

Impacts of Measles-elimination Activities on Immunization Services and the Health Systems



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Impacts of Measles-elimination Activities on Immunization Services and the Health Systems

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ICDDR,B working paper no. 173

October 2010

ISBN: 978-984-551-320-3

© International Centre for Diarrhoeal Disease Research, Bangladesh

Publisher

ICDDR,B

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(Mohakhali, Dhaka 1212)

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Acronyms

ADB	Asian Development Bank
AEFI	Adverse Events Following Immunization
AHI	Assistant Health Inspector
AHO	Assistant Health Officer
AMEA	Accelerated measles-elimination activities
ARI	Acute respiratory infection
CC	Community Clinic/City Corporation
CDC	Centers for Disease Control and Prevention
CHO	Chief Health Officer
CS	Civil Surgeon
DCC	Dhaka City Corporation
DGFP	Directorate General of Family Planning
DGHS	Directorate General of Health Services
DIMO	District Immunization Medical Officer
EPI	Expanded Programme on Immunization
ESD	Essential service-delivery
FPI	Family Planning Inspector
FWA	Family Welfare Assistant
GoB	Government of Bangladesh
GR	Geographic Reconnaissance
HA	Health Assistant
HEU	Health Economics Unit
HI	Health Inspector
HNPSP	Health, Nutrition and Population Sector Programme
HSEU	Health System and Economics Unit
ICDDR,B	International Centre for Diarrhoeal Disease Research, Bangladesh
ILR	Ice-lined refrigerator
IPC	Inter-personal communication
IMCI	Integrated Management of Childhood Illness
LSHTM	London School of Hygiene & Tropical Medicine
MA	Medical Assistant
MCH-FP	Maternal and child health–family planning
MCV1	Measles-containing vaccine dose 1
MCWC	Maternal and Child Welfare Centre

MDG	Millennium Development Goal
MIS	Management information system
MMR	Mumps, measles and rubella
MoHFW	Ministry of Health and Family Welfare
MoLGRD	Ministry of Local Government, Rural Development & Co-operatives
NGO	Non-government organization
NID	National Immunization Day
NIPORT	National Institute of Population Research and Training
NT	Neonatal tetanus
PHC	Primary healthcare
RHC	Rural health centre
SACMO	Sub-Assistant Community Medical Officer
SIAs	Supplementary immunization activities
SMO	Surveillance Medical Officer
SSFP	Smiling Sun Franchise Programme
UCI	Universal child immunization
UHFWC	Union Health and Family Welfare Centre
UHC	Upazila Health Complex
UHFPO	Upazila Health and Family Planning Officer
UNICEF	United Nations Children's Fund
UPHCP	Urban Primary Health Care Project
VPDs	Vaccine-preventable diseases
WHO	World Health Organization

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ACKNOWLEDGEMENTS

This research was funded by the London School of Hygiene & Tropical Medicine (LSHTM) (Grant No. VW05/005). ICDDR,B acknowledges with gratitude the commitment of LSHTM to the Centre's research efforts.

We express our sincere gratitude to Dr. Borendra Nath Mondal, former Director, Primary Health Care; Dr. Md. Abdul Jalil Mondal, Deputy Director, EPI and Surveillance and Programme Manager, Child Health and Limited Curative Care (LCC); Brig Gen (Dr.) Md. Showkat Ali, Chief Health Officer; Dhaka City Corporation (DCC); Dr. Md. Nurul Islam, Deputy Chief Health Officer, DCC; Dr. Serguei Diorditsa, Medical Officer (IVD), WHO; and Dr. Ataur Rahman, Immunization Specialist, UNICEF, for their valuable support while conducting the study.

We are indebted to Civil Surgeon, Sunamgonj; Upazila Health and Family Planning Officers, Derai and Jamalgonj; and Assistant Health Officers, Zone 5 and 7 of DCC for their constant support during data collection. We also acknowledge the support of all the respondents who participated in key-informant interviews and staff profiling survey.

We thank Dr. Md. Abdul Jalil Mondal, Deputy Director, EPI and Surveillance and Programme Manager Child Health and LCC and Dr. Tazul Islam A. Bari, Medical Officer, EPI, for reviewing the earlier draft of this report.

We are thankful to the members of the ICDDR,B measles study team, especially Mrs. Meghla Islam, Md. Wazed Ali, Md. Tauhidul Islam Sarker, and Md. Abul Kalam for conducting key-informant interviews and assisting in analysis of qualitative data.

We are grateful to Md. Emdadul Haque, Administrative Officer, Health System and Infectious Diseases Division of ICDDR,B and Md. Nuruzzaman and Md. Mahbubur Rahman for their administrative and logistics support.

EXECUTIVE SUMMARY

Context: Measles is among the most infectious diseases of humans, and a very high immunity level is, therefore, required for its elimination. In Bangladesh, the measles-coverage rates range from 80% to 89%. However, 15% of vaccinated children do not develop immunity because of only 85% efficacy of measles vaccine when given at 9 months. And as much, 25-30% of children in each birth-cohort are susceptible to measles. A second opportunity for measles immunization, along with simultaneous strengthening of routine immunization, is an effective way to reduce the proportion of susceptible children in the community and, thus, to prevent measles outbreak. Countries, such as Bangladesh, that offer only one dose of measles vaccine through routine EPI services experienced frequent outbreaks of measles. Countries providing two opportunities for measles vaccination have experienced precipitous declines in the number of cases and even greater reductions in the number of deaths. These reductions have been achieved after high-quality campaigns with over 95% coverage, even in countries with relatively low routine measles coverage. Bangladesh endorsed the measles mortality-reduction goal set at the United Nations Special Session on Children in May 2002 and endorsed by the World Health Assembly in 2003. In accordance with the joint World Health Organization–United Nations Children’s Fund (WHO-UNICEF) measles mortality-reduction strategic plan, Bangladesh adopted a national Measles Control Plan of Action for 2004-2010. Its overall goal was to reduce measles mortality by 90% by 2010 compared to the 2000 estimates. To achieve this goal, the national Expanded Programme on Immunization (EPI) strengthened the measles-vaccination effects through routine immunizations. Strategies adopted for strengthening measles-vaccination effects through routine immunizations included massive motivational activities in the community, strengthening of the measles-surveillance system. At the same time, the Government of Bangladesh (GoB) organized measles campaigns targeting all children aged 9 months to 10 years.

Objective: The overall aim of the study was to evaluate the impact of measles-elimination activities on the health system and on routine immunization services.

Methods: A mixed-method approach was employed to capture both outcomes and process factors relating to measles-eradication activities and their impact. The study was conducted at the national, sub-national and service levels in both rural and urban areas. Data for the study were collected through a review of documents, key-informant interviews, and a staff profiling survey. Both qualitative and quantitative approaches were adopted in analyzing the generated data.

Results: In Bangladesh, the EPI is highly integrated within the health system. The programme is fully incorporated into the comprehensive healthcare-delivery system of the country and is integrated within the general health-system functions under the Health, Nutrition and Population Sector Programme (HNPSP). The EPI is one of several programmes administered by the Director, Primary Health Care (PHC) and Line Director, Essential Service Delivery (ESD) of the Ministry of Health and Family Welfare (MoHFW, GoB). The current immunization strategy is based on a model of eight outreach sites per ward (old), with two immunization sessions held each week. In rural areas, vaccinations are delivered by Health Assistants (HAs) and Family Welfare Assistants (FWAs), appointed by the MoHFW at the village level. Immunization services in urban areas are provided through a public-private partnership. The city corporations (CCs) and the municipal government are responsible for providing EPI services but the implementation is carried out mainly through national non-government organizations (NGOs), which deliver more than 95% of vaccinations in urban areas. The EPI is considered a success story of health services in Bangladesh because of its remarkable progress

during the last 25 years. It provides almost universal access as measured by the percentage of children aged under one year receiving BCG vaccine, which has increased from 2% in 1985 to 99% in 2009.

In accordance with the immunization schedule, one dose of measles vaccine is provided to children at nine months of age. A second dose of routine measles vaccine has not yet been introduced into the routine EPI. The measles-vaccination coverage reached 83% in 2009.

The present study revealed that measles supplementary immunization activities (SIAs) had an overwhelmingly positive impact on routine immunization services. The study informants identified numerous areas where measles SIAs had positive impacts, such as improved awareness in communities about the importance of measles vaccination and motivated service providers to manage national-level large programmes efficiently. In addition, according to the informants and validated by the coverage reports, the routine measles-coverage rates increased from below 60% to above 80% after the catch-up measles SIAs during 2005-2006.

Measles-elimination activities had a positive impact on the health system. Highlights include the strengthening of the integration of EPI within the health system; ensuring a high level of political commitment towards this health-related goal; and serving as an example of effective inter-agency collaboration. Further, measles SIAs have strengthened the measles surveillance system and support for the introduction of a second dose of measles vaccine into the routine immunization schedule.

Increased workload of staff members; lack of technically-skilled manpower; late arrival of funds at operational levels; use of additional forms for reporting the performance of measles SIAs; shortage of refrigerators and cold-boxes; and inadequate and interrupted power supply had negative impacts on immunization services and health systems as the key-informants reported.

Conclusions: Measles-elimination activities have, overall, had a positive impact on the national immunization programme and the health systems of Bangladesh. Recent proposed changes, such as introduction of second dose of measles vaccine into the routine immunization schedule, may expedite the elimination of measles from Bangladesh. More generally, measles vaccination and the EPI serve as models for the effective integration of vertical programmes within the health system for developing a high level of political commitment and for effective inter-agency collaboration.

I. Introduction

Measles is among most infectious diseases of humans, and a very high level of immunity is, therefore, required for its elimination (1). Results of sero-prevalence studies in the USA and other industrialized countries suggest that 90-95% coverage is needed to eliminate the disease (2). Another study measured that, to prevent measles outbreaks, it is important to maintain high level of immunity among population against the virus. In Bangladesh, measles is a leading cause of death and disability among children. Rates of routine measles-vaccination coverage in Bangladesh range from 80% to 89% by district. However, about 15% of vaccinated children do not develop immunity since the vaccine efficacy when given at 9 months is only about 85%. And as such, 25-30% of children in each birth-cohort remain susceptible to measles (3). The experiences of other countries have revealed that, once the accumulated number of children reaches the size of a birth-cohort, a measles outbreak occurs (4).

Countries, such as Bangladesh, that offer only one dose of measles vaccine through routine EPI services continue to experience frequent outbreaks of measles. A second opportunity for measles immunization, along with simultaneous strengthening of routine immunization services, is an effective way to reduce the proportion of susceptible children in the community and, thus, to prevent outbreak of measles (3,4). Although virus transmission will not be interrupted, outbreak of measles and deaths will be significantly reduced due to the development of herd immunity (4,5). Countries providing two doses of measles vaccine have, thus, experienced a sharp decline in the number of cases and even a greater decline in the number of deaths. These reductions have been achieved after high-quality campaigns with over 95% coverage, even in countries with relatively-low routine measles coverage (4).

The World Health Organization–United Nations Children’s Fund (WHO-UNICEF) comprehensive strategy for measles elimination and reduction of measles mortality aims to: (a) achieve and maintain high coverage (>90%) of the first dose of measles-containing vaccine (MCV1) among all children by the age of 12 months through routine immunization services; (b) ensure that all children receive a second opportunity for measles immunization, either through a second routine dose or through periodic campaigns; (c) implement effective laboratory-supported disease surveillance; and (d) provide appropriate clinical management for measles cases (2).

A recent analysis of measles landscape concluded that “the four components of the WHO-UNICEF comprehensive measles strategy are sound” where these have been implemented effectively, as confirmed by close monitoring and supervision, the impact has been impressive in a wide range of settings (6).

The Government of Bangladesh (GoB) decided to provide a second opportunity for measles vaccination through nationwide catch-up and follow-up supplementary immunization activities (SIAs) (4). The first catch-up SIAs were undertaken in 2005-2006 and the follow-up SIAs were completed in February 2010.

The present study sought to understand the impact of measles-elimination activities on immunization services and the health system, rather than focus on measuring the health impact. Bangladesh is one partner in a six-country study. The other countries in the study are: Brazil, Cameroon, Ethiopia, Tajikistan, and Vietnam. Similar studies on the impact of polio-eradication activities concluded that it is intrinsically difficult to define reliable, quantitative indicators for measuring the health-systems impact of eradication activities. Hence, the present study sought to triangulate qualitative information against quantitative indicators.

2. Objective of the study

The overall aim of the study was to evaluate the impact of measles-elimination activities on routine immunization services and the health systems. The impact includes past, ongoing and potential future impact. The specific aims were to:

- a. Describe the health system and immunization system structure in Bangladesh and assess the linkages between these and measles-vaccination activities;
- b. Assess integration of measles-vaccination activities within the health and immunization systems;
- c. Assess the impacts of previous and ongoing measles-elimination activities on various key functions of the health and immunization systems; and
- d. Develop recommendations on how measles-eradication activities can be used for strengthening routine immunization services and the health systems while mitigating negative impact.

3. Study methods

Multiple approaches were employed using both quantitative and qualitative assessments at various levels of the health system.

3.1. Ethical approval

The ethics committee of the London School of Hygiene & Tropical Medicine (LSHTM) approved the multi-country study. Ethical approval of the Bangladesh study was obtained from the Ethical Review Committee of ICDDR,B before the implementation of the study. The respondents were interviewed after obtaining written informed consent. Efforts were made to ensure that all the respondents were properly informed about the study and thoroughly understood what their participation in the study involved. Participation was voluntary. The participants were ensured that refusal would have no adverse consequences for them. The participants were assured that the information provided by them would be used for research purposes only and would not be shared anywhere by the name of the participants. Interviews were conducted according to convenience of the respondents.

3.2. Study sites

The study was conducted at national, district/sub-national and service levels. One rural district and one urban city corporation (CC) were selected (Fig. 1).

Selection of rural district and service levels: Geographically and administratively Bangladesh is divided into six divisions. These divisions consist of 64 districts, which are further subdivided in 476 upazilas (subdistricts). Sunamganj district (sub-national) and Dearai and Jamalganj upazilas (service level) were purposively selected for the study. The study areas were selected based on the following criteria: relatively low routine vaccination-coverage rates.

Selection of urban areas: Dhaka City Corporation (DCC) was selected as an urban study site. The DCC comprises 10 administrative zones of approximately one million people each. Two low-performing zones (Zone 5 and 7) were purposively selected (Annexure 1) for the study. Both DCC and NGO staff members of the two zones were interviewed. Table 1 includes some basic information on the selected study sites.

Fig. 1. Levels covered by the study

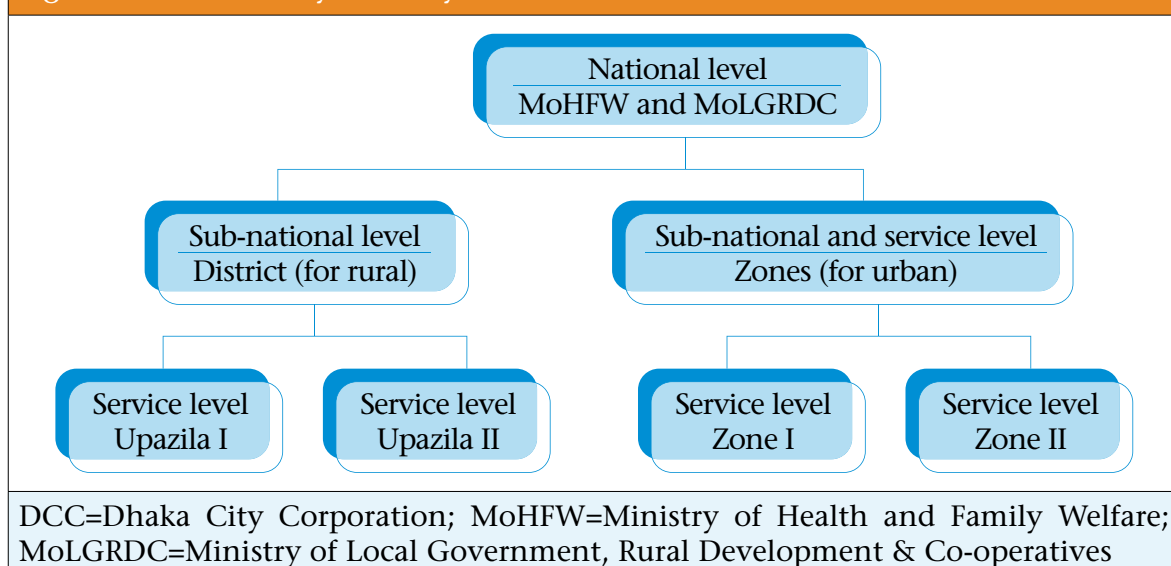


Table 1. Basic information on the study sites

Indicator	Dhaka (urban)	Sunamgonj (rural)
Name of region	Dhaka	Sylhet
Population of study sites	2,000,000	400,000
Distance from capital city	Within capital city	350 km from capital city
MCV1 coverage rate*	84 (in slums)	85 (Sunamgonj district)
Date of last catch-up SIAs	Phase 1: 3-22 September 2005 and Phase 2: 25 February 25-16 March 2006	Phase 1: 3-22 September 2005 and Phase 2: 25 February-16 March 2006
Date of follow-up SIAs	14-28 February 2010	14-28 February 2010
Number of health facilities visited	4	2

*National coverage evaluation survey report 2009 (7)

3.3. Data sources

3.3.1. Review of documents

An initial review of the health system, immunization services, and measles-elimination activities based on published qualitative, quantitative and analytical data was undertaken. The review included examination of documents mentioned below.

