CHAPTER IV

RESEARCH DESIGN AND RESEARCH METHODOLOGY

4.1 Conceptual Framework:

In this study, cost and effectiveness of two methods of case finding activities (ACD and PCD and PCD alone) in non-endemic and endemic area of the country for the year 2006 are analyzed. The decision maker can decide which method of case finding activity should be emphasized in which area.

The costs for each method of case finding activity are assessed from both provider side and patient side. Effectiveness is expressed as the number of newly detected leprosy cases.

Incremental cost analysis (ICA) is used to analyze the data. This is because PCD was practiced in all study areas while ACD was only done in some of them and it is difficult to differentiate between the outcome of ACD and PCD method in the launched areas.[6]

By ICA in this study we can determine which strategy (combined ACD and PCD or PCD alone) has more operative efficiency for new case detection.

In this study, costs and effectiveness are determined in endemic and non-endemic areas by evaluating existing combined active and passive case detection and passive case detection alone methods. The cost-effectiveness analysis is expressed as below.

The diagram for conceptual framework of this study is shown in Figure 4.1 and Figure 4.2.

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[6] Incremental Cost Analysis was used to analyze the data between PCD alone method and combined ACD and PCD method because we can not differentiate the outcome (in terms of the number of newly detected leprosy cases) between those methods.

Figure 4.1 Cost-effectiveness analysis of combined active and passive versus passive leprosy case detection alone in Thailand
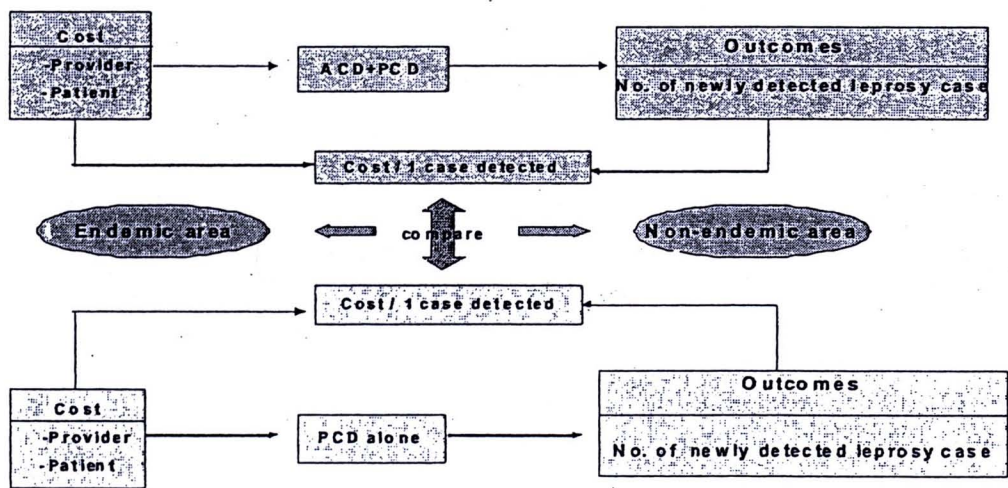

Figure 4.2 Incremental Cost Analysis of combined active and passive versus passive leprosy case detection alone

$$ICA = \frac{\text{Cost of ACD+PCD} - \text{Cost of PCD alone}}{\text{No. of cases detected from ACD+PCD} - \text{No. of cases detected from PCD alone}}$$
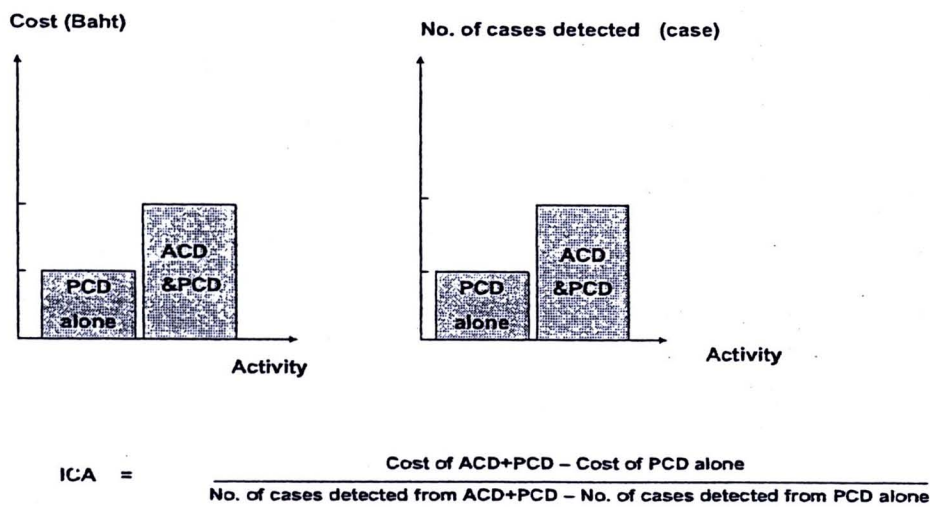
Figure 4.2 shows the comparison of costs between two leprosy case finding methods which is combined ACD and PCD, and PCD alone method. The effective was expressed as number of newly detected leprosy cases. ICA calculation is the total cost of combined ACD and PCD minus the total cost of PCD alone divided by number of newly detected case from combined ACD and PCD minus number of newly detected case from PCD alone method.

