

# **Costing of National Immunization Programs: The Whys and Whens**

By Ann Levin, *PHRplus/URC* and Janet Edmond, *PHRplus/DA*

August 2001

# **1. Introduction**

## **1.A Purpose**

Costing of immunization programs is an important activity and provides information essential to decision-making on financing options and program sustainability. Considerable confusion exists about when to do costing as opposed to other types of financial analyses. This paper will attempt to clarify these issues by explaining the differences between types of financial analyses, why costing of programs is valuable, and when different types of costing should be applied.

## **1.B Background**

Most developing countries began to implement their Expanded Programme on Immunization (EPI) programs in the 1980s. Tremendous gains in immunization coverage were made in the 1980s in these countries. However, coverage rates began to plateau or even decline in many countries in the 1990s as funding for immunization programs declined after UNICEF's Universal Coverage Immunization Campaign ended. In addition, donors began to reduce their funding for immunization programs as they turned towards funding other health needs such as HIV/AIDS.

As funding for immunization programs has become more limited, program managers have realized the need to more carefully estimate the finances required for their programs to ensure adequacy of resources. They have also been required to do more financial planning for their programs as countries have begun implementing sector-wide planning and/or decentralization of the health sector. In addition, external funders have begun asking immunization program managers to conduct planning exercises where funding needs are projected over three to five years to help them with their needs assessments.

As the need for financial analysis becomes more frequent, program managers and policymakers have often been confused regarding the difference between budgeting, expenditure analysis, and costing of immunization programs. In this paper, the difference between the three will be clarified and the appropriate time to conduct costing analyses discussed.

## **1. C Why is Costing Important for Immunization Programs?**

Program managers in developing countries need information on all levels of program performance, including cost data. Costing analyses provide useful information about actual resource needs or inputs required to provide a service. Furthermore, costing analyses can provide in-depth information on the efficiency and effectiveness of the use of these resources, as well as estimate the value of additional efforts needed, often in terms of staff labor and inputs.

Costing analyses are useful tools when assessing financing options for national immunization programs. They provide comprehensive information for assessing resource requirements for immunization activities, to estimating the share of each component, and identifying potential cost saving measures. They also allow program managers to evaluate different options for program improvements by estimating the resource requirements for each. In resource constrained

countries, the additional costs of improvements into a country program are an important consideration in deciding whether or not to proceed with their use.

Many developing countries rely on myriad donor agencies and partners for funds to ensure national immunization goals are met. Given the complexities of these multi-partner efforts, costing analyses assist program managers to assess the financing roles of governments, the private sector, donors and international organizations by showing the contribution of each financier of the program. Using these data and analyses, program managers can work with local institutions, international donors and cooperating partners to develop financing plans for long-term sustainability.

## **2. When should costing be done, rather than budgeting and expenditure analyses?**

Each year or set of years, a cycle of activities takes place to manage an immunization program. These include the following: 1) planning for which activities will take place, including an assessment of options; 2) developing a budget; and 3) monitoring and evaluation of the program implementation, with periodic use of cost analyses.

Budgets are usually required on an annual basis to plan for funding allocations. They estimate the financial requirements for each program component. To develop a budget, a program manager needs a detailed list of all resources required to implement the program over the year. He/she also must quantify the amount of resources needed and their monetary value. In addition, a program manager can add in some funding for unforeseen expenses that could be required. For example, an immunization campaign may be required to combat a disease outbreak. To check the budget, a manager can use the expenditures from the previous year to compare the numbers, and then add the projected outlays required for program improvement. An example of information required for budgeting, expenditure assessments and costing is shown in Table 1.

Expenditures are amounts spent on items in a particular time period. Examples of program expenditures are the amounts spent on purchases of vaccines and supplies in a particular year. Because the quantities of commodities obtained in a particular year were based on estimates of program needs, however, the amount purchased is often larger or smaller than needed for the program.

An analysis of expenditures provides useful information about annual fluctuations in spending. When combined with information on sources of funding, it can be used to examine the shares of program funding contributed by various national sources, donors and international organizations. The regularity of flows of funding can also be assessed with this information. An assessment of trends in expenditures provides useful information for making decisions regarding logistics and for management purposes.

