plasmodium falciparum*'s resistance to Artemisinin, a front-line antimalarial drug. The discovery of significant phenotypic resistance, despite the absence of common genotypic markers, challenges the traditional approach of tracking resistance via mutations in the K13 propeller gene.

Notably, the Bangladeshi strain of the parasite showed delayed clearance from patients, even without major K13 mutations, hinting at the presence of alternative resistance pathways. This groundbreaking research suggests that current markers may not be sufficient for comprehensive resistance tracking, underscoring the need for new indicators. These findings carry substantial implications for the country's malaria elimination efforts, as they provide a new perspective on monitoring and combating drug resistance.

Nima MK, Mukherjee A, Sazed SA, et al. Assessment of *Plasmodium falciparum* Artemisinin Resistance Independent of kelch13 Polymorphisms and with Escalating Malaria in Bangladesh. mBio. 2022 Jan 25;13(1):e0344421. doi: 10.1128/mbio.03444-21.

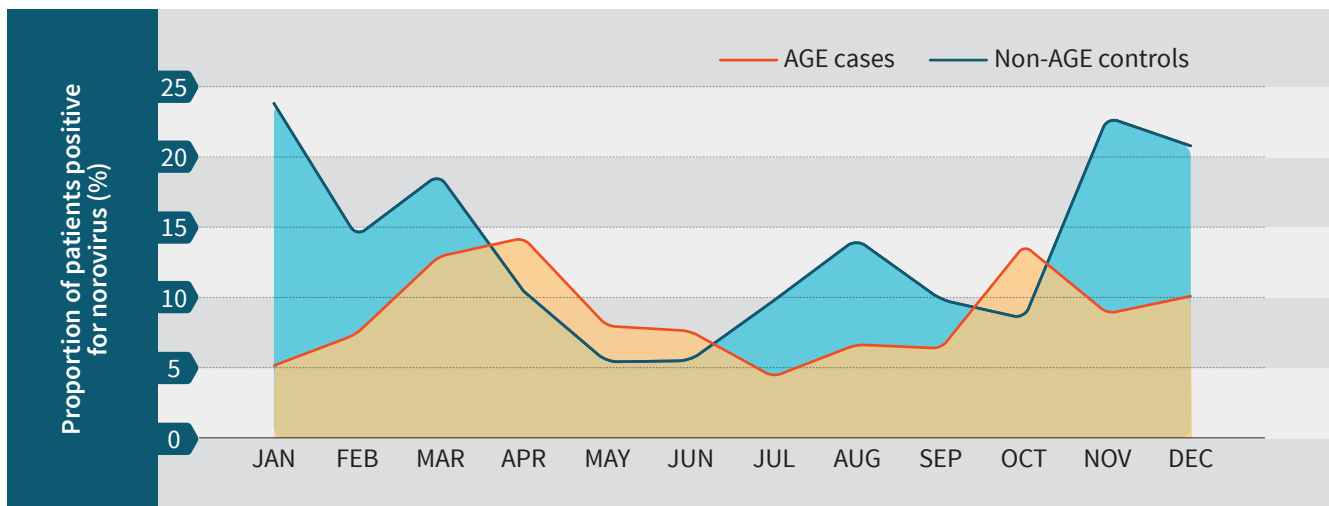
UNVEILING NOROVIRUS PATTERNS AND RISK FACTORS IN BANGLADESH

Our research studied norovirus prevalence and risk factors among hospitalised diarrhoea patients across seven divisions in Bangladesh. Conducted in 10 tertiary care hospitals, the study revealed a higher norovirus

prevalence among non-acute gastroenteritis controls (15%) compared to cases (9%). Our findings suggested seasonality, with peaks in winter and early summer. We also identified exposure to acute gastroenteritis within the last 10 days and a recent history of diarrhoea as key risk factors. Predominant strains were GII.3[P16] and GII.4 Sydney[P16]. These results challenge prior research, raising new questions about prolonged norovirus shedding.

TRACING NOROVIRUS AND ROTAVIRUS CONTAMINATION IN HOSPITAL ENVIRONMENTS

Throughout 2022, we studied the transmission dynamics of norovirus and rotavirus within two tertiary hospitals in Bangladesh. By collecting and analysing environmental and air samples from specific acute gastroenteritis cases, we found a high prevalence of rotavirus contamination (86% and 80%, respectively) and lower rates of norovirus presence (7% and 6%). Observational data also revealed areas for infection control improvement, such as infrequent bedsheet changes and inadequate cleaning practices.



Norovirus positivity among AGE cases and non-AGE controls March '18 October '21

ACHIEVING UNIVERSAL HEALTH COVERAGE



Programme Lead
(Acting)

**DR MAHBUB ELAHI
KHAN CHOWDHURY**
Scientist

We support the achievement of universal health coverage (UHC) in Bangladesh through health system research, policy research and advocacy to increase accessibility, improve quality and reduce financial barriers to healthcare services.

We are committed to the principle that all people, irrespective of their social and economic position, have access to affordable, acceptable, high-quality and responsive healthcare. Our new strategic plan focusses on identifying the gaps in service delivery and developing innovative models to strengthen health system through multi-sectoral engagement. Developing a resilient health system for primary healthcare for urban population is one of our area of interests. We focus on applying digital health technology to strengthen health systems by increasing service utilisation, promoting preventive healthcare and improving health system governance. We thrive undertaking policy research and promote research uptake to influence health, population, and nutrition policies and programmes for strengthening governance and multi-sectoral engagement. We leverage our expertise by undertaking research on healthcare financing to minimise the financial burden in utilisation of healthcare and ensure equity in health financing. For our researches we promote maximising the utilisation of icddr,b Health and Demographic Surveillance System (HDSS) platforms. During COVID-19, our researchers contributed to understanding the epidemiology, tracking COVID patients who used national telemedicine, and the impact of COVID-19 on health and the health system and food environment to inform policy.

We continue to engage policymakers and implementers at the national and grassroots level by encouraging them to use evidence-based strategies to address health system issues. We also develop stronger links with the global universal health coverage by undertaking research on regional and country comparisons to assess progress in the implementation of UHC.

RESEARCH GROUP: HEALTH SERVICE DELIVERY

REVAMPING RETENTION STRATEGIES FOR DOCTORS IN CONTRACTED-OUT PRIMARY HEALTHCARE IN BANGLADESH

Our study delved into the persistent challenge of retaining skilled doctors in the Urban Primary Health Care Project (UPHCP), which contracts out primary healthcare services to NGOs. We

conducted 42 key informant interviews with UPHCP stakeholders to explore factors influencing doctors' retention at both managerial and service provision levels. The main concerns included low salaries compared to the public sector, absence of performance-based incentives, and lack of clear career progression. Other deterrents included limited training opportunities, problematic staffing

arrangements, and job insecurity post-project completion. To maintain a high-quality health workforce, we suggest improved career development opportunities, better salary structures and incentives, and enhanced working conditions as essential measures for retaining staff in contracted-out healthcare settings.

Bashar F, Islam R, Khan SM, Hossain S, Sikder AAS, Yusuf SS, Adams AM. Making doctors stay: rethinking doctor retention policy in a contracted-out primary healthcare setting in urban Bangladesh. *PLoS One* 2022 Jan 5;17(1):e0262358. doi: 10.1371/journal.pone.0262358.

NAVIGATING CHALLENGES IN MEDICAL WASTE MANAGEMENT: A FACILITY ASSESSMENT

This study assessed medical waste (MW) management practices at a District Hospital (DH) and a Mother and Child Welfare Centre (MCWC) in Bangladesh, noting areas for improvement. Observations revealed subpar scores in areas of waste bin management, segregation, and collection in both facilities. In particular, segregation of reusable waste and handling of infectious waste were inadequately handled.

Waste transportation lacked necessary precautions, while disposal of sharp and liquid waste disregarded safety protocols. This highlights an urgent need for advocacy, refresher training, and supportive supervision to improve MW management. Furthermore, a more extensive study to identify underlying causes of these poor practices is recommended.

Sujon H, Biswas TK, Chowdhury A, Chowdhury ME. Medical waste management: an assessment of district-level public health facilities in Bangladesh. *Cureus* 2022 May 8;14(5):e24830. doi: 10.7759/cureus.24830.

RESEARCH GROUP: HEALTH ECONOMICS AND FINANCING

COVID-19 IMPACT ON HEALTHCARE ACCESS IN URBAN SLUMS

This rapid assessment studied the repercussions of COVID-19 on healthcare access within Dhaka and Gazipur’s urban slums. A survey, complemented by targeted interviews, found general and chronic illness prevalence at 12% and 25%, respectively. However,

healthcare use was reduced during lockdowns. Most sought help from informal providers, with only 39% of recently delivered women seeking healthcare within 3 months. Inadequate COVID-19 information sharing, mismanagement of resources, and shortage of healthcare professionals were key concerns. The findings underline the necessity for effective pandemic

management and targeted resources allocation for efficient interventions.

Mahmood SS, Hasan MZ, Hasan AMR, Rabbani MG, Begum F, Yousuf TB, Hanifi SMMA, Reidpath D, Rasheed S. Health system impact of COVID-19 on urban slum population of Bangladesh: a mixed-method rapid assessment study. *BMJ Open* 2022 Feb 23;12(2):e057402. doi: 10.1136/bmjopen-2021-057402.



UNDERSTANDING HEALTHCARE UTILISATION UNDER SHASTHYO SUROKSHA KARMASUCHI SCHEME

The Health Economics Unit's Shasthyo Suroksha Karmasuchi (SSK) scheme aims to reduce out-of-pocket (OOP) health expenditure and increase healthcare access for the below-poverty-line population in Bangladesh. A study surveyed 806 households, with 24.6% reporting illness. Among them, only 8% used the SSK scheme for healthcare, while 28.2% sought other medically trained providers. Increased scheme awareness correlated with higher utilisation. Current utilisation of the SSK scheme among the target population remains low, highlighting the need for strategic awareness

initiatives and an updated benefits package to enhance usage and reduce OOP barriers.

Hasan MZ, Ahmed MW, Mehdi GG, Khan JAM, Islam Z, Chowdhury ME, Ahmed S. Factors affecting the healthcare utilization from Shasthyo Suroksha Karmasuchi scheme among the below-poverty-line population in one subdistrict in Bangladesh: a cross sectional study. *BMC Health Serv Res* 2022 Jul 8;22(1):885. doi: 10.1186/s12913-022-08254-1.

IMPACT OF MATERNAL HEALTH VOUCHER SCHEME ON ANTENATAL CARE COVERAGE

The Maternal Health Voucher Scheme in Bangladesh shows promising results for the improvement of antenatal care

coverage. The study, involving 1,944 women attending antenatal clinic visits, highlighted the scheme's role in boosting the completeness of antenatal care. Women participating in the scheme achieved higher scores in a 'completeness index' notably those from the lowest socioeconomic group. The scheme helped reduce gaps related to health facility type and socioeconomic status, suggesting its potential to enhance maternal and newborn health by maximising the thoroughness of service provision.

Mia MN, Mahmood SS, Iqbal M, Bhuiya A, Pallikadavath S, Stones W. The Bangladesh Maternal Health Voucher Scheme: impact on completeness of antenatal care provision. *J Biosoc Sci* 2022 Mar;54(2):217-224. doi: 10.1017/S0021932020000784.

RESEARCH GROUP: URBAN HEALTH

PROGRESS AND SOCIO-DEMOGRAPHIC INFLUENCES ON INFANT AND UNDER-FIVE MORTALITIES IN DHAKA'S URBAN SLUMS

In urban slums of Dhaka, Bangladesh, notable progress has been made in reducing under-five and infant mortalities. Analysis of data from 6,666 married women shows a 68.2% decline in under-five mortality between 1990 and 2018, with child mortality (1-4 years) decreasing more than infant mortality. However, disparities persist, with higher mortality rates observed for working mothers, small-sized babies, babies delivered vaginally or with complications, and those born after a short birth interval. Neonatal mortality reduction remains slower, indicating the

necessity of targeted interventions addressing these socio-demographic factors for urban disadvantaged populations.

Razzaque A, Chowdhury R, Mustafa AHMG, Begum F, Shafique S, Lawton A, Islam MZ. Levels, trends and socio-demographic determinants of infant and under-five mortalities in and around slum areas of Dhaka city, Bangladesh. *SSM Popul Health* 2022 Jan 28;101033. doi: 10.1016/j.ssmph.2022.101033.