4.2 Study Design

This study, a retrospective, descriptive study, focuses on the analysis of the cost for combined ACD and PCD versus PCD alone method. First, the costs for each case detection method are calculated and second, the number of cases detected is determined. The data consist of primary data and secondary data from the leprosy elimination program of Thailand (2006).

4.3 Study Area

There are 12 regions in Thailand and these are divided into two groups according to newly detected cases as shown in Table 4.1. I excluded region12 because it is an unrest area.

Table 4.1 Different Endemic Areas of Thailand

Area	No. of region	Newly detected case
Non-endemic area	7	1-50 cases
Endemic area	4	> 50 cases

Source: Annual report, Leprosy control program, Thailand, 2006

The map of Thailand showing leprosy prevalence rate per 10,000 populations by provinces and districts is shown in Figure 4.3

Figure 4.3 The Map of Thailand showing leprosy prevalence rate per 10,000

populations by provinces and districts

Prevalence rate: 10 000 Populations
No patient registered 440 district (47.62%)
PR 0.01 - 0.49 has 381 district   (41. 14%)
PR 0.50 - 0.99 has   82 district   (8. 86%)
PR > 1 has 2 3 district (2 . 48%) in 15 Province

Map of Thailand 926 district 76 province
National Statistic Office
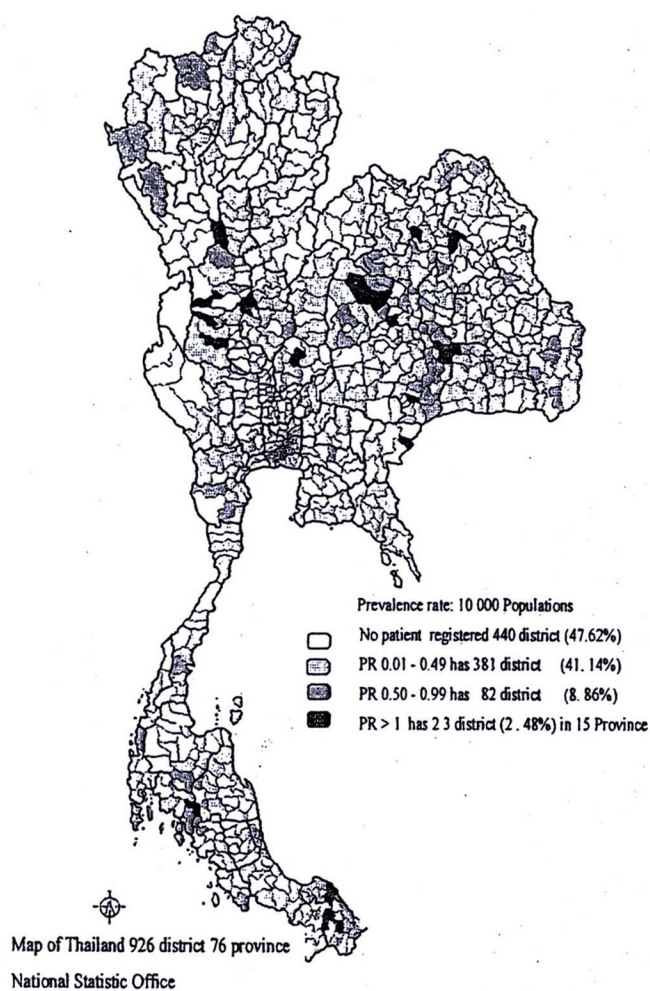
Source: Annual report, Leprosy elimination program of Thailand, 2006.

The prevalence rate in 2006 of the 14 selected districts is shown in Table 4.2

Table 4.2 The prevalence rate (2006) of the 14 selected districts

Area	Province	District	PR/10 000 pop.
Non-endemic:			
DPCR 4	Nakhon Pathom	Bang Len	0.11
		Muang Nakhon Pathom	0.04
DPCR 8	Nakhon Sawan	Banphot Phisai	1.25
		Phaisali	0.99
DPCR 11	Surat Thani	Phrasaeng	0.66
		Muang Surat Thani	0.18
Endemic:			
DPCR 5	Buriram	Satuek	1.65
		Prakhon Chai	0.98
DPCR 6	Nong Khai	Bueng Kan	0.36
		Si Chiang Mai	0.96
DPCR 7	Sisaket	Uthumphon Phisai	0.46
		Kantharalak	0.30
DPCR 10	Chiang Mai	Fang	0.91
		Chiang Dao	0.58

* DPCR: Department of prevention and disease control region

4.4 Research methodology

4.4.1 Population and Sample

4.4.1.1 Study population

- **Provider:**

The entire health provider whose responsibility is the leprosy elimination program at the regional, provincial, district level and health centers in selected areas are acting as the study population from provider's perspective.

The 60 providers interviewed consist of those responsible for leprosy control programs at the regional level, provincial health office, district health office, and

community/provincial hospital as well as heads of finance & accounting, general administration officers, and supply analysts.

