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Case Study on the Costs and Financing of Immunization Services in Bangladesh

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Partnerships
for Health
Reform



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Abstract

This study estimates the current and future costs of Bangladesh's immunization program, including the additional costs proposed for improvements to the program, both to assist planning and to inform the international community about global immunization costs.

The estimated total cost of the national program, including national immunization days (NIDs) and surveillance, was about \$34.4 million in 1997/98—about \$0.52 per dose, \$21.47 per fully immunized child (FIC), and \$0.28 per capita. Fifty-two percent of total cost was for personnel, 31 percent for vaccines, and 9 percent for capital costs. The estimated total cost of the routine program was \$28.9 million—\$0.84 per dose and \$18.06 per FIC—with personnel comprising 56 percent, vaccines 26.7 percent, and capital costs 10.6 percent. The estimated total cost of NIDs and surveillance was about \$5.4 million, about 16 percent of total program costs. The largest cost component of NIDs was vaccines (54 percent), since the personnel time cost is relatively low (28 percent). The recurrent, variable non-personnel costs of the program, for which the Ministry of Health must find financing each year, are approximately \$13.3 million, or about 39 percent of total estimated costs; vaccines account for 80 percent of these costs.

Proposed improvements to the program will cost \$0.9–\$2.7 million per year without the introduction of Hepatitis B vaccine. (If Hepatitis B is introduced nationwide, the annual cost of vaccines alone will increase \$10–11 million; an alternative is to phase in the vaccine, beginning in highly endemic or urban areas.) The improvements include a catch-up campaign for low-performance subdistricts, annual refresher training for mid-level managers, a communications program carried out by new community clinics, and the purchase of new sterilization and cold chain equipment as well as incinerators for waste disposal.

Even assuming cost savings of \$1–1.7 million from better estimating of vaccine needs, over the next five years improvement costs (excluding Hepatitis B) will produce a funding gap of \$1.4–3.1 million (\$0.7–1.8 million if donors fund investment costs). Therefore, additional resources will need to be mobilized.

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Acronyms

ADP	Annual Development Program
AFP	Acute Flaccid Paralysis
BASICS	Basic Support for Institutionalizing Child Survival
BCG	Bacille-Calmette-Guerin (vaccine against tuberculosis)
CDC	Centers for Disease Control
CFC	Chloro-fluro Carbons
DFID	Department for International Development
DPT	Diphtheria, Pertussis, Tetanus
DT	Diphtheria, Tetanus
EPI	Expanded Programme on Immunizations
FIC	Fully Immunized Child
FWC	Family Welfare Center
GDP	Gross Domestic Product
GOB	Government of Bangladesh
HA	Health Assistant
HPSP	Health and Population Sector Programme
ICDDR,B	International Center for Diarrheal Research, Bangladesh
IEC	Information, Education, Communications
IPH	Institute of Public Health
MCH	Maternal and Child Health
MOLGRD&C	Ministry of Local Government, Rural Development and Cooperative
MMR	Measles, Mumps, Rubella
MOHFW	Ministry of Health and Family Welfare
NCAB	National Control Authority for Biologicals
NGO	Non-government Organization
NIDs	National Immunization Days
OPV	Oral Polio Vaccine
PHR	Partnerships for Health Reform Project
SIDA	Swedish International Development Agency
Td	Tetanus, Diphtheria with a reduced Diphtheria component

THC	Thana Health Complex
TK	Taka (Bangladesh monetary unit)
TST	Time Steam and Temperature Indicator
TT	Tetanus Toxoid
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VII	Vaccine Independence Initiative
WHO	World Health Organization

Exchange Rate

Exchange rates range from USD 1 = 40.0 TK for 1993/1994 to an exchange rate of 46.0 TK in 1997/98.

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Executive Summary

Background, Objectives, and Methods

The Partnerships for Health Reform (PHR), in collaboration with the BASICS Project and the Bangladesh Ministry of Health and Family Welfare (MOHFW), conducted an in-depth case study on the cost and financing of immunization services in Bangladesh. The study, conducted in the winter and spring of 1999, is one of four PHR country case studies on immunization financing. The main objectives of the studies are to:

- > Draw lessons learned concerning immunization financing strategies in Bangladesh that other countries and the international health community can use in planning sustainable financing of immunization programs with country resources,
- > Estimate the current and future costs of the country's immunization program, including the additional costs of improvements to the program, both to assist Bangladesh in planning its program and to update and add to the available information on immunization costs of the global community, and
- > Provide recommendations to the Bangladesh government on ways to improve its immunization financing strategies for the current program as well as the introduction of improvements to the program.

Cost and financing data for this analysis were obtained through government documents and in-depth interviews with key informants in the MOHFW, the donor community, non-governmental organizations (NGOs), and international organizations. Estimates of the total costs of the national immunization program, as well as the recurrent costs for which financing must be found each year, were obtained. The financing analysis is based on the estimated costs—as opposed to expenditures—to make it possible to account for all resources to the program, including donor contributions, NGO contributions, local government contributions, and personnel time. The study provides estimates of the share of financing by each major funding source, both in terms of the total estimated cost of the program and the “program-specific” costs, that is, the costs that are incurred specifically for the delivery of immunization services.

This analysis also provides estimates of the projected expenditures required for the next five years to introduce a series of improvements to the program. The report ends with an analysis of options to improve the program's financing in order to create a more sustainable program.

Main Findings

Costs

The estimated total cost of the national immunization program, including national immunization days (NIDs) and surveillance, was about \$34.4 million in 1997/98—about \$0.52 per dose, \$21.47 per fully immunized child (FIC), and \$0.28 per capita. Fifty-two percent of total cost was for personnel, 31 percent for vaccines, and 9 percent for capital costs. The estimated total cost of the routine

Expanded Programme on Immunizations (EPI) component of the national program was \$28.9 million—\$0.84 per dose and \$18.06 per FIC—with personnel comprising 56 percent, vaccines 26.7 percent, and capital costs 10.6 percent. The estimated total cost of NIDs and surveillance was about \$5.4 million, about 21 percent of total program costs. The largest cost component of NIDs was vaccines (54 percent), since the personnel time cost is relatively low (28 percent). The recurrent, variable non-personnel costs of the program, for which the Ministry of Health must find financing each year, are approximately \$13.3 million, or about 39 percent of total estimated costs; vaccines account for 80 percent of these costs.

The improvements that have been proposed for the national immunization program will cost \$0.9 million to \$2.7 million per year without the introduction of Hepatitis B vaccine. Improvements include a catch-up campaign for low-performance *thanas* (subdistricts), annual refresher training for mid-level managers, a communications program to be started with the introduction of community clinics under the Health and Population Sector Programme, the purchase of autoclave drums and autoclaves to improve sterilization of syringes and needles, the replacement of existing refrigerators with CFC-free ones, the construction of a cold room and freezer room in Dhaka, and the purchase of incinerators to improve waste disposal.

If Hepatitis B vaccine is introduced throughout the country, the annual cost of vaccines alone will increase by \$10–\$11 million. An alternative solution is to phase in the vaccine, beginning in highly endemic or urban areas, if an appropriate donor can be found.

Cost reductions can also be realized in two other ways: (1) improving methods of projecting vaccine needs and stock management, and (2) reducing vaccine wastage rates. By changing the way that vaccine needs are determined, the cost of vaccines could be reduced by as much as \$1–\$1.7 million. Costs can also be reduced either by reducing the number of sessions in which immunizations are provided or by increasing the number of clients. However, the MOHFW will probably want to postpone these latter changes until after FIC coverage within the country has been stabilized.

Financing

Expenditures (nominal) on the national immunization program have increased by roughly 50 percent from 1993/94 to 1997/98.

The sources of funding for the program in 1997/98 were the following: the Bangladesh central government (52 percent), local governments (5.7 percent), a World Bank International Development Association loan (23.4 percent), donors and international organizations (16.7 percent), and donor-supported NGOs (2.0 percent). Several donors have contributed towards the program: Major donors to the routine EPI have been UNICEF, the Swedish International Development Agency, and the World Bank, while Japan was the main contributor to the NIDs. If the funding for program-specific costs are examined (funding not shared by other programs), the share provided by non-government sources is larger: central government (15 percent), local government (1.8 percent), World Bank loan (43.4 percent), donors and international organizations (38.2 percent), and donor-supported NGOs (1.7 percent).

The MOHFW has been purchasing one vaccine, DPT, through UNICEF's Vaccine Independence Initiative (VII) and most other vaccines through regular UNICEF procurement. Although there are few complaints about the procurement through the VII, the country appears to be receiving few benefits from the use of the initiative: It does not have a foreign-exchange problem, since it is using the World Bank loan to purchase vaccines. In addition, the MOHFW does not need to defer payment

for the vaccines, because it is on a different fiscal year than UNICEF and has already allocated funds for the vaccines before UNICEF's calendar begins.

Future Financing

In the next five years, improvements to the immunization program (excluding the start-up of Hepatitis B) will produce a funding gap of \$1.4–\$3.1 million (\$0.7–\$1.8 million if donors pay for investment costs during the period)—even assuming cost savings in estimating vaccine needs. Savings of \$1–\$1.7 million can potentially be realized if changes to the way in which vaccine needs are estimated can be introduced. In any case, however, additional resources will need to be mobilized for the program.

This report proposes three ways in which these resources might be mobilized: (1) increasing central government budget allocations for the immunization program, (2) increasing the role of local governments in financing immunization services, and (3) introducing or increasing fees for services or registration cards in urban areas.

If the government of Bangladesh increases its budget allocation to finance more of the operating costs of the national immunization program, donors will be able to focus on improving the program through funding of social mobilization, training, and polio eradication activities, as they are doing to some extent now. They will also be able to finance more of the required investment costs that will be needed in the future. The way in which the central government could consider increasing its contribution needs to be further studied.

Conclusions and Lessons Learned

The Bangladesh national immunization program has made considerable progress in the last 15 years in increasing the FIC percentage from 2 percent to around 50 percent. In addition, the MOHFW has begun to pay for one vaccine through the VII mechanism and others with a World Bank loan. Another positive change is that local governments have begun to contribute towards the program in urban areas.

Nevertheless, the program still relies on donors to finance many of its recurrent costs, including training, social mobilization, and supplies. At the same time, certain needed improvements, such as construction of a cold room and a freezer room, have had to be postponed since 1996 due to lack of investment funding. If both the central and local governments would increase their allocations to the program operating budgets, taking over all supply costs and some of the other costs, donors would be able to redirect their funding to needed investments.

One way to increase domestic funding for the program is to begin charging small fees for immunization services in urban areas, since urban clients have more disposable income than do rural clients. Local governments could consider charging nominal fees for immunization services themselves, or for registration cards. The revenues could then be used to purchase supplies or other immunization program-related items, such as stationery. If local governments can indeed assume more supply costs, the central government will be able to use its funding elsewhere in the program. It should be noted, however, that price-setting should take into account client willingness and ability to pay, so as not to discourage use. To this end, instituting charges for registration may be more effective than charging for immunizations themselves.

Currently, NGOs provide some immunization services, mostly in urban areas, thus reducing personnel costs that would otherwise be incurred by the government. The MOHFW should encourage

NGO service provision as a way to expand coverage to areas where access to government services is limited or non-existent, for example, in rural areas where government services are not offered on a regular basis. The NGOs should consider using some of the user fees that they collect to pay for immunization supplies after they recover their operating costs.

The MOHFW has been purchasing vaccines through the Vaccine Independence Initiative. This mechanism initially facilitated the payment of up to a third of MOHFW vaccine costs by allowing the Ministry to pay with local currency. However, most vaccines now are purchased with a World Bank loan; therefore, the government does not have an immediate foreign currency problem. In addition, since the government's fiscal year differs from the calendar year of UNICEF, the loan allows it to allocate funds for vaccine purchase well before delivery. Thus, it appears that there are limited advantages to using the VII rather than regular UNICEF procurement.

The MOHFW does benefit from using regular UNICEF procurement rather than procuring vaccines directly from manufacturers. First, this procurement mechanism provides quality assurance for the vaccines, thus obviating the need for a national biologicals control authority to ensure that the vaccines are safe and effective. Second, UNICEF procurement ensures transparency during the annual process of negotiating prices and delivery costs for vaccines.

Recommendations

The MOHFW should design a multi-year plan for the national immunization program. The plan should set out specific objectives and include detailed plans for the introduction of improvements, based on the results of this study and other data collection and analysis; for conducting additional research to obtain critical information on which to base program decisions; for capacity building in critical areas; and for financing the program in a sustainable manner, based largely on domestic funding and in conjunction with the planned health sector reforms.

The consideration and analysis of costs should be included in the program decision-making process on a more systematic and regular basis, along with considerations of effectiveness and quality.

Vaccine Procurement and Supply

If the government of Bangladesh would like to try direct procurement rather than use of UNICEF procurement system to obtain its vaccines, it should start with one vaccine to see if the process operates smoothly. During this time, it should develop a mechanism for tracking the safety, regularity of shipments, and payments, and costs should be introduced during the time it is tested to see whether it is working smoothly. In addition, it should introduce a national control authority for biologicals to license vaccines on the basis of safety, potency, and efficacy; to oversee the quality of the vaccines by rating each lot; and to monitor the impact of vaccines through a well-functioning surveillance system. A mid-term evaluation should be planned to assess the effectiveness and efficiency of using direct procurement of vaccines.

Training should take place in procurement management and control of quality of vaccines.

Financing

A study of cost recovery and out-of-pocket payments for government immunization services should be carried out to analyze the amount of revenues generated, the effect on utilization of services, and the possible impact on financing and equity.

Training of program managers should be initiated to strengthen capacity for financial planning for the program.

Research

Plans for the future of the program, including the diversification of financing sources and mobilization of new resources, should be based on information concerning needs, effectiveness, costs, and cost-effectiveness. Given the program's objectives and plans for the future, the following studies and analyses are recommended:

- > A study on ways to improve immunization coverage, considering the effectiveness, costs, and cost-effectiveness of different delivery and social mobilization strategies; local-level mini-campaigns; increased outreach through mobile health teams, home visits, etc. and different types of information, education, and communications and social mobilization strategies; and,
- > An analysis of the potential for reducing vaccine wastage, for which antigens, and how.

1. Introduction

1.1 Background and Purpose of Study

In recent years, national governments and the international health community have become increasingly concerned with the issues of financing childhood vaccines and immunization programs. Despite tremendous gains achieved in immunization coverage in the 1980s in nearly all developing countries with the establishment of national immunization programs, often called Expanded Programmes on Immunization (EPI), coverage rates in the 1990s have reached a plateau or even declined in a number of countries, as donors reduce their funding for immunizations, as national health budgets decline with deteriorating economic conditions, and as other national health priorities consume increasing attention and limited health funds.

With support from the Child Survival Division of the United States Agency for International Development's (USAID) Office of Health, the Partnerships for Health Reform (PHR) Project has developed a Special Initiative on Immunization Financing, the goal of which is to assist in the evaluation and development of country-level financing strategies for replacing donor funding and sustaining and expanding immunization programs with local resources. One of the main activities of this special initiative is to conduct several country case studies on immunization financing in order to both provide lessons learned concerning country-level immunization financing strategies that other countries and the international health community can use in planning sustainable national immunization programs, including the introduction of additional vaccines; and to provide recommendations to the countries involved on ways to improve their immunization financing strategies.

In each country, the case study examines the current financing strategies (in terms of their adequacy; sustainability; and impact on coverage, quality, equity and efficiency); estimates the global costs of the program and the costs of adding new vaccines (under various scenarios) or other innovations; as well as analyzes and weighs various options to improve the financing and sustainability of the program. These options include: changing vaccine procurement mechanisms, increasing central government allocations to national immunization programs, reducing costs, increasing the role of the private sector in immunization service delivery, and mobilizing resources through different types of cost recovery.

Bangladesh was chosen as one of the first three countries for the case studies because of its relatively high level of self-sufficiency in vaccine financing (estimates of central government contributions range from 40–45 percent of total immunization program costs), its relatively low income level, and its involvement in the Vaccine Independence Initiative (VII). Another reason to conduct a study in Bangladesh was to follow up on work undertaken as part of an international EPI Review team. As part of this review, two PHR-sponsored consultants estimated the costs and cost-effectiveness of the Bangladesh national immunization program. One of their recommendations was to develop a long-term plan for financing EPI activities.

Because USAID has a long-term project (Basic Support for Institutionalizing Child Survival, BASICS) that is facilitating immunization activities in urban areas in Bangladesh, PHR conducted the case study collaboratively with BASICS/Dhaka. To conduct this study, a technical team was formed

that included PHR health economist Dr. Ann Levin, BASICS acting representative Dr. Mizan Siddiqi, BASICS urban technical officer Dr. Syed Izaz Razul, economics professor Sushil Howlader, and Dr. Subrata Routh, team leader of the Sustainability Team of the Operations Research Project of the International Centre for Diarrheal Research, Bangladesh (ICDDR,B). This team was joined by an advisory team of Ministry of Health and Family Welfare (MOHFW) officials that included Dr. Shamsul Hoque, line director of the Essential Service Package and director of Primary Health Care and Disease Control; Dr. Mozammel Hoque, program manager for Child Health and Limited Curative Care; and Dr. Mahbubur Rahman, deputy program manager for EPI; the medical officer of EPI; and a representative from the Health Economics Unit.

The first section of the paper describes the country context of the national immunization program in Bangladesh, while the second section presents the study objectives and methods. The third and fourth sections present information on expenditures and costs of the program as well as sources of financing. The fifth section describes the future financing needs of the program while the sixth section focuses on the immunization program financing strategies. The final section describes the conclusions of the study.

1.2 Socioeconomic Context of Bangladesh

Bangladesh is located in South Asia and is almost completely surrounded by India, but also has a small border with Burma and the Bay of Bengal. It's land area of 147,570 square kilometers, slightly smaller than the U.S. state of Wisconsin, and large population of approximately 128,000,000 make Bangladesh one of the most densely populated countries in the world.

Administratively, the country is divided into six divisions, 64 districts, and 490 *thanas* (subdistrict level). The population is almost 90 percent Muslim but also has a small Hindu population (10 percent).

The economy of Bangladesh is largely agricultural, with this sector employing 64 percent of the population (Bangladesh Bureau for Statistics 1997). However, the importance of this sector has declined over time with the growth of the industrial sector, which now accounts for more than 10 percent of gross domestic product (GDP). Exports comprise textiles, jute and jute goods, leather, frozen fish, and seafood. Bangladesh recently discovered natural gas reserves, but it has not yet exploited this resource. The annual GDP growth has averaged over 4 percent in recent years.

The level of poverty remains high in Bangladesh. The per capita income in Bangladesh remains low and was around \$260 in 1997/98. In addition, more than half of the population has income levels below the poverty line (Government of Bangladesh [GOB] and Macro International Inc., 1997).

1.3 Characteristics of Health System

1.3.1 Health Status Indicators

Bangladesh is a relatively small country that has experienced very high rates of population growth in the last 50 years. The population increased from 42 million in 1941 to approximately 123 million in 1997. At the same time, numerous improvements have been made in lowering fertility and mortality in the country. The total fertility rate, the average number of children per woman, has

declined from 6.3 in the mid-1970s to less than 3.3 in 1996/97 (GOB and Macro International Inc., 1997).

The infant mortality rate has decreased by almost 50 percent from 150 deaths per 1000 live births in 1975 to 77 in 1998. The decline has been faster in urban areas than in rural areas. However, health differentials can be found in urban areas as well and mortality indicators are higher in slum areas than in non-slum areas.

The main causes of child morbidity and mortality are preventable and include acute respiratory infections, diarrhea, malnutrition, measles, and neonatal tetanus (Perry 1997). A study in 1997 (Levin et al., 1998) found that childhood morbidity was common and that 51 percent of children surveyed had had an illness episode in the preceding two weeks. The most common illnesses reported by the caretakers in the study were acute respiratory infections and diarrhea.

