POPULATION FOUNDATION OF INDIA

COST ANALYSIS FOR SCALING UP INITIATIVES

A TRAINING MANUAL

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PREFACE

One of the key challenges to universal health care in India is the scaling up of models or innovations that have been tested in a variety of contexts. Findings from several evaluations and reviews, especially of the National Rural Health Mission, highlight bottlenecks in rapid and effective scaling up. Key factors that need to be addressed are the lack of a scaling up strategy, poor knowledge management, little attention to technology transfer, assessment of costs and cost effectiveness, and capacity building.

Population Foundation of India (PFI) in partnership with Management Systems International (MSI) adopted the *Scaling Up Management (SUM) Framework* in 2006 and has since been applying it to NGO and government-led pilots for the scaling up of innovations in health and nutrition in India. The initiative is supported by **The John D and Catherine T MacArthur Foundation.** The SUM framework is an operational framework that enables a systematic approach to scaling up.

PFI has trained various NGOs, funding organizations and government representatives on the SUM framework to enable them to systematically apply the scaling up management principles to their programmes. PFI, with the support of the Planning Commission, organized a National Conference on *Scaling Up: Lessons Learnt and Way Forward* in 2010 to share experiences from health and other social sectors on scaling up, and to develop a vision and strategy for scaling up social sector programmes in India. PFI and MSI have also developed a tool kit and offer training workshops for practitioners and researchers on Scaling Up. Details can be accessed at: *http://populationfoundation.in/news/pfi-conducts-training-programme-trainers-scaling*

The cost of scaling up interventions has been one of the most critical areas of dialogue among policy actors in developing countries. Without a means of determining the costs of expanding health interventions, the feasibility or sustainability of scaling up interventions cannot be assessed. This manual attempts to fill the gap by analyzing cost data at the point of service delivery for taking scaling up decisions. This will also help in estimating resource requirements and efficiently allocate scarce resources especially in the context of scaling up pilot interventions.

We hope that this manual will be helpful to organizations advocating for Scaling Up.

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INTRODUCTION

Background

The cost of scaling up primary health care interventions has been one of the most critical areas of dialogue among policy actors in developing countries. Without a means of determining the costs of expanding health interventions, policy makers cannot assess the feasibility or sustainability of scaling up interventions. It is also important to know whether costs incurred to scale up an intervention would produce adequate value for money or, at least, are more cost effective than other competing interventions. Clearly, the broader issue of efficiency in resource allocation and consequent speed and scope of scale up rates depend crucially on the knowledge of costs and cost-effectiveness of potentially scalable interventions.

Unfortunately, the evidence on costs and cost-effectiveness often remain unavailable or inaccessible to the programme managers/policy makers when they have to make crucial decisions on maintaining or scaling up a programme.The primary reason behind such a miss is an apparent lack of adequate interest and skill to grip and analyze the cost data at the service delivery level.The manual attempts to fill this gap by helping health professionals estimate resource requirements and efficiently allocate scarce resources especially in the context of scaling up pilot interventions.

Purpose of this manual

The central purpose of the manual is to provide guidance to health programme managers on (1) how to apply costing techniques for estimating resource needs for an intervention, and (2) how to do a simple cost-effectiveness analysis to assess the value for money invested on a particular intervention.The concepts and techniques discussed are linked and made relevant to scaling up operations of the interventions.

After the training based on this manual, the trainees should be able to identify and categorize the problems they face in allocating scarce resources. It would help to convince programme managers to use cost information as one important indicator of the efficiency of their facilities. Finally, service providers may develop a better understanding of how to use resources more effectively to improve the delivery of health services.

Who will use this manual?

The manual is primarily targeted at programme managers and health professionals from agencies associated with Scaling Up initiatives organized by PFI. However, more generally, it may be used by those who will conduct cost studies and related evaluations. They should be of interest also to officials who will use the results. Experience with similar studies is not a requirement; neither is training in economics, accounting, or epidemiology.

Sources

As a user of this manual one might require access to a particular methodological text for estimating costs and the related aspects of health services, especially their effects and cost effectiveness. *Cost Analysis in Primary Health Care: A Training Manual for Programme Managers*[1] is an excellent resource and is the basis for this manual in several places. The manual liberally uses some of the text's language verbatim or with slight paraphrase. Application of the manual, however, does not require access to the above reference despite its relevancy to various topics, especially costs.

In addition to above resource, this manual draws heavily upon the following resources.

- Janowitz B and Bratt J (1994). Methods for costing family planning services. UNFPA and FHI.

- Over M (1991). Economics for health sector analysis: concepts and cases. The World Bank.

- Johns B and Torres T (2005). Cost of Scaling up health interventions: A systematic review. *Health Policy and Planning*, 20(1), p 1-13

Organization of the manual

The manual starts with an introduction (Section I). In the next section (Section II), the basic concepts and classifications related to costs are discussed. Next section (Section III) is the core where the process of cost analysis is presented step by step. Section IV extends the analysis to scaling up initiatives. Finally, the last section (Section V) presents a simple procedure on how to do cost-effectiveness analysis.

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1 Creese A and Parker D (1994). Cost analysis in primary health care: A training programme for programme managers. WHO: Geneva

DEFINITIONS AND CLASSIFICATIONS

Introduction

In common parlance we often use the words 'costs', 'prices', 'payments', and 'expenditures' interchangeably. For example, we ask 'how much did the shirt cost you?' to mean 'what was the price you paid for the shirt?' Similarly, the actual expenditure incurred to run a hospital may often be denoted as costs of producing hospital services.

However, from an economist's or a manager's viewpoint, the words bear different connotations. To an economist, costs always imply the value of resources or inputs – expressed in terms of monetary units - used in the *production* of a certain good or a set of services. Thus costs are always associated with some production – a kind of sacrifice you make as a producer to transform inputs into output. It may be expressed either in terms of how much was the actual value of the resources (Actual cost) or how much value we should assign to them (Standard costing). In any case, it is different from price which indicates how much one would pay per unit of a good or service when he/she wishes to purchase it.

It is important to note that the connotation of cost varies according to how you look at it. In other words, as a programme manager, there are several ways you can classify the concept depending on which aspects of programme you are interested in. The major classifications are given below.

Economic costs vs. accounting costs

Suppose, in a Reproductive and Child Health care (RCH) programme run by a voluntary agency, three types of human resources are used: (1) paid clinical staff (doctors, paramedical staff, etc.), (2) paid managerial staff (programme coordinator and assistants), and (3) community level volunteers for counselling pregnant women. Since the first two categories are paid staff there will be cash outflow to pay their salaries and this outflow will be recorded (or, booked) by the accountant. This is an explicit cost since you used the resources, paid for it in cash and recorded it. On the other hand, for the third category (volunteers) there is apparently no cost since there is no cash outflow for them (except probably some expenses for their refreshment and travel). So the cost does not show up explicitly in any record (or, book) for this category even though you are using these resources.

From an accounting viewpoint, therefore, only the payments to the first two categories will be included while the third will remain unaccounted or excluded. This is called Accounting cost. An economist will, however, include all of them. For the third category, the economist will impute the market price of the volunteers' time (i.e., the wage a volunteer would have earned had he/she been employed on a similar but paid job). This is called Opportunity cost which implies that the cost of using a resource arises from the value of what it could be used for instead.