NUTRITIONAL STATUS OF URBAN SLUM CHILDREN IN BANGLADESH DURING COVID-19

Despite severe economic disruption caused by the first wave of COVID-19 in Bangladesh, a cross-sectional study conducted in Dhaka and Gazipur's major

slum areas revealed resilience against nutritional decline among children. Although household income saw a 23% decrease, nutritional status indicated marginal improvement. Contrarily, non-migrant children in Tongi exhibited an increased incidence of stunting and a slight reduction in weight-for-height. As the pandemic continues, with persistent threats to nutritional well-being, it is crucial to maintain vigilant monitoring and interventions to prevent long-term hindrances to the country's nutritional advancements.

Win H, Shafique S, Probst-Hensch N, Fink G. Change in nutritional status of urban slum children before and after the first COVID-19 wave in Bangladesh: a repeated cross-sectional assessment. *PLOS Glob Public Health* 2022;2(7):e0000456. doi: 10.1371/journal.pgph.0000456

THE IMPACT OF MATERNAL EMPLOYMENT ON CHILD STUNTING IN DHAKA'S URBAN SLUMS

A cross-sectional investigation conducted in two major Dhaka slums reveals a direct association between a mother's employment status and the risk of stunting in children. The study demonstrates that children with working mothers are nearly twice as likely to suffer from stunting compared to children of non-working mothers. This increased likelihood of stunting is significantly evident in families lacking comprehensive support. Hence, instituting adequate childcare support measures for working mothers in low-income urban areas might serve as an effective tactic in combating chronic malnutrition among slum-dwelling children.

Win H, Shafique S, Mizan S, Wallenborn J, Probst-Hensch N, Fink G. Association between mother's work status and child stunting in urban slums: a cross-sectional assessment of 346 child-mother dyads in Dhaka, Bangladesh. *Arch Public Health* 2022 Aug 17;80(1):192. doi: 10.1186/s13690-022-00948-6.

PHYSICIANS' STRUGGLES IN IMPLEMENTING ESSENTIAL PUBLIC HEALTH FUNCTIONS AT PERIPHERAL LEVELS

A qualitative study delving into Essential Public Health Functions (EPHFs) at district and sub-district levels in Bangladesh highlights the difficulties faced by physicians in leadership positions. Despite the breadth of responsibilities entailing population-oriented, clinical preventive, and administrative roles, these physicians lack adequate training and support staff. The blurring of clinical and public health roles at the peripheral levels often impedes effective public health function execution. Prioritising the recognition and appropriate implementation of EPHFs in Bangladesh is crucial, suggesting a need to reassess job descriptions and bolster health services at all tiers to meet Sustainable Development Goals.

Bhattacharyya DS, Shafique S, Nowrin I, Anwar I. Challenges of performing essential public health functions by the physicians at leadership positions in peripheral level government health system in Bangladesh: qualitative exploratory study. *PLoS One* 2022 May 12;17(5):e0268026. doi: 10.1371/journal.pone.0268026.

THE IMPERATIVE FOR MENTAL HEALTH TRAINING AMONG PHYSICIANS IN BANGLADESH

In Bangladesh, a nation grappling with a high mental health condition burden and lacking health infrastructure, stakeholders unanimously assert the necessity for mental health training among physicians. This necessity arises from low mental health awareness and an inadequate mental health system. The proposed training, focusing on identification and management of conditions, can reduce the mental health treatment gap. Stakeholders advocate for online, practical training coupled with a certification system. They also urge the incorporation of mental health curriculum in undergraduate medical education and enhancing awareness at policy levels, leading to improved universal health coverage and mental healthcare.

Koly KN, Christopher E, Ahmed S, Baskin C, Saba J, Islam MS, Tariq MR, Alam SF, Sultana MS, Mushtaq M, Ahmed HU. Mental health training needs of physicians in Bangladesh: views from stakeholders. *SSM Ment Health* 2022;2:100107.

RESEARCH GROUP: DIGITAL HEALTH AND HEALTH INFORMATION SYSTEMS INITIATIVE

TELEMEDICINE AMIDST A PANDEMIC: A CASE STUDY FROM BANGLADESH

In light of the COVID-19 pandemic, the Government of Bangladesh effectively amplified the use of its pre-existing teleconsultation service, Shastho Batayon. Following adaptations for the pandemic, including making the

service toll-free and increasing call-center staff, a significant surge was recorded in the service usage, from less than 20,000 monthly calls pre-pandemic, to over 125,660 calls in April 2020. By providing preventive guidelines, debunking misinformation, and facilitating appropriate referrals, Shastho Batayon demonstrated the potential of telemedicine in

mitigating healthcare challenges during public health emergencies.

Khatun F, Ahmed NU, Rahman H, Roy SS, Chowdhury SA, Chowdhury R, Sheikh SP, Rasheed S, Reidpath DD. The promise of teleconsultation in the era of pandemic: a case from Bangladesh (case report). *Telemed J E Health* 2023 Apr;29(4):602-606. doi: 10.1089/tmj.2021.0529. Epub 2022 Jul 20.

RESEARCH GROUP: POPULATION SCIENCE

COVID-19'S EFFECT ON ROUTINE VACCINATION

The COVID-19 lockdown measures in Bangladesh led to a significant decrease in routine child immunisations, according to a study based on the Chakaria Health and Demographic Surveillance System. The study noted a drastic drop in the outreach sessions of the Expanded Programme on Immunization (EPI), with an estimated 3.2 million children missing their scheduled vaccinations between March and May 2020. Primary reasons included the community's unwillingness to hold sessions and vaccinators' absences due to social distancing regulations and safety concerns. The study underscores the urgent need to resume EPI sessions and integrate strategies to address such

immunisation disruptions in future pandemic preparedness plans.

Hanifi SMA, Jahan N, Sultana N, Hasan S-A, Paul A, Reidpath D. Millions of Bangladeshi children missed their scheduled vaccination amidst COVID-19 pandemic. *Front Public Health* 2022 Jan 17;9. doi: 10.3389/fpubh.2021.738623.

GEOSPATIAL PREPAREDNESS IN INSTITUTIONAL CHILDBIRTH: RURAL-URBAN DIVIDE IN BANGLADESH

This study unveils a rural-urban divide in the influence of geospatial and individual preparedness on institutional childbirth in Bangladesh. Data from the 2019 Bangladesh Multiple Indicator

Cluster Survey shows that female newborns and those from less affluent households in rural areas were less likely to be born in facilities. Meanwhile, in urban areas, these factors did not significantly impact facility births. Our geospatial preparedness assessment accounted for 8% and 9% of institutional birth variability in rural and urban areas respectively. For a more equitable utilisation of institutional childbirth, enhancing district-level preparedness and tailoring strategies to rural and urban settings is vital.

Rahman MM, Ara T, Aninda MHHMK, Nurul A, Haider MM. Rural-urban differentials in the influences of individual and geospatial preparedness on institutional childbirth: a cross-sectional study in Bangladesh. *BMJ Open* 2022 Sep 5;12(9):e060718. doi: 10.1136/bmjopen-2021-060718.



ACHIEVING GENDER EQUALITY AND PROMOTING SEXUAL AND REPRODUCTIVE HEALTH AND RIGHTS



Programme Lead

**DR RUCHIRA
TABASSUM NAVED**

Emeritus Scientist

We carry out research to address key gender-related health issues and to promote gender equality in sexual and reproductive health and rights (SRHR). Our research focuses on describing the problems, identifying the factors contributing to them, finding solutions and informing programmes and policies regarding gender equality and SRHR.

Violence against women and children is a major public health issue globally and in Bangladesh. While one in three women report experiencing intimate partner violence worldwide, in Bangladesh, almost three-fourths of the women experience this violence. Violence against children is almost universal in Bangladesh. We have studied the magnitude and drivers of this violence in vulnerable rural and urban communities. We will evaluate an intervention to address violence against children in these sites. We conduct research not only on violence against women and children but also on the intersections between the two.

Child marriage has been widely recognised as a harmful practice adversely impacting health, well-being, human rights and development. Bangladesh reports one of the highest rates of child marriage globally. While one in three girls worldwide gets married before reaching the age of 18, two in five girls in Bangladesh face the same predicament. Thus, reducing child marriage features as one of the goals of icddr,b. We have documented that high participation of girls in a social norm heavy intervention focusing on girls' empowerment and movement building with sensitisation of the stakeholders reduce child marriage by 63%.

Historically, the pace of reduction of child marriage has been slow in Bangladesh. There exist geographic variations in the trend in child marriage. Currently, we are trying to understand what drives the differential trends.

As part of the AdSEARCH project, we are promoting SRHR among vulnerable populations such as adolescents, young married women, garment workers, and sexual minorities. In addition, we are committed to promoting SRHR in services provided by icddr,b and some of its partner organisations.

UNDERSTANDING SOCIAL NORMS THAT PERPETUATE CHILD MARRIAGE IN BANGLADESH

Our qualitative study explored social norms in northern Bangladesh that contribute to the continued practice of

child marriage. Through interviews and focus groups with adolescents, parents, and community leaders, we found that norms dictating restricted mobility and limited engagement with male peers for girls significantly bolster child marriage. Any perceived violation of these norms applies substantial pressure for early

marriage to preserve family reputation. Conclusively, to effectively combat child marriage, interventions must focus on redefining these deeply-rooted norms alongside enhancing education and economic opportunities for girls.

Naved RT, Kalra S, Talukder A, Laterra A, Nunna TT, Parvin K, and Mamun MA. . An exploration of social norms that restrict girls' sexuality and facilitate child marriage in Bangladesh to inform policies and programs. *J Adolesc Health* 2022 Mar;70(3S):S17-S21. doi: 10.1016/j.jadohealth.2021.12.002.

THE IMPACT OF HUMANITARIAN CRISES ON CHILD MARRIAGE: INSIGHTS FROM SYRIAN AND ROHINGYA REFUGEE COMMUNITIES

This study probes the exacerbation of girl-child marriage (CM) in humanitarian crises, using insights from Syrian refugees in Jordan and Rohingya refugees in Bangladesh. Participants revealed a strong inclination towards preserving traditional norms, even under displacement. Girls reported having minimal agency, with norms reinforced across generations.

These norms were resilient to change, especially amidst conflict and displacement. However, participants recognised that social influence could effectively challenge these persistent norms, presenting an opportunity to curtail the practice of girl-child marriage.

Gausman J, Huda FA, Othman A, Atoom MA, Shaheen A, Hamad I, Dabobe M, Mahmood HR, Ibnat R and Langer A. Girl child marriage and the social context of displacement: a qualitative comparative exploration of Syrian refugees in Jordan and Rohingya refugees in Bangladesh. *BMC Public Health* Dec 23;22(1):2417. <https://doi.org/10.1186/s12889-022-14832-z>



EXAMINING THE HEALTH CONSEQUENCES OF AND ADAPTATION TO CLIMATE CHANGE



Programme Lead
(Acting)

**DR S.M. MANZOOR
AHMED HANIFI**
Scientist

We are addressing health risks related to climate change through identifying the impact of climate change on human health, exploring gender issues and increasing the resilience of vulnerable communities by designing and testing adaptation models.

The Initiative for Climate Change and Health (ICCH) of icddr,b is researching the impact of climate change, migration patterns, and changing food systems on population health. While icddr,b has previously focused on the relationship between climate variables and infectious diseases, ICCH is now examining the effects of climate change on heat stress and mortality, sea-level rise, salinity and hypertension, environmentally driven migration, ecosystem services, livelihoods, and changing food systems. The impact of temperature changes on health of vulnerable group of population, specially the children, women and the elderly ones, including cardiovascular and respiratory diseases, is a significant area of research for ICCH, alongside the impact of changing nutrition and food diversity. The aim of the research is to identify ways in which populations can adapt to the effects of climate change on health and to inform policies that promote climate resilience and better health outcomes for communities.

ICCH is an active member of South-East Asia Region Advisory Group, WHO-Alliance, Planetary Health Alliance and other organisations working to expand, mobilise and strengthen links between national, regional and global initiatives on climate change and health. Also, we created an 'EnHealth-Bob' network in the Bay of Bengal to link information and data from public health and climate change domains to promote appropriate policy action plans.