**Table 1. Comparison of information required for budgeting, expenditure evaluations and costing analyses**

Activity	Information Categories Needed
Planning and Budgeting	<ul style="list-style-type: none"> <li>• Capital/investment outlays required Unit costs, quantities</li> <li>• Operating cost outlays required Unit costs, quantities</li> </ul>
Expenditure Evaluation	<ul style="list-style-type: none"> <li>• Trends in expenditures on operating costs</li> <li>• Trends in expenditures on investment</li> </ul>
Cost Analysis	<ul style="list-style-type: none"> <li>• Fixed costs</li> <li>• Variable costs</li> <li>• Direct costs</li> <li>• Indirect costs</li> <li>• Total costs</li> <li>• Average costs</li> <li>• Additional or Incremental Costs</li> </ul>

Note: Table is adapted from Abt Associates Health Policy Training Institute course materials

While information on expenditures can be used to determine trends in amounts spent for particular program inputs, these do not reflect the actual use of goods and therefore the actual need for resources. For example, \$1000 could have been spent in a year to purchase vaccines. However, if only half of the vaccines were required to immunize the target population, the actual use of resources is valued at \$500 even though expenditures would be \$1000.

A costing analysis differs from an expenditure analysis in that it estimates the actual value of resources used. The quantity of resources used for the good or service is estimated and its value calculated. For example, for vaccines, the amount of vials opened to vaccinate a given population of children is estimated, taking into account actual coverage and wastage levels. This amount is more precise in estimating the value of resources used than the amount spent on vaccines in that year.

Costs can also be classified into different types (e.g. recurrent and capital, fixed and variable), allowing program managers to assess how funds are being used in a program. With this information, a manager can examine the percent of funds that were used to finance operating or recurrent expenses rather than capital or investment expenses. Cost analyses also estimate the value of shared resources used in a service through allocating a proportion of the total in the cost calculations. The costs of capital goods, i.e. those that last more than one year such as equipment, are calculated differently than for expenditures and are annualized, to take into account the life expectancy of the goods. The types of costs are described later in the paper.

Other ways in which costs differ from expenditures is that they also estimate the value of in-kind costs<sup>1</sup> such as donated goods or volunteer time. Cost analyses also estimate the value of shared resources used in a service through allocating a proportion of the total in the cost calculations. In addition, the costs of capital goods, i.e. those that last more than one year such as equipment, are calculated differently than for expenditures and are annualized, to take into account the life expectancy of the goods.

<sup>1</sup> Cost analyses estimate the value of all resources used to produce a service, assuming that every resource has an opportunity cost and could have an alternative use.

Costing can be used several times during the management cycle for immunization programs. First, during the planning part of the cycle, it can be used to compare all of the costs of various program options. For example, program managers may want to evaluate the costs and benefits of a catch-up campaign in high-risk areas as opposed to the introduction of auto-destruct syringes. This type of costing is known as incremental cost analysis.

Secondly, cost analyses can be used to evaluate the efficiency of a program and assess the mix of financing sources used. Two types of costing should be conducted: total costing and unit costing. For example, a program manager may want to compare the costs of different service delivery strategies such as delivery of services from fixed clinics as compared to mobile sites or compare the cost of delivering services among different districts.

### **3. What kind of analysis is required for a given purpose?**

#### **3.1 Total costing**

Total costing provides useful information to program managers to use to improve the efficiency and effectiveness of their program, assess adequacy of current funding, evaluate the roles of various financiers in the program and for developing sustainable financial plans over the long-term. Thus, a costing of the program should be conducted periodically in order to plan for the program more effectively. A costing should be done when program managers are designing five-year plans and estimating the adequacy of funding for the various components of their program.

Total costing involves examining all costs of the provision of immunization services, no matter who bears the costs. These costs include all kinds of costs -- fixed and variable costs, direct and indirect costs, and investment and recurrent costs. These include not only the costs of operating the program on a daily basis but also the costs of setting up the program or investment costs. In a complete costing study, other types of costs are included as well, such as in-kind contributions.