Health systems-related documents and data

National health plan/strategy/health system

- Bangladesh country cooperation strategy 2008-2013 (8)

- Health Bulletin 2009 (9)
- Bangladesh health briefing paper, produced by the Department of International Development Health System Resource Center (10)
- Developing urban health system in Bangladesh (11)
- National health system profile, Bangladesh (12)
- Health workforce in Bangladesh: who constitutes the healthcare system (13)
- Health worker's dairy, 2009 (14)
- Bangladesh health workforce strategy, 2008 (15)

Immunization and measles-related documents

National immunization policy/strategy/report (including measles-specific)

- Expanded Programme on Immunization (EPI), policy paper (16)
- EPI coverage reports (2006-2009) [source: EPI recorded data]
- National EPI coverage evaluation survey report (7)
- Measles eradication is long way off (17)
- Surveillance reports
- EPI surveillance bulletin 2009 (18)
- Bulletin of the World Health Organization—measles vaccine effectiveness and risk factors for measles in Dhaka, Bangladesh (3)
- National Measles Control Programme 2005-2006 (19)
- National Measles Control Programme, 2010 (20)
- Number of vaccinators participated in measles catch-up campaign [recorded data]
- Measles SIAs performance reports (5)

The documents were accessed through electronic and hand searches and also through contact with stakeholders. The research team conducted a meeting with all major EPI stakeholders in Bangladesh, including officials from MoHFW, DCC, WHO, UNICEF, and NGOs before the implementation of the study to increase its awareness and to seek support during implementation. Meeting participants provided relevant documents included in the study.

Data extracted from review of the documents provided a comprehensive understanding of the health system, immunization, and measles services and also the past and current measles SIA activities.

3.3.2. Key-informant interviews

The study used the following two sampling methods for the selection of key-informants:

Purposive sampling: This involved the selection of participants based on their professional characteristics to include role or experience to shed light on a range of issues relevant to the research questions. Our aim was to interview as diverse a range of individuals as possible.

Snowball sampling: This involved asking interviewees to nominate other people who might have been willing to participate in the study.

Key-informant interviews were conducted at the national, district and service levels. In total, 60 key-informants were interviewed (Table 2). The key-informants included government, WHO, UNICEF, and the NGO sector (Annexure 2). Government interviewees at the national

level included policy-makers and managers based at the MoHFW and Ministry of Local Government, Rural Development & Co-operatives (MoLGRD) involved in the health system and immunization activities. At the sub-national level, interviewees were from operation-level managers, and at the district level, key-informants were involved in management functions and for healthcare-delivery.

Table 2. Number of key-informants interviewed according to organizational affiliation

Organizational affiliation	National level	District 1 (urban)	District 2 (rural)
Government			
Policy-makers	16	-	-
District-level managers	-	4	5
Service-level managers	-	2	8
Service-level staff	-	4	8
NGOs			
District-level managers	-	2	-
Service-level staff	-	4	-
International organization			
Policy level	5	-	-
District-level managers	-	-	2
Total	21	16	23

A guideline was used for interviews. Each respondent was interviewed using one or more modules within the interview guideline depending on his/her area of expertise. The interviews were recorded in both writing and on audiotape with the permission of the interviewees. Transcripts of each interview were written in Bangla and translated into English. Transcription was done on the same day of interview.

3.3.3. Staff-profiling survey

A staff-profiling survey was conducted in the selected two districts. A standard questionnaire prepared by the LSHTM team was given to 60 healthcare workers. The respondents had direct experience working on measles-related activities. The respondents included Health Assistants (HAs), Family Welfare Assistants (FWAs), and vaccinators and were randomly selected from the two districts. Copies of the questionnaire of the staff-profiling survey were distributed at the beginning of the researchers' visit to the districts and collected at their departure. The questionnaire was self-administered and written in the plain language. Each questionnaire contained questions designed to capture basic characteristics and roles of the staff, their training experience, their workload, and their income with focus on the changes or differences that may have occurred in relation to measles SIAs. Additional questions on management support and job satisfaction were also included. The average completion time for the questionnaire was approximately 15 minutes.

Analysis of data

Analysis of generated data combined both qualitative and quantitative approaches, which are described below.

Analysis of secondary data (documents): Evidence from the review of policy documents provided general information necessary to describe the general context and the functioning of immunization services and the health system. Documents contributed particularly to the analysis of historical interactions. The analysis of documents broadly followed the classification of themes outlined in the framework and research questions. A complete list of documents retrieved appears is given as Annexure 3.

Analysis of qualitative data: Analysis of qualitative data began following the initial collection of field data and led to refinements as the study progressed. The interviewers wrote transcripts on the same day of interviews. Transcripts were reviewed daily with the field team. The field team met the investigators every day to discuss the results of their activity sessions/interviews and to determine the best practices for further activity sessions/interviews.

The processes followed a sequence of inter-related steps that included reading, coding, displaying, reducing, and interpreting. At first, transcripts were carefully read, main findings were listed, and then coding of the main findings was carried out. Reading and coding were initiated while data were being collected. The data-display and reduction process was conducted once all data had been collected. Even during data display and reduction, the investigators looped back through earlier steps to refine codes, re-read texts, and revise some aspects of analysis. After reading, re-reading, and coding text, the main themes were begun to formalize. However, the complex issues were presented in some verbatim forms. Each theme was then examined separately and fully within the available data.

Analysis of quantitative data: Quantitative data collected through the staff-profiling survey were entered into the SPSS software (version 11.5). The data were ranged, and consistency was checked by the investigators. Univariate analysis was done to explore each of the selected variables in a dataset separately; assess the range of values; and describe the pattern of responses to the questions.

4. Results

Overview of the health system

Stewardship and governance

The MoHFW is one of the largest government ministries in Bangladesh. At the national level, the MoHFW is responsible for policy, planning, and decision-making at the macro level [12].

Under the MoHFW, there are four Directorate Generals or Directorates, such as Directorate General of Health Services (DGHS), Directorate General of Family Planning (DGFP), Directorate General of National Institute of Population Research and Training (NIPORT), Directorate General of Drug Administration, and Directorate of Nursing Services (8).

Directorate General of Health Services

The DGHS is entrusted with the nationwide implementation of policy decisions of the MoHFW regarding health service-delivery. It provides technical guidance to the MoHFW. The

DGHS administers its responsibilities through different Directors, Project Directors, institution heads, district and upazila health managers, and union health staff (12).

Healthcare-delivery systems of Bangladesh

Distribution of public healthcare services and facilities follows the uniform pattern of administrative tiers ranging from national (mostly capital-based in Dhaka), regional (in divisions), district, upazila, to union, and ward. The country has 6 divisions, 64 districts, 482 upazilas, and 4,498 unions. Further, the MoHFW deploys the health workforce according to the old ward system, which divides each union into three wards. Therefore, the number of wards under the MoHFW is 13,494. Primary healthcare (PHC) in urban areas is provided by the MoLGRD and in the rural areas by the MoHFW. Provision of secondary and tertiary care in both urban and rural areas is the sole responsibility of the MoHFW. The MoHFW delivers its services through two separate executing authorities: the DGHS and the DGFP (9,21,22).

PHC services of the DGHS and DGFP begin at the ward level through community health staff, at least one per ward. To supervise these field staff, at the union level, there is one Assistant Health Inspector (AHI) for the DGHS and one Family Planning Inspector (FPI) for the DGFP. Community facilities provide outpatient services at the union level (1,466 for DGHS and 3,500 for DGFP). Additionally, the DGFP also operates 97 maternal and child welfare centres (MCWCs) and 471 maternal, child health and family-planning (MCH-FP) clinics. An unspecified number of clinics at the upazila, district and national levels are organized by NGOs. The DGHS mainly provides public-sector hospital care in Bangladesh (9).

Divisional level health organization

At the divisional level, one Director (Health) from the DGHS is the administrative head of the division and supervises its health service activities, and the Civil Surgeons (CSs) are accountable to him/her.

District-level health organization

At the district level, the Civil Surgeon is the head of health services management. S/he has own administrative office supported by various categories of staff. There is either a general hospital or a sadar hospital in each district headquarter. Generally, the Civil Surgeon is in charge of Superintendent of the district hospitals. Recently, in some 100-bedded district hospitals, a separate Superintendent (in the rank of AD/CS) has been deployed. District hospitals render outpatient, inpatient, emergency, laboratory, and imaging services to the people. It is the secondary-level referral facility of health services in Bangladesh. Currently, the country has 59 sadar/district hospitals and 2 general hospitals, each having 100-250 beds (9).

Upazila-level health organization

The Upazila Health Complex (UHC) is another fixed service-delivery point designed to provide first-level referral services to the people. The UHC is meant for curative, preventive, promotive and rehabilitative health services using the hospital facility and by field-level workers. In each UHC, there are posts for nine doctors, including one Upazila Health and Family Planning Officer (UHFPO). UHFPO, the Chief Health Officer of the upazila, is also the head of the UHC. Other doctors in the UHC include junior consultants-4, residential medical officer-1, assistant surgeon-2, and dental surgeon-1. There are 418 UHCs in the country, of which 153 have been upgraded to 50-bedded hospitals, with an increased provision of manpower, and the remaining one has 31 beds. The UHCs provide outpatient, inpatient,

and emergency services, limited diagnostic and imaging services, emergency obstetric care, maternal healthcare, and dental care (9).

Union-level health organization

There are four types of static health facilities at the union level. These are Rural Health Centres (RHCs—each one is a 10-bed hospital), Union Subcentres, Union Health and Family Welfare Centres (UHFWCs), and Community Clinics (CCs). Service providers at the union-level facilities include Medical Officers/Assistant Surgeons, Medical Assistant (MA), Pharmacist, and MLSS from the health side. From the family-planning side, facility-level service providers include Sub-Assistant Community Medical Officer (SACMO), Family Welfare Visitors (FWVs), pharmacists, and *Aya*/MLSS.

The main health workforce at the union level is the domiciliary staff called Health Assistants (HAs). They are placed in each old ward, which is the lowest and smallest administrative unit of the health sector. They make home-visits to provide PHC services and collect routine health data. The HAs routinely organize outreach centres for immunization services. For family-planning services, there is another category of workforce at the union level called Family Welfare Assistant (FWA). For every 5,000 people, one FWA is assigned to provide domiciliary family-planning services (22).

The situation in urban areas of Bangladesh is different. The MoLGRD is responsible for urban health matters, which are executed by the city corporation/municipality authorities. The Chief Health Officer (CHO) is the head of the health department of each city corporation/municipality. Each city corporation is divided into several zones, and one Assistant Health Officer (AHO) is assigned to lead the activities of the health department of each zone. City corporation/municipal authorities are supported by various government and non-government organizations and private-sector agencies that also provide services in urban areas. Necessary vaccines, logistics, and training on immunization and disease surveillance are provided from EPI authorities to city corporations and municipalities for conducting immunization services in urban areas. The government sector, including municipal health department, and NGOs concentrate on preventive and promotive healthcare while the private sector concentrates mainly on curative healthcare (11,23).

Any overview of the Bangladesh health system would be incomplete without including the non-state sector, which plays a significant role in the delivery of healthcare services to the people. There are three major groups in the non-state sector: NGOs; private-sector providers—both formal and informal; and traditional medicine. The list of NGOs working in the health sector in Bangladesh is extensive. In the formal sector, there are multiple hospitals and clinics in urban areas and municipalities. There are widespread problems of dual-practice, inadequate licensing, and personnel absenteeism between the public and the private-sector providers.

For-profit modern healthcare is mostly provided in urban areas, particularly in the larger cities. Recently, services have also been extended to some prosperous upazilas. Private diagnostic centres now account for the largest share of this sector but their rationality and quality are frequently questioned (24).

The traditional medicine systems practised in Bangladesh include the Unani and Ayurvedic systems which have a joint governing board, although each has its own network of teaching colleges. The expansive informal sector includes traditional birth attendants, drug vendors, and village doctors. While reliable figures on the numbers of these different types of informal practitioners are lacking, the Bangladesh Health Labour Market Study has estimated that

the total number of private practitioners in Bangladesh is around 0.45 million, or 3.6 per 1,000 people. Of these, traditional and unqualified providers outnumber formally-qualified ones by 12 to 1 (25). Private health expenditure is growing more rapidly than public health expenditure, and for-profit providers have responded by expanding the range of their services and by increasing their volume by approximately 15% per annum (25).

In Bangladesh, there is a very high volume of use of private practitioners for first-line curative care (26).

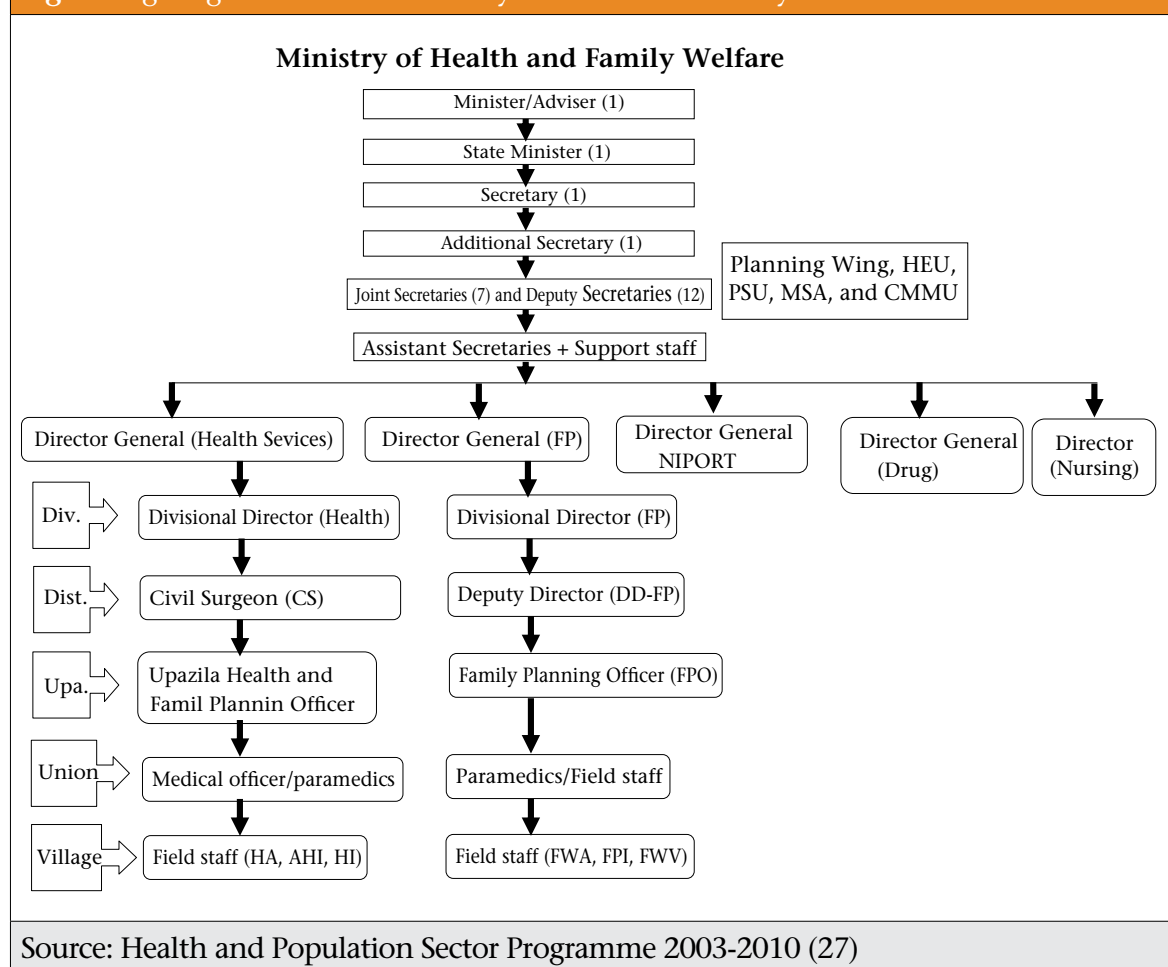
Health, Nutrition and Population Sector Programme

The Constitution of Bangladesh mandates basic healthcare services for all citizens as one of the fundamental responsibilities of the state. Towards this goal, the Government has made efforts to extend health facilities to the entire population. The broader policy document of the GoB that shapes the direction of healthcare is the poverty-reduction strategy paper (PRSP), although the present Government has indicated that it will develop a Five-year Plan. The present government programme is titled as “Health, Nutrition and Population Sector Programme” (HNPS) for the July 2003–June 2011 period (HNPS 2003-2011) (27). The MoHFW designed the Programme Implementation Plan (PIP) in accordance with the PRSP to implement its sector-wide programme, such as HNPS.