To address the health challenges that coastal areas will face in the future, a collaborative and integrated approach on health system resilience and community engagement will be required. Our plan is to strengthen healthcare infrastructure and response mechanisms, while involving local communities in identifying and addressing health challenges through health promotion programmes, community-based health clinics, and disaster preparedness planning. This approach ensures healthcare services remain accessible and effective during future disruptions.

icddr,b runs three Health and Demographic Surveillance Systems (HDSS) in three geographically unique sites (Matlab-flood prone, Chakaria-Coastal, Slum-temperature and air pollution). Real-time temperature monitoring is implemented using 150 data loggers in indoor and outdoor locations in 3-HDSS sites. All the 3-HDSS sites operate through extensive engagement with the community people.

LEVERAGING MOBILE TECHNOLOGY FOR CHOLERA RISK MITIGATION IN RURAL BANGLADESH

Our study explores how personalised cholera risk predictions via a smartphone application influence water usage behaviours among rural

Bangladeshi households. Results show the application facilitates a shift towards safer water choices for bathing and washing, reducing reliance on surface water. However, it did not stimulate enhanced investment in drinking water treatment or decrease self-reported cholera incidence. Conclusively, dynamic risk information could help households make safer

choices, particularly if targeted at high-risk individuals, potentially mitigating cholera transmission in endemic regions.

Pakhtigian EL, Aziz S, Boyle K, Akanda AS, Hanifi MA. Early Warning Systems, Mobile Technology, and Cholera Aversion: Evidence from Rural Bangladesh. Washington, DC: Resources for the Future; 2022.



PREVENTING AND TREATING NON-COMMUNICABLE DISEASES



Programme Lead

DR ALIYA NAHEED

Scientist
Initiative for Non-communicable Diseases

We are responding to the burden of chronic diseases in Bangladesh, documenting current care practices and health-seeking behaviours, and evaluating new interventions relevant to low-income countries, with a focus on cardiovascular disease, diabetes and mental health disorders, using existing evidence and best practices available in different parts of the world. Our work will contribute to identifying scalable, cost-effective solutions in reducing the Non-communicable Diseases (NCD) and related multimorbidity burden in Bangladesh and potentially applicable elsewhere in the global South.

icddr,b initiated a developmental research programme in 2015 dedicated to developing research for identifying solutions to the prevention and control of NCDs in Bangladesh. Since its inception, the Initiative for Non-communicable Diseases has been conducting research on all major NCDs in a wide range of multiple disciplines in order to document credible evidence of burden, care practices, systems readiness, social challenges, financial barriers, and other aspects of social determinants of health that prevent access to universal health coverage for NCD care in Bangladesh. The vision of the programme is to evaluate new interventions relevant to LMICs, with a focus on cardiovascular disease, diabetes, and mental health disorders that would drive effective, pragmatic solutions for people of all ages.

We are playing a significant role in developing primary care infrastructure for cardiovascular risk management in both urban and rural healthcare settings using a digital platform. Recently, a new programme “NIHR Global Health Research Centre for Non-communicable Diseases (NCDs) and Environmental Change” has been established to strengthen the primary care infrastructure in coastal regions for the management of cardiovascular risk attributed to behavioural and environmental factors. We also have played a pioneering role in the research capacity strengthening of the clinicians and public health researchers of Bangladesh from the inception of the Initiative for NCD. We are working with UNICEF to develop the country’s first comprehensive paediatric NCD care services at primary health care services. Now we are looking forward to enhancing capacity for health research and data science in Asian region through our innovative network, The Global Health Network (TGHN) Asia. It will bring together stakeholders across the region to collaborate and share their expertise, knowledge, and resources.

EFFICIENT LOW-COST MENTAL HEALTH CARE MODELS

Our study evaluates the feasibility and impact of a school-based mental health programme on the quality of life and depression levels among mothers of children with autism in Dhaka city. Additionally, we examined the potential of integrating mental health services into routine non-communicable disease (NCD)

care in rural Bangladeshi health facilities. The findings could guide strategies to integrate mental health into primary healthcare and highlight gaps in current mental health services. This research aids policy-making towards addressing common mental health disorders among NCD patients in Bangladesh.

Naheed A, Islam MS, Brooks MB, Fawzi MCS, Ashraf MN, Ahmed HU, Uddin MMJ, Koly

KN, Galea JT, Akhter S, Nelson C, Hossain SW, Munir KM. Feasibility of a school-based mental health program implementation to improve the status of depression and quality of life of mothers of children with autism spectrum disorders in urban Bangladesh: MENTHOL study. *Glob Ment Health* 2022 Mar 23. doi: 10.1017/gmh.2022.16.

Naheed A, Ashraf MN, Chakma N, Jennings HM, Nahar P. Protocol for integrating mental health services into primary healthcare facilities: a qualitative study of the perspectives of patients, family members and healthcare providers in rural Bangladesh. *BMJ Open* 2022 Feb 7;12(2):e052464. doi: 10.1136/bmjopen-2021-052464.



CLINICAL SERVICES

Our hospitals in Dhaka, Matlab, and SARI ITC in Teknaf provide free care to those in need and provide a basis for an extensive programme of clinical research and training.

icddr,b DHAKA HOSPITAL: A GLOBAL LEADER IN DIARRHOEAL DISEASE TREATMENT AND CLINICAL RESEARCH

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 Nutrition 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).

MATLAB HOSPITAL: INNOVATING PUBLIC HEALTH RESEARCH AND TREATMENT

Established in December 1963, icddr,b-run Matlab Hospital, with its 120 bed capacity operated by 9 doctors, 19 nurses, and 34 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, over 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 233 preterm and low birth babies efficiently. Of them, 5 babies survived with birth weight less than 1,200 gm only. In essence, Matlab Hospital blends life-saving treatment with ground breaking research, impacting both immediate community health and future public health developments.



DHAKA HOSPITAL IN 2022



215,662
patients treated



123,349
number of
males (57%)



92,313
number of
females (43%)

By Age:



125,435
are less than 5
years of age (58%)



90,227
are 5 years and
above (42%)

MATLAB HOSPITAL IN 2022



81,137
patients treated



37,063
number of
males (46%)



44,074
number of
females (54%)

By Age:



45,215
are less than 5
years of age (56%)



35,922
are 5 years and
above (44%)

TRANSFORMATION OF SARI ISOLATION CENTRE INTO RESPIRATORY DISEASE HOSPITAL IN TEKNAF

Since November 2022, icddr,b, with support from UNICEF and the Asian Development Bank, has transitioned the SARI Isolation and Treatment Centre into a 65-bed Respiratory Disease Hospital. This shift broadens the scope of medical assistance available to the local population, now including COVID-19, non-COVID respiratory illnesses, diarrhoea, and malnutrition treatments without any user fees. This strategic decision targets both the FDMN and the host community, maintaining its commitment to accessible healthcare. The funding supports operational costs and future infrastructural development with construction work for a permanent facility slated to start in June 2023. This transformation exemplifies icddr,b's agility and responsiveness to public health needs amidst evolving circumstances.

SARI ITC IN 2022

34,529
patients treated
for different health
complications



1,396
were COVID-19 positives

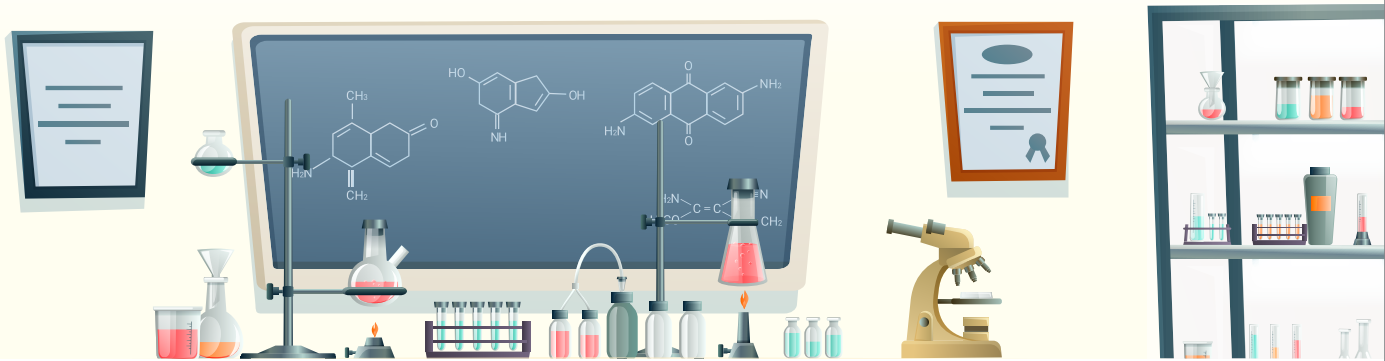


379
patients were treated
at the hospital
(female 206, male 173)



DHAKA HOSPITAL

LABORATORY SCIENCES AND SERVICES



The Laboratory Sciences and Services Division (LSSD) of icddr,b discovers and innovates new tools and methods for better health of the people and provides quality lab services for research and everyday life.

The LSSD of icddr,b is a self-sustaining division and consists of research and clinical service laboratories. It comprises four research laboratories and four service laboratories. The research labs are Laboratory of Gut-Brain Signalling; Laboratory of Environmental Health; Laboratory of Food Safety and One health; and icddr,b Genomics Centre (iGC). The service laboratories include Clinical Biochemistry lab; Clinical Microbiology and Immunology lab; Molecular diagnostics lab; Clinical Haematology and Cancer Biology Lab. The Quality Assurance unit and Biosafety Office of the LSSD ensure quality diagnostic services and a risk-free working environment across all laboratories, respectively. The Animal Resources Facility of the LSSD is the only animal facility in the country certified by the National Institutes of Health, USA. It supports all research laboratories across icddr,b and contributes to research and other related activities of public and private institutions and organisations in the country. The Media and Lyophilization unit of LSSD is the pillar for quality media production for all labs in icddr,b and for external labs as well.

The ISO 15189 and ISO 15190 accreditation of clinical laboratory services (CLS) is unprecedented in Bangladesh. LSSD's clinical lab is the first to achieve this feat in the country. It generates surplus revenues to support icddr,b's humanitarian projects, including its hospitals. The LSSD has opened two new sample collection centre in 2022 located in Uttara and Gulshan. The new sample collection centre/booth has been playing a significant role in revenue generation. A total of 248,661 patients visited CLS; CLS performed 690,391 tests which resulted in net contribution of US\$ 2.5 million to the core fund in 2022.

Apart from its flagship clinical lab services, the Division supports field and hospital-based clinical trials and basic and epidemiological research. In 2022, LSSD supported 38 research projects across all divisions of icddr,b. LSSD published 20 original research papers in 2022.

QUALITY ASSURANCE

The QA unit ensures robust laboratory quality management at icddr,b through in-house programmes, external audits, and ISO accreditations. In 2021, ISO 15189 and ISO 15190 accreditations were secured for the 6th consecutive term, valid until 2025. Clinical laboratories actively participated in 50 CAP panels for External Quality Assurance. Additionally, the QA unit conducted 16 in-house QMS training sessions, benefiting 345 participants in 2022.

BIOSAFETY AND BIOSECURITY

The Biosafety Office (BSO) organised seven training sessions in 2022, with 123 staff members and students participating in both face-to-face and online formats. BSO played a crucial role in obtaining ISO 15190 accreditation for clinical laboratory services and ensuring safety in ISO 15189. It reviewed protocols involving risk group 3 agents and conducted hazard risk assessments in 13 laboratories. BSO maintains robust biohazardous waste management and oversees a central biorepository with 1,651,581 specimens. It also supports nationwide efforts to strengthen biosafety and biosecurity beyond icddr,b.

RESEARCH AND ACTIVITIES FOR ANTIMICROBIAL RESISTANCE

LSSD contributes to a project addressing critical gaps in antimicrobial-resistant bacteria surveillance in human, animal, and aquatic sectors in Bangladesh.

A study by LSSD revealed that over 75% of infants in rural areas are colonised with multidrug-resistant *E. coli*. Additionally, LSSD identified a high prevalence of blaCTX-M-15 gene in extended-spectrum β -lactamase-producing *E. coli* causing extraintestinal infections. LSSD researchers investigated Azithromycin resistance in *Shigella*, reporting the first plasmid-mediated mph(E)-msr(E)-IS482-IS6 pathogenicity island in *Shigella*. They concluded that macrolide resistance genes can transfer horizontally in *Shigella*.