The concept of opportunity cost is very important to the programme managers who are in-charge of using scarce resources to gain some health outcomes. For example, if you receive a free supply of vaccines from the government or any other agency for your MCH programme the accounting cost will be zero, but the opportunity cost will be the value you would have to pay if you would purchase the vaccines from the market. It can also be looked at in an alternative way. For example, the opportunity cost of providing a free medical check-up for women is the revenue you have sacrificed had you treated them with a 'fee'.

The question is: why should we bother at all about these 'zero' costs and treat them as a legitimate cost item since we are not paying anything anyway? There are two reasons: (1) the items which cost you nothing today (e.g., donated vaccines, volunteer workers, etc) may come up with a price tag tomorrow. Hence, if you are concerned with the long term sustainability of the programme, the total cost of all inputs – even those temporarily provided by donors or paid for at below market rates – must be estimated at their full value. (2) Assessing the efficiency of the inputs may produce distorted results (and, hence, wrong decisions regarding their allocation) if some inputs are assumed to have zero or less-than-market value. For example, a programme run by a set of inefficient or idle volunteers may look more cost-efficient than one which is being managed by a paid but efficient set simply because in the former case you get some output without paying anything.

Programme cost vs. users' cost

We should also distinguish between costs borne by programs and costs borne by users (apart from service fees). Some programmes bear a part of costs related to delivery of services and the users supplement it by paying from their own pockets. For example, in no-cost fixed service delivery points such as clinics, the user bears the costs of travelling to the clinic to obtain the services. In that case, the travel cost is the users' cost while the rest (e.g., medicines, consultations, etc.) are programme costs. On the other hand, in an outreach door to door service, the program bears that cost and users pay nothing. The total costs of fixed and outreach programs may be the same but the cost burden falls differently on programs and users.

Non-shared (or, Direct) vs. Shared (or, Indirect) costs

In any programme, it is possible to identify certain inputs that contribute directly to the production of output, and other inputs that are associated with supporting direct activities. Accordingly we can classify the associated costs as "shared" and "non-shared" costs.

For example, consider the RCH programme again. Suppose, the programme wants to analyze its cost for running fixed clinics which is one of its many activities. There are several inputs which are exclusively devoted to this activity and, hence, are 'traceable' to this activity – for example, the clinical staff, maintenance of the equipment, medicines and consumables. The costs for these inputs are directly attributed to the clinic activities and, hence, they may be termed as Non-shared or Direct Costs.

The above inputs are, however, ineffective without the support of some other inputs. These inputs support other activities also but it is difficult to identify their contribution to a particular activity without applying some allocation rule or formula. For example, if the clinic is located in the programme office building and the rent is charged for the whole building, it is difficult to assess how much of this rent could be 'apportioned' to the clinic room. Similarly, a part of the time of the programme coordinator is also used by the clinic, who spends time also for other activities. As *Table 1* shows, the salaries, supplies, and other costs are classified as non-shared costs of the clinic (because, these inputs are exclusively used by the clinic), while programme coordinator's salary, rent, utilities, etc. are classified as shared costs (because, these inputs are shared also by other non-clinic activities).

Table 1. Monthly cost reports of the RCH clinic

Classification	Amount (in Rs.)
Non-shared costs	
Salary of clinic staff	75,000
Furniture + equipment	10,000
Medicines and consumables	5,000
Total Non-shared costs	**90,000**
Shared costs (allocated)	
Programme coordination	1,500
Administration	500
Rent + utilities	250
Maintenance	200
Total shared costs	2,500
Total costs	**92,500**

Capital cost vs. Recurrent cost

The key issue in distinguishing between recurrent and capital costs is the life expectancy of project inputs. "Recurrent costs" usually are defined as the costs associated with inputs that will be consumed or replaced in one year or less, while "capital costs" are defined as the annual costs of resources that have a life expectancy of more than one year, such as equipment or buildings. Recurrent and capital costs may be either direct or indirect.

In a primary health care setting, examples of recurrent costs can include commodities (such as drugs, contraceptives, etc.), medical materials and supplies, office supplies, utilities and staff salaries. Capital costs can include clinic space, operating room equipment and vehicles for transporting people and commodities. Staff training also can be classified as a capital cost if the new skills are expected to last for one year or more. The costs of refresher training courses that occur throughout the year should be classified as recurrent.

Table 2 presents an example of this classification based on the experience of a Breast-feeding Promotion programme in health facilities.

Table 2: Classification of cost by inputs: An example of a Breastfeeding Programme[2]

CAPITAL COSTS

- **Vehicles:** Bicycles, motorcycles, 4-wheel drive vehicles, trucks
- **Equipment:** Televisions, VCRs, slide projectors, refrigerators, sterilizers, bassinets, electric breast pumps, scales, other equipment with relatively high unit costs ($100 or more)
- **Buildings (Space):** Health centres, hospitals, administrative offices, storage facilities
- **Training (Non-recurrent):** Trainers, education materials, space, trainees, travel
- **Social Mobilisation (Non-recurrent):** Social mobilisation activities that occur only once or rarely (example: formation of community based committee)

RECURRENT COSTS

- **Personnel (all types):** Supervisors, health workers, health volunteers, administrators, counsellors, consultants, casual labour
- **Supplies:** Drugs, breast milk substitutes, manual breast pumps, bottles and nipples, educational materials, baby cots, small equipment (less than $100)
- **Vehicles (Operation & Maintenance):** Petrol, diesel, lubricants, tires, spare parts, registration, insurance
- **Buildings (Operation & Maintenance):** Electricity, water, heating, fuel, telephone, fax, insurance, cleaning, painting, repairs of electric fittings, plumbing, roofing, Air Conditioning
- **Training (Recurrent):** Short courses, in-service training
- **Social Mobilisation:** Operating costs
- Other operating costs not included above

Fixed vs. Variable cost

Fixed costs do not change in response to changes in volume. They are a function of the passage of time, not output. For instance, in the RCH example (see *Table 1*), maintenance costs will remain Rs. 200 irrespective of output level (i.e., number of beneficiaries); hence it will be a fixed cost. *Variable costs*, on the other hand, are functions of output. In other words, starting from zero (when there is no output) it increases as output increases. For example, costs on medicines and consumables are variable – it increases as the number of users increase.

In the context of programme management, the distinction is important. Fixed costs are often committed and, hence, difficult to control. For example, you have to pay the salaries of permanent staff even if your programme is not doing well. Hence, a programme with a high percentage of fixed cost but low output may risk low sustainability.

2 Robertson R et al (1995). Guidelines for estimating costs, savings, and cost-effectiveness of breastfeeding promotion through health facilities. University Research Corporation/International Science and Technology Institute. Bethesda, MD..

EXERCISE

Assume that you are doing a cost classification of a School Health Education programme to be implemented by a local NGO. The programme's objective is to generate awareness about major communicable diseases and their simple hygienic and dietary solutions among school children. In this programme, thirty schools will be targeted and trained community health workers will visit and interact with the students of Class VIII and IX with different types of education materials. At least four visits will be made to each school. All activities – including the training of health workers – will be supervised by a team of two public health specialists (Medical officers).

1. List all key activities and required inputs of the programme.
2. Impute cost to all inputs (hypothetical)
3. Classify them by recurrent/non-recurrent, direct/indirect, and fixed/variable
4. Cross classify Direct/Indirect and Fixed/Variable. For example, in the first cell, write the items and their costs which are direct as well as variable. And, so on.

	Variable	Fixed	Total
Direct			
Indirect			
Total			

COST ANALYSIS: HOW TO ESTIMATE UNIT COST?