The HNPS covers 38 Operational Plans (OPs) for implementation by 38 Line Directors and 14 projects/programmes. The Government has recently decided to continue the present HNPS until 2011. The details of the programmes are well-documented duly endorsed at the highest policy level of the Government—the Executive Committee for National Economic Council (ECNEC) (27).

One of the overarching priorities of the HNPS is the attainment of the Millennium Development Goals (MDGs). The priority objectives of the HNPS are to: (a) reduce maternal mortality rate (MMR), (b) reduce total fertility rate (TFR), (c) reduce malnutrition, (d) reduce infant and under-five mortality, (e) reduce the burden of tuberculosis (TB) and other infectious diseases, and (f) prevent and control non-communicable diseases, including injuries. The Government is committed to the target of reaching the goal of sustainable improvement in health, nutrition, and family-planning status of the people by the end of programme period (9,27).

The MoHFW is headed by a Minister/Advisor, assisted by a State Minister. The Secretary heads the secretariat under the ministry. He is assisted by one Additional Secretary and six Joint Secretaries and two Joint Chiefs. There are 13-15 Deputy Secretaries and Assistant Secretaries. Each Joint Secretary is entrusted to oversee specific areas as noted below. The highlighted ones are most relevant to the policy and planning processes and include: Joint Secretary for WHO and Public Health; Joint Secretary for Hospitals and Gender Issues; Joint Chief of Planning; Joint Chief of the Health Economics Unit; Joint Secretary for Development of Family Welfare; Joint Secretary for Coordination; and Joint Secretary for Administration and Programme Management. Within the MoHFW, there is a Director Planning and Research for each of DGHS and DGFP, along with the respective Director General who plays a key role in the policy-planning process. Further, under the HNPS, a DFID-supported body has been created recently, known as the Program Support Office (PSO), to facilitate policies and programmes. Figure 2 shows the organogramme of the MoHFW.

Fig. 2. Organogramme of the Ministry of Health and Family Welfare


Health financing

The total expenditure on health accounted for 3.2% of gross domestic product (GDP) in Bangladesh in 2006, and the per-capita health expenditure was US\$ 12, of which US\$ 4 per-capita was financed by the Government. Although total expenditure on health as a percentage of GDP has declined since 2000 (3.3% to 3.2%), general government expenditure on health has increased as a percentage of total expenditure on health during the same period (26.5% in 2000 versus 31.8% in 2006) (28).

Nearly 86% of private expenditure on health is out-of-pocket expenditure. Although services should be provided at no-cost at the point-of-service in all government facilities, results of research showed that at least one-quarter of users make extra payment (11). Initiatives to increase the uptake of services, particularly the priority areas in MDGs include a large pilot project of a demand-side financing voucher scheme for safe motherhood and a conditional cash transfer for skilled birth attendance at delivery (3). Urban primary healthcare, apart from for-profit private providers, is provided by the Urban Primary Health Care Project II (UPHCP II) through NGOs in six city corporations and five municipalities. The Smiling Sun Franchising Programme, supported by the USAID having 29 partner NGOs, provides essential service-delivery (ESD) services in 63 districts of Bangladesh, except 3 hilly districts. Non-communicable diseases are not a priority for the UPHCP.

Human resources

As stated, PHC in the public sector is organized around the UHC at the upazila level, with inpatient (31 beds) and basic laboratory facilities at UHFWC. The union level is supported by sub-centres at the lowest administrative level and the network of field-based functionaries (13). The public-sector field-level staff members include HAs in each union who make home-visits every two months for preventive healthcare services and FWAs (females) who supply condoms and oral contraceptive pills during home-visits. Recently, some female HAs and the FWAs have been trained as birth attendants to provide skilled services in home-delivery. The HAs and FWAs are supervised by the Health Inspector (HI) and Family Planning Inspector (FPI) respectively posted at the union level. Each UHC is staffed by nine qualified allopathic practitioners and supporting staff while the UHFWCs are staffed by professionals, such as one Medical Assistant/Sub-Assistant Community Medical Officer (MA/SACMO) and one midwife (Family Welfare Visitor–FWV) both trained in formal institutions. The UHC provides both inpatient and outpatient care, and the UHFWC provides outpatient care only (9,13).

In the private sector, there are traditional healers (*kabiraj*, *totka*, and faith healers, such as *pir/fakirs*), homeopath practitioners, village doctors (rural medical practitioners/*palli chikitsoks*), and community health workers, and also drugstores that sell allopathic medicines on demand. In addition to dispensing medicines, drug-sellers at mostly unlicensed and unregulated retail outlets also diagnose and treat illness despite having no formal professional training. These informal providers are deeply embedded in the local community and culture. They are easily accessible and provide inexpensive services to the villagers, with occasional deferred payment. Payment in kind is accepted by them instead of cash. Unqualified practitioners in the private sector provide 60% of curative services in rural Bangladesh. To this is added an emerging cadre of semi-qualified community health workers/volunteers, trained by NGOs, whose numbers have been increasing since the 1990s, with the expansion of the PHC infrastructure in the country (9,13,24).

Health information systems

Health management information system (MIS) data are collected by the public health facilities at the district level and below. Tertiary and non-state sector providers and facilities are generally in poor compliance with their reporting obligations (30). Information is collected on disease-specific morbidity and mortality based on 37 selected diseases, including non-communicable diseases. Reports are filed monthly. To improve data collection, plans are underway to convert paper-reporting systems into an electronic reporting system, and to that effect plans are underway to equip each upazila (subdistrict health complex) with a wireless modem and to test the equipping of village health workers with personal digital assistants (PDAs) (22).

The MIS department of the DGHS receives information from six postgraduate institute hospitals, six medical college hospitals, and 64 district hospitals (including district and other hospitals, and all public health facilities below them). Statistical staff members work in the hospitals to code mortality events according to the International Statistical Classification of Diseases (ICD-10). Forty major conditions are used for classifying deaths. The information gathered by the MIS department is disseminated nationwide through the annual Health Bulletin. Further, the DGHS and MIS department maintain websites that disseminate certain statistical information.

Statistical data from the non-state sector are not systematically reported to the health MIS. For this reason, the DGHS conducts a Geographic Reconnaissance (GR) each year from Janu-

ary to February at the household level and records information on births, deaths, and other changes in family information (24).

5. Overview of immunization services

5.1. History and governance

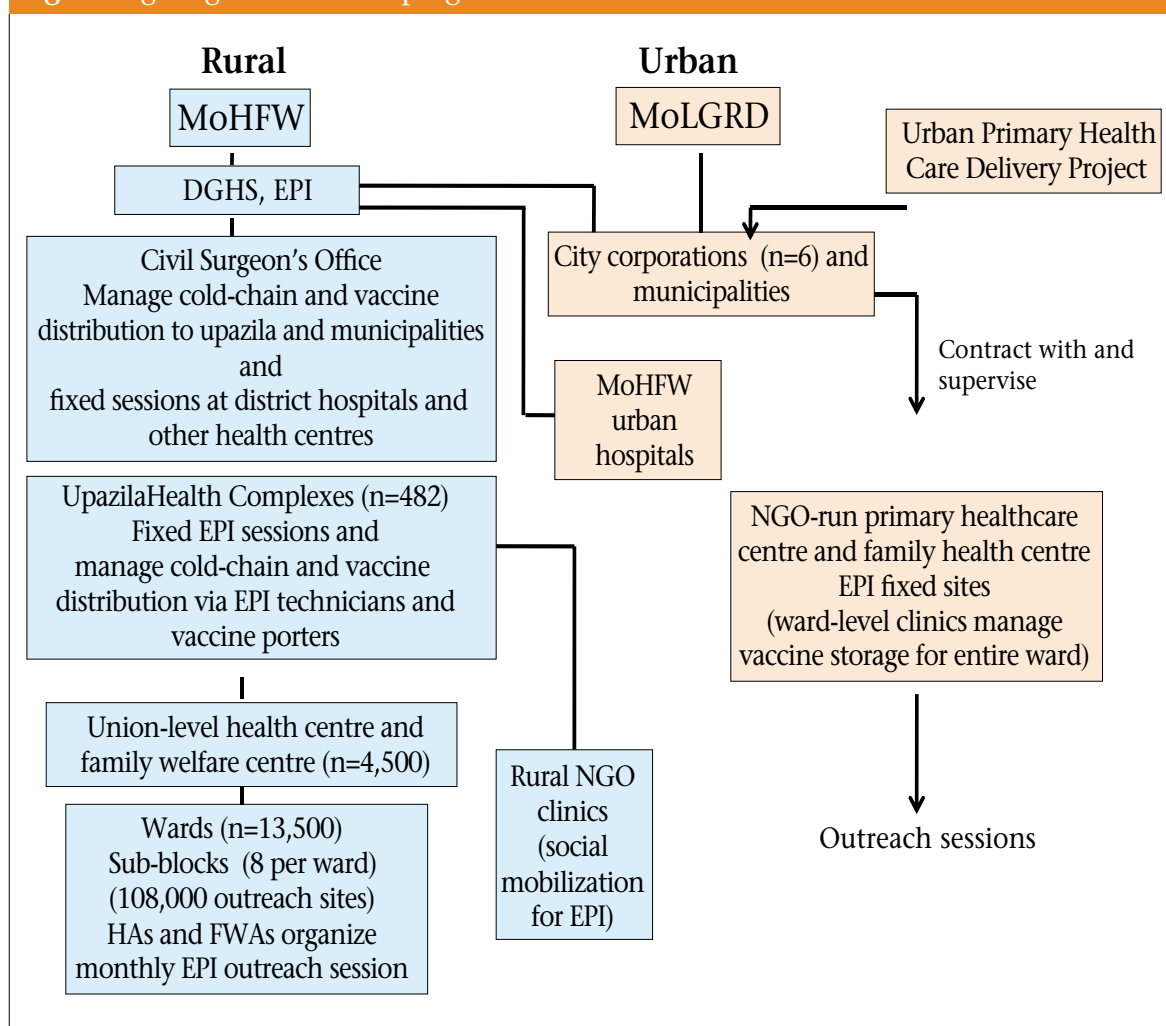
Within the broader context of the Bangladesh National Strategy for Economic Growth, Poverty Reduction, and Social Development (Bangladesh PRSD), the Government's vision for health is articulated through the strategic goal of the MoHFW, which seeks to "create conditions whereby the people will have the opportunity to reach and maintain the highest level of health. It is a mission that recognizes health as a fundamental human right." As a vehicle to deliver the essential development goal, the GoB established the HNPS to increase the availability and use of user-centred effective and efficient equitable, affordable, and accessible quality services for a defined ESD including immunization (31).

Under the HNPS, the EPI is one of several programmes of the ESD administered by the Director, PHC and Line Director, ESD. Under him, the Deputy Director EPI and Surveillance and Programme Manager (PM), Child Health and Limited Curative Care (CH & LCC); Deputy Program Managers, EPI, Surveillance, ARI, Control of Diarrhoeal Diseases (CDD) and School Health assist the PM-CH&LCC in managing EPI activities and other child-health activities. However, cold-chain, logistics, training, surveillance, and communication under the HNPS are the responsibilities of various Line Directors. Each Line Director is responsible for each of the respective sector areas, e.g. logistics, training, management information system, and behavioural change communication. Effective coordination and collaboration is maintained with other Line Directors to ensure an effective immunization programme (16).

The EPI in Bangladesh was launched in 1979. The National vaccination coverage remained <2% till 1985. Committing to the Global Universal Child Immunization Initiative (UCI), the GoB began a phase-wise expansion of the immunization programme in the country during 1985-1990, with the aim at vaccinating all infants against six vaccine-preventable diseases, including measles. During this time, routine immunization services were extended throughout the country to all rural and urban areas based on the PHC service-delivery infrastructure.

Today, the objective of the EPI is to reduce mortality, morbidity, and disability associated with eight diseases, such as tuberculosis, tetanus, diphtheria, measles, pertussis, poliomyelitis, hepatitis B virus infection, and pneumonia and meningitis due to *Haemophilus influenzae* type B (Hib). The current immunization strategy is based on a model of eight outreach sites per ward, with two immunization sessions held each week. The HAs and FWAs who deliver immunizations in rural areas are appointed by the MoHFW at the community level. Porters deliver vaccine from the UHC to the distribution point, and from this point, HA and FWA carry vaccine to the site of vaccination. Besides vaccination, the field workers carry out all types of basic health activities at the local level. However, the FWAs, along with the HAs, conduct social mobilization activities one day before the outreach sessions in the locality, inviting the caretakers of children to attend the outreach site for vaccination and for registration of newborns. Although the HAs and FWAs are responsible for administering vaccinations, in many cases, the FWAs also help deliver EPI services in the outreach sites but the HAs mostly conduct the EPI outreach centres, and the FWAs often help them deliver services (31).

Fig. 3. Organogramme of EPI programme



Immunization services in urban areas are provided through a public-private partnership. Although the CCs and the municipal authorities are responsible for providing EPI services, their implementation is carried out mainly through national NGOs which deliver more than 95% of immunizations in urban areas. The remaining 5% is delivered by the CCs and municipalities, which belong to the MoLGRD. In addition to the CCs, municipalities, and NGOs, the national EPI of the MoHFW supports this system by ensuring vaccines and other logistic supports, e.g. auto-disable (AD) syringes and needles, refrigerators, cold-boxes, vaccine carriers, and funding for vaccine transportation, to the CCs, municipalities, and NGOs. The CCs assist NGOs in planning, monitoring, and evaluation. Like rural areas, within this service-delivery system, vaccines are provided mainly through urban zones, and the site is based on the population-size of the ward; no immunizations are provided at home (23).

With the strong historical commitment and support from both GoB and external resources, such as GAVI, WHO, UNICEF, CDC, IDA, DFID, EU, The Netherlands, SIDA, CIDA, GTZ, UNFPA, Government of Japan, and USAID, the EPI has been one of the largest recipients of funds among development projects in the health sector since 1990/1991. GAVI fund is used under the Inter-Agency Coordination Committee (ICC) which consists of members from different government and NGO stakeholders. Secretary, MoHFW, is the Chairperson of the

Committee. Other members include:

MoHFW: (i) Director General of Health Services, (ii) Director General of Family Planning, (iii) Joint Secretary (PHC and WHO), (iv) Programme Manager, Child Health and Limited Curative Care, and (v) Deputy Secretary

MoLGRD: Joint Secretary, Local Government Division

Ministry of Finance: Joint Secretary, Finance Division

Ministry of Environment: Director, Technical

Rotary International: Secretary, National Polio Plus Committee

Development Partners: WHO, UNICEF, USAID, World Bank, DFID, JICA, Royal Netherlands, and SIDA

NGOs: BRAC, Proshika, and Grameen Bank

Others: ICDDR,B, Save the Children-USA, Immunization Consultant, and GAVI

The functions of the ICC (32) are to: (a) support the MoHFW in strengthening routine EPI, (b) identify effective tools for periodic in-depth assessments of the EPI programme, (c) ensure that the national programme achieves national and international targets, (d) mobilize for efficient and effective use of funds and human resources, (e) share and consider technical and programmatic information and guidelines from international agencies, and (f) assist the GoB for the ownership of EPI.

5.2. Immunization schedule and trends in vaccine-coverage rates

The full course of child vaccinations in Bangladesh consists of three doses of pentavalent vaccine (diphtheria, pertussis, tetanus, hepatitis B, and Hib), four doses of oral polio vaccine (OPV), one dose of Bacillus Calmet-Guerin (BCG) vaccine against tuberculosis, and one dose of measles (Table 3). According to the immunization schedule, BCG should be given at birth but it is often given at the time of the first dose of pentavalent vaccine at six weeks of age. Doses of pentavalent vaccine and OPV are given a minimum of at four weeks apart. Measles vaccination is given at nine months of age (270 days) of age (33).

Table 3. Child (0-11 months) vaccination schedule

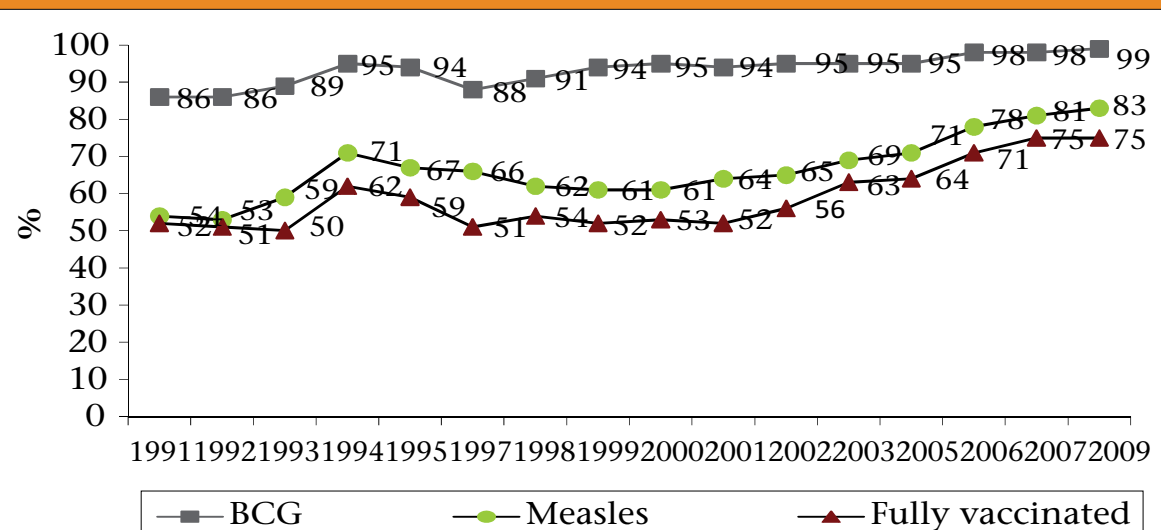
Disease	Name of vaccine	No. of doses	Interval between doses	Starting time of vaccination
Tuberculosis	BCG	1	-	After birth
Diphtheria, pertussis, tetanus, hepatitis B, and Hib	Pentavalent	3	4 weeks	At the age of 6 weeks
Poliomyelitis	OPV	4*	4 weeks	At the age of 6 weeks
Measles	Measles	1**	-	At 9 months (270 days) of age

*Three doses of OPV are given with pentavalent, and the fourth dose of OPV is given with measles; ** Vitamin A (blue capsule and 100,000 IU) is given with measles vaccine

The EPI is considered a success of health services in Bangladesh because of its remarkable progress during the last 25 years. It provides almost universal access to immunization services as measured by the percentage of under-one children receiving BCG, which has increased

from 2% in 1985 to 99% in 2009. Similarly, a substantial improvement of the EPI coverage occurred with other antigens over the time (Fig. 4).

