CHAPTER 4

RESEARCH METHODOLOGY

4.1 Study Design

This study is a methodological study in which how to calculate the costs for each case finding activity, how to determine early case and how to examine cost saved for early case detection will be explored . It is a retrospective analytic study and secondary data from the Leprosy Control Program of Myanmar(1992) and some hypothetical data are used to present the general feature of the program.

4.1.1 Study Area

There are 14 States and Divisions(S/D) in Myanmar and these are divided into three groups according to registered prevalence. Numbers of States and Divisions and registered prevalence are shown in Table 4.1.

The map of Myanmar showing leprosy registered prevalence rate per 10,000 population by States and Divisions is shown in 4.1.

Table 4.1: Different Endemic Areas of Myanmar

Area	No. of S/D	Registered Prevalence
Low endemic area	4	1-<10 / 10,000
Middle endemic area	6	>10-20 / 10,000
High endemic area	4	>20 / 10,000

Source: LCP Annual Report, 1992

In this study, one State or Division was selected from each endemic area and these States or Divisions are acting as the study area.

Figure 4.1: Map of Myanmar Showing Leprosy Registered
Prevalence Rate Per 10,000 Population by
States and Divisions
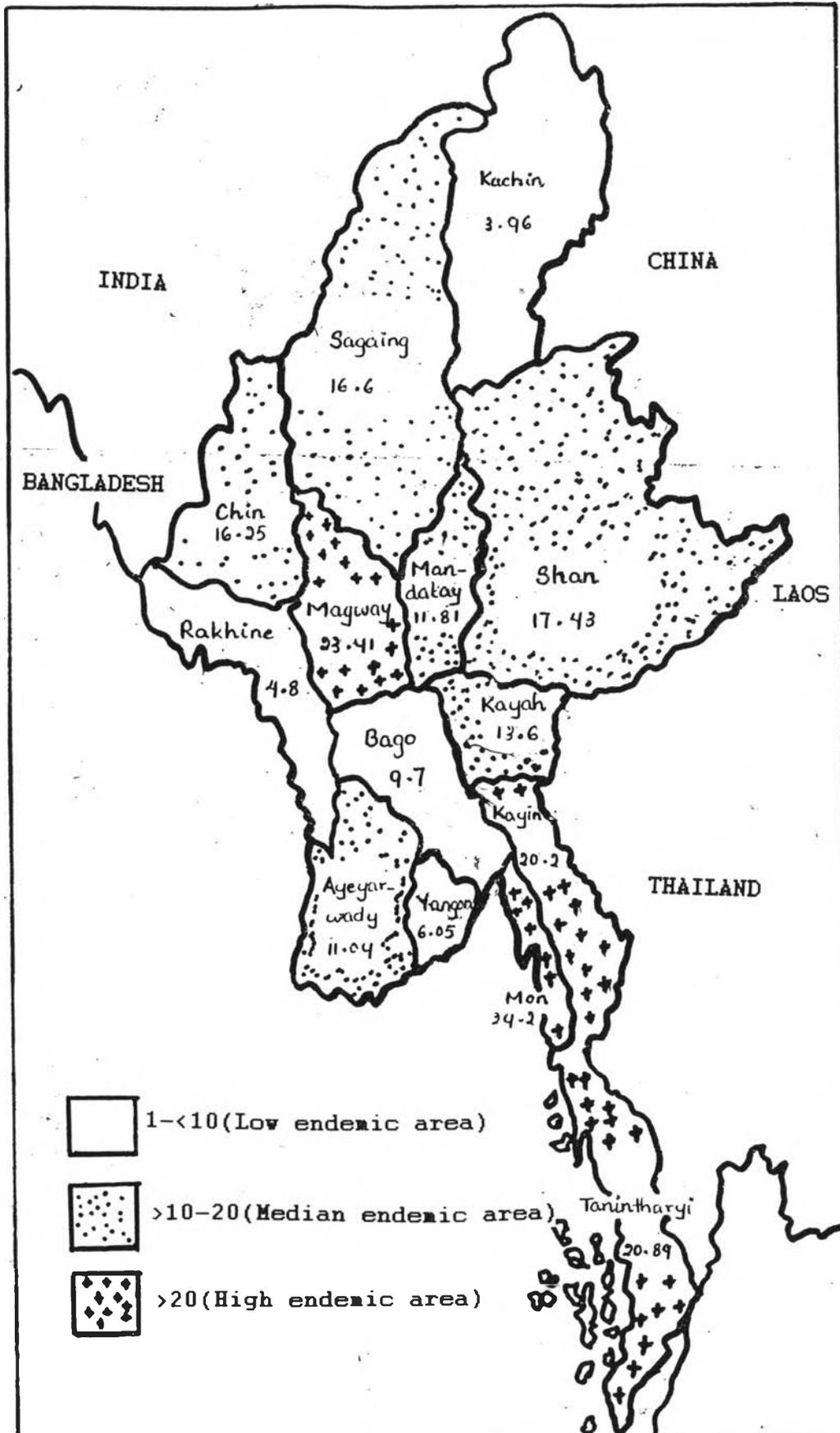
Source: Annual Report, Leprosy Control Program(Myanmar), 1992

4.1.2. Study Population

The registered patients in selected States and Divisions are acting as study population for patient perspective.

Inclusion Criteria: Newly detected leprosy patients who registered in the selected States and Divisions.

Exclusion Criteria: A patient who had a past history of leprosy will not included in this study. (i.e. relapse case)

All the health personnel including Basic Health Staff and leprosy control personnel in selected States and Divisions are acting as the study population from the provider perspective.

