Dissemination Seminar

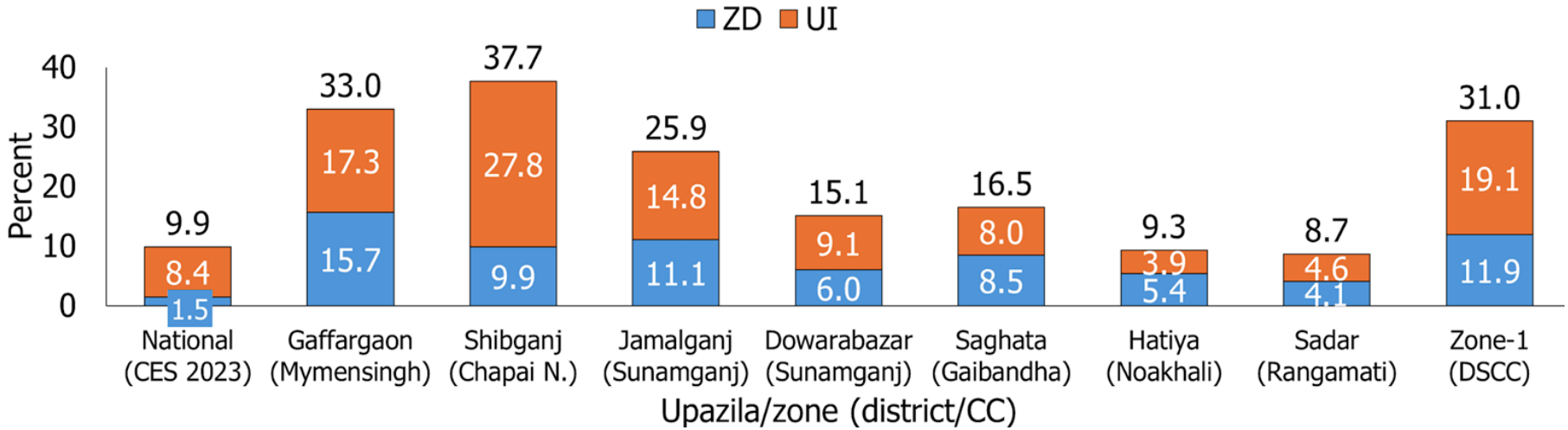
Implementation research to reduce zero-dose and under-immunized children in selected areas of Bangladesh

January 15, 2026

Conference Room
Institute of Public Health (IPH), Mohakhali, Dhaka

Background

- Bangladesh has experienced great success in vaccination coverage – from 2% in 1985 to 81.6% in 2023; yet inequities in coverage persist (CES 2023)
- A recent rapid assessment found zero-dose (ZD) and under-immunized (UI) children throughout Bangladesh and identified areas of high ZD and UI prevalence



Source of upazila/zone level data: DHIS2 2022

ZD: missing the first dose of pentavalent ; UI: missing the third dose of pentavalent

Background (cont.)

- Rolling reviews of DHIS2 data show increasing numbers of upazilas and zones with ZD children

Indicators	2022 (n=485)	2023 (n=485)	2024 (n=485)
# of upazilas with ZD	149	227	385
# of upazilas with ZD >4%	31	86	231
# of zones in city corporations (CCs) with ZD	8	17	34
% of ZD in top 10 upazilas	>7.4%	>12.6%	>21.0%

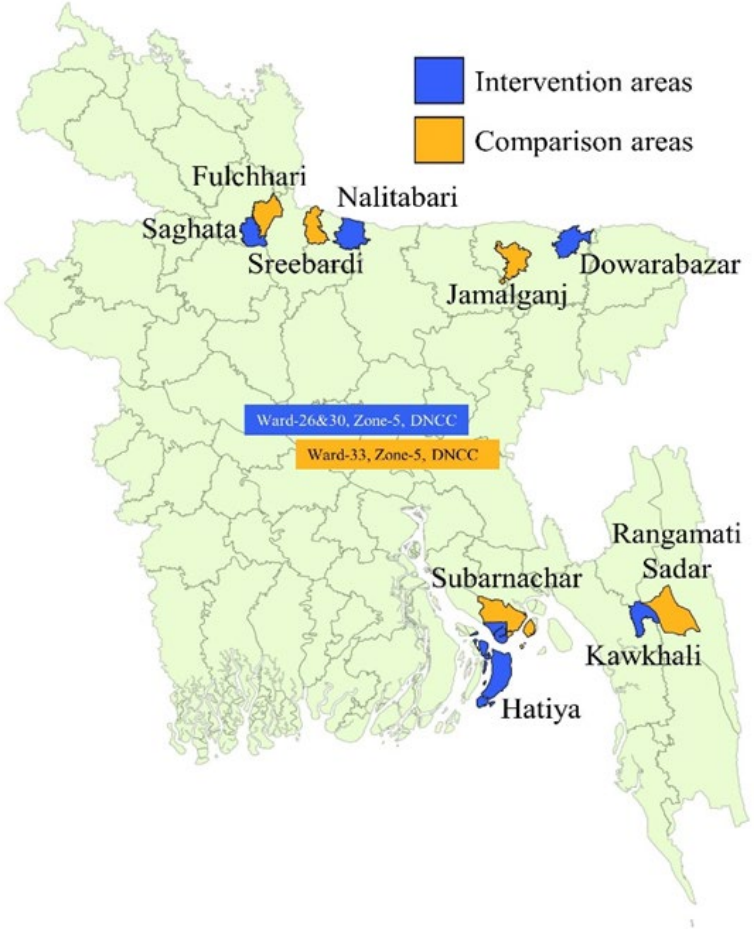
- Literature reviewed identified potential pro-equity interventions (Ducharme et al, 2023)
- This project aimed to develop and implement innovative and effective interventions for reducing ZD and UI children
- Implemented within the existing health systems in collaboration with the GoB, development partners, NGOs and CSOs