Fig. 4. Trend in national valid vaccination coverage by age 12 months among 12-23-month old children, 1991-2009.



Source: National coverage evaluation surveys 1991-2003, 2005, 2006, 2007, and 2009

5.3. Logistics and supply

The EPI is a logistic dependent programme; thus, effective management of logistics is essential for this programme. However, an added challenge and opportunity is to strengthen the coordination among the ESD, DGHS, and the Central Medical Store Depot (CMSD) to ensure that routine EPI logistics and cold-chain, including vaccines, AD syringes, safety boxes, and other stationeries, injection safety, record-keeping, and reporting forms are made available in adequate quantities at all levels. Vaccines are distributed to each district on a quarterly basis, based on requests for each item from each district and from district to upazila. A computerized logistics management system has been created for inventory and systematic monitoring of the supply and distribution of materials to the field (16).

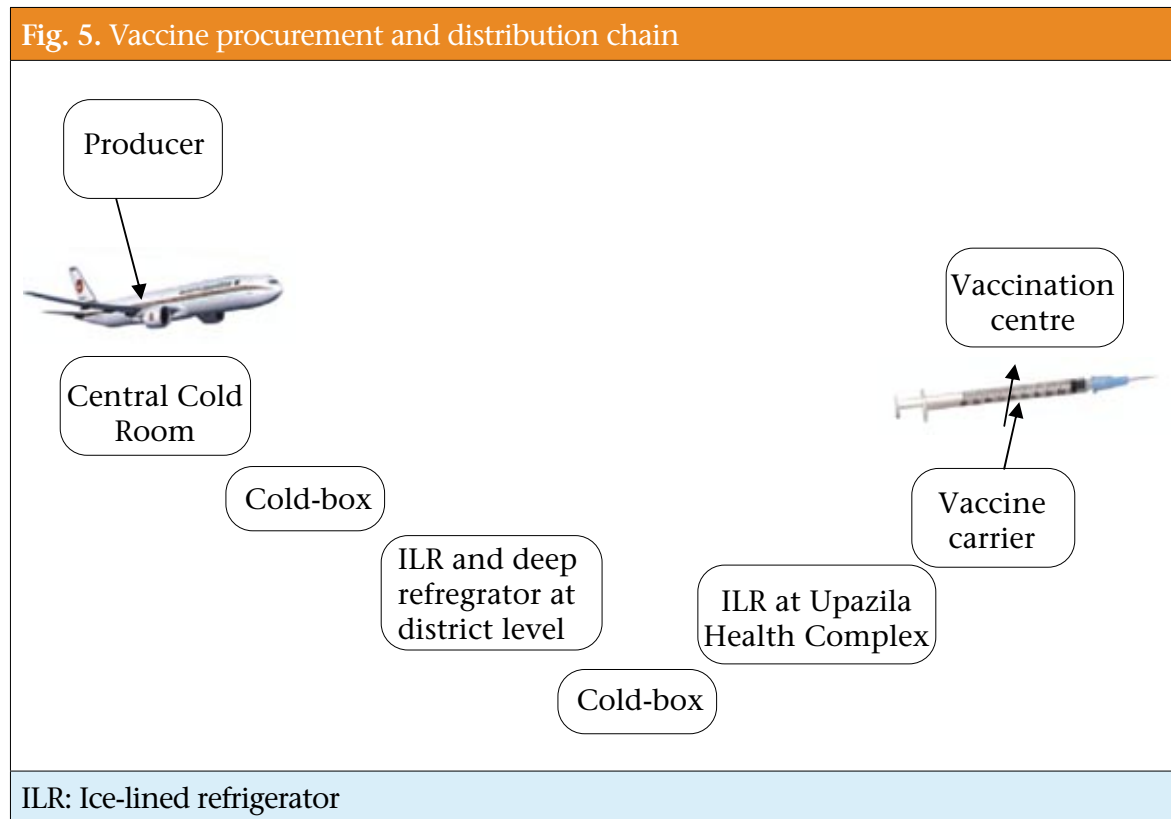
Vaccine procurement and vaccine distribution chain

Vaccines used in the EPI in Bangladesh are procured from abroad. The vaccines are shipped to Dhaka by a refrigerated cargo plane to Shah Jalal International Airport in Dhaka and are kept for sometime in refrigerated cargo space for custom clearance. Insulated cartons maintaining proper temperature are preserved in the central cold store at the EPI headquarters. The vaccines are transported from the EPI headquarters to districts and subsequently to upazilas by road and river using cold-boxes. The vaccines are carried from the upazila to vaccination centres on days when EPI services are scheduled using vaccine carriers. Figure 5 shows the vaccine procurement and distribution chain in Bangladesh.

5.4. Financing of immunization service

The GoB finances the health sector through two channels: the GoB revenue and donor’s development budgets. Increases in the GoB spending on the health sector, however, have not been consistent with increases in government revenues in recent years. The GoB spending

on the health sector only increased by 21.8% between the fiscal year (FY) 1999/2000 and the FY 2003/2004 while, over the same period, GoB revenues increased by 80.3%. The HNPSP's Strategic Investment Plan seeks to ensure that the Government's total financial contributions to the health sector is increased by at least 6% per year. The total donor contribution for the same period is estimated at US\$ 1.22 billion and will represent about one-third of the total expenditure by the MoHFW (31).



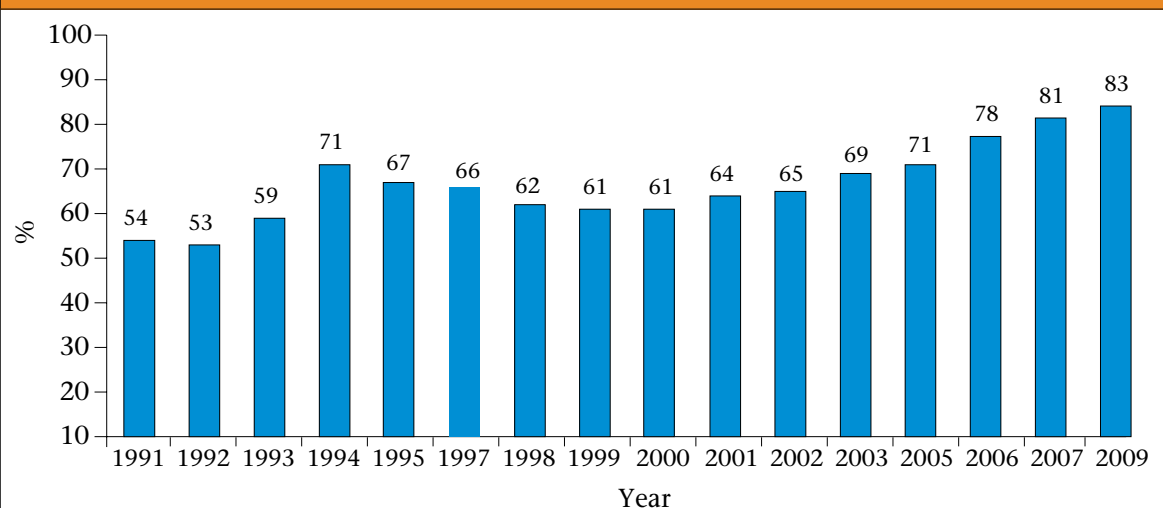
Resources for the national immunization programme form part of the ESD operational plan. ESD receives funding from both revenue and development budgets. Funding for most salaries is allocated from the revenue budget while funding for vaccines is usually allocated from pooled funding in the development budget. Some donors and multilateral organizations provide financing directly to the immunization programme on an ad-hoc basis; this funding is not channelled through the government budgets (31).

6. Measles-elimination activities

6.1. Routine measles vaccination

The national immunization programme is integrated with PHC services under the HNPSP. According to the national immunization schedule, one dose of measles vaccine is provided to children at nine months of age through the routine programme. A second dose of measles vaccine has not yet been introduced into the routine EPI. The measles-vaccination coverage steadily increased in the past decade and reached 83% in 2009. Figure 6 shows the trend in the measles-vaccination coverage during 1991-2009.

Fig. 6. Status of measles coverage by age of 12 months among 12-23-month-old children during 1991-2009



Source: National EPI coverage evaluation survey report, 2009

6.2. History of measles SIAs

Bangladesh endorsed the goal of reducing mortality due to measles set at the United Nations Special Session on Children in May 2002 and the World Health Assembly in 2003. Bangladesh also reaffirmed its commitment through endorsing the recommendations of WHO/SEA Regional Technical Consultative Group meeting in 2003 and Cape Town Declaration on Measles in October 2003. In accordance with the joint WHO-UNICEF measles mortality reduction strategic plan, Bangladesh developed a national Measles Control Plan of Action 2004-2010 (31). Its main goal was to reduce measles-associated mortality by 90% by 2010 compared to the 2000 estimates. The full set of objectives includes:

- To achieve >90% coverage with the first dose of measles-containing vaccine (MCV1) nationally and $\geq 80\%$ MCV1 coverage in every district by 2010.
- To achieve $\geq 90\%$ completeness and $\geq 80\%$ timeliness of weekly reporting of measles cases and deaths, together with AFP, NT, and other priority VPD, from facilities including 'zero' reporting by 2010.
- To conduct case-based measles surveillance within an integrated VPD surveillance.
- To ensure adequate case management of all measles outbreaks by 2010.
- To provide a second opportunity for measles immunization to all children aged 9 months to 9 years, while ensuring $\geq 90\%$ coverage nationally by 2010.

To achieve the goal, the national EPI strengthened measles vaccination through the routine immunization programme. At the same time, the MoHFW organized measles catch-up SIAs for all children aged 9 months to <10 years in 2005 and 2006 in a phase-wise manner. Phase 1 of the measles SIAs took place in September 2005 where an estimated 1.37 million children were vaccinated against measles in Bogra and Rajshai districts and in Rajshahi City Corporation. In the second phase, the MoHFW implemented measles SIAs with support from the Measles Initiative, a partnership comprising American Red Cross, UN Foundation, WHO, UNICEF, and CDC. The measles SIAs were the largest public-health activity undertakings in the history of Bangladesh; approximately 33.5 million children were targeted to be vaccinated by 50,000 qualified vaccinators and 750,000 mobilized volunteers, through more

than 100,000 schools and 150,000 EPI centres. The achievement of measles catch-up SIA coverage was 93% (31).

It was planned that the MoHFW would organize follow-up measles SIAs in 2009, targeting all children aged 9-59 months. It was also planned that a second dose of measles vaccine would be introduced into the routine immunization programme from 2010 after the measles follow-up SIAs. However, the follow-up SIAs were organized in 2010. Table 4 summarizes the information of SIAs.

Table 4. Information about catch-up and follow up measles SIAs							
National measles SIAs	Target group	Target population	Achievement	Vaccination sites	No. of Vaccination sites	Involvement of health staff from GoB and NGO	Involvement of volunteers
Measles catch-up campaign 2005-2006	9 months- <10 years old children	35 million	103% (reported)	Primary school, outreach and fixed EPI centres	230,000	50,000	750,000
Measles follow-up campaign 2010	9 months- <5 years old children	20 million	Yet to be published	Community outreach centres and fixed centres	120,000	60,000	600,000

Bangladesh has achieved a high routine measles immunization coverage since the catch-up SIAs conducted in 2005-2006. The routine coverage ranged from 80% to 89% by district. However, 15% of the vaccinated children did not develop immunity since the efficacy of measles vaccine when given at 9 month was 85%. Accordingly, 25-30% of the children in each birth-cohort may remain susceptible to measles. The experience of other countries revealed that once the accumulated number of susceptible children reached the size of birth-cohort, outbreaks of measles may begin to occur. To prevent this situation, the MoHFW conducted follow-up measles SIAs in February 2010 for those children who were born after the measles catch-up SIAs in 2005-2006 or not yet aged 9 months at that time, to provide a second dose of measles vaccine. The national EPI targeted 20 million children aged 9-59 months in the follow-up SIAs (31). Vaccination of follow-up SIAs was done in the outreach EPI centres. The HAs and FWAs completed registration of all target children before the measles SIA schedule. This follow-up SIA was conducted with the National Immunization Day (NID) where OPV was also administered to children aged 0-<5 years. It was a combined campaign. The aim was to promote greater health equity, increase efficiency, reduce cost, and achieve MDG 4. In addition to measles and polio vaccinations, vitamin A and albendazole tablets were also provided to children during the follow-up SIA.

The Scientific and Technical Sub-committee of the National Committee for Immunization Practices (NCIP) decided to incorporate the second dose of measles vaccine through the routine EPI for children aged 15-18 months from 2011. The GoB developed cMYP for 2011-2016 in which the goal was to achieve the coverage of measles vaccination up to 95% and reach the measles-elimination status by 2016.

7. Integration of immunization services and measles-elimination activities into general health system functions

7.1. Governance

The integration of immunization services into the health systems in Bangladesh, as it is called functional integration, is done at the top and bottom levels of administration. The EPI is functionally operating within the DGHS of the MoHFW. Under the Sector Wide Approach (HNPS), the EPI is integrated from top to bottom level with other programmes of the ESD/PHC administrated by the Director, PHC. Under him, the Deputy Director EPI & Surveillance and Programme Manager (PM), Child Health and Limited Curative Care manage the child-health programmes, along with the EPI, with the help of Deputy Programme Managers, EPI, Surveillance, ARI, CDD, and Programme Manager IMCI. There is effective coordination and collaboration of Director, PHC with other Directors to ensure an effective immunization programme within the health system of Bangladesh. A monthly coordination meeting, chaired by the DGHS with all Directors and Programme Managers of the Directorate, reviews the performance, identifies problems, and allocates resources for all programmes, including EPI. More specifically, EPI, ARI, School Health, CDD, and IMCI are the programmes under the Child Health (CH) Programme of ESD run by the Programme Manager and is overseen by the Director, PHC, DGHS. IMCI is comparatively a newly-adopted programme, which is gradually expanding to cover the whole country. IMCI training curriculum also covers immunization and supports the EPI in different intra-sectoral activities.

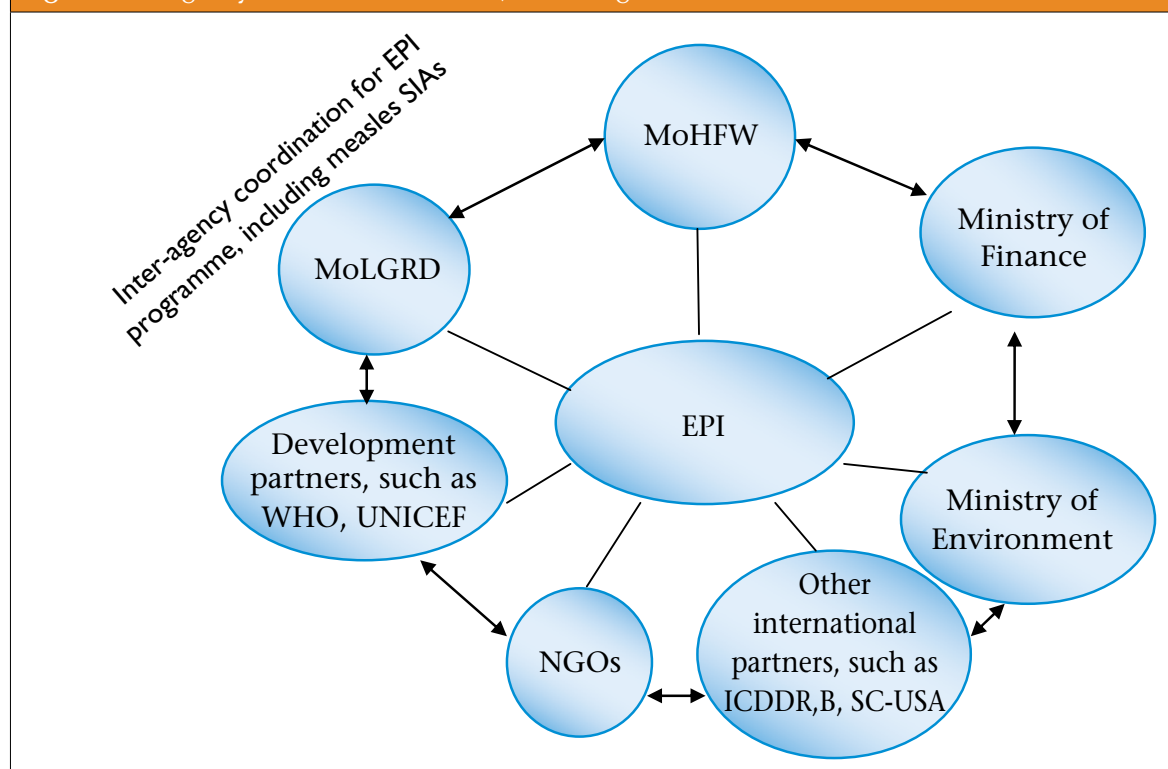
Planning and implementation of measles SIAs are supervised by the NCIP. The NCIP is headed by the Secretary of MoHFW, with a Technical and Scientific Subcommittee of NCIP headed by the Director General, DGHS. However, the ICC is also very active and plays important roles in maintaining active collaboration for the immunization programme and measles SIAs. In divisions (regions), facilitation of central level decisions and review of district-wise performance are done by the Division Director's office. Coordination meeting, organized by the child-health programme at offices of the six Divisional Directors, with all Civil Surgeons (district managers), UHFPOs (upazila managers), and other stakeholders of health, such as representative from WHO, UNICEF, and NGOs, quarterly reviews the performance of each programme of health, including EPI.