EXPLORING PATHOGENESIS AND TREATMENT OF GBS

The Laboratory of Gut-Brain Signalling at icddr,b has established one of the world's largest cohorts for Guillain-Barré syndrome (GBS). Alongside molecular, genetic, and epidemiological studies, the group focuses on novel drug development for GBS treatment. A phase 1b clinical trial of the humanised monoclonal antibody ANX005, a C1q inhibitor, demonstrated safety and tolerability, paving the way for further clinical stages. Phase 2/phase 3 trials for ANX005 are underway in Bangladesh. The lab initiates clinical trials for related autoimmune and neurovegetative diseases like Huntington's disease, Lupus Nephritis, Amyotrophic Lateral Sclerosis, and Multifocal Motor Neuropathy. Additionally, they study Experimental Autoimmune Neuritis (EAN), an animal model for autoimmune peripheral demyelinating diseases, including GBS. The lab's research encompasses the human gut microbiome's impact on GBS development and severity, T and B cell differentiation regulation for

immune tolerance prediction, and association with GBS severity. The research group currently manages research funds worth US\$8.0 million.

icddr,b GENOMICS CENTRE

icddr,b Genomics Centre (iGC) aims to enhance internal capacity, enabling the implementation of genome-related projects. In 2022, iGC supported eight projects, including antimicrobial resistance, gut and placental microbiomes, and whole genome sequencing of bacteria and viruses. Over 2,000 bacterial and 1,000 viral whole genomes were sequenced, along with 400 gut microbiota tests. iGC hosted a training session on genome sequencing, secured two research projects worth USD 450K, established new assays, and installed a robotic liquid handler. The Genomics Centre generated US\$ 300,000 and achieved full cost recovery in 2022.

ANIMAL RESOURCES FACILITY

The Animal Resources Facility (ARF) is the sole animal facility in the country accredited by the National Institutes of Health, USA. In 2022, ARF provided support to six icddr,b laboratories, 11 leading pharmaceutical companies, and 40 institutions including universities, medical colleges, hospitals, and research organisations. Ethical training on laboratory animal research was conducted, attended by 59 participants. A new test, Rat menotropin potency, was initiated. The Animal Facility achieved its highest revenue in the past decade in 2022.

TECHNICAL TRAINING UNIT

icddr,b provides a wealth of training opportunities for researchers, practitioners, policymakers and others from Bangladesh and globally.

icddr,b, as a global leader in public health research, prioritises enhancing competencies in the field. The Technical Training Unit (TTU) has been providing diverse learning platforms since 1978. Over 68,000 participants from 87 countries, including researchers, physicians, and students, have attended TTU's programmes.

With expert facilitators from around the world, TTU employs innovative pedagogic methods for synchronous and asynchronous online, and blended learning. It focuses on research fundamentals, ethical aspects, scientific communication, and result-oriented monitoring. TTU also collaborates with national and international educational institutes to demonstrate evidence-based, affordable, and scalable tools and approaches for sustainable health solutions. By equipping public health personnel and health sector actors, TTU contributes to the development, operation, and efficient delivery of life-saving solutions worldwide.

In 2022, TTU hosted 848 participants (313 male, 535 female) representing 11 countries (Australia, Bangladesh, Canada, China, India, Malaysia, Nepal, Spain, Thailand, UK, USA) in 14 training events, three academic orientation programmes, and student services.



INTERNAL TRAINING

As per the strategic plan, TTU prioritised staff development, particularly for junior and mid-level researchers. Collaboration with NCS D resulted in two training courses with 48 participants (29 male, 19 female). Additionally, in partnership with MCHD and LSSD, two technical training courses were held, training 28 participants (17 male, 11 female). Overall, four training courses were conducted, engaging 76 participants (61% male, 39% female).

OPEN TRAINING

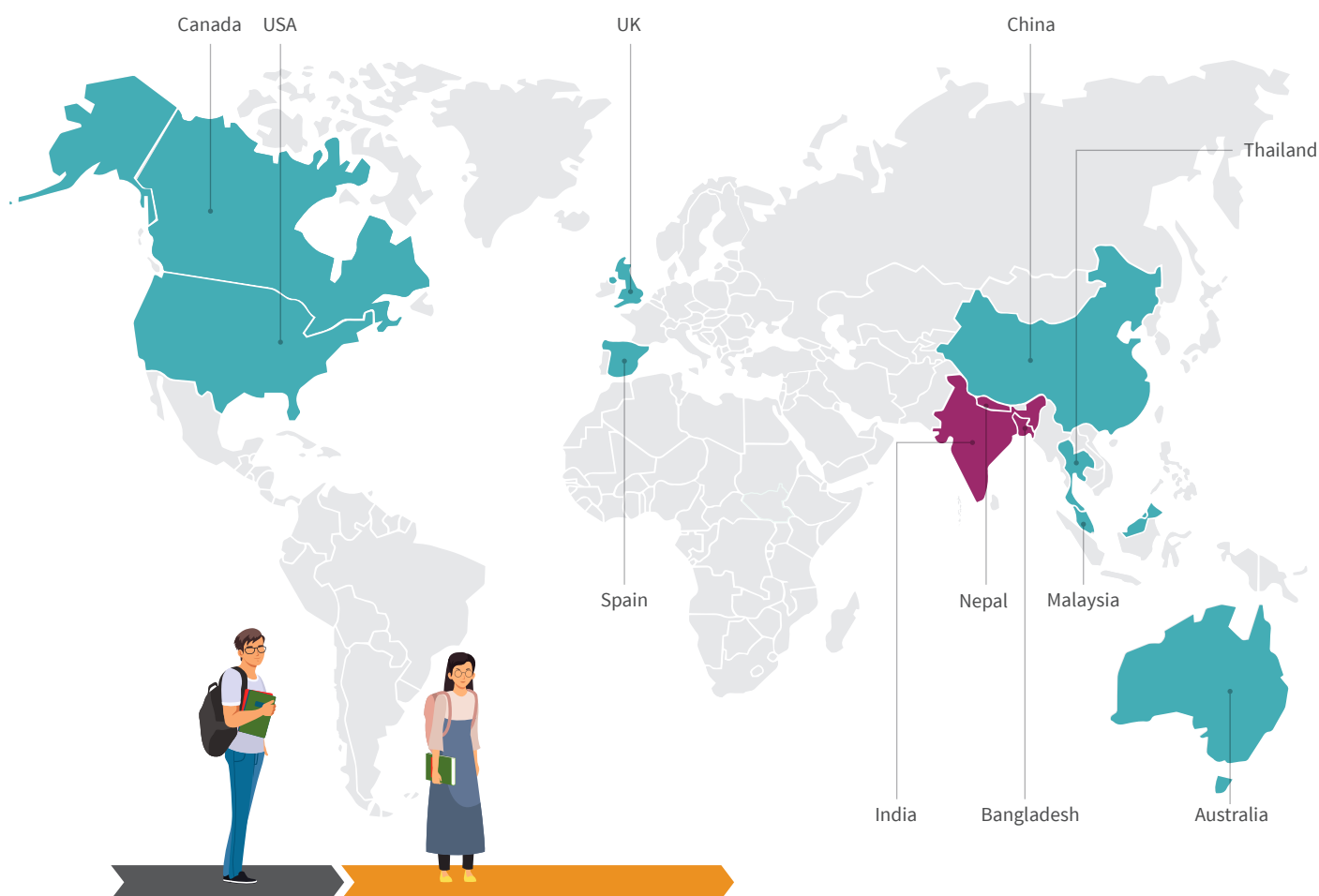
In 2022, TTU offered problem-oriented learning on public health challenges, including resource-poor settings. Ten training courses were held (4 face-to-face, 2 online, 4 blended), training 220 participants (96 male, 124 female; 219 national, 1 international). Two courses were conducted in collaboration with NCS D and IDD.

ACADEMIC TRAINING

TTU conducts academic orientation sessions for undergraduate and postgraduate students, showcasing icddr,b's achievements. In 2022, 290 students (85 male, 205 female) from three medical colleges attended, including 175 national and 115 international participants from Bangladesh, India, and Nepal.

STUDENT FIELD EXPERIENCE/INTERNSHIP PROGRAMME

In 2022, TTU facilitated hands-on field experiences for 262 students/interns from 73 universities (48 national, 25 international). Of these, 240 were from Bangladesh and 22 were from several countries including Australia, Canada, China, India, Malaysia, Spain, Thailand, UK, and USA. The programme provided valuable exposure to context-specific scientific solutions guided by icddr,b experts.



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 2022

Throughout 2022, icddr,b researchers made notable scholarly contributions, producing 509 original publications and contributing to 232 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.



9



Book Chapters

509



Original Papers

1



Reports/
Monographs

98



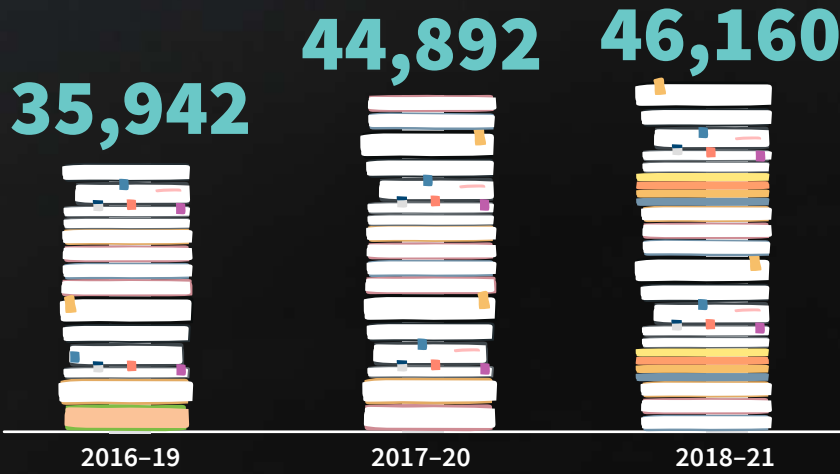
Letters,
Editorials, etc.

124



Abstracts in
conference
proceedings

CITATIONS I: ALL PAPERS



CITATIONS II: PAPERS IN HIGH-IMPACT JOURNALS



SELECTED AWARDS AND ACHIEVEMENTS



DR SAYERA BANU

Dr Sayera Banu, Senior Scientist at PEI, IDD, won the The World Academy of Sciences (TWAS) Fayzah M Al-Kharafi Award for transformative tuberculosis research and policy implementation. Her accomplishments in TB research, particularly in drug-resistance TB have influenced national health policies.



DR MOHAMMAD JOBAYER CHISTI

Dr Chisti, a Senior Scientist at icddr,b, was among four global recipients of The Bailey K. Ashford Medal by the American Society of Tropical Medicine and Hygiene for exceptional contributions to tropical medicine.

He has also been appointed as a Visiting Scientist at Massachusetts General Hospital (MGH), USA for a two-year term starting June 2022.



MD. GOLAM DOSTOGIR HARUN

Md. Golam Dostogir Harun an Assistant Scientist, Emerging Infections, Infectious Diseases Division has been honored as a '2022 SHEA International Ambassador' by the Society for Healthcare Epidemiology of America for his efforts in advancing healthcare epidemiology and antimicrobial stewardship in Bangladesh and beyond.



FATEMA KHATUN

Fatema Khatun, an Associate Scientist at icddr,b, has been selected for the WHO Western Pacific Regional Office’s Expert Panel. She’ll help develop a ‘Digital Health’ course aimed at enhancing digital health competency for sustainable health development in Member States.



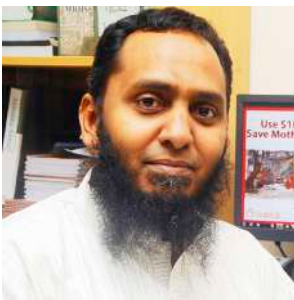
DR ALIYA NAHEED

Dr Aliya Naheed of icddr,b has been honoured with the “Dr Sultan Ahmed Choudhury Science and Technology Gold Medal Award 2021” by the Bangladesh Academy of Science (BAS) for her outstanding contributions to medical sciences research.