- **Patient:**

Inclusion criteria:

- newly detected leprosy patients in 2006 who registered in selected areas are acting as study population for patient perspective.

Exclusion criteria:

- patients with past history of leprosy are not included in this study, (i.e. relapse and re-instate cases) since it is the number of new cases that indicates how much leprosy there is in an area, which may indicate whether activities aimed at controlling the disease are effective.

The total number of newly detected cases in 2006 for selected areas is 51 cases, but we interviewed 42 cases because 6 cases went to other provinces, and 3 cases died.

The 42 patients interviewed by sex, and disability grade 2 are shown in Table 4.3.

Table 4.3 The number of patients interviewed by sex, and disability grade 2 (N= 42)

Area	Combined ACD&PCD			PCD alone			Total / grade 2
	Male	Female	Grade 2	Male	Female	Grade 2	
Non-endemic:							
DPCR 4	1	1	1	1	0	0	3
DPCR 8	4	4	0	3	0	1	11
DPCR 11	3	2	0	3	0	1	8
Total	**8**	**7**	**1**	**7**	**0**	**2**	**22/3**
Endemic:							
DPCR 5	0	2	0	2	1	0	5
DPCR 6	0	0	0	0	0	0	0
DPCR 7	3	3	0	2	1	0	9
DPCR 10	3	3	2	0	0	0	6
Total	**6**	**8**	**2**	**4**	**2**	**0**	**20/2**

4.4.1.2 Sampling Technique

Stratified two stages sampling was used to select the study areas as follows:

- All 11 regions were divided into two groups, endemic and non-endemic areas, according to the number of newly detected cases[7] (see Table 4.1); DPCR which carried out both ACD and PCD methods were chosen as study areas

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[7] We divided endemic areas according to the number of newly detected cases, not prevalence rate. This is because the best indicator of leprosy transmission would be the rate of incidence. This, however, is almost impossible to measure, as it would required the total population to be surveyed at regular intervals. We thus have to make do with case detection as a proxy indicator of incidence. Prevalence rate is not used to divide the endemic areas because it is a poor measure of the real leprosy situation. (ILEP,2001)

- DPCR 4, 8 and 11 as non-endemic and DPCR 5, 6, 7, and 10 as endemic areas

- Simple random sampling was used to select 1 province from each region (if the region carried out ACD and PCD method in more than one province). The selected provinces were Nakhon Pathom Province in DPCR4, Nakhon Sawan Province in DPCR 8, Surat Thani Province in DPCR 11, Buriram Province in DPCR 5, Nong Khai Province in DPCR6, Sisaket Province in DPCR 7, and Chiang Mai Province in DPCR 10.

- The districts of each selected province were divided in to two groups. Districts which carried out both ACD and PCD, and those which carried out PCD alone. (as shown in Figure 4.4)[8]
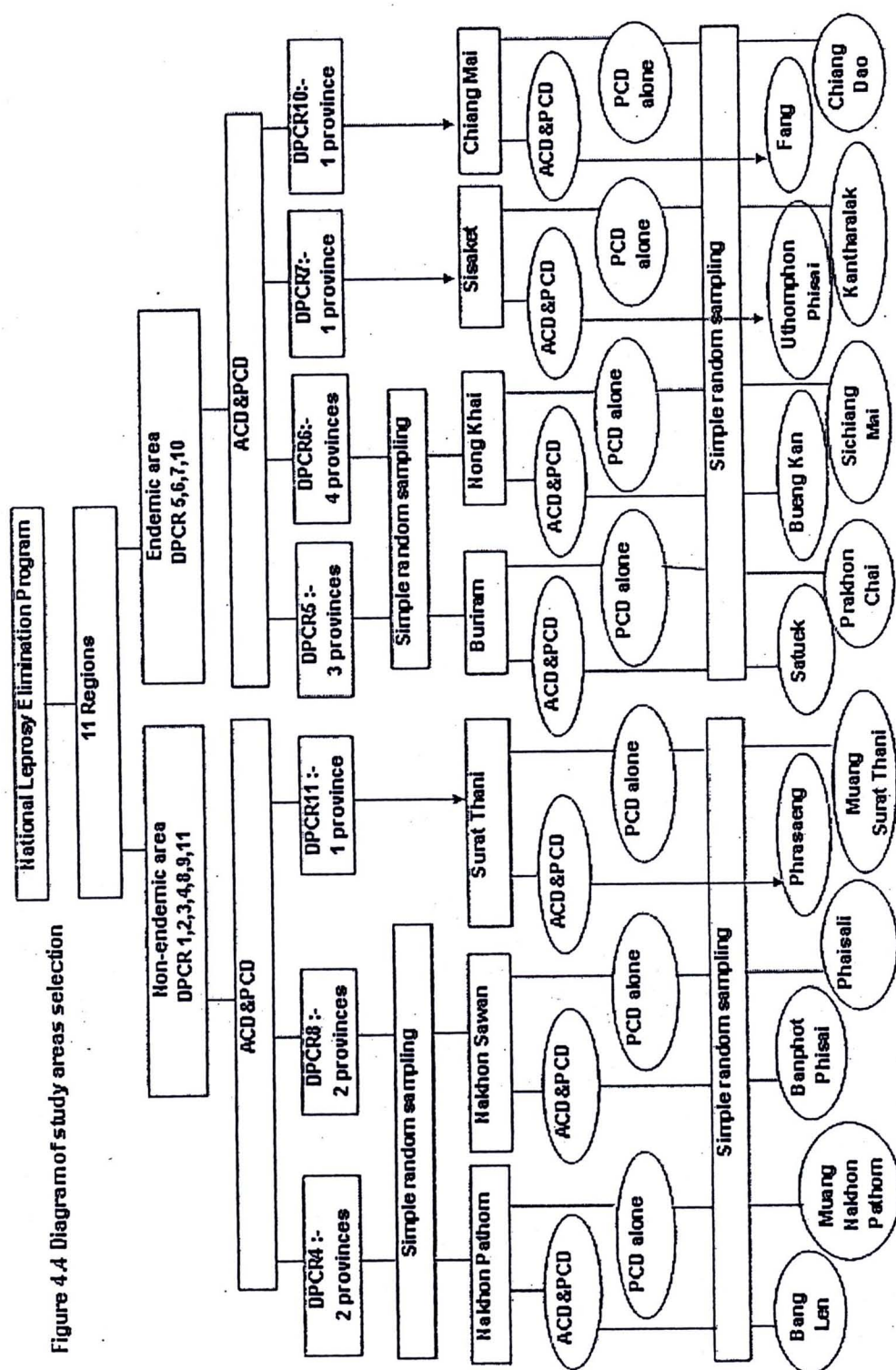
Figure 4.4 Diagram of study areas selection

