

# **HOSPITAL COSTING MODEL MANUAL**

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## **INTRODUCTION**

A concern of most countries is health sector resources: the sources of finance for health services, the ability to maintain past funding levels, resource allocation patterns, and the efficiency of health services delivery. The hospitals of these countries are an important element of the concern about health resources because they are the largest and most costly operational unit of these health systems and account for a large portion of the health sector's financial, human, and capital resources. In aggregate terms,

- ◆ hospitals utilize nearly half of the total national expenditure for the health sector;
- ◆ hospitals commonly account for 50 to 80 percent of government recurrent health sector expenditure;
- ◆ hospitals use a large proportion of the most highly trained health personnel (Newbrander, Barnum, and Kutzin, 1992).

Despite the level of resources devoted to hospitals and the health sector, there is a growing gap between available and required resources because the health needs of developing countries have not diminished, although they may have shifted with social, demographic, and epidemiological changes. This gap has led many countries to explore ways to generate additional revenue resources for their hospitals and health systems. One of the greatest possibilities for generating “additional” resources is by using existing resources more effectively through improved allocation patterns and increased efficiency in the management of hospital operations.

There is interest in dealing with the costs of operating hospitals due to wastage. In the Americas, WHO estimated that wastage accounts for as much as 40 percent of the available resources for health services (Parker and Newbrander, 1993). The resources that could be generated from savings through efficiency gains alone are substantial due to the scale of hospital resources and operations. For example, a study in Malawi estimated that simple management correction of inefficient practices could result in a savings of 44 % of that nation's major hospital non-personnel recurrent costs. The magnitude of hospital operational costs and inefficiencies in the health system raise questions about the utilization of resources by hospitals. Hospitals also have need for additional resources. Cost information can help set prices and determine revenue objectives.

This manual will help you to obtain the information you need on the cost of your hospital's operations.

### **Why are hospital costs important?**

Hospital cost information is derived by relating the inputs of resources in monetary terms to the outputs of services provided by the hospital. Cost information is part of the basic information needed by managers and policy makers for making decisions about how to improve the performance of a hospital, where to allocate the resources within or among hospitals, or to compare the performance of different hospitals to one another. Some of the basic reasons for wanting cost information are to improve efficiency, increase effectiveness, enhance sustainability, and improve quality.

## **What are the uses of cost data?**

Cost data can be used for two primary purposes, relative to time: for the present and for the future. It can be used to assess the current situation of a hospital, such as for assessing its efficiency, determining the effectiveness of the hospital, reviewing its priorities, and setting of prices. Cost information may also be used for the future: making cost projections, budgeting, and scenario planning with “what if?” situations.

Information on the costs and outputs of hospitals can provide considerable information for managers of hospitals, regional coordinators of health services, and policy makers overseeing the issues of the national health system. The information can be used to assess the internal operations and performance of a single hospital—such as helping assess the utilization of health personnel in different departments of the hospital in providing services—and to make comparisons of the operations and efficiency of different hospitals. Some of the specific potential uses of cost information for a health care administrator are:

- ❑ comparison across facilities to identify those that are efficient from those that are not,
- ❑ comparison of costs with fees,
- ❑ development of a cross-subsidization strategy,
- ❑ evaluation of the financial requirements of a new program, or
- ❑ analysis of the effect of changing the use of staff, equipment, and supplies in providing services in an existing program.

When the cost data (the financial cost of the resource inputs) can be related to information about the outputs (the type and quantity of services provided) assessments of efficiency of the input-output relationship can be made. These and other uses of the information will be reviewed in the final section, “Using the Hospital Costing Model to Make Management and Policy Decisions.”

## **Who can use cost data?**

Cost data on a series of hospitals, within an area or country, may be used by national, regional, and provincial managers to compare the performance of similar types of hospitals. They may also use such information to establish standards of performance and efficiency for hospitals.

The managers or administrators of hospitals may also use the cost data on their individual hospital. This information can be used to

- ❑ measure performance of different departments, wards or units within the hospital;
- ❑ examine composition of costs: staff, supplies; and
- ❑ assess revenue generation to costs of various services.

