การวิเคราะห์ต้นทุน-ประสิทธิผลของการค้นหาผู้ป่วยโรคเรื้อน
ด้วยวิธีเชิงรุกร่วมกับเชิงรับเปรียบเทียบกับวิธีเชิงรับอย่างเดียวในประเทศไทย

นางสาววีณา พริ้มแก้ว

COST-EFFECTIVENESS ANALYSIS OF COMBINED ACTIVE AND PASSIVE VERSUS PASSIVE LEPROSY CASE DETECTION ALONE IN THAILAND

Miss Weena Primkaew

A Thesis Submitted in Partial Fulfillment of the Requirements

for the Degree of Master of Science Program in Health Economics
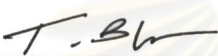
Faculty of Economics

Chulalongkorn University

Academic Year 2010

Thesis Title	COST-EFFECTIVENESS ANALYSIS OF COMBINED ACTIVE AND PASSIVE VERSUS PASSIVE LEPROSY CASE DETECTION ALONE IN THAILAND
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วีณา พริ้มแก้ว : การวิเคราะห์ต้นทุน-ประสิทธิผลของการค้นหาผู้ป่วยโรคเรื้อน
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(COST-EFFECTIVENESS ANALYSIS OF COMBINED ACTIVE AND PASSIVE
VERSUS PASSIVE LEPROSY CASE DETECTION ALONE IN THAILAND)
อ.ที่ปรึกษาวิทยานิพนธ์หลัก : อ.ดร.ชานทอล เฮอร์เบอร์โฮล อ.ที่ปรึกษาวิทยานิพนธ์
ร่วม : ศ. นพ.ภิรมย์ กมลรัตนกุล, 130 หน้า

การวิจัยนี้มีวัตถุประสงค์เพื่อการวิเคราะห์ต้นทุน/ค่าใช้จ่าย   และประสิทธิผลของวิธีการค้นหา
ผู้ป่วยโรคเรื้อนรายใหม่ในประเทศไทย ด้วยวิธีเชิงรุกร่วมกับเชิงรับ   เปรียบเทียบกับวิธีเชิงรับเพียง
อย่างเดียวทั้งในพื้นที่ที่มีการระบาดและไม่มีการระบาดของโรค ในปีพ.ศ. 2549 จากมุมมองของผู้
ให้บริการและมุมมองผู้ป่วยโรคเรื้อน โดยวัดประสิทธิผลจากการค้นพบจำนวนผู้ป่วยโรคเรื้อนรายใหม่
ของแต่ละวิธี

จากการศึกษาพบว่า ต้นทุนทั้งหมดจากมุมมองของผู้ให้บริการโดยวิธีเชิงรุกร่วมกับเชิงรับรวม
เป็นเงินทั้งสิ้น 1,427,800.23 บาท สามารถตรวจพบผู้ป่วยใหม่จำนวน 35 ราย คิดเป็นต้นทุนต่อการ
ค้นพบผู้ป่วยใหม่ 1 ราย เป็นเงิน 40,794.29 บาท โดยในพื้นที่ที่ไม่มีการระบาดของโรคมีต้นทุนต่อ
การค้นพบผู้ป่วยใหม่ 1 ราย เป็นเงิน 42,521.15 บาท ในพื้นที่ที่มีการระบาดของโรคมีต้นทุนต่อการ
ค้นพบผู้ป่วยใหม่ 1 ราย เป็นเงิน 39,340.10 บาท ต้นทุนทั้งหมดจากมุมมองของผู้ให้บริการโดยวิธี
เชิงรับเพียงอย่างเดียว รวมเป็นเงินทั้งสิ้น 1,340,230.20 บาท ตรวจพบผู้ป่วยใหม่จำนวน 16 ราย
คิดเป็นต้นทุนต่อการค้นพบผู้ป่วยใหม่ 1 ราย เป็นเงิน 83,764.39 บาท โดยในพื้นที่ที่ไม่มีการระบาด
ของโรคมีต้นทุนต่อการค้นพบผู้ป่วยใหม่ 1 ราย เป็นเงิน 92,563.55 บาท ในพื้นที่ที่มีการระบาดของ
โรคมีต้นทุนต่อการค้นพบผู้ป่วยใหม่ 1 ราย เป็นเงิน 74,965.23 บาท ค่าใช้จ่ายทั้งหมดจากมุมมอง
ของผู้ป่วยมีลักษณะเหมือนกันทั้ง 2 วิธี แต่ในพื้นที่ที่ไม่มีการระบาดของโรคมีค่าใช้จ่ายสูงกว่าใน
พื้นที่ที่มีการระบาดของโรคเป็น 2.2 เท่า วิธีเชิงรุกร่วมกับเชิงรับในพื้นที่ที่ไม่มีการระบาดของโรคมี
ค่าใช้จ่ายต่อการค้นพบผู้ป่วยใหม่ 1 ราย เป็นเงิน 1,361.18 บาท ในพื้นที่ที่มีการระบาดของโรค มี
ค่าใช้จ่ายต่อการค้นพบผู้ป่วยใหม่ 1 รายเป็นเงิน 231.50 บาท วิธีเชิงรับเพียงอย่างเดียวในพื้นที่ที่ไม่
มีการระบาดของโรค มีค่าใช้จ่ายต่อการค้นพบผู้ป่วยใหม่ 1 รายเป็นเงิน 1,345.33 บาทในพื้นที่ที่มี
การระบาดของโรค มีค่าใช้จ่ายต่อการค้นพบผู้ป่วยใหม่ 1 รายเป็นเงิน 816 บาท การศึกษานี้สรุปว่า
การค้นหาผู้ป่วยโรคเรื้อนรายใหม่โดยวิธีเชิงรุกร่วมกับเชิงรับคุ้มค่ากว่า การค้นหาโดยวิธีเชิงรับเพียง
อย่างเดียวทั้งในพื้นที่ที่มีการระบาดและไม่มีการระบาดของโรค ดังนั้นในการควบคุม
โรคเรื้อนควรให้ความสำคัญต่อการค้นหาผู้ป่วยใหม่โดยวิธีเชิงรุกร่วมกับเชิงรับมากกว่าการใช้วิธีเชิง
รับเพียงอย่างเดียว