Table 1. Health Status Indicators from 1975–1998

Indicator	1975	1988	1994	1998
Crude Death Rate	19	11.3	NA	10.6
Infant Mortality Rate	150	110	88	77
Life Expectancy	46	NA	57	NA

Source: GOB and Macro International 1997

One explanation for the continued importance of infectious diseases in Bangladesh is the lack of basic sanitation among the population. Although most of Bangladesh's population has access to clean drinking water, less than half have adequate sanitation facilities. Only 43 percent of the population has access to hygienic toilets while 26 percent have no access at all to toilet facilities.

1.3.2 Bangladesh's Health Care System

1.3.2.1 Government Health System

The structure of the health system differs in rural and urban areas. The services in the rural areas are administered by the MOHFW. There is a tiered structure with hospitals found at the district level and thana levels, family welfare and health clinics at the union level (administrative unions have population sizes ranging from 20,000 to 50,000 people), and fieldworkers at the smallest unit, the ward.

At the ward level, services are provided through home visits and at outreach posts by two types of fieldworkers: the health assistant and the family welfare assistant. The country's 19,000 health assistants visit homes three times a week to inform clients of services, and they provide immunizations at outreach sites two times a week. The 23,500 family welfare assistants provide family planning methods (pills and condoms) and limited maternal health services at homes three to four times a week as well as motivate women to bring their children to the outreach sites for immunizations.

In the urban areas, the Ministry of Local Government, Rural Development and Cooperative (MOLGRD&C) is responsible for the provision of health and family planning services. Some of the local government's health facilities provide a variety of family planning and maternal and child health

services while others provide only immunizations for children and women. The central government provides some support, including the provision of commodities and supplies to these facilities.

1.3.2.2 Role of the Private Sector

The private sector can be divided into not-for-profit providers and commercial providers in Bangladesh. The not-for-profit providers are non-governmental organizations (NGOs). These facilities are an important provider of health and family planning services in urban areas and provide a variety of preventive and limited curative care. The Ministry of Health and Family Welfare subsidizes the NGOs' provision of immunizations by providing vaccines and supplies.

The commercial private sector provides mainly curative care services in Bangladesh, but has some limited involvement in preventive care services such as family planning and immunizations. The private sector in Bangladesh consists of trained allopathic private practitioners who provide services through pharmacies and doctor's chambers, and several types of untrained private practitioners: *kabiraj* (herbalists), homeopathic practitioners, and untrained allopathic practitioners (or village doctors). One study found that the most widely used practitioners for curative care in rural areas are the village doctors, also known as quacks, followed by homeopathic practitioners (Levin et al. 1998).

1.4 Summary of Bangladesh's National Immunization Program

1.4.1 History of the Program

The national immunization program began in 1979 and provided immunization services from fixed centers. It was funded primarily by UNICEF. The program had insufficient funding, only \$1.5 million, and stockouts of vaccines were common. This service delivery strategy was not very effective, and, by 1985, only 2 percent of infants were fully immunized (Khan and Yoder, 1998).

In 1985, the government of Bangladesh (GOB) launched the Expanded Programme on Immunization. With financial assistance from bilateral and multilateral donors, especially Swedish International Development Agency (SIDA) and UNICEF, the program aimed to achieve 80 percent coverage of children under one year of age by 1990. The plan for the program was to gradually expand service delivery so that all *thanas* and unions were covered. As part of the program, workers in rural areas provided immunizations from eight outreach sites in each ward during a month. This expansion also required that improvements take place in the cold chain, logistics, training, communications, and information systems.

Immunization coverage was expanded to 190 of 460 *thanas* in 1989, and the national coverage for DPT3/OPV3 (diphtheria, pertussis, tetanus/oral polio vaccine) increased to 22 percent in the first year of life. By 1991, a coverage survey found that the coverage for DPT3/OPV3 had increased threefold to 68 percent

During the period from 1993 to 1995, the goal of the program was to raise the coverage rate to 85 percent. In addition, local leadership in EPI activities was encouraged, health workers were trained, NGOs were asked to participate in provision of services, and integration of immunization services with other health services was attempted.

Since 1995, the program coverage has plateaued, and may even have declined according to the latest coverage survey. The percent of children fully immunized by age one has stayed at 54 percent and the coverage for DPT3/OPV3 in 1998 was still 68 percent (see Table 2).

Table 2. Immunization Coverage

Vaccine	1989	1991	1993	1995	1998
BCG*	NA	89	89	94	91
DPT3/OPV3	22	68	63	73	68
Measles	NA	NA	59	61	62
Fully Immunized Child**	NA	NA	50	54	54
Tetanus Toxoid 2	NA	NA	80	88	86

Source: MOHFW 1998

*Bacillus Calmet-Guerin vaccine against tuberculosis

** Fully immunized child is the number of percentage of children receiving valid doses of immunizations (3 DPT shots, 4 OPV, 1 BCG, and 1 measles) by the age of 12 months

A new EPI five-year plan was developed and approved in 1996 with a goal of 90 percent coverage.

1.4.2 Current Service Delivery Strategies

The service delivery strategies differ for rural and urban areas. In the rural areas, immunizations are delivered through several strategies: (1) monthly, weekly, or daily sessions at district hospitals and rural subdistrict hospitals, (2) monthly or weekly sessions at union-level clinics, (3) weekly outreach sessions in each ward (24 sites per union), (4) quarterly catch-up campaigns, where registers are used to identify leftouts and dropouts for home visits and referrals, (5) annual campaigns for inaccessible and low coverage areas, and (6) national immunization days (NIDs) for polio and Vitamin A (MOHFW 1998).

In urban areas, immunization services are delivered regularly from sites on a weekly basis. Since the local government has limited staff, the services of city/municipal vaccinators are supplemented by service provision at hospitals, by NGOs, and by private for-profit providers.

1.4.3 Cost Recovery

No official fees are charged for immunization at central government facilities or outreach sites. However, fees are charged by other providers. At least one local government, Chittagong, is charging a nominal fee of Taka (TK) 2 (US\$.04) for immunizations. In addition, fees of about TK 5-10 (\$.10-\$.20) are being charged by NGOs and private for-profit providers.

1.4.4 The Vaccine Independence Initiative

Bangladesh has been using the Vaccine Independence Initiative to purchase DPT vaccine since 1994/95. The advantages to this procurement mechanism over regular procurement of vaccines through UNICEF are that payment can be made with local currency and that payment does not need to be made until the order has been received. This is made possible by the establishment of a Revolving Fund at UNICEF headquarters, which in the case of Bangladesh was capitalized by USAID and the United Kingdom. The Revolving Fund is used as a line of credit to cover the lag time

between the time the vaccines are paid for in advance by UNICEF in dollars and the country reimburses UNICEF in local currency upon delivery of the vaccines. In addition, the unit cost of vaccines procured through UNICEF is likely to be lower than other sources because it has volume discounts since it purchases such large quantities of vaccines.

The VII for Bangladesh was established with an initial capitalization of \$1.05 million provided by USAID and the United Kingdom. The government of Bangladesh has a single contract with UNICEF to buy DPT¹ through the VII, and negotiates the exact terms of the payments and delivery each year. This contract will continue until the year 2000 and will be up for negotiation at that time.

1.4.5 The 1998–2003 Health and Population Sector Program

A fifth five year plan has been developed by the Ministry of Health and Family Welfare, the World Bank, and other donors for the period of 1998–2003 and is known as the Health and Population Sector Programme (HPSP). In the plan, several changes to reform the health and population program are to take place and a package of essential health care services is to be introduced. One important change is that the program will shift from a project-driven approach to a program approach with a sectorwide policy framework. Changes to the health and population program include: (1) the health and family planning branches are to be more fully integrated, (2) a pooled funding mechanism is to be put into place, and (3) the rural service delivery system is to be shifted from community-based fieldworkers to fixed clinic delivery.

The effect of the HPSP on the national immunization program will be in two areas: (1) service delivery, and (2) procurement. The planned change in service delivery will take place in 2000 or 2001 and will have health assistants provide services from one community clinic within each ward eight times a month rather than at eight outreach sites. The implication of the new delivery strategy on the cost of the national immunization program will be explored in a later section of this paper.

Another effect of the HPSP on the national immunization program is the change to the procurement mechanism. Rather than having the EPI procure vaccines, supplies, and equipment directly as it did in the past, under the HPSP, all materials are now obtained through a unified procurement system in the MOHFW. The effect of this new system has been to centralize the decisionmaking on use of resources, and, in the short term (1998–99), has resulted in logistical problems in the shift over to the new system, i.e., there has been a slowing of the disbursement of funds for transport and other operational costs.

1.4.6 1998 EPI Programme Review

An international team composed of donor and international organization representatives as well as MOHFW personnel reviewed Bangladesh's EPI in mid-1998. The report noted the significant achievement of the program in increasing the coverage from 2 percent in 1985 to 92 percent for BCG and 62 percent for measles in 1997.

Issues that were identified by the team were the following: (1) inadequate waste disposal of syringes, needles, and partly filled vials of vaccines and drugs in health facilities, (2) insufficient

¹ Originally, there were plans to buy tetanus toxoid as well with the VII, but now the funds are only being used for DPT, probably because of access to the other vaccines through other mechanisms (donors and World Bank loans).

refresher training of mid-level managers and EPI workers, (3) inaccuracy of immunization targets provided by EPI to thanas because of poor information on population growth, birth rates, and infant mortality, (4) low immunization coverage rates in parts of Bangladesh, (5) inadequate sterilization of needles and syringes used for immunization, and (6) excess stocks of OPV and, often, measles and tetanus toxoid vaccines. Regarding the issue of financing, the report notes that many of EPI's traditional external partners are shifting their support to other health and development needs, and recommended that a 5-10 year financing plan for EPI be developed.

In addition, the report notes that MOHFW decision makers are considering whether to add new vaccines to the EPI schedule (Hepatitis B and DT or Td for school children). However, because the current program needs to be strengthened, the team recommended that priority first be given to maintenance of the existing program. In addition, the team recommended that the financial and operational implications of introducing a new vaccine take place due to the high unit costs of newer vaccines. Without an assured source of funding for at least four to five years, the introduction of the vaccine will not have the desired effectiveness.

1.4.7 Future Plans and Goals of Bangladesh's National Immunization Program

Partially as a response to the EPI Programme Review as well as National Coverage Evaluation Surveys, the MOHFW is planning for a number of changes to take place in its national immunization program over the next several years. These include: (1) improving coverage in low-performance areas such as Sylhet and Chittagong, (2) improving sterilization of needles and waste disposal at health facilities, (3) provision of services in rural areas from community clinics at the ward level under the HPSP, (4) additional refresher training, (5) replacement of the cold chain system, and (6) introduction of Hepatitis B vaccine in selected areas. Analysis of how these changes will affect the cost and financing of the Bangladesh immunization program—under different scenarios and assumptions—constitutes a major component of this study. The following factors need to be taken into account.

The 1998 National Coverage Evaluation Survey identified that the coverage within the country is uneven. The percent of children less than 12 months old fully immunized is lowest in Chittagong (and Sylhet) Division (48 percent). Also, some thanas in Dhaka Division and one in Rajshahi Division were found to have low coverage for measles and OPV3 (MOHFW 1998). The government would like to have special catch-up campaigns to improve immunization coverage in these areas, involving, for example, extra sessions and a communications campaign.

Inadequacies in the sterilization practices for reusable syringes should be addressed by a sterilizing system using sterilizer drums, Time, Steam and Temperature indicator (TST spots), and existing autoclaves. UNICEF has already begun supplying some thanas with sterilizer drums and TST spots.

One possible way to rectify improper disposal of syringes is to introduce clinical waste incinerators at health facilities.

The new service delivery structure in rural areas that is being introduced under the HPSP will have an effect on service costs and needs to be costed out.

Regular refresher training for mid-level managers that would improve the quality and effectiveness of service delivery needs to be costed out.

Some elements of the cold chain will need to be replaced in the next five years. For example, EPI refrigerators are being replaced gradually with CFC-free refrigerators. The 1996 Five Year Plan for EPI has called for the construction of additional cold rooms.

Considerable discussion is taking place within Bangladesh as to whether it should introduce Hepatitis B vaccine. The additional costs of introducing the vaccine in the program in selected areas or countrywide should be costed out to help policymakers with decisionmaking on this issue.

2. Study Objectives and Methods

2.1 Objectives and Research Questions

The objectives of this study are to: (1) draw lessons learned concerning immunization financing strategies in Bangladesh that other countries and the international health community can use in planning sustainable financing of immunization programs with country resources; (2) estimate the current and future costs of the Bangladesh immunization program, including the additional costs of introducing new vaccines and other innovations and improvements, both to assist the country in planning its program and to update and add to the available information on immunization costs for the global community; and (3) provide recommendations to the Bangladesh government on ways to improve its immunization financing strategies for the current program as well as for the introduction of additional vaccines and other innovations or improvements.

The types of current or potential future sources and strategies for financing immunization services that this study considers are the following: central government allocations; donor contributions; local government allocations or contributions; cost recovery mechanisms in the public sector, such as fees for vaccination cards or the use of curative care fees to cross-subsidize immunization and other preventive health services; out-of-pocket fees for services in the private sector; and various mechanisms for procuring and financing vaccines, including direct procurement on the international open market through a tender and bid process or by negotiating directly with one or more suppliers; participation in the Vaccine Independence Initiative; or procurement from local vaccine producers.

The main research questions that this case study will attempt to answer are the following:

> Costs

What are the annual costs of the current national immunization program in Bangladesh, including both recurrent and capital costs?

What are the costs of the national immunization days vs. the routine program costs?

What are the projected costs of the program for the next five years, including the additional costs of each innovation and change being considered?

What are areas for possible cost savings and what degree of cost savings are possible?

> Financing

What is the mix of financing strategies that the country has been using to fund immunization services and the procurement of vaccines?

How successful have each of these strategies been in terms of securing sufficient funding for immunization services as a whole and for key components, such as vaccines, cold chain, outreach, refresher training, and personnel? maintaining or increasing coverage? preventing

inequities in coverage (e.g., between urban and rural areas)? maintaining or increasing the quality of the vaccines and the program? mobilizing new resources for the national program? encouraging efficient use of resources (e.g., minimizing waste)?

How successful has the VII been in Bangladesh in meeting the country's vaccine needs?

How do immunization financing strategies compare with the strategies used for all other health services? Is Bangladesh using the full range of financing strategies available in the country's health system? If not, why not?

> Financing for the future

What are the projected needs for the next five years to finance the current program as well as the addition of new vaccines and other innovations and changes being considered? What is the projected funding available for the next five years and the projected funding gap?

How can Bangladesh improve upon the current financing strategies and the mix of strategies being used for immunizations in order to be able to develop sustainable financing for the national immunization program, including other planned changes?

What are appropriate financing mechanisms for the planned improvements and changes? Can they be funded under existing strategies and funding sources or must new strategies be developed?

Which findings can be generalized for other countries with similar economic, health financing, and immunization program circumstances?

2.2 Methodology

2.2.1 Data Collection Process and Data Sources

While some of the information on the sources and uses of financing for the national immunization program was already available from a PHR report on the costs of the program (Khan and Yoder, 1998), additional data collection was required for this study, because most of the data were aggregated. The data that needed to be collected were the following: contributions of government, disaggregated by type of input (e.g., personnel, vaccines, supplies); contributions of donors, disaggregated by type of input; contributions of local governments, disaggregated by type of input; contributions of NGOs (mostly donor-financed), disaggregated by type of input; and contributions of the private for-profit sector.

The data on contributions of the central government, donors, and NGOs were collected in Dhaka from EPI headquarters, donor databases (e.g., SIDA), and projects that support NGOs (e.g., Urban Family Health Partnership, Rural Service Delivery Project, Bangladesh Population and Health Consortium, and Bangladesh Rural Advancement Committee).

In addition, a survey of municipalities was conducted to obtain data on contributions of local governments towards the national immunization program. Of the 191 municipalities in Bangladesh, the survey collected data in 28 sites: the four city corporations, 12 large municipalities, and 12 small municipalities. A questionnaire was developed by the team for this activity.

To find out about the provision of immunization services by the for-profit sector, the team also conducted a survey of 23 private clinics and doctor's chambers in Dhaka City. The survey asked questions about the type of antigens offered by private providers, source of procurement of vaccines, charges for the service/vaccine, and quality of service provision.

Interviews were conducted with a large number of key informants to assess future requirements of the program. In-depth interviews were conducted with members of the MOHFW as well as with international organizations and donors: UNICEF, USAID, SIDA, the BASICS project, the World Health Organization (WHO), the British Department for International Development (DFID), and the Japanese International Cooperation Agency.

A field trip was made by team members to a government immunization delivery point in the Savar Thana. Team members interviewed the health assistant, assistant health inspector, and clients who were present at the outreach clinic. Specific information was obtained on the use of sterilization equipment, vaccine wastage, average attendance at sessions, and willingness to pay for immunization sessions. The team also visited the Thana Health Complex, the local hospital at Savar, to obtain information on cold chain equipment and the district's immunization coverage rates.

Information on immunization coverage rates were obtained from National Coverage Evaluation Surveys.

2.2.2 Methods of Analysis

Both expenditures and estimated costs were examined to determine trends in financing of the national immunization program. The first analysis was to examine the source and use of spending on the national immunization program and their changes over time and is presented in Section 3. The analysis is divided into data on EPI and NIDs, individually, and EPI and NIDs combined. However, data on the contributions of the local government and donor-funded NGOs could only be examined for 1997/98.

The second analysis was to estimate the costs of the program in 1997/98. This analysis was undertaken to estimate actual costs of the program, rather than to examine expenditures in a particular year. It gives a more accurate picture of total costs since it includes annualized capital costs. It also estimates costs based on needs rather than on budget allocations. The analysis is divided into the costs of routine EPI, NIDs and surveillance, and also presents the total costs of the combined program.

Since the focus of the cost analysis for this case study is on the costs of the program to the government of Bangladesh, this analysis does not try to estimate costs to the users of the immunization program, such as costs of travel to a health facility and so forth. The study concentrates instead on what the MOHFW and its partners currently spend and will need to spend in the future, to provide immunization services with acceptable levels of quality and coverage.

This analysis is a cost estimation using existing data. More refined work on costs could be done if it were possible to collect primary data. This cost exercise uses a mix of available expenditure, budget allocation, and cost information in order to approximate the total annual costs of the national immunization program.

2.2.2.1 Description of Variables

Recurrent Costs

Calculating personnel costs includes apportioning salaries and benefits of staff involved in the management and provision of immunization services, based on percentages of total time spent. Staff involved at the service delivery level in rural areas include the health assistants and their supervisors, the assistant health inspector, and the health inspector. A percentage of the time of other service delivery personnel, family planning personnel, the family welfare assistant, and the family welfare visitor was also included, since they take part in social mobilization. The costs of managerial personnel at the various levels of the health system were also included (headquarters, division, district, and thana). In urban areas, the salaries of staff such as medical officers, sanitary inspectors, vaccinator supervisor, health assistant, and vaccinators were included.

The vaccine costs include the cost of vaccines based on unit costs, targeted population size, and a calculated wastage factor (wastage coefficient), based on vials dispersed and doses administered.

The costs of supplies include the value of items such as needles, syringes; information, education and communication (IEC) materials; vaccination cards; registers; and ice packs.

The transport costs include the costs of transport of vaccines and supplies from the central level to the division, district, and subdistrict levels. In addition, it includes transport of the commodities and supplies from the storage area to the outreach sites, i.e., the cost of porters to carry the commodities to outreach sites in rural areas, and costs of local transport in urban areas.

The maintenance and overhead costs include overhead costs, such as electricity, as well as maintenance of cold chain equipment

Short-term training costs consist of expenses for short-term, in-service training related to immunization for any type of health personnel that take place annually.

Capital Costs

Capital costs are the annual costs of resources that have a useful life of more than one year; i.e., they are not consumed or replaced every year. The purchase cost of capital goods such as equipment or buildings (also called capital investment) is distributed across the estimated useful life of the investment item, with adjustment by a factor that accounts for the opportunity cost of having money tied up in capital. This process is called amortization, or annualization. For the purposes of this analysis, the adjustment factor used was 5 percent.

The cost of buildings involves the annualization of EPI-related buildings using the construction cost per square feet. The cost of equipment includes annualization of costs for cold chain and laboratory equipment. The cost of vehicles include the annualized cost of vehicles based on the type and numbers of vehicles used by the Ministry of Health for immunization activities. Last, the cost of long-term education/training includes the cost of any long-term education, with or without a degree, that is provided to staff.