At the district level, the governance, planning, and implementation of EPI activities are fully integrated with other programmes under the responsibilities of the Civil Surgeon (CS). The CS coordinates planning, implementation, and evaluation of all health programmes, including EPI. A monthly coordination meeting with representatives from all upazilas is organized. An EPI unit, consisting of district EPI Supervisor and Cold Chain Technician, assists the CS in EPI activities. The EPI unit provides technical support to all the upazilas of a district in terms of supervision, technical guidelines, and assistance to planning and implementation of routine immunization and measles SIAs.

In Bangladesh, The upazila is the implementation level of EPI and measles SIAs, including all other health activities, under the leadership of UHFPO. This is the level where there is a potential managerial capacity close to service-delivery. Immunization services are provided through the rural outreach sites and delivered by the HAs and FWAs; they are appointed by the MoHFW at the community level. The HAs and FWAs are responsible for not only immunization services but also for other components of PHC services. Immunization services in urban areas are provided through a public-private partnership. Although the CCs and the

municipalities under the MoLGRD are responsible for providing EPI services, implementation is carried out mainly through contracted out national NGOs. In addition to CCs, municipalities, and NGOs, the EPI supports this system by ensuring technical support, training, vaccines, and other logistics support to the CCs, municipalities, and NGOs. The CCs assist NGOs in planning, monitoring, and evaluation.

Fig. 7. Inter-agency coordination for EPI, including SIAs



Measles campaigns and other strategies for the elimination of the disease from the country are already a part of the health system of Bangladesh. In 2004, the EPI developed a comprehensive plan for reducing mortality due to measles for Bangladesh. Based on the plan, surveillance has been expanded for measles, including comprehensive investigations of outbreaks and case management. Routine measles immunization activities were more emphasized, resulting in an increased coverage, and a measles catch-up campaign and follow-up campaigns were implemented in 2005/2006 and 2010 respectively.

7.2. Financing

With the strong historical commitment and support from the GoB and external donors, such as WHO, UNICEF, GAVI, CDC, IDA, DFID, EU, The Netherlands, SIDA, CIDA, GTZ, UNFPA, Japan government, and USAID, the EPI has been one of the largest recipients of funds among the development projects in the health sector since 1990/1991.

The GoB share of the total EPI spending has increased from less than 2% in the mid-1980s to 45% in 1994/1995 and has averaged 35% over the last years (34). The EPI receives separate budgets at national levels that are, in turn, allocated to districts and onwards to upazila levels. Funds reach the operational levels from the national levels as separate line items for the EPI.

Apparently, the EPI gets more funds than other programmes, and the programme has greater

financially flexibly than other programmes of the MoHFW. Considering the financial sustainability of the EPI, the GoB has planned to spend more money from their own funds, aiming at gradual decrease of funds from other sources.

Separate budgets for organizing measles SIAs are used in Bangladesh, and the funds mostly come from development partners. The SIAs attract a larger number of external funders while routine EPI activities are funded mainly by the Government and GAVI. The main donors involved in funding for measles SIAs are: GAVI which finances for vaccines and some operational costs; UNICEF assists vaccine procurement with GoB money and social mobilization activities; and WHO offers technical assistance, planning, and surveillance activities.

7.3. Planning and management

The EPI follows its comprehensive multi-year plan (cMYP) for 2008-2010 prepared with inputs from all the stakeholders concerned with immunization. The plan encompasses the routine, surveillance, and measles SIA activities relating to immunization. Accordingly, it has been incorporated in the annual operational plan of the ESD programme of the DGHS which was, after approval from the highest authority, taken for implementation. The planning process is a mix of bottom-up and top-down approaches. Each year, through micro-planning meetings and training for the district, upazila, CCs, and municipalities, the EPI provides themes and guidelines for micro-planning at the local level. The implementing levels then develop their own activities and strategies for implementing those activities along with the required fund to achieve their objectives. These micro-plans are then reviewed, revised, and approved by the Director Primary Health Care and Line Director ESD at the national level and are then sent back to the implementation level for use. Accordingly, the plan is also revised and approved at the national level.

After its inception in 1979, the EPI gradually gathered momentum and is now considered one of the most accomplished programmes among other programmes/activities of the DGHS. It is one of several programmes of the ESD package of the DGHS and is managed by programme Manager Child Health and Limited Curative Care along with Programme Manager of IMCI where acute respiratory infections (ARIs), control of diarrhoeal diseases (CDDs), and neonatal health included. In 1999, the responsibility for delivering PHC in urban areas was taken over by the MoLGRD, although the EPI is under the MoHFW. Except for service providers, the EPI continued to provide all other supports for implementing the programme in urban areas. The EPI initially started as a vertical programme but was gradually integrated within the health system of the DGHS, separate vaccine procurement, transport, and storage systems and also programme-specific supervision, monitoring, and surveillance systems. This has enabled strong management and adequate infrastructure for which the EPI did not have to compete for priority and resources with other health programmes.

7.4. Human resources, including involvement of volunteers

The EPI, now integrated (see page 49), thrives on the performance of GoB-paid multipurpose field workers—HAs and FWAs and their supervisors in rural areas, NGO staff, and CC/municipality supervisors in urban areas. A large group of community volunteers are also there for social mobilization. Involvement of the volunteers is tremendous during the measles SIAs. During the SIAs, in addition to the existing health workforce, trained volunteers are deployed to manage all the fixed, outreach and additional sites throughout the country.

7.5. Procurement and logistics

The procurement plan for the EPI (routine and campaign) is part of its multi-year and annual operational plans. Procurement and logistics of measles vaccines are integrated into the EPI, which means that same staff and resources of the EPI are being used for measles vaccines in both routine and campaigns. They are not, however, integrated with logistics and procurement of the health systems, i.e. they are not linked to procurement of other medical supplies (see page 49). The EPI is responsible for the procurement and distribution of logistics to all the service-delivery centres. For vaccines and cold-chain-related logistics, the EPI provides funds to UNICEF to procure and import goods and procure other logistics the EPI does. Goods are then stored centrally at the EPI headquarters and distributed according to needs to the districts and CCs through its own and hired transportation systems.

7.6. Information system

The EPI has a well-established record-reporting system from the periphery up to the central level for its own programme. All the activities are recorded in the field in the supplied reporting formats which are, after compilation at different levels of rural and urban settings, transmitted to the national level. These reports are shared at the national level with the overall management information system of the DGHS. For measles SIAs, different reporting formats were developed, and through the same mechanism, it comes to the central level.

7.7. Surveillance

Disease-surveillance activities in Bangladesh need to be more integrated. Currently, different divisions of the DGHS are conducting surveillance activities on different issues, e.g. data on all vaccine-preventable disease are collected by the EPI whereas information on diseases under the priority communicable disease surveillance activities, including diarrhoeal diseases, hepatitis, malaria, leishmaniasis, tuberculosis, leprosy, encephalitis, and emerging diseases (e.g. dengue, Nipah, severe acute respiratory syndrome, and influenza) are collected by the Institute of Epidemiology, Disease Control and Research (IEDCR), an institute of the DGHS. With the goal of improving the national capacity to conduct outbreak surveillance, the GoB, together with WHO, aimed at developing an effective public-health laboratory system that will be able to investigate and manage outbreaks. Under this programme, the EPI, with financial support from the WHO, established a national reference laboratory at the Institute of Public Health (IPH) for polio and measles. The IEDCR established a national laboratory and some sentinel laboratories around the country.

Locally, the village-levels HAs visit households surrounding each outreach site monthly to provide EPI services along with PHC services and to collect routine health data, and these are compiled at the union level. Each UHFPO and CS at the districts are responsible for managing this surveillance system. This system is maintained at the concerned UHC. Besides, the hospital-based disease profile is added which is reported in the UHC's monthly disease profile to districts and from there to the national level. These reports are submitted to the district level at monthly intervals. The districts then send the reports to the MIS section and other concerned sections of the DGHS on a monthly basis. The EPI receives the report on vaccine-preventable disease profiles, including measles and neonatal tetanus. Besides, the EPI also conducts AFP and AEFI surveillance. For the AFP and measles, specimens are collected and transported to the national reference laboratory at the IPH using special messengers. After laboratory testing, the IPH provides necessary feedback to the EPI and the specimen-sending institute.

In the surveillance system from 767 sites they report about VPDs where 140 facilities included weekly active surveillance for AFP, NT, and measles. At the same time, they report about six EPI diseases on weekly basis. All the UHCs are included in a weekly passive reporting, and 156 additional facilities conduct weekly passive reporting. Since 15 July 2008, the GoB introduced case-based surveillance from all the surveillance sites. In the case-based surveillance system, 5 mL of blood is collected after the development of rash to detect IgM for measles at the national polio and measles control laboratory. Also, there is a provision of urine collection and nasopharyngeal swabs for molecular study of the measles virus.

8. Impact of measles-elimination activities on immunization services and the general health system

8.1. Impacts of measles SIAs on the immunization system

8.1.1. Impacts on governance

The national-level key-informants attributed the successful implementation of measles SIAs to the participation of different government sectors. Although the MoHFW leads the SIAs from the central level, the catch-up SIAs were designed to provide vaccine at school setting; so, the Ministry of Education became a key player. Other ministries, such as Ministry of Defense, Ministry of Religion, and Ministry of Social Welfare; other non-governmental and international stakeholders; private-sector partners, such as Grameen Phone; different television channels; and other media played substantial roles to make the SIAs successful. The national-level key-informants mentioned that an inter-ministerial coordination committee was formed at the national level, and the committee worked together starting from the preparatory phase to the implementation phase of measles SIAs. These initiatives helped strengthen inter-ministerial coordination and collaboration that eventually permitted the health sector to strengthen the measles SIAs and immunization in general throughout the country.

Moreover, the SIAs created an opportunity to establish effective collaboration between the MoHFW and the development partners. The following is an example from a key-informant from the national level concerning the positive impact of measles SIAs.

The positive impact of the last measles SIAs were that there were people from policy-level of all the ministries involved in the SIAs. There was intra-ministerial coordination bodies to implement the SIAs. Besides, the active involvement of other sectors, such as NGOs, civil society, village defense party, and the community, made the atmosphere as a great festival of the campaign coordination meetings, awareness-raising meetings, advocacy meetings, micro-planning, training, press briefings, and rigorous advertisements made by media and mobile phone companies, free of charge, resulted in the coverage of the full target of SIAs. Due to such joint activities, the field staff became motivated.

Most national-level key-informants informed that the roles of both NCIP and ICCs were important to the successful completion of SIAs. They said that the NCIP and ICC met before the SIAs and decided to secure funds and use of efficient and effective mobilization of funds and human resources.

Both national- and local-level political leaders became more aware of immunization and were more involved with measles SIAs as the key-informants reported. The national-level informants from the national level stated that, to coordinate and to ensure better performance during SIAs, a high-power national coordination committee was formed under the di-

rect leadership of the Health Minister. In addition, the Prime Minister supervised the overall implementation of measles SIAs, which, in turn, contributed to the successful implementation of the campaign and immunization programmes. The upazila-level informants stated that the Upazila Chairmen (public representatives at sub-district level) were involved in awareness-raising activities of SIAs, along with health and family-planning officials, which increased their knowledge about immunization and had an impact in encouraging the community about the benefits of immunization and motivating field staff of EPI.

The key-informants from all levels reported that the involvement of political leaders in measles SIAs contributed to improving the accountability of the EPI. They said that the EPI staff, particularly the field staff, felt that the political leaders were concerned with the performance of the EPI which encouraged and motivated them during the SIAs. Therefore, the EPI staff became more responsive about their performance which happened after the SIAs.

8.1.2. Impacts on planning and management

The last measles SIAs had an impact on strategy development and planning. The planning for measles SIAs was initiated early, involving the multi-stakeholders during planning activities. The inter-ministerial coordination committee met several times to plan and develop the management strategy for the campaign. During the measles catch-up SIAs, a group of skilled people participated in the preparation of plans for the SIAs. Area demarcation among service providers from different sectors, such as government, NGOs, and others, was done well ahead of time. Most key-informants at both national and sub-national levels mentioned that the health and EPI staff were already involved with local-level planning (LLP) for their routine work. This helped them do micro-planning easily for the campaign, resulting ultimately in the successful management of such large SIAs. One immunization specialist working with an international organization said:

It was possible to do proper micro-planning and managing the measles last SIAs, ... as experienced people from all sectors were involved and got enough time for this, ... were possible to do a good plan for the last SIAs.

Some rural key-informants informed that the SIAs helped them do mapping of target children at the remote hard-to-reach areas. They added that, during the SIAs, they identified the remote areas with special care, made plan for children of those areas, and covered the areas according to the plan. This helped them do mapping and making plan for the children of the remote hard-to-reach areas for the routine immunization programme. The informants further reported that the plans were prepared jointly with other departments, such as family-planning department, NGOs, and other stakeholders, which stimulated them to make such plans for the routine immunization programme.

According to the key-informants, the SIAs contributed to increasing the rate of measles coverage, which would permit Bangladesh to move from the measles mortality-reduction stage to measles-elimination stage by 2016, which eventually would lead policy-makers to take decision to introduce MCV2 in the routine immunization programme for children aged 15-18 months.

8.1.3. Impacts on financing and resource generation

Most national-level key-informants mentioned that there were enough funds for measles SIAs. A key-informant said:

Money is not the main problem for measles-eradication activities. Because the Govern-

ment of Bangladesh has a huge pool of fund. There must be ways to channel-up the funds. Important things are political commitment and proper planning and management. Moreover, contribution of development partners in this regard is notable.

All the key-informants mentioned that there was no budget deficit for the last SIAs; the development partners provided enough money, although funds for SIAs come from the Government's core funds. Moreover, funds were available in Bangladesh at the time of catch-up SIAs because of the international response to the Tsunami of 2005. There was no evidence of opportunity cost due to the implementation of the last measles SIAs. It means that Bangladesh had sufficient funding for campaigns, so that it was not necessary to route funding from the routine EPI or from other areas in the health sector.

In terms of positive impacts, most national-level key-informants said that the measles SIAs helped develop skills of the policy-level people in fund-raising from local and international partners. They added that, in addition to having money from the donor community, support in both cash and kinds was available from Rotary Clubs, different mobile phone companies, and television channels in Bangladesh. They informed that the policy-level people approached all the television channels, newspapers, and mobile measles companies for doing publicity about measles SIAs. This motivated them to invest money and did rigorous advertisements about measles SIAs, which had a great impact in making people aware of measles and other vaccine-preventable diseases, which had great benefit for the routine immunization programme.

The GoB contributed 75% of the total budget from the pool funds for the measles follow-up SIAs while it contributed only 25% for the measles catch-up SIAs in 2006. The key-informants from the WHO and UNICEF mentioned that the Government's contribution to the follow-up SIAs has significant implications for the health-system financing of the country. The informants believed that, due to the positive experience of the catch-up SIAs, the Government was convinced to cover a large proportion of the cost of follow-up SIAs. In turn, this might have created more opportunities for Bangladesh to receive funds for other diseases.

The informants added that there was no evidence of negative impacts on the immunization programme or on the health systems for spending money for the implementation of measles SIAs as there was enough money for the SIAs.