DR SHARFUL ISLAM KHAN

Dr Sharful Islam Khan, Head, Programme for HIV and AIDS, IDD has been appointed to the Steering Committee of the World Association of Sexual Health’s Sexual Justice Initiative. His role will involve providing expert advice to promote intersectional human rights, social justice, and sexual health until 2023.



ANISUDDIN AHMED

Anisuddin Ahmed, Assistant Scientist, Maternal and Neonatal Health, has been honored with the Daily Amader Somoy’s Youth Achievement Award for his innovative “Low Cost and Reusable Thermal Jacket.”



MAHBUB-UL ALAM

Mahbub-ul Alam, Associate Scientist has been recognised with the Sanitation Workers Research Award at the UNC Water and Health Conference 2022 for his outstanding research on PPE usage barriers among sanitation workers in Bangladesh.



FARHANA SULTANA

Farhana Sultana, Assistant Scientist, Environmental Interventions Unit, IDD has been recognised with the ‘AAAB Women Leadership Award (AWLA) 2022’ in the Health and Medical Science category.



DR MD. ZAKIUL HASSAN

Dr Md. Zakiul Hassan, Assistant Scientist at PEI, IDD, icddr,b, was recently recognised as the best graduate student at the University of Oxford, earning a Merit and the NDM Award 2021 for public engagement. He also participated in the Oxford Union’s annual pandemic preparedness debate.

KEY VISITORS IN 2022

MR KENICHI YOKOYAMA ADB DG (SOUTH ASIA) VISITS TEKNAF SARI ITC



Mr Kenichi Yokoyama, Director General of the South Asia Department at the Asian Development Bank (ADB), visited SARI ITC in Teknaf on 14 March 2022. He was accompanied by Edimon Ginting, ADB Country Director for Bangladesh, and other ADB officials. The purpose of the visit was to assess the replacement of the current bamboo structures at SARI ITC with permanent and semi-permanent buildings, with ADB expressing interest in funding the reconstruction. Mr Yokoyama expressed satisfaction with the quality services provided by SARI ITC despite challenges and appreciated the partnership between icddr,b and ADB. SARI ITC, in collaboration with UNICEF, has been providing healthcare services to Forcibly Displaced Myanmar Nationals (FDMN) and host communities since August 2020.

H.E. DR LILLY NICHOLLS, CANADIAN HIGH COMMISSIONER



The Canadian High Commissioner to Bangladesh, H.E. Dr Lilly Nicholls, along with Mr Joseph Sebhatu visited icddr,b on 15 March 2022. Dr Nicholls expressed keen interest in learning about icddr,b's life-saving work. Canada, one of our core donors since 1998, provides consistent financial support to icddr,b.

H.E. JEREMY BRUER, AUSTRALIAN HIGH COMMISSIONER



The Australian High Commissioner to Bangladesh, H.E. Jeremy Bruer, accompanied by Ms Sanuki Jayarajah and Shahriar Islam, visited icddr,b on 4 April 2022. The High Commissioner expressed gratitude and admiration for icddr,b's remarkable work, saving millions of lives and improving many more, making a significant impact locally, regionally, and globally.

MR EDIMON GINTING, ADB COUNTRY DIRECTOR

Mr Edimon Ginting, Country Director of the Asian Development Bank (ADB) to Bangladesh, along with his team, visited icddr,b on 23 May 2022. Mr Ginting expressed a keen interest in expanding ADB's health portfolio to support the people of Bangladesh. ADB and icddr,b will collaborate on various initiatives, including urban health, COVID-19, and SARI ITC in Teknaf.



MR MATT CANNELL, DEVELOPMENT DIRECTOR OF FCDO, BRITISH HIGH COMMISSION



Mr Matt Cannell, Development Director of the Foreign, Commonwealth & Development Office (FCDO) at the British High Commission in Dhaka, visited icddr,b on 29 August. The exceptional partnership between icddr,b and FCDO, with UK aid being a major donor, has supported research, innovations, and capacity building, enabling icddr,b to save thousands of lives annually. Mr Cannell expressed the commitment to continue this partnership, particularly in addressing malnutrition and public health challenges in Bangladesh.

H.E. MR ESPEN RIKTER-SVENDSEN, AMBASSADOR OF ROYAL NORWEGIAN EMBASSY

H.E. Mr Espen Rikter-Svendsen, Ambassador of Royal Norwegian Embassy in Dhaka, expressed deep admiration during his visit to icddr,b on 5 September 2022. He praised the academic and scientific excellence, the compassionate approach to healthcare, and the meticulous attention to detail, particularly in maternal care. The Ambassador commended icddr,b's remarkable achievements, stating that Bangladesh can rightfully take pride in its outstanding institution.



H.E. MS ALEXANDRA BERG VON LINDE, AMBASSADOR OF SWEDEN



On 20 October 2022, the Ambassador of Sweden, H.E. Ms Alexandra Berg von Linde, visited icddr,b. H.E. Ms Linde expressed appreciation for icddr,b's life-saving work and emphasised the longstanding partnership between Sweden and icddr,b, highlighting its importance and impact.

For over 40 years, Sweden has been generously supporting icddr,b's major interventions and innovations. The partnership includes capacity building of our young researchers and scientists, with more than 22 ongoing research initiatives being funded by Sida.

MR JOE GOODINGS, HEAD OF DEVELOPMENT COOPERATION AT THE HIGH COMMISSION OF CANADA

Mr Joe Goodings, Head of Development Cooperation, Bangladesh Programme, along with Mr Joseph Sebhatu, First Secretary (Development), High Commission of Canada, visited icddr,b on October 23, 2022. Dr Tahmeed Ahmed, Executive Director of icddr,b, and Dr Shams El Arifeen, Senior Director of MCHD and Project Director of AdSEARCH, welcomed the visitors.





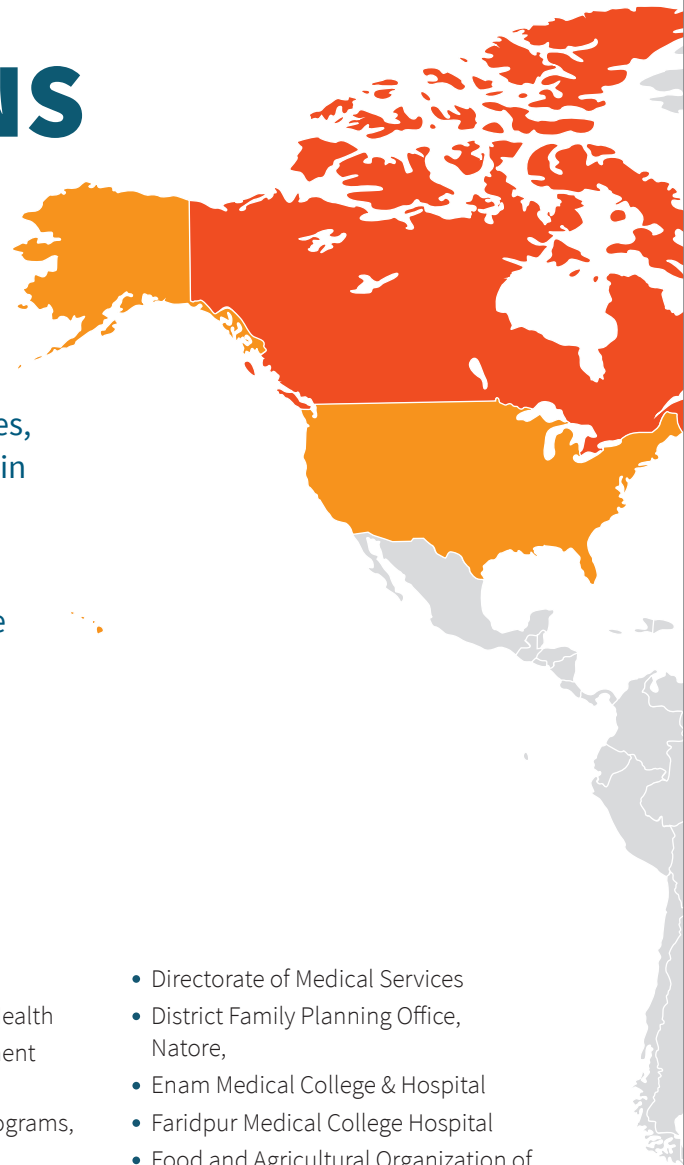
 icddr,b

 icddr,b

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.

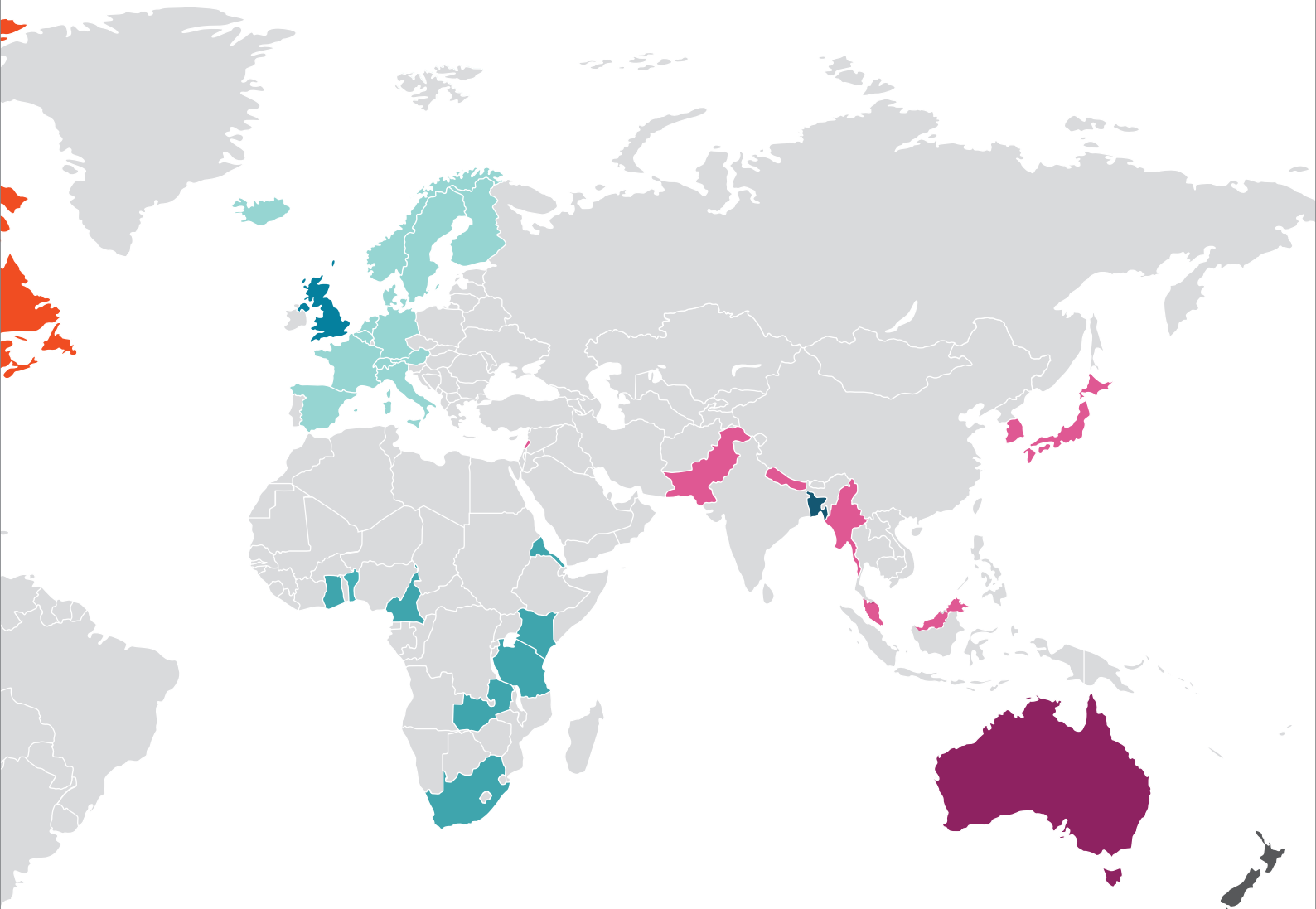
We are also members of a range of regional networks and work closely with partners across South Asia and the Global South.