4.4.2 Data collection

4.4.2.1 Study Variables

The variables used in this study are shown in Table 4.4 and a list of abbreviations used is available in Appendix 8.

Table 4.4 Variables, unit analysis and data source used in the study

Variable	Definition	Unit	Source
1) Calculation of Cost:			
1.1 By provider side for Doing ACD&PCD:			
▪ TC_{pr}	▪ Total costs which is a summation of all costs items incurred by provider side for doing case finding activities.	Baht/year	2nd data
- $TC_{pr.ACD+PCD}$	- Total costs incurred by provider for doing ACD&PCD method.	Baht/year	2nd data
- $TC_{p.ACD+PCD}$	- Total personnel costs for doing ACD&PCD method	Baht/year	2nd data
- $TC_{M.ACD+PCD}$	- Total material costs for doing ACD&PCD method which contain costs of glass slide, reagent, sterile knife, paper and pens	Baht/year	2nd data
- $TC_{TP.ACD+PCD}$	- Total training program costs for doing ACD&PCD method including per diem costs, traveling allowance and costs for training materials	Bath/year	2nd data

Variable	Definition	Unit	Source
- $TC_{SM.ACD+PCD}$	- Total operating social mobilization activity costs for doing ACD&PCD which contains costs for transporting education material and costs for providing health education	Bath/year	2nd data
- $TC_{B.ACD+PCD}$	- Total building costs for doing ACD&PCD	Bath/year	2nd data
- $TC_{E.ACD+PCD}$	- Total equipment costs doing ACD&PCD	Bath/year	2nd data
- $TC_{V.ACD+PCD}$	- Total vehicle costs for doing ACD&PCD	Bath/year	2nd data
- TC_{RVS}	- Total RVS cost for doing ACD&PCD	Bath/year	2nd data

1.2 By provider side for Doing PCD alone:

Variable	Definition	Unit	Source
▪ $TC_{pr.PCD}$	▪ Total costs incurred by provider for doing PCD alone	Baht/year	2nd data
- $TC_{p.PCD}$	- Total personnel costs for doing PCD alone	Baht/year	2nd data
- $TC_{M.PCD}$	- Total material costs for doing PCD alone which contain costs of glass slide, reagent, sterile knife, paper and pens	Baht/year	2nd data

Variable	Definition	Unit	Source
- $TC_{TP.PCD}$	- Total training program costs for doing PCD alone method including per diem costs, traveling allowance and costs for training materials	Baht/year	2nd data
- $TC_{SM.PCD}$	- Total operating social mobilization activity costs for doing PCD alone which co costs for transporting education material and costs for providing health education	Baht/year	2nd data
- $TC_{B.PCD}$	- Total building costs for doing PCD alone	Bath/year	2nd data
- $TC_{E.PCD}$	- Total equipment costs for doing PCD alone	Bath/year	2nd data
- $TC_{V.PCD}$	- Total vehicle costs for doing PCD alone	Bath/year	2nd data

2.1 By patient side for Doing ACD+PCD:

▪ TC_{pt}	▪ Total costs in which summation of all cost items incurred by patient side for diagnosis of leprosy	Baht/year	Primary data

Variable	Definition	Unit	Source
- $TC_{t.ACD+PCD}$	- Total time costs for patients which means absence of work for seeking diagnosis of leprosy by ACD& PCD metho	Baht/year	Primary data
- $TC_{tr.pt..ACD+PCD}$	- Total transporting costs for patients who need to seek for diagnosis of leprosy	Baht/year	Primary data
- $TC_{tr.re.ACD+PCD}$	- Total transportation costs for relatives who are accompanying with patients who need to seek for diagnosis of leprosy	Baht/year	Primary data