Introduction

One fundamental item of financial data needed by a health programme manager is the unit cost of health care services they are providing. A unit of health services may be one child immunized, or a birth delivery at the programme's health facility. This section explains how to allocate costs by such activities and how to compute unit costs. To perform these calculations precisely, the programme needs an accurate and comprehensive financial accounting system. In many programmes, however, existing accounting systems have gaps, such as excluding some costs or lacking the data to relate the costs to specific activities. In these cases, estimates are needed. This section provides a number of suggestions for generating such approximations. It is organized based on the following steps.

Steps of cost analysis

1. Decide purpose of the cost analysis.
2. Decide time horizons
3. Identify the programmes/activities
4. Identify the costs for non-recurrent inputs
5. Identify the costs for recurrent inputs
6. Allocate all costs to the programme/activity
7. Compute total and unit cost for each programme/activity

Step 1: Decide purpose of the cost analysis and assess data availability

What are the services or programmes for which you are interested in computing unit costs? For example, do you want to know the unit cost for all programmes, or a separate unit cost figure for each service? The decision will depend on two key questions:

- *Purpose of the Analysis.* If you want to do a comparison of costs of certain services (e.g., immunization, neo-natal care, maternal care, etc) covered by your programme, you will need to compute unit costs for each service separately. If you want to compare multiple programmes or service delivery centres with similar services (e.g., comparing the unit cost of the programme across multiple centres), it may be sufficient to compute a single unit cost for all programme services for each centre.

- One may also look at the purpose from a different angle. If your programme is ongoing you may want to know how efficiently the resources are being used. In that case, data on actual expenditure should be used to estimate the unit costs. On the other hand, if you are planning a new intervention (or, scaling up an existing intervention) you should use the standard cost or 'shadow price'[3] of the inputs to estimate resource requirement and their allocation. Hence, in the first case, you should use how much was actually spent (including the imputed value of "free" resources) while, for the later, your focus is in how much they should cost.

- *Type of Data Available.* Your ability to compute unit costs will be constrained by how aggregate or disaggregate the available data are for both costs and utilization. For example, in order to compute unit costs by service, you would need to have at minimum utilization data by service (e.g., actual total beneficiaries for each service for a particular budget year).

Step 2: Decide time horizons

One can analyze unit cost based on data for a single month, a quarter, or a year. The data period chosen will depend first upon how the available data are organized. Sometimes important data such as maintenance costs are only available on an annual basis, and to do a quarterly analysis, one would have to make assumptions about use patterns within the year. In such situations, it may make more sense to analyze data for a whole year rather than for each quarter.

A second consideration in the choice of the data period is the purpose of the analysis. If managers are trying to understand a rapid recent change in costs, then quarterly or monthly analysis may be appropriate. However, if the aim is to compare a particular programme's costs to other programmes, it may make more sense to use a longer time-period. Using annual data may help to "equalize seasonal variations" since each programme is affected by these factors differently.

Step 3: Identify the activities in the programme

The next step for computing unit costs is to determine the centres of activity or programme in the organization to which direct and/or indirect costs will be assigned. It is useful to begin by listing all activities that relate to the implementation of your program and are candidates for costing. For example, in a FP/RH programme you may want to identify the unit cost of (1) sterilization, (2) condom distribution, and (3) safe abortion.

Step 4: Identify the costs for non-recurrent inputs (or, capital costs)

Capital assets are assets having an economic useful life exceeding one year and

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3 Shadow price is the opportunity cost of an activity or project to a society, computed where the actual price is not known or, if known, does not reflect the real sacrifice made. In a free market economy, the market price reflects this real sacrifice and approximates the shadow price.

not acquired primarily for resale. A cost analysis which ignores capital is essentially assuming that the present physical assets will be available forever. In reality, assets are being worn down by the programme's daily activities, and this depreciation is an expense. Unlike drug purchases or salaries, depreciation is not expenditure, it does not require an actual cost outlay. However, depreciation may be hard to measure, if certain information is not available (such as purchase price and the useful life of its equipment). If this is the case, then determining the depreciation expense becomes more sensitive to the analyst's assumptions.

The technique we use to estimate capital costs is called "annualization." Essentially, we calculate the amount of the good that is used up (depreciated) in the period of time corresponding to the cost study. Depreciation is only one part of the annual cost of a capital good. The other part is an allowance that represents the interest that could have been earned if the program had invested the funds used to purchase the item. This component is usually referred to as the "opportunity cost of capital."

Although this seems complicated, the mechanics of annualization are made relatively simple by standard tables like the one presented at the end of this manual (see *Annex*).

To use the annualization table, we need the following information for each capital good:

- Estimate of the replacement cost
- Estimate of the useful life
- Discount rate

Estimate of the replacement cost

To determine the replacement cost for a capital item you need to use the current value (actual or projected). For example, to identify the replacement cost of a building at its current site, you need to determine the cost of the land and the current construction cost for a similar building. The original construction cost should not be used. Current value can be established in one of several ways. If the item to be purchased is new, the market price can be used. If the item is used, you can check the market prices of comparable items or estimate the replacement cost of the item. For example, if a four year-old jeep is to be used, you might check the prices of comparable vehicles or ask a mechanic what it would cost to replace the vehicle with a similar one.

Estimate of the useful life

There are no clear-cut rules for estimating useful life. The period may be relatively short for medical equipment, say two years, moderate for vehicles, say seven years, and much longer for buildings, say 25-30 years. You should use the remaining life expectancy of used items, not the life expectancy at the time of original purchase. Purchasing agents or government accountants may be able to provide standard life expectancies for common items.

Discount rate

In addition, we need an estimate of the discount rate, which is the rate used for economic appraisals of projects in the country where you are working. The discount rate should reflect the rate of return on investments that the program could have made. An easier alternative is to accept the World Bank standard rate of 3%.

Given these three pieces of information, you can compute the annualized value of the capital item by applying the following formula:

$$AV = RC \times \frac{[r(1+r)]^n}{[(1+r)^n] - 1}$$

Where, AV= Annualized value
RC= Replacement Cost
r= rate of discount, and n = useful life

Suppose, the RC of an equipment is Rs. 10,300. Total useful life is 20 years and the discount rate is 3%. Applying the above formula, the annualized cost would be Rs. 692.30.

Fortunately, you can reach the same result without much effort if you use the Annualization Table given in the Annex (see *Box 1* and *Table 3* on how to use the table).

Box 1: Example of how to compute the annual capital cost

Table 3 provides data for this example of how to compute annual capital cost on the equipment. The assumptions are as follows:

1. Total life of the asset: 20 years.
2. Replacement cost: to replace each asset at today's prices would cost Rs. 10,000. The price of locally produced items is increasing at 3% per year.
3. Discount rate: 3%

Using these assumptions, you can compute a reasonable measure of its annual capital cost using the following formula:

Capital cost in year k = Replacement cost in year k/annualization factor

In *Annex*, we find the annualization factor for a 3% discount rate and a life of twenty years. The annualization factor is 14.877.

The replacement cost next year will be Rs. 10,300/-, since 3% inflation will have occurred. Dividing by the annualization factor, the capital cost for next year is therefore Rs. 692.30 (Rs. 10300/14.877). The following year's capital cost is similarly computed as Rs. 713 (=10,609/14.877). The capital cost therefore increases from year to year at the rate of inflation. (Equivalently, capital cost computed in this way stays constant in real terms).

So the capital cost this year is Rs. 692.30, and this becomes part of the programme's costs .