COLLABORATING INSTITUTIONS

BANGLADESH

- 500 Bed Mugda General Hospital
- Aspire to Innovate
- Ad-Din Medical College Hospital
- Apollo Hospitals, Bangladesh
- Armed Forces Research Institute of Medical Science (AFRIMS)
- Asgar Ali Hospital
- Bangabandhu Sheikh Mujib Medical University and Hospital
- Bangladesh Agricultural University
- Bangladesh Atomic Energy Commission
- Bangladesh Forest Department
- Bangladesh Institute of Child Health
- Bangladesh Institute of Research and Rehabilitation in Diabetes
- Bangladesh Jute Mill Corporation
- Bangladesh Livestock Research Institute
- Bangladesh Lung Foundation
- Bangladesh National Nutrition Council
- Bangladesh Specialized Hospital
- Bangladesh University of Engineering Technology
- Bangladesh Council of Scientific and Industrial Research
- bKash
- BRAC
- Centre for Women and Child Health
- Central Drug Addiction Treatment Centre
- Centre for Communication Programs, JHU, Bangladesh
- Centre on Integrated Rural Development for Asia and the Pacific
- Child Health Research Foundation
- Chittagong Veterinary and Animal Sciences University
- Civil Surgeon Office, Natore
- Colonel Malek Medical College, Manikganj
- Connecting people, Saving Life
- Daffodil International University
- Department of Fisheries
- Department of Livestock Services
- DGHS and Institute of Epidemiology Disease Control and Research
- Dhaka Medical College and Hospital
- Dhaka Mohanogor Shishu Hospital
- Dhaka North City Corporation
- Dhaka Shishu Hospital, Bangladesh
- Dhaka Tribune
- Directorate General of Family Planning
- Directorate General of Health Services
- Directorate of Medical Services
- District Family Planning Office, Natore,
- Enam Medical College & Hospital
- Faridpur Medical College Hospital
- Food and Agricultural Organization of The United Nations
- Global Fund Programme for People Who Inject Drugs
- Gonoshasthaya Kendra
- High Commission of Canada, Bangladesh
- Ibrahim Cardiac Hospital and Research Institute
- ideSHi /CMBT (Institute for Developing Science & Health Initiatives)
- Incepta Pharmaceuticals, Bangladesh
- Institute for developing science & Health Initiatives
- Institute of Child and Mother Health
- Institute Of Child Health & Dr. M R Khan Shishu Hospital
- Institute of Epidemiology Disease Control and Research
- Institute of Public Health
- Institute of Public Health Nutrition
- International Food Policy Research Institute



- Kurmitola General Hospital
- Labaid Specialized Hospital
- LAMB Hospital
- Marie Stopes Clinic Society
- Maternal & Child Health Training Institute
- Measure Evaluation
- Ministry of Health and Family Welfare
- Mohammadpur Fertility Services & Training Center
- Mymensingh Medical College and Hospital
- National Centre for Hearing and Speech for Children
- National Centre for Tuberculosis and Research
- National Heart Foundation and Research Institute
- National Heart Foundation of Bangladesh
- National Institute of Cardiovascular Disease
- National Institute of Diseases of Chest and Hospital

- National Institute of Ear, Nose and Throat
- National Institute of Neurosciences and Hospital
- National Institute of Preventive and Social Medicine
- National Malaria Elimination Program
- National Medical College and Hospital
- National Tuberculosis Control Programme
- National Institute of Population Research and Training
- North South University
- Northern University
- Nutrition International
- Obstetrical and Gynecological Society of Bangladesh
- Patuakhali Science and Technology University
- Patwary General Hospital pvt ltd
- Projahnmo Research Foundation
- Shaheed Suhrawardy Medical College

- Sheikh Russel Gastroenterology Institute and Hospital
- SHIMANTIK
- Sir Salimullah Medical College and Hospital
- UChicago Research Bangladesh
- UH&FPO, Bangladesh
- United Nations Children's Fund
- United Nations Population Fund
- United States Agency for International Development
- University of Dhaka
- Urban Primary Healthcare Project
- US Embassy Dhaka
- World Health Organization
- World Vision Bangladesh

AFRICA

- African Population & Health Research Centre, Kenya
- Armauer Hansen Research Institute (AHRI), Ethiopia

COLLABORATIONS

- Center for Infectious Disease Research in Zambia, Zambia
- Centre Pasteur du Cameroun, Cameroon
- Chris Baragwanath Hospital, South Africa
- International Institute of Tropical Agriculture, Benin
- KEMRI-Wellcome Trust Research Programme, Kenya
- Malaria Research Centre, Agogo Presbyterian Hospital, Ghana
- Muhimbili University of Health and Allied Sciences, Tanzania
- Mycobacteriology Laboratory, Centre Pasteur du Cameroun (CPC)

ASIA

- Armed Forces Research Institute of Medical Science (AFRIMS), Thailand
- Banaras Hindu University, India
- Bharat Biotech International Limited, India
- Bio Farma, Indonesia
- Centre for Development Studies, India
- Center for Public Health Kinetics, India
- Chinese Center for Disease Control and Prevention, China
- Christian Medical College, Vellore, India
- Clinogent, India
- Duke-NUS Graduate Medical School Singapore, Singapore
- GlaxoSmithKline, India
- Greentech Knowledge Solutions Pvt. Ltd. (GKSPL), India
- Hiroshima University, Japan
- Institute for Human Development, India
- Institute of Medical Biology Chinese Academy of Medical Sciences, China
- Institute of Social and Economic Change, India
- Interactive Research and Development (IRD), Pakistan
- International Centre for Genetic Engineering and Biotechnology (ICGEB), India
- International Food Policy Research Institute (IFPRI), India
- International Vaccine Institute (IVI), Korea (South)
- Lebanese University, Lebanon

- Mahidol University, Thailand
- Ministry of Health and Welfare of the Korean government, Korea (South)
- Myanmar Ministry of Health & Sports, Myanmar
- National Institute of Infectious Diseases, Japan
- National University Hospital (NUH), Singapore
- Nay Pyi Taw, Myanmar,
- Oxford University Clinical Research Unit Nepal
- Postgraduate Institute of Medical Education and Research, India
- Rajendra Memorial Research Institute, India
- Serum Institute of India Ltd, India
- Sinovac Biotech Co, China
- Sree Chitra Tirunal Institute for Medical Science and Technology, India
- Tokyo-Kasei University, Japan
- Universitas Nasional (UNAS), Indonesia
- University of Malaya, Malaysia
- University of Tokyo, Japan
- University of Tsukuba, Japan
- XIAMEN Innovax BIOTECH CO.Ltd, China

AUSTRALIA

- CSIRO
- Griffith University
- James Cook University
- Menzies School of Health Research
- The Royal Children's Hospital
- The University of Queensland
- University of Melbourne
- University of New South Wales
- University of Sydney
- University of Technology Sydney
- University of Western Australia
- Western Sydney University

USA

- Albany Medical College
- Barnard College
- Berkeley Air Monitoring Group
- Bill & Melinda Gates Foundation
- Boston University School of Public Health
- Brown University
- Centers for Disease Control and Prevention

- Children's Hospital Oakland Research Institute
- Children's Hospital of Richmond at VCU
- Columbia University
- CTK Biotech Inc.
- Data for Impact
- Department of Pharmaceutical Sciences, College of Pharmacy
- Duke Global Health Institute, Duke University
- EcoHealth Alliance
- Emory University
- Evolve BioSystems, Inc.
- Frederick National Laboratory for Cancer Research, Leidos Biomedical Research Inc
- Gynuity Health Projects
- Harvard Kennedy School
- Harvard Medical School
- Harvard TH Chan School of Public Health
- Infectious Disease Research Institute
- Johns Hopkins Bloomberg School of Public Health
- Johns Hopkins University School of Medicine
- La Jolla Institute of Immunology
- Mailman School of Public Health, Columbia University
- Management Sciences for Health
- Massachusetts General Hospital
- Maternal, Child and Community Health Division
- National Institute of Allergy and Infection Diseases
- Nationwide Children's Hospital
- North Carolina State University
- Novavax, Inc.
- PATH Vaccine Solutions
- PATH
- Pennsylvania State University
- PREVENT
- Pure Earth
- Rollins School of Public Health
- RTI International
- Save the Children
- Scripps Research
- Stanford University
- TechLab Inc.
- The Consortium for Conservation Medicine
- The Emmes Company, LLC
- Tufts University School of Medicine

- United States Agency for International Development
- United States Department of Agriculture
- University at Albany
- University at Buffalo
- University of California, Berkeley
- University of California, Davis
- University of California, Los Angeles
- University of California, San Diego
- University of Central Florida
- University of Chicago
- University of Colorado
- University of Florida
- University of Georgia College of Veterinary Medicine
- University of Kentucky
- University of Maryland School of Medicine
- University of Maryland
- University of North Carolina
- University of Notre Dame
- University of Pennsylvania
- University of Texas at Galveston
- University of Texas Health Sciences Center
- University of Utah
- University of Vermont
- University of Virginia Health System
- University of Virginia
- University of Washington
- U.S. National Poultry Research Center
- Vanderbilt University
- Virginia Commonwealth University
- Warren Alpert Medical School of Brown University
- Washington State University
- Washington University School of Medicine
- Washington University
- Western Human Nutrition Research Center
- Yale University

CANADA

- Salu Design
- St. Michael's Hospital
- The Hospital for Sick Children
- University of Alberta
- University of Calgary
- University of Saskatchewan
- University of Toronto

UK

- Bangor University
- Imperial College London
- Institute of Child Health
- Institute of Development Studies (IDS)
- Liverpool School of Tropical Medicine
- London School of Hygiene and Tropical Medicine (LSHTM)
- Loughborough University
- M&C Saatchi World Services
- Oxfam GB, UK
- Sheffield Hallam University
- The Children Investment Fund Foundation
- The Jenner Institute
- The Pirbright Institute
- The University of Edinburgh
- The University of Sheffield
- University College London
- University of Aberdeen
- University of Bath
- University of Cambridge
- University of Glasgow
- University of Greenwich
- University of Huddersfield, UK
- University of Nottingham
- University of Oxford
- University of Portsmouth
- University of St. Andrews
- University of Stirling
- University of Warwick

EUROPE

- Antoni van Leeuwenhoek Hospital/ the Netherlands Cancer Institute, Netherlands
- CIRI, France
- DNDi, Switzerland
- Drugs for Neglected Diseases initiative, Switzerland
- Eawag, Switzerland
- Erasmus MC University Medical Center Rotterdam, The Netherlands
- European Molecular Biology Laboratory (EMBL), Germany
- European Vaccine Initiative, Germany
- EveliQure Biotechnologies GmbH, Austria
- Fondation Mérieux, France
- Georg-August-Universität Göttingen, Germany

- Goteborg University, Sweden
- Institut Pasteur, France
- Institute of Tropical Medicine, Belgium
- International Atomic Energy Agency (IAEA), Austria
- International Maternal and Child Health Department, Sweden
- Karolinska Institute, Sweden
- KU Leuven, Belgium
- Laboratorio de Referencia de Leishmaniasis, Spain
- Laboratoire des Pathogènes Emergents, Fondation Mérieux, Lyon, France
- Max Planck Institute for Evolutionary Anthropology, Germany
- Ministry for Social Affairs and Health, Finland
- Nestle Research Center, Switzerland
- Nestle Nutrition, Switzerland
- Norwegian Institute of Public Health, Norway
- Norwegian University of Science and Technology, Norway
- Örebro University Hospital, Sweden
- REGA Institute, Belgium
- San Raffaele Scientific Institute, Italy
- Stockholm University, Sweden
- TDR, WHO, Switzerland
- Université de Neuchâtel, Switzerland
- University of Basel, Switzerland
- University of Bergen, Norway
- University of Copenhagen, Denmark
- University of Gothenburg, Sweden
- University of Heidelberg, Germany
- University of Iceland, Iceland
- University of Leipzig, Germany
- Uppsala University, Sweden
- Wageningen University, Netherlands
- World Health Organization, Switzerland
- Zoetis, Spain

OTHERS

- FHI 360
- International Centre for Genetic Engineering and Biotechnology (ICGEB)
- School of Pharmacy, University of Otago, New Zealand
- Stop TB Partnership
- University of Auckland, New Zealand

CENTRAL MANAGEMENT SERVICES (CMS)

Central Management Services (CMS) has continually improved and efficiently increased its support for research. We have strengthened the capacity of the departments and increased effectiveness by adopting policies and procedures to improve overall governance, accountability, and transparency.