2.2.2.2 Calculating Future Vaccine Needs

Vaccine needs for the next five years were estimated using two methods: the population-based method and the session method. Since UNICEF is currently using the session method to calculate needs for two antigens, BCG and measles, this method was used for these two antigens.

For the other antigens, the population-based method was used to calculate vaccine needs. Target populations were estimated using the official global projected figures from the last census and demographic indicators (crude birth rate, infant mortality rate). Since BCG is given to newborn children, the number of live children born during the year was used as the target population. For the other antigens, the average population for children under one was calculated, taking into account infant mortality rates.

Estimates of immunization wastage rates were calculated by antigen using vials disbursed and the number of doses administered for the years 1993–1998. The desired coverage rate was assumed to be 90 percent for the current vaccine needs analysis. To calculate future vaccine needs, the current vaccination schedule and policy is assumed.

2.2.3 Financing Analysis Methods

Estimated costs are used as a basis for the financing analysis, as opposed to expenditures. This allows accounting for all resources to the program, several of which would not appear in expenditure reports, including costs of the use of capital goods. Since the cost analysis required a number of assumptions, the same cautions that apply to that analysis should be taken in interpreting the results of the financial analysis.

Three different types of costs for the financing analysis are calculated. The first is the *total estimated costs* of running EPI, no matter who bears these costs. Total costs include the proportion of overall health-related capital costs—health facilities, government vehicles, equipment, etc.—that are attributable to immunization services, as well as the estimated health personnel costs that go toward the services. The total cost analysis presents a picture of which funding sources are contributing to the national immunization program and to each cost category.

The second type of cost estimate includes the “*program-specific*” costs of the immunization program. These include only the costs that are incurred specifically for the delivery of immunization services, over and above the costs shared with other health activities and regardless of who pays for them. Thus, EPI program-specific costs exclude health personnel costs and capital costs such as those enumerated above (facilities, vehicles, etc.) since these costs are shared with other MOHFW programs and would be incurred by the MOHFW with or without the national immunization program. Program-specific costs include all recurrent variable costs required to provide immunization services, such as vaccines; syringes, needles, and other vaccine supplies; transportation (i.e., fuel and porter) for both the NIDs and routine services; maintenance and overhead; IEC/social mobilization costs; and immunization-related equipment, such as cold chain and sterilization equipment.

Program-specific costs are useful to MOHFW and EPI managers in determining exactly what it costs specifically to provide immunization services and in planning program changes, such as how to eventually replace the NIDs and who will bear these costs. For the analysis of current financing of the program (Section 4), the financing picture is presented both in terms of *total costs* and *program-specific costs*.

A third set of costs, *recurrent, variable, non-personnel costs*, are costs that the MOHFW must mobilize each year for the national immunization program—either from its own budget or from donors. These cost estimates are most useful to the MOHFW in planning the financing of the national immunization program. They include vaccines, syringes and other supplies, and other recurrent costs, such as maintenance, transportation costs incurred by the MOHFW, IEC, and short-term training. They exclude personnel costs, since health personnel giving immunizations are shared with other health programs. They also do not include equipment costs, since they do not constitute regular operating costs that the government must pay for each year.² In this analysis, these costs are used as the basis for estimating the additional costs of, and financing required for future planned improvements, such as improving the cold chain system (Sections 5 and 6). They are also used as the basis for the possible future financing scenarios presented in Section 6.

2.2.4 Study Constraints and Limitations

Limited data on the contribution of non-MOHFW financing sources for immunizations, such as private sector contributions, particularly for the NIDs, did not allow them to be included in the analysis. In addition, the lack of local level data on population size did not allow more detailed vaccine needs projections to be conducted.

Data limitations and the fact that plans are still being developed also made it impossible to provide meaningful cost projections for some of the planned additions and changes to the national immunization program.

² However, they do include costs of maintaining and operating equipment.

3. National Immunization Program Expenditures and Estimated Total Costs in 1997/98

In this section the expenditures and estimated total costs for the national immunization program in 1997/98 in Bangladesh are presented. The same categories as those used by the Ministry of Health and Family Welfare accounting systems are shown for the expenditures. The expenditures for the routine EPI and the national immunization days are shown separately because funding differs for the two, and change over time in financing trends is reflected more accurately with this breakdown. It should also be noted that since some of the data were obtained from surveys, complete information is available only for 1997/98.

Estimated total costs are also shown since they indicate the value of resources used for the program regardless of its source, as opposed to expenditures or flows of money through the system for goods or services that are subject to annual variation. These costs are disaggregated into capital and recurrent costs.

The section first looks at program expenditures for the routine EPI, the NIDs and surveillance, and for the program as a whole. It then examines the estimated costs for 1997/98, again for the routine EPI, the NIDs, surveillance, and for the program as a whole. Last, it presents the recurrent, variable, non-personnel costs.

3.1 Expenditures for the National Immunization Program in 1997/98

The expenditures for the national immunization program are presented in this section. The tables contained herein indicate the amount of contributions made for routine EPI and NIDs and for the total program during the year 1997/98.

3.1.1 Program Expenditure for Routine EPI

The total expenditure on routine EPI activities in 1997/98 was approximately \$29.8 million, or 13,723 Lakh (lakh = 100,000) Taka. The expenditure categories for routine EPI include EPI-related personnel salaries and benefits (see section 3.2 for details of calculation), vaccines, operational costs (supplies, transport, and social mobilization), monitoring and surveillance (e.g., surveys, training), equipment, construction, and vehicles.

Table 3 presents the expenditures by uses. The largest expenditures were for personnel, vaccines, and operational costs.³ Expenditures for personnel comprised over half (54 percent) of total EPI expenditures while those for vaccines made up 36 percent. Operational costs for supplies, transport

³ However, it should be noted that the percentage that these program expenditure categories represented of total expenditures was high in part because no expenditures for construction and vehicles, and only a small amount for equipment, took place during this year.

and social mobilization were about 9 percent of total expenditure. Other expenditures, including those for monitoring and surveillance and equipment, comprised less than 2 percent. Less than 1 percent of expenditures were for capital goods, i.e., equipment and construction.

Table 3. Expenditures for Routine EPI by Uses

Expenditure	Lakh Taka	US\$	Percentage
Personnel	7,462.00	\$16,221.74	54.4%
Vaccine	4,879.80	10,608.26	35.6%
Operational Cost	1,162.71	2,527.63	8.5%
Monitoring and Surveillance	124.07	269.72	0.9%
Equipment	89.75	195.11	0.7%
Construction	5.00	10.87	0.0%
Vehicles	0.00	0.00	0.0%
Total	13,723.33	\$29,833.33	

3.1.2 Program Expenditure for NIDs

Two NIDs were held during 1997/98. During these NIDs, OPV and Vitamin A were distributed to children under the age of five. The additional expenditures specifically for these NID activities are categorized as the following: personnel, vaccines, operational costs, monitoring and surveillance, and equipment. Since expenditures on NIDs and acute flaccid paralysis (AFP)⁴ surveillance activities were not available separately, they are shown in combination together in Table 4. However, the share for surveillance is likely to be small.

The total costs of NIDs were approximately \$9.0 million or 4150 Lakh Taka. The composition of expenditures for the NIDs differed from those for the routine program. Vaccines was the largest category of expenditures (77 percent), while expenditures on health personnel were relatively small (16.5 percent), reflecting the small time requirement for these workers to participate in national immunization days.⁵ It should be noted that these expenditure estimates are probably not complete, since they do not include private in-kind contributions from the communities where the campaign took place.

Table 4. Expenditures for NIDs and Surveillance

	Lakh Taka	US\$	Percentage
Personnel	684.06	\$1,487.09	16.5%
Vaccine	3,210.6	6,979.57	77.4%
Operational Cost	159.0	345.65	3.8%
Monitor and Surveillance	72.0	156.52	1.7%
Equipment	24.0	52.17	0.6%
Total	4,149.66	\$9,021.00	100.0%

⁴ AFP surveillance is conducted to determine if cases of poliomyelitis is occurring.

⁵ It was assumed that each type of health personnel spent approximately 11 days for preparatory activities and service provision or supervision for each of the two national immunization days based on discussions with MOHFW personnel.

Other expenditures for NIDs included those for operational costs (4.2 percent), monitoring and surveillance (1.9 percent), and equipment purchased (cold chain laboratory) (0.6 percent).

3.1.3 Total Program Expenditures

The total expenditure for the national immunization program (routine EPI plus NIDs and AFP surveillance) was found to be approximately \$39 million, or 17,800 Lakh Taka (Table 5), with the expenditures for NIDs and surveillance at about one-fifth of the total.

The proportions of total expenditures going for personnel and vaccines were similar, at 45 percent each.

Table 5. Expenditures on the National Immunization Program, 1997/98

	Lakh Taka	(US\$000s)	Percentage
Personnel	8146.5	\$17,704.61	45.7%
Vaccines	8090.4	17,588.26	45.4%
Operational Costs	1321.7	2,527.98	6.5%
Monitoring and Surveillance	196.07	426.24	1.1%
Equipment	113.8	274.28	0.7%
Construction	5.0	10.87	0.0%
Total	17836.4	\$38,774.78	100.0%

3.2 Current Costs of National Immunization Program

The estimated costs of Bangladesh's national immunization program are presented in this section. The costs are divided into recurrent and capital expenses and looked at by routine EPI, NIDs, and surveillance activities. Costs differ from expenditures in that they are needs-based⁶ rather than based on amounts contributed or purchased for the program. They include annualized costs of capital goods.

3.2.1 Estimating Costs of the Routine EPI

3.2.1.1 Recurrent Costs

The recurrent costs of the national immunization program include the cost of personnel, vaccines, supplies, transport, social mobilization/communications activities, and maintenance and overhead.

A very large cadre of personnel—including those from the field level, thana level, district level, division level, and MOHFW headquarters—contribute time to the immunization program.

⁶ That is, the costs of items are based on estimated needs such as the amount of vaccines that should be administered in a given year given the target population size, appropriate number of doses, and wastage coefficients.

Approximately 19,000 health assistants provide immunization services at outreach sites in rural areas, while 23,000 family welfare assistants inform clients of the sessions as well as assist at the sites. The managerial staff for the program includes 157 personnel at headquarters, 36 at divisional offices, 606 at district offices, and 8,000 at thana offices. Additional personnel provide services at immunization sites in urban areas (both those of the local government and NGOs). This study estimates the value of their time spent on immunization activities. (See Annex B for the designation of employees, their number, and an estimated percentage of their time that is spent on immunization.)

Estimating EPI personnel costs involves determining the value of their time spent on this activity. In order to determine that value, the approximate percentage of total time that each type of worker spends on EPI⁷ is multiplied by their annual salary and benefits.

The cost of vaccines was calculated by estimating the amount of vaccine required for the target population, taking into account desired immunization coverage and wastage. The costs of other categories were calculated through estimating average annual or monthly costs. For example, the cost of transport is assumed to be the fees for porters who carry the vaccines and cold carriers.

3.2.1.2 Capital Costs

Capital costs include those of buildings, cold chain and laboratory (for surveillance) equipment, and vehicles. The costs of buildings were based on estimated construction costs per square foot for EPI-related buildings. These were multiplied by average square footage and percentage of time used for the EPI. A standard 20-year life of a building and an interest rate of 5 percent were used in this study.

The study also determined the annualized value of services derived from the use of vehicles. It assessed the value of vehicles used by the EPI in 1997/98 using information on prices for each type of vehicle, number of each type of vehicles, useful life of the vehicles, and an interest rate of 5 percent.

Cold chain equipment costs were estimated through valuing the equipment that was used in 1997/98. The equipment includes refrigerators, cold boxes, and carriers. The items were valued using current prices, number of pieces of equipment, useful life, and an interest rate of 5 percent. The costs of laboratory equipment used for AFP surveillance were also annualized.

Training that accounted for capital costs includes long-term training. An adjustment to the benefit derived from this training was made since trained personnel are often transferred to another department of the government or could leave public service altogether.⁸

3.2.2 Total Estimated Annual Costs of the Routine EPI

Table 6 shows the estimated costs of the routine EPI in Bangladesh in 1997/98. The total cost was estimated to be 13,380 Lakh Taka or \$29.0 million. The majority of total program costs were recurrent (89 percent), with capital costs comprising only 10 percent. Most of the recurrent costs were

⁷ The majority of personnel perform other non-EPI tasks.

⁸ An example of this is the following: Long-term training is given to 10 persons at a cost of \$4,000. The mean remaining career of these people is 10 years with the EPI, since some are transferred in one to two years, others retire or leave the Ministry, and still others continue for 20 years. Thus, the per person year of EPI costs of long-term training is $\$4,000/(10 \times 10) = \40 .

for personnel (56 percent) and vaccines (27 percent). The remaining 6 percent consisted of the cost of supplies, transportation, social mobilization, and maintenance and overhead. Capital costs were mostly the costs of buildings and equipment.

Table 6. Estimated Costs of the Routine EPI

Cost Category	Lakh Taka	US\$	Percentage
Recurrent Costs			
Personnel	7,462.00	\$16,221,739	55.8
Vaccines	3,566.00	7,752,000	26.7
Supplies	386.90	841,087	2.8
Transportation	188.67	410,152	1.4
Short-term Training	21.95	47,717	0.2
Social Mobilization	125.74	273,347	0.9
Maintenance and Overhead	149.98	326,043	1.1
Subtotal	11,901.78	\$25,872,085	89.4
Capital Costs			
Building	800.00	1,739,150	6.0
Vehicles	92.20	200,478	0.7
Equipment	516.20	1,122,000	3.9
Long-term Training	6.93	15,180	0.5
Subtotal	1415.33	3,076,304	10.6
Total Annual Costs	13317.11	\$28,948,889	100.0

It should be noted that estimated costs were lower than expenditures largely because estimated vaccine need was lower than the amount actually expended for vaccines.⁹

3.2.3 Estimated Annual Additional Costs of the NIDs

Some of the assumptions that were made in the estimation of annual additional costs of the national immunization days were the following:

- > For personnel costs, it was estimated that health personnel spent 10–12 days in preparatory activities and service delivery for the two NIDs held in 1997/98. In addition, per diem of TK 10 per NID was calculated for the volunteers who assisted in service delivery.
- > Vaccine costs were calculated based on the target population size, average price per vial during 1997/98, and wastage coefficient for OPV.
- > The costs of supplies and transportation were calculated by totaling expenditures from three sources: UNICEF, USAID, and local government.

⁹ This occurs because expenditures on vaccines are often based on availability of financing in a particular year. Expenditures in a given year may, for example, exceed costs, for catch-up reasons or for other reasons other than need.

- > Social mobilization costs were based on calculating the costs of conducting advocacy and planning meetings in *thanas* and unions as well as undertaking communication activities at the ward levels in preparation for NIDs.
- > The annual cost of NID-specific cold chain equipment (vaccine carriers and ice packs) was estimated by calculating the total expenditures during a five-year period, life expectancy of the equipment, and then deriving the annual cost.

Because additional information was not available on the contributions of schoolteachers and communities, these were not included in the calculations.

The additional costs associated with the two NIDs held in 1997/98 were found to be \$5.4 million (Table 7). Because the number of days spent on NIDs-related activities was relatively small (20 days per year) compared to routine EPI activities, most of the costs for this activity were for vaccines (54 percent). Next most costly was personnel time, which accounted for 28 percent of total costs. Other cost categories included supplies (6 percent), transportation (3.5 percent), and social mobilization (4.6 percent). The one capital cost was the annualized cost of cold chain equipment, which was 4.7 percent of additional costs for the NIDs.

Table 7. Estimated Additional Costs of the National Immunization Days

Cost Category	Lakh Taka	US\$	Percentage
Recurrent Costs			
Personnel	684.06	\$1,487,087	27.6
Vaccines	2,742.50	2,896,201	53.7
Supplies	147.60	320,870	6.0
Transportation	85.80	186,522	3.5
IEC and Social Mobilization	114.20	248,261	4.6
Subtotal	3,774.20	\$5,138,941	95.3
Capital Costs			
Cold Chain Equipment	115.86	251,870	4.7
Total Annual Costs	3,890.00	\$5,390,811	100.0

3.2.4 Surveillance

Table 8 shows the expenditures and/or estimated costs of surveillance activities in the country during 1997/98. The costs of surveillance were estimated based on the following assumptions:

- > Five health personnel work full-time as supervisors of the surveillance system within each division.¹⁰
- > Supply costs were for expenditures made for stool sample kits by UNICEF.
- > Training costs were taken from information on expenditures for a training session on surveillance held during the period.

¹⁰ The costs of technical assistance from WHO and the U.S.-funded Centers for Disease Control and Prevention technical assistance were not added to this total.

- > Social mobilization includes the costs of several planning and advocacy meetings that were held in the country.
- > The costs of laboratory equipment were taken from expenditures made by Rotary International for the purchase of laboratory equipment.

Table 8. Estimated Additional Costs Associated with AFP Surveillance

	Lakh Taka	\$US	Percentage
Recurrent Costs			
Personnel	10.50	\$22,826	29.5
Supplies (stool sample kits)	5.50	11,900	15.5
Training	11.12	24,165	31.2
Social Mobilization	5.35	11,630	15.1
Sub-Total	32.48	70,521	91.3
Capital Costs			
Laboratory Equipment	3.11	6,756	8.7
Total Annual Costs	35.59	\$77,277	100.0

The cost of surveillance activities totaled 35 Lakh Taka or \$77,000. The costs were largely for personnel (30 percent) and training (31 percent). Other costs included supplies (16 percent) and social mobilization (15 percent). Annualized laboratory costs made up about 9 percent of total costs.

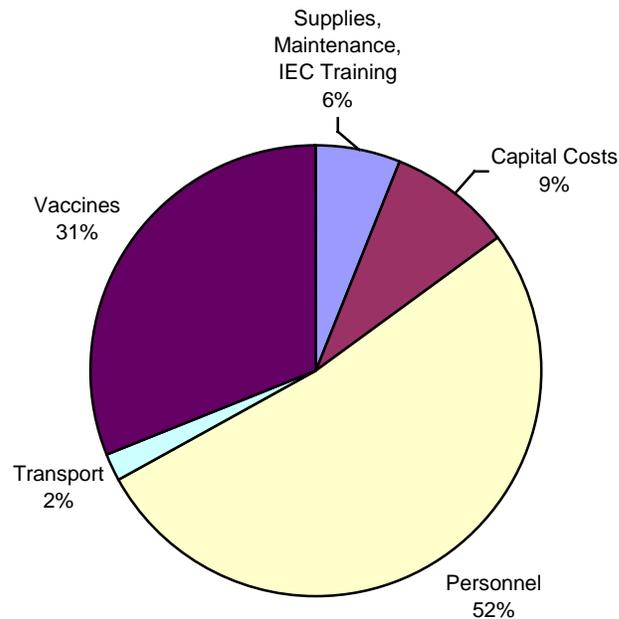
3.2.5 Estimated Total Cost of the National Immunization Program

The total cost of the national immunization program was \$34.4 million when the costs of NIDs and surveillance were added to routine EPI costs (Table 9). The highest proportion of cost was for personnel (51.5 percent), followed by vaccines (31 percent) (Figure 1). Routine program costs represented 84 percent of total costs, NIDs approximately 16 percent. Surveillance costs made up only a small proportion of total costs.

Table 9. Total Estimated Costs of the National Immunization Program, 1997/98 (US\$ 000s)

	Routine Program Costs	NIDS Costs	Surveillance Costs	Total Program
Recurrent Costs				
Personnel	\$16,221	\$1,487	\$23	\$17,731
Vaccines	7,752	2,896	NA	10,649
Supplies	841	321	12	1,174
Transportation	410	187	NA	597
IEC and Social Mobilization	273	248	11	532
Maintenance and Overhead	326	NA	NA	326
Short-term Training	48	NA	24	72
Subtotal	25,872	5,139	70	31,080
Capital Costs				
Building	1,739	NA	NA	1,739
Vehicles	200	NA	NA	200
Equipment	1,122	251	7	1,380
Long-term Training	15	NA	NA	15
Subtotal	3,076	251	7	3334
Total Annual Costs	\$28,947 (84.1%)	\$5,390 (15.7%)	\$77 (0.2%)	\$34,414 (100%)

Figure 1. Breakdown of Total Immunization Program Costs by Component, 1997/98



When the costs of the routine program and NIDs were compared, the composition were found to differ. The highest costs for the routine program were for health personnel, while the largest costs for the NIDs were for vaccines. The costs for vaccines for NIDs were only 20 percent lower than for the routine EPI since the target population was different (all children under five are vaccinated during NIDs). A second cost category that was particularly high for NIDs was that of social mobilization/IEC. In contrast, other costs of NIDs, such as supplies and transportation, were less than half of those of the routine EPI.

