Chapter IV

Research Methodology

4.1 Study Design

This study is a methodological one in which how the costs for the prevention and control and the treatment of HIV/AIDS are calculated, how total number of HIV positive cases and AIDS cases are predicted and how economic burden of HIV/AIDS is estimated, are explored.

The cost of treatment of HIV/AIDS patients is studied from 40 patients who were diagnosed as full blown AIDS cases, admitted to Infectious Diseases Hospital (IDH), Yangon, Myanmar during April 1, 1994 to March 31, 1995. The cost is calculated by reviewing the medical records retrospectively and by using price list of the drugs supplied by the Central Medical Store Depot (CMSD) i.e. government price and market price for those purchased from different markets.

This study covers only provider direct cost for the treatment of HIV/AIDS patients and the cost for the prevention of HIV/AIDS is only focused on those matters related directly to the HIV/AIDS patients. Because this study is the starting point of economic study for HIV/AIDS from the provider perspective and the ultimate aim of this study is to provide information to the government about the magnitude of the burden for the government to fight this disease, especially for preparation of financial estimates.

To calculate the cost of treatment of HIV/AIDS patients, the data were collected from the Infectious Diseases Hospital (IDH), which is located at central level. This hospital is the biggest infectious diseases hospital in the country in which the majority of full blown AIDS cases are admitted and treated. Nearly 60% of the reported AIDS cases are in Yangon and nearly 80% of them are admitted to IDH for treatment. So this is a good reason to choose this hospital to collect the data to calculate the hospital care cost during the study period which is very limited.

The cost for prevention of the spread of HIV infection from HIV positive cases, is calculated from discussion with the personnel concerned from Central Health Education Bureau (CHEB), DOH in March, 1996.

4.2 Operational Definitions

- Economic burden in this study means the total cost of prevention and treatment of HIV/AIDS patients incurred by the Government.

- HIV/AIDS means the persons, infected with Human-Immuno-deficiency Virus, diagnosed and reported to the health personnel, with or without clinical symptoms of any stage of HIV infection (including AIDS).

- Provider in this study means the Government .

- In this study, prevention of HIV/AIDS means prevention of the spread of HIV infection from those who are already infected with HIV virus. It means that this study will focus only on the preventive measures concerning with HIV positive cases.

4.3 Projection Model Used

People prefer facts to projections, but facts exist only in the past. Planners are concerned with the future, where there are no facts, and so facts are no use to them unless they can project the observations towards the future. Extrapolation from the known towards the unknown always demands that we use a model: physical, mathematical, computer-simulation, or diagrammatic models.

In this study, Epimodel is used to project HIV/AIDS cases and deaths, and to predict the cost of HIV/AIDS for the next 5 years. A value of $p = 5$ is also used in this study since this $p = 5$ gamma distribution for HIV infection also provides the best empirical "fit" to the reported AIDS cases curves in Myanmar.

Justification for Choosing Epimodel

It is generally important to make maximum value of the models although modeling is still far from an exact science and disagreements exist between the modelers. Such models are vital to understanding the AIDS epidemic, planning for its socio-economic effects and proposing interventions that will reduce the numbers infected. In order to be of maximum value, the models should be readily accessible and easily understandable. Epimodel is such kind of model.

Epimodel is a simple model that can provide AIDS control programs with reasonable insight into likely trends and programs of

AIDS cases over the short term (3 to 5 years). It can also be used for longer periods than 3 to 5 years by assuming that annual HIV infection beyond the reference year will continue along the epidemic curve of HIV infection used in Epimodel.

With additional input of a population denominator, it can also calculate the annual incidence and prevalence rates for HIV infection.

The most significant feature of Epimodel is that it includes a costing module which can estimate and project detailed costs of AIDS based on the general HIV scenario constructed.

In this study the cost for the treatment, prevention and control incurred by the government is calculated. To calculate the cost, it is necessary to obtain the number of HIV and AIDS patients. For this, different HIV scenarios are constructed. Epimodel requires less data than SIMULAIDS and other complicated models. It needs only the estimated current number of HIV infections and to determine in what year the number of new infections peaked.