Objectives

1. Develop and test appropriate approaches to reduce ZD and UI children
2. Identify key barriers and enabling factors to reach ZD and UI children
3. Assess cost-effectiveness of the interventions

Methods: overall design

- Study design
  - Quasi-experimental pre-post design
- Study population
  - Caregivers of children aged 4.5-23 months, district and upazila level managers and frontline providers
- Study period
  - December 2023 to May 2025
- Study areas
  - Five rural districts and one urban zone of DNCC selected based on rapid assessment results
  - Two upazilas/wards per district/DNCC as intervention and comparison, respectively



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Methods: designing the interventions

1: Identified evidence-based interventions implemented in hard-to-reach (HTR) areas and with HTR populations

2: Shared and discussed the identified interventions with key immunization stakeholders

3: Revised the interventions according to recommendations received through in-person meetings and seminars

4: Used human-centered design (HCD) approach to understand the drivers of ZD/UI within families, and the interventions for improving uptake of routine immunization

5: Designed area-specific interventions for the IR

Methods: selected interventions

- Three intervention categories*:

➢ **Digitalization**
  - E-screening checklist
  - E-supervision checklist

➢ **Modifications to service delivery system**
  - Evening EPI session for urban slums
  - Crash programme for rural remote HTR areas
  - Re-organize EPI sessions as per local needs

➢ **Community engagement and Behaviour Change Communication (BCC) activities**
  - Advocacy with community leaders
  - Courtyard meetings with caregivers
  - Health education through health service providers/counsellors using BCC materials

* Skill development through training was a common intervention for all groups

Methods: interventions implemented

Area specific packages in response to identified needs

All Areas	• Training of service providers • Use of E-screening checklist • Distribution of BCC materials • Modified EPI service schedule (Evening Session / Crash Programme/ Additional Session) - as needed
HTR char areas	• Advocacy with community leaders about importance of immunization
HTR haor areas	• Strengthen EPI support groups (Landowners, UP members, Religious leaders, Teachers etc.)
HTR hilly areas	• Advocacy with community leaders about importance of immunization • Involvement of existing NGO community worker
HTR coastal areas	• Health education through Community Health Care Provider (CHCP) • Use of E-supervision checklist
Plain land	• Courtyard meetings to raise awareness among caregivers
Urban slum	• Community engagement (Counsellors, Slum managers, Club/ committee member, Religious leader etc.) • Health education through NGO counsellors

Methods: evaluation approach

a. Impact evaluation

- Impact at the client level via surveys before and after the interventions

Sample size

- Required sample size per area was 1,150 (total of 13,800) considering 6% prevalence of ZD, 5% significance level, 80% power, a design effect of 1.58 and 10% non-response rate
- Stratified two-stage random cluster sampling design

Data analysis

- Chi-square tests to assess bivariate associations between ZD/UI and covariates
- Binary logistic regression adjusting for cluster effect
- Difference-in-Differences (DID) analysis to estimate the intervention effect

Methods: evaluation approach (cont.)

b. Process evaluation

Data generation

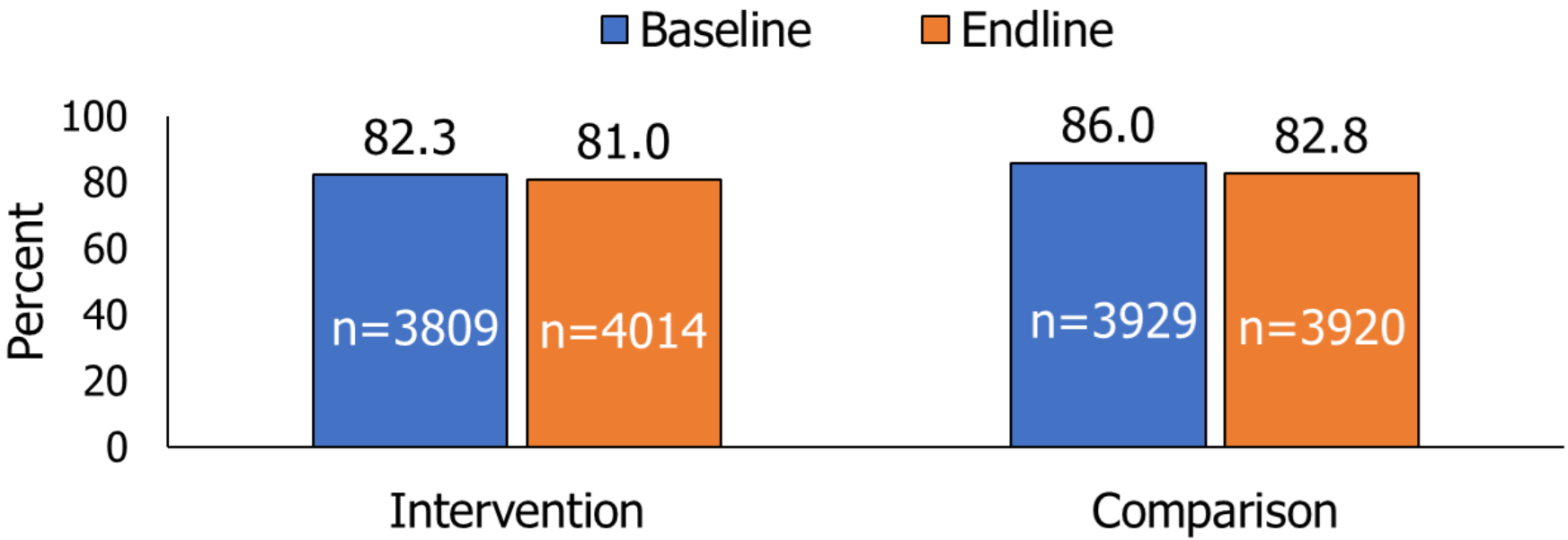
- Observation of field activities, process documentation, qualitative interviews and group discussions
- Examined: perceptions of service providers, effectiveness of the interventions and respondents' recommendations for modification/strengthening of the interventions