4.1.3. Sampling Technique

Although this is a methodological study, an empirical study will be carried out when feasible and this will call for sampling. Selection of patients and health personnel will then be done by following sampling methods.
(1) Stratified sampling of the whole country according to the level of endemicity.
(2) Simple random sampling for selection of township as a sampling unit from each stratified region.

All the detected new cases and all the health personnel in selected townships for one year study period will be used for evaluation of costs and benefits for patients as well as provider.

For this study, we select Yangon Division as low endemic area, Mandalay Division as median endemic area and Magway Division as high endemic area. The population, new case detection and number of townships in each States and Divisions are shown in Table 4.2.

Table 4.2: Population, New Case Detection and Number of Townships in Each States and Divisions

Items	States and Divisions		
	Yangon	Mandalay	Magway
Population	4825,918	5576,329	3896,254
New Case Detection	922	1,667	2,729
No. of Townships	43	29	25

Source: Leprosy Control Program, Annual Report, 1992

4.1.4 Study Variables

The variables used in this study are shown in Table 4.3.

Table 4.3: Variables Used in the Study

Variable	Definition of Variable	Unit	Source
1. Calculation of Cost			
- TC_{pr}	- Total costs which is a summation of all costs items incurred by provider side for doing CFA	Kyats per year	S°data and Calcu: lation
- $TC_{pr.ACD}$	- Total costs incurred by provider for doing ACD acitvities	Kyats per year	S°data and Calcu: lation
- $TC_{p.ACD}$	- Total personnel costs for doing ACD activities	Kyats per year	S°data and Calcu: lation

Variable	Definition of Variable	Unit	Source
$-\ TC_{M.ACD}$	– Total material costs for doing ACD activities which contain costs of glass slide, reagent, sterile knife, paper and pens	Kyats per year	S'data and Calcu: tion
$-\ TC_{STT}$	– Total costs for short term training including perdiem costs, traveling allowance and costs for training materials	Kyats per year	S'data and Calcu: tion
$-\ TC_{pr.PCD}$	– Total costs incurred by provider for doing PCD acitvities	Kyats per year	S'data and Calcu: lation
$-\ TC_{p.PCD}$	– Total personnel costs for doing PCD activities	Kyats per year	S'data and Calcu:
$-\ TC_{M.PCD}$	– Total material costs for doing PCD activities which contain costs of glass slide, reagent, sterile knife, paper and pens	Kyats per year	S'data and Calcu: lation
$-\ TC_{STT}$	– Total costs for short term training including perdiem costs, traveling allowance and costs for training materials	Kyats per year	S'data and Calcu: lation
$-\ TC_{SM}$	– Total operating costs for social mobilization activity which contains costs for transporting educational materials and costs for providing health education	Kyats per year	S'data and Calcu: lation

Variable	Definition of Variable	Unit	Source
$-$ TC_{pt}	$-$ Total costs in which summation of all cost items incurred by patient side for diagnosis of leprosy	Kyats per year	P·data and Calcu: lation
$-$ $TC_{pt.ACD}$	$-$ Total costs incurred by patients for diagnosing leprosy by ACD method	Kyats per year	P·data and Calcu: lation
$-$ $TC_{ti.ACD}$	$-$ Total time costs for patients which means absence of work for seeking diagnosis of leprosy by ACD method	Kyats per year	P·data and Calcu: lation
$-$ $TC_{pt.PCD}$	$-$ Total costs incurred by patients for diagnosing leprosy by PCD method	Kyats per year	P·data and Calcu: lation
$-$ $TC_{ti.pt}$	$-$ Total time costs for patients which means absence of work for seeking diagnosis of leprosy by PCD method	Kyats per year	P·data and Calcu: lation
$-$ $TC_{ti.re}$	$-$ Total time costs for relatives which means absence of work for accompanying with patients who need to diagnose leprosy	Kyats per year	P·data and Calcu: lation

Variable	Definition of Variable	Unit	Source
$- TC_{tr,pt}$	– Total transportation costs for patients who need to seek for diagnosis of leprosy	Kyats per year	P°data and Calcu: lation
$- TC_{tr,re}$	– Total transportation costs for relatives who are accompanying with patients who need to seek for diagnosis of leprosy	Kyats per year	P°data and Calcu: lation

2. Identification of Early Case

• N_E	–Number of early case means a new case of leprosy without visible deformity detected within a year of 1992	Number	Hypothe: tical data

3. Calculation of Cost savings for Early Case Detection

• C_S	–Cost savings mean that because of early case detection, these patients are not disabled and so costs can be saved from provider side for rehabilitating those people and costs can also be saved from patient side for no loss of productivity	Monetary unit/year	Hypothe: tical data and calcu: lation

4.2 Conceptual Framework

This study is carried out by methodological approach. In this study cost and benefit of two different methods of case finding activities (Active case detection and Passive case detection) in three different endemic areas of the country for the year 1992 are analyzed. The decision maker can decide which method of case finding activity should be emphasized in which area.

Costs for each method of case finding activity can be evaluated from both provider side and patient side. Benefits are expressed as cost savings for early case detection. If the cases are detected in early stage and given effective treatment, these cases will not go to further stage. Therefore, cost will be saved from the program side for rehabilitation for these early detected cases because these cases do not need to be rehabilitated and costs will also be saved from the patient side because they are detected in early stage and so they are not disabled at all. And then, from these cost and benefit figures benefit cost ratios can be determined from provider perspective and patient perspective.