FINANCE



THOMAS LIAM BARRY
Director, Finance

2022 has been a fruitful year with the decline in the Covid 19 pandemic, activities increased substantially compared to 2021. We had anticipated a healthy surplus as at 31st December, 2022 right from the first quarter. While the size of the surplus reduced compared to 2021, we still achieved a healthy surplus of \$1.37m.

Overall income stood at \$79.7m and overall expenditure was \$78.36m reflecting only a marginal reduction of 1% compare to last year. However, we received the largest philanthropic contributions of \$21m during 2022, Ms Mackenzie Scott gave \$20m and Summit Group \$1m towards supporting our hospital.

In addition, we achieved a successful unqualified audit report for 2022. Finance has consistently managed icddr,b resources effectively and efficiently throughout 2022. In addition, the implementation of a new ERP, Microsoft D365 required significant finance staff time to assist in the functional design of processes which was no easy task on top of operational duties and multiple deadlines. Finance also received the highest distinguished platinum award for Good Financial Grant Practice by the African Academy of Sciences.

Our cash reserves during 2022 increased significantly by 40% standing at \$51.1m, allowing icddr,b to manage future adverse circumstances. Total staff costs only increased by 1% despite an increase in numbers, pay rises and increments. Full cost recovery targets have also been achieved, but we continue to appreciate the excellent support from donors, which represented a significant contribution towards meeting our central management costs.

Despite challenges in receiving lower overheads from several donors and lower core funding compared to prior years, we still managed to fully meet core operational costs. For sustainability purposes, icddr,b has continued in the development of a wider portfolio of income, donor and philanthropic sources, supporting and expanding laboratory income generation services, launching further hospital appeal funds, updating and negotiating tariffs, and securing appropriate recovery of costs for projects that are acceptable to all donors.

FACILITIES MANAGEMENT



A K M RAHMAT ULLAH

Head, Bio-medical Engineering Unit & RCO, Facilities Management

Facilities Management provides reliable 24/7 support through six units: Electrical Engineering, Biomedical Engineering, Civil Engineering, General Services, Transport, and Cafeteria Services. In-house capacity building has reduced outsourcing of services and personnel (CCTV monitoring, Fire Hydrant, Baggage Scanner, etc.), ensuring safe and efficient operation, reducing downtime, and saving expenses of USD 350,000 in 2022.

To enhance safety, reduce the carbon footprint, and contain costs, Facilities Management has started replacing conventional fluorescent tube lights with energy-efficient LED lighting, installed motion sensors, reused refrigerants, and replaced Distilled Water Plants with Reverse Osmosis systems. It also provides technical support to 30 government labs and hospitals for equipment repair, calibration, and certification, as well as renovation and hospital facilities. Hands-on training is provided to 30 doctors and lab technicians from government labs on basic principles, routine maintenance, and calibration of equipment at icddr,b.

SUPPLY CHAIN MANAGEMENT



MIRZA MUHAMMAD MASUD RANA, MCIPS

Senior Manager, Supply Chain Management

Supply Chain Management (SCM) at icddr,b provides a robust, efficient operating environment supporting core business functions. Amid the global challenges in 2022, including the Russia-Ukraine conflict and inflation, SCM upheld its commitment to quality work, striving to eliminate waste and minimise disruption.

Despite facing initial supply and subsequent demand shocks due to logistics challenges, the team's foresight and preparedness ensured the smooth delivery of goods and services. Operational achievements included logistic support valued at USD 384K to the Oral Cholera Vaccine (OCV) campaign, vaccinating about 2.4 million people in five hotspots in Dhaka City.

SCM ensured business continuity during a cholera outbreak by maintaining supplies of vital logistics to both Dhaka & Matlab Hospital, despite global supply chain disruption. Additionally, SCM collaborated with various organisations including WHO, UNICEF, USAID, CDC, and DAI Global, LLC, assisting the Government of Bangladesh by providing crucial lab equipment and kits, renovating laboratories to BSL2 standard, and installing laboratory equipment.

Cost-saving measures resulted in USD 793K savings. Strategic procurement services were enhanced through long-term agreements and Just-in-Time deliveries, reducing inventory and improving SCM's efficiency.

INFORMATION TECHNOLOGY



TANVIR AZAD CHOWDHURY
Head, Information Technology

The Information Technology (IT) department at icddr,b focused on optimising efficiency and sustainability in 2022, aligning its efforts with organisational strategy and objectives. Multiple business processes were automated, including the travellers clinic revamp and vendor management in the ERP, resulting in improved efficiency and reduced turnaround times.

The IT department made significant strides towards the implementation of a new Enterprise Resource Planning (ERP) system, Rupantor, achieving 47% progress by the end of 2022. Emphasising cybersecurity resilience, the department undertook an IT security audit following NIST standards, conducted comprehensive penetration testing, and initiated corrective actions to address identified vulnerabilities.

Working with Bangladesh Government's e-Government Computer Incident Response Team (BGD e-GOV CIRT), icddr,b conducted digital forensic investigations on two occasions. The department also reviewed and fortified email service configuration and implemented SSL security for 44 web applications to prevent DNS spoofing and hijacking, thereby enhancing overall network security.

The configuration of 11 existing IT security solutions was reviewed to bolster cybersecurity resilience and enhance security operations. The IT department also championed a comprehensive cybersecurity awareness programme for all staff in 2022, underlining the organisation's commitment to security.

REGULATORY AND LEGAL AFFAIRS



BARRISTER MOHAMMAD NAFIU ALAM
Head, Regulatory and Legal Affairs

The Regulatory and Legal Affairs (R&LA) unit at icddr,b achieved a significant milestone with the enactment of the International Centre for Diarrhoeal Research, Bangladesh (icddr,b) Act 2022, replacing the 1978 Ordinance. R&LA has coordinated meticulously with several government offices including the Ministry of Health and Family Welfare, Finance, National Board of Revenue, and Labour and Employment. They addressed queries, contributed to drafting and finalising the legislation, and represented icddr,b at various forums.

Throughout 2022, R&LA reviewed and processed an impressive count of 913 legal documents, spanning grant agreements, service agreements, procurement-related contracts, and rental agreements, among others. They also assessed constitutional documents for capacity evaluation and executed amendments for several agreements.

R&LA contributed significantly to training and awareness sessions, working alongside the Human Resources (HR) and Finance departments. These sessions revolved around code of conduct, various policies, disciplinary proceedings management, and grant/contractual obligations. They provided oversight in the sourcing process managed by SCFM and actively contributed to audit responses, implemented audit recommendations, and donor reporting.

Moreover, R&LA is managing patent applications at the Department of Patent, Design, and Trademark (DPDT). To boost icddr,b's intellectual property (IP) capacity, R&LA organized a seminar facilitated by an IP expert to promote an IP-aware environment among icddr,b's scientists and researchers.

DEVELOPMENT



ZAHEEN ZAEMA KHAN

Senior Manager, Donor Relations,
Development and Communications

In 2022, icddr,b's Development Unit upheld strong ties with key donors like the Foreign, Commonwealth, and Development Office, UK, Global Affairs Canada, Swedish International Development and Cooperation Agency, and the Government of Bangladesh. The latter's unrestricted support, coupled with increased project funding, has proven instrumental.

Our hospital appeal, launched in 2020, continues securing significant commitments from diverse global sources. Regional and international donor landscaping efforts are targeting potential 'non-conventional' benefactors from Turkey, the Middle East, and the Far East. Locally, the unit's outreach to entrepreneurs resulted in substantial donations from philanthropists like Ms Mackenzie Scott and Mr Muhammed Aziz Khan. Noteworthy donations from Professor Sufia Akhter Islam and Ms Tahmina Begum significantly contributed to the Hospital Endowment Fund. Throughout the year, we've welcomed notable visitors, including ambassadors, high commissioners, business leaders, and representatives from ADB.

COMMUNICATIONS



A K M TARIFUL ISLAM KHAN

Senior Manager
Communications

Over the past year, our Communications Department has significantly boosted our digital footprint, achieving a 30% increase in social media reach. Our active engagement has yielded over 25 press releases and support for over 15 dissemination seminars and events, amplifying our reach on a national and international scale.

Strategic media engagement has resulted in 15 international news reports including exclusive reports in The Economist, NHK Japan, The New York Times among others, and over 1,300 local reports, contributing to impactful policy and practice change. Our rapid response to Dhaka's historical diarrhoeal disease outbreak underscores our commitment to health awareness and advocacy.

Furthermore, we have actively provided support to many projects and programmes, including ACTB, AdSEARCH, SARI ITC, and have facilitated the establishment of multiple specimen collection centres in Dhaka for our Diagnostic unit.

Our contribution to key initiatives, such as the ASCODD 2022 Conference held in Kolkata, India and the transformation of SARI ITC into RDH by facilitating communications with ADB, highlights our strategic engagement. We have also actively contributed to fundraising, donor communications, and the crafting of our strategic plan for 2023-27.

As we look ahead, we commit to further expanding our digital presence, adhering to international best practices, and supporting our community with effective and innovative communication strategies.

RESEARCH ADMINISTRATION



ARMANA AHMED
Head, Research Administration

The Research Administration (RA) department at icddr,b serves as a crucial information and knowledge hub. Among its key functions, RA provides detailed institutional reporting on research activities to a broad spectrum of stakeholders, including the Board of Trustees (BoT), Scientific Advisory Group (SAG), Programme Committee (PC), donors, Senior Leadership Team (SLT), and Central Committee (CC). This includes information generation and analysis for strategic documentation like annual reports, grant applications, and donor interactions.

RA is pivotal in tracking institutional Key Performance Indicators (KPIs), relaying the impact of icddr,b's work to relevant parties. Acting as the Programme Committee's (PC) focal office for the Board, the RA also functions as the secretariat for the Programme Coordination Committee (PCC) and the Institutional Review Board (IRB). As an active participant in the Policy Translation Cell (PTC), it plays a significant role in shaping organisational policy.

In 2022, RA heightened its support to icddr,b researchers with a 25% increase in funding opportunity announcements (471 in total) from the previous year. This was mirrored by a rise in competitive grant acquisition from 28% in 2021 to 35% in 2022. Cross-collaborative grant applications within the organisation doubled, with a marked increase in the approval of new research protocols by the IRB. International collaboration was also bolstered, especially with Global South countries. Of 36 such collaborative projects, icddr,b assumed a leading or co-leading role in one-third.

The Library and Information Services (LIS) unit under RA is renowned for providing high-quality information services. Regarded as one of Bangladesh's most advanced medical libraries, it serves the information needs of scientists and oversees publication clearances. In 2022, LIS facilitated 672 publications, 509 of which were original papers published in international peer-reviewed journals. Additionally, it secured a Research4Life training grant from ITOCA (Information Training & Outreach Centre for Africa) to conduct international training.

HUMAN RESOURCES



HUGUES BELLO
Director, Human Resources

In 2022, icddr,b's staff count rose to 4900, marking a 285-person increase from 2021. Of these, 99.34% were national staff, and 45.22% were female employees, though we noted a sharp decline in the number of international professionals. Notably, recruitment efficiency improved, with an average 12-day Turn Around Time (TAT) thanks to greater rehiring and utilising a reserve pool.

Our HR department continued to be bolstered with new initiatives. The preparation for the new Strategic Plan 2023-2027 marked a significant shift towards "promoting excellence in our work", underlining our commitment to fostering an organisational culture that values employees. In line with this goal, we've been refining our service delivery approach, enhancing the expertise of HR professionals, and establishing an accountability model throughout icddr,b.

A key development in 2022 was the inauguration of a staffing review programme aimed at ensuring optimal staff placement, a crucial factor in our ongoing pursuit of efficiency. We've also adapted our talent development approach in response to the COVID-19 pandemic. Mental health awareness and mandatory Code of Conduct training were emphasised, and a higher study procedure encouraged more staff to undertake PhD programmes at no cost to the organisation.

Further progress was made in policy refinement, following recommendations from an E&Y Audit. Our response was twofold: we consolidated policies into a single document titled "Staff Regulations", and embedded work processes into an "HR Procedures Manual". Lastly, we made strides in disability inclusion. We identified challenges through physical infrastructure and work-related problem analysis and executed an action plan. The first-ever career fair for people with disabilities resulted in multiple internships and staff hires.