Data analysis

- Transcribed and coded data via careful review of transcripts
- Content analysis to code, summarize, and interpret data

Findings

Crude FVC (card + history) among children aged 12-23m



Crude FVC was comparable across intervention and comparison areas at baseline and endline

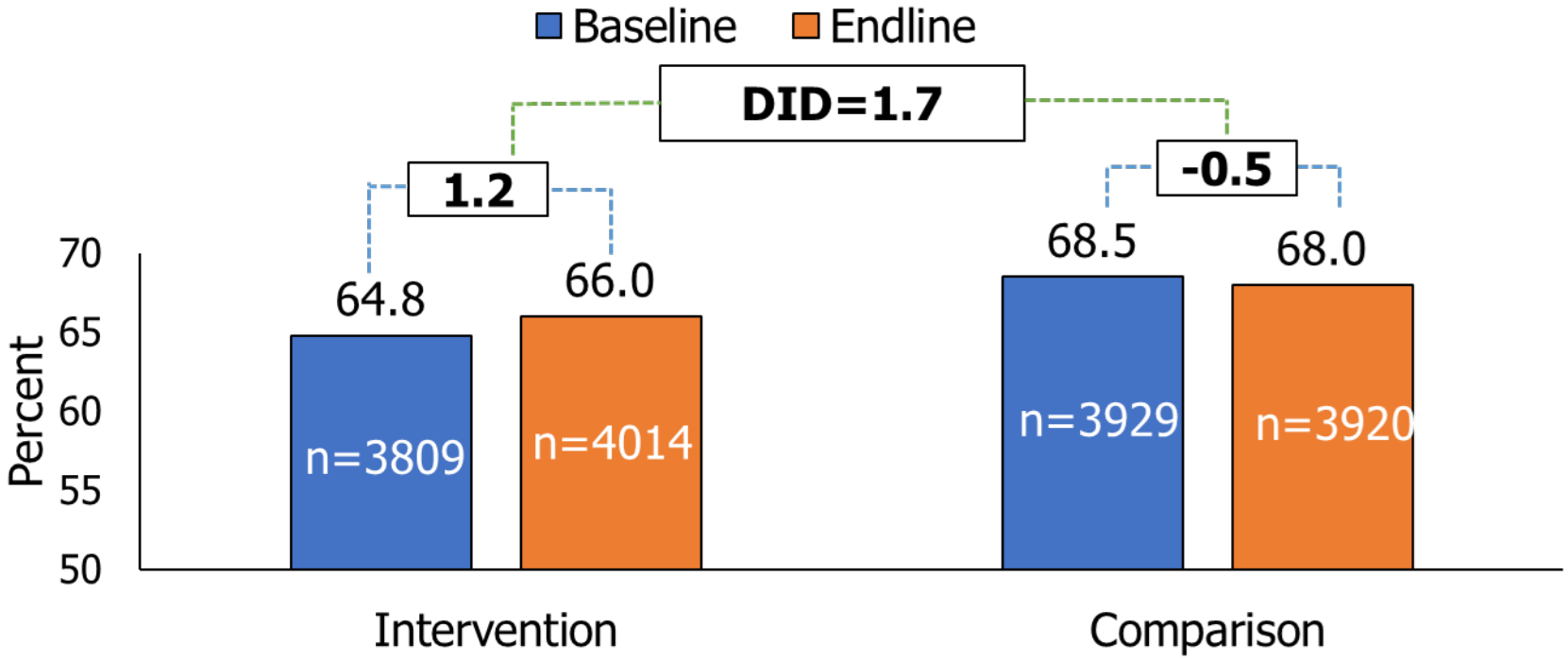
FVC (Full Vaccination Coverage): Child has received 1 dose BCG, 3 doses Pentavalent, 3 doses OPV, 3 doses PCV, and 1 dose MR vaccine

Vaccine-wise crude vaccination coverage among 12-23m children

Name of antigen	Crude (Card + History)			
	Intervention (%)		Comparison (%)	
	Baseline	Endline	Baseline	Endline
	n=3809	n=4014	n=3929	n=3920
BCG	98.7	98.8	99.1	98.8
Penta-1	98.4	98.4	98.8	98.2
Penta-3	91.1	90.9	93.1	91.0
PCV-1	98.4	98.2	98.7	97.9
PCV-3	91.1	89.7	92.9	89.1
OPV-1	98.1	98.5	98.6	98.4
OPV-3	90.8	92.2	92.9	92.8
MR-1	83.7	82.8	86.6	86.0
FVC	**82.3**	**81.0**	**86.0**	**82.8**