2.2 By patient side for Doing PCD alone:

Variable	Definition	Unit	Source
■ $TC_{pt.PCD}$	■ Total costs incurred by patients for diagnosis leprosy by PCD method	Baht/year	Primary data
- $TC_{t.PCD}$	- Total time costs for patients which means absence of work for seeking diagnosis of leprosy by PCD method	Baht/year	Primary data

Variable	Definition	Unit	Source
- TC_{Lre}	- Total time costs for relatives which means absence of work for accompanying with patients who need to diagnosis leprosy	Bath/year	Primary data
- $TC_{tr.pt.PCD}$	- Total transporting costs for patients who need to seek for diagnosis of leprosy	Bath/year	Primary data
- $TC_{tr.re.PCD}$	- Total transportation costs for relatives who are accompanying with patients who need to seek for diagnosis of leprosy	Bath/year	Primary data
2) Identification of leprosy newly detected case			
■ N_L	■ Number of leprosy newly detected case mean that a new case of leprosy detected in a given time period, who had not been diagnosed and treated as having leprosy before.	Number	2nd data

Food costs of patients are not considered in this study. I assumed that the patients bring food from home since cooking food at home is cheaper than buying it outside.

4.4.2.2 Operational Definitions

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

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

- Patient's Cost: 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.

- Effectiveness: The number of leprosy newly detected case by each method of case finding activity.

- Cost - Effectiveness Analysis (CEA): CEA is a comparison of the cost of different case detection methods to achieve an outcome (effectiveness) which is the cost of each method divided by its effectiveness. Therefore, the result that we obtained is the cost per unit of outcome.

- Active Case Detection (ACD): suspected cases are gathered and examined for the diagnosis of leprosy in villages or elsewhere out of health services, or health centers in villages during the mobile team of health workers' trip to a location. It is one of the methods of case finding activity in which cases are detected by health personnel. It includes RVS, contact examination, school survey, and consisted of:
  a) health education sessions about leprosy signs presented in villages by a mobile team from DPCR or mobile team of district/province;
  b) provincial Leprosy Coordinator (PLC)/District Leprosy Coordinator (DLC)'s examination of suspicious cases of leprosy immediately after the education session;
  c) confirmation of the leprosy diagnosis by the mobile team from DPCR. (Adapted from WHO, 2002 and Tiendrebeogo and others, 1999)

- Passive Case Detection (PCD): suspected cases go to health services and are examined there to confirm the diagnosis of leprosy. This method of case detection, carried out in health centers. The passive case detection method consisted of:

a) health education sessions about leprosy signs presented in villages by the nearest health center;

b) counseling of people with suspect signs of leprosy, referring them to the peripheral health center;

c) examination of suspicious cases by nurses at the peripheral level of the health system;

d) confirmation of the leprosy diagnosis by DLC/PLC or doctor (specialized in leprosy) in the district level. (Adapted from WHO, 2002 and Tiendrebeogo and others, 1999)

• A leprosy case: A leprosy case is a person showing clinical signs of leprosy with or without bacteriological confirmation of diagnosis, requiring chemotherapy. (WHO,2006)

• A new leprosy case: It is a case of leprosy detected in a given time period, who has never been previously treated with anti-chemotherapy. (WHO, 2006)

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

• Early case: It is a case of leprosy without visible deformity (grade 2 deformity).

• Disabled (Late case): Leprosy case or discharged case with grade 2 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.

Table 4.5 Disability Grading for leprosy

Case	Grade	Hands & Feet	Eyes
Early	0	- no anesthesia	- no eye problem
		- no visible deformity	- no visual loss
	1	- anesthesia present	- eye problem present
		- no visible deformity	- vision not severely affected
Late	2	- visible deformity present	- severe visual impairment

Source: WHO, Technical Report Series, 1988

- Relapse case: A case of leprosy is the re-occurrence of the disease at any time after the completion of a full course of treatment. (WHO, 2006)

- Re-instate case: A re-entry case of leprosy who fails to complete treatment within the prescribed time-frame. (WHO, 2006)

- Training program: comprises in-service training provided by Raj Pracha Samasai Institute (National level), workshops for provincial health staff by DPCR, workshops for village health volunteers by provincial level facilities once a year, used in combined ACD and PCD and PCD alone method

- Social mobilization: social mobilization and information, education and communication (IEC), used in combined ACD and PCD and PCD alone method, for example social mobilization and IEC one week in January in each village; by tape, poster, community radio, etc once a year. Both ACD and PCD use social mobilization and IEC by staff of DPCR who co-ordinate with staff of provincial and district level facilities during one year in each village once a year.

4.5 Data analysis

4.5.1 Calculation for Costs

In this study, cost for case detection method will be calculated from both provider (supplier) and patient (consumer) perspectives.

All the cost items from the provider perspective are shown in Table 4.6. Total costs items for doing combined ACD and PCD from provider perspective are the same as those costs for PCD alone.

Table 4.6 Total costs for Provider Perspective.