## **Who is this manual for?**

Any health professional can learn from this manual and its Hospital Cost Model through a training session or self-study. This model and manual have been prepared for hospital managers as well as those responsible for the supervision and policy oversight of hospitals at the national, regional, and district levels.

This manual will help guide one through the process of costing a hospital with instructions for how to enter data in the Hospital Cost Model. It concludes with a section on how to use the information for making policy and management decisions.

### **How does one do a hospital costing exercise?**

The process of determining the costs of a hospital involves six steps:

1. Defining the major and relevant activity areas of the hospital.
2. Gathering information on the services provided or the output of the hospital.
3. Determining the labor and other recurrent costs.
4. Ascertaining the capital costs of the hospital.
5. Allocating indirect costs.
6. Reviewing and using the hospital cost summary.

The steps in costing of the hospital services are provided in the six sections below. The relevant spreadsheet tab in the workbook is reflected in italics in the parentheses of each section heading.

#### **Step 1: Defining the major and relevant activity areas of the hospital** (go to *Service\_Volume* tab)

Define the relevant areas of hospital operations which need to be costed. Factors to consider are (1) the importance of an activity relative to the hospital's total output or level of activity, (2) the amount of detailed costing information available, and (3) the amount of detail needed from the output of this exercise. For example, if you have a medical male ward and medical female ward, but all of the data on workload is combined, you may want to just cost out the medical ward, which is a combination of the male and female components. Or if a hospital has a TB ward but it accounts for less than ½ of 1% of all the patients, it may be best not to identify that as one of the major areas but include all its data in the medical ward. For this exercise, it was determined that the following provide sufficient detail for the major areas of activity of a district hospital for which cost and workload data will be gathered. There is space on the spreadsheet (*Service\_Volume* tab) to add other activity areas if it is determined that the given list is inadequate to accurately reflect the hospital's service mix/profile/major activity areas. A word of caution: only add activity areas if they are important in terms of the volume of services or costs or both. Having too many activity areas with many that are not significant will dilute the cost information and its usefulness.

##### Major Cost Areas for Hospital

1. Inpatient
  - ◆ Medical ward
  - ◆ Surgical ward
  - ◆ Maternity
  - ◆ Private ward
2. Outpatient clinic
3. Ancillary services
  - ◆ Pharmacy

- ◆ Laboratory
- ◆ Radiology (X-Ray)
- 4. Outreach services (services provided off-site: mobile MCH clinics, patrols, etc.)
- 5. Training school

**Step 2: Gathering information on the services provided or the output of the hospital** (go to *Service\_Volume* tab)

Information to be gathered for each of these areas will be based on a typical measure of workload. For inpatient services two outputs are sought: total inpatient days and total admissions. The reason for two measures is that since these measures will serve as a denominator and determine the outputs of this model, it is often useful to have not only the unit cost per day of hospitalization (total costs/total patient days) but also to have the average cost per admission (total costs/total admissions). This latter output of the model—total cost per admission—is especially helpful if attempting to determine the payments or premiums on a capitation basis.

For outpatient clinics it is typical to use total visits for a time period as a measure of workload. Ancillary services will use the number of examinations, procedures, or prescriptions filled. Outreach services would use number of visits to the mobile clinic, number of contacts, or number of surveillance visits. Training schools may be a major source of resource commitment. The number of students enrolled would be a useful measure of the workload of the institution.

**Step 3: Determining the labor and other recurrent costs** (*Costs\_Labour* and other relevant tabs: *Costs\_IP*, *Costs\_OP*, etc.)

In this step you must identify the major cost components for the major activities identified in step 1. The major components of expenditure are detailed below and on the spreadsheet.

***Recurrent costs:***

- Labor (see step 3.1 below)
- Salaries
- Allowances (uniforms, housing, education, home leave, rural or hardship incentive pay, etc.)
- “Free” labor (foreign or missionary health personnel who provide their services at no cost to the facility). Their services should be costed as the equivalent of what a national would receive for doing that same job
- Drugs
- Medical Supplies
- Transportation (petrol and maintenance for vehicles and ambulances)
- Maintenance (for all facilities and equipment other than vehicles)
- Food (total food costs incurred for both patients and staff)
- Telecommunications
- Office expenses
- Other

### 3.1 Labor costs (go to *Costs\_Labour* tab)

Determine labor costs for each activity area of the hospital.