Dr Firdausi Qadri of icddr, b kindles the Mangal Pradeep, symbolising welfare, during the inauguration of ASCODD 2022. She is joined by India's Union Minister of State for Health & Family Welfare, Dr Bharati Pravin Pawar, among others.

SENIOR LEADERSHIP TEAM

Our staff of over 4,800 are 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 2022



DR TAHMEED AHMED
Executive Director



DR SHAMS EL ARIFEEN
Senior Director
Maternal and Child Health Division



DR FIRDAUSI QADRI
Acting Senior Director
Infectious Diseases Division



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



DR DINESH MONDAL
Acting Senior Director, Laboratory
Sciences and Services Division



THOMAS LIAM BARRY
Director, Finance



HUGUES BELLO
Director, Human Resources



ARMANA AHMED
Head, Research Administration



**BARRISTER MOHAMMAD
NAFIU ALAM**
Head, Regulatory and Legal Affairs

SECRETARIAT



LORETTA SALDANHA
Executive Assistant to the
Executive Director

OBSERVERS



NAGARAJAN NAGARAJAN
Director, Internal Oversight



A K M RAHMAT ULLAH
In-charge of Facility
Management, and Head, Bio-
medical Engineering Unit



TANVIR AZAD CHOWDHURY
Head, Information Technology



A K M TARIFUL ISLAM KHAN
Senior Manager, and In-charge
of Communications

BOARD OF TRUSTEES

icddr,b's Board of Trustees comprises 15 professionals and researchers from both developed and developing countries.

As of December 2022

The Board was created by an Ordinance of the Government of the People's Republic of Bangladesh. Three members are nominated by the Government of Bangladesh, with the World Health Organization and UNICEF nominating one member each. icddr,b's Executive Director serves as the Member-Secretary.

The Board operates under 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



MS SHARIFA KHAN
Secretary, Economic Relations Division,
Ministry of Finance
(from July 2022)



MS FATIMA YASMIN
Secretary, Economic Relations Division,
Ministry of Finance
(until July 2022)



**DR MD. ANWAR HOSSAIN
HOWLADER**
Secretary, Health Services Division
Ministry of Health and Family Welfare
(from September 2022)



MR MD. LOKMAN HOSSAIN MIAH
Secretary, Health Services Division
Ministry of Health and Family Welfare
(until September 2022)



DR ABBAS BHUIYA
Former Deputy Executive Director icddr,b

NOMINATED BY UNICEF



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

NOMINATED BY WHO



DR SUMAN RIJAL

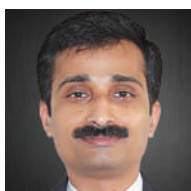
Director, Communicable Diseases
WHO Regional Office for South-East Asia
(SEARO)
(from November 2022)



DR SISWANTO

Senior Adviser Science Research and
Innovation
WHO-SEARO, New Delhi, India
(until October 2022)

INDEPENDENT MEMBERS



MR AMOL KHISTY

Expert, Finance & Accounting Services



DR SISWANTO

Senior Health Policy Analyst
Health Development Policy Agency,
Ministry of Health Republic of Indonesia
Jakarta, Indonesia (from November 2022)



MS 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

Director and Professor of Child Health
UCL Great Ormond St Institute of Child
Health, UK



PROFESSOR THEIN THEIN HTAY

Former Deputy Minister for Health
Senior Public Health Advisor
University Research Co., Myanmar



DR ANU KANTELE

Professor, Infectious Diseases
Helsinki University, Finland
(until September 2022)



PROFESSOR ABDULLAH H BAQUI

Professor, Department of International
Health
Director, International Center for Maternal
and Newborn Health, Johns Hopkins
Bloomberg School of Public Health, USA
(until July 2022)



DR HANNA MARIA NOHYNEK

Chief Physician, Infectious Diseases Control
and Vaccines, Department of Health
Security at the Finnish Institute for Health
and Welfare, Finland
(from September 2022)

FINANCE

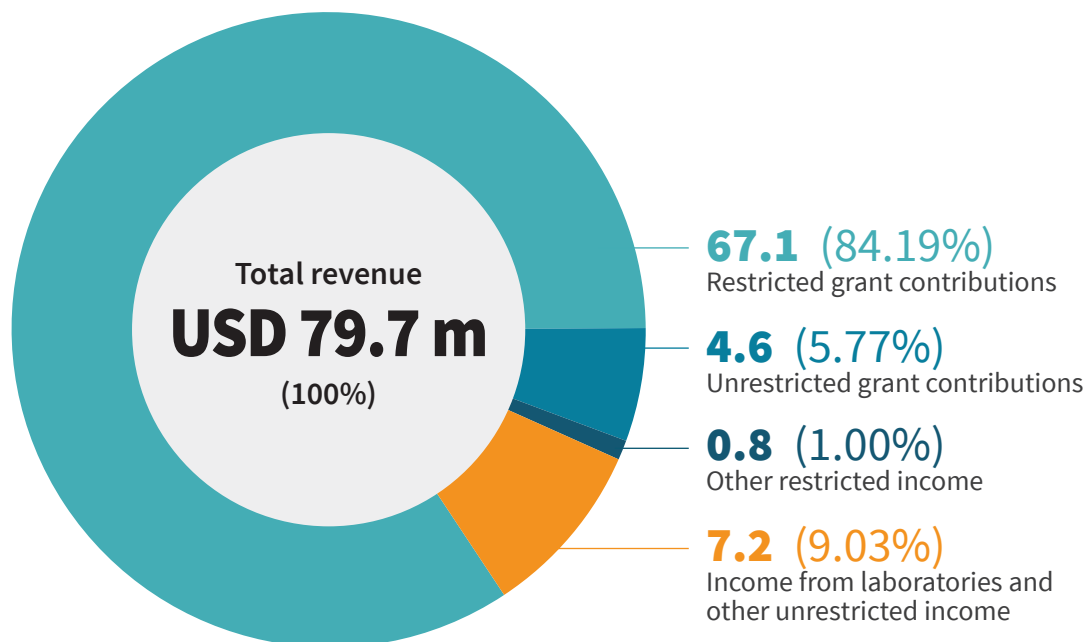
icddr,b's overall revenue for 2022 amounted to USD 79.7 million compared with a total expenditure of USD 78.4 million, generating a net surplus for the year of USD 1.37 million.

REVENUE

Our overall revenue for 2022 of USD 79.7 million (see below) only marginally reduced by 1% amounting to USD 828k compared with 2021. Research grant income for 2022 increased by 4.5% percent equal to USD 2.9 million vs. 2021, which was mainly due to the full-scale operation of UNICEF, WHO and GAC-funded projects. Unrestricted lab income decreased by USD 1.1 million mainly due to the depreciation of the taka against the USD, as a major share of laboratory diagnostic income from external sources is received in BDT, however, our functional currency is USD, consequently, USD laboratory income is lower and, we experienced much lower demand for COVID-19 tests in 2022, compared with 2021.

BREAKDOWN OF REVENUES 2022

(in USD millions)

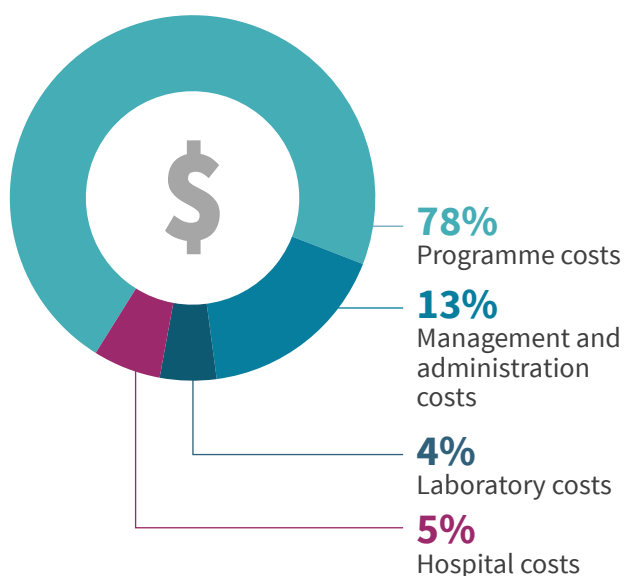


EXPENDITURE

- Overall expenditure for 2022 was USD 78.4 million, representing an marginal increase of 1.2% percent equivalent to USD 957k compared with 2021.
- The majority of total expenditure, 60.1% relates to staff salaries and benefits. Other key costs are; supplies and materials 13.8%, collaborative partnership costs 5.4%, travel and vehicle hire charges 5.1%, rent, communication and utilities 2.3% and training, dissemination and staff development 2.1%.

BREAKDOWN OF EXPENDITURE FOR 2022

(in USD millions)



DETAILED EXPENDITURE FOR 2022: (in USD millions)

National staff	USD 41.96
International staff	USD 4.02
Emeritus staff	USD 1.15
Supplies and materials	USD 10.81
Collaborative partnership costs	USD 4.21
Travel and vehicle hire charges	USD 4.02
Rent, communication and utilities	USD 1.80
Training, dissemination and staff development	USD 1.68
Other operational costs	USD 8.70

ABBREVIATED STATEMENT OF FINANCIAL POSITION

(in USD millions)

	31 December 2022 USD ('000)	31 December 2021 USD ('000)
Assets		
Total non-current assets	49,938	30,851
Total current assets	66,335	57,440
Total assets	116,272	88,291
Liabilities and Funds		
Non-current liability	5,193	4,200
Total current liabilities	47,725	40,774
Total liabilities	52,918	45,074
Total funds	63,355	43,217
Total funds and liabilities	116,272	88,291

OTHER KEY FINANCIAL STATISTICS FOR 2022

1. At the end of the year, icddr,b had USD 63.4 million in net assets which increased by USD 20.2 million equivalent to 46.7%, as a result of increasing investments by 96%, increase in cash balances by 40% and decrease of accounts payable by 23%.
2. Cash and cash equivalents amounted to USD 51.1 million at the end of the year.
3. Accounts receivables (debtors) decreased by 23% percent. This was mainly due to collecting long outstanding debts through improved follow up process.
4. Accounts payables decreased by 23% due to a reduction in creditors collection times.
5. The current ratio (liquidity) is 1.39 increased by 1% compared with 2021.
6. Stock inventories have increased by 29% amounting to USD 102k, mainly due to the increase in project activities and requirements.
7. Investments increased by 96%, because during 2022, we received from Ms MacKenzie Scott, a donation of \$20m and from Summit Group, \$1m which was allocated to our hospital and general endowment funds.
8. Loans and advances decreased by 50% 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 2022 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.

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 2022

Donor partners	Restricted (USD)	Unrestricted (USD)	Total (USD)
1 USG - United States Agency for International Development (USAID)	3,143	-	3,143
2 Bill & Melinda Gates Foundation	2,185	-	2,185
3 Global Affairs Canada (GAC)	777	502	1,278
4 USG - Centers for Disease Control and Prevention (CDC)	1,045	-	1,045
5 United Nations Development Group (UNDG)	1,039	-	1,039
6 USA - Other than USG	897	-	897
7 USG-National Institutes of Health (NIH)	767	-	767
8 Government of the People's Republic of Bangladesh (GoB)	269	397	666
9 The Global Fund to Fight AIDS, Tuberculosis and Malaria (GFATM)	417	-	417
10 Johns Hopkins University (JHU)	380	-	380

A complete list of donors is provided in Note 22 to the financial statements:

www.icddr.org/about-us/reports/financial-reports

CORE DONOR FUNDING

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

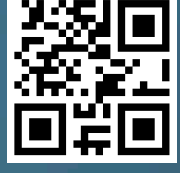
The core donors provide funding that:

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. Zimbabwe (2009)
10. Haiti (2010)
11. Pakistan (2010)
12. Kenya (2011 and 2012)
13. Somalia (2011 and 2012)
14. Sierra Leone (2012)
15. Iraq (2013-2016)
16. South Sudan (2014)
17. Mozambique (2015)
18. Syria (2016)
19. Ethiopia (2017)
20. Sudan (2017)
21. Yemen (2017)
22. Rohingya Population (2017 -till present)



ANNUAL REPORT 2022



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