In this study, costs and benefits are to be determined in three different scenarios. 'Do nothing' is a base line scenario, in which the project is evaluated in its exiting situation which is including ACD and PCD. The other two scenarios are the ACD alone scenario and the PCD alone scenario in which if the program conduct only ACD or PCD activity, what will be costs and benefits are found out. The benefit cost ratios are expressed as above, three scenarios for each low, median and high endemic areas. The diagram for Conceptual Framework for this study is shown in Figure 4.1.

The main assumptions in this study are -
(1) The benefit cost ratios are determined from three scenarios in this study. In base line scenario, the project is evaluated in existing situation(i.e. case finding activities are done by ACD and PCD). In ACD alone or in PCD alone scenario, we assumed that if the program conduct case finding activities only by ACD or PCD in the year of 1992.

Figure 4.2: Conceptual Framework for Cost Benefit Analysis of
Case Finding Activities for Leprosy Control Program
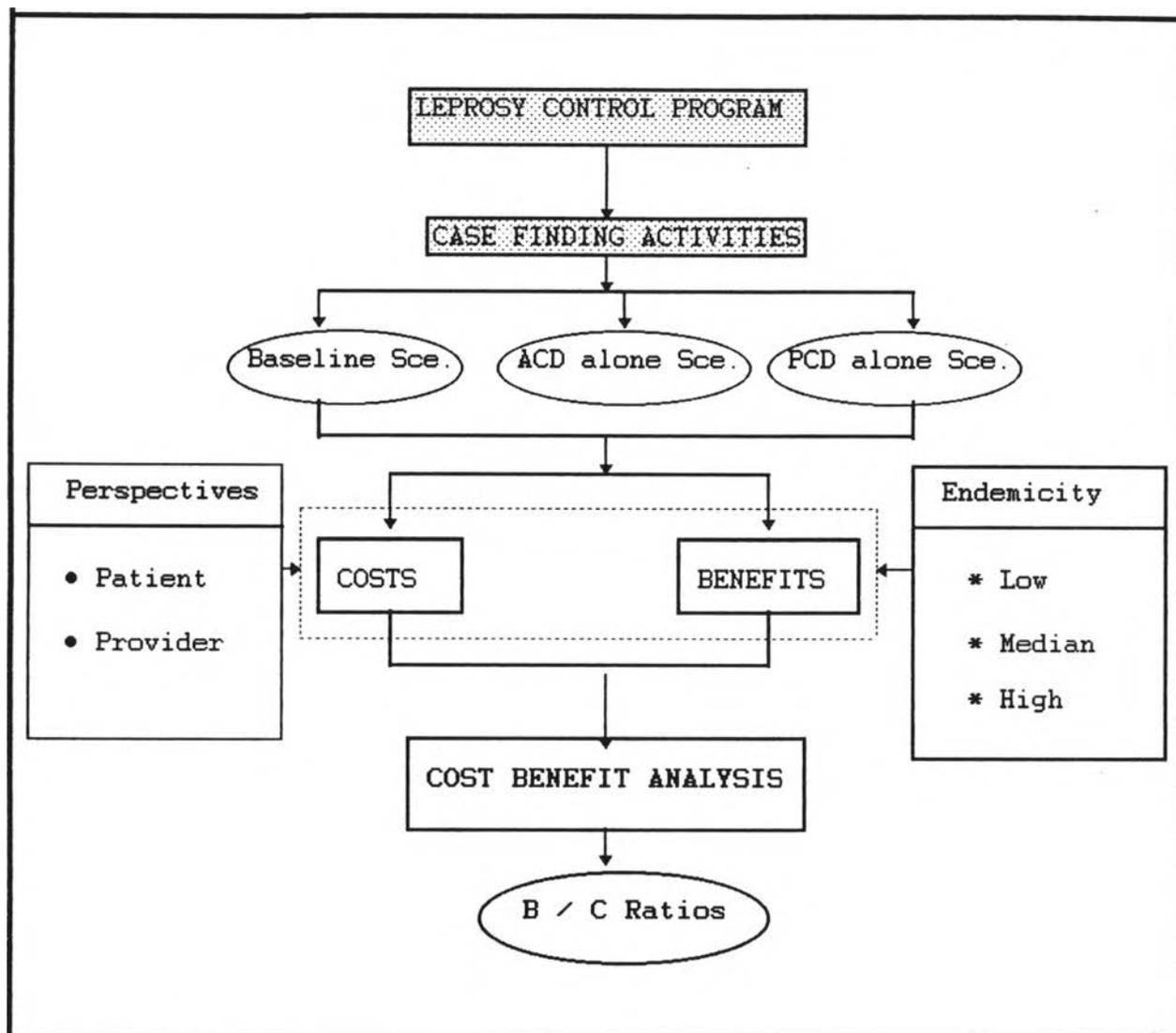
(2) In this study, the benefits are shown as cost savings for
early case detection. Therefore we need to know number of early
cases detected by ACD and PCD. There is no secondary data for
early case detection and so we assumed 16% of newly detected
cases are late case according to the study of Myint, Htoon and
Shwe, 1992. In general ACD can detect more early cases than PCD.
Therefore the second assumption for benefit calculation is 'ACD
can detect 95% of all new cases detection as the early cases'.

In this study hypothesis is made by following.
'In high endemic area ACD might be better than PCD because many cases stay in that area but in low endemic area PCD might be better than ACD because few cases stay in that area and by doing ACD is more costly'.

4.3 Operational Definition

Cost: Cost is defined as the value of resources used to produce something, including a specific health service or a set of services.