When estimating the total costs of a program, the value of all resources used to run the program should be estimated, including shared costs. Shared costs are the value of resources that are jointly used by other health programs. For example, some resources that are shared usually include personnel, building, or vehicles. In order to calculate these costs, the share of resources used for the immunization program needs to be estimated. Because these costs are difficult to calculate, planners sometimes prefer to estimate program-specific costs that do not include shared costs. Since these costs may be covered under another budget and would be covered regardless of other factors, it may not be necessary to estimate these costs. However, if these costs are not estimated, it is important for the managers to be aware that they are underestimating the total costs of the program. For example, Table 2 shows the total costs of the Morocco national immunization program in 1997/98.

**Table 2. Estimated Total Costs of the Moroccan National Immunization Program (NIP) (US\$000s)**

<b>Cost Components</b>	<b>Morocco (1997-1998)</b>	<b>Percent of Costs (1997-1998)</b>
<b>Recurrent Costs</b>		
Personnel	6,718.1	59.9%
Vaccines	2,217.7	19.8%
Supplies	157.7	1.4%
Transportation	534.7	4.8%
Short-term training	2.9	0.03%
Social mobilization	95.3	0.85%
Maintenance/overhead	181.2	1.6%
<b>Subtotal</b>	<b>9,907.5</b>	<b>88.5%</b>
<b>Capital Costs</b>		
Building	935.6	8.4%
Vehicles	57.5	0.5%
Equipment	289.3	2.6%
Long-term training	8,510	0.08%
<b>Subtotal</b>	<b>1,290.7</b>	<b>11.5%</b>
<b>Total annual costs</b>	<b>11,213.2</b>	<b>100%</b>

Source: Kaddar 1999

This analysis indicates that recurrent costs in the Morocco example above accounted for approximately 89 percent of total costs of the immunization program, while annualized capital costs made up the remaining 11 percent. Personnel are the largest cost category and accounted for more than half of the total costs (and approximately two-thirds of recurrent costs), followed by vaccines, which accounted for nearly 20%. Other cost components of recurrent costs comprised less than 10 percent of the total costs.

The information in this table indicates the magnitude of the total cost of the program and how much is being spent on each component. This information is useful for planning and, together with information on sources of financing, can be used to evaluate the roles of the government, donors and the private sector in financing the program. Gaps in funding for the program can be estimated with this information as well. It can also be used to determine what percent of the program is being spent on routine immunization versus other types of service delivery.

### **3.2 Average costing**

Average cost is defined as the total cost of output divided by the number of units of output or the average value of inputs used per unit of output. These average measures are calculated when program managers are evaluating their program. For example, they may want to compare differences in cost per dose across districts or assess the impact of various cost-saving strategies on cost per dose.

In the case of immunization financing activities, several average cost measures are used for immunizations, including cost-per-dose administered, cost per fully immunized child, and cost

per capita, represent the average costs of completing immunization activities. Table 3 represents the average costs for the national immunization programs of Morocco or Bangladesh in 1997/1998. The variation in cost per dose can be explained by differences in service volume, service delivery strategy, and mix of antigens offered.

**Table 3. Cost-Effectiveness Estimates for National Immunization Program**

Measure	Morocco (1997/98)		Bangladesh (1997/98)	
	Output	Cost-Effectiveness Ratio (US\$)	Output	Cost-Effectiveness Ratio (US\$)
No. of doses administered:				
During routine activities	6,822,748	\$1.12 per dose	34,378,179	\$0.84 per dose
During NIDs	7,819,647	\$0.45 per dose	32,245,922	\$0.17 per dose
Total	14,642,394	\$0.77 per dose	66,624,101	\$0.52 per dose
Children fully immunized by age 12 months (FIC)	536,692 (82.5%)	\$20.89	1,603,260 (54%)	\$21.47
Per capita cost	28,000,000	\$0.40	123,080,614	\$0.28

Source: Kaddar 1999, Levin 2000

### 3.3 Incremental or Additional Costing

Incremental or additional costing analyses should be used by program managers when they want to estimate the cost of adding an activity to their program. This analysis provides information on the extra costs of changing program activities or adding additional activities to existing ones. Program managers may do incremental costing in order to make decisions about the benefits and costs of undertaking additional activities, such as introducing auto-destruct syringes or introducing Hepatitis B vaccine to the existing program. This cost information can be used to make informed decisions about future costs to the program as a whole.