Table 3. Worked example of annualized capital cost

	Beginning of this year	End of this year	End of next year
Total useful life	20	20	20
Annualization factor	-	14.877	14.877
Replacement cost	10000.00	10300.00	10609.00
Annual capital cost	n.a.	692.30	713.10

If the replacement cost of the item is less than Rs. 5,000 (or $100), do not annualize the cost – it is not worth the trouble. Instead, treat the item as a recurrent cost. If the programme has several of the same type of item, add their costs and annualize the total cost of all the items. For example, assume that a recovery room in a sterilization unit has eight beds, which each cost Rs. 40,000. Sum their costs (Rs. 3,20,000) and annualize the cost in one step.

Step 5: Identify the costs for recurrent inputs

Salaries and benefits
Salaries and benefits usually represent the largest cost component of public health programmes. They typically represent from one-third to three-quarters of the total programme costs. Clearly, you will need to devote considerable time and effort to identifying precisely all personnel-related costs. Every employee who is connected with the programme in any way should be listed according to job function and location. The list should include, in addition to physicians, nurses and other health workers, all clerical, administrative and maintenance staff, plus any volunteers or consultants. Sometimes staff from other divisions or organizations provide support to your programmes; these individuals should be included as well.

The next step is to determine the cost to the employer of each employee's compensation for some unit of time (i.e., monthly or annually) including all fringe benefits such as vacation and sick leave, social security, and pension. The computation of personnel costs can be streamlined by aggregating similar types of employees into categories and calculating their costs all at once.

Supplies
This category is for materials (drugs, consumables, stationeries, etc.) used up in a year, as direct inputs to the principal activities performed by the programme. For example, for a disease control of programme it could include such items as drugs, reagents for tests, insecticides for vector control, needles, stationary, etc. For an immunization programme, it would include vaccines, needles, and syringes, among other things. Also, as mentioned earlier, any item costing less than Rs. 5,000 may be itemized in this recurrent category even if it lasts more than a year.

In addition to the item cost, the full cost of supplies should also include the cost of transport to the point of use. The cost should include all the materials used including waste or damaged items. The cost, however, should not include the inventory stocks (i.e., those kept in stores and not used).

Operation and Maintenance (O&M)
The capital inputs – building, vehicles, equipment – require regular maintenance and costs on this account are grouped under recurrent costs. For building, O&M costs include charges for utilities, insurance, cleaning materials, painting, repairing, and so on. The standard practice of allocating a percentage of total budgets (say, 5%) may understate the true annualized cost of the building. One must devise a rule to allocate some portion of the total budget of the programme being studied. The simplest way would be to assume that the building's share of maintenance costs is proportional to its age; the idea is then to weigh older buildings more heavily, assuming they need more intensive maintenance.

For vehicles, the costs of operating, maintaining, and repairing vehicles should all be measured. These will include, materials, such as fuel, lubricants, insurance, tyre, batteries, and spare parts. However, where repairs and maintenance are contracted out, or where they are performed by a different agency, their costs should be included under vehicle O&M costs.

Other recurrent costs
This is, of course, the residual category, which covers all recurrent inputs not dealt with elsewhere. These may include O&M costs of equipment, postage, printing, photocopying, etc.

Step 6: Cost allocation

Allocation process and criteria
We have already seen that the total cost of providing a service is equal to the sum of shared and non-shared costs. Hence, to identify the unit cost of a particular programme or service, it is essential to allocate the proportion of resource value in each category. Allocating non-shared costs is straightforward. Since 100% of non-shared inputs are devoted exclusively to the programme in reference, you just add the full cost of these inputs. In some cases, it may be less than 100% but a known percentage; in that case also, allocation follows the simple rule: add the known fraction of the resource costs. For example, if in a programme, a doctor spends full time and another doctor spends half-time by contract, 100% of the salary of the first and 50% of the second need to be added.

Shared costs – for which the share percentage is unidentified – are a bit complicated. In this case you need a formula or allocation criteria to apportion and then allocate the cost. This process is called cost allocation. The best way to start with this process is to find some allocation statistic – or some proxy variable – for each shared input, which would reflect the magnitude of resource use of that input. For example, if a vehicle is used for multiple programmes the distance travelled by the vehicle for each programme could be a proxy indicator or allocation statistic of vehicle use. In that case, what you have to do is to compute the proportion of distance travelled for a programme in total distance travelled and use this proportion to allocate the shared cost to the particular programme. If, for example, a clinic is located in the room of a building which accounts for approximately 10% of the total building space, and the annualized building cost is Rs. 50,000, Rs. 5,000 (10% of 50,000) may be allocated to clinic under the building cost item.

The table below lists some of the popular allocation statistic for each type of resource.

Table 4. Cost allocation

Shared inputs	Allocation criteria
Vehicles	Distance travelled/time used
Equipment	Time used
Building space	Space used
Personnel	Time worked
Supplies	Weight/volume
Vehicle O&M	Distance travelled/time used
Building O&M	Space used

It is, however, not always easy to derive the percentages in a straightforward way. In that case, you may use other allocation statistics to measure another resource. For example, if you cannot measure the proportion of vehicle costs that should be allocated to the immunization programme, you can use the proportion of staff time devoted to the programme as a way of allocating the value of shared vehicle costs. If half the staff time during a particular period is devoted to immunization, it is reasonable to assume that half the transport is, too.

Personnel time is, indeed, a commonly used indicator of allocating not only the manpower but also the shared costs of other resources. The easiest way to measure and apportion the time is to fill up a time sheet by asking each worker about the time devoted to each activity. However, measuring by this way may not always yield the desired result. For example, a programme coordinator may handle two programmes simultaneously and the time devoted to one may be apparently indistinguishable from the same spent on other. In that case, his/her response may be vague and arbitrary. The alternative, which may yield more concrete and accurate data, is to directly observe staff on a random sample of days recording how much time they spend on each activity (a time motion study) in a day. However, this procedure may require substantial effort and time, and may not be feasible.

An easier alternative, in such difficult cases, is to use some other proxy of time. For example, number of visits for outreach programmes may be considered as a proxy of time (more visits mean more time used). However, the problem in this case is that your result depends heavily on assumptions that you make to compare visits for different programmes. For example, if you run two programmes – immunizations and treatment of children diarrhoea – comparing personnel time in terms of number of visits may not be appropriate since the time taken for a visit for immunization may not be the same for a visit for treatment. In that case, it is necessary to put some weight to one in terms of the other to make comparison feasible (for example, a visit for treatment= two visits for immunization).

Cost allocation template and application

Given the considerations described above, you can now proceed to estimate the allocated cost of a programme or an activity. Below we demonstrate the process through a set of templates and a simple example on a nutrition programme.

Example: Suppose a nutrition programme has the following components: (1) prevention, (2) high-risk screening, (3) growth monitoring, and (4) rehabilitation. The programme uses the following non-recurrent (capital) inputs:

- Building space
- Equipment

The recurrent inputs are:

- Personnel
- Supplies, and
- Others

We wish to estimate the total cost for each component. It is known that some of the inputs under each category are shared across the components. For demonstration we estimate the cost of one component (prevention) here with a set of hypothetical data;

the other components can be costed in a similar way.

The costing process could be done in three steps of estimation: Non-recurrent cost, recurrent cost, and total cost. First we estimate the non-recurrent cost.