Cost Benefit Analysis(CBA): CBA estimates the value of resources used by each program compared with the value of resources the program might save or create(CAN MED ASSOC J. 130:1431, 1984).

Active Case Detection(ACD): It is the one of the methods of case finding activity in which cases are detected by health personnel. It includes mass survey, contact examination and school children examination.

A Contact: A contact is defined as an individual living under the same roof with a leprosy patient who is taking treatment.

Passive Case Detection(PCD): In PCD, the patients are encouraged through health education and opening the clinic to seek diagnosis at the out-patient clinics and specialized clinics both in urban as well as in rural areas.

A Case: A case is a person showing clinical signs of leprosy with or without bacteriological confirmation of diagnosis, requiring chemotherapy.

A New Case: It is a case of leprosy detected in a given time period, who had not been diagnosed and treated as having leprosy before.

Early Case: It is a case of leprosy without visible deformity.

Disabled(Late Case): Leprosy case or discharged case with grade two deformity which appears as visible distortion to limbs and/or severe visual impairment and causes social stigma which affect the ability to earn an income.

Provider's Costs: Costs incurred by the leprosy control program for case detection.

Patient's Costs: Costs incurred by the patient for seeking diagnosis of leprosy.
    − Direct Costs: Costs incurred by patient for
                diagnosis of leprosy.
    − Indirect Costs: Costs incurred by relatives
                accompanying the patient for
                diagnosis of leprosy.

Benefit: In this study, benefit in terms of cost saved for early case detection by each method of case finding activity.

4.4 Data Collection and Analysis

4.4.1 Calculation for Costs

    In this study, costs for case finding activity will be calculated by both provider(supplier) and patient(consumer) perspectives.

    All the cost items for provider perspective is shown in Table 4.4. Total costs for doing ACD from provider perspective are the same as those costs for PCD except in ACD there are no extra social mobilization costs.

    The methodology for calculation of capital costs are explained only for the empirical study. In this study we can only consider the recurrent costs because of time constraints in preparing thesis and the limitation of available data.

Table 4.4: Total Costs for Provider Perspective

Cost Items	Unit of measurement	Source of Data (see appendix 1)
Capital		
- Building	Kyats / year	Secondary Data(P I A)
- Equipment	Kyats / year	Secondary Data(P I B)
- Vehicle	Kyats / year	Secondary Data(P I C)
- Long-Term Training	Kyats / year	Secondary Data(P I D)
- Social Mobilization	Kyats / year	Secondary Data(P I E)
Recurrent		
- Personnel	Kyats / year	Secondary Data(P II)
- Material Supply	Kyats / year	Secondary Data(P III)
- Short-Term Training	Kyats / year	Secondary Data(P IV)
- Social Mobilization (Operational Costs)	Kyats / year	Secondary Data(P V)

Source: Adapted from Creese and Parker(1994)
Note: P = Part I to V seen in Appendix 1

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:
- 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).
- Estimates 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 if necessary.
- Find out the discount rate used for the economic appraisals by the economic planning office or Ministry of Finance. As the inflation rate is higher than interest rate, World Bank discount rate of 10% should be used.
- Derive the annuallization factor by consulting the annualization tables to calculate the correct factor or by using the annualization formula.

Annualization formula: $a(r,n) = [r(1 + r)^n] / [(1+r)^n - 1]$

where a = annualization factor

r = discount rate

n = useful life or life time of asset for depreciation

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

Total Building Costs for OPD

$$= \sum_{i=1}^{n} [B_{ia}]$$

for diagnosis of leprosy

Where   B = Annual costs of building

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

a = Proportion of space used for OPD

Total Equipment Costs for CFA

$$= \sum_{i=1}^{n} [E_{ie}]$$

for diagnosis of leprosy

Where   E = Annual costs of equipment

i = Number of equipment; i=1,......,n.

e = Proportion of time used for CFA

Total Vehicle Costs for CFA

$$= \sum_{i=1}^{n} [V_{im}]$$

for diagnosis of leprosy

Where   V = Annual costs of vehicle

i = Number of vehicle; i=1,......,n.

m = Proportion of time used for CFA

(1) Calculation for Personnel Costs

Firstly, in order to calculate the allocation of time spent by health personnel for detection of leprosy cases according to different methods of case finding activity, all health personnel from selected townships should fill the forms for the empirical study which will be conducted in the future. In this study, only the hypothetical situation will be considered. The percentage of time spent by each person according to different case finding activity can be calculated from Table 4.5.

The next step is to calculate the total personnel cost for each method of case finding activity. It can be calculated by multiplying the total annual income of individual health personnel by the proportion of time spent by each method of case finding activity. From individual personnel cost, total personnel cost can be easily calculated by just summing all the individual personnel costs(Table 4.6).

Table 4.5: Percentage of Time Spent by Each Person

Activities	8-9 am	9-10 am	10-11 am	etc.	Hours spent	% spent

ACD
  -CE
  -SE
  -MS						

Total						

PCD
  -open
    clinic						

Total						

Note: The sources of data are seen in Appendix 1.

Table 4.6: Total Personnel Costs for Case Finding Activities

(1) Name of the person	(2) Annual salary	(3) Other fringe benefits	(4) Total annual income	(5) Proport ion of time s p e n t for d o i n g ACD	(6) Total personnel cost for doing ACD $(4*5)$	(7) Proporti on of time s p e n t for d o i n g PCD	(8) Total personnel cost for doing PCD $(4*7)$
Total							

Note: The sources of data are seen in Appendix 1.