In 1999, the Moroccan MOH considered whether or not to include in the NIP the introduction of the Hepatitis B vaccine. In addition, the additional costs of administering the Hep B vaccine with auto-destruct syringes instead of the regular sterilizable syringes were also calculated. Table 4 shows the estimated costs of adopting auto-destruct syringes.

**Table 4. Additional Cost of Auto-Destruct and Regular Disposable Syringes, 1999/2000 – 2003/04 (US\$)**

Year	No. of Syringes Needed*	Additional Cost of Auto-Destruct Syringes (over sterilizables)**	Additional Cost of Regular Disposable Syringes***	Cost Savings using Disposable vs. Auto-Destruct Syringes
1999/2000	7,340,096	\$558,447	\$317,972	\$240,475
2000/2001	7,449,533	\$562,101	\$319,552	\$242,549
2001/2002	7,501,433	\$565,116	\$320,741	\$244,375
2002/2003	7,524,602	\$565,793	\$320,506	\$245,287
2003/2004	7,517,731	\$564,028	\$318,783	\$245,245
<b>Total</b>		<b>\$2,815,485</b>	<b>\$1,597,554</b>	<b>\$1,217,931</b>

Source: Kaddar 1999

\* Includes Hepatitis B requirements

\*\* Additional costs are costs over and above the cost of sterilizable syringes currently being used. 1998 price for all syringes is \$0.08, which includes disposable boxes.

\*\*\* 1998 prices for regular disposable: \$0.06 for BCG; \$0.037 for others; \$0.85 for disposal box.

The analysis indicated that using regular disposable syringes rather than auto-destruct syringes can cut the additional costs by \$240,000 per year or \$1.2 million over five years, a savings of 40 percent.<sup>2</sup>

Calculation of average incremental costs is also useful when comparing program options. That is, a program manager may want to compare the incremental cost of introducing auto-destruct syringes or a new vaccine at different levels of coverage. In making these estimates, a program manager can anticipate some of the additional costs that could be incurred if coverage changes. It is also possible that the average incremental cost will decrease if such factors as vaccine wastage decline as coverage increases.

### 3.4 Marginal costing

Marginal costing examines the additional cost incurred for the production of one additional unit of output. For example, the cost of increasing immunization coverage by one percentage point can be estimated. This information informs program managers or policymakers of how much it will cost to reach a goal of increasing coverage or reaching more children in harder-to-reach areas. In addition, it will provide information on whether costs will increase, stay the same, or decrease as coverage increases. This relationship can change over time since marginal costs may decline as fixed costs are shared as more immunization services are provided, and then increase as more immunizations are provided in hard-to-reach areas.

## 4. What are the underlying concepts of costing?

<sup>2</sup> This example does not include all costs related to introducing new vaccines, including training, IEC activities and administrative costs.



## 4.1 What is the definition of cost?

In general, costs are defined as the value of the resources used to produce or provide a good or service. “Cost” is different from “price,” in that the price is the amount charged to consumers, usually set by the producer of a good, and it may vary from the actual cost of production of the good. There are different costs for different decisions and it is important to know what costs are relevant to any decision.

## 4.2 What are the different classifications of costs?

There are several classifications of cost, depending on the scope and breadth of the analyses. The different classifications are briefly summarized in this section.

### 4.2.1 Total, average, incremental and marginal Costs

**Total costs** are the sum of the value of all resources used to produce a total output. To calculate total costs, the quantities of all program components used are determined and multiplied by their unit cost. An example is the total cost of delivering immunizations in a district or country.

**Average costs** are the average value of inputs used per unit of output or total cost of output divided by the number of units of output. They are obtained through dividing total costs by number of outputs delivered. For example, an average cost is the cost of providing one dose of DTP antigen.

**Incremental or additional costs** are the value of supplementary resources of adding a component to a program or service. For example, the additional costs of introducing a new vaccine could be estimated.