Cost Items	Unit of measurement	Source of Data
Capital costs:		
• Building	Baht/year	Secondary data* (Part 1A)
• Equipment	Baht/year	Secondary data* (Part 1B)
• Vehicle	Baht/year	Secondary data* (Part 1C)

Cost Items	Unit of measurement	Source of Data
Recurrent costs:		
• Personnel	Baht/year	Secondary data* (Part 2)
• Material supply	Baht/year	Secondary data* (Part 3)
• Training program	Baht/year	Secondary data* (Part 4)
- Personnel		
- Material		
• Social mobilization		
- Personnel	Baht/year	Secondary data* (Part 5)
- Material		
• RVS implementation meeting/workshop	Baht/year	Secondary data* (Part 2)
- fuel		
- perdiem		
- drug		

*From check list in Appendix 1.

For the capital cost calculation[9], a special procedure (annualization or depreciation) is required to estimate the annual costs. The general steps are described as follows (Drummond et al, 2005):

- 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).

- Estimate the expected years of useful life of the capital item, after

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[9] Drummond et al. (2005): provides the definition of capital costs as follow:1) land does not depreciate at all, equipment depreciate, material and supplier 'depreciate' or are used up instantaneously and so are costed fully in the year of use, and equipment depreciate more slowly and may be handled in a variety of ways. 2) capital equipment costs have 3 components:- depreciate cost, opportunity cost, and actual operating costs.

purchase, expert judgment or opinion has to be taken from interviews with staff who use if necessary.

    -   Derive the annuallization factor by consulting the annuallization table to calculate the correct factor or by using the annuallization formula

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

        where: a = annuallization 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 annuallization factor obtained from the table 4.4 or from the above annuallization formula calculation.

Total Building costs for OPD (PCD method)

$$\text{For diagnosis of leprosy} = \sum\nolimits_{i=1}^{n} [B_{ia}]$$

      where: B = Annual costs of building

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

              a = Proportion of space used for OPD

Total Equipment costs for Case Finding Activity (CFA)

$$\text{For diagnosis of leprosy} = \sum\nolimits_{i=1}^{n} [E_{ie}]$$

      where: E = Annual costs of equipment

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

              e = Proportion of time used for CFA

Total Vehicle costs for Case Finding Activity (CFA)

$$\text{For diagnosis of leprosy} = \sum\nolimits_{i=1}^{n} [V_{im}]$$

      where: V = Annual costs of vehicle

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

              m = Proportion of time used for CFA

For the recurrent cost calculation, the cost for **training program** can be calculated by summation of following items.

1. Annual costs for per diem (persons x days)

2. Annual costs for traveling allowance

3. Annual cost for training material

The cost for **Social mobilization** can be calculated by summation of following items.

1. Annual cost for media (i.e. posters, pamphlets, audiovisual aid, video tape etc.)

2. Annual costs for giving health education about leprosy.

Total cost for **RVS implementation** can be calculated by summation of following items:

1. Meeting/workshop of the local health personnel and village health volunteers.

2. Fuel

3. per diem of mobile team

4. Drug

4.5.1.1 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 districts were asked to fill the questionnaires for the empirical study. In this study, only the hypothetical situation will be considered. The percentage of time spent by each person according to different case finding method can be calculated from Table 4.7

Table 4.7 The percentage of Time Spent by Each Person

Activities	8-9 am	9-10 am	10-11 am	Etc.	Time spent	% of time spent
ACD:						
-Health education (excl.Training progamme & SM)						
-Examination of Suspicious cases						
-Confirmation by mobile team from DPCR						
Total						
PCD:						
-Health education (excl.Training progamme & SM)						
-Examination of suspicious case at peripheral level						
-Confirmation by specialist at district level						
Total						

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 from Table 4.8.

Table 4.8 Total Personnel Costs for Case Detection Activities

(1) Name of the person	(2) Annual salary	(3) Other fringe benefits	(4) Total annual income	(5) Proportion of time spent for doing ACD &PCD	(6) Total Personnel Cost for doing ACD &PCD (4x5)	(7) Proportion of time spent for doing PCD	(8) Total Personnel Cost for doing PCD (4x7)
Total							

Table 4.7 shows the total annual income of each health personnel. The data can be obtained from the records of Leprosy Elimination Program (LEP). From these forms, the total annual personnel cost for each method of case detection activity can be calculated.

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

Total personnel cost for doing combined ACD and PCD method

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

Where: S = Total annual income of health personnel

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

p = Proportion of time spent on doing ACD+PCD; p = 1.., q

Total personnel cost for doing PCD alone

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

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

4.5.1.2 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 4.8.

From this calculation the following equation will be obtained.

Total material cost for doing combined ACD and PCD

$$TC_{M.ACD+PCD} = \sum\nolimits_{i=1}^{n} [M \times N_{A+P}] \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (3)$$

Where: M = Unit cost of material

N_{A+P} = No. of material used for doing ACD+PCD

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

Table 4.9 Calculation for Total Material costs

(1) Item of material	(2) Unit cost	(3) No. of material used for ACD+PCD	(4) Cost of material used for ACD+PCD (2x3)	(5) No. of material used for PCD	(6) Cost of material used for PCD (2x5)
1.Glass slide					
2. Reagent					
3. S. knife					
4. Paper & Pen					
Total					

Total material cost for doing PCD alone

$$TC_{M.PCD} = \sum\nolimits_{i=1}^{n} [M \times N_{P}] \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (4)$$

Where: M = Unit cost of material

N_P = No. of material used for doing PCD

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

4.5.1.3 Calculation of Training Program (TC_{TP})

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

The calculation is the same in combined ACD and PCD, and PCD alone method.