3.2.6 Recurrent, Variable, Non-Personnel Costs in 1997/98

The recurrent, variable, non-personnel costs that are used as the baseline for the cost and financing projections for the national immunization program in the future are shown in Table 10. They include the cost of the routine program and the national immunization days, as explained at the beginning of this section. The cost of NIDs and surveillance are included, because they will need to take place for at least the next five years.¹¹

¹¹ After polio is eradicated, NIDs and surveillance activities will have to be continued for at least three additional years until the South Asian Region is certified polio-free.

Table 10. Estimated Recurrent, Variable Non-Personnel Costs of the Immunization Program

Cost Category	US\$	Percentage
Vaccines	\$10,649	79.8
Supplies	1,174	8.8
Transportation	597	4.5
Maintenance and Overhead	326	2.4
IEC/Social Mobilization	532	4.0
Short-term Training	72	0.5
Total	\$13,349	100.0

The total costs are \$13.3 million. Most of these costs are for vaccines (80 percent). After vaccines, the next largest cost is for supplies (9 percent), followed by transportation (5 percent). Other costs include social mobilization (4 percent), maintenance and overhead (2 percent), and short-term training (0.5 percent).

4. Immunization Financing in Bangladesh: Description and Assessment

This section presents an assessment of immunization financing in Bangladesh. It first examines the trends in financing of the health sector as a whole and then looks at trends in financing of the national immunization program. It examines sources of finance for the program, by both expenditure and estimated costs for the year 1997/98, and their implications on the adequacy of finance and sustainability.

4.1 Trends in Overall Health Financing

4.1.1 Health Sector Financing

The public financing of the health sector is increasing over time. The share of total public spending for health and family planning has increased from 4.7 percent in 1986/87 to 7.5 percent in 1997/98 (MOHFW 1999). Per capita expenditures on health and family planning have doubled over the last five years, reaching \$3.80 in 1997/98.

The combined public and private expenditure on health and family welfare in 1996/97 was US\$10.59 per capita, 3.9 percent of GDP. This percentage is between those of neighboring countries, i.e., it is higher than that of Sri Lanka (3.4 percent) but lower than that of India (5.6 percent).

4.1.1.1 Government Budget Allocations

The expenditures on health and family planning are financed by two types of budgets: revenue and development. The revenue budget finances mostly salaries and benefits while the annual development budget (ADP) finances development activities through projects and programs. Table 11 indicates that the health sector's share of the revenue budget has stayed relatively constant at around 6 percent of total expenditures, while the development budget has increased annually during the last five years, from 6.7 percent in 1993/94 to 9 percent in 1997/98. In other words, the share of the GOB revenue budget going towards MOHFW expenditures is decreasing as the annual development budget is increasing.

The proportion of health and family planning expenditure financed by GOB (64 percent) and donors (36 percent) has stayed roughly the same over the last five years (MOHFW 1999).

**Table 11. Trends in MOHFW Revenue and Annual Development Program Budget Expenditures
(in crore* Taka)**

Year	Revenue	Revenue Budget Share in Total Revenue	Annual Development Budget	ADP Share in Total ADP	Total Budget	Share in Total GOB Expenditure
1993/94	503.8 (\$126.0 M)	6.6	568.6 (\$146.6 M)	6.7	1072.4 (\$268.1M)	6.6
1994/95	593.2 (\$148.3 M)	6.2	780.5 (\$195.1 M)	8.1	1363.6 (\$340.9M)	7.2
1995/96	646.6 (\$160.4 M)	6.0	812.3 (\$198.9 M)	8.5	1458.9 (\$357.3 M)	7.2
1996/97	733.1 (\$166.6 M)	6.2	1025.1 (\$233.0 M)	9.2	1758.2 (\$399.6M)	7.6
1997/98	786.24 (\$170.9 M)	6.0	1111.6 \$241.7 M)	9.0	1897.8 (\$412.6)	7.5

Source: MOHFW, 1999
Crore* =10,000,000 or 100 lakh taka

A breakdown of MOHFW expenditures (combining revenue and ADP spending) presented in Table 12 indicates that a large part of expenditures are for hospitals. About 60 percent of total expenditures are spent on hospitals, if thana-level facilities are considered hospitals.

Table 12. Percent of Total Expenditures for GOB Health and Family Planning Services, 1996/97

Service	MOHFW Budget (TK)	Percent Budget	Other GOB (TK)	Percent Other GOB Expenditures for Health	Total Expenditures (TK)	Percent Total
Administration	220.5	12.8	0.0	0.0	220.5	11.8
Hospitals	636.3	37.0	0.0	0.0	636.3	34.0
Thana-level Facilities	498.8	29.0	0.0	0.0	498.8	26.6
Lower-level Facilities	156.5	9.1	0.0	0.0	156.5	8.4
Other MOHFW and GOB Facilities	13.0	0.8	84.4	56.4	97.4	5.2
Education, research and training facility	192.0	11.1	59.0	39.4	251.0	13.4
NGO Providers	0.0	0.0	6.2	4.1	6.2	0.3
Total	1717.1	100.0	149.6	100.0	1872.9	100

Source: Data International, 1998.

4.1.1.2 Household Health Expenditures and Cost Recovery

A large proportion of total expenditures for health and family planning came from out-of-pocket expenditures in households, or \$6.80 per capita. The bulk of these expenditures was to drug retail outlets (73 percent) (Data International 1998). The remaining expenditures were to private practitioners and for laboratory tests.

4.1.2 Financing of Immunization Services in Bangladesh

This section discusses financing trends and the current financing situation of immunization services and compares them to the health sector as a whole. As in preceding sections, the discussion first looks at routine EPI, NIDs, and surveillance costs, and then at total costs.

Table 13 shows the trend of the total nominal expenditures for the immunization program in Bangladesh during the last five years. Year-to-year total expenditure steadily increased in all years but one; overall, total expenditures doubled from 1993/94 to 1997/98 due in part to a 50 percent increase in expenditure on EPI but even more to the addition of NIDs. Table 13 divides total expenditure into three components: expenditure for EPI, for NIDs, and for personnel. The personnel cost is broken out for both EPI and NIDs and shown separately in order to trace the trends of non-personnel costs. It is evident from the table that the cost of personnel accounted for a large portion of expenditure, with the annual proportion fluctuating over a wide range, from 31 to 47 percent. A similar trend is shown by the proportion of non-personnel expenditure for EPI, which fluctuated between 33 and 53 percent. In contrast, the proportion of non-personnel expenditure for NIDs varied within a very narrow range and in the last two years remained stable at 18 percent of the total program expenditure.

Table 13. Trend of Expenditure for EPI and NIDs during 1993/94–1997/98 (LakhTaka)

Year	Expenditure, Excluding Personnel		Cost of Personnel	Total Expenditures for EPI and NIDs	EPI and NIDs Share of MOHFW Budget	EPI Share of MOHFW Budget
	EPI	NID				
1993/94	4201.47	0.00	3731.82	7933.29	7.4	7.4
1994/95	6107.42	2506.79	4192.45	12806.66	9.3	7.5
1995/96	3643.13	2719.70	4631.87	10994.70	7.5	5.7
1996/97	6412.77	2783.72	5190.23	14386.72	8.2	6.6
1997/98	6231.53	2790.21	7170.80	16769.98	8.8	7.1

Note: Does not include expenditures of local government and NGOs on personnel for comparability.

Although the share of MOHFW expenditure for EPI and NIDs combined has fluctuated, its overall increase is due to additional expenditures for NIDs. At the same time, the share of expenditures on EPI relative to total MOHFW expenditures has decreased slightly over time.

Table 14 shows the trends of expenditure of each EPI line item during the last five years. The proportion of expenditure for each of the three major line items—personnel, vaccine, and operations, which constituted about 98 percent of total EPI expenditure in 1997/98—fluctuated within a narrow range, between 95 percent and 98 percent.

Table 14. Actual Expenditure for EPI in Bangladesh by Line Items during 1993/94–1997/98 (Lakh* Taka)

Head of Expenditure	1993/94	1994/95	1995/96	1996/97	1997/98**
Personnel	3731.82	3840.28	4242.8	4754.13	6568.5
Vaccine	2925.15	4676.36	2371.93	4598.15	4880.4
Operational cost	866.36	839.36	1037.47	1062.56	1157.2
Training fellowship, monitoring of operational research	159.04	155.00	147.50	225.69	123.2
Equipment	146.78	418.00	74.43	431.35	65.73
Furniture/Support to IPH	90.26	9.00	0.00	30.27	0.00
Construction	3.89	9.70	2.80	4.75	5.00
Vehicles	9.99	0.00	0.00	60.00	0.00
Total	7933.29	9947.8	7876.93	11167.07	12800.03

*Taka/\$ exchange rate: 1993/94–TK 40.0; 1994/95–TK 40.0; 1995/96–40.83; 1996/97–44.00; 1997/98–46.00

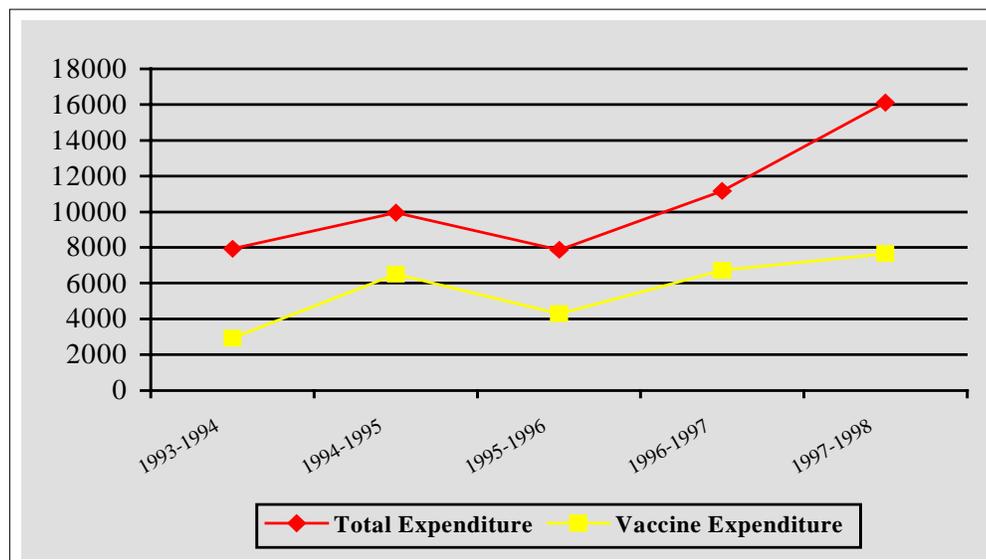
**Does not include contributions of local government and NGOs in addition to government expenditures; also does not include personnel costs for NIDs.

The proportion of personnel cost was 47 percent in 1993/94; it rose to 54 percent in 1995/96, and fell to 52 percent in 1997-98. The proportion of vaccine expenditure varied within the range of 29 percent and 45 percent, but, interestingly, it was 37 percent of total expenditure in both the beginning year and the last year of the study period. The operational cost was 11 percent in 1993/94, increased to 13 percent in 1995/96, and then declined to 7 percent in 1997/98.

Over the past five years, the cost of personnel increased at the average rate of 18 percent per annum, and vaccine expenditure at 14 percent per annum. The operational cost remained more or less constant.

Figure 2 depicts the trends of total expenditure and that of vaccine expenditure for EPI. It is evident that the two trends are similar, indicating that fluctuation in vaccine expenditure is the main argument of the fluctuation in total expenditure for EPI.

Figure 2. Trend of Actual Total EPI Expenditure and Vaccine Expenditure for EPI, 1993/94-1997/98



The trends of expenditures for NID line items are shown in Table 15. The activities for NIDs started in 1994/95. This expenditure has increased at a very low rate. The total expenditure increased at 4 percent per annum on average, and the vaccine expenditure for NIDs increased at 12 percent per annum. Cost of personnel being excluded, vaccine expenditure is the most important line item of NIDs, accounting for more than 70 percent of NID expenditure in every year.

Table 15. Actual Expenditure for NIDs in Bangladesh by Line Items during 1994/95–1997/98 (Lakh Taka)

Head of Expenditure	1994/95	1995/96	1996/97	1997/98*
1. Pay of other allowance officers and staff	352.17	389.03	436.0	602.35
2. Vaccine	1836.41	1925.21	2118.65	2548.01
3. Operational cost	320.70	289.82	343.58	146.2
4. Training fellowship, monitoring of operational research.	124.77	120.00	110.00	95.26
5. Equipment	208.99	300.00	181.00	24.0
6. Furniture/Support to IPH	0.00	79.67	25.49	0.00
Total	2843.04	3103.78	3214.72	3415.82

*Includes contribution of local government and NGOs.

4.1.3 Expenditure by Source of Finance

The sources of funds for the immunization program in Bangladesh can be divided into two broad types: government sources and external sources. The government sources include the central government and local government (in urban areas only), while the external sources comprise all the donor agencies and international organizations providing funds for the program. The donor agencies provide funds in two ways: directly to the government and through NGOs.

Table 16 shows the trend of financing by each source. The contribution of the local governments is relatively low, with estimates of the contribution only available for 1997. However, while small, the contribution has been increasing in recent years, as will be discussed in a later section.

Table 16. Actual Expenditure for EPI and NIDs by Source during 1993/94–1997/98 (Lakh Taka)

Year	Government Sources			External Sources			Grand Total*
	Central Govt.	Local Govt. (Urban)	Total	To Program	To NGOs	Total	
1993/94	3731.8	NA	3731.8	4214.1	229.7	4443.8	8163.0
1994/95	7915.0	NA	7915.0	4891.7	344.8	5236.5	13151.5
1995/96	6685.5	NA	6685.5	4300.2	161.0	4461.2	11146.7
1996/97	7651.7	NA	7651.7	6735.0	128.1	6863.1	14514.8
1997/98	8429.8	897.65	9327.5	7681.2	333.7	8014.9	17342.7

*Includes contribution of donor-supported NGOs (unlike Table 13).

Among external donors, UNICEF, SIDA, and the World Bank loan¹² were the major sources of funds for EPI (Table 17), and Japan has been the main contributor to the fund for NIDs (Table 17). Contributions have increased from the World Bank loan as well as from Japan. The contributions of other donors and international organizations have stayed the same (e.g., USAID) or have been declining (e.g., UNICEF).

Table 17. Trend of Actual Expenditure for EPI Project during 1993/94–1997/98 by Source of Fund (Lakh Taka)

Source of Fund	1993/94	1994/95	1995/96	1996/97	1997/98
GOB	3731.82	6662.88	6230.73	7210.65	8131.17
UNICEF	2903.43	1320.48	434.90	2634.02	82.34
USAID	106.27	120.00	155.00	122.35	111.55
WHO	53.90	80.00	39.43	157.48	46.06
World Bank	1150.53	1948.81	1220.67	1062.50	4297.38
Japan	0.00	0.00	0.00	209.00	227.37
SIDA	1681.20	1178.00	592.00	1950.52	0.00*

*SIDA began putting funds into the HPSP pool in 1997/98.

Some contributions of donors are shown as 0 in 1997/98. However, this is deceptive since it reflects a new mechanism for financing of the health and population section that has been put into place under HPSP. Under this mechanism, donors pool their funding and give to the health and population sector as a whole. The MOHFW then chooses where the funding should be allocated, given designated priorities of individual programs. Thus, it is difficult to determine how much these donors are contributing to the national immunization program.

Table 18 presents the trend of expenditures for NIDs during the period 1993/94–1997/98. The magnitude of the contribution is decreasing for some of the funders—the GOB, UNICEF and WHO—while others, such as Rotary International and Japan, have increased their contributions.

Table 18. Trend of Actual Expenditure for NIDs during 1993/1994–1997/1998 by Source of Fund (Lakh Taka)

Source of Fund	1994/95	1995/96	1996/97	1997/98
GOB	1252.12	454.76	441.68	332.64
UNICEF	477.23	142.50	137.50	157.81
USAID	48.52	67.50	87.50	57.6
WHO	241.50	246.50	251.70	0
Rotary	655.12	654.00	659.00	739.80
Japan	0.00	1339.71	1413.95	2041.20
Total	2673.99	2904.97	2991.33	3375.11

¹² The World Bank funds come from an IDA loan and have a concessional rate of interest.

4.2 Current Financing of Immunization Services

4.2.1 Sources of Immunization Financing

The current sources of funding for the immunization program and their relative importance are discussed below.

Central Government

The central government makes a substantial contribution to the national immunization program both through its revenue and development budgets. From the revenue budget, it purchases one vaccine, DPT, through the Vaccine Independence Initiative and provides much of vaccine supplies and transport costs. Both the revenue and development budgets contribute to pay salaries of the health personnel in the rural areas and at headquarters. The GOB has also made contributions towards capital investments through the development budget.

It should be noted that the government plans to transfer program financing of personnel costs that are currently in the development budget, mainly field workers, to the revenue budget. When this occurs, the personnel costs of field workers will increase due to the increased costs of employee benefits.

Local Government

The local governments pay the salaries and benefits of health personnel in urban areas as well as provide some operational costs for the immunization program with the use of tax revenues. This contribution to the immunization program is recent and reflects joint efforts by the Inter-Ministerial Urban Primary Health Care/EPI-MCH Coordination Committee and the USAID-sponsored BASICS project to improve the management of health services by municipalities. The number of health personnel, particularly medical officers, increased dramatically from 1996 to 1997 (Table 19).

Table 19. Number of Health Personnel Working in the National Immunization Program Posted in the Municipalities, 1996 and 1997

Personnel	1996	1997
Medical Officers	6 (6%)	45 (51%)
Sanitary Inspector	25 (26%)	37 (43%)
Vaccination Supervisor	30 (21%)	31 (27%)
Health Assistant	94 (40%)	116 (59%)
Vaccinator	252 (38%)	337 (61%)
Health Visitor	10 (3%)	14 (5%)

Source: Tawfiq et al. 1998

Note: 1996 data is for 96 municipalities, while the 1997 data is for 84 municipalities.

A description of immunization services and contributions of municipalities and city corporations can be found in Annex A.

World Bank Loan Funds

Funds from a World Bank loan are used to pay for most of the vaccines in the routine EPI.

Donors and International Organizations

Donors have played a very important role in providing support to the national immunization program. Some of the donors have financed vaccines and cold chain equipment (i.e., Japan and SIDA) while others have focused on training and social mobilization/communications (e.g. USAID). UNICEF has played an important coordinating role for fundraising for vaccines and cold chain equipment and has provided support to the program (training and monitoring and surveillance).

International organizations such as WHO have been important in improving the country's surveillance system, especially for acute flaccid paralysis under the polio eradication program. A private donor that has been particularly important in supporting NIDs is Rotary International.

Donor-funded NGO Provision of Immunizations

Numerous NGOs provide immunization services as well as conduct support activities, such as social mobilization activities, particularly in urban areas. Most of the NGOs are funded by donor organizations such as USAID and DFID. Since the MOHFW provides vaccines and supplies to these organizations, their primary contribution is that for the cost of personnel time and social mobilization/IEC activities.

Table 20 presents the expenditures of four consortiums of NGOs. Over half of the expenditures are for personnel time (63 percent). Another major expenditure is for social mobilization (14 percent), and about 16 percent is for operational costs such as transportation, rent, maintenance, and supplies. The rest went toward training sessions (7 percent) and cold chain equipment (<1 percent).