Non-recurrent cost
The cost for "prevention" is computed by using the following templates. The percentage given in column (g) should be based on some appropriate allocation statistic (e.g., space)

Table 5. Calculating non-recurrent costs

Cost items (a)	Unit (b)	Replacement cost/unit (c)	Total (d) = (b) ×(c)	Annualization Factor (@3%) (e)	Annualized Cost (f) = (d) ÷ (e)	% allocated (based on allocation statistic) (g)	Allocated Cost (Rs) (h) = (f) × (g)
Building space							
Main building	5000 sq.ft	Rs. 1,000	Rs. 5 million	14.877 (20 years)	3,36,090	10%	33,609
Annex building	1000 sq. ft	Rs. 1,000	Rs. 1 million	14.877	67,218	40%	26,887 **60,496**
Total							
Equipment							
Clinical equip set	1	50,000	50,000	4.58 (5 years)	10,917	50%	5,459
Furniture	5	12,000	60,000	4.58	13,100	25%	3,275
Total							**8,734**
Total non-recurrent (annualized)							**69,230**

Total non-recurrent cost for a year works out to Rs. 69,230.

Recurrent cost
The recurrent costs for the component "prevention" are allocated using the following template.

Table 6. Calculating recurrent costs

Cost items (a)	Unit (b)	Replacement cost/unit (c)	Total (d) = (b) ×(c)	% allocated (based on allocation statistic) (e)	Allocated Cost (Rs) (f) = (d) × (e)
Personnel					
Medical Officer	1	Rs. 50,000	Rs. 50,000	10%	5,000
Nutrition specialist	1	Rs. 30,000	Rs. 30,000	25%	7,500
Counsellor	4	Rs. 20,000	Rs. 80,000	100%	80,000
Office help	1	Rs. 10,000	Rs. 10,000	25%	2,500
Total					**95,000**
Supplies					
Nutrition supplement	100 boxes	1,000	1,00,000	100%	1,00,000
Test reagents	1	12,000	12,000	100%	12,000
Other supplies		10,000	10,000	25%	2,500
Total					**1,14,500**
Others					
Maintenance	1	50,000	50,000	10%	5,000
Total recurrent					**2,14,500**

Total cost

Finally, the results from the above are summarized and total cost for the "prevention" is computed.

Cost items	Allocated cost (Rs)
Recurrent	2,14,500
Non-recurrent	69,230
Total	**2,83,730**

Step 7: Calculating unit costs

At this point you know the total costs that were incurred at each of the programme or programme components. What is the output of each component, in numbers? This requires incorporating utilization data into the analysis. This is the point at which any problems with the utilization data become particularly important, because they directly alter the unit costs.

In the context of primary health programmes, the most important output would be number of beneficiaries actually covered by the components. The possible problem is that 'benefits' are not equally weighted across the components so that the number of beneficiaries in one component may not be directly compared to the same in other. For example, in the nutrition programme, the beneficiaries of the "prevention" component are not qualitatively comparable to beneficiaries of "screening". In that case, you have to impute comparable weights to each component if you want to compare their unit costs (e.g., 1 child covered under "prevention"= 2 covered under screening). However, the problem does not arise if you compare the unit cost of one across different periods or different service delivery centres.

Once you have obtained the utilization data, the unit cost can be computed. For each of the components, divide its fully allocated cost (from above) by its units of service. *Table 7* shows the calculated unit cost for one component (Prevention) based on the estimated allocated cost.

Table 7. Unit cost calculation of nutrition programme

		Cost		Cost Per Unit		Non Shared % of Total
		Non-shared	Total	Non-shared	Total	
Component	**Units**					
Prevention Screening	5,000	1,92,000	2,73,730	38.40	54.70	70%
GM Rehabilitation						

What is the significance of the unit cost estimated above? As you see, the unit non-shared cost for prevention is Rs. 38.4, which is quite less than the true unit cost (Rs. 54.7). Hence, if you use the former, which is more likely since this is the only explicit and visible part of the cost, you will end up underestimating your resource use or resource need. For a true representation, it is essential that you allocate and add the shared costs to its non-shared counterpart.

EXERCISE

The following exercise is adapted from Creese (1994). The table below presents total expenditure recorded for the last year for each of the inputs of a RCH programme. Examine the list and answer the questions:

Table 8. Exercise on recorded expenditure

Input	Expenditure (Rs.)
Nurse (2)	3,60,000
Vaccine	5,00,000
Refrigerators	0
Bicycles	0
Jeep	0
Driver	1,50,000
Scales	0
Nurse assistant	2,80,000
Health centre (building)	0
Drugs	10,00,000
Syringes	20,000
Fuel	30,000

The programme has four components: (1) growth monitoring of 0-5 year olds; (2) treatment of common child diseases (0-5 years); (3) immunization; and (4,5) pre and post natal care.

In addition, the following information are also given:

1. Refrigerator has 10-years life time; current cost is Rs. 15,000
2. Bicycle has 10-years life time; current cost is Rs. 5,000

3. Jeep has 8-years lifetime; current cost is Rs. 10,00,000
4. Scales have 25-years lifetime; current cost is Rs. 2,000
5. Health centre building has 25-years lifetime; current cost of construction Rs. 20,00,000.

Also assume that:

- The nurse and nurse assistant spend approximately equal time on all five components.
- The volume of drugs is approximately three times that of vaccines, and one-third of the drugs must be stored in the refrigerator. Half of the drugs are used for treatment of common child diseases, and one quarter each for pre and post natal care.
- The mobile child health clinic (which provides outreach services equally for all RCH components except pre and post natal care) accounts for 10% of the time for which the jeep and driver are used.

Questions:

1) Which input costs are still difficult to allocate? What assumptions would you take for each of them (regarding allocation statistic, cost values, etc.) to allocate costs, in the absence of more information?
2) Calculate the total costs for each component and overall total cost after cost allocation.
3) Suppose, for (1)-(3) components, 2000 children and for (4) and (5) 500 mothers are being served by the programme. Calculate the unit costs for each component. Interpret.

COSTING SCALING UP OPERATIONS

Introduction

Most service delivery interventions begin as pilot projects. When a pilot study of an intervention is successful, managers begin to think about scaling up the project to new areas. Cost is a critical factor influencing the extent and pace of this scale up process. In order for managers and policy makers to plan for these changes, they need to analyze the change in costs when interventions are 'scaled up' to cover greater percentages of the population. They, for example, may be interested in the cost of extending health interventions to the poorest people in their country, who often live in rural or remote areas previously uncovered. Without a means of determining the costs of expanding health interventions into such areas, they cannot assess the desirability or feasibility of scaling up interventions.

One may, however, argue that information on the costs of a pilot project is adequate to estimate the costs when this intervention is scaled up. Hence, why do we need to address it separately? For example, the cost of providing 'preventive' nutrition services for 5,000 children, as worked out in Section III, was Rs. 2,73,730. Hence, it is a simple arithmetic that it would need about Rs. 2.73 million (2,73,730 × 10) if you plan to scale up your coverage to 50,000 children. Therefore, you just need to estimate the pilot costs and multiply it with scale multiplier (e.g., 10 times in the above example).

As we will see in the next part of this section, the above argument is unlikely to be accurate in many cases. There are several factors which remain insignificant in a pilot project but may emerge as crucial determinants when you try to scale it up. In that case, you need to identify those factors and predict how they can affect the unit and total costs of a scaling up process. Our purpose is not to provide a "cookbook" solution for estimating scale up costs. Rather, it is designed to help managers think critically about the factors that must be considered in estimating the costs of scaling up an effective intervention.

Economies and diseconomies of scale

Scale describes the extent or level of activity and output at which an intervention is operating. The scale of a project can thus be measured in a number of ways: by the coverage of activity (e.g. the proportion or percentage of people reached by an intervention); by the volume of output of these activities (e.g. the total number of condoms provided, total number of persons trained); or more simply by the level at which the activities are undertaken (e.g. community, district or national).