Crude vaccination coverage declined from 1st to 3rd dose

Valid FVC (Card Only) among children aged 12-23m



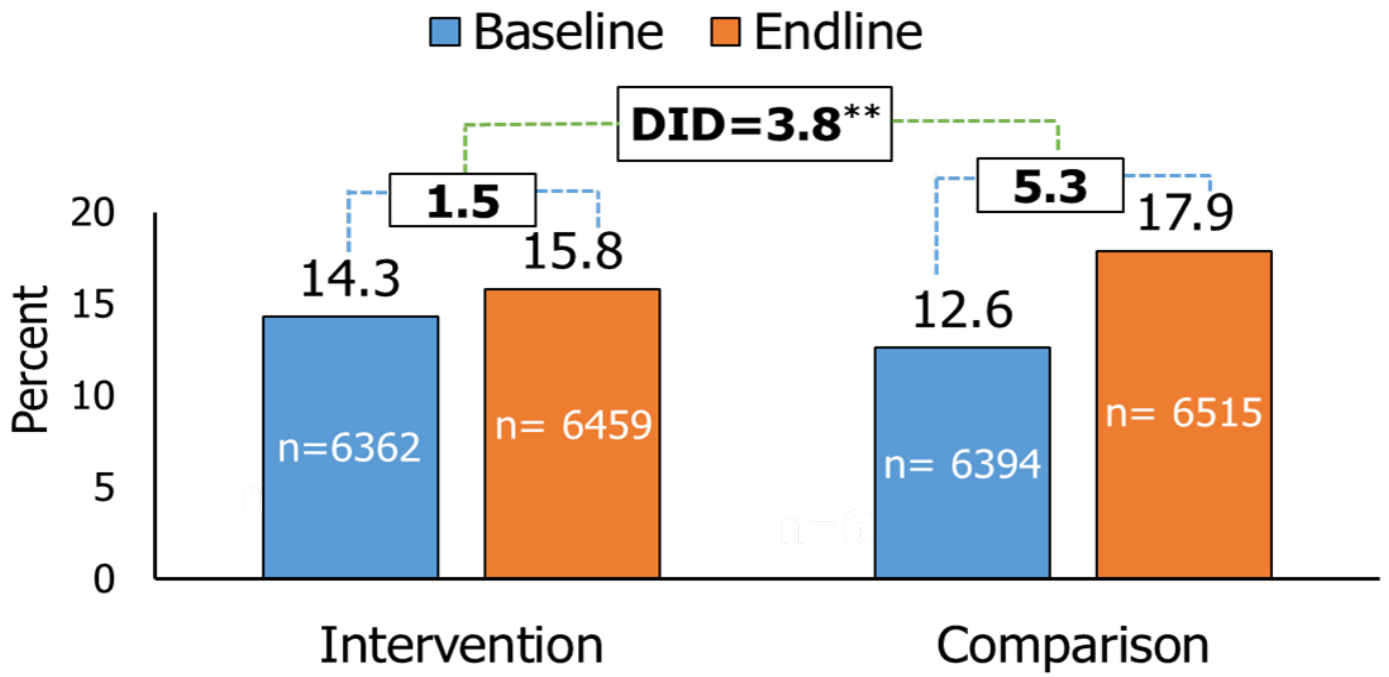
About 1.2% increased in intervention but 0.5% decreased in comparison areas

Vaccine-wise valid vaccination coverage among 12-23m children

Name of Vaccine	Valid (Card Only)			
	Intervention (%)		Comparison (%)	
	Baseline	Endline	Baseline	Endline
	n=3809	n=4014	n=3929	n=3920
BCG	85.3	87.0	85.9	86.5
Penta-1	82.6	85.2	83.7	84.8
Penta-3	78.3	79.5	80.1	78.9
PCV-1	82.7	84.7	83.7	84.6
PCV-3	78.4	77.5	79.8	76.6
OPV-1	82.5	84.9	83.6	84.6
OPV-3	78.9	80.3	80.0	80.9
MR-1	71.3	72.8	74.5	75.1
FVC	**64.8**	**66.0**	**68.5**	**68.0**

Valid vaccination coverage declined from 1st to 3rd dose

Prevalence of ZD/UI among 4.5-23m children



ZD/UI significantly increased in comparison compared to intervention areas

*Statistical significance: ***<0.01, **<0.05 and *<0.1*

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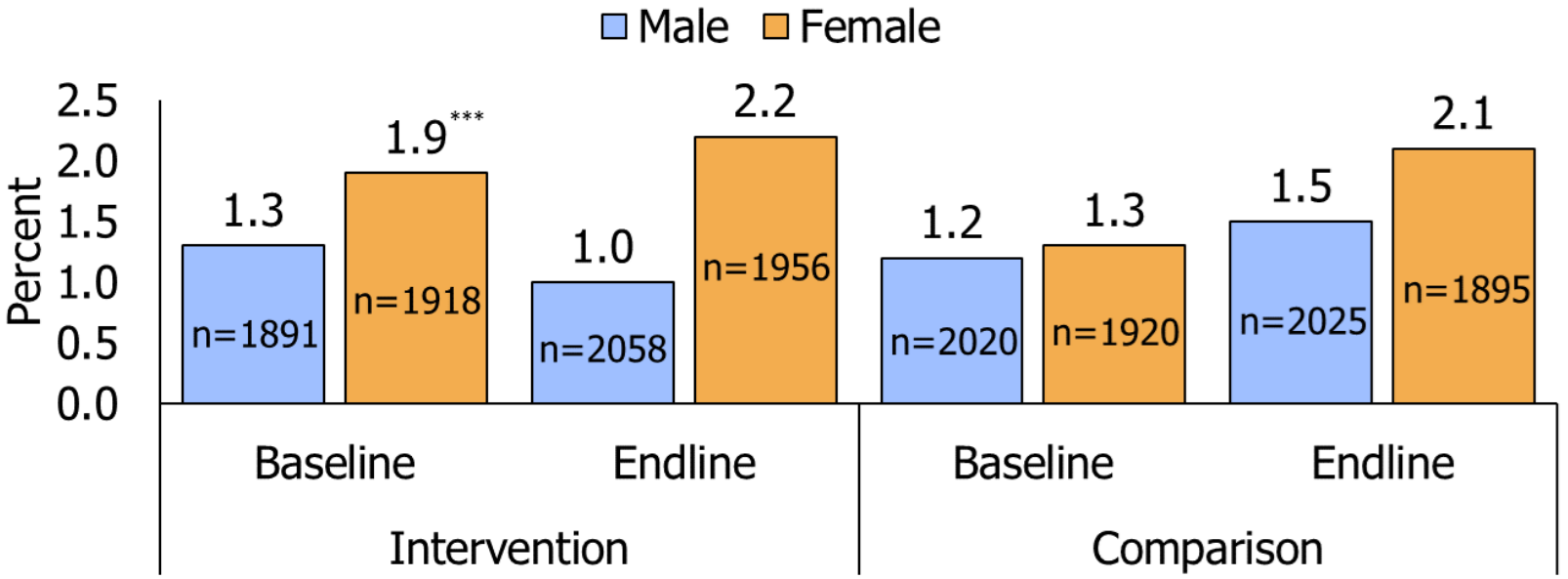
Prevalence of ZD/UI among 4.5-23m children by geo-landscape