In terms of channelling funds for the SIAs from the headquarters to the operation levels, there were some problems as noted by the key-informants. Several key-informants stated that, despite the availability of adequate funds for the implementation of measles SIAs, some districts did not receive funds in time. Two UHFPOs mentioned that they received funds after the completion of SIAs, and it was very difficult for them to manage activities. According to them, they had to manage funds from their personal sources, which were reimbursed later. A national-level key-informant shared his experience in a coordination committee meeting with the Civil Surgeons:

A Civil Surgeon said, I asked UHFPOs of my district to manage money for organizing SIAs from their own sources as there was delay in receiving funds from the headquarters. In response, one UHFPO said that how could we manage? We don't have any zamindary (landlord/wealthy benefactor).

According to the respondents, late arrival of funds at upazilas also created problems for the field staff. They paid travel costs from their own pockets, although they are low-wage earners.

This problem was worse in the hard-to-reach areas, such as hilly and *haor* (low-lying/marsh/flood-prone) areas, where local conveyance cost is higher than other parts of the country. Most service-level staff in Sunamgonj (a *haor* area) reported that they did not receive the allocated hard-to-reach allowance before the campaign. Some service-level key-informants in Sunamgonj district mentioned that they did not receive the full amount of their conveyance bills. They repeatedly complained against their supervisors during interview and suggested that the supervisors might have done something else with the money.

8.1.4. Impacts on human resources

All the key-informants stated that, during measles catch-up SIAs, the availability of skilled manpower with technical expertise to provide vaccine is essential. It was a great challenge to arrange a huge number of vaccinators. The MoHFW did not have a sufficient number of qualified personnel. Moreover, a large number of “vaccinator” positions remained vacant. Successful completion of the last SIAs was possible only by involving skilled personnel from NGOs, hospitals, and medical colleges, in addition to the MoHFW staff members.

Most key-informants stated that the SIAs had a great impact on the existing health workforce in both positive and negative ways. The positive impacts included that the SIAs helped the staff members increase their ability to work under pressure and to manage workloads. Training provided to staff members during SIAs also helped improve their skills. Many key-informants reported that the training and travel allowances, food, and stationery provided to the staff members made them motivated. The staff members informed that they received training not only on implementation of SIAs but also on other areas, such as safe vaccination and management of side-effects and wastes during SIAs, which also helped them use skills in routine immunization programme. The informants informed that the training manuals and guidelines prepared during SIAs were integrated with the immunization programme, and some areas of the guidelines have also been used in the routine programme. Additionally, the SIAs contributed to the development of inter-personal communication among the staff members involved from different sectors. Some key-informants mentioned that, during SIAs, they hired technical staff from other sources, i.e. from hospitals, medical colleges, NGOs, and the private sector, who had technical knowledge but did not have knowledge on EPI or measles. The SIAs created an opportunity for workers in other areas to learn more about the EPI, which ultimately benefitted the entire health sector.

Most service-level key-informants stated that the field staff became encouraged and motivated after the completion of SIAs. Rigorous publicity was done mainly by health workers in their community about benefits of measles vaccination, which influenced the mothers to vaccinate their children during the SIAs. As a result, the incidence rate of measles and other measles-related diseases decreased. This enhanced the value of staff members in their community, and mothers listened to the advice of staff members about other immunizations of their children.

The district and upazila-level respondents reported that the SIAs increased stock of EPI workforce for future SIAs and routine immunization programme. They said that staff members from other departments, hospitals, and NGOs and volunteers were involved with SIAs and got training. These staff members become a strength for the EPI programme who can support both technical and mobilization activities for the routine immunization programme and future SIAs.

There were also some negative effects in terms of human resources. The informants stated that the SIAs increased the workload of the staff. It was difficult to cover the very large target

population in each area due to a general shortage of staff. According to the informants, one staff member had to vaccinate 25-30 children every day. Moreover, the field staff had to conduct interpersonal communication, which was an additional task for them. Some informants noted that the staff did not get any incentive for measles SIAs. For getting support for the implementation of SIAs, non-paid volunteers from the community were recruited and trained. The staff members reported that they did not always get enough support from the volunteers because they did not get adequate remuneration (less than US\$ 0.50 per person per day for refreshment). In many areas, particularly in the remote village, the SIAs did not attract a sufficient number of volunteers. A service-level staff in Jamalgonj said:

As in other areas, I recruited five volunteers, provided them training ... but on the day of SIAs, I found only two and that was just because of money as there was no provision of honorarium for the volunteers.

In Sunamgonj, some service-level key-informants said that there was a shortage of technical staff in the hard-to-reach areas, and the NGO workers were not interested to work in those areas. Therefore, the MoHFW staff alone had to do work in those areas. In addition, there was a provision of organizing two vaccination sites by one HA in the hard-to-reach area due to the shortage of staff, which was an overburden for the HA. In this situation, one HA from Derai upazila of Sumamgonj district noted:

I worked half a day in one site and half a day in another site during the campaign—when I worked in such a way, how can I ensure quality services? But we did not compromise with our work! We did extra work for providing better services.

The district and service-level informants informed that, due to some management issues, the staff members, particularly the field staff, were de-motivated towards their work. They stated that there was late arrival of funds in some areas, and the staff members did not find their conveyance bills and money for other related expenses in time which de-motivated the staff members.

8.1.5. Impacts on logistics and procurements

Most national-level key-informants stressed that, for Bangladesh, conducting such a large campaign was a great challenge to everyone who was directly involved with the management of logistics and maintaining cold-chain. With good management at all levels, including effective coordination among different ministries and other departments, it was possible to manage the tasks without any problem. There was a rational distribution of tasks among the stakeholders; for example, UNICEF was responsible for procuring supplies, particularly measles vaccine. The key-informants involved with measles SIAs for maintaining logistics and procurement mentioned that all challenges were identified before the SIAs through proper planning, and the SIAs gave the informants the opportunity to address all the issues properly. Feasibility assessment and the process of preparing inventory during SIAs helped the relevant staff members skillfully manage logistics and procurement systems, which also helped them to continue the process in the routine immunization programme. The key-informants believed that strong preparation lead to the result of no AEFI cases being identified after the completion of SIAs.

Through the SIAs, the relevant staff was trained on technical areas, including management of logistics. International experts came to impart the training and technical assistance to the local staff, which increased their skills and confidence to maintain cold-chain equipment and manage the cold-chain which benefited the EPI.

The measles SIAs were also noted for their impact on logistics and maintenance of cold-chain. For SIA purposes, huge numbers of ice-lined refrigerators (ILRs), cold-boxes, and vaccine carriers were procured. After the SIAs, the new equipment was kept as fixed assets for routine immunization. Most urban sub-national and service-level key-informants reported that, after measles SIAs, they did not encounter problems in terms of cold-chain equipment in their routine EPI programme.

However, this situation was not same in all the areas, particularly in the rural areas. Most key-informants in Sunamgonj did not have enough refrigerators and cold-boxes. Besides, inadequate power supply worsened the situation. One informant noted:

We had only one deep freezer during the last campaign but it was not sufficient to produce required ice packs for the campaign due to lack of power supply. We had to take alternative steps as we had scarcity of deep freezers. We managed the problem by purchasing ice from the local ice-cream factory.

Some service-level key-informants also reported that they did not find adequate stationery, such as reporting forms, tally sheets, markers, cotton, and scissors. They had to purchase their own equipment and copied tally sheets locally and at their own expense, which was never reimbursed. Although these problems did not have any direct negative impact on the immunization system but the local staff had to manage these. The key-informants suggested taking care of the problems by policy level in future SIAs.

8.1.6. Impacts on the surveillance and laboratory system

The key-informants mentioned that measles SIAs had a direct impact on future measles surveillance and laboratory support. They stated that the field-level EPI staff and laboratory staff had better surveillance skills after SIAs, which happened due to rigorous training and strengthening of the surveillance system. They further added that the surveillance system has been integrated with other surveillance systems after SIAs. The informants informed that, there was a strategic change on the surveillance system after the completion of SIAs. Most key-informants involved with the surveillance system explained that, before the SIAs, a community-based surveillance system was used for reporting measles cases. They reported that, if a health worker found any patient who had symptoms of measles, it was reported to the EPI headquarters and counted as a measles case without laboratory confirmation, since previously there was no laboratory support for the investigation of measles cases. After the SIAs, measles outbreaks reduced substantially, and the measles surveillance system was changed from a community-based surveillance system to a case-based surveillance system, with a separate laboratory support set-up for the confirmation of measles cases. In the case-based surveillance system, if a health worker suspects a measles case, he/she collects specimens of blood or urine and sends these along with reported case information to the central laboratory maintaining the proper cold-chain procedures. The key-informants also reported that when case-based surveillance started functioning, the incidence rate of measles drastically reduced because incorrect diagnoses were now eliminated. A key-informant said:

In 2009, 144 outbreaks were investigated but after laboratory confirmation none of these were identified as measles, rather all the cases were rubella.

According to the key-informants, particularly the EPI programme managers and the staff who were involved with laboratory services, stated that a good number of new laboratory equipment were procured during SIAs which are being used in regular laboratory-related services for routine EPI.

The key-informants also stated that the case-based surveillance identified new challenges for the health system of Bangladesh. They reported that the case-based surveillance system helped identify new diseases. The recent surveillance report found a substantial number of rubella cases. Referring to the rubella situation, some sub-national-level key-informants stated that the Government should not concentrate on MCV1 only but should consider introducing measles, mumps and rubella (MMR) vaccine.

Most key-informants reported that the catch-up SIAs contributed to a change in the definition of measles outbreak. Before the introduction of case-based surveillance, 10 cases were required to define a measles outbreak but currently measles outbreak is defined as an occurrence of 3 or more suspected measles cases in one month in a rural ward/urban *mahalla*. The strategic change in the measles surveillance system has also another positive impact. According to the informants, the new system encouraged staff members to visit more areas to identify measles cases, which helped the EPI to increase the sensitivity of measles and rubella surveillance. The key-informants explained that, if any area was identified with an outbreak, rigorous house-to-house searching was done by concerned staff members to identify additional cases, and outbreak-control steps were taken very promptly. After the strategic change, case-by-case investigation is being done repeatedly to support the health system of the country. This case-based surveillance system created scope to search for more measles cases compared to the past effort. This will help identify and confirm cases through laboratory tests. In this regard, a district-level manager gave an example of an outbreak investigation. He reported:

A few months ago, we investigated measles-outbreak areas with new definition in Sunamgonj district, and after searching we found about 50 cases. If we would have followed the old definition, we might not have visited all the areas ... that could be a disaster for the programme due to missing of such a large number of cases, although all 50 cases were rubella diagnosed after laboratory investigation.

8.1.7. Impact on the information system

According to the national-level key-informants, the information system for measles SIAs was developed along the lines of the information system for National Immunization Days (NIDs) for polio as opposed to the system used for reporting routine immunization under the EPI. Bangladesh has a long history of organizing polio NIDs and has an established information system. There are basic differences between the two campaigns: NIDs are completed in one day whereas the measles SIAs were held over two weeks. As most key-informants stated that the report on SIAs was prepared every day during SIAs whereas the routine EPI reporting is made monthly. During the SIAs, the control rooms were established at two levels: national and district levels to maintain the information system from the field to district to national levels. Information was also sent through fax, email, telephone, and mobile phone from different levels for updating the coverage on a daily basis. According to the informants, the operational-level staff became skilled in using information technology. The following is an example of a national-level key-informant discussing the SIA's information procedures they followed:

During the SIAs, we established control rooms at the national and district levels. People were available and working in the control room. All modern technologies, such as mobile, fax, and email, were used for collecting data on the performance of SIAs.

The system contributed not only to improving the quality of data during SIAs but also the routine immunization programme. The system improved the skills of staff members about

information management, and in most cases, they continued using the technology in routine EPI, as the key-informants stated.

The SIAs helped improve the registration of immunization. Before the implementation of SIAs, all the target children were registered with their detailed particulars, which helped calculate the exact target children in each community. Thus, the field staff and volunteers could bring all the target children under vaccination, resulting in the improved measles-vaccinations coverage. Further, the system also helped the operation-level staff learn the proper registration system for routine immunization.

Considering the complex reporting format, a rigorous training was provided to the staff at all levels that included monitoring, supervision, and procedures to use standard reporting formats. Most national-level key-informants stated that such training helped increase the skills and confidence of EPI staff. Most of the time, training was considered an incentive for health workers. However, most service-level key-informants reported that reporting of SIAs created additional work and mental pressure for the staff. A considerable time was needed to complete of the form. Since the report was sent the same day, the service-level staff felt that did not get enough time to check it. The district-level staff also reported similar problems, where they were responsible for next-level monitoring.

Most key-informants accorded more importance on monitoring and supervision of measles catch-up SIAs because it was a national programme, and the Government's prestige was directly involved with that programme and media people were more active at that time. The national-level key-informants said that, because of the huge number of vaccinators recruited from different sectors, managing them required a high quality of supervision. Supervision was done at different levels by different types of supervisors, including international observers. The key-informants, particularly the supervisors who were interviewed, learnt much about the supervisory system during the SIAs, which helped them implement their knowledge on the routine immunization programme.

The service-level key-informants stated that, during the measles SIAs, they worked closely with their supervisors, which increased their skills and confidence because they received instant feedbacks from their supervisors. However, some service-level staff had to work with supervisors from outside the health department. In these cases, the informants felt that the supervisors did not have enough technical skills. Also, such supervisors were very reluctant to extend support to the service providers. The informants suggested providing sufficient orientation to outside supervisors before involving them in such activities.

The implementation-level key-informants reported that, for recording information about vaccination during the measles SIAs, no cards were used, and hence, it was not possible to know the children who received measles vaccines during the SIAs. Therefore, the informants suggested developing a system to incorporate the information in the existing EPI cards.

Impacts on healthcare-delivery

The key-informants at all levels stated that measles catch-up SIAs helped improve the quality of immunization and healthcare services. They repeatedly mentioned that measles SIAs increased awareness among the community members because, during the SIAs, huge publicity was done through miking, door-to-door visits, and interpersonal communication. The service providers considered the SIA a '*festival*' because it stimulated them to join other people and let people know about their services. They found that, after the SIAs, people were

willing to visit the EPI centre for other EPI services. As a result, the service providers were able to concentrate more on delivering vaccination services rather than motivating the people. A district-level key-informant said:

Before SIAs, we used to visit people and motivate them to bring their children to the centre but now people themselves mostly come to EPI centres which also helped improve the coverage of other vaccines ... this is just because of SIAs and publicity.

The informants mentioned that the SIAs also helped increase the willingness of the community members to use health services because the interactions with the service providers that occurred during the SIAs helped increase awareness of the availability of services.

Decreased outbreaks: Most informants reported that Bangladesh experienced a large number of measles outbreaks before the measles catch-up SIAs but these dramatically decreased thereafter. A national-level key-informant said:

We have now changed the definition of measles outbreaks in our country. Earlier we considered an outbreak if the number of cases was 10 in a community but currently we consider this if the number is 3 only. The reason for changing the definition is that the incidence of measles has decreased after the campaign.

Reduced burden of disease: Most key-informants reported that the measles SIAs helped decrease the burden of disease in Bangladesh and contributed to improving the health systems of the country. One national-level key-informant said:

Since we have planned to eliminate measles from our country, the SIAs helped us move from the control stage to the elimination stage, and after the second dose, we may reach the eradication status which would have a great impact on the overall health systems of our country.

The SIAs not only contributed to decreasing the incidence of measles but also contributed to decreasing the incidence of measles-associated complications which is a support for the health systems. Most informants, particularly from national and district levels, mentioned that measles is a highly infectious disease that contributes to other diseases in children, such as pneumonia, diarrhoea, blindness, and disability. One national-level key-informant said:

Measles has other complications. Measles decreases the child's resistance to other infections. As a result, children frequently get infected with other diseases, such as pneumonia, diarrhea, and malnutrition. Thus, a child affected with measles puts the family in a crisis. The SIAs helped reduce the burden of such diseases.

8.2. Impacts of measles-eradication activities on the health systems

The key-informants mentioned that the measles SIAs also contributed to improving the health systems in Bangladesh in the areas of governance, planning and management, financing and resource generation, human resources, information system, surveillance, and service-delivery, which are described below.

8.2.1. Impacts on governance

According to the the key-informants, the involvement of other sectors with measles SIAs had a great impact on the health systems both at national and local levels. The involvement of other ministries, such as Ministry of Education, Ministry of Defense, Ministry of Religious

Affairs, Ministry of Social Welfare, and non-governmental and international stakeholders and private-sector partners, such as Grameenphone, different television channels, and other media, played substantial roles to not only making the SIAs successful but they are also playing vital roles in the implementation of other health activities after SIAs. For example, these stakeholders have been contributing to the implementation of other health programmes, such as activities on IMCI, TB, reproductive health, family-planning programmes, and many other activities of the health sector. They also added that the measles SIAs helped strengthen inter-ministerial coordination and collaboration with other sectors that eventually permitted the health sector to strengthen the health systems in general throughout Bangladesh.

The service-level key-informants reported that the involvement of staff from other departments, such as teachers and students of schools, colleges, and madrasahs (religious institutions), staff members of the department of social welfare and local NGOs, and staff members of administrative cadre in SIAs was remarkable. According to the key-informants, contribution of those departments made SIAs successful. They also added that, after the SIAs, the involvement of those departments in other health programmes, particularly in distribution of vitamin A to under-five children, sanitation campaign, and awareness-raising about TB and malaria has become a regular practice.