Table 20. NGO Expenditure in the EPI, 1998 (in Taka)*

Cost Categories	RSDP**	UFHP**	CARE**	BPHC**	Total
Vaccines	—	—	—	—	—
Officer/Admin.	1,641,600	3,219,192	242,016	236,716	5,339,524
Staff/Providers	9,880,560	1,689,600	1,540,128	1,420,296	14,530,584
Vaccine supplies	—	—	—	—	—
Cold chain equipment	—	201,960	—	—	201,960
Transportation	1,041,216	415,800	705,600	473,432	2,636,048
Training	—	259,200	1,176,000	710,148	2,145,348
Social mobilization	—	1,275,420	1,881,600	1,183,580	4,340,600
Others (Rent of space, stationery items, other overhead costs, etc.)	561,600	655,200	340,656	710,148	2,267,604
TOTAL	13,124,976	7,716,372	5,886,000	4,734,320	31,461,668
					US \$ 655,450

*1 US\$ = TK 48.00

**Rural Service Delivery Project, Urban Family Health Partnership, Cooperative Agency for American Relief Everywhere, Bangladesh Population and Health Consortium

Household Contributions

The contribution of out-of-pocket payments for immunization services is small. Immunization services provided through the central government and most local government are free of charge officially. Only one municipality, Chittagong, charges a nominal fee, TK 2 (\$US 0.04), for immunization services.

In addition, customers pay fees at some NGO facilities, in the form of registration and service fees.

Some 2 percent of the population in Dhaka pay fees for immunizations at private for-profit facilities such as doctor's chambers (Table 21). The average fees charged by clinics/chambers for routine immunizations ranges from TK 71 (\$1.48) for tetanus toxoid to TK 168 for a measles immunization. Another immunization, Hepatitis B, that is not yet provided in the national immunization program has a high price—TK 424 (\$8.83). (For more information on provision of immunization services in private for-profit facilities, see the annexes.)

Table 21. Fees (Mean and Range, in Taka) Charged for Immunization at Private For-profit Facilities

Vaccine	Private Clinic's Mean Fee	Doctor's Chamber Mean Fee	Total Mean (Range)
BCG	127 (100-200)	177 (100-300)	156(100-300)
DPT	100 (75-150)	157 (50-300)	134(50-300)
OPV	104 (80-150)	83 (50-100)	94 (50-150)
Measles	108 (100-150)	208 (100-350)	168 (100-350)
TT	47 (20-100)	88 (30-200)	71 (20-200)
Hepatitis B	410 (350-500)	433 (300-550)	424 (300-550)

* Data is based on a survey of 23 Dhaka clinics.

** Range of fees is in parentheses.

Other contributions that customers are making are those of indirect costs: travel costs, travel time, and waiting time, but the amount that they are paying is not documented. While these have been relatively small in rural areas due to extensive outreach activities, they might increase under the HPSP service delivery strategies that propose offering of services from community clinics and gradual reduction in the number of outreach sessions. The distance to the community clinics is likely to be farther than to the outreach clinics. The extent of travel costs in urban areas is less well-known.

4.2.2 Estimated Annual Costs of Routine EPI by Source of Financing

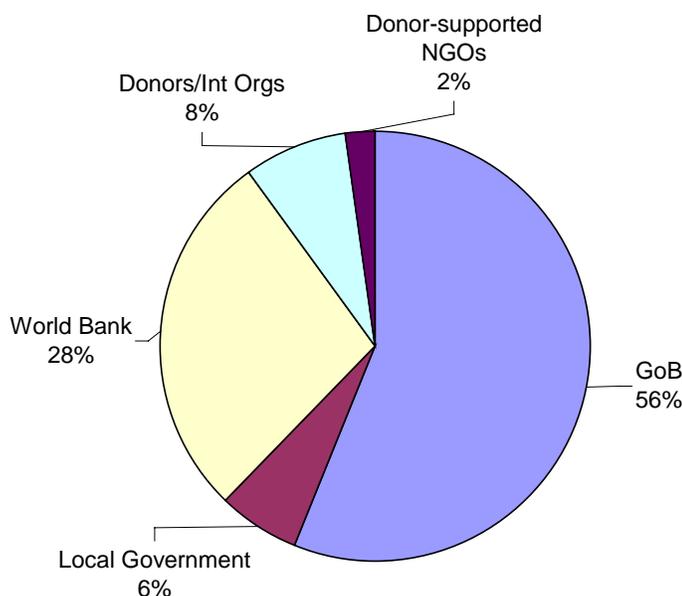
The estimated cost of routine services by source of financing is shown in Table 22 and illustrated in Figure 3. The table indicates that the central government finances about half of the routine EPI, since it pays for most of the salary and benefits of personnel who provide EPI services, about half of the supplies, and much of transport and maintenance costs, and it has also begun to pay for some vaccines.

Table 22. Annual Estimated Costs of Routine EPI by Source of Financing, 1997/98 (in US\$000s)

	GOB	Local Gov.	World Bank	Donors/ Int'l Orgs.	Donor-supported NGOs	Total
Recurrent Costs						
Personnel	\$14,279	\$1,542	0	\$ 3.0	\$396.0	\$16,221
Vaccines	772	0	6,487	494.0	0.0	7,753
Supplies	313	206	0	273.0	49.3	841
Transportation	345	0	0	7.8	57.3	410
Short-term training	0	0	0	1.0	46.6	47
IEC/Social Mobilization	0	0	0	179.0	94.3	273
Maintenance Overhead	326	0	0	0.0	0.0	326
Subtotal	16,035	1,748	6,487	957.8	643.5	25,871
Capital Costs						
Buildings	174	0	1,565	0.0	0.0	1,739
Vehicles	0	0	0	200.0	0.0	200
Equipment	0	0	0	1,122.0	0.0	1,122
Training	0	0	0	15.0	0.0	15
Subtotal	174	0	1,565	1,337.0	0.0	3,076
TOTAL	\$16,209 (56.0%)	\$1,748 (6.0%)	\$8,052 (27.8%)	\$2294.8 (7.9%)	\$643.5 (2.2%)	\$28,947

The World Bank loan covers an estimated 28 percent of costs, since it is used to purchase vaccines for the program. Donors and international organizations play an important role in the provision of supplies, short-term training, and social mobilization/IEC for the program. They finance approximately 10 percent of the program. Some 2 percent of this contribution is through the service provision in NGOs. The local governments finance an estimated 6 percent of costs, since they pay salaries and benefits of immunization personnel and supplies in urban areas.

Figure 3. Financing of Routine EPI, by Funding Source, 1997/98



The program-specific costs of routine EPI in 1997/98, or the costs of the program that are incurred specifically for the delivery of immunization services, are shown in Table 23. These do not include joint costs such as personnel and building costs that would be incurred with or without the immunization program.

Table 23. Program Costs of Routine EPI by Source of Financing, 1997/98 (in US\$000s)

	GOB	Local Gov.	World Bank	Donors/ Int'l Orgs.	Donor-supported NGOs	Total
Recurrent Costs						
Vaccines	\$772,313	0	\$6,487	\$494.0	0.0	\$7,753
Supplies	345	206	0	273.0	49.3	841
Transportation	0	0	0	7.8	57.3	410
Short-term training	0	0	0	1.0	46.6	48
IEC/Social Mobilization	326	0	0	153.7	94.3	248
Maintenance Overhead	1,756	0	0	0	0	326
Subtotal	\$774,740	206	6,487	929.5	248.2	9,626
Capital Costs						
Vehicles	0	0		200.0	0	200
Equipment	0	0	0	1,122.0	0	1,122
Training	0	0	0	15.0	0	15
Subtotal	0	0	0	1,337.0	0	1,337
TOTAL	\$1,756 (16.0%)	\$206 (1.9%)	\$6,487 (59.2%)	\$2266.5 (20.7%)	\$248.2 (2.3%)	\$10,963 (100%)

The annual program-specific costs in 1997/98 were about \$11 million. The breakdown by source of financing indicates that non-GOB sources were financing most of the program-specific costs (82 percent). The World Bank loan was being used to finance over half of the costs (59 percent). Donors and international organizations financed 21 percent directly and 2 percent through NGOs.

The central government financed about 16 percent of program-specific costs. This finding suggests that despite the fact that the GOB covers over 50 percent of total routine EPI costs, the immunization program is being financed to a significant extent by donors and international organizations.

4.2.3 Estimated Annual Costs of NIDs and AFP Surveillance by Source of Financing

The estimated total and program-specific costs of the national immunization days and polio-specific (AFP) surveillance in 1997/98 are presented in Table 24 and Figure 4. Donor and international organizations are the principal sources of financing for the NIDs and surveillance (63 percent of total costs in 1997/98). They provide funds for several of the recurrent costs—vaccines, supplies, transport, and social mobilization—and for all of the capital costs—vehicles, equipment, and long-term training. They also provide funding for service delivery through their support of NGOs.

The central government supports NIDs and surveillance mostly through personnel, supplies, and provision of transportation. In 1997/98 it paid for approximately 33 percent of total costs. The local

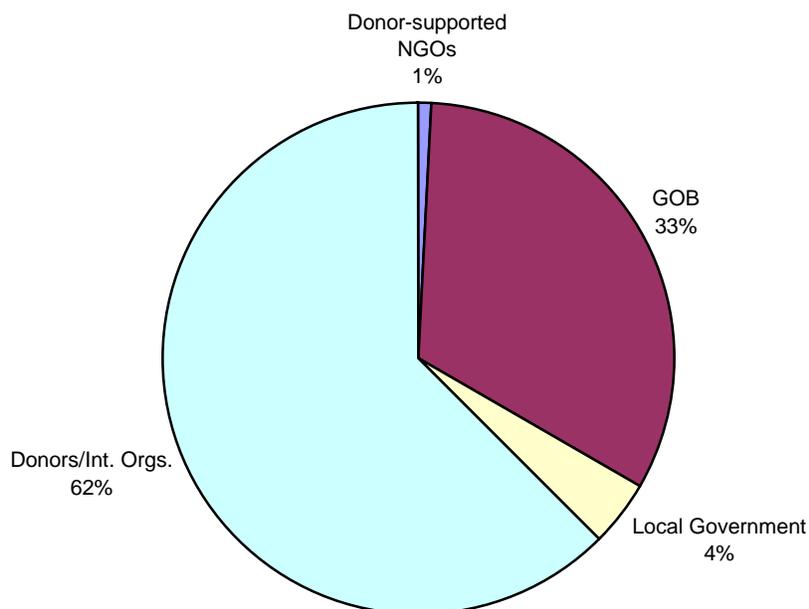
governments similarly provide funds for personnel time and supplies and fund a little more than 4 percent of total costs.

The program-specific costs are largely provided through donors and international organizations (86 percent), while the government finances approximately 12 percent of these costs.

Table 24. Estimated Total and Program-specific Costs of the NIDs and Surveillance, by Source, in 1997/98 (in US\$000s)

						Program-specific Costs			
	GOB	Local Gov.	Donors/ Int'l Orgs.	Donor-support NGOs	Total	GOB	Loc. Gov	Donors/ Int'l Orgs	Total
Recurrent Costs (NIDs)									
Personnel	\$1,309	\$141	\$1.3	\$36.0	\$1,487	0	0	0	0
Vaccines	0	0	2,896.0	0.0	2,896	0.0	0	2,896	2,896
Supplies	235	59	27.0	0.0	321	235.0	59	27	321
Transportation	187	0	0.0	0.0	187	187.0	0	0	187
IEC/Social Mobilization	0	0	248.0	0.0	248	0	0	248	248
Subtotal	1,731	200	3,173.0	36.0	5,139	422	59	3,171	3,652
Recurrent Costs (Surveillance)									
Personnel	0	0	23	0	23	0	0	0	0
Stool Sample Kits	0	0	12	0	12	0	0	12	12
Training	0	0	24	0	24	0	0	24	0
Social Mobilization	0	0	12	0	12	0	0	12	12
Subtotal	0	0	71	0	71	0	0	48	24
Capital Costs									
Cold Chain Equipment	61.5	0	190	0	251.5	61.5	0	190.0	257.5
Laboratory Equipment	0	0	6.8	0	6.8	0	0	6.8	6.8
Subtotal	61.5	0	196.8	0	258.3	61.5	0	196.8	264.3
TOTAL	\$1,793 (32.8%)	\$200 (3.7%)	\$3,440 (62.9%)	\$36.0 (0.7%)	\$5,469.3 (100.0%)	\$484 (12.2%)	\$59.0 (1.5%)	\$3416.0 (86.3%)	\$3,959 (100.0%)

Figure 4. Financing of the National Immunization Days, by Funding Source, 1997/98



4.2.4 Sources of Financing of Total Costs of the National Immunization Program

Table 25 shows the estimates of the combined costs of the national immunization program by source of financing. In the aggregate estimates, the central government provides financing for about half or 52.3 percent of total costs and 23 percent via the World Bank loan, donors and international organizations 19 percent (17 percent directly and 2 percent through NGOs), and the local governments contribute some 6 percent of total costs of the program.

Table 25. Total Estimated Costs of the National Immunization Program, 1997/98 (in US\$ 000s)

	GOB	Local Gov.	World Bank	Donors/ Int'l Orgs.	Donor-supported NGOs	Total
Recurrent Costs						
Personnel	\$15,589	\$1,683.5	0	\$27.0	\$431.3	17,730.8
Vaccines	772	0	6487	3390.0	0	10,648.0
Supplies	548	265	0	312.0	49.3	1,174.3
Transportation	532	0	0	7.8	57.3	597.1
Short-term Training	0	0	0	24.0	46.6	70.6
IEC/Social Mobilization	0	0	0	438.0	94.3	532.3
Maintenance	326	0	0	0.0	0	326
Subtotal	17,767	1948.5	6487	4198.8	678.5	31,080.1
Capital Costs						
Buildings	174.0	0	1,565	0	0	1,739.0
Vehicles	0.0	0	0	200.0	0	200.0
Equipment	61.5	0	0	1,318.8	0	1,380.3
Training	0.0	0	0	15.0	0	15.0
Subtotal	235.5	0	1,565	1,533.8	0	3,334.3
TOTAL	\$ 18002.5 (52.3%)	\$1948.5 (5.7%)	\$8,052 (23.4%)	\$5,732.6 (16.7%)	\$678.5 (2.0%)	\$34,414 (100%)

Figure 5. Financing of the Total National Immunization Program, by Funding Source, 1997/1998

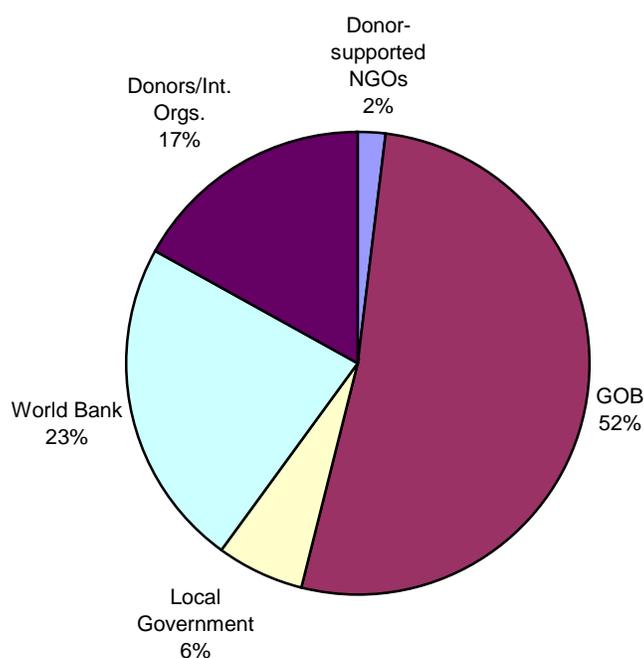


Table 26 presents the program-specific costs of the national immunization program by source of funding. The largest funder of program-specific costs is the World Bank loan, which funds 43 percent of the program. The next largest source is donors and international organizations that cover 38 percent of these costs directly and 2 percent through NGOs. The government funds 15 percent of the costs directly.

Table 26. Program-Specific Costs of the National Immunization Program by Source of Funding (US\$000s)

	GOB	Local Gov't	World Bank	Donors / Int'l Orgs	Donor-support NGOs	Total
Recurrent Costs						
Vaccines	\$772	0	\$6,487	\$3,390	0.0	\$10,649
Supplies	548	265	0	312.0	49.3	1,174
Transportation	532	0	0	7.8	57.3	597
Training	0	0	0	24.0	46.6	71
IEC/Social Mobilization	0	0	0	438.0	94.3	532
Maintenance	326	0	0	0.0	0.0	326
Subtotal	2,178	265	6,487	4,171.8	247.5	13,349.3
Capital Costs						
Vehicles	0	0	0	200.0	0	200
Equipment	61.5	0	0	1,318.8	0	1,386
Training	0	0	0	15.0	0	15
Subtotal	61.5	0	0	1,533.8	0	1,601
TOTAL	\$2,239.5 (15.0%)	\$265 (1.8%)	\$6,487.0 (43.4%)	\$5,705.6 (38.2%)	\$247.5 (1.7%)	\$14,944.6 (100%)

4.2.5 Estimation of Cost-Effectiveness Measures

With information on the costs of the national immunization program, the cost per dose, costs per fully immunized child, and cost per capita of the program can be calculated for 1997/98. Table 27 shows the cost per dose of vaccine, cost per FIC, and cost per capita. In order to calculate the cost per dose of vaccine, the total number of doses of vaccine administered through the national program was calculated and divided by the cost. For routine EPI, the cost of dose was \$0.84, while the cost per dose for NIDs and surveillance was \$0.17. The cost per dose of the national immunization program was \$0.52.

Table 27. Cost Effectiveness Ratios for National Immunization Program, 1997/98

	Output	Cost-effectiveness Ratio
Number of Doses Administered		
Routine	34,378,179	\$0.84
NIDs	32,245,922	\$0.17
Total	66,624,101	\$0.52
Number of FIC/Routine Program	1,603,260	\$18.06
Number of FIC/Total	1,603,260	\$21.47
Total population	123,080,614	\$0.28

The cost per fully immunized child was determined by dividing 54 percent of the number of children under the age of one year by the cost of the program. This yielded a cost of \$21.47 for the total program and \$18.06 for the routine program. The cost of the program per capita was \$0.30.

4.2.6 Analysis of Financing Strategies: Adequacy of Funding, Sustainability, Program Performance, Access and Equity

4.2.6.1 Adequacy of Current Funding and Sustainability of the Routine EPI

Current funding is for the most part adequate for the existing routine EPI. The two largest costs, vaccines and personnel, are covered by the World Bank loan,¹³ and financed by central and local governments and donor-supported NGOs. The other recurrent costs of supplies, transport, training, and social mobilization/IEC are being financed by a combination of the central government, donors, and international organizations. Capital costs are, for the most part, being financed by donors.

However, several concerns remain about the current funding and whether it is sufficient within the context of the goals of the program. For one, because the coverage in the country appears to have plateaued (or may even have declined according to the 1999 coverage survey), the program needs to initiate some special catch-up efforts. It is likely that additional funding will be needed for these catch-up sessions/campaigns.

In addition, much of the program-specific cost of routine EPI is financed by donors and international organizations. Donors not only provide funding for short-term training and social mobilization/IEC, but they also fund some of the operational costs, such as purchasing registers and

¹³ The current loan will continue until 2003/04 and another loan is likely to be negotiated after that.

vaccination. In the event that donors decide to reduce their level of funding for the immunization program, the GOB will need to fund these items.

4.2.6.2 Adequacy of Current Funding and Sustainability of the NIDs and Surveillance

The polio eradication campaign, including NIDs and surveillance (also mop-up activities starting in late 1998), is mostly donor-financed, largely by two donors, Japan and Rotary International. Japan, with the assistance of Rotary International, is financing the vaccine costs; personnel costs are being financed by the central and local governments as well as donor-funded NGOs; and other recurrent costs of supplies, transport, training and social mobilization are being financed by USAID, UNICEF, and the central government. The campaign appears to be adequately financed.

Since this campaign is part of a worldwide effort to eradicate polio, it is likely that this campaign will continue to be mostly financed by donors and will end in five to ten years.