- a. First list the names of all staff at the facility. Sometimes it is easier to get a list of names of all staff members at the facility from the Office of Personnel Management or Civil Service Office *before* the visit to the hospital. If this is done, the first step is to review the list with the matron and hospital secretary to cross out those on the list who no longer work at the facility and add those who work at the facility but who are not listed. If no list exists then take a list from the hospital or sit with key staff and develop a list. This should include all employees or those regularly paid by the hospital, including:
  - Clinical staff (nurses, doctors, physiotherapists, pharmacists, lab technicians, etc.)
  - Administrative staff
  - Drivers
  - Casual laborers

If more rows are needed, please insert them in the appropriate sections.

- b. For each name, also write the position title, their grade or rating, and their salary if available.
- c. For each staff member, write the percentage of time spent on each major hospital activity over the course of the last year or last month. The longer the period used for the estimate, the less likely that it will be non-representative. (For example, if figures for the past month are used, and less outreach was done than usual due to heavy rains, the percentage of time allocated to other activity areas may be too high.) Time should be allocated among the major activities listed in step one of this exercise, plus there should be a column for “Indirect/Administration” for any duties performed that are not direct patient care.
- d. Also list all “free labor,” their position, and the equivalent salary of what a national person would be paid for performing that same job. Though it is not a direct expenditure this labor must be included in the listing or personnel. Total costs must also include labor that is not paid directly by the government, but that is used in providing care (even though government expenditure is not required). This might include doctors or nurses who are at the facility from a mission society or are foreign aid technical assistance of another country to the host country. For example, a foreign doctor from country Alpha is working in Gamma, the host country, as a technical exchange between Alpha and Gamma. The doctor from Alpha country may continue to receive his salary of \$25,000 from the Alpha government while he is working in Gamma. But doctors of Gamma—the host country—with similar qualifications are only paid \$10,000 by the Gamma government. Hence, these foreign doctors from Alpha would be listed on the labor list of this hospital in Gamma and their salary would be stated as \$10,000, though that is not their actual salary, since that is what would be paid if a doctor of Gamma were paid to perform these same tasks.
- e. The total percentages of time of each person should equal 100%.
- f. If allowances are included in pay, include these separately on the relevant cost worksheet tab (e.g., *Costs\_IP*). Allowances may include uniforms, housing, education grants, or rural or hardship posting allowance.

As the percentage of time is entered the model will compute the portion of each staff member's salary that is allocated to each activity. For example, let us assume there are three employees: a physician, Dr. Doogood, a nurse, Sister Patience, and an administrative person, Mr. Takiteasi. The major activities in this hospital are inpatient medical, outpatient, and administration. Their salaries and allocation of their time is reflected in the chart below. You can see that their salaries are allocated in the last columns:

Name	Position	Grade	Salary	Percentage Time Allocation (should sum across to 100%)			Allocation of Salary		
				Medical	OP	Admin	Medical	OP	Admin
Doogood	Physician	P 8	10,000	55%	40%	5%	\$5,500	\$4,000	\$ 500
Patience	Nurse	P 5	6,000	40%	50%	10%	2,400	3,000	600
Takiteasi	Admin	G 4	2,500			100%			2,500
<b>TOTAL</b>							<b>\$7,900</b>	<b>\$7,000</b>	<b>\$3,600</b>

From this there will be an allocation of labor costs among the various activity areas, including administration.