Economies of scale or scale efficiency are said to be present if unit (or, average) costs decrease as the level of output increases. Economies of scale may be present as a result of indivisibilities in how the project is operated or specialization and the division of labour that requires a large volume of output to be beneficial. For example, a minimum level of fixed inputs is needed to run the Nutrition centre (e.g. the building), regardless of whether one or 100 children are seen.The average cost of seeing one client is far more than the average cost of seeing 100 people, as the fixed costs are spread over fewer people (or outputs). The lowest cost per person reached is described as the minimum average cost and is the point of scale-efficiency.

Conversely, if unit (or, average) costs rise as the scale of operations increases, the situation (i.e., average cost increases when output is increased) is called Diseconomies of Scale. This usually happens when the intervention has grown too far. Becoming larger produces cost disadvantages.This may be because of problems such as increased bureaucracy, poorer communications and worse labour coordination which are often encountered in larger organizations.

There are several concerns to address before you plan for a scalable pilot intervention – information on economies of scale (or, conversely diseconomies) is just one of them. You may not find it technically or otherwise suitable to scale up an intervention even if its unit cost is predicted to decline if you do so. However, scale efficiency becomes extremely important when there are alternative interventions competing to scale up with scarce resources.

Factors influencing scaling up cost

What are the factors that you should keep in mind (in addition to the costing of an intervention as shown in Section III) when you estimate the resource need for a scaling up initiative? There are four major factors that you need to focus and count as additional costs when you plan for scaling up.

Geography and infrastructure

Many studies have demonstrated that, in general, unit cost of primary care interventions in rural areas is higher than in urban areas[4]. The higher price of transport, supervision and training due to greater distances travelled and difficult terrain in remote areas

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4 Kumaranayake L, Kurowski C, Conteh L. 2001. Costs of scaling up priority health interventions in low-income and selected middle income countries: methodology and estimates. WHO Commission on Macroeconomics and Health, Working Group 5 Paper 18. Geneva: World Health Organization.

is one reason costs are higher in rural areas, and these inputs cause diseconomies of scale. Similarly, poor infrastructure such as, lack of roads, supply chain and other basic infrastructure elements may hinder the ability to scale up, make communication and training more difficult, or otherwise substantially increase prices in new areas of coverage.

Following steps should be kept in mind to estimate unit costs in these cases:

Step 1: Group the intervention areas in order of their relative difficulties (say 3-4 groups). For example, remote mountain areas, hilly areas, and plain areas.
Step 2: Estimate the cost in plain areas.
Step 3: Assign weights in ascending order of difficulties. For example, Plain= 1, Hilly= 2, Mountain= 4. Justify the weights by some evidence.
Step 4: Adjust the unit cost of each group accordingly

Human resources
As such, lack of human resources constitutes one of the most binding constraints to scaling up in the short run. The cost of recruiting, training and retaining skilled personnel must be accounted for when considering the cost of scaling up. A programme using an existing community health worker network might imply no human resource constraint, but if this network does not pre-date the programme, setting it up would incur additional costs. Expansion into remote areas may also entail offering incentives to health personnel to locate to these areas and programmes. In that case, an additional amount should be imputed to unit costs of personnel.

Specifically, the following points should be kept in mind when you estimate human resource cost for scaling up.

- Cost of recruiting and developing additional skilled staff
- Cost of retention of staff especially at remote areas (special incentive)

Fixed costs
The traditional argument for decreasing unit costs involves spreading fixed costs over more people as output increases. For example, as more patients utilize a heath service unit, the cost per patient becomes lower. For reasons of equity or equal access, health centres in rural areas are often located such that they cannot possibly serve the equivalent number of people as urban or semi-urban health centres. The fixed costs of rural health centres are, thus, spread over fewer people.

The bottom-line of the above argument is that the scale up may involve substantial fixed cost at the initial level, but the unit cost should reduce consistently when the costs are spread out among more and more users. Since the unit cost is usually higher in rural and low-demand areas, a good strategy to help the unit cost reduce at a faster rate would be to adopt alternative technologies, such as campaigns, outreach or mobile facilities, to reach a remote population, although these technologies may still be more expensive per patient than the average cost in urban areas. In addition, significant streamlining in the administration of the programme may result in fixed costs dropping to a manageable level (say to 10-15%).

Management and support system
The management of a programme and system support must be accounted for in the

costing process. These concerns tend to be more important in the short run because they represent problems in utilizing an existing infrastructure (physical or human capital). During the process of scaling up, for example, there is an increased need for communication among the various levels of personnel implementing the programme.

The pilot programmes are often guided by focused attention and tight management which make them efficient and successful. It is also experienced that these interventions are carefully insulated from the mainstream system faults and barriers. However, the insulation weakens and the 'external' system occupies internal space when the intervention is scaled up and gets too dispersed for the initial small management team. In that case, it is not only important to link up and leverage the system resources, but also necessary to organize a new network of decentralized management, information systems and capacity building.

As an example, consider a Social Franchise programme in Family Planning run by an NGO in a district. The programme requires establishing a franchise network with a small number of private providers (for sterilization and other contraceptives). This, in turn, would require intensive training of the franchisees, a smooth logistic management (for supply of contraceptives, providers' payment, etc), and demand generation campaign among potential users. This may be well organized by a small team of dedicated workers of the NGO without much support from the government. However, it is a different game when the intervention is scaled up to the whole state. For an effective result, it is extremely important to set up training hubs across the state, substantial technical support, and an extensive monitoring and information system. In addition, a huge set of infrastructure needs to be built up if the existing government infrastructure is not leveraged. Conversely, there should be gains in the long run in terms of resource savings through bulk purchase of contraceptives and *economies of scope* – that is, implementing more than one programme with common resources (for example, the franchise clinics may also be used for a parallel intervention on safe abortion). All these have serious implications on costs – extrapolation of the NGO's programme cost might be an inaccurate estimate of the resource need.

In short, following key areas need to be addressed and costed to ensure an effective management and support system:

- New infrastructure for capacity building or leveraging existing infrastructures
- Technical support team
- Coordination team (Project management unit)
- Demand generation through mass communication
- MIS infrastructure
- Logistic hubs (e.g., distribution centres, etc.)

Changes in the intervention

If some components of the pilot project prove more effective than others, decision-makers may change the intervention to emphasize these components in the scale up. Such changes likely will affect costs. For example, if in the example of Social Franchising, the pilot project focused more on permanent methods (e.g., sterilization) and less on semi-permanent contraceptives (e.g., IUD). However, if the decision-makers now want to promote IUD insertion in scaling up process, there will be significant implication on costs since IUD insertion costs much less than sterilization.

Summary

The general guidelines for costing scale up operations are summarized below.