Geo-landscape	Intervention			Comparison			DID
	Baseline	Endline	Endline-Baseline	Baseline	Endline	Endline-Baseline	
Char	8.5	11.9	3.4	6.6	14.5	7.9	**4.5**
Coastal	19.0	28.0	9.0	18.5	35.6	17.1	**8.1***
Hilly	10.6	9.3	-1.3	3.7	9.2	5.5	**6.8****
Plain	9.2	5.3	-3.9	9.5	12.1	2.6	**6.5****
Haor	21.2	21.3	0.1	21.5	15.2	-6.3	**-6.4***
Urban slum	19.4	18.4	-1.0	17.1	21.4	4.3	**5.3****
All	**14.3**	**15.8**	**1.5**	**12.6**	**17.9**	**5.3**	**3.8****

Although ZD/UI increased in some areas, DID estimate showed positive impact of interventions

*Statistical significance: ***<0.01, **<0.05 and *<0.1*

Prevalence of ZD among 4.5-23m children by gender



% of ZD was higher among female children compared to male

*Statistical significance: ***<0.01, **<0.05 and *<0.1*

Reasons for being ZD/UI among 4.5-23m children

Reasons*	Intervention		Comparison	
	Baseline (%)	Endline (%)	Baseline (%)	Endline (%)
	n=911	n=1019	n=808	n=1169
The child was ill	48.4	44.4	46.1	39.5
Would vaccinate in future	17.0	44.3	18.5	34.9
Vaccine shortage	6.5	31.5	14.1	35.5
Caregivers were busy	21.8	31.1	24.8	30.4
Fear of side effects	21.1	8.8	15.7	9.2
Migration	12.0	7.3	15.0	8.3
Family members didn't permit	6.6	6.8	3.9	4.9
Vaccination centre was distant	7.1	3.6	4.0	2.1
Health worker was unavailable	1.8	3.5	0.5	4.6
Didn't know the vaccine schedule	8.5	3.4	6.1	3.0
The session time was inconvenient	12.7	2.9	12.6	4.9

*Multiple responses

Note: Sorted by intervention area endline percentage; other reasons not shown due to low percentage

The type of illness reported were Cold & Cough, Fever (102°F or above), Pneumonia, Diarrhea and Allergy/skin disease

Days of vaccine shortage by vaccine and area

District (geo-landscape)	Upazila/Zone (area)	Name of vaccine (in days*)					
		Penta	PCV	IPV	OPV	MR	BCG
Noakhali (Coastal)	Hatiya (Int.)	166	163	122	-	-	-
	Subaranachar (Com.)	110	146	47	5	-	-
Gaibandha (Char)	Saghata (Int.)	129	90	42	37	-	-
	Fulchhari (Com.)	108	174	67	17	-	-
Sunamganj (Haor)	Dowarabazar (Int.)	9	122	-	31	-	65
	Jamalganj (Com.)	-	86	-	22	-	21
Sherpur (Plain)	Nalitabari (Int.)	46	106	29	-	37	-
	Sreebordi (Com.)	46	87	-	-	34	-
Rangamati (Hilly)	Kawkhali (Int.)	-	40	-	-	-	13
	Sadar (Com.)	-	-	-	-	-	-
DNCC (Urban)	Zone-5	23	8	-	-	-	-

* 290 working days from Jan'24 to Apr'25

Prevalence of ZD/UI by background characteristics of caregivers

- Bivariate analysis showed that the prevalence of ZD/UI was significantly higher in:
  - char (25.2%), haor (19.8%) and urban slum (19.1%) compared to plain land (9.0%)
  - older caregivers (35-44 years: 15.7%) compared to middle aged (25-34 years: 14.5%)
  - caregivers with no education (24.1%) compared to higher education (8.5%)
  - higher parity group (3^+ children: 19.3%) compared to lower parity (1 child: 13.1%)
  - lower wealth quintile (20.2%) compared to higher quintile (8.5%)
  - younger age group of children (4.5-<12m: 25.6%) compared to higher age group (12-23m: 8.5%)

- Binary logistic regression results confirmed these differences unlikely to have arisen by chance