4.3 Assessment of the VII in Bangladesh

The MOHFW has been using UNICEF's Vaccine Independence Initiative to purchase one vaccine, DPT. (Vaccines other than DPT are being purchased through normal UNICEF procurement.) The agreement with UNICEF to purchase the vaccine through the VII will end in the year 2000. The GOB is now considering whether to continue purchasing vaccines through the program.

An important change that has occurred since the use of the VII began is that the MOHFW has a new procurement system under the HPSP. The two procurement systems of the health and family planning wings are being combined under the new system. The unified logistics and procurement cell under HPSP is expected to make use of standard bidding documents and standard requests for proposal. There currently is no provision under the new system for procurement through international organizations such as UNICEF. For this reason, the MOHFW now has to decide whether it should procure directly through vaccine manufacturers or make special provisions to procure through UNICEF.

The MOHFW has been purchasing DPT through the Vaccine Independence Initiative since 1994. The advantages to using the VII are that the vaccines can be purchased with local currency and payment is deferred until the vaccines are received rather than at the time of the order, as with normal UNICEF procurement. In this way, the GOB can show its commitment to spending some of its own budget on the recurrent cost of vaccines. However, if the GOB decides instead to use its World Bank loan to purchase DPT, then it will have little reason to continue with the VII, because loan financing would be in foreign currency.

There are several advantages to non-VII procurement through UNICEF as well. One is that it assists in providing expertise for purchase of vaccines as well as manages quality assurance for the products. In addition, because it purchases large quantities of vaccines, it is able to offer reasonable unit prices for them. Disadvantages are surcharges added onto its prices such as a 6–8 percent service charge and cargo costs.¹⁴

¹⁴ UNICEF picks the lowest bid in choosing manufacturers, and their locations may be located far away from the final destination.

If the MOHFW wants to purchase its vaccines directly from manufacturers, it will first have to establish a National Control Authority for Biologicals (NCAB) in Bangladesh to ensure quality of the vaccines (Centre International de l'Enfance et de la Famille 1998). NCAB functions will be to define criteria on which licensing of vaccines for use in the country; issue licenses on the basis of safety, potency, and efficacy; continually oversee the quality of the vaccines by rating each lot; and monitoring the impact of vaccines through a well-functioning surveillance system.

5. Cost and Financing Projections of the National Immunization Program

This section projects the estimated program costs of the national immunization program for the next five years based on two scenarios: the program continuing as it is and the program incorporating the improvements and changes desired by the MOHFW.

5.1 Projected Costs of the “Basic” National Immunization Program

The recurrent variable non-personnel costs of the “basic” program are used as the basis for the projections for the next five years in Table 28.¹⁵ Using the 1997/98 estimated costs of the program, the costs of the program for each future year were estimated in 1998 dollars. The bottom line of the table shows the costs of the program with inflation, assuming that annual inflation is 6.2 percent (IMF 1999). Vaccine costs were calculated assuming that one BCG and one measles vial would be opened during each session, while other vaccine costs were calculated using the target population size, number of doses, wastage factor, and unit vaccine cost.

Table 28. Recurrent, Variable, Non-personnel Costs of the “Basic” Program from 1999-2003 (1998 US\$ 000s)

Cost Category	1999/2000	2000/01	2001/02	2002/03	2003/04	Total
Vaccines	10,906	11,037	11,169	11,303	11,439	\$55,855
Supplies	1,174	1,174	1,174	1,174	1,174	\$ 5,870
Transport	597	597	597	597	597	\$ 2,985
Maintenance and Overhead	326	326	326	326	326	\$ 1,630
Social Mobilization	532	532	532	532	532	\$ 2,605
Training	72	72	72	72	72	\$ 360
Total	13,606	13,737	13,869	14,003	14,139	\$69,355
Total w/Inflation	15,345	16,453	17,642	18,917	20,285	\$88,644

* An annual inflation factor of 6.2 percent was used.

¹⁵ The costs of mop-up polio eradication activities that started in December 1998 were not included in this analysis.

5.2 Projected Costs of Planned Changes/Improvements

This section presents the costs of desired changes/improvements to the program during the years 1999/2000-2003/04. Some of the expenditures are for durable equipment and buildings and will require a lump sum at the time of purchase, but the cost estimates of the items should be depreciated.

5.2.1 Catch-up Campaigns for Low Performance Districts

Based on the coverage survey that was conducted by UNICEF in 1998 (GOB and UNICEF 1998), 13 districts were identified as having low coverage, i.e., less than 60 percent of children under one year of age had received measles immunizations. The government plans to initiate some catch-up campaigns/sessions in these areas as a strategy to increase coverage.

The costs of these catch-up campaigns is estimated in terms of the following components: planning and advocacy meetings, communications, miking,¹⁶ distribution of leaflets to parents and to the larger population, and provision of extra sessions. The total annual expenditures of the catch-up campaign were estimated using the costs of former campaigns and calculated to be \$211,205 in 2000/01 (see the annexes).

5.2.2 Improvements in Sterilization of Reusable Needles and Syringes

A second improvement to the program would be to improve the methods of sterilization of needles and syringes. The EPI Programme Review noted that having health assistants carry sterilizers and stoves to outreach sites is particularly cumbersome and makes sterilization difficult to ensure. An alternative that has been tested successfully by UNICEF is to use autoclave drums and TST spots. UNICEF conducted a trial in a few thanas where sterilizations were carried out at the thana health complex (THC) using autoclave drums in the autoclave. These drums were than sealed and carried by the porter to the outreach spot with the vaccine. The TST spot was placed on every drum to show that sterilization had taken place.

The estimated annualized cost of replacing sterilizers and stoves with autoclave drums, carrying bags, and sheets of TST spots is \$324,000. If new autoclaves are purchased as well for each thana at a unit cost of \$500, the investment cost in 1999/2000 would be \$358,847.

5.2.3 Improvements to the Cold Chain

Another planned improvement to the national immunization program is to replace and renovate the cold chain. Two types of improvements have been proposed: (1) replacement of refrigerators and freezers with CFC-free ones, and (2) construction of two new cold rooms. Refrigerators and freezers are being replaced because of CFC's negative effect on the environment. Thus far, 750 CFC-free refrigerators have been procured. Another 2,684 need to be purchased. The annual cost of purchasing these CFC-free refrigerators over five years would be \$268,400.

¹⁶ This activity involves information dissemination in a community through the use of a moving loudspeaker on some type of transport such as an automobile or autorickshaw.

The construction of two additional cold rooms for storage of vaccines was proposed in the 1996 EPI five-year plan (EPI-MOHFW Project Proposal, 1996-2000), but has not yet taken place. The need is pressing—UNICEF has had to rent storage space at times because of an overflow of vaccines. The cost of constructing two additional cold rooms is TK 25,884,937 (\$539,270) and includes the following: TK 1,564,170 (\$32,587) for construction of a two-storied building for a central cold room and a freeze room, TK 10,349,800 (\$215,621) for equipment and supplies for the cold room, TK 11,276,387 (\$234,925 for equipment and supplies for the freeze room), and TK 2,694,580 (\$56,137) for two generators. The assumption that is made here is that the construction of the two cold rooms will not take place until 2000/01.

5.2.4 Improvements in Waste Disposal

Another problem that was identified in the 1998 EPI Programme Review was inadequate disposal of used needles and syringes, and opened vials. This is particularly dangerous since infectious diseases can be spread when clinical waste is not properly disposed.

One possible solution is to install portable incinerators at thana health complexes and family welfare centers (FWCs). These are of low cost (TK 1150, or \$24) and should be tested at these sites. The annual cost of installing incinerators at all THCs and FWCs over a period of five years would be approximately \$84,375.

5.2.5 Cost of Refresher Training for Mid-level Managers

Refresher training on EPI is not conducted on a regular basis for mid-level managers. However, it is important that these managers are well informed about technical issues and management techniques so that they can improve their supervisory activities.

The annual outlay to provide refresher training on EPI was estimated, based on the cost of training conducted by BASICS, and is approximately \$261,350 in 1999/2000. It assumes that five mid-level program managers from each thana and district as well as one to two EPI program managers from each municipality would attend annual five-day courses.

5.2.6 Cost of Service Delivery under the HPSP

Under the new service delivery strategy of the HPSP, which is to be implemented in the next few years, immunization services will be delivered one to two days a week at fixed sites known as “community clinics.” Many existing outreach sites will be closed, though some will continue to operate. Under the new system, the health assistants and family welfare assistants will visit homes one day a week to motivate clients to attend EPI sessions. The costs of providing services from the community clinics should be similar to that from outreach sites because vaccines and supplies will still need to be transported to the clinics from the THCs in order to maintain the cold chain. However, if the child’s caretaker takes advantage of other clinic services, such as curative care and family planning, cost savings to the overall health system should take place.

However, the distance for clients to travel to the community clinics and outreach sites is likely to be greater since there will be fewer outreach sites than before. Thus, it will be important to have additional social mobilization/ IEC activities to inform the population both of the new location as well as the importance of immunizing children and pregnant women in a timely manner. The campaign

will involve the use of TV spots, documentary dramas, miking, billboards, and distribution of leaflets, handbills, and brochures. The estimated cost of the start-up campaign during the first year (estimated to be 2000/01) of the community clinics is \$917,568 (see annex tables). Ensuing annual campaigns will cost less, about \$334,000.

5.2.7 Adding Hepatitis B to Immunization Schedule

The MOHFW is considering adding Hepatitis B as an antigen to its routine EPI program. Part of the reason for this is that carrier rates have been shown to be between 4 percent and 9 percent of the general population and 25 percent of infected individuals are expected to die from a liver-related disease caused by Hepatitis B.

The problem with introducing Hepatitis B is that its vaccine is nearly as expensive as all of the other antigens combined. (For a discussion of unit cost of vaccines, see DeRoeck and Levin 1998.) In addition, its introduction would involve the purchase of additional storage space and cold chain equipment. Since the estimated annual additional cost of the vaccine would be \$6,418,297 for one year, it is unlikely that the country will use it for the entire population under age one. The MOHFW needs to consider, instead, whether it wants to introduce it to selected populations, particularly if a donor¹⁷ is interested in funding this vaccine as well as other operational costs that would be involved.

In Table 29, the estimated costs of providing recombinant¹⁸ Hepatitis B vaccine as part of the program are given, using the UNICEF price of \$0.69 per dose, a target under 1 population based on a crude birth rate of 26.5¹⁹ per 1,000 population, an annual population growth rate of 1.75 percent, an infant mortality rate of 77 per 1,000 live births (BBS 1997), and the same wastage coefficient as for DPT.

The costs of the vaccine alone relative to the basic EPI antigens would be very high if introduced to the entire under age one population. The costs would be even higher if additional operational costs such as cold chain, storage, and transport needs were estimated as well. One alternative is to phase in the introduction of Hepatitis B so that the costs could be spread out over time. For example, one proposal by the Asian Development Bank is to introduce it first in the four city corporations.

¹⁷ The Asian Development Bank has already expressed interest in introducing Hepatitis B in four city corporations.

¹⁸ If the program chooses to use the plasma-derived form instead, the unit cost would be lower.

¹⁹ Because of the short time period, this calculation assumes that the crude birth rate remains constant.

Table 29. Estimated Vaccine Costs of introducing Hepatitis B Antigen over Next Five Years in the Entire Country and for Four City Corporations, 1999/2000–2003/04 (US\$)

	Country < 1 Population	Wastage Coefficient*	Vials Needed (10 doses)	Total Cost
Total Population under One Year				
1999/2000	3,089,744	1.64	1,520,154	\$10,489,063
2000/2001	3,143,815	1.64	1,546,757	\$10,672,623
2001/2002	3,198,831	1.64	1,573,825	\$10,859,393
2002/2003	3,254,810	1.64	1,601,367	\$11,049,429
2003/2004	3,311,770	1.64	1,629,391	\$11,243,797
City Corporation under One Year				
1999/2000	330,204	1.64	162,460	\$1,120,974
2000/2001	335,982	1.64	165,303	\$1,140,591
2001/2002	341,862	1.64	168,196	\$1,160,552
2002/2003	347,844	1.64	171,139	\$1,180,859
2003/2004	353,932	1.64	174,135	\$1,201,532

*The wastage coefficient is based on the current wastage rate for DPT.

5.2.8 Summary of Estimated Expenditures Required for the Planned Improvements

Table 30 shows the total outlays required for the national immunization program over the next five years with the improvements desired by the MOHFW. The investment expenditures have been separated from operating costs in order to help program managers in their planning decisions. In addition, donor support is more likely to be used for investment expenditures.

Table 30. Estimated Expenditures of the National Immunization Program with Planned Additional Improvements, 1999/2000–2003/04 (US\$)

Improvement	1999/2000	2000/01	2001/02	2002/03	2003/04	Total
“Basic” program	15,345,569	16,453,750	17,642,356	18,917,247	20,284,715	\$88,643,636
Operating costs						
Catch-up campaign	—	211,205	224,300	238,207	—	\$ 673,712
Refresher training	261,350	277,554	294,762	429,804	332,446	\$ 1,595,916
Communications under HPSP	—	917,568	376,700	400,055	424,859	\$ 2,119,182
Investment Costs						
Sterilization	358,837	381,085	404,712	429,804	456,452	\$ 2,030,890
Cold chain	268,400	824,311	302,713	321,482	341,413	\$ 2,058,319
Waste disposal	84,375	89,609	95,165	101,065	107,331	\$ 477,545
Total	\$16,318,531	\$19,155,082	\$19,340,708	\$20,837,664	\$21,947,216	\$97,599,200
Total as percent of current program	106.3%	116.4%	109.6%	110.2%	108.2%	110.1%
With Hepatitis B vaccine	10,489,063	10,672,623	10,859,393	11,049,429	11,243,797	\$ 54,314,305
Total	\$26,807,594	\$29,827,705	\$30,200,101	\$31,887,093	\$33,191,013	\$151,913,505
Total as percent of current program	174.7%	181.3%	171.2%	168.6%	163.6%	171.4%

With all of the changes proposed, with the exception of introducing Hepatitis B vaccine, costs of the program will increase by \$1–2.7 million dollars, or 6–16 percent more than the basic program. These estimates include the costs of the NIDs as well as for the routine EPI program.

However, if Hepatitis B vaccine were to be introduced countrywide, the costs would increase by a substantially greater amount—\$10.5 million in 1999/2000 and a total increase over the five years of 75 percent. If Hepatitis B were to be introduced only into the city corporations, the additional increase in expenditures would be lower, 14 percent.

5.3 Projected National Immunization Program Budget and Funding Gap

This section examines the ability of the national immunization program to pay for the additional outlays required over the next five years, by projecting the expected funding available and the gap between this funding and the required expenditures discussed in the above section. In order to do so, the noninflated operating costs versus stable government operating outlays plus World Bank loan funds will be examined first. Then the impact of introducing investment and operating costs of improvements, potential growth of government allocation to MOHFW, and inflation will be discussed.

5.3.1 Projected Available Funding

To estimate the current government funding for the immunization program, the noninflated estimated recurrent variable non-personnel costs were used as a basis. To project available government funding for the immunization program for the next five years, the funds from the World Bank loan are included, because they will be available through 2003 and are likely to be renewed. An annual increase in the government's funding of 11.1 percent was also projected, based on the yearly increases of the entire MOHFW budget over the last five years. Since most of the funding from the local government is for personnel expenditures, it was not included

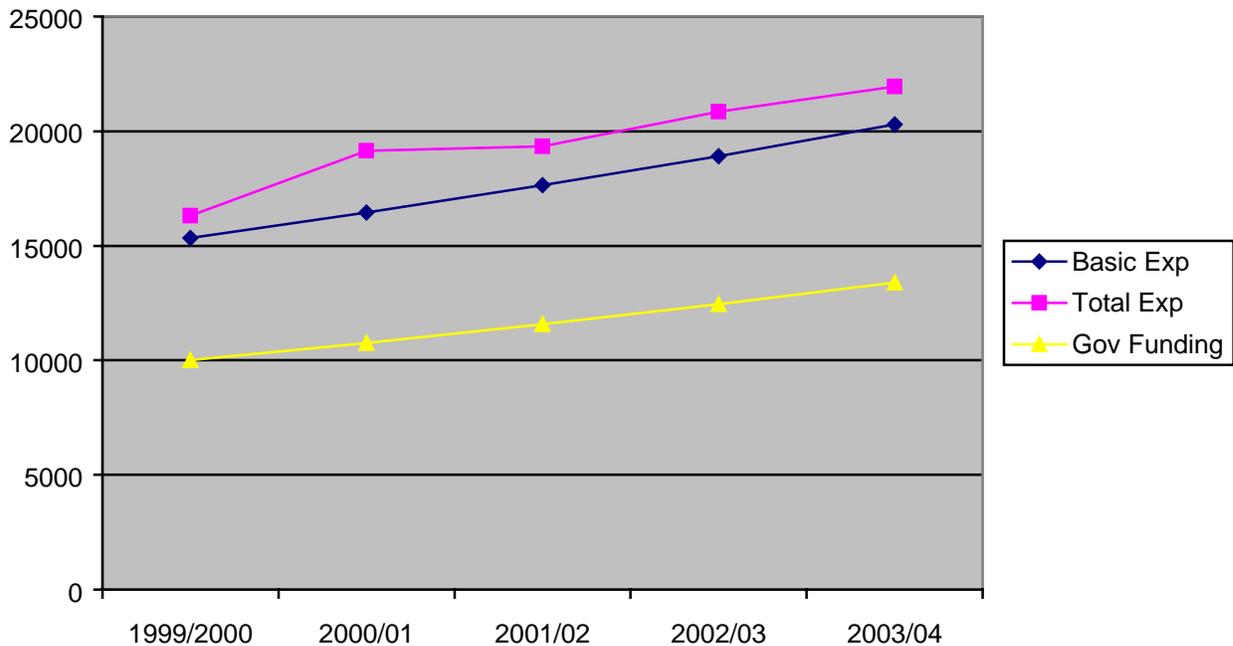
Table 31. Program and Projected Government Funding for Recurrent Variable Non-Personnel Expenditures for the Immunization Program, 1999/2000-2003/2004 (1998 US\$000s)

	1999/2000	2000/01	2001/02	2002/03	2003/04	Total
Total Basic Expenditures	13,606	13,737	13,869	14,003	14,139	\$69,354
GOB funding +World Bank loan	8,665	8,665	8,665	8,665	8,665	\$43,325
Difference between Basic Expenditures and GOB	4,941	5,072	5,204	5,338	5,474	\$20,029
Additional investment and operating costs of improvements	973	2,701	1,698	1,920	1,663	\$ 8,956
Total with improvements	14,579	16,438	15,567	15,923	15,802	\$78,310
Potential Growth in Gov. Allocations for national immunization program	10,004	10,757	11,570	12,450	13,402	\$58,183
Total Expenditures w/Inflation Factor	16,318	19,155	19,340	20,838	21,947	\$97,599
Difference between gov. funding and total expenditure	6,314	8,398	7,770	8,388	8,545	\$39,415

Figure 6 shows the funding gap that is projected for the program if the improvements to the program (excluding Hepatitis B) are implemented. The difference between total expenditures required and available government funding ranges from \$9.6 million to \$12.9 million, and the difference between the basic program expenditures and program expenditures with the improvements is \$0.8 to \$2.3 million. The increase in expenditures if Hepatitis B vaccine are added is also shown.

The adequacy of financing of the funding gap between available government funding and the basic program needs will depend on whether donors will continue to support the program. In addition to the activities that are usually funded by donors, such as social mobilization/IEC and training, financing the planned improvements will require still more fundraising.

Figure 6. Total Expenditures with and without Program Improvements and Government Funding, 1999/2000–2003/2004



6. Options for Building a Sustainable Immunization Program in Bangladesh

With the many changes that the MOHFW would like to make to improve immunization program performance and quality, and with uncertain donor funding, options for increasing the sustainability of the program need to be considered. This section presents some strategies to reduce the expected funding gap.