Table 4.6 shows the total annual income of each health personnel. The data can be obtained from the records of LCP (secondary data). From these forms, the total annual personnel cost for each method of case finding activity can be calculated.

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

Total personnel cost for doing ACD

$$TC_{P.ACD} = \sum_{i=1}^{n} [\sum_{p=1}^{q} S_{ip}] \text{---------------------- (1)}$$

Where S = Total annual income of health
             personnel
       i = Health personnel; i=1,............,n.
       p = Proportion of time spent on doing
          ACD; p = 1,.........,q.

Total personnel cost for doing PCD

$$TC_{P.PCD} = \sum_{i=1}^{n} [\sum_{u=1}^{v} S_{iu}] \text{-------------------- (2)}$$

Where S = Total annual income of
             health personnel
       i = Health personnel; i=1,............,n.
       u = Proportion of time spent on doing
          PCD; u = 1,.........,v.

(2) Calculation of Total Material Costs(TC$_M$)

Material costs can be calculated by multiplying unit cost for each material into number of these material used for each method of case finding activity within one year. Calculation for this cost item is shown in Table 4.7.

From this calculation the following equation will be obtained.

Total material cost for doing ACD

$$TC_{M.ACD} = \sum_{i=1}^{n} [M . N_A] \text{---------------------- (3)}$$

Where M = Unit cost of material
      N$_A$ = No. of material used for doing ACD
      i = Items of material; i=1,........,n.

Table 4.7: Calculation for Total Material costs

(1) Items of material	(2) Unit cost	(3) No. of material used for ACD	(4) Cost of material used for ACD (2*3)	(5) No. of material used for PCD	(6) Cost of material used for PCD (2*5)
1. Glass slide					
2. Reagent					
3. S. knife					
4. Paper & Pens					
Total					

Note: The sources of data are seen in Appendix 1.

Total material cost for doing PCD

$$TC_{M.PCD} = \sum_{i-1}^{n} [M . N_P] \text{---------------------------(4)}$$

Where M = Unit cost of material

   N_P = No. of material used for doing PCD

   i = Items of material; i=1,.........,n.

(3) Calculation of Short Term Training(TC$_{STT}$)

The costs of short term training can be calculated by summation of following items.

   (1) Perdiem * No. of days for training

   (2) Costs for training materials

   (3) Traveling allowance of participants

The equation for calculation of short term training is as follows:

$$TC_{STT} = \sum_{i-1}^{n} [C_p + C_{TM} + C_{TA}] \text{------------------- (5)}$$

Where C_p = Costs for perdiem

   C_{TM} = Costs for training material

   C_{TA} = Costs for traveling allowance

   i = No. of short term training

      within one year; i=1,.........,n.

This cost item is belongs to ACD as well as PCD because health personnel need to attend refresher course for case detection.

(4) Calculation of Costs for Social Mobilization(TC_{SM})

It is calculated by summation of operation costs for social mobilization activity within one year. In this item, operation costs for social mobilization contained costs for transporting educational material(pamphlets and posters) and cost for providing health education by leprosy control personnel.

The equation of total cost for social mobilization is following.

$$TC_{SM} = \sum_{i=1}^{n} [C_{SM}] \text{ ---------------------- (6)}$$

$$\text{Where } C_{SM} = \text{Costs for social mobilization}$$
$$i = \text{No. of township in selected}$$
$$\text{States \& Divisions; } i=1,\ldots\ldots,n.$$

This cost item mainly belongs to PCD because in PCD, the patients are encouraged through health education which is the activity of social mobilization.

(5) Total Provider Costs for Each Method of Case Finding Activities

Total costs for each method of case finding activities can be calculated from summation of above equations.

Total Provider Costs for Doing ACD($TC_{pr.ACD}$)
(Equation 1 + 3 + 5)

$$TC_{pr.ACD} = TC_{p.ACD} + TC_{M.ACD} + TC_{STT} \text{ ------------------- (7)}$$
$$TC_{pr.ACD} = \text{Total provider cost for doing ACD}$$
$$TC_{p.ACD} = \text{Total personnel cost for doing ACD}$$
$$TC_{M.ACD} = \text{Total material cost for doing ACD}$$
$$TC_{STT} = \text{Total cost for short term training}$$

Total Provider Costs for Doing PCD($TC_{pr.PCD}$)
(Equation 2 + 4 + 5 + 6)

$$TC_{pr.PCD} = TC_{p.PCD} + TC_{M.PCD} + TC_{STT} + TC_{SM} \text{ ------------- (8)}$$

$TC_{pr.PCD}$ = Total provider cost for doing PCD

$TC_{p.PCD}$ = Total personnel cost for doing PCD

$TC_{M.PCD}$ = Total material cost for doing PCD

TC_{STT} = Total cost for short term training

TC_{SM} = Total cost for social mobilization (operation cost)

Total provider costs for doing ACD and PCD can be found out from equation 7 and 8 respectively.

In empirical study, the total provider costs will be calculated from the data according to the check list for determining the provider costs(seen in Appendix 1).

(6) Unit Cost of Provider Side for Each Method of Case Finding Activities

A unit cost is a kind of simple average: cost per unit output.