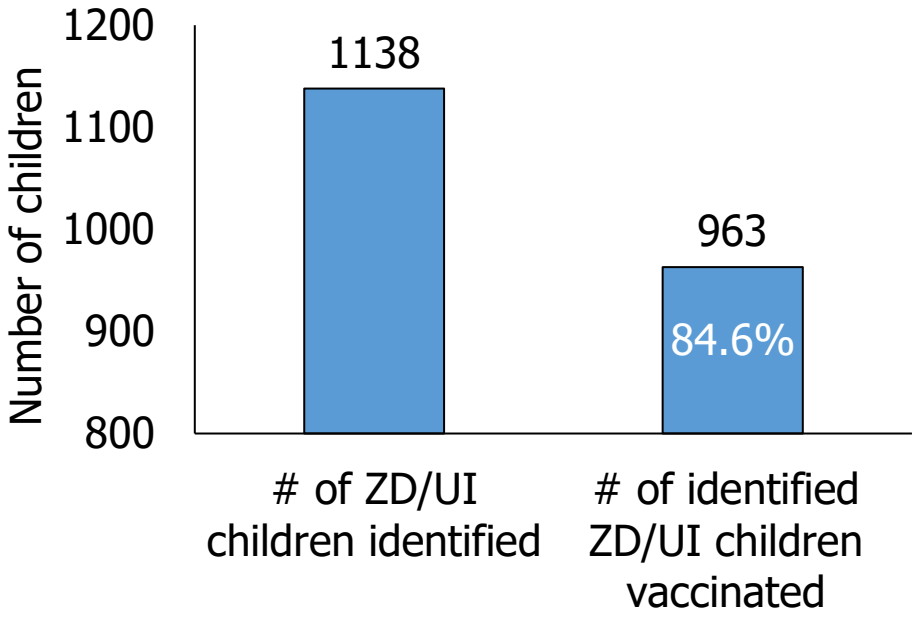
Impact of some promising interventions

E-screening checklist

E-SCREENING CHECKLIST APP

A New Horizon in Vaccination of Zero-Dose and Under-Immunised Children in Bangladesh

E-screening checklist



- Most of the key informants (n=10) and FGD participants said that the E-screening checklist contributed both in identification and vaccination of ZD and UI children. A CHCP shared her experience,

"A mother came to me for medicine. Her child was sick, missed few doses of vaccines. She didn't know where to vaccinate. …. When she was talking about her child, I asked her whether she vaccinated her child. She said, few doses are left yet. I told her to bring the card and after seeing the card, I did entry that child on E-screening. Later, that child was fully vaccinated."

* Data updated up to May 2025

Crash programme

- A total of **76 crash programmes** were conducted at char and coastal IR areas during the study period where **1,834 children** were vaccinated
- According to key informants (n=11) and FGD participants (n=4), crash programmes demonstrated outstanding success in vaccinating ZD and UI children. One MT-EPI of Hatiya said,

"It was not possible to provide vaccines to the children in Ghashiar char this year without the crash programme supported by the ZDLH project. High officials always told us to conduct crash programme but they never provide any support for this purpose. The ZD and UI children of those areas are vaccinating only through crash programme. And the coverage is now really good. We can provide vaccine to 150-200 children in each crash programme in those areas"

Evening session

In urban intervention areas, **119 evening sessions** were held and a total of **1,099 children** were vaccinated in the evening sessions

Monitoring of IR activities

Monitoring committee at national level :

Chairperson- Additional Secretary, Health Services Division (HSD), Ministry of Health & Family Welfare (MOHFW)

Member Secretary- Principal Investigator of Bangladesh Learning Hub

Members- Joint Secretary, HSD, MOHFW; Line Director, MNC&AH; Director, MIS; Program Manager, EPI; Team Leader, IVD-WHO; Health Manager Immunization, UNICEF; Senior Program Officer, PATH

Sub-national committees at districts of IR:

Chairperson- Civil Surgeon (CS) / Chief Health Officer, Dhaka North City Corporation (DNCC)

Member Secretary- UH&FPO / Assistant Health Officer, Zone-5, DNCC

Members- Medical Officer (CS); SIMO, WHO; Consultant, UNICEF; District EPI Superintendent; Health Inspector, Medical Technologist (EPI); EPI Supervisor; NGO Clinic Manager; Monitoring Officer, icddr,b

Both the committees monitor and review project activities and provide necessary assistance and recommendations to guide the implementation of the project activities

Challenges in implementing the interventions

- Though the interventions contributed in reducing ZD and UI children, there were some challenges:
  - Inadequate human resources
  - Vaccine shortage
  - Shortage of EPI cards
  - Frequent administrative changes
  - Denominator issue in EPI administrative data
  - Unavailability of upazila level data in CES

Economic Evaluation

Rationale

- Increasing immunization coverage to reduce ZD/UI prevalence in resource constrained, geographically challenging (Hard-to-reach) and socioeconomically marginalized communities is **arduous task, costly and exhibits context-specific variation in resource requirement**
- Economic evaluation can guide investment decisions for such complex interventions
- Examining the cost-effectiveness of the ZD/UI program is critical for:
  - Determining its economic viability
  - Generating evidence on economic trade-offs
  - Evaluating the intervention's expected impact and associated costs

Objectives

- The economic evaluation aimed to assess:
  - The area-specific and overall incremental/programme cost to reach ZD/UI children in the selected six intervention areas
  - The cost-effectiveness of the ZD/UI programme compared to standard of care in reaching ZD/UI children in selected missed communities of Bangladesh

Method: cost estimation

- The cost was estimated from a **provider perspective** using an **activity-based micro-costing approach**
- Activity cost = ∑ Inputs used × Unit cost of each input.
- Start-up phase and implementation phase financial expenses and opportunity costs were calculated and combined to derive the total incremental cost
  - Start-up phase: October'23- December'23
  - Implementation phase: January'24-December'24

Method: cost data collection

Data collection methods	Data source/respondent	Information collected
Key informant interviews (KII)	Medical Officer- Disease Control	• Map the programme timeline • Identify the program activities and sun-activities • Identify and quantify the required resources • Determine the incremental proportion of involvement and usage of resources • Collect the cost related data of respective resources • Training & meeting related information • Facility cost-related information
	Medical Technologist-EPI	
	Head Assistant	
	Field Research Officer	
	Health Inspector & Assistant Health Inspectors	
	Service provider interviews (Health Assistant, Vaccinator)	
	Program team personnel (field and central level)	
Document review	Expenditure reports Statistical documents (Vaccine supplies, vaccine coverage, wastage rate etc.)	
Observation	Physical inventory	