6.1 Ways to Reduce Current and Future Program Costs

6.1.1 Improving Methods of Projecting Vaccine Needs and Stock Management

Assessments of vaccine stocks in 1998 indicated that more than enough of most vaccines were being stored at the Central Vaccine Store (MOHFW 1998). In fact, two vaccines, TT and OPV, were in surplus. On the other hand, not enough stocks of DPT were available, and the vaccine had to be reordered during the same year.²⁰ In the field, more stocks of OPV than were required were found in a third of the stores visited, probably due to surplus from NIDs. In addition, in a few places, a surplus of measles and TT vaccines were reported.

One way to avoid the problem of excess vaccine stocks is to improve projection of vaccine needs. At present, vaccine needs are projected in Bangladesh using two methods. For BCG and measles, the session method is used, i.e., the number of yearly immunization sessions is multiplied by the average number of vials required per session. This method is probably used because vials still containing vaccines must be disposed of after the session since the vaccines do not contain a preservative. An assumption that is made is that one vial is opened at each session.

The rest of the vaccine requirements (OPV, DPT, and TT) are calculated using the target population-based method. This method estimates the target population for OPV, DPT and TT by multiplying the total population by the crude birth rate and the infant survival rate (1- infant mortality rate) or by multiplying the total population by the percentage of pregnant women. This is then multiplied by a wastage rate based on the ratio of the number of vials dispensed times number of doses per vial to the number of doses administered; and multiplied by the number of doses required for a particular vaccine (e.g., three for DPT and four for OPV) as well as by a desired coverage rate. A coverage rate of 100 percent is used in this case.

Some problems with the way that routine vaccine requirements are estimated have been identified. They include: (1) the use of a desired coverage rate of 100 percent is too high considering that coverage rates for children under one year are around 50 percent; (2) some of the wastage rates are probably too high, because they are based on data from only two years; in addition they are

²⁰ This is probably related to the fact that DPT was purchased through a different procurement mechanism, the VII, and was funded with central government funds.

calculated based on the usage from vials disbursed to the field rather than vials opened; and (3) the session method of estimation is likely to be an overestimate for measles vaccines since a vial may not need to be opened at every session.

Some ways in which the MOHFW can adjust the methods in which vaccine needs are calculated include: (1) the desired coverage rate that is used could start at 80 percent and then increase gradually to 90 percent; (2) wastage coefficients should be based on data for at least five years so that they are not subject to annual variation; e.g., the wastage coefficient for TT would be 1.9 rather than 2.43 if data for 1993–1998 were used. Table 32 indicates that costs savings could be as high as \$1,734,613.

Table 32. Vaccine Needs Calculations by MOHFW/UNICEF and Alternative Method

	MOHFW/UNICEF	Alternative Method
BCG	\$2,112,480	\$2,112,480
DPT	\$1,366,953	\$1,115,748
OPV	\$1,615,412	\$1,361,091
Measles	\$2,285,280	\$1,385,989
TT	\$844,155	\$842,229
TOTAL	\$8,224,280	\$6,817,537

The number of doses required for NIDs are estimated by multiplying the number of children under age five by a wastage factor, the number of doses (two), and a desired coverage rate of 100 percent. Although this method appears to be appropriate, the fact that surplus stocks of OPV were found in the field suggests that there is overreporting of coverage, or the target population estimate is too high. In addition, existing stocks of vaccines do not appear to have been taken into account when the requirements were estimated.

6.1.2 Reducing Vaccine Wastage Rates

Vaccine wastage is high in Bangladesh. Table 33 indicates that vaccine usage rates range from 16 to 70 percent, with three rates less than 50 percent. The rate is particularly low for BCG (15 percent) since it is only available in 20-dose vials.

Table 33. Vaccine Usage Rates

Vaccine	Usage Rates
BCG	16%
DPT	59%
OPV	70%
Measles	28%
TT	36.5%

The amount of vaccine wastage—and, thus, vaccine cost—would decline if the number of sessions were reduced. For example, if clinics held only one session per week rather than two, attendance and, therefore, vaccine usage per session should double; wastage should decrease, because fewer vials would be opened. More specifically, for instance, if the number of children requiring measles doubled at each session, the usage rate would increase to 56 percent, while only one vial of vaccine would be required. If there were two sessions, two vials would need to be opened rather than one. Whether this strategy is adopted by the new community clinics will depend on what is decided by the MOHFW.

A second way to reduce wastage is to change the open-vial policy (opening the vials every time a client comes to an immunization session rather than waiting for a larger number of clients to come). However, given the problems in FIC coverage in the country, the program probably would not want to change this policy at this time.

It is unlikely that the MOHFW will pursue either of these strategies in the next two to three years due to the recent decline in FIC coverage. However, it may decide to do so in the longer term. The cost savings are estimated to be approximately \$450,000 for one year if vaccine wastage were reduced by 10 percent.

A third strategy to reduce vaccine wastage is by increasing attendance at sessions through such strategies as communications campaigns.²¹ While this strategy would not reduce the costs of the total program since a similar number or slightly more vials would be required, it would likely reduce the cost per FIC since fixed costs such as personnel costs would be divided among a larger number of children fully immunized. In addition, the performance of the program would improve.

6.1.3 Summary of Potential Cost Savings

Table 34 summarizes the potential cost savings to the national immunization program. By adopting measures to improve projections of vaccine needs and reduce vaccine wastage, the program could save \$1.45–\$2.6 million. However, it is more likely that the program would adopt the former measure first and the latter at a later date, since it needs to concentrate on increasing coverage at this time. In that case, the annual savings would be between \$1 and \$1.7 million until the wastage reduction measures could be put into place.

Table 34. Summary of Potential Reduction in the Required Expenditures for the National Immunization Program for the Next Five Years, US\$

Cost Saving Measure	Approximate Annual Savings
Improving vaccine needs projections	\$1,000,000–\$1,700,000
Reducing vaccine wastage	\$ 450,000–\$900,000
Total possible savings	\$1,000,000–\$2,600,000
Average projected expenditures with program improvements	\$23,346,200
Projected expenditures minus savings	\$21,546,200
Percent reduction in estimated expenditures	7.7%

²¹ It would be useful to compare the costs of campaigns with the savings in vaccines.

6.2 Changing the Mix of Financing and Mobilizing Additional Resources for the Immunization Program

In order to pay for the planned improvements to the program as well as ensure that funding is available if any of the donors reduce their current level of funding, it is important for the MOHFW to change the mix of financing for the national immunization program as well as mobilize additional resources for it. In this section, some ways to go about mobilizing additional resources will be discussed.

6.2.1 Increasing Central Government Budget Allocations

As mentioned above, the central government currently pays personnel costs and some vaccine costs of the routine EPI. It also covers certain operational costs: supplies, transport, and maintenance of overhead. However, it pays little for social mobilization, trainings, and for various cold chain costs and nothing at all for still other operational costs, (e.g., most forms and registers are funded by UNICEF). With the uncertainty that donor funding will continue at its current level, it is important that the program increase its level of national self-sufficiency. In order to do so, the MOHFW could consider increasing the amount that it allocates to the routine immunization program. Since it is using the HPSP implementation plan as a basis for budgeting, if, during the course of designing the HPSP, not all the program costs of the program were included in the plan, the estimated costs could be amended to increase all necessary costs.

Since campaigns for polio eradication are time-limited and receive considerable donor support, the government probably will not need to increase its contribution towards NIDs (and mop-ups). However, it should start picking up some of the surveillance costs since it will need to continue this function after the polio eradication campaign is finished.

6.2.2 Increasing the Financing Role of Local Governments

At this time, the local governments of municipalities fund about 6 percent of total costs of the routine EPI program and 2 percent of the costs of NIDs and surveillance by paying for personnel and some supply costs. Since the municipalities constitute roughly 20 percent of the population and do not pay for vaccines or many supplies, these local governments should gradually increase their level of contribution. For example, they could gradually begin purchasing their own supplies and eventually even buy vaccines from the government similarly to the way they buy insecticides and other supplies.

6.2.3 The Role of Donors and International Organizations

Donors and international organizations play an important role in providing support to the program. They are also an important source of finance for both the routine EPI program, and for NIDs and surveillance. However, it is likely that a few of the donors may consider phasing some of their support in the next few years. The government of Japan, for example, has said that it will be phasing out its support for both the routine program and NIDs. UNICEF has stated that it would like to stop providing funding for supplies and focus on support for other activities.

Despite the fact that some donors may decide to phase out their support, most are likely to continue their support for the immunization program for some time, particularly for capital costs such as building up the cold chain, and assisting with social mobilization and training.

Another role that may make sense for donors to adopt in the future is to provide financing for the introduction costs of newer vaccines such as Hepatitis B vaccine. This is the role that the Asian Development Bank has proposed it assume in the four city corporations. However, it is important that this new activity take place only if significant issues being faced in the urban areas, such as low coverage for routine vaccines, are addressed. For this reason, it may make sense to postpone this activity until after an assessment of the urban EPI takes place.

6.2.4 The Role of Donor-supported NGOs

At this time, donor-supported NGOs in Bangladesh play a small but important role in increasing coverage to immunization services, and offering social mobilization, personnel and training support. This support can be expected to continue and the role of these organizations in extending coverage should be expanded in areas where NGOS have better access than the MOHFW.

Some possible roles that NGOs can take to improve the program and lower costs of the government are the following: (1) to provide immunization services in hard-to-reach areas, (2) purchase of supplies and possibly vaccines from the government.

6.2.5 The Role of Private For-profit Clinics and Doctors' Chambers

The private for-profit sector plays a very small role in the provision of immunization services. Fees charged for services are relatively high and there is questionable service quality since most providers have not received EPI training. For these reasons, it is unlikely that the role of this sector will change to a more significant one any time soon.

6.3 Possible Scenarios for Long-term Sustainable Financing

The scenarios for long-term sustainable financing of the national immunization program are based on the recurrent variable, non-personnel costs of the program (see Section 3) and the additional expenditures that will be required to implement the planned improvements and changes, including the upgrading of the cold chain system and the other improvements discussed in Section 5. It is assumed that these improvements will be made within the next five years. However, the scenarios also assume that national immunization program will phase in several of the desired improvements and reduce costs by introducing some of the measures discussed in Section 6.1. In particular, the scenarios assume the following:

- > Upgrading the cold chain system, replacing refrigerators and other cold chain equipment by 10 percent per year over the next five years, and building one cold room and one freeze room in 2000/01;
- > Improve the sterilization of needles and syringes as well as the waste disposal;
- > Introduce campaigns both for catch-up in low performance areas and for communications for the new service delivery system in rural areas under the HPSP to start in 2000/2001;
- > Annual refresher training for mid-level managers conducted starting in 1999/2000;

- > Continuing the NIDs as they currently are being implemented and assuming that other government sectors will continue to contribute to personnel, transportation, and other costs;
- > Hepatitis B vaccine will not be introduced in the next few years, and after that, only if it is introduced in a phased-in manner with funding for both operating and investment expenses from a donor organization;
- > Achieving cost savings of around \$1.0–\$1.7 million in the first year, changing to the population-based method of determining vaccine needs, basing the needs on more realistic “desired” coverage, and perhaps by reducing vaccine wastage.

The funding required for the next five years, based on the above assumptions is shown in Table 35. The table indicates that there will be a gap in funding if the improvements to the program take place. The funding gap was calculated in three ways: (1) subtracting out the GOB budget allocation and World Bank loan expenditures, (2) subtracting out expenditures that are usually provided by donors such as social mobilization, training, and NID vaccines; and (3) subtracting out donor expenditures listed in (2) as well as expenditures on investment costs such as cold chain equipment and buildings that are likely to be paid for by donors. The gap ranged between \$5.3 and \$7.3 million, \$1.4 and \$3.1 million, and \$0.7 and \$1.8 million, for the three methods, respectively.

Table 35. Assumed Financing Requirements for the Financing Scenarios, 1999/2000–2003/2004, (US\$)

Improvement/Addition	1999/2000	2000/01	2001/02	2002/03	2003/04	Total
“Basic” Program						
Operating costs:	15,345,569	16,453,750	17,642,356	18,917,247	20,284,715	88,643,636
Catch-up campaign	-	211,205	224,300	238,207	-	673,712
Refresher training	261,350	277,554	294,762	313,037	332,446	1,595,916
Communications	-	917,568	376,700	400,055	424,859	2,119,182
Investment Costs:						
Sterilization	358,837	381,085	404,712	429,804	456,452	2,030,890
Cold chain system	268,400	824,311	302,713	321,482	341,413	2,058,319
Waste disposal	84,375	89,609	95,165	101,065	107,311	477,545
TOTAL	\$16,318,531	\$19,155,082	\$19,340,708	\$20,837,664	\$21,947,216	\$97,599,200
Potential cost savings	\$1,000,000	\$1,100,000	1,210,000	1,331,000	1,464,200	\$6,105,200
TOTAL ADJUSTED COSTS	\$15,318,531	\$18,055,082	18,130,708	19,506,664	20,483,016	\$91,494,000
Projected GOB funding*	\$10,004,000	\$10,757,000	\$11,570,000	\$12,450,000	\$13,402,000	\$58,183,000
Remaining funding gap	\$5,314,531	7,298,082	6,560,708	7,056,664	7,081,016	\$33,311,000
Funding gap less expenditures on social mobilization, training, and NID vaccines	\$1,366,850	\$3,105,645	\$2,108,340	\$2,328,249	\$2,059,439	\$10,968,523
Funding gap less expenditures on investment improvements	\$655,238	\$1,810,640	\$1,305,750	\$1,475,898	\$1,154,243	\$6,401,769

*Includes additional projected GOB funding allocations (assumes a 13.5 percent annual increase) and World Bank loan contributions (adding a 6.2 percent annual inflation factor)

In terms of financing, the scenarios also assume the following:

- > World Bank funding will continue until 2003/2004 and be renewed after that; and
- > Donor funding will continue at about its current level, with donors continuing to fund IEC and short-term training costs for the next five years, and polio vaccine for the NIDs;

Scenario 1: The central government, as appropriate, increases its budget allocation for the national immunization program.

In this scenario, the central government increases its budget allocation and pays for all supplies, catch-up campaigns, refresher training, and some additional expenditures to build the cold rooms. Donors continue paying for expenditures they currently cover and assist with the purchase of cold chain equipment and equipment for sterilization and waste disposal. The additional expenditure for the central government will be approximately \$534,000 in 1999/2000, and increase to \$1,012,000 in 2000/01. This increase represents 5 percent and 9.1 percent of non-personnel operating costs in 1999/2000 and 2000/01, respectively.

Scenario 2: Local governments and the central government increase their allocations to the program.

Local governments increasing their contributions to the immunization program will reduce the outlays required from the central government. The local governments could, for example, increase their contribution for supplies and maintenance.

Scenario 3: In urban areas, nominal fees-for-service or fees for registration cards in urban areas can be gradually introduced to recover a proportion of their operational costs.

Since NGOs are already charging fees for services/registration cards for immunizations, it seems reasonable that municipal facilities can also charge their clients nominal fees to recover some of their operational costs. Because there is a possibility that some clients will be unable to pay, however, the local government may need to institute a policy to allow them to receive services without paying. They could, for example, have a day a month where services are provided for free or use another similar strategy to ensure that all clients have access to services. If municipal facilities begin charging TK 2 for registration fees/cards, then in one year, the amount of TK 5,359,608 (\$111,658) could be raised through these fees²² (Table 36).

Table 36. Revenue Gain through Introduction of Fees in Municipalities

	# of Doses given per month	Revenues per Month (TK)	Revenues per Year (TK)
Small Municipalities	104,667	209,334	2,512,008
Large Municipalities	71,162	142,324	1,707,888
City Corporations	47,488	94,976	1,139,712
Total	223,317	446,634 (\$9,305)	5,359,608 (\$111,658)

²² It should be noted however, that some administrative costs will be associated with the introduction of fees and will reduce the net revenues.

7. Summary, Conclusions, Lessons Learned and Recommendations

7.1 Summary of the Main Findings

The main findings of the study are as follows:

7.1.1 Costs

The estimated total cost of the national immunization program, including national immunization days (NIDs) and surveillance, was about \$34.4 million in 1997/98—about \$0.52 per dose, \$21.47 per fully immunized child (FIC), and \$0.28 per capita. Fifty-two percent of total cost was for personnel, 31 percent for vaccines, and 9 percent for capital costs. The estimated total cost of the routine Expanded Programme on Immunizations (EPI) component of the national program was \$28.9 million—\$0.84 per dose and \$18.06 per FIC—with personnel comprising 56 percent, vaccines 26.7 percent, and capital costs 10.6 percent. The estimated total cost of NIDs and surveillance was about \$5.4 million, about 16 percent of total program costs. The largest cost component of NIDs was vaccines (54 percent), since the personnel time cost is relatively low (28 percent). The recurrent, variable non-personnel costs of the program, for which the Ministry of Health must find financing each year, are approximately \$13.3 million, or about 39 percent of total estimated costs; vaccines account for 80 percent of these costs.

The improvements that have been proposed for the national immunization program will cost \$0.9 million to \$2.7 million per year without the introduction of Hepatitis B vaccine. Improvements include a catch-up campaign for low-performance *thanas* (subdistricts), annual refresher training for mid-level managers, a communications program to be started with the introduction of community clinics under the Health and Population Sector Programme, the purchase of autoclave drums and autoclaves to improve sterilization of syringes and needles, the replacement of existing refrigerators with CFC-free ones, the construction of a cold room and freezer room in Dhaka, and the purchase of incinerators to improve waste disposal.

If Hepatitis B vaccine is introduced throughout the country, the annual cost of vaccines alone will increase by \$10–\$11 million. An alternative solution is to phase in the vaccine, beginning in highly endemic or urban areas, if an appropriate donor can be found.

Cost reductions can also be realized in two other ways: (1) improving methods of projecting vaccine needs and stock management, and (2) reducing vaccine wastage rates. By changing the way that vaccine needs are determined, the cost of vaccines could be reduced by as much as \$1–\$1.4 million. Costs can also be reduced either by reducing the number of sessions in which immunizations are provided or by increasing the number of clients. However, the MOHFW will probably want to postpone these latter changes until after FIC coverage within the country has been stabilized.

7.1.2 Financing

Expenditures (nominal) on the national immunization program have increased by roughly 50 percent from 1993/94 to 1997/98.

The sources of funding for the program in 1997/98 were the following: the Bangladesh central government (52 percent), local governments (5.7 percent), a World Bank International Development Association loan (23.4 percent), donors and international organizations (16.7 percent), and donor-supported NGOs (2.0 percent). Several donors have contributed towards the program: Major donors to the routine EPI have been UNICEF, the Swedish International Development Agency, and the World Bank, while Japan was the main contributor to the NIDs. If the funding for program-specific costs are examined (funding not shared by other programs), the share provided by non-government sources is larger: central government (15 percent), local government (1.8 percent), World Bank loan (43.4 percent), donors and international organizations (38.2 percent) and donor-supported NGOs (1.7 percent).

The MOHFW has been purchasing one vaccine, DPT, through UNICEF's Vaccine Independence Initiative (VII) and most other vaccines through regular UNICEF procurement. Although there are few complaints about the procurement through the VII, the country appears to be receiving few benefits from the use of the initiative: It does not have a foreign-exchange problem, since it is using the World Bank loan to purchase vaccines. In addition, the MOHFW does not need to defer payment for the vaccines, because it is on a different fiscal year than UNICEF and has already allocated funds for the vaccines before UNICEF's calendar begins.

7.1.3 Future Financing

In the next five years, improvements to the immunization program (excluding the start-up of Hepatitis B) will produce a funding gap of \$1.4–\$3.1 million (\$0.7–\$1.8 million if donors pay for investment costs during the period)—even assuming cost savings in estimating vaccine needs. Savings of \$1–\$1.7 million can potentially be realized if changes to the way in which vaccine needs are estimated can be introduced. In any case, however, additional resources will need to be mobilized for the program.

This report proposes three ways in which these resources might be mobilized: (1) increasing central government budget allocations for the immunization program, (2) increasing the role of local governments in financing immunization services, and (3) introducing or increasing fees for services or registration cards in urban areas.

If the government of Bangladesh increases its budget allocation to finance more of the operating costs of the national immunization program, donors will be able to focus on improving the program through funding of social mobilization, training, and polio eradication activities, as they are doing to some extent now. They will also be able to finance more of the required investment costs that will be needed in the future. The way in which the central government could consider increasing its contribution needs to be further studied.