Average Provider Cost for Doing ACD($AC_{pr.ACD}$)

$$AC_{pr.ACD} = \frac{TC_{pr.ACD}}{N_{ACD}} \text{ ------------------------ (9)}$$

$AC_{pr.ACD}$ = Average provider cost for doing ACD

$TC_{pr.ACD}$ = Total provider cost for doing ACD

N_{ACD} = Number of case detected by ACD

Average Provider Cost for Doing PCD($AC_{pr.PCD}$)

$$AC_{pr.PCD} = \frac{TC_{pr.PCD}}{N_{PCD}} \text{ ------------------------ (10)}$$

$AC_{pr.PCD}$ = Average provider cost for doing PCD

$TC_{pr.PCD}$ = Total provider cost for doing PCD

N_{PCD} = Number of case detected by PCD

Costs for the patient perspective are as follow. In this study direct cost means cost incurred by patient for diagnosis of leprosy and indirect cost means cost incurred by relatives accompanying the patient for diagnosis of leprosy.

Total costs for patients who were detected by PCD method is shown in Table 4.8.

Table 4.8: Total Costs for Patient Side
       (detected by PCD method)

Category	Unit of measurement	Source of Data
●Direct Cost		(see Appendix 2)
o Explicit — Traveling cost(Pt)	Kyats/year	Primary data Q II.1
— Food cost(Pt)	Kyats/year	Primary data Q II.3
o Implicit — Time cost(Pt)	Kyats/year	Primary data Q II.4
●Indirect Cost		
o Explicit — Traveling cost(Re)	Kyats/year	Primary data Q II.7
— Food cost(Re)	Kyats/year	Primary data Q II.8
o Implicit — Time cost(Re)	Kyats/year	Primary data Q II.9

Source: Adapted from Kaewsonthi, 1995
Note: Q = Question No. seen in Appendix 2

For calculation of costs for patient side who were detected by ACD method is same classification with PCD method but in ACD patient didn't need to go to health center and so there is no traveling costs for patients. And in ACD method there is no need to accompany the relative and so there is no indirect costs.

In the empirical study, the total costs for patient perspective will be determined from the primary data by using questionnaire for patient interview(seen in Appendix 2).

(7) Direct Costs

(a) Estimation of Traveling Costs of Patients

In this study, traveling costs of patient will be just estimated. But in empirical study in the future, this data will be a primary data. This cost item is considered only in PCD because the patient does not need to go to health center in ACD.

$$TC_{tr.pt} = \sum_{i=1}^{n} (C_{tr.pt}) \; \text{------------------------} \; (11)$$

$TC_{tr.pt}$ = Total traveling cost for patient

$C_{tr.pt}$ = Traveling cost for patient

i = Number of patient; i=1,.........,n.

(b) Food Costs of Patients

Food costs of patient can not consider in this study because of no available primary data in time.

(c) Time Costs for Patient(Absence from Work)

This cost item will be estimated from average wage of the patients. But in empirical study, this cost item will be collected as primary data.

$$TC_{ti.pt} = \sum_{i=1}^{n} (C_{ti.pt}) \; \text{--------------------------} \; (12)$$

$TC_{ti.pt}$ = Total time cost for patient

$C_{ti.pt}$ = Time cost for patient

i = Number of patient; i=1,.........,n.

(8) Indirect Costs

(a) Estimation of Traveling Costs of Relatives

In this study we assume that only one relative accompanied for each patient and this cost is same with each patient. But in the empirical study this cost item will also be primary data.

$$TC_{tr.re} = \sum_{i=1}^{n} (C_{tr.re}) \; \text{-------------------------} \; (13)$$

$TC_{tr.re}$ = Total traveling costs for relative

$C_{tr.re}$ = Traveling costs for relative

i = Number of patient; i=1,.......n

(b) Time Cost for Patient(Absence from Work)

In this study we assume that only one relative accompanied each patient and this cost is same with each patient. But in the empirical study this cost item will also be primary data.

$$TC_{ti.re} = \sum_{i=1}^{n} (C_{ti.re}) \quad \text{------------------------------} \quad (14)$$

$TC_{ti.re}$ = Total time cost for relative
$C_{ti.re}$ = Time cost for relative
$\quad$ i = Number of patient; i=1,.........,n.

(9) Total Patient Costs for Each Method of Case Finding Activities

Total patient cost for each method of case finding activity can be calculated from summation of the above equations.

Total Costs for ACD(from Patient Side)
$\quad$ (Equation 12)

$$TC_{pt.ACD} = TC_{ti.pt} \quad \text{------------------------------} \quad (15)$$

$TC_{pt.ACD}$ = Total cost for ACD(from patient side)
$TC_{ti.pt}$ = Total time cost for patient

Total Cost for PCD(from Patient Side)
$\quad$ (Equation 11 + 12 + 13 + 14)

$$TC_{pt.PCD} = TC_{tr.pt} + Tc_{ti,pt} + TC_{tr.re} + TC_{ti,re} \quad \text{----------------} \quad (16)$$

$TC_{pt.PCD}$ = Total cost for PCD(from patient side)
$TC_{tr.pt}$ = Total traveling cost for patient
$TC_{ti.pt}$ = Total time cost for patient
$TC_{tr.re}$ = Total traveling cost for relative
$TC_{ti.re}$ = Total time cost for relative

(10) Unit Cost of Patient Side for Each Method of Case Finding Activities

Average Patient Cost for ACD($AC_{pt.ACD}$)

$$AC_{pt.ACD} = \frac{TC_{pt.ACD}}{N_{ACD}} \quad \text{--------------------} \quad 17$$

$AC_{pt.ACD}$ = Average patient cost for ACD
$TC_{pt.ACD}$ = Total patient cost for ACD
N_{ACD} = Number of patient detected by ACD

Average Patient Cost for PCD($AC_{pt.PCD}$)

$$AC_{pt.PCD} = \frac{TC_{pt.PCD}}{N_{PCD}} \qquad \text{------------} \quad 18$$

$AC_{pt.PCD}$ = Average patient cost for PCD

$TC_{pt.PCD}$ = Total patient cost for PCD

N_{PCD} = Number of patient detected by PCD

4.4.2. Estimation of Benefits

Benefit of this study is in terms of ''cost savings by early case detection''. Therefore, the number of early cases detected by each method of case finding activity is considered first. It will be measured by classifying the new cases according to the grading of disability. According to WHO classification for disability there are three grades (0,1 and 2) by seeing hands and feet and Eyes of the Leprosy patient. The disability grading for leprosy are shown in Table 4.9.