Scale Factors	Specific points of interest	Selected key additional areas in the costing process
Geography and infrastructure	• Higher cost of transport, training and Supervision • Some topographies are more costly to build in/maintain/travel in	• "Difficulty" weights in the estimation of unit cost
Human resources	• Not enough trained and professional people to implement scale up • Staff may need incentives/pay to locate in rural areas	• Additional cost for recruitment, training of new staff • Retention incentives
Fixed costs	• Programmes with high fixed costs/ centralization will show declining unit costs • May need different technologies in rural and low-demand areas (e.g., mobile health)	• Additional fixed costs • Costs of alternative technology
Management and support system	• Increased need for system support • Lack of management infrastructure • Need for expansion of technical support • Increased need for demand generation and communication	Additional costs for • New infrastructure for capacity building or leveraging existing infrastructures • Technical support team • Coordination team (Project management unit) • Demand generation through mass communication • MIS infrastructure • Logistic hubs (e.g., distribution centres, etc.)
Changes in the intervention	• The composition of components in the pilot stage may change in the scale up stage	• Change in the proportion of cost components

EXERCISE

Consider the exercise given in the last section (Section III). Suppose the above programme serves 2000 children and 500 mothers in an average block. Now, it is decided that the programme will be scaled up to 50 blocks spreading over 5 districts in the state. Among them, 30 are remote, and 20 are average. It is expected that approximately 1,50,000 children and 40,000 mothers will be covered through the programme.

1. Take necessary assumptions to identify the scale up factors and input costs. Justify your assumptions from your experience.
2. Calculate total costs for each component and overall total cost.

HOW TO DO A COST-EFFECTIVENESS ANALYSIS?

Introduction

Among the major uses of cost information, its application for measuring **efficiency** is particularly noteworthy. However, efficiency is usually referred to in terms of immediate output of a programme; for example, number of condoms distributed. In contrast, effectiveness is usually related to the real benefits or outcome of a programme. Thus, in the case of condom distribution, "number of condoms distributed" may be a good indicator of efficiency, but it fails to provide a reliable idea about the effectiveness of the programme. "Number of STD cases averted due to condom use" may be a better indicator for measuring effectiveness, or impact, or, benefits. Note that **effectiveness is a measure of the extent to which programme objectives are achieved.**

Cost-effectiveness analysis produces an estimate that takes into account the benefits of an activity as well its costs, and weighs up the "pros" and "cons." It is based on cost numerator in relation to an effectiveness denominator to obtain cost effectiveness measure, such as cost per life saved by a program. The ratio is expressed as:

$$Cost\ effectiveness\ ratio = \frac{Total\ cost}{Number\ of\ lives\ saved\ or\ cases\ averted}$$

One problem with the denominator is that the 'effectiveness' is measured in binary terms, i.e., lives saved or not, or, cases averted or not. This may not reflect the whole of 'effects' of a programme since, in many cases an intervention may also benefit those who suffer from a health condition but do not necessarily die. In other words, a programme may not only avert deaths or cases but also help reduce the burden of morbidity of those who are already affected (e.g., a diarrhoea control programme may reduce the possibility of infection through strong preventive measures, and, at the same time, reduce the length of morbidity by treating the affected persons as well).

One way to include the morbidity effects is to convert the health outcomes (mortality and morbidity) into a single utility index, such as Disability-Adjusted Life Years (DALY). However, for simplicity's sake, we will demonstrate the application of the simple CE ratio as given above.

In brief, Cost-Effectiveness Analysis (CEA) is a technique to assist in decision making. It helps in identifying the areas of a health program that are ineffective and thus helps in designing a better program. It involves assessing the gains (effectiveness) and resource inputs required (costs) of alternative ways of achieving a specified objective, usually expressing the results in terms of cost per unit of effectiveness for each alternative and then comparing the cost effectiveness of each alternative. The alternative with the lowest cost per unit of effectiveness is called the most "cost-effective" and is generally to be preferred on grounds of economic efficiency.

Below we discuss how this ratio can be estimated by following several steps.

Step 1: Define the objectives of the programme

First, the programme, on which the cost-effectiveness analysis will be done, needs to be concretely defined in terms of its objectives. For example, one of the objectives of a family programme is to avert unwanted births. Similarly, the objective of a sexual health programme among sex workers is to reduce the incidence of STDs.

Step 2: Identify the alternative ways to achieve the objectives.

The next step is to identify all possible alternative ways (or, approaches) to achieve the objective. For example, some possible alternatives for the above-mentioned FP programme: (1) improving access to availability and accessibility of affordable contraceptives, (2) improving reproductive health service delivery, (3) raising awareness about the benefits of small families, and so on. Similarly, for the sexual health programme, they might be: (1) distribute condoms among sex workers, (2) provide STD treatment through satellite clinics, (3) promote safe sex practices through IEC activities, and so on.

Step 3: Compute incremental costs for different approaches

Next, the total programme costs (recurrent and non-recurrent) for each alternative needs to be worked out. However, this is just the gross cost and may not properly reflect the true cost of the programme. To get a better result, subtract the clients' potential cost of treatment had there been no such programme. For example, if the FP programme were not there, some couples would have sought contraceptives from private outlets and spent some amount of money for that. With the programme, these costs would probably be saved. The savings in cost thus needs to be subtracted to get the net cost of the programme.

Step 4: Compute net "benefits" for the approaches

The effectiveness of each approach needs to be estimated through a common indicator which should sufficiently reflect the impact of the approaches. For example, a good indicator for the FP programme would be "numbers of unwanted births averted". Similarly, for the sexual health programme it could be the "number of STD cases averted". The problem is that programme data usually gives information on immediate outputs and does not give any direct information on estimation of the long run outcome. One needs to collect additional information from experts and/or existing research literature to predict the probable outcomes. For example, there are now well-tested models available, such as *MSI Impact or Spectrum* (UNFPA) which can estimate the numbers of birth averted from a given set of data on projected use of contraceptives.

Step 5: Calculate cost-effectiveness ratio for each alternative

The final step in this analysis is straightforward. The ratio of cost and effectiveness for each approach needs to be calculated and compared. The result should be interpreted as "cost per case averted/life saved/births averted". The approach with the least cost per case averted is the most cost-effective approach.

A Case Study and Exercise[5]

Problem

This exercise presents information on different approaches to a STD control program. The required task is to identify and quantify the total costs of each and to calculate the cases of STD averted as a result of each approach. Then this information must be used to make a judgement about the cost effectiveness of each approach. The purpose of the exercise is to highlight the important concept of units of outcome in ranking proper worth.

General background

The area in and around Calcutta, the capital of West Bengal, attracts a large and diverse population from all over the eastern region of the Indian sub-continent, including countries like Nepal and Bangladesh. This is because of the abject poverty in this part of the world and Calcutta being the only major centre for commerce in the region. Most of these people are involved in manual labor in the dock/port, transport, etc. Most of them leave their family behind and are highly mobile.

The socio-psychological nature of the emigrant population, coupled with their mobility, makes this segment highly prone to Sexually Transmitted Diseases (STD). With a highly positive correlation between the prevalence of STD to the prevalence of HIV/AIDS, a program for STD control becomes necessary. Also diagnosis and treatment of STD is relatively easier than for AIDS, which makes STD control all the more essential.

Given the importance of STD control; in and around Calcutta, an NGO took up the challenge of STD control (prevention) in the region, through counselling and condom distribution. The project was targeted to males in the high risk population segment. The NGO was assured assistance in this novel effort from the Department of Health and some international funding agencies.

Now the NGO was faced with the task of identifying a particular approach for the STD prevention program. There were a lot of different approaches available, but the NGO concentrated on three/four distinct and widely acceptable approaches. Subsequently,

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5 The following exercise is a modified version of a case presented in *Economics for Health Sector Analysis* by Mead Over [Washington: The World Bank, 1991, pp. 145-154]. The exercise, which is used here as a demonstration of the tool, should not be viewed as a reflection of any particular reality.

the decision makers in the NGO got on with the task of studying in details the cost and outcome implications of each approach to select the best among them.