7.2 Conclusions and Lessons Learned

The Bangladesh national immunization program has made considerable progress in the last 15 years in increasing the FIC percentage from 2 percent to around 50 percent. In addition, the MOHFW

has begun to pay for one vaccine through the VII mechanism and others with a World Bank loan. Another positive change is that local governments have begun to contribute towards the program in urban areas.

Nevertheless, the program still relies on donors to finance many of its recurrent costs, including training, social mobilization, and supplies. At the same time, certain needed improvements, such as construction of a cold room and a freezer room, have had to be postponed since 1996 due to lack of investment funding. If both the central and local governments would increase their allocations to the program operating budgets, taking over all supply costs and some of the other costs, donors would be able to redirect their funding to needed investments.

One way to increase domestic funding for the program is to begin charging small fees for immunization services in urban areas, since urban clients have more disposable income than do rural clients. Local governments could consider charging nominal fees for immunization services themselves, or for registration cards. The revenues could then be used to purchase supplies or other immunization program-related items, such as stationery. If local governments can indeed assume more supply costs, the central government will be able to use its funding elsewhere in the program. It should be noted, however, that price-setting should take into account client willingness and ability to pay, so as not to discourage use. To this end, instituting charges for registration may be more effective than charging for immunizations themselves.

Currently, NGOs provide some immunization services, mostly in urban areas, thus reducing personnel costs that would otherwise be incurred by the government. The MOHFW should encourage NGO service provision as a way to expand coverage to areas where access to government services is limited or non-existent, for example, in rural areas where government services are not offered on a regular basis. The NGOs should consider using some of the user fees that they collect to pay for immunization supplies after they recover their operating costs.

The MOHFW has been purchasing vaccines through the Vaccine Independence Initiative. This mechanism initially facilitated the payment of up to a third of MOHFW vaccine costs by allowing the Ministry to pay with local currency. However, most vaccines now are purchased with a World Bank loan; therefore, the government does not have an immediate foreign currency problem. In addition, since the government's fiscal year differs from the calendar year of UNICEF, the loan allows it to allocate funds for vaccine purchase well before delivery. Thus, it appears that there are limited advantages to using the VII rather than regular UNICEF procurement.

The MOHFW does benefit from using regular UNICEF procurement rather than procuring vaccines directly from manufacturers. First, this procurement mechanism provides quality assurance for the vaccines, thus obviating the need for a national biologicals control authority to ensure that the vaccines are safe and effective. Second, UNICEF procurement ensures transparency during the annual process of negotiating prices and delivery costs for vaccines.

7.3 Recommendations

The MOHFW should design a multi-year plan for the national immunization program. The plan should set out specific objectives and include detailed plans for the introduction of improvements, based on the results of this study and other data collection and analysis; for conducting additional research to obtain critical information on which to base program decisions; for capacity building in critical areas; and for financing the program in a sustainable manner, based largely on domestic funding and in conjunction with the planned health sector reforms.

The consideration and analysis of costs should be included in the program decision-making process on a more systematic and regular basis, along with considerations of effectiveness and quality.

7.3.1 Vaccine Procurement and Supply

If the government of Bangladesh would like to try direct procurement rather than use of UNICEF procurement system to obtain its vaccines, it should start with one vaccine to see if the process operates smoothly. During this time, it should develop a mechanism for tracking the safety, regularity of shipments, and payments, and costs should be introduced during the time it is tested to see whether it is working smoothly. In addition, it should introduce a national control authority for biologicals to license vaccines on the basis of safety, potency, and efficacy; to oversee the quality of the vaccines by rating each lot; and to monitor the impact of vaccines through a well-functioning surveillance system. A mid-term evaluation should be planned to assess the effectiveness and efficiency of using direct procurement of vaccines.

Training should take place in procurement management and control of quality of vaccines.

7.3.2 Financing

A study of cost recovery and out-of-pocket payments for government immunization services should be carried out to analyze the amount of revenues generated, the effect on utilization of services, and the possible impact on financing and equity.

Training of program managers should be initiated to strengthen capacity for financial planning for the program.

7.3.3 Research

Plans for the future of the program, including the diversification of financing sources and mobilization of new resources, should be based on information concerning needs, effectiveness, costs, and cost-effectiveness. Given the program's objectives and plans for the future, the following studies and analyses are recommended:

- > A study on ways to improve immunization coverage, considering the effectiveness, costs, and cost-effectiveness of different delivery and social mobilization strategies; local-level mini-campaigns; increased outreach through mobile health teams, home visits, etc. and different types of information, education, and communications and social mobilization strategies; and,
- > An analysis of the potential for reducing vaccine wastage, for which antigens, and how.

Annex A. Results of Municipality and City Corporation Survey

Survey Methodology

Information about local government contributions to the Expanded Programme on Immunization (EPI) and for national immunization days (NIDs) is not readily available nor is there broad awareness of such contributions among officials and immunization program administrators in Bangladesh. To determine the extent of local government involvement, the current study felt a municipality and city corporation survey was necessary. Cost constraints limited the survey to only 24 municipalities (13 percent), randomly selected from among the 185 municipalities in the country. All the four city corporations in the country were included in the survey sample. For analysis, the sample was divided into three groups: 13 small municipalities (from among 139) whose population numbered less than 80,000, 11 large municipalities where the total population size was greater than 80,000 people, and four city corporations with an average population 1,619,000.

Local interviewers collected mainly quantitative information on the following categories:

- > Coverage and access information to routine immunization services
- > Salaries and benefits specific to immunization-related personnel, including allocation of time spent on immunization services
- > Budget expenditure information for the delivery of EPI services
- > Budget information about the local government's contributions for the fourth NID
- > Qualitative information about the impact of NIDs on routine services

Access to Services and Coverage Information

Bangladesh's population growth rate is approximately 2 percent per year; in urban areas, the rate is 6 percent per year. Over the next two decades, the urban population is expected to double to approximately 50 million people (Perry et al., 1996). According to the 1998 EPI Review, demand for urban health services will also increase 10 percent or more per year, compounding an already complex situation for local governments that provide EPI services.

The provision of EPI services by the local government falls under the jurisdiction of the Ministry of Local Government, Rural Development and Cooperative (MOLFRD&C) rather than the Ministry of Health and Family Welfare (MOHFW). This further complicates urban EPI service delivery, which is provided by a combination of loosely coordinated local government vaccinators, hospitals, non-governmental organizations (NGOs) and private providers. The 1998 EPI Review recommended that a separate review of EPI should be conducted at the local government level to assess access to

services, quality and consistency of services, coverage, high-risk populations, and surveillance and sustainability.

The survey found that access to routine EPI services varies between the municipalities and city corporations (Table A-1). Two of the smaller municipalities offer no immunization services and a third small municipality offers a limited number of services. However the data do show that the number of sessions held increases as the population size of the catchment area increases. Municipalities rely on a similar ratio of satellite clinics to fixed sites to deliver immunization services, while the city corporations are more dependent on fixed sites.

Table A-1. Access to Services

Location	Monthly EPI sessions (Jan. average)	Percent of satellite to total sessions (Jan. average)	Immunizations offered per center (Jan. average)	Under one population per center
Small municipalities	30	40%	37	53
Large municipalities	53	38%	80	114
City corporations	560	13%	81	196

The survey also collected information on the number of immunizations given during January 1999 (Table A-2). Results show that, despite their smaller population size, large municipalities distribute an average number of immunizations (80) equal to the city corporations (81). Coverage rates were also determined for the total under-one-year-old population per center in both municipalities and city corporations. Some large variations exist among the municipalities when the total target population is considered. City corporations also have a large population size per center (196). It should be noted, that urban residents have alternatives delivery points, such as NGOs and the for-profit sector that offer immunization services in their catchment areas.

Table A-2. Immunizations Distributed

Location	Average immunizations doses (Jan. average)	Percent of TT doses to total doses (Jan. average)	Percent of DPT/OPV3 doses to total doses (Jan. average)	Percent of OPV4 doses to total doses (Jan. average)
Small municipalities	753	22%	45%	11%
Large municipalities	1,547	26%	44%	4%
City corporations	11,872	22%	46%	7%

While the number of immunizations offered at each municipal and city corporation varies again with the target population size, the percentage of certain immunization doses compared to total doses offered does not vary greatly among the locations. For example, the percentage of the first three doses of DPT and OPV compared to the total immunization doses remains around 45 percent. A slight variation to this can be found for OPV4, where the small municipalities offer a greater share of total doses (11 percent) compared to larger municipalities and city corporations (4 percent)

Table A-3. Expenditure Information

Location	Average annual expenditures	average annual expenditures per one year old child	Average monthly expenditure per immunizations given
Small municipalities	258,863 TK (\$5,393)	244 TK (\$5.30)	29 TK (\$.62)
Large municipalities	571,225 TK (\$12,418)	218 TK (\$4.73)	31 TK (\$.67)
City corporations	6,876,715 TK (\$143,265)	193 TK (\$4.20)	48 TK (\$1.05)

Exchange rate used \$1= 46 Taka 1997

Average expenditure information contains the following categories of immunization-related costs salary and allowances immunization personnel, supplies, transportation, office rental, repair and maintenance of EPI equipment, training, social mobilization, communications, monitoring, cold chain equipment, furniture, and vehicles.

Total average expenditure for each location increases with the size of the population. Total city corporation contributions are greater than all the municipalities, due to the large population in their catchment area.

According to the 1991 national census, the under one-year-old population was assumed to be 2.2 percent of the total population. Assuming that every child in the catchment area receives EPI services, average expenditure per child was calculated based on the total number of under one-year-old population in the catchment area. Based on this assumption, city corporation contributions per child are greater than that of the municipalities. It was interesting to find that the small municipalities spend more per child compared to the larger municipalities.

A more realistic picture of the degree of variation in expenditures is found when viewing expenditures per contact or actual immunizations given in the catchment areas. However it was surprising to see that large municipalities and city corporations despite their large differences in population size have similar spending patterns.

Cost Categories

Table A-4 shows that salary and allowances comprise the largest component of local government contributions for immunization services (EPI and NIDs) across all locations. The more minor categories, such as operational and accommodation costs, increase with population size. For example, city corporations pay 12 percent of the total expenditures for office accommodations, while small municipalities spend only 2 percent of their total expenditures on accommodations, in their case for immunization personnel.

Table A-4. Breakdown of Expenditure by Type of Municipality

Location	Salaries/allowances	Operational costs	Office space
Small municipalities	91%	1%	2%
Large municipalities	87%	2%	6%
City corporations	80%	5%	12%

Personnel

As mentioned above, personnel expenditures are the largest category of costs borne by local governments. Survey interviewers collected specific information on personnel salaries, allowances, and percentage of time spent performing EPI-related work for roughly 15 local-level job classifications. These classifications can be separated into officer or staff positions. Officer positions are commissioner, chairperson, chief executive officer, medical officer, secretary, accountant and cashier. Staff positions include the health assistant, vaccinator, sanitary inspector, and EPI supervisor.

Closer examination shows little variation in EPI staffing among small and large municipalities, greater variations between city corporations and municipalities, irrespective of size. Municipalities have a similar ratio of officer to staff positions (average 18 percent). City corporations also tend to have more medical officers than the municipalities (average of three spending more than 75 percent of their time on EPI services). Health assistants are more widely utilized in the city corporations than vaccinators while municipalities tend to rely on vaccinators more than health assistants to deliver EPI services.

Table A-5. NID Contributions

Location	Average NID expenditure	NID contribution versus total annual expenditure	Largest component of contribution (percent)
Small municipalities	29,119 TK (\$633)	11%	Salaries and benefits 65%
Large municipalities	58,661 TK (\$1,275)	10%	Salaries and benefits 68%
City corporations	545,653 TK (\$11,862)	8%	Salaries and benefits 81%

Exchange rate used \$1= 46 Taka 1997

Local government contribution toward the fourth NID was minimal compared to local expenditure on routine EPI services. NID expenditure patterns of small and large municipalities and the city corporations mirror those of total annual expenditures: contributions increase with the size of the catchment population. However, municipalities give a greater proportion of their total contributions to polio eradication activities than do city corporations.

Local contributions for NIDs are primarily for personnel, training, and orientation and communication (advocacy planning, miking) activities. It was assumed that 8 percent of overall salary and benefit expenditures goes to personnel time spent planning and implementing NID activities.

Overall Local Government Contribution

The local government contribution in 1997/98 was found to be 6 percent of the total budget for the national immunization program (see Section 4). According to government sources, no municipality contributed to payment of its recurrent costs in 1994. However, local contributions have steadily increased in recent years. This study reveals that both municipalities and city corporations are funding a large proportion of their personnel costs to deliver immunization services (Table A-6).

Table A-6. Total Local Government Contributions (Average Annual Expenditures)

	EPI	NIDs	Total	National Total*
Small municipalities	229,744 TK (\$4,994)	29,119 TK (\$633)	258,863 TK (\$5,627)	35,981,996 TK (\$782,217)
Large municipalities	512,563 TK (\$11,143)	58,661 TK (\$1,275)	571,225 TK (\$12,418)	26,276,350 TK (\$571,225)
City corporations	6,331,062 TK (\$137,632)	545,653 TK(\$11,862)	6,876,715 TK \$149,494)	27,506,862 TK (\$597,975)
Average Total	1,212,469 TK (\$26,358)	114,515 TK (\$2,489)	1,326,984 TK(\$28,847)	29,921,730 TK (\$650,472)

Exchange rate used \$1= 46 Taka 1997

*national total is based on 139 small municipalities, 46 large municipalities and 4 city corporations.

Annex B. Personnel Assumptions

	Total Post	Percentage of Time Spent on NIP
MOHFW Personnel		
Project Director	1	100.00%
Assistant Director	5	100.00%
Sr. Cold Chain engineer	1	100.00%
Medical Officer	12	100.00%
Store manager	1	100.00%
Logistic Officer	1	100.00%
Cold Chain Engineer	1	100.00%
Statistical & Evaluation Officer	1	100.00%
IEM Officer	1	100.00%
Training Officer	1	100.00%
Survey & Monitor Officer	1	100.00%
IEC Officer	1	100.00%
Accounts Officer	1	100.00%
Administrative Officer	1	100.00%
Transport Officer	1	100.00%
Sub Assist Engineer	7	100.00%
Computer Operator	1	100.00%
Head Assistant	1	100.00%
Stenographer	1	100.00%
Draftsman	1	100.00%
Statistics Assistant	4	100.00%
UD Assistant	3	100.00%
EPI Storekeeper	4	100.00%
Cashier	1	100.00%
Accountant	1	100.00%
Audio-visual Tec.	1	100.00%
Telephone Operator	1	100.00%
EPI Technician	12	100.00%
Account Assistant	3	100.00%
Driver	15	100.00%
Recordkeeper	2	100.00%
LDA-Cum-Typist	11	100.00%
Electrician	1	100.00%
Cash Sarker	1	100.00%

	Total Post	Percentage of Time Spent on NIP
MOHFW Personnel		
Dup. Machine Operator	1	100.00%
Track Helper	4	100.00%
MLSS	5	100.00%
Packers	5	100.00%
Darwan	2	100.00%
Night Guard	2	100.00%
Sweeper	2	100.00%
Gardener	1	100.00%
Deputy Director	1	100.00%
Assistant Director	1	100.00%
Cold Chain Engineer	1	100.00%
Medical Officer	2	100.00%
Statistical Officer	1	100.00%
UD Assistant	2	100.00%
Steno Typist	2	100.00%
LDA-Cum-Typist	4	100.00%
BCG Technician	4	100.00%
Sr. Mechanic	1	100.00%
Jr. Mechanics	2	100.00%
Vaccine Carrier	8	100.00%
MLSS	4	100.00%
Griger-Cum-Lasker	1	100.00%
Divisional Level	157	
Medical Officers	15	100.00%
Divisional Director	4	5.00%
Health Education Officer	4	500.00%
Divisional Health Sup.	4	2000.00%
Statistician	1	500.00%
Ass. Director	8	1000.00%
District level	36	
District Civil Surgeon	64	7.50%
Cold Chain Techn.	64	100.00%
EPI Supervisor	64	100.00%
EPI Storekeepers	43	100.00%
Senior Hlth. Edu. Off.	64	17.50%
Junior Health Edu. Off.	51	17.50%
District Sanitary Inspe	64	5.00%

	Total Post	Percentage of Time Spent on NIP
MOHFW Personnel		
Medical Officer, CS	128	7.50%
Statistician	64	10.00%
Thana Level	606	
Thana Health & Family Planning Officer	460	7.50%
Medical Officer of MCH	460	25.00%
Medical Officer, Disease Control	460	50.00%
EPI Technician	460	100.00%
Statistician	460	17.50%
Health Inspectors	1200	20.00%
Family Planning Inspec	4500	10.00%
	8000	
Union/Ward Level		
Family Welfare Visitor	4500	2.00%
Assistant Health Director	4200	30.00%
Health Assistants	19000	40.00%
Family Welfare Assistant	23000	10.00%

Annex C. Cost of Catch-up Campaign

Cost of Catch-up Campaign				
Expenses	Unit Costs (Taka)	# of Items	Total (Taka)	Total (US\$)
Urban Areas				
Planning & Publicity Meetings	1,000.00	60	60,000	
Communications: miking	500.00	60	30,000	625.00
Leaflets: general mass	0.007	2,000,000	14,000	\$291.67
Additional Session	150.00	12,000	18,000,00	37,500.00
Television and Radio	298,080.00	2	596,160	12,420.00
Total Urban			2,500,160	52,086.67
Rural Areas				
Communications: miking	500.00	910	455,000	9,479.167
Leaflets: general mass	0.007	5,460,000	38,220	796.25
Additional Session	150.00	43,680	6,552,000	136,500.00
Total Rural			7,045,220	146,775.40
Total Costs of Urban and Rural				198,862.10
With Inflation Factor				211,191.50

Annex D. Cost of Sterilization

Unit cost	Unit cost	# required per session	# of Sites	Cost
Autoclave Drums	\$59	3	4500	\$796,500
Carrier Bags	\$ 5	3	4500	\$ 67,500
TST Spots	\$45/sheet	1	443	\$19,935
Sub-total				\$883,935/\$324,580
With autoclave				
Autoclave	\$500	1	443	\$221,500/\$34,266
Total/Annualized Cost				\$1,105,435/\$358,847

Annex E. Cost of Upgrading Cold Chain

Cost of Refrigerators

750 CFC-free refrigerators were procured in 1996/97. 2,684 additional refrigerators are needed in the next five years (1999/2000-2003/04).

Unit cost of refrigerator = \$500

Total cost = \$500 x 2,684 = \$1,342,000

Average annual cost during 5 years = \$268,400

Cost of Constructing and Equipping Cold and Freezer Rooms

Equipment and supplies for cold room	TK10,349,800
Equipment and supplies for freeze room	TK11,276,387
75 HVA generator	TK 1, 334,696
200 KVA transformer	TK 1,359,884
Construction of building	TK 1,564,170
Total	TK25,884,937 (\$539,270)

Table E-1. Cost of Upgrading Cold Chain Over 5 Years

Item	1999/2000*	2000/01*	2001/02*	2002/03*	2003/04*	Total Cost
CFC-free Refrigerators	\$268,400	\$285,041	\$302,713	\$321,482	\$341,413	\$1,519,049
Cold and Freezer Rooms	0	\$539,270	0	0	0	\$539,270

*An inflation factor of 6.2% was added.

Annex F. Cost of Communication Campaign for HPSP Delivery System

Communications	Unit Cost	Quantity	Cost	Grand Total
TV spots	\$6,209.89	30	186,296.7	
Radio spots				
Leaflets	\$0.007	3,000,000	21,000	
Hand bill	0.01	100,000	1,000	
Brochures - mothers	0.01	2000000	20,000	
Brochures - FWs	\$0.018	500000	9,000	
Documentary Drama	\$217.680	100	21768	
Miking	\$10.420	7280	75,857.6	
Audio cassette	1.10	1100	1,210	
Video cassette	6.60	500	3,300	
Billboards	1041.70	460	479,166.7	
Sub-Total			\$818,599	
Social and Mobilization Meetings	\$62.50	724	\$45,200	\$863,849

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