Table 4.9: Disability Grading for Leprosy

Case	Grade	Hands and Feet	Eyes
E A	0	—no anesthesia —no visible deformity	—no eye problem —no visual loss
R L Y	1	—anesthesia present —no visible deformity	—eye problem present —vision not severely affected
LATE	2	—visible deformity present	—severe visual impairment

Source: WHO, Technical Report Series, 1988

By using this grading system, all the newly detected cases are defined as, early cases (i.e. grade 0 and 1) and late cases (i.e. grade 2).

Cost saved by early case detection determined from provider side as well as patient side. In that case, assume that these early case detected are equal to disability prevented

because if these cases can not detect in early stage, these cases will become disabled in later.

(1) Cost Saved by Early Case Detection(Provider Side)

Cost savings for early case detection from the provider perspective is determined as cost savings for rehabilitation for those early cases. There are many rehabilitation activities from the program side such as - community based versus institution based rehabilitation, physical rehabilitation, psychological rehabilitation, social and economic rehabilitation(Gilbody, 1992).

In this study cost savings for rehabilitation from the program are considered only on physical rehabilitation because upto the year 1992, the provision from the program side for rehabilitation activity is physical rehabilitation which can be measured by monetary units. The psychological and social rehabilitation are not measured by monetary unit.

The community based rehabilitation(CBR) was started in 1994 and it was a collaboration with WHO and UNDP. It was implemented in (36) townships. The economic rehabilitation is just started and which was collaboration with DOH and UNDP. The project was implemented in (36) townships and in each township the program provide the revolving fund to the disabled persons.

The following explanations are the methodology for calculations of costs for community based rehabilitation and economic rehabilitation which can be used in the further empirical study.

The following costs items are included in community based rehabilitation(CBR).

- Personnel costs which mean that the costs for the persons who implement this project. This cost item contains salary, fringe benefit, daily allowance and traveling allowance within one year.

$$TC_p = \sum_{i-1}^{n} [C_p]$$

where TC_p = Total personnel costs for doing CBR within one
                      year
               C_p = Personnel costs for doing CBR
               i   = Number of persons who are implementing
                      the CBR; i=1,.............,n.

- Material costs in CBR which contains the costs of materials
provided to the disabled persons within one year.

$$TC_m = \sum_{i-1}^{n} [C_m]$$

where TC_m = Total material costs for doing CBR within one
                      year
               C_m = Material costs for doing CBR
               i   = Number of material which are used in
                      the CBR; i=1,............,n.

     Therefore, the total costs for doing CBR within one year
period will be calculated by following.

$$TC_{CBR} = TC_p + TC_m$$

where TC_{CBR} = Total costs for doing CBR within one year
               TC_p = Total personnel costs for doing CBR
               TC_m = Total material costs for doing CBR

     The following costs items are included in economic
rehabilitation(ER).

- Personnel costs which mean that the costs for the persons who
implement this project. This cost item contains salary, fringe
benefit, daily allowance and traveling allowance within one
year.

$$TC_p = \sum_{i-1}^{n} [C_p]$$

where TC_p = Total personnel costs for doing ER within one
                      year
               C_p = Personnel costs for doing ER
               i   = Number of persons who are implementing
                      the ER; i=1,.............,n.

- Material costs in ER which contains the costs of materials provided to the disabled persons within one year.

$$TC_m = \sum_{i=1}^{n} [C_m]$$

where TC_m = Total material costs for doing ER within one year

         C_m = Material costs for doing ER

         i = Number of material which are used in the ER; $i=1,\ldots\ldots\ldots\ldots,n$.

- Training costs especially vocational training in economic rehabilitation which contains the costs of training material, traveling allowance of the disabled persons who attend the training within one year.

$$TC_{tr} = \sum_{i=1}^{n} [C_{tr}]$$

where TC_{tr} = Total training costs for doing ER within one year

         C_{tr} = Training costs for doing ER

         i = Number of training within one year; $i=1,\ldots,n$.

Therefore, the total costs for doing economic rehabilitation within one year period will be calculated by following.

$$TC_{ER} = TC_p + TC_m + TC_{tr}$$

where TC_{ER} = Total costs for doing ER within one year

         TC_p = Total personnel costs for doing ER

         TC_m = Total material costs for doing ER

         TC_{tr} = Total training costs for doing ER

For this study, we only considered in physical rehabilitation. Therefore for this study, we assumed that if the cases will be detected in early stage, cost saved for rehabilitation from program side can be calculated by following.

$$\frac{\text{Cost saved for}}{\text{rehabilitation}} = \frac{\text{\# of disability}}{\text{prevented}} * \frac{\text{Unit cost for}}{\text{rehabilitation}} \quad\text{————————}\quad (19)$$

For calculation of cost saved for rehabilitation, assume that ----
1. If all the early cases can not be detected in early stage assume that all of them have 'foot drop'. In that case, the unit cost for rehabilitation is used as average cost for reconstructive surgery for 'foot drop'.
2. If all the early cases can not be detected in early stage assume that all of them have 'claw hand'. In that case, unit cost for rehabilitation is used as average cost for reconstructive surgery for 'claw hand'.