Methods: outcome measure and effectiveness analysis

- **Outcome measures:** Cost per ZD/UI reached, Disability Adjusted Life Years (DALY) averted, Incremental Cost Effectiveness Ratio (ICER)
- **Outcomes and effectiveness analysis**
  - Area specific and total number of ZD & UI children reached was calculated using the **area specific EPI target population** and **ZD/UI coverage change data** from baseline and endline estimates.
  - The area specific cost of the programme and average cost per ZD & UI child reached were calculated after adjusting for central level cost

Method: cost-effectiveness analysis

- The **Lives Saved Tool (LiST)** was used to estimate cost-effectiveness
- LiST input
  - ✔ ZD/UI coverage change data: vaccine preventable disease cases averted and under-five child lives saved from **pneumonia and meningitis diseases.**

- DALY = Years of life lived with disability (YLD) + Years of life lost due to death (YLL). Where,
  - ✔ YLD = Disease cases averted × average duration (years) until remission × disability weight and,
  - ✔ YLL = Number of deaths averted × standard life expectancy at the age of death in years

Methods: cost-effectiveness analysis (cont.)

- **Cost-effectiveness**
  - Incremental Cost Effectiveness Ratio (ICER) = $\frac{Total\ incremental\ cost\ of\ the\ program}{Total\ DALY\ averted\ by\ the\ Program}$
  - Incremental cost per DALY averted was compared with the WHO recommended GDP threshold for Bangladesh (USD 2820, FY 2024-25)

Findings from Economic Evaluation

Resource-based total program cost, 2024

Resource Category		Plain land (BDT)	HTR Char area (BDT)	HTR Haor area (BDT)	HTR Hilly area (BDT)	HTR Coastal area (BDT)	Urban slum & street dwellers (BDT)	Central and others (BDT)	Total (BDT)	Total (USD)	% of total
Capital	Equipment	5,758	5,299	3,327	12,274	22,019	7,941	334,950	391,569	3,208	1%
	Furniture & Others	2,118	867	209	7,004	3,344	1,700	209,244	224,486	1,839	1%
Recurrent	Salary	913,548	824,452	335,145	1,808,857	746,133	656,645	**14,073,432**	19,358,212	158,609	63%
	Honorarium/ Allowances	524,876	552,559	593,049	391,184	503,064	264,495	132,480	2,961,706	24,266	10%
	Transportation Resources	169,883	296,424	320,913	529,271	162,855	134,020	427,375	2,040,740	16,721	7%
	Materials	110,757	76,972	113,087	76,733	91,721	90,181	273,433	832,884	6,824	3%
	Venue/Facility usage cost	34,253	12,751	13,114	18,579	29,215	**823,531**	**1,072,605**	2,004,049	16,420	7%
	Food/ Refreshment	121,380	118,949	151,710	114,465	91,086	161,076	60,633	819,300	6,713	3%
	Other resources	131,725	117,603	93,473	77,190	206,225	132,272	1,116,210	1,874,697	15,360	6%
Grand total		**2,014,300**	**2,005,877**	**1,624,026**	**3,035,557**	**1,855,661**	**2,271,861**	**17,700,362**	**30,507,644**	**249,960**	**100%**

Major cost drivers

- Human resource, honorarium & allowances, transportation resources, were the major cost drivers.
- Regular monitoring and evaluation meetings along with other area specific training activities contributed significantly to this high share
- Variation in cost across the areas was mostly due to opportunity cost of existing EPI personnel
- Major cost share was concentrated at central level

The ZD/UI programme implementation mostly relied on incremental use of existing resources