For the above-mentioned reasons, Epimodel (type II) is the most appropriate model for this study.

4 .4 Conceptual Framework

In this study, the necessary variables to be put in the Epimodel computer program are collected from sentinel surveillance reports and some ad-hoc survey reports.

According to the natural history of HIV/AIDS, there are basically 4 main interventions namely:

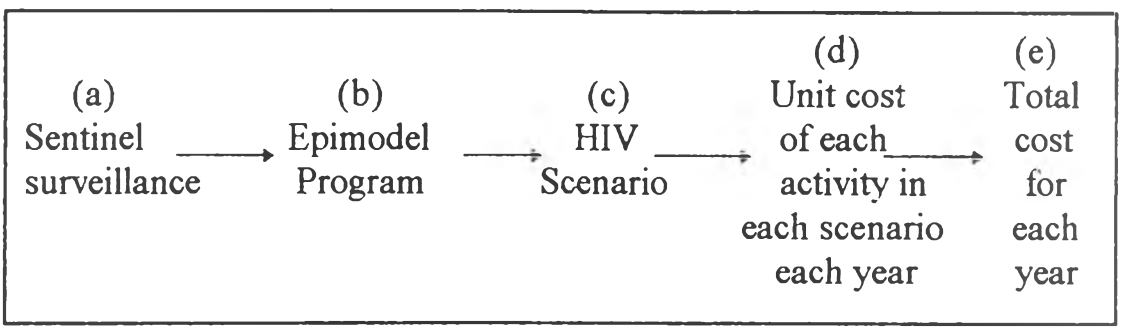
- Health promotion
- Specific protection
- Early diagnosis and prompt treatment
- Disability limitation

The activities in various interventions are interrelated. In general, the costs of blood testing, health education and counseling programs, training of health care personnel, distribution of condoms, and treatment are included in this study.

For each activity, all the possible cost items are identified and the unit cost for each cost item is calculated. Total cost for each activity for each scenario will be calculated by multiplying unit cost into total number of HIV/AIDS patients obtained from the Epimodel programming. In this way the total costs for the next 5 years are calculated.

Figure: 4.1

Conceptual Framework



(a) For the purpose of sentinel surveillance of HIV infection "Surveillance" has been defined as: the continued scrutiny of all aspects of occurrence and spread of disease that are pertinent to effective control (DOH, 1992). From the sentinel surveillance reports the necessary variables, to be put into the Epimodel program, can be estimated.

(b) Epimodel can construct different (baseline, medium and high intervention) scenarios of HIV, predict the number of HIV incidence and prevalence, annual new AIDS cases , cumulative AIDS cases and AIDS deaths.

(c) For each year and for each scenario different interventions and activities such as health education, counseling and medical examination, are identified. The unit of measurement in HIV scenarios is the number of cases.

(d) For each scenario (each year) the following interventions and activities are implemented according to the natural history of HIV infection.

(e) Total cost for each activity can be calculated by multiplying unit cost into total number of cases. By summing up all the total costs for each activity, the grand total for the prevention and treatment of HIV/AIDS will be obtained. Unit of measurement actually depends on the quantity of output to be measured. Cost items are identified according to the classification of costs by inputs. This issue is discussed later in detail.

Figure: 4.2

Interventions, Activities and Cost Items by Natural History of HIV

Natural history of HIV, (Stage of HIV)	Inter-ventions	Activities	Unit of measure-ment	Cost items	Source of data
Asymptomatic HIV	Health Promotion	Health education	Cost per case	Capital cost -building -equipment -vehicle	Records (secondary data)
	Specific protection	Counseling	Cost per case	Recurrent cost -personnel -supplies -vehicle (maintenance) -building (maintenance)	and
		Medical examination	Cost per case		Structured questionnaire (primary data)
		Condom distribution	Cost per case		
Symptomatic HIV	Early diagnosis and prompt treatment	Investigation	Cost per case	(For all activities)	
		Treatment	Cost per case		
	Disability limitation		Cost per in-patient day		
			Cost per OPD visit		

4.5 Cost Calculation:

In principle, total cost or the economic burden in this study will be the sum of all the provider costs. Cost, in this study, refers to the accounting cost including all the resources input for the specific activities of prevention and treatment of HIV/AIDS patients.