(2) Cost Saved by Early Case Detection(Patient Side)

In this study, it is assumed that if the cases are not detected in early stage, all these cases will be disabled in the future. Therefore costs saved for disability from patient side are estimated in following way.

The indirect costs of an illness are all costs other than those for health care. As many as 16 percent(Myint, Htoon, and Shwe 1992) of those with the disease may have serious(currently grade 2) disability with concomitant loss of productivity. Thus, the indirect costs from loss of productivity might be expected to be significant(Htoon, 1993).

A recent promising approach to formulation of a measure of health impact is the concept of healthy days of life proposed by the Ghana Health Assessment Project Team (Morrow and others, 1981.quoted in Barnum, 1986).

The Ghana Team procedure is essentially an accounting approach that uses estimates of incidence, case fertility and duration and extent of disability to calculate the number of healthy days lost from disease.

It is important to note that use of unweighted healthy days of life lost to evaluate a health program or policy having wide effects on morbidity and fatality throughout the population implies comparability across age groups and assumes indifference to adult productivity (Barnum, 1986).

In general, temporally near events are given greater weight or value than distant events. This phenomenon has clear application in the case of financial benefits – one would obviously prefer an immediate financial payment compared to an equivalent payment to be received only after several years. Time preference is also applicable to disease events. A healthy day of life in the present has a greater intrinsic value to the individual than a day in the future. The time stream of healthy days of life lost to disease can be reduced to an equivalent present value through the use of a discount rate. The discount rate is chosen to reflect the trade-off between present and future events. The rate chosen should represent the consensus of society and be consistent across projects to be compared.

Focusing on productivity does not ignore the welfare of children. Adult productivity is important to the quality and sustenance of life for all age groups. Weights for productivity were added to the Ghana model by estimating the age earnings profile. It is also assumed that entry into the labor force occurs at age 14 with an income of one half the mean for all age groups. Income then increases at regular increments up to the age of thirty. In addition per capita productivity is projected to grow by 2.5 percent per annum. The expected income at age thirty is divided by the expected income of all age groups gives the profile expressed in terms of productivity weights. Productivity days lost to disease are obtained by multiplying healthy days lost by the productivity weights for each group and then discounting and summing over the expected remaining life span to get the present equivalent number of productive days lost(Barnum, 1986). For this study the outcome is interms of benefit and so we need to find out the outcome as monetary term. Therefore the productive days lost (which is set to 365.5 days) is multiplied into average annual income of all age groups.

The formula used in calculation of the stream of benefits from disease intervention is as follows.

Costs of Chronic Disability:

$$VCD = IN.PD.DP.\sum_{a-AO}^{AD} Y_a SR_a I(1+R)^{-(a-AO)} \text{ —————— (20)}$$

VCD = Value of chronic disability
AO = Average age at onset(yrs.)
AD = Average age at death(yrs.)
PD = Percentage of those affected who do
        not die but who are permanently
        disabled
DP = Percentage disablement of those
        permanently disabled
IN = Incidence(new cases/1000)
SR = Survival rate
R   = Discount rate
I   = Average income of all age groups
Y   = Weights for productivity or days
        lost depending on application
        (to calculate days lost Y is set to
        365.25)

In addition to the cost of loss of productivity, there are social costs associated with the loss of healthy life brought about by leprosy. These include the burden on family members of living with and caring for a disabled relative. The cost of these social consequences should be considered as part of the indirect costs of leprosy. Though they are not insignificant, these social costs are not readily calculable(Htoon, 1993).

The direct cost for disability contained cost for reconstructive surgery from patient side. Infect these activities are provided by program side, transportation cost, food cost and other cost for patient as well as relative during hospitalization for reconstructive surgery should also be considered. But for this study, we assumed that these amounts are very small and so this cost item is not considered.

4.4.3. Cost Benefit Analysis

From the above equations(1 to 18) costs for each method of case finding activity are calculated. And benefits in terms of cost saved for early case detection are also calculated from equations 19 and 20.

In this study, costs and benefits are analyzed under three different scenarios. In 'Do nothing'(Baseline scenario), the real secondary data of LCP are used. In the other two scenarios, if the program conducts ACD or PCD alone what will happen in costs and benefits are also analyzed by using the above equations.

The formula for computing the benefit cost ratio is following.(Sassone and William, 1978)

$$\frac{B}{C} = \sum_{t=0}^{n} \frac{B_t}{(1 + d)^t} \bigg/ \sum_{t=0}^{n} \frac{C_t}{(1 + d)^t}$$

Where

B_t = Dollar value of benefits incurred at time t

C_t = Dollar value of costs incurred at time t

d = discount rate

From this formula cost and benefits for each method of case finding activity are expressed as follows.

Table 4.10: Cost Benefit Analysis for Three Different Scenarios for Three Different Endemic Areas

Program	Low		Middle		High	
	Pt.	Pro.	Pt.	Pro.	Pt.	Pro.
Doing nothing	B/C	B/C	B/C	B/C	B/C	B/C
PCD alone	B/C	B/C	B/C	B/C	B/C	B/C
ACD alone	B/C	B/C	B/C	B/C	B/C	B/C

The information derived from Table 4.10 will be useful for the program manager who can made a decision for implementing the program. For example, in a high endemic area ACD alone scenario will get the highest B/C ratio, he or she can made a decision like 'ACD activities are given more priority than PCD in high endemic area'.