สาขาวิชา เศรษฐศาสตร์สาธารณสุข   ลายมือชื่อนิสิต..
ปีการศึกษา 2553   ลายมือชื่ออ.ที่ปรึกษาวิทยานิพนธ์หลัก..........................
                               ลายมือชื่ออ.ที่ปรึกษาวิทยานิพนธ์ร่วม..........................

WEENA PRIMKAEW: COST-EFFECTIVENESS ANALYSIS OF COMBINED ACTIVE AND PASSIVE VERSUS PASSIVE LEPROSY CASE DETECTION ALONE IN THAILAND. THESIS ADVISOR: CHANTAL HERBERHOLZ, Ph.D. THESIS CO-ADVISOR: PROF. PIROM KAMOL-RATANAKUL, M.D., 130 pp.

The major objective of this study is to analyze the cost and effectiveness of different case finding activities: Combined active and passive leprosy case detection (ACD and PCD) versus passive leprosy case detection alone (PCD) for the year 2006 in Thailand, from provider as well as patient perspectives. In this study, effectiveness in terms of new cases detected is used to find out which method of case finding activity is better. The cost-effectiveness ratios are calculated for non-endemic and endemic areas.

The total cost, from the provider perspective, of the combined ACD and PCD method was 1,427,800.23 Baht and the number of newly detected cases 35. The cost-effectiveness ratio was 40,794.29 Baht. In non-endemic areas, the cost-effectiveness ratio was 42,521.15 Baht. In endemic areas, the cost-effectiveness ratio was 39,340.10 Baht. The total cost, from provider perspective, of the PCD alone method was 1,340,230.20 Baht, with 16 newly detected cases. The cost-effectiveness ratio was 83,764.39 Baht. In non-endemic areas, the cost-effectiveness ratio was 92,563.55 Baht. In endemic areas, the cost-effectiveness ratio was 74,965.23 Baht.

The total costs from a patient perspective were similar in both methods, but 2.2 times higher in non-endemic areas than in endemic areas. The cost-effectiveness ratio of the combined ACD and PCD method in non-endemic area and in endemic area was 1,361.18 Baht and 231.50 Baht respectively. The cost-effectiveness ratio of the PCD alone method in non-endemic areas was 1,345.33 Baht and in endemic areas was 816 Baht.

The study concludes that the combined ACD and PCD method is more cost-effective than the PCD alone method in both methods. Therefore, the leprosy control program should focus on combined ACD and PCD method more than on the PCD alone method.

Field of Study	Health Economics	Student's Signature........W. Primkaew...............
Academic Year	2010	Advisor's Signature......Chantal Herberholz.............
		Co-Advisor's Signature...P. Kamolratanakul............