Based on all the costing methodologies mentioned in Chapter III, costing methodology is identified. In addition to this, cost analysis in PHC (Creese and Parker, 1994) methodology is also included in this study. In this study, cost calculation for hospital care is mainly based on hospital costing methodology (1) and cost analysis in PHC.

This methodology can be applied in every health centers and hospital in Myanmar as its budget system includes both capital and

recurrent. When the study is conducted in the future by using the same methodology, the real data can be plugged in the costing model and the real economic burden can be calculated.

In this study, the cost components for the treatment of HIV/AIDS patients and for the prevention of spread of HIV infection from the HIV positive persons are considered. Costs for the screening of HIV antibody and pre-screening counseling are also included.

4.5.1 Cost Components

In all activities both the routine capital and recurrent costs are included to be calculated. The followings are additional costs. (The quantity of each cost component should be counted to calculate the cost) (Figure 4.3).

(a) Pre-screening counseling

The guide books or instruction books for the counselor are included in the cost components in pre-screening. They should be distributed to every counseling area.

(b) Screening

Costs for the HIV antibody test (ELISA) in the screening and the costs of the confirmatory test (WESTERN BLOT) or second time ELISA for those HIV positive cases from routine screening tests, are also included in the cost components.

(c) Post-screening counseling

For this, pamphlets for the HIV positive persons and their family members are needed. It is important to make a counseling for those who are positive although they do not have any symptom.

(d) Medical examination, treatment and investigation

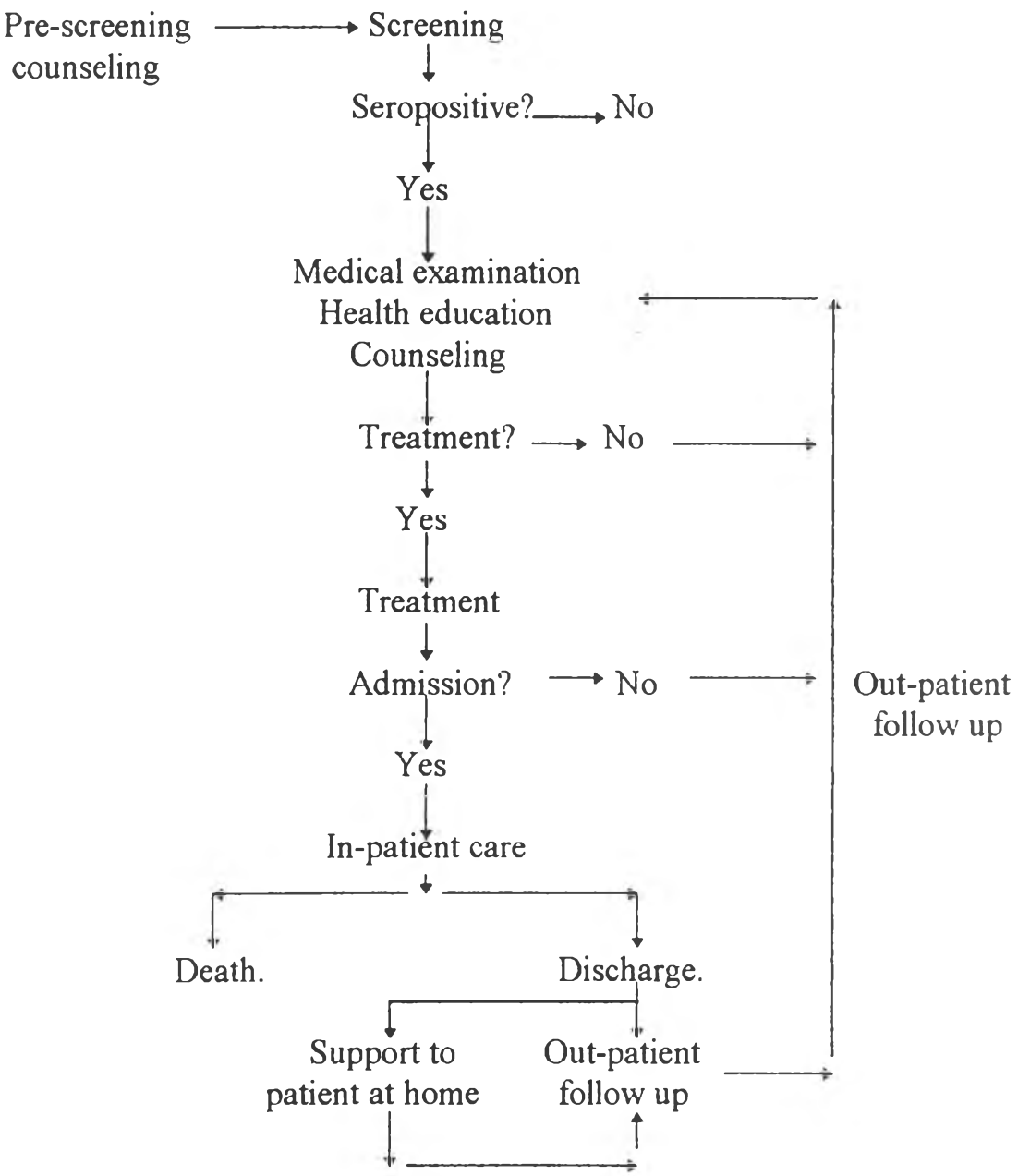
The components of the cost in these activities are building, equipment, personnel drugs and reagents. In addition to that, guide books for the doctors, nurses and other health care personnel who are dealing with HIV positive persons, are also required to be included in the cost components.