**Marginal costs** are the cost of adding an additional unit of service or good. For example, the cost of increasing immunization coverage by one percentile could be calculated. The additional cost of immunizing one more child is the additional value of resources required to do so. This includes the extra vaccines, additional syringes and needles, supplies, and the amount of personnel time spent in administering the vaccine.

Whether marginal cost increases or decreases is affected to a greater extent by fixed rather than variable costs. The marginal cost generally declines when fixed costs (e.g. the cost of personnel time) can be divided over an additional unit of output. If, however, fixed costs increase due to the need for additional resources needs such as the time of an additional worker or purchase of another vehicle, the marginal cost will increase. Variable costs such as the cost of an additional unit of vaccine are more likely to stay the same with increased volume.

### 4.2.2 Fixed and Variable Costs

**Fixed costs** are the costs that do not vary with the quantity of the good or service produced in the short term. Examples include rent on a building, utilities, administration salaries, and the depreciation of the physical plant or buildings.

**Variable costs** are the costs that vary with the quantity of the goods or services produced or provided in the short term. Examples include the costs of personnel for doctors, nurses and laboratory technicians, vaccines, needles and syringes, drugs, lab tests, and transportation.

#### *4.2.3 Direct and indirect*

**Direct costs** are those costs relating to the provision of a service, such as personnel directly involved in providing the service, supplies and medicines and lab tests. For example, in an immunization program, personnel time spent providing immunizations, vaccines, needles and syringes are considered direct material costs.

**Indirect costs** are the costs of goods and services that support the services or activities but are not directly involved in service provision. Indirect costs allow the health facility to function or make it possible to deliver services. Examples include facility maintenance, electricity and water consumed by a facility, training, salaries of the managers, and time spent on recordkeeping and administration of the facility.

#### *4.2.4 Investment and Recurrent costs*

**Investment or capital costs** include the acquisition of goods and services that usually last for more than one year. Examples include infrastructure, major technical equipment and long-term staff training. For immunization programs, typical capital costs include cold chain equipment, buildings, and vehicles.

The start-up cost to set up a program or additional component of a program is also considered to be a capital costs. For example, if a new vaccine cost is introduced, start-up costs might include the cost of planning activities for introduction, one-time training of health workers, and IEC/social mobilization on benefits of new vaccine.

**Recurrent costs** include the costs of goods or services that do not last for more than one year. These costs generally include personnel costs, costs of maintaining infrastructure and equipment, in-service training to maintain skills, vaccines, needles and syringes, and consumable supplies.

Investment and recurrent costs may be either direct or indirect.

## 5. Why are different definitions used for total costs; when is it appropriate to use each?

In the calculation of total costs, it is not always necessary to include all costs. Three definitions have been used to explore different aspects of total costs. These include total costs, program-specific costs, and recurrent, variable, non-personnel costs.

**Total costs** include all costs of an immunization program, regardless of whom bears these costs. Total costs include the proportion of depreciated capital costs - health facilities, vehicles, equipment, etc.—that are estimated to be used for immunization services, as well as the estimated cost of health personnel time used to provide immunization services. Total costs are useful to

calculate for evaluating the full costs of a program and to estimate the cost per dose and cost per fully immunized child. This information is useful when making comparisons of costs of different services, trends in program costs over time, and for the purpose of making international comparisons. Because this information is more difficult to obtain than the other two types, only periodic calculation of this measure is required. It is suggested that this cost analysis could be calculated every five years in order to provide relevant information to be used in the five-year planning.

**Program-specific costs** of the immunization program 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. These include: all recurrent variable costs required to provide immunization services, such as vaccines, syringes, needles and other vaccine supplies; transportation costs for both the NIDs and routine services; maintenance and overhead costs; and IEC/social mobilization costs that are related to the immunization program; contributions from non-health sectors for the NIDs; as well as the cost of immunization-related equipment (i.e., cold chain and sterilization equipment). The calculation of this type of total costs is useful for two reasons: 1) it includes costs specific to the program and leaves out costs that would mostly likely be paid for anyway since these are shared costs, e.g. personnel time; and 2) it does not necessitate the calculation of shared costs, costs that are more difficult to calculate. This type of costing is a measure that can be calculated without too much difficulty and could be conducted on an annual basis.