### 3.2 Non-labor recurrent costs (see the relevant tab for the activity areas: *Costs\_IP*, *Costs\_OP*, etc.)

List costs for each of these by the activity area or center on the spreadsheet. If the total costs are not broken out by activity, a proxy measure will have to be used to allocate the total costs among the major activities. For example, we know that total food costs for a hospital were \$10,000 for the past year, but we do not know how much was for medical, surgical, maternity, or private ward patients. However, we know that these patients accounted for 30%, 40%, 20%, and 10%, respectively, of the total patient days. Then we would assign \$3,000 (30% of \$10,000) of the total food costs to the medical ward, \$4,000 (40% of \$10,000) to surgical, \$2,000 to maternity ward, and \$1,000 to the private ward.

Even if some of the food costs are for staff, we are attempting to allocate all costs to patient delivery areas and we would thus assign those staff food costs in the same manner of a proportional allocation based on some measure of workload.

Similarly, we do not allocate anything to outpatient clinics or outreach services, as food is not provided to patients there. But if this food expense also covers food supplied to students in the training school, we would first estimate how much of the total food costs are accounted for in feeding the students. In our example, if it is estimated that students account for 30% of the total food costs, then we would allocate \$3,000 to the training school, and finally allocate the remaining \$7,000 to the inpatient wards based on the measure of workload (e.g., patient days) chosen earlier. Hence the medical ward would be allocated 30% of \$7,000—or \$2,100—for food costs.

### **Step 4: Ascertaining the capital costs of the hospital** (go to *Costs\_Capital* tab)

#### **Capital Costs:**

- Building** (construction or modification but not routine maintenance, which is included in recurrent costs)



- **Equipment** (major equipment purchased for the facility). Equipment is considered capital equipment if its cost is higher than some set amount (such as US\$ 200) and it has an expected useful life of more than one year. If it does not meet these requirements then it is a recurrent cost. For example, waste cans have a useful life of greater than one year but because they cost much less than \$200 their purchase is considered a recurrent rather than a capital cost.
- **Vehicles**

#### 4.1 Building costs

If building costs are known or can be obtained from the Ministry of Public Works, the figure must be adjusted for current costs. Increase it by an approximation of increases over the years to determine the current building costs; this figure goes in the Building section of the *Costs\_Capital* tab. The spreadsheet will automatically depreciate building costs over a 20 year period using the straight-line method. This divides the total cost by the estimated years of life for the building, in this case 20. Square meters may be used to apportion these depreciation costs across the major activity cost centers.

If no building costs are available, there are several ways to obtain a proxy measure. You may determine the cost of a similarly-sized facility which was recently built from the government contracts office and use that as the approximate value, adjusting for major variations that make your hospital more or less costly to construct, such as location (in a rural area, it will be more expensive to bring in the building supplies for construction) or the type of building materials used (brick and mortar compared to wooden buildings).

Another means for approximating the cost of a building is to contact a real estate agent to determine the annual rental cost of a similar building. It is assumed that the rental price of a building accounts for the depreciation of the building and a fair return on investment for the owner. Though this may overstate the annual depreciated cost of the building, it is an approximation in the absence of more specific capital cost information.

#### 4.2 Equipment

If the actual cost of equipment is known, obtain that information from the government tendering office or other office. Depreciate the value of equipment over a 7½ year period, adjusting this downward in those circumstances where the life span of equipment is shorter due to adverse conditions, such as tropical conditions.

If specific information is not available, one may use the percentage of building costs, usually 10% to 25% of building costs depending upon the extent of technology used in the facility, with the equipment of larger hospitals representing a larger percentage of total building costs. Or one may use the experience of recently built hospitals as the basis for assessing the total equipment costs. Local dealers in hospital equipment may also be sources of cost information. Again, these costs are divided by 7½ to represent the annual depreciation cost.

#### 4.3 Vehicles

Vehicles include cars, trucks, ambulances, motorcycles and even bicycles. Use the current cost of a similar vehicle, including freight and any duties which must be paid, rather than the

original purchase price. This information can be obtained from government contracts, donor records, or local dealers if the facility does not have the information on hand.

Vehicles are assumed to have a shorter life than other hospital equipment and are depreciated over 5 years. The spreadsheet *Costs\_Capital* allows one to put in three years if the vehicle is operated in particularly rough terrain or is constantly in use. Hence the useful life in this case is less than five years.