(e) Health education

Distribution of education material are to be made through health care institutions. The cost of these education material such as handouts, pamphlets, brochure, posters are included in the cost components.

Figure : 4.3

Cost Components of HIV/AIDS Incurred by the Government



(f) Condom distribution

In order to prevent the spread of HIV infection from those who have already been infected, condoms are to be distributed to HIV positive cases. The cost of condoms and instruction leaflets about condom utilization distributed to these persons are included in the cost components.

4.5.2 Detailed Methodology for Costing

Total provider cost can be calculated by summing up the total cost for treatment and the total cost for prevention.

TPC = TCT + TCP
TPC = Total Provider Cost
TCT = Total Cost for Treatment (Hospital Care Cost)
TCP = Total Cost for Prevention

(A) TCT = CCT + RCT
CCT = Capital Cost for Treatment
RCT = Recurrent Cost for Treatment

(A)1. CCT = CB + CE + CV
CB = Total Cost of Building (depreciated)
CE = Total Cost of Equipment (depreciated)
CV = Total Cost of Vehicle (depreciated)

(A)2. $CB = \sum_{i=1}^{n} (B_i \cdot PS)$

B = Cost of building (depreciated)
i = Number of building: i = 1,.....,n
PS = Proportion of space used for HIV/AIDS patients

(A)3. $CE = \sum_{p=1}^{n} (E_p \cdot PT)$
E = Cost of equipment (depreciated)
p = Number (item) of equipment used for HIV/AIDS patients
PT = Proportion of time used for HIV/AIDS patients

(A)4. $CV = \sum_{u=1}^{v} (V_u \cdot PT)$
V = Cost of vehicle (depreciated)
u = Number of vehicles used for HIV/AIDS patients

Based on the Government budget, the cost is calculated according to the cost classification by inputs i.e. Capital and Recurrent Costs. Recurrent costs can be divided into labor or personnel cost and material or non-personnel cost. These costs are calculated as follows:

(a) Calculation of labor cost

Firstly, in order to calculate the allocation of time spent by each health personnel for the care of HIV/AIDS patients, it should be started to collect the required information from each individual. Each and every personnel from the hospital should fill the forms and from these forms, percentage of time spent for the care by each person can be calculated (Table 4.1).