1. Per diem x No. of days for training.

2. Costs for training materials.

3. Traveling allowance of participants.

The equation for calculation of training program is as follow:

$$TC_{TP} = \sum_{i=1}^{n} [C_P + C_{TM} + C_{TA}] \quad \text{...(5)}$$

Where: C_P = Costs for per diem

C_{TM} = Costs for training materials

C_{TA} = Costs for traveling allowance

i = No. of training program within one year; $i = 1........, n$

4.5.1.4 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, posters, banners, and audio-visual aids) and cost for providing health education by leprosy control personnel. The calculation is the same in combined ACD and PCD, and PCD alone method.

The equation of total cost for social mobilization is following.

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

Where: C_{SM} = Costs for social mobilization

i = No. of district in selected area; $i = 1......, n$

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

4.5.1.5 Calculation of costs for RVS implementation (TC_{RVS})

The costs of RVS implementation can be calculated by summation of operation costs for RVS implementation within one year. This cost contains costs for meeting/workshop of the local health personnel and village health volunteers, fuel cost, per diem of mobile team, and drug cost.

The equation of total cost for RVS implementation is following:

$$TC_{RVS} = \sum\nolimits_{i=1}^{n} [C_{RVS}] \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (7)$$

Where: C_{RVS} = Costs for RVS implementation

   i = No. of village in selected area; $i = 1\dots\dots, n$

This cost items belongs to ACD activity.

4.5.1.6 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 combined ACD and PCD ($TC_{pr.\ ACD+PCD}$) (these are obtained by summing up equations 1, 3, 5 and 6)

$$TC_{pr.\ ACD+PCD} = TC_{p.\ ACD+PCD} + TC_{M.\ ACD+PCD} + TC_{TP.ACD+PCD} + TC_{SM.ACD+PCD}$$
$$+ TC_{B.ACD+PCD} + TC_{E.ACD+PCD} + TC_{V.ACD+PCD} + TC_{RVS} \dots\dots(8)$$

Where: $TC_{pr.\ ACD+PCD}$ = Total provider cost for doing ACD&PCD

   $TC_{p.\ ACD+PCD}$ = Total personnel cost for doing ACD&PCD

   $TC_{M.\ ACD+PCD}$ = Total material cost for doing ACD&PCD

   $TC_{TP.ACD+PCD}$ = Total training program cost for doing ACD&PCD

   $TC_{SM.ACD+PCD}$ = Total social mobilization cost for doing ACD&PCD

   $TC_{B.ACD+PCD}$ = Total building cost for doing ACD&PCD

   $TC_{E.ACD+PCD}$ = Total equipment cost for doing ACD&PCD

   $TC_{V.ACD+PCD}$ = Total vehicle cost for doing ACD&PCD

   TC_{RVS} = Total RVS cost for doing ACD&PCD

Total Provider Costs for Doing PCD alone ($TC_{pr.\ PCD}$)

(These are obtained by summing up equations 2, 4, 5 and 6)

$$TC_{pr.\ PCD}   = TC_{p.\ PCD} + TC_{M.\ PCD} + TC_{TP.PCD} + TC_{SM.PCD}$$
$$+ TC_{B.PCD} + TC_{E.PCD} + TC_{V.PCD}\dots\dots\dots\dots\dots\dots\dots\dots(9)$$

Where: $TC_{pr.\ PCD}$ = Total provider cost for doing PCD alone

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

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

   $TC_{TP.PCD}$ = Total training program cost for doing PCD alone

   $TC_{SM.PCD}$ = Total social mobilization cost for doing PCD alone

   $TC_{B.PCD}$ = Total building cost for doing PCD alone

   $TC_{E.PCD}$ = Total equipment cost for doing PCD alone

   $TC_{V.PCD}$ = Total vehicle cost for doing PCD alone

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

4.5.1.7 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 combined ACD and PCD (AC $_{pr.\ ACD+PCD}$)

$$AC_{pr.\ ACD+PCD} = TC_{pr.\ ACD+PCD} / N_{ACD+PCD} \dots\dots\dots\dots\dots\dots\dots (10)$$

Where: AC $_{pr.\ ACD+PCD}$ = Average provider cost for doing ACD+PCD

TC $_{pr.\ ACD+PCD}$ = Total provider cost for doing ACD+PCD

N $_{ACD+PCD}$ = No. of all case detected by ACD+PCD

Average Provider Cost for Doing PCD alone (AC $_{pr.\ PCD}$)

$$AC_{pr.\ PCD} = TC_{pr.\ PCD} / N_{PCD} \dots\dots\dots\dots\dots\dots\dots\dots (11)$$