As stated, earlier political leaders—from the Prime Minister to local-level public representatives—were actively involved with SIAs which helped make the SIAs successful. Most key-informants said that the involvement of political leaders did not only make the SIAs successful but it also contributed to making the political leaders aware of other health programmes. The informants added that the political leaders are now used to involve themselves in other programmes of the health sectors after the SIAs.

Most district- and service-level key-informants stated that the involvement of communities, such as school teachers, local elites, motivated mothers, senior students of schools and colleges, religious leaders, and volunteers, in the planning and implementation of SIAs was also remarkable. The key-informants said that the involvement of the community people in other programmes of the health system increased after their involvement with SIAs.

8.2.2. Impacts on planning and management

Most national and sub-national-level key-informants mentioned that the health and EPI staff developed micro-plans during the measles SIAs and developed strategies how to cover all the target children, which resulted in the successful management of such large SIAs. They also reported that they had to prepare a plan about how to use available resources, including human resources and resources required from other sources, and how to procure resources. According to the informants, the planning exercise done by the staff members during the SIAs also made them skilled to manage the available and added resources in the health system.

Most key-informants at all levels stated that the planning and management of SIAs were a big task for the national and operational levels, and the SIAs brought the opportunity to complete this task. They added that the SIAs contributed to improving the planning and management of mass campaigns on other preventable activities. They also added that the planning and management process followed during the SIAs stimulated the concerned staff members for developing long-term plans for other health-system activities.

8.2.3. Impacts on financing and resource generation

The national and district-level key-informants reported that the success of SIAs might en-

courage donors in providing more funds for other interventions in the health system. They added that the interventions, such as vitamin A and deworming, were provided with measles vaccines during the SIAs. According to them, the coverage rates of all the interventions were very impressive, which might attract donors in providing more funds. They thought that the SIAs increased the opportunity in fund-raising from local and international partners for other health interventions to be delivered together with measles.

8.2.4. Impacts on human resources

The district and service-level key-informants reported that, in Bangladesh, there is a good system of target setting, analysis of performance, and reporting by concerned staff members. The SIAs helped the staff understand better about review, analysis, and reporting of programme performance. They said that, during the SIAs the local-level staff members had to analyze their performance and to report the results to higher levels. This helped them understand better about review, analysis, and reporting of information. The knowledge acquired from this type of work implement will help the health system by the staff members.

The key-informants reported that the incentives received by the staff members during the SIAs motivated them to become more committed to their responsibilities towards the health systems. Many key-informants stated that the training and travel allowances, food, and stationery provided to the staff members made them motivated. The key-informants also stated that they had the scope to meet top-level supervisors who came from home and abroad, trained, and advised them to do better performance in the EPI and other primary healthcare activities, which are being executed in their work not only in the EPI but also in the area of the health system as a whole.

The key-informants mentioned that the staff members, particularly the operation-level staff members, had to perform substantially-increased amount of work during the SIAs, in addition to their normal work, which is a pressure for them. All the informants said that working under such a pressure during the SIAs increased their skills to work under pressure and to manage workloads of activities relating to other activities of the health systems. The respondents from the district and upazila levels reported that the involvement of volunteers in SIAs increased stock of human resources for the EPI and health systems in Bangladesh. The support of volunteers was very useful for the successful implementation of SIAs. The key-informants informed that the volunteers were also used in other events of the health systems, such as mobilizing the community for PHC services.

Some national-level key-informants informed that the involvement of staff members from other than the EPI hampered their normal work. They reported that, due to the shortage of technical personnel for vaccination during the SIA, human resources, such as staff nurse, medical officer, and paramedics, had to depute under the measles SIA programme. According to the key-informants, the normal work of those staff hampered due to the absence of staff members from their own work places.

8.2.5. Impacts on the information system

Regarding the positive impacts of SIAs on the information system, the informants from all levels mentioned that the SIAs helped improve the registration of immunization. Before the implementation of SIAs, all the target children were registered with their detailed particulars, which helped calculate the target children in each community. This helped the field staff and volunteers to bring in all the target children under vaccination, resulting in improved

measles coverage. Further, the system helped the operation-level staff learn the proper registration system for other programmes of ESD, such as registration of newborns, pregnant mothers, and suspected TB patients.

8.2.6. Impacts on service-delivery

The measles SIAs increased awareness on primary healthcare among the community members. The key-informant mentioned that rigorous publicity was done during the SIAs. Although the main focus of publicity was measles vaccination but other components of PHC were also announced, which helped the community become aware of other components of PHC.

Moreover, the measles SIAs created an opportunity for mothers to receive information on other health services available in local clinics. The informants mentioned that such interactions helped change healthcare-seeking behaviours of mothers. A few service-level key-informants in urban settings reported that they experienced an increased number of patients in the local clinics following the SIAs.

Some key-informants, particularly from service level, reported that the SIAs created a positive image of service providers among the local community. They felt that the SIAs contributed not only to decreasing the burden of disease but also increased positive attitudes among the local people towards service providers and also encouraged the community members to seek more services from healthcare facilities. For example, one service-level staff in a rural area said:

Children were frequently affected by measles before the catch-up campaign. During the SIAs when we visited door-to-door and said to them that suffering from measles of their children will be reduced if they vaccinate their children. Following the SIAs, they got the result which eventually increased their confidence on us.”

Most key-informants stated that the SIAs provided not only measles vaccines but also included other components of PHC. They said that the SIAs provided a platform for add-on health activities during campaigns, such as vitamin A, deworming, and polio vaccines.

9. Lessons learnt from the polio-eradication programme

The polio-eradication activity in Bangladesh is considered a highly ‘achieved’ programme in the country. The high-level efforts to eradicate polio from Bangladesh resulted in the polio-free declaration in August 2000, which was maintained for the next five years. In 2006, an AFP case of 9-year-old child was identified by the national surveillance system. According to genetic analysis of the Global Specialized Polio Laboratory that confirmed that this wild poliovirus was an importation from neighbouring countries and not inhabitant in Bangladesh. It became a great challenge for the country to maintain the polio-free status in the long run. Thus, the NID programme was integrated with the long-term immunization strategy in Bangladesh, which resulted in the programme that is influencing the health and immunization system of the country.

In terms of the eradication strategy, there is a substantial difference between polio eradication and current measles eradication in Bangladesh. Most key-informants mentioned that this difference was commonly emerged at the operational level, e.g. frequency of the immunization campaigns and the use of injectables rather than oral vaccine. Pointing to the

above, all the informants classified that the measles campaign required more resources compared to the polio campaign.

Although there are significant differences between polio and measles-eradication activities, the key-informants at all levels found that both these activities had a positive impact on the overall health and immunization system. The strength of the Bangladesh polio-eradication programme helped maintain a high routine coverage, strengthen AFP surveillance, conduct NIDs, and mop-up polio campaigns. In addition, the measles campaign helped improve technical skills of staff on injecting measles vaccine, using safe waste disposal, and managing adverse events associated with errors in reconstituting and injecting the vaccine. Moreover, both the campaigns help integrate additional health interventions, such as providing deworming tablets and vitamin A capsules. Given the example of measles follow-up campaign, the key-informants pointed that the measles campaign was also integrated with the NID that helped minimize wastage and maximize the use of resources. However, except the increase of workload, none of the key-informants found any adverse effect of both the campaigns.

10. Staff profile

The staff profiling survey showed that all staff members involved with the EPI and measles activities were from the field staff (HAs and FWAs) in rural areas while the urban staff members were from different groups, such as vaccinators, paramedics, staff nurse, and others (Table 5). Around 90% of the respondents had 10-14 years of education. Over two-thirds of the rural respondents were working for more than 15 years in the health sector while 80% of the urban respondents were working in the health sector for more than 15 years. All the rural respondents had working experience with immunization services for more than 10 years. On the other hand, 70% of the urban respondents were involved with immunization services for 2-10 years. A similar scenario was found in the involvement of the staff members with activities relating to measles. With a few exceptions, both rural and urban staff members received in-service training several times on measles, immunization, and health services.

The staff members provided multiple responses about their roles in measles-related activities. The main roles they played in measles-related activities were organizing vaccination centres, promoting vaccines, making people aware of measles, preparation of reports, and tracing of defaulters (Table 6).

The findings revealed that there were no major differences in terms of workload of staff members during a regular day and during an SIA day. Table 7 shows that 97% and 83% of the respondents, respectively, worked for >8 hours during a regular day and also during days spent on SIAs. Almost an equal percentage of staff members had to work for >9 hours during a regular day and during days spent on SIAs.

Over two-thirds of the staff members reported that they spent >75% of their time with immunization services during an SIA day while, during a regular day, 30% spent 75% of their time in immunization services. Similarly, over two-thirds of the staff members spent 75% of their time during an SIA day compared to 23% of the staff members who spent 75% of their time during a regular day for measles-related activities. Most staff members of both the groups (during a regular day and during an SIA day) spent 25-50% of their time for health services (Table 8).

Salary of the staff members ranged from Tk 4,000 to Tk 12,000 per month (Table 9). About 72% received Tk 4,000 to Tk 10,000. Less than one-third received more than Tk 10,000 per

month. Around 15% had income from the non-health sector, such as agriculture and others. Eighteen percent informed that their income level changed during the SIAs but did not mention how this change happened (data not presented in the table).

Table 5. Profile of staff involved with EPI and measles activities in Dhaka and Sunamgonj districts

Staff profile	Percentage		
	District		Total (n=60)
	Dhaka (n=30)	Sunamgonj (n=30)	
Position			
HAs	-	80.0	40.0
FWAs	-	20.0	10.0
Vaccinators	26.7	-	13.3
Paramedics	56.7	-	28.3
Senior staff nurses	6.7	-	3.3
Others (labrotory technicians, service promoters, supervisors)	9.9	-	5.1
Education			
<10	16.7	3.3	11.6
Completed 10	46.7	16.7	31.7
Completed 12	13.3	40.0	26.7
≥14 years	23.3	40.0	30.0
Years working in the health sector			
2-5	23.3	-	11.7
6-10	36.7	-	18.3
11-15	20.0	36.7	28.3
16-20	-	50.0	25.0
>20	20.0	13.3	16.7
Years working in immunization services			
2-5	33.3	-	16.7
6-10	36.7	-	18.3
11-15	13.4	40.0	26.7
16-20	-	46.7	23.3
>20-25	16.6	13.3	15.0

Contd.

Table 5—Contd.

Staff profile	Percentage		
	District		Total (n=60)
	Dhaka (n=30)	Sunamgonj (n=30)	
Years working in measles-related activities			
2-5	33.3	-	16.7
6-10	30.0	-	15.0
11-15	16.7	40.0	28.3
16-20	6.7	46.7	26.7
>20	6.7	13.3	10.0
In-service training received			
Measles-specific training			
Once	36.7	23.3	30.0
Twice	16.7	33.3	25.0
Thrice	3.3	-	1.7
4 times	6.7	16.7	11.7
≥5 times	36.7	26.7	31.7
Immunization service training during the past three years			
Not at all	3.3	10.0	6.7
Once	20.0	10.0	15.0
Twice	40.0	46.7	43.3
Thrice	20.0	30.0	25.0
≥4 times	16.7	3.3	10.0
Other health services training during the past three years			
Not trained even once	6.7	-	3.3
Once	13.3	-	6.7
Twice	20.0	53.3	36.7
Thrice	16.7	13.3	15.0
≥4 times	43.3	33.3	38.3

Table 6. Roles in measles-related activities of staff members

Responsibilities (multiple responses)	Percentage	
	District (n=60)	
	Dhaka (n=30)	Sunamgonj (n=30)
Organizing vaccination centre	100	100
Promoting vaccines	90.0	96.7
Raising awareness in people about measles	33.3	86.7
Preparation of report	26.7	76.7
Tracing of defaulter	26.7	3.3
Searching for measles cases	10.0	3.3
Supervising measles SIAs at ward level	10.0	-
Providing vitamin A capsules	6.7	13.3

Table 7. Daily working hours of EPI staff during a regular day and during SIA planning

Average number of working hours per day	% of respondents	
	During a regular day (n=60)	During a SIA day (n=60)
>8 hours	96.6	83.3
>9 hours	3.4	3.3
Not involved in SIAs	-	13.4

Table 8. Time spent on immunization, measles, and health services by staff members of rural and urban areas

% of time spent	% of respondents		
	Immunization services	Measles activities	Health services
During a regular day			
≥25	5.0	16.7	46.7
26-50	20.0	23.3	33.3
51-75	45.0	36.7	18.3
>75	30.0	23.3	1.7
During a day of SIA			
≥25	-	-	83.4
26-50	5.0	3.3	16.6
51-75	26.7	35.0	-
>75	68.3	61.7	-

Table 9. Wage/salary of staff members of the health sector

Wage/salary range (Tk)	Percentage		
	District		Total (n=60)
	Dhaka (n=30)	Sunamgonj (n=30)	
4,000-6,000	43.3	6.7	25.0
6,001-8,000	10.0	50.0	30.0
8,001-10,000	16.7	16.7	16.7
10,001-12,000	20.0	26.7	23.3
>12,000	10.0	0.0	5.0

More than 85% of the staff members perceived that the system of management and support for SIA was excellent and good before, during, and after the SIAs (Table 10).

Table 10. Perception on system management and support for SIAs

Perception	% of respondents		
	Before SIA (n=60)	During SIA (n=60)	After SIA (n=60)
Excellent	15.0	11.7	10.0
Good	70.0	75.0	76.7
Fair	3.3	3.3	5.0
Not good	3.3	1.7	8.3
No comments	8.3	8.3	10.0

Similar information on job satisfaction of staff members from both the areas at the time of before, during, and after the SIAs was found. Most respondents' level of job satisfaction during those three periods was either excellent or good (Table 11).

Table 11. Job satisfaction of EPI staff

Level of job satisfaction	Percentage		
	District		Total (n=60)
	Dhaka (n=30)	Sunamgonj (n=30)	
Before SIAs			
Excellent	26.7	13.3	20.0
Good	70.0	83.3	76.7
Fair	3.3	3.3	3.3
			Contd.

Table 11—Contd.			
Level of job satisfaction	Percentage		
	District		Total (n=60)
	Dhaka (n=30)	Sunamgonj (n=30)	
During SIAs			
Excellent	23.3	30.0	26.7
Good	76.7	66.7	71.7
Fair	0.0	3.3	1.7
After SIAs			
Excellent	10.0	20.0	15.0
Good	90.0	73.3	81.7
Fair	0.0	6.7	3.3

11. Discussion

The EPI is considered a success in Bangladesh because of its remarkable progress achieved over the last 25 years (7). The Government's vision for health is articulated in the strategic goal of the MoHFW, which seeks to "create conditions whereby the people will have the opportunity to reach and maintain the highest level of health in Bangladesh". As a vehicle to deliver this essential development goal, the GoB established the HNPS to increase the availability and use of user-centred, effective and efficient, equitable, affordable, and accessible quality services for a defined ESD. Under the HNPS, the EPI is one of several programmes of ESD, meaning that the EPI is an integrated programme run by the PHC department with effective coordination and collaboration with other programmes of the MoHFW to ensure an effective immunization programme (27). The EPI in Bangladesh introduced a one-dose measles (MCV1) vaccination schedule through the routine immunization programme. In 2005-2006, the GoB organized a measles catch-up SIA for children aged 9 months to 9 years with support from the Global Measles Initiative. In February 2010, a follow-up campaign was undertaken. The findings of the present study revealed that the SIAs strengthened the integration of measles and EPI and had a positive impact on immunization and on the health system of Bangladesh.

Table 12 graphically displays both integration of EPI within the health system of Bangladesh and integration of measles campaign activities within the routine immunization systems of Bangladesh. In terms of the integration of EPI with the health system, only the logistics remain separate for immunization from the rest of the health system, as exemplified by the cold-chain and separate vaccine import and transportation systems. Further financing and information systems are less than fully integrated with the health system; however, there is a crossover of some areas. The measles campaigns are almost fully integrated with the routine EPI system in Bangladesh, except coordination, which receives additional emphasis through the activation of the NCI.

Table 12. Aggregated mapping of integration

Integration	Gov	Fin	Pla	HR	Log	IS	Sur	SD
Integration of EPI in the health systems								
Integration of measles campaigns in routine EPI								
<p>Full integration: The large majority of the elements of the programme are fully integrated with the general health system</p> <p>Coordination: Most elements of the programme share common strategies, policies, or activities with the general health system. Or, there is a fair mixture of integrated and non-integrated elements</p> <p>Linkage: There are some interactions between the programme and the general health system but no coordinated activities</p> <p>No integration: The large majority of the programme elements have formal interactions and are not integrated with the general health system.</p> <p>Gov=Governance; Fin=Finance; Pla=Planning; HR=Human resource; Log=Logistics; IS=Information system; Sur=Surveillance; SD=Service delivery</p>								

There was a very high level of political commitment to the measles SIAs. Traditionally in Bangladesh, all government bodies come together in support of child-health interventions. Likewise, the measles SIAs gained the highest level of political support which is essential for making these successful. The positive impacts of the first SIAs included increased rate of measles-vaccination coverage, reduced the frequency and size of measles outbreaks, reduced the overall burden of disease, creating positive attitudes among mothers towards service providers, and improved the skills of providers, generation of funds, and establishment of case-based surveillance system for measles and rubella throughout the country.