Table 4.1 : **Percentage of Time Spent by Each Person for HIV/AIDS**

Activities	8-9 am	9-10 am	10-11 am	11-12 am	etc.	Hours spent	% spent
Administration							
For HIV/AIDS in-patients							
For HIV/AIDS out-patients							
-------							
etc.							
Total						e.g. 8.00	100.00

Table 4.1 shows a structured questionnaire, which each and every health personnel in the institutes has to fill in according to his/her activities. This kind of form has to be filled daily for at least one week, and more than one week if necessary. After that, it will be assumed that average daily hours spent for HIV/AIDS patients will be the same for the whole year. From these forms, % or proportion of time spent by each health personnel for HIV/AIDS IP or OP can be known.

The next step is to calculate the total labor cost for HIV/AIDS patients. It can be calculated by multiplying total annual income of individual to proportion of time spent by each. From individual labor cost, total labor cost can be easily calculated by just summing all the individual labor costs (Table 4.2).

Table 4.2 shows the total annual income of each health personnel. These data can be obtained from the administrative office or records (secondary data) study. From these forms, total annual labor cost for all HIV/AIDS IP or OP can be calculated. Unit of measurement will be total annual cost per all HIV/AIDS IP or OP. Different unit costs can be calculated by using different outputs.

Table 4.2 : Total Labor Cost for HIV/AIDS

(1) Name of the person	(2) Annual salary	(3) Annual bonus	(4) Other fringe benefits	(5) Total annual income	(6) Proportion of time spent for HIV/AIDS in-patients (IP)	(7) Total labor cost for HIV/AIDS (IP) (5 × 6)	(8) Proportion of time spent for HIV/AIDS out-patients (OP)	(9) Total labor cost for HIV/AIDS (OP) (5 × 8)
Total								

From the above calculations, the following equations can be obtained.

Total labor cost for HIV/AIDS (IP) = $\sum_{i=1}^{n} [S_{ip}]$

where S = Total annual income of the health personnel

i = Health personnel; i = 1,....., n.

p = Proportion of time spent on HIV/AIDS (IP)

Total labor cost for HIV/AIDS (OP) = $\sum_{i=1}^{n} [S_{iu}]$

where i = Health personnel; i = 1,....., n.

u = Proportion of time spent on HIV/AIDS (OP)

(b) Calculation of material cost

Material cost inputs are allocated as the following. Weight or volume or number of units are used as units of measurement depending on the nature of material (See Tables 4.3, 4.4, and 4.5).

Table 4.3 : Percentage of Material Used for HIV/AIDS

Items or names of material	Weight or volume or units used for HIV/AIDS (IP)	Percentage or proportion of total weight or volume or units (for IP)	Weight or volume or units used for HIV/AIDS (OP)	Percentage or proportion of total weight or volume or units (for OP)	For other activities
1					
2					
3					
4					
.....etc.					
Total					

Table 4.3 shows the weight or volume or units of material used for HIV/AIDS IP or OP obtained from the records, and from these data % or proportion of total material can be calculated.

Table 4.4 : Total Cost of Material Used for HIV/AIDS (IP)

(1) Items or names of material	(2) Weight or volume or units used for HIV/AIDS (IP)	(3) Unit cost of the item	(4) Total cost of the item used for HIV/AIDS (IP) (2 × 3)	(5) Percentage / proportion of total weight or volume or units (for IP)	(6) Cost of total weight or volume or units	(7) Total cost of the item used for HIV/AIDS (IP) (5 × 6)
1						
2						
3						
4						
.....						
etc.						
Total						

Table 4.5 : Total Cost of Material Used for HIV/AIDS (OP)

(1) Items or names of material	(2) Weight or volume or units used for HIV/AIDS (OP)	(3) Unit cost of the item	(4) Total cost of the item used for HIV/AIDS (OP) (2 × 3)	(5) Percentage / proportion of total weight or volume or units (for OP)	(6) Cost of total weight or volume or units	(7) Total cost of the item used for HIV/AIDS (OP) (5 × 6)
1						
2						
3						
.....etc.						
.Total						

Tables 4.4 and 4.5 show the calculation of total material cost for HIV/AIDS respectively. Unit cost of each item of material can be obtained from the records or from the experts' opinions. Unit of measurement is total annual material cost for all HIV/AIDS IP or OP depending on the output to be measured. From these results other units can also be calculated without any difficulties.