Where: AC $_{pr.\ PCD}$ = Average provider cost for doing PCD alone

TC $_{pr.\ PCD}$ = Total provider cost for doing PCD alone

N $_{PCD}$ = No. of case detected by PCD alone

Costs for the patient perspective are as follows. 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 alone method are shown in Table 4.10

Table 4.10 Total Costs for Patient Side

Category	Unit of measurement	Source of Data
● **Direct Cost:**		
- Explicit:		
- Traveling cost (pt.)	Baht/year	Primary data
- Food cost (pt.)	Baht/year	Primary data
- Implicit:		
- Time cost (pt.)	Baht/year	Primary data
- Stigma of leprosy (pt.)	Baht/year	Primary data
● **Indirect Cost:**		
- Explicit:		
- Traveling cost (re.)	Baht/year	Primary data
- Food cost (re.)	Baht/year	Primary data
- Implicit:		
- Time cost (re.)	Baht/year	Primary data
- Stigma of leprosy (re.)	Baht/year	Primary data

Source: Adapted from Kaewsonthi, 1995

The method of cost calculation for patients is the same for PCD alone method and combined of ACD and PCD method.

4.5.1.8 Direct Costs:

A) Traveling Costs of Patients.

In this study, traveling costs of patient will be a primary data. This cost item is calculated for ACD and PCD as well as PCD.

$$TC_{tr.pt} = \sum_{i=1}^{n} [C_{tr.pt}] \dots\dots\dots\dots\dots (12)$$

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

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

i = No. of patient; $i = 1\dots n$

B) Food Costs of Patients

Food costs of patients are not considered in this study. Instead it is assumed that patients bring food from home since cooking food at home is cheaper than buying it outside.

C) Intangible costs (stigma of leprosy) are also excluded. The literature review of past work suggest that measures of the stigma of leprosy seem to exist and its development is left for future research (Brakel WH van., 2006).

D) Time Costs for Patient (Absence from work)

This cost item will be estimated from average wage of the patients (only who leave and absenteeism).

$$TC_{t.pt} = \sum_{i=1}^{n} [C_{ti.pt}] \dots\dots\dots\dots\dots\dots\dots (13)$$

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

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

i = No. of patient; i = 1...... n

4.5.1.9 Indirect Costs:

a) Traveling Costs of Relatives

In this study, traveling cost of relatives will be a primary data. This cost item is calculated for ACD and PCD as well as PCD.

$$TC_{tr.re} = \sum_{i=1}^{n} [C_{tr.re}] \dots\dots\dots\dots\dots\dots\dots (14)$$

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

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

i = No. of patient; i = 1...... n

b) Time Cost for Relatives (Absence from work)

In this study, time cost for relatives will be a primary data. This cost item is considered in PCD as well as ACD (based on average income).

$$TC_{t.re} = \sum_{i=1}^{n} [C_{t.re}] \dots\dots\dots\dots\dots\dots\dots (15)$$

Where: $TC_{t.re}$ = Total time cost for relative

$C_{t.re}$ = Time cost for relative

i = No. of patient; i = 1...... n

4.5.1.10 Total Patient Costs for Each Method of Case Detection Activities

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

- Total Costs for combined ACD and PCD method (from patient side)

(these are obtained by summing up equations 12,13,14 and15)

$$TC_{pt.ACD+PCD} = TC_{tr.pt} + TC_{t.pt} + TC_{tr.re} + TC_{t.re} \quad\ldots\ldots\ldots\ldots\ldots (16)$$

Where: $TC_{pt.ACD+PCD}$ = Total cost for ACD+PCD   (from patient side)

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

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

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

$TC_{t.re}$ = Total time cost for relative

- Total Costs for PCD alone method (from patient side)

(These are obtained by summing up equations 12, 13, 14 and15)

$$TC_{pt.PCD} = TC_{tr.pt} + TC_{t.pt} + TC_{tr.re} + TC_{t.re} \quad\ldots\ldots\ldots\ldots\ldots (17)$$

Where: $TC_{pt.PCD}$ = Total cost for PCD   (from patient side)

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

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

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

$TC_{t.re}$ = Total time cost for relative

4.5.1.11 Unit Cost of Patient Side for Each Method of Case Detection Activities

Average Patient Cost for combined ACD and PCD method ($AC_{pt.ACD+PCD}$)

$$AC_{pt.ACD+PCD} = TC_{pt.ACD+PCD} \; / \; N_{ACD+PCD} \quad\ldots\ldots\ldots\ldots\ldots\ldots (18)$$

Where: $AC_{pt.ACD+PCD}$ = Average patient cost for ACD+PCD

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

$N_{ACD+PCD}$ = No. of all patient detected by ACD+PCD

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

$$AC_{pt.PCD} = TC_{pt.PCD} \; / \; N_{PCD} \quad\ldots\ldots\ldots\ldots\ldots\ldots\ldots (19)$$

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

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

N_{PCD} = No. of patient detected by PCD

4.5.2 Cost - Effectiveness Analysis:

From the above equations (1 to 19) costs for each method of case finding activity and effectiveness in terms of the number of leprosy newly detected cases are calculated.

In this study, costs and effectiveness are calculated by dividing the total cost of each case finding activities with total number of newly detected cases from each case finding activities.