The findings revealed that the involvement and support of development partners, such as WHO, UNICEF, GAVI, CDC, IDA, DFID, EU, The Netherlands, SIDA, CIDA, GTZ, UNFPA, the Government of Japan, and USAID, worked together to make the EPI the largest recipient of funds among development projects in the health sector of Bangladesh. Further, the involvement of NGOs, Rotary International, civil society, and community leaders was vital for the success of the campaigns. Thus, multi-sectoral involvement has been an overarching key to success in both measles-elimination activities in particular and the overall health system of Bangladesh in general.

The findings of our study showed that the contribution of the ICC is notable for guiding the successful implementation of the EPI in Bangladesh. The officials involved in the ICC were from the MoHFW, Ministry of Finance, Ministry of Environment, Rotary International, development partners (WHO, UNICEF, USAID, World Bank, DFID, JICA, Royal Netherlands, and SIDA), NGOs, and others (ICDDR,B, Save the Children-USA, Immunization Consultant, and GAVI Hepatitis B Consultant) in support of the national EPI. The ICC has the balanced decision power. Thus, well representation of all stakeholders and balanced decision power may be the key areas for strengthening the ICC.

The comprehensive Multi-year Plan cMYP provides a framework to plan activities to achieve the important objectives of the national immunization programme as contained in the national health policy. The Bangladesh cMYP for the immunization programme is based on the Global Immunization Vision and Strategy (GIVS), ratified by the World Health Assembly in May 2005. The plan seeks to reduce vaccine-preventable diseases through integrated interventions that would strengthen the overall health system. The cMYP also contains the cost of the immunization programme, including SIAs, and provides financing scenarios that can guide investments of the MoHFW and other partners to ensure a sustainable and high-performing immunization programme, including SIAs, in Bangladesh. The cMYP contributes significantly to improving child health and also contributes to attaining the MDGs in Bangladesh. The effective implementation of cMYP is, thus, crucial in improving child health as a whole.

Although the participants were generally highly positive regarding the impact that the measles SIAs had on routine immunization and on the health system of Bangladesh, the informants raised several concerns. The field-level staff mentioned inadequate manpower at the implementation level as the vacant positions of health workers were not filled up and the unavailability of technically skilled staff. Some key-informants from the district and service levels stated that the measles SIAs had increased the workload of service-level staff. A few service-level staff mentioned that the SIAs affected their performance in routine work and routine EPI activities as it seemed impossible to do both activities simultaneously. It was suggested that vacant positions of field workers should be filled up before initiating large campaigns. However, the need to fill up the vacant positions is an ongoing activity within the health system of Bangladesh. Further, rigorous technical training for the staff members who are involved from other sectors, such as NGOs and the private sector, should be conducted before the implementation of a campaign. Despite reports of being overwhelmed during campaigns, the job satisfaction rates of the field staff remained high before, during, and after campaigns, demonstrating a small disconnect between information gathered during interviews and that gathered in the survey.

There was no negative impact on overall health-system financing, although some financial management problems occurred during the SIAs. The respondents from some district and service levels in rural areas did not receive funds on time. Some operational-level managers received funds after the completion of SIAs, and it was, therefore, very difficult for them to manage the campaign. The late arrival of funds at the upazila levels also created problems for the field staff because they had to pay travel cost from their own pockets, although they are the low-paid employees. Financial management problems might have negative impacts on future SIAs. Therefore, the predictability of committed funds for SIAs is critical, and timely disbursement of funds especially to operational level is essential.

In general, we found that the measles catch-up SIAs had a great impact on logistics and cold-chain maintenance. Refrigerators, cold-boxes, and vaccine-carriers were procured for the SIAs, and these were kept as fixed assets for routine immunization. Besides, through the SIAs, the relevant staff members were trained in technical issues and logistics management which improved their skills.

The study further demonstrated that measles control has been accompanied by strategic improvements in measles surveillance and laboratory diagnostic support. Most key-informants involved with the surveillance system explained that before the control goal a community-based measles surveillance system was implemented. However, after the

SIAs, measles outbreaks were substantially reduced. The measles surveillance system was changed to a case-based surveillance system, and a separate laboratory was established for the confirmation of suspected measles cases. The participants informed that the case-based surveillance system identified new challenges. Laboratory confirmation revealed that a substantial number of suspected measles cases were, in fact, rubella cases. Some key-informants at the sub-national level felt that the Government should not concentrate on MCV1 only but should consider the introduction of either measles or rubella (MR) vaccine as is used in Sri Lanka or of the measles, mumps and rubella (MMR) vaccine.

The key-informants at all levels mentioned that, like other components, there were both positive and negative impacts on the information system of SIAs. Considering the complex reporting format, a rigorous training was provided to the staff at all levels, which included monitoring, supervision, and procedures to use reporting formats of the campaign. As most national-level key-informants stated that such training helped increase the skills and confidence of the EPI staff. Most of the time, training was considered an incentive for the field staff. On the other hand, most service-level key-informants stated that reporting for SIAs involved an additional work and mental pressure for the staff. Since reports were sent on the same day of SIAs, the service-level staff did not get enough time for their checking. The district-level staff also reported similar problems, where they were responsible for next level monitoring. Simpler, user-friendly information systems for SIAs may reduce the additional time and pressure of staff members in future. Further, there was no spot on the childhood immunization card to record immunizations received during the SIAs.

The national-level key-informants reported that the SIAs had impacts on overall measles immunization. They believed that the SIAs contributed to increasing the rate of measles coverage which helped push Bangladesh from the measles mortality-reduction stage to the measles-elimination stage. They added that the introduction of MCV2 in the routine immunization programme is essential for the eradication of measles from Bangladesh. Most key-informants believed that a country cannot depend only on the performance of SIAs, and, as such, the introduction of MCV2 in routine programme is necessary. A similar conclusion was drawn in a previous review (6).

The findings from the staff profile survey showed that there was no major difference in terms of workload, spending time, and job satisfaction of staff members during a regular day and during an SIA day. Therefore, organizing such large SIAs in this country is feasible. However, key-informants' interviews with different groups of people noted their stress and feelings of not being able to complete their tasks during the SIAs when they are simultaneously tasked to provide routine EPI services.

Overall, measles-elimination activities had enormous positive impacts on the immunization programme and health system of Bangladesh. Effective integration of the immunization programme with the health system, high-level political commitment, and effective inter-agency collaboration contributed to make the SIAs successful.

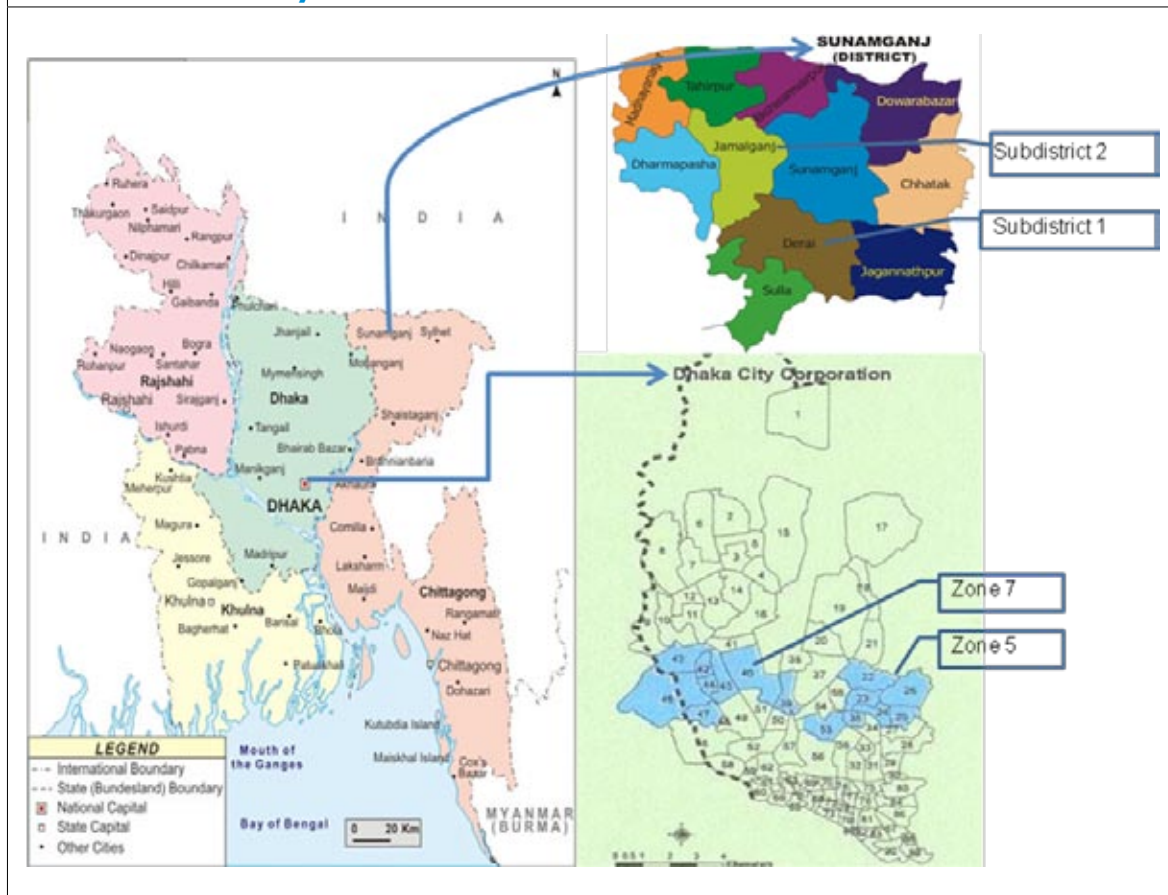
The overwhelming feeling in Bangladesh towards measles SIAs is one of benefits to both health of the people and strengthening the health system. The informants repeatedly mentioned the capacity-building effects of receiving additional training and supervision but more importantly they discussed the confidence they gained from planning and implementing a large-scale intervention. Further, the involvement of senior government leadership and of multiple sectors from both inside and outside the health sector indicates that Bangladesh has the political will and societal interest to eradicate measles.

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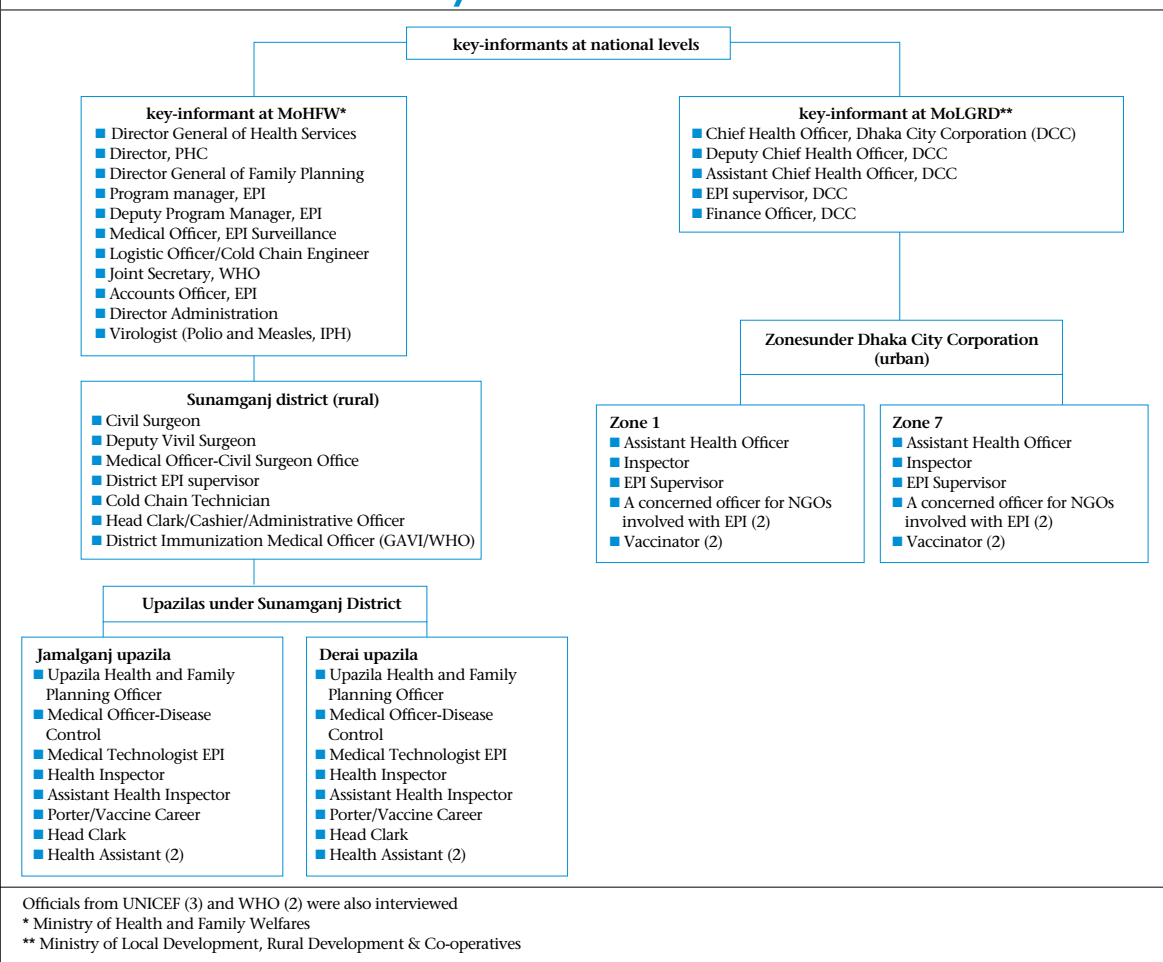
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Annexure I. Study sites



Annexure 2. Selection of key-informants at different levels



Annexure 3. List of documents retrieved in literature search

1. Bangladesh country cooperation strategy 2008-2013, published by WHO
2. Health Bulletin 2009, published by Ministry of Health and Family Welfare
3. Bangladesh health briefing paper: a paper produce by the department of international development health system resource centre
4. Developing urban health system in Bangladesh, published by WHO
5. Administrative and financial management handbook for WHO-EPI programme in Bangladesh, jointly published by MoHFW and WHO
6. National health system profile, Bangladesh
7. EPI fact sheet, 2004, published by WHO
8. EPI surveillance bulletin 2009 WHO
9. The state of health in Bangladesh-health workforce in Bangladesh: who constitutes the healthcare system, published by Bangladesh Health Watch
10. Bangladesh health workforce strategy, 2008, published by MoHFW
11. Health worker's dairy, 2009, published by MoHFW
12. EPI coverage report (2006-2009)

13. National Polio Eradication and Measles Control Program (planning and implementation guide 2010)
14. National Measles Control Program 2005-2006 (English and Bangla)
15. National Measles Control Programme, 2010 (draft)
16. Country update of measles, published by WHO
17. Measles eradication is long way off (2006); *Bulletin WHO* 79(6)
18. Expanded Programme on Immunization, policy paper
19. Phase-1 of the Measles Catch-up Campaign 2005-2006
20. Measles Catch-up Campaign 2005-2006
21. Number of vaccinators participated in last measles campaign
22. Measles campaign performance reports
23. Surveillance report
24. Giving them a second chance (The Measles Catch-up Campaign 2005-2006)
25. Bangladesh prepares to conduct the world's largest-ever measles immunization campaign
26. Bulletin of the World Health Organization—Measles vaccine effectiveness and risk factors for measles in Dhaka, Bangladesh
27. Chronic of Measles Catch-up Campaign, Bangladesh
28. Measles Catch-up Campaign (Newsletter—first edition 2005-2006)
29. Measles Catch-up Campaign (Newsletter—second edition 2005-2006)
30. Measles Catch-up Campaign (Newsletter—third edition 2005-2006)
31. Measles Catch-up Campaign, Bangladesh (compact disc 2005-2006)
32. Budget summary (Phase—1, 2005)
33. Budget summary (Phase—2, 2006)
34. Total country budget summary (18th NID and measles vaccination campaign 2010)
35. Others brochure (6 types:)
36. Measles Catch-up Campaign (Phase—1) Bangladesh, draft budget for national and divisional level activities.
37. Measles Catch-up Campaign (Phase—2) 2005-2006, budget break-up for city corporation activities
38. Measles Catch-up Campaign (Phase—2) 2005-2006, budget break-up for upazila activities
39. Measles Catch-up Campaign 2006 (expenditure statement training part Ban-IVD003) voucher forms
40. Checklist: micro plan form (school), vaccine distribution form, report form, supervision checklist, pre-campaign checklist, checklist for independent observer, rapid convenience assesment (RCA) form, micro-plan form-4 2005-2006 (district, upazila, city corporation), report compilation form 2005 to 2006
41. Measles coverage of Zone 5 and 7 in Dhaka City Corporation from 2001 to 2009
42. Measles coverage of Sunamgonj district from 2001 to 2009
43. Budget for measles catch-up campaign 2006 for Zone 5 and 7 of DCC
44. Budget for measles catch-up campaign 2006 for Sunamgonj district



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