From the above calculations, the following equations can be obtained.

Total material cost for HIV/AIDS (IP) = $\sum_{i=1}^{n} [M_{iy}]$
where M = Unit cost of material
i = Items of material; i = 1,....., n.
y = Quantities of material used for HIV/AIDS (IP)

Total material cost for HIV/AIDS (OP) = $\sum_{i=1}^{n} [M_{is}]$
where i = Items of material; i = 1,....., n.
s = Quantities of material used for HIV/AIDS (OP)

(c) Calculation of capital cost

For the capital cost calculation, a special procedure (annualization or depreciation) is required to estimate the annual costs. The general steps are described as follows (See Tables 4.6 - 4.11):

1. Estimate the current value of the capital item, i.e., the amount to be paid to purchase a similar item at the present time (i.e., the replacement value rather than original price). If it is necessary, expert judgment or opinion has to be taken.

2. Estimate the expected years of useful life of the capital item, after being received, expert judgment or opinion has to be taken from interviews with staff who use it if necessary.

3. Find out the discount rate used for the economic appraisals by the economic planning office or Ministry of Finance. If the inflation rate is higher than the interest rate, the World Bank discount rate of 10% should be used.

4. Derive the annualization factor by consulting the annualization tables to calculate the correct factor or by using the annualization formula (Reynolds, 1993).

Annualization formula: $a(r, n) = [r (1 + r)^n] \div [(1 + r)^n - 1]$
where a = annualization factor
r = discount rate
n = useful life or life time of asset for depreciation.

5. Calculate the annual cost by dividing the current value of the item by the annualization factor obtained from the table or by multiplying the current value of the item to the factor obtained from the annualization formula calculation.

Table 4.6 : Annual Depreciated Cost of Buildings

Building.	Current value	Useful life	Discount rate	Annualization factor	Annual cost
1					
2					
3					
.....					
etc.					

Table: 4.7 : Annual Cost of Building Used for HIV/AIDS

(1) Building	(2) Annual cost	(3) Proportion of space used for HIV/AIDS (IP)	(4) Annual cost of building for HIV/AIDS (IP) (2 × 3)	(5) Proportion of space used for HIV/AIDS (OP)	(6) Annual cost of building for HIV/AIDS (OP) (2 × 5)
1					
2					
.....					
etc.					
Total					

In table 4.7, proportion of space of the building, proportion of time of equipment usage and proportion of time or distance of vehicle usage for HIV/AIDS patients can be obtained from the records and if necessary, prospective study for (say) one month has to be carried out to get the estimated proportions to calculate the capital cost.

Table 4.8 : Annual Depreciated Cost of Equipment

Equipment.	Current value	Useful life	Discount rate	Annualization factor	Annual cost
1					
2					
3					
.....					
etc.					

Tables 4.6 to 4.11 show the calculation of capital cost. The cost of each item should be the current value. Current value and useful life can be obtained from the records or experts' opinions. Discount rate can be obtained from the Ministry of Finance or if necessary, the World Bank

discount rate of 10% can be used for convenience. Annualization factors for the respective useful life and discount rate can be obtained from the annualization table (Appendix 4).

Table 4.9 : Annual Cost of Equipment Used for HIV/AIDS

(1) Equipment	(2) Annual cost	(3) Proportion of time used for HIV/AIDS (IP)	(4) Annual cost of equipment for HIV/AIDS (IP) (2 × 3)	(5) Proportion of time used for HIV/AIDS (OP)	(6) Annual cost of equipment for HIV/AIDS (OP) (2 × 5)
1					
2					
.....					
etc.					
Total					

Table 4.10 : Annual Depreciated Cost of Vehicles

Vehicle	Current value	Useful life	Discount rate	Annualization factor	Annual cost
1					
2					
3					
.....					
etc.					