**Step 5: Allocating the indirect costs** (go to *Summary\_TotalCosts* tab)

The model includes a summary chart, constructed from the labor and the other costs listed, which lists the **total** cost for each activity area. Because we also want the **unit** costs of those areas providing patient care services, the indirect or administrative costs must be allocated to the inpatient, outpatient, other ancillary services, and any other activities as defined in the first step.

The administrative costs are considered indirect in that they support the care and ancillary services delivered to patients and are part of the total costs of the facility. To allocate these indirect costs of administration we must use what is termed “the step-down allocation method.” Since the ancillary, inpatient, and outpatient services cannot use a common workload measure we will use the other direct costs as a basis for allocating the indirect costs. The assumption is that the indirect costs follow the same proportional representation that the direct service costs use among these areas. To illustrate this see the table below:

	Column No.	1	2	3	4	5	6	7
Row No.	Service	IP	OP	Admin	X-Ray	Lab	Pharmacy	Total
1	Costs	\$10,000	\$8,000	\$3,000	\$3,000	\$2,000	\$4,000	\$30,000
2	Total Costs without admin expenses							\$30,000 -3,000 =\$27,000
3	Proportion of total costs without admin expenses	10,000/ 27,000	8,000/ 27,000		3,000/ 27,000	2,000/ 27,000	4,000/ 27,000	
4	Percentage	37%	30%		11%	7%	15%	
5	Allocable admin costs	.37* \$3,000	.30* \$3,000		.11* \$3,000	.07* \$3,000	.15* \$3,000	
6	Allocable costs	\$1,110	\$900		\$330	\$210	\$450	\$3,000
7	Total direct and indirect costs	10,000 +1,110 =\$11,110	8,000 + 900 =\$8,900		3,000 + 330 =\$3,330	2,000 + 210 =\$2,210	4,000 + 450 =\$4,450	\$30,000

The total costs of each activity can be divided by the workload data to give the unit or average cost per unit of activity. Hence if IP total costs are \$11,110 and the workload was 100 admissions and 1,111 patient days, then the unit costs are  $(\$11,110/100) = \$111.10$  per admission and  $(\$11,110/1,111) = \$10$  per patient day of care. If total pharmacy costs are \$4,450

and 1,000 prescriptions were filled for both inpatients and outpatients, then the average cost of a prescription filled is  $(\$4,450/1,000) = \$4.45$  per script. *Note: The model will perform this calculation automatically once cost figures are entered.*

Sometimes it is necessary to know precisely what the unit costs are for just the direct patient care services. In this case we must “step down” the ancillary service costs as well as the indirect/administrative costs. To do this we must get the exact proportion or an estimate from each of the ancillary areas (radiology, laboratory, and pharmacy) as to what proportion of their total workload is attributable to inpatients and what percentage of their workload is comprised of outpatients. The user needs to enter the percentage of each of these services used for inpatients; the model will calculate the outpatient percentage (except pharmacy, where the user enters inpatient and outpatient percentages, and the model calculates percentage allocation to outreach activities).

	Inpatient	Outpatient	X-Ray	Lab	Pharmacy	TOTAL
Total Costs	\$11,110	\$8,900	\$3,330	\$2,210	\$4,450	\$30,000
Percentage of workload:						
IP			90%	40%	55%	
OP			10%	60%	45%	
Ancillary Costs attributable to IP			$(3,330 * .90) = \$2,997$	$(2,210 * .40) = \$884$	$(4,450 * .55) = \$2,448$	\$6,329
Ancillary Costs attributable to OP			$(3,330 * .10) = \$333$	$(2,210 * .60) = \$1,326$	$(4,450 * .45) = \$2,002$	\$3,661
IP Costs	$(\$11,110 + 2,997 + 884 + 2,448) = \$17,439$					
OP Costs		$(\$8,900 + 333 + 1,326 + 2,002) = \$12,561$				
Workload	2,000 patient days; 250 admissions	20,000 visits				
Unit Costs	\$8.72/day \$69.76/admission	\$0.63/visit				

**Step 6: Reviewing and using the hospital cost summary** (go to *Summary\_TotalCosts* and *Summary\_UnitCosts* tabs)

The *Summary\_TotalCosts* and *Summary\_UnitCosts* tabs provide the output and costs pulled in from the other spreadsheet tabs of the workbook.