**Recurrent, variable, non-personnel costs** are the costs that the MOH must mobilize each year for the national immunization program—either from its own budget or from donors. These costs include: vaccines, syringes and other supplies, and other recurrent costs, such as maintenance, transportation costs incurred by the MOH, IEC, and short-term training. This set of costs is useful in calculating the base costs when making cost projections for the program.

**Table 5. Estimated Recurrent, Variable, Non-personnel Costs of the Moroccan NIP (US000s)**

<b>Cost Components</b>	<b>Morocco (1997-1998)</b>	<b>Percent of Costs (1997-1998)</b>
Vaccines	2,217.7	79%
Supplies	157.8	5.6%
Transportation	137.8	4.9%
Maintenance/overhead	181.2	6.5%
IEC/social mobilization	95.3	3.4%
Short-term training	2.9	0.1%
<b>Total</b>	<b>2,792.6</b>	<b>100%</b>

Source: Kaddar 1999

## 6. What are the likely sources of data for different types of costing?

Before beginning a cost analysis, the availability of data from different sources should be assessed. The information that should be collected is actual expenditure rather than planned expenditure because this information shows what was actually spent rather than allocated.

Usually the information on expenditures will need to be obtained from more than one set of accounting records. Some of the information is likely to be available from the central MOH offices. For example, data on personnel salaries may be available at one of the central MOH offices. Other information such as expenditures on transport and supplies may only be available at regional or district offices. The data will need to be collected at either health management offices or at facilities.

Other information such as the time that personnel spend on immunization services can be obtained either through direct observation of health workers as they work or through conducting interviews with these persons.

Some field visits to regional and district facilities should be conducted to verify the information that is provided at the central level.

During the assessment of available financial data, inadequacies in the existing data are sure to become apparent. This is because the structure of financial systems is not usually set up for estimating program costs, but rather for checking that funding is being received and dispersed. These systems do not usually categorize expenditures by the activity for which they are being used. In addition, they usually record expenditures but not the value of the resources that were used in a specific time period. As a consequence, it will be important to examine how to best reassign the accounting data so that they can be used to calculate costs.

## REFERENCES

- Abt Associates Health Policy Training Institute (AAHPTI) course materials, *Application of Costing Tools to Health Reform, Module 1*. November 2000. Bethesda, Maryland: Abt Associates, Inc.
- Creese, Andrew and David Parker. 1999. *Cost Analysis in Primary Health Care: A Training Manual for Programme Managers*. Geneva, Switzerland: World Health Organization.
- Cripps, Gilbert, et al. October 2000. *Guide to Designing and Managing Community-based Health Financing Schemes in East and Southern Africa, including Toolkit, Version 1*. Bethesda, Maryland: Partnerships for Health Reform Project, Abt Associates, Inc.
- DeRoeck, MPH, and Ann Levin, MPH, Ph.D. December 1998. *Review of Financing of Immunization Programs in Developing and Transitional Countries*. Special Initiatives Report No. 12. Bethesda, Maryland: Partnerships for Health Reform Project, Abt Associates, Inc.
- Kaddar, Miloud, D. Econ., Ann Levin, MPH, Ph.D, Leanne Dougherty and Daniel Maceria, Ph. D. May 2000. *Costs and Financing of Immunization Programs: Findings of Four Case Studies*. Special Initiatives Synthesis Report No. 26. Bethesda, Maryland: Partnerships for Health Reform Project, Abt Associates, Inc.
- Kaddar, Miloud, D.Econ., Sangeeta Mookherhi, MHS, Denise DeRoeck, MPH, and Denise Antona, MD, MPH. September 1999. *Case Study on the Costs and Financing of Immunization Services in Morocco*. Special Initiatives Report No. 18. Bethesda, Maryland: Partnerships for Health Reform Project, Abt Associates, Inc., p. 35.
- Levin, Ann, Howlader, Sushil, Ram, Sujata, Siddiqi, Syed Mizan, Razul, Izaz, and Routh Subrata. December 1999. *Case Study on the Costs and Financing of Immunization Services in Bangladesh*. Special Initiatives Report 21. Bethesda, MD: Partnerships for Health Reform, Abt Associates, Inc.