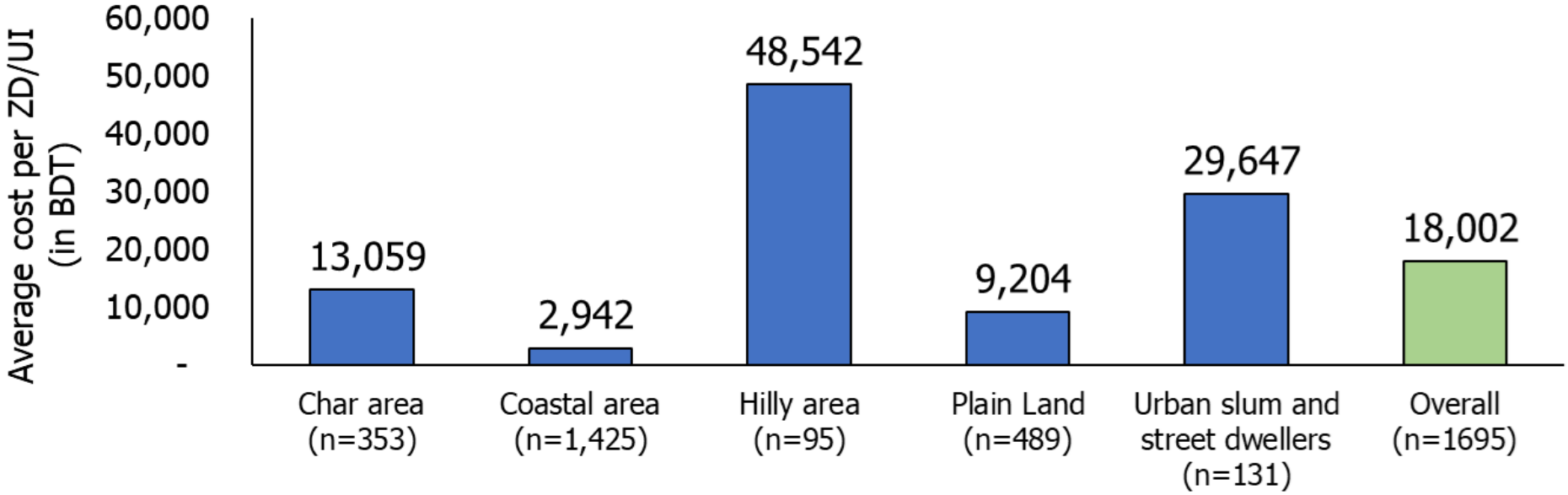
Activity-based total program cost, 2024

Activities	Plain land (BDT)	HTR Char area (BDT)	HTR Haor area (BDT)	HTR Hilly area (BDT)	HTR Coastal area (BDT)	Urban slum and street dwellers (BDT)	Central and others (BDT)	Total (BDT)	Total (USD)	% of total
Skill development training	459,152	295,490	389,191	316,605	316,292	190,216	2,500,329	**4,467,276**	**36,602**	**15%**
Use of E-screening	33,116	63,079	95,485	122,347	93,605	-	298,486	**706,117**	**5,785**	**2%**
Modified EPI sessions: Crash program	15,632	19,023	59,631	12,380	47,347	-	-	**154,011**	**1,262**	**1%**
Modified EPI sessions: Additional sessions	60,959	-	-	11,458	63,146	313,531	-	**449,095**	**3,680**	**1%**
Modified EPI sessions: Evening sessions	-	-	-	-	-	748,257	-	**748,257**	**6,131**	**2%**
Community awareness through BCC materials	7,931	7,931	7,931	7,931	7,931	7,931	97,850	**145,435**	**1,192**	**0.5 %**
Advocacy with community leaders	-	59,382	-	31,035	-	-	-	**90,417**	**741**	**0.3 %**
Strengthen EPI support groups (TBAs, IMAMs, UP members)	-	-	25,507	-	-	-	-	**25,507**	**209**	**0.1 %**

Activity-based total program cost, 2024 (cont.)

Activities	Plain land (BDT)	HTR Char area (BDT)	HTR Haor area (BDT)	HTR Hilly area (BDT)	HTR Coastal area (BDT)	Urban slum and street dwellers (BDT)	Central and others (BDT)	Total (BDT)	Total (USD)	% of total
Involvement of existing NGO community worker	-	-	-	642,521	-	-	-	**642,521**	**5,264**	**2%**
Health education through CHCP	-	-	-	-	103,962	-	-	**103,962**	**852**	**0.3%**
E-supervision checklist	-	-	-	-	78,001	-	298,486	**376,487**	**3,085**	**1%**
Conduct courtyard meeting	44,939	-	-	-	-	-	-	**44,939**	**368**	**0.1%**
Community engagement (Landlord, club/committee member, Imam etc.)	-	-	-	-	-	95,891	-	**95,891**	**786**	**0.3%**
Health education through NGO counsellors	-	-	-	-	-	64,528	-	**64,528**	**529**	**0.2%**
Database maintenance	-	-	-	-	-	-	298,486	**298,486**	**2,446**	**1%**
Administration and monitoring	1,392,572	1,560,972	1,046,283	1,891,281	1,145,377	851,507	14,206,726	**22,094,717**	**181,030**	**72%**
Total cost	2,014,300	2,005,877	1,624,026	3,035,557	1,855,661	2,271,861	17,700,362	**30,507,644**	**249,960**	**100%**

Average cost per ZD/UI reached by intervention area, 2024



- Cost per child reached inversely related to target population
- High cost per ZD/UI child reached for the HTR Hilly area due to low target
- Lower cost per ZD/UI for HTR coastal area with relatively higher target population

Cost-effectiveness of reaching ZD/UI child, 2024

	Outputs	Cost BDT (USD)
DALY averted by ZD & UI programme (compared to no intervention scenario)	566	
Total programme cost		30,507,644 (249,960)
Incremental Cost Effectiveness Ratio (cost per DALY averted)		53,934 (442)
GDP per Capita for Bangladesh, FY 2024-25		339,211 (2,820)

- The program exhibits great potential for sustainability and future level scale up opportunity
- The programme can reach economies of scale during scale-up with increased coverage

Remarks

- **The ZD/UI programme was identified as highly cost-effective compared to standard of care**
- **Context-specific variation in investment plans** is required to ensure effective coverage for all geographic locations
- Significant resource requirement for **administrative and monitoring activities** (resource efficiency, functional health system at PHC)
- The estimates will help identify funding gaps and develop a budget for strategic investment
- The required resource can be linked to immunization output to monitor programme performance

Conclusions and Recommendations

Conclusions

- Findings suggest that interventions had a positive impact despite broader system challenges
- Qualitative findings indicate positive response to interventions from care-givers and service providers
- Economic evaluation suggests that the interventions have great potential in terms of sustainability and future-level scale up opportunities

Recommendations and policy implications

- Scale up the promising interventions on priority basis
- Ensure uninterrupted vaccine supply
- Ensure required human resources
- Recognize the need for area-specific plans
- Give special attention to high prevalent ZD/UI areas and groups
- Conduct periodic rolling-review and rapid assessments to identify new and high prevalent ZD and UI areas
- Improve coordination and involvement of other departments
- Strengthen effective monitoring and supervision
- Focus upon gender disparity in immunization
- Strengthen IPC activities focusing on older, higher parity, poorly educated and socioeconomically disadvantaged caregivers

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Thank You

This project has been funded

By **Gavi, the Vaccine Alliance**

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icddr,b thanks its core donors
for their on-going support

Government of the People's
Republic of Bangladesh

Canada