There is value at times to know not only the unit costs of the inpatient and outpatient services but also for the ancillary services. These are reflected in Section VII of the *Summary\_TotalCosts* spreadsheet tab. To obtain the total unit costs of those activities that provide direct patient care,

mainly inpatient and outpatient services, the ancillary services must also have their costs allocated between the inpatient and outpatient. This is done in the *Summary\_TotalCosts* spreadsheet tab. The “step-down” method is used by ascertaining the amount of each ancillary services total workload that is attributable to inpatient and outpatient care. These percentages allow these costs to be allocated. The result is the total costs for the inpatient and outpatient services. When this is divided by the workload of those activity areas, the result is unit costs as shown in the *Summary\_UnitCosts* spreadsheet tab.

The resulting information can be used by an individual institution or for comparing several institutions. The uses, as mentioned in the introduction, include:

1. Accountability

Using the information to report to the hospital board or the ministry how financial resources have been used, and that they have been used properly and efficiently. Budgets may be generated using cost information.

2. Assessing efficiency

Efficiency is achieved when more hospital services (outputs) are produced with the same amount of resources (staff, finances, equipment) or when the same output is produced with fewer resources. So when cost profiles of several hospitals are available for the manager to review, an assessment of their relative levels of efficiency may be made.

3. Establishing standards

When cost information is available for a cross-section of similar type hospitals, the comparison can result in setting a standard for what that type of hospital should be able to produce with a given set of resources.

4. Cost Recovery: Establishing prices

Knowing the cost of services allows the managers to set prices for all services “at cost” plus a small margin, or determine which services will receive cross subsidies.

5. Cost Projections: Planning for the future

What-if” scenarios may be generated with the service volume and costing information generated. This can help in the planning of new services or expanding existing services.

## CONVENTIONS USED IN THE HOSPITAL COSTING MODEL

- Where input is expected from the user, the area is shaded light green.
  - **Note:** *The only exception to this is on the tab for inpatient costs, Costs\_IP, where the user has the option to provide detailed information or not. If detailed information is available, the user may enter it in the appropriate column (Medical, Surgical, Maternity, etc.); these columns are shaded light yellow. If inpatient costs are not broken out to that level of detail, simply enter the information in the column labeled “All Other,” which is shaded light green.*
- If there is an area that needs clarification, we have inserted comments to help you use the model. These may appear as italicized comments in the column to the right or left of information being requested, or the user may see a red “flag” in the upper right-hand corner of a particular cell in the spreadsheet. To see the comment, move the mouse so it is on the cell in question. The comment will appear.
- In the *Costs\_Labour* sheet, some of the data entry areas have been restricted. If the user tries to enter incorrect information, an error message will appear. Also, when the cursor is in one of these restricted cells, a descriptive message will appear so that the user knows what is expected. For example, under “Percentage of time worked,” full-time (FT) = 1 and half-time equals 0.5. If the user tries to enter, say, the number 2, an error message will flash on the screen. Similarly, when allocating staff time among the activity areas, an error message will appear if the **total** percentage allocation (summing across) exceeds 100%.
- Use of the spreadsheet requires the user to have Microsoft Excel, version 7 for Windows.
- **Caution:** every effort has been made to keep the model free of computer viruses. Nevertheless, before using the software, it is recommended that you use a virus scan package, especially if your computer is used by more than one person or if the software has been used on different computers.

## **ASSUMPTIONS**

Several assumptions were used in the model, based on prior experience (both in Kenya and other countries). These include the following:

- Depreciation for buildings: 20 years
- Depreciation for hospital equipment: 7 ½ years
- Depreciation for vehicles: 5 years (normal conditions) or 3 years (difficult conditions)
- For calculating unit administrative cost, it was assumed that 7 outpatient visits represented about the same level of resource use as 1 inpatient day.

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