Study design

A study was undertaken to find the cost and outcomes with respect to each of the alternatives. The alternatives identified were as under:

- **Approach 1**: (Control case) No special inputs were provided in this case. Regular health services provided by the government were allowed to continue without any special focus on STD. This was to provide the basis for calculating the STD cases prevented by other approaches.
- **Approach 2**: Distribution of condoms through local level STD clinics, in collaboration with government health centres at the local level. It also involved counselling the clients by the doctors at the centre.
- **Approach 3**: Distribution of condoms and counselling in the field by the health workers of the NGO.
- **Approach 4**: A sustained IEC (Information, Education, Communication) campaign with the aim of educating the target segment in safe sex practices.

A specific number of males from the high risk population segment were covered under each approach (as in *Table 9* below). Outcome of the different approaches were measured as the number of STD cases prevented. STD cases averted is a measure of the difference between the number of STD cases that actually occurred and the number of cases that could be expected without intervention. By multiplying the number of persons covered in each approach other than the control case, by the STD specific morbidity rate in the control case (0.0155 or 15.5 per thousand) and subtracting the total number of STD cases observed in each approach from the product, the number of STD cases averted is obtained (see *Table 9* below).

Data (Cost and outcomes)

The study of various approaches were conducted in the months of October to December 1998 and the information compiled on project costs and number of STD cases averted under various approaches are given in the tables below.

1. STD cases averted

Table 9: STD cases by each approach during the three months of observation

S.No. 1	Approach 2	Number of males covered 3	STD specific morbidity		Cases averted (3 x 0.0155) - 4 6
			Number of cases 4	Rate (per 1000) 5	
1.	Approach 1	4400	68	15.5	
2.	Approach 2	6018	91		
3.	Approach 3	6875	53		
4.	Approach 4	7023	51		

2. Costs

Cost per packet of condoms (containing 5 condoms each): Rs 1.00
The number of packets used in each approach was:

Approach 2: 844
Approach 3: 23056
Approach 4: 2280

3. Manpower (Salaries)

Table 10: Monthly Salary by Profession/No. of Persons Involved in Study by Approach

Profession 1	Amount per month (Rs.) 2	Staff directly involved in the project		
		Approach 2 3	Approach 3 4	Approach 4 5
Nurses/Health Workers	3000	0	21	24
Physicians	10,000	7	0	0
Project/Field Officers	10,000	3	3	4

4. Transportation, Training and IEC

These include costs for transportation by health workers for home visits and also by program officers for field supervision. Training costs included the orientation of staff towards STD prevention, safe sex practices and the art of counselling. Cost of IEC materials included cost towards posters, banners and related IEC materials. All these costs pertain to the quarter in question (Oct-Dec 2010).

Table 11: Cost of Transportation/Training/Poster by Approach (in Rs. '000 for the whole quarter)

Cost Items	Approach 2	Approach 3	Approach 4
Transportation	197	205	214
Training	2	15	17
IEC materials	0	17	39

EXERCISE

You have been appointed as Project Co-ordinator in the NGO. On the basis of the data collected for the period of three months for the three different approaches to STD prevention, you must make a decision on the best design of the project. The resources are limited, so you will be interested in initiating a cost-effective program. This means preventing as many STD cases as possible with the least expenditure of resources.

1. Decide which approach provides the most cost-effective method of STD prevention. In order to make this decision:
   a) Calculate total costs for approaches 2 to 4.
   b) Calculate the cost per person covered for each approach.
   c) Calculate the number of STD cases averted for each approach.
   d) Finally calculate the cost per STD case averted for each approach.
   e) Which approach is the most cost-effective?

When calculating costs please remember that the duration of the study was three months.

APPENDIX . Table of Annualization Factor

Useful Life (years)	Discount rate														
	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%
1	1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909	0.901	0.893	0.885	0.877	0.870
2	2	1.970	1.942	1.913	1.886	1.859	1.833	1.808	1.783	1.759	1.736	1.713	1.690	1.668	1.647	1.626
3	3	2.941	2.884	2.829	2.775	2.723	2.673	2.624	2.577	2.531	2.487	2.444	2.402	2.361	2.322	2.283
4	4	3.902	3.808	3.717	3.630	3.546	3.465	3.387	3.312	3.240	3.170	3.102	3.037	2.974	2.914	2.855
5	5	4.853	4.713	4.580	4.452	4.329	4.212	4.100	3.993	3.890	3.791	3.696	3.605	3.517	3.433	3.352
6	6	5.795	5.601	5.417	5.242	5.076	4.917	4.767	4.623	4.486	4.355	4.231	4.111	3.998	3.889	3.784
7	7	6.728	6.472	6.230	6.002	5.786	5.582	5.389	5.206	5.033	4.868	4.712	4.564	4.423	4.288	4.160
8	8	7.652	7.325	7.020	6.733	6.463	6.210	5.971	5.747	5.535	5.335	5.146	4.968	4.799	4.639	4.487
9	9	8.566	8.162	7.786	7.435	7.108	6.802	6.515	6.247	5.995	5.759	5.537	5.328	5.132	4.946	4.772
10	10	9.471	8.983	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145	5.889	5.650	5.426	5.216	5.019
11	11	10.368	9.787	9.253	8.760	8.306	7.887	7.499	7.139	6.805	6.495	6.207	5.938	5.687	5.453	5.234
12	12	11.255	10.575	9.954	9.385	8.863	8.384	7.943	7.536	7.161	6.814	6.492	6.194	5.918	5.660	5.421
13	13	12.134	11.348	10.635	9.986	9.394	8.853	8.358	7.904	7.487	7.103	6.750	6.424	6.122	5.842	5.583
14	14	13.004	12.106	11.296	10.563	9.899	9.295	8.745	8.244	7.786	7.367	6.982	6.628	6.302	6.002	5.724
15	15	13.865	12.849	11.938	11.118	10.380	9.712	9.108	8.559	8.061	7.606	7.191	6.811	6.462	6.142	5.847
16	16	14.718	13.578	12.561	11.652	10.838	10.106	9.447	8.851	8.313	7.824	7.379	6.974	6.604	6.265	5.954
17	17	15.562	14.292	13.166	12.166	11.274	10.477	9.763	9.122	8.544	8.022	7.549	7.120	6.729	6.373	6.047
18	18	16.398	14.992	13.754	12.659	11.690	10.828	10.059	9.372	8.756	8.201	7.702	7.250	6.840	6.467	6.128
19	19	17.226	15.678	14.324	13.134	12.085	11.158	10.336	9.604	8.950	8.365	7.839	7.366	6.938	6.550	6.198
20	20	18.046	16.351	14.877	13.590	12.462	11.470	10.594	9.818	9.129	8.514	7.963	7.469	7.025	6.623	6.259
21	21	18.857	17.011	15.415	14.029	12.821	11.764	10.836	10.017	9.292	8.649	8.075	7.562	7.102	6.687	6.312
22	22	19.660	17.658	15.937	14.451	13.163	12.042	11.061	10.201	9.442	8.772	8.176	7.645	7.170	6.743	6.359
23	23	20.456	18.292	16.444	14.857	13.489	12.303	11.272	10.371	9.580	8.883	8.266	7.718	7.230	6.792	6.399
24	24	21.243	18.914	16.936	15.247	13.799	12.550	11.469	10.529	9.707	8.985	8.348	7.784	7.283	6.835	6.434
25	25	22.023	19.523	17.413	15.622	14.094	12.783	11.654	10.675	9.823	9.077	8.422	7.843	7.330	6.873	6.464

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