Table 4.11 : Annual Cost of Vehicles Used for HIV/AIDS

(1) Vehicle	(2) Annual cost	(3) Proportion of time used for HIV/AIDS (IP)	(4) Annual cost of vehicle for HIV/AIDS (IP) (2 × 3)	(5) Proportion of time used for HIV/AIDS (OP)	(6) Annual cost of vehicle for HIV/AIDS (OP) (2 × 5)
1					
2					
.....					
etc.					
Total					

From the above calculations, the following equations can be obtained.

Total building cost for HIV/AIDS (IP) = $\sum_{i=1}^{n} [B_{i} a]$

where B = Annual cost of building

i = Number of buildings = 1,....., n.

a = Proportion of space used for HIV/AIDS (IP)

Total building cost for HIV/AIDS (OP) = $\sum_{i=1}^{n} [B_{ic}]$
where i = Number of buildings ; i = 1,....., n.
c = Proportion of space used used for HIV/AIDS (OP)

Total equipment cost for HIV/AIDS (IP) = $\sum_{i=1}^{n} [E_{ie}]$
where E = Annual cost of equipment
i = Number of equipment; i = 1,....., n.
e = Proportion of time used for HIV/AIDS (IP)

Total equipment cost for HIV/AIDS (OP) = $\sum_{i=1}^{n} [E_{ij}]$
where i = Number of equipment ; i = 1,....., n.
j = Proportion time used used for HIV/AIDS (OP)

Total vehicle cost for HIV/AIDS (IP) = $\sum_{i=1}^{n} [V_{ig}]$
where V = Annual cost of vehicle
i = Number of vehicle; i = 1,....., n.
g = Proportion of time used for HIV/AIDS (IP)

Total vehicle cost for HIV/AIDS (OP) = $\sum_{i=1}^{n} [V_{im}]$
where i = Number of vehicle ; i = 1,....., n.
m = Proportion time used used for HIV/AIDS (OP)

Routine service cost for IP and OP is calculated as follows, and since there is no user charge system in the studied hospital, indirect costs from NRPCC AND RPCC are not calculated in this study.

Routine Service = Labor + Material + Capital Depreciated
Cost Cost Cost Cost

RSC = LC + MC + CC

Cost for the prevention of HIV/AIDS is calculated as follows.

TCP = CCP + RCP
CCP = Capital Cost for Prevention
RCP = Recurrent Cost for Prevention

CCP = CB + CE + CV (Calculation is the same as CCT)

$RCP = CS_c + CC_s + CH_e + CC_d$

CS_c = Cost of Screening
CC_s = Cost of Counseling
CH_e = Cost of Health Education
CC_d = Cost of Condom Distribution

1. $CS_c = \sum_{i=1}^{n} (\sum_{e=1}^{f} S_{c\,ie} .Un)$
   S_c = Screening test
   i = Type of screening tests: i = 1,.....,n

   e = Number of tests: e = 1,.....,f
   Un = Unit cost per screening test

2. $CC_s = \sum_{i=1}^{n} (\sum_{l=1}^{m} MC_{s\,il} . Un)$
   MC_s = Material used in counseling
   i = Items of material used in counseling: i = 1, ...,n
   l = Number of material used in counseling: l =1,.....,m
   Un = Unit cost of material used in counseling

3. $CH_e = \sum_{i=1}^{n} (\sum_{c=1}^{d} MH_{e\,ic} . Un)$
   MH_e = Material used in health education
   i = Items of material used in health education: i = 1, ...,n
   c = Number of material in each item: c = 1,.....,d
   Un = Unit cost of material used in health education

4. $Cd = \sum_{i=1}^{n} (\sum_{g=1}^{h} C_{d\,ig} . Un)$
   C_d = Condom distributed to HIV positive persons
   i = Items of condoms used: i = 1, ...,n
   g = Number of condoms distributed: g = 1,.....,h
   Un = Unit cost per condom

Unit of measurement in this hospital costing and prevention is total annual cost. Unit cost will depend on the quantity of output to be measured. Unit cost can be unit cost per OP/IP case, per OPD visit, per admission, per in-patient day and so on.