ACKNOWLEDGEMENTS

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ABBREVIATIONS

ACD	Active Case Detection
CFA	Case Finding Activities
C/E	Cost-effectiveness
DLC	District leprosy coordinator
DPCR	Department of Prevention and Disease Control Region
ICA	Incremental cost analysis
ILEP	The international Federation of Anti-Leprosy Association
LCP	Leprosy Control Program
MB	Multi Bacillary
MDT	Multi Drug Therapy
PB	Pauci Bacillary
PCD	Passive Case Detection
PLC	Provincial Leprosy Coordinator
RVS	Rapid Village Survey
RLC	Regional Leprosy Coordinator

CHAPTER I

INTRODUCTION

1.1 Problems and Its Significance

Leprosy is an infectious disease which leads to physical and social consequences for those who affected. Regarding the leprosy situation in Thailand, it has been shown that the prevalence rate has gradually declined from 51.5 cases per 10,000 in 1964 (Pirayavaraporn, 1996) to 0.17 case per 10,000 inhabitants in 2007 (LCP, Annual Report, 2007). According to WHO definition, the prevalence of less than 1 per 10 000 populations means that leprosy is not a public health problem. However, the proportion of new cases with grade 2 disability (defined on page 41) at the time of diagnosis has not declined which could be interpreted that the delayed diagnosis still exists. From 1984 to 2007 it has been between 11.76% (Pirayavaraporn, 1996) and 11.46% (LCP, Annual Report, 2007). Leprosy program need to be sustained for many years to come.

Case finding is one of the core activities of leprosy elimination and control. It raises the leprosy awareness and encourages community's members to participate in detecting people with suspected leprosy symptoms to provide them with appropriate diagnosis and treatment before developing disease severity, developing disability, and further transmission. There are two methods of case finding which are; active case detection (ACD) (defined on page 40) such as rapid village survey and total population survey; and passive case detection (PCD) (defined on page 40) which is conducted by implementing intensive health education campaigns and encouraging suspected cases to voluntary report to health centers.

As prevalence rate has gradually declined and the budget is limited, appropriate case detection is needed. The researcher, therefore; is interested to carry out a comparative study of passive case detection alone and combined active and passive methods of leprosy case detection, to find out which one is most effective.

1.1.1 Nature of Disease

As explained in W.H. Jopling, A.C. McDougall (1995) and WHO (1998), leprosy is a chronic infectious disease caused by *Mycobacterium leprae*. It usually affects the skin and peripheral nerves, but has a wide range of clinical manifestations. The disease is classified as Paucibacillary or Multibaciilary, depending on the bacillary load. Paucibacillary leprosy is a milder disease characterized by few (up to five) hypo-pigmented, anesthetic skin lesions (pale or reddish). Multibacillary leprosy is associated with multiple (more than five) skin lesion, nodules, plaques, thickened dermis or skin infiltration, and in some instances, involvement of the nasal mucosa resulting in nasal congestion and epistaxis.

The modes of transmission of *Mycobacterium leprae* remain uncertain, but most authorities consider the naso-respiratory tract the major route of entrance via aerosols (Ree & McDougall, 1976). Skin to skin transmission is also likely, but may require broken skin. There is no evidence that ingested food or water transmits leprosy.

The route of infection is thought to be via coughing and sneezing, but transmission is very inefficient. Of those infected with the slow-growing leprosy bacillus, few develop the disease.

Individuals exposed to *Mycobacterium leprae* who remain healthy either recognize a clinically important antigens which susceptible individuals do not, or they eliminate phagocytes bacteria more effectively, or both. The susceptible infected patients the disease develops insidiously with an incubation period is 2-5 years, but it shorter or longer times have been recorded. The signs and symptoms of the disease result from three interrelated processes; growth and dissemination of *Mycobacterium leprae,* host immune response and damage to nerves (Meyers and Marty, 1991). The average incubation period is 2-3 years, but it can range from 6 months to 40 years or longer (DermNet NZ, 2009).

Among communicable disease, leprosy is a leading cause of permanent physical disabilities. Timely diagnosis and treatment of cases, before nerve damage has occurred, is the most effective way of preventing disabilities due to leprosy; effective management of leprosy complications, including reactions and neuritis, can prevent or minimize the development of further disabilities, the disease and its associated

deformities are responsible for social stigma and discrimination against patients and their families in many societies.

Disability affects the economic status of patients principally as results of unemployment, which may arise either directly through a reduced ability to work (patient factors) or indirectly as result of adverse social customs, attitudes, or restrictive laws (society factors). In a wider sense, the socio-economic development of some endemic countries may have been hampered by a loss of manpower due to leprosy (Gilbody, 1992).

1.1.2 Global leprosy situation

The global burden of leprosy measured in terms of the number of new cases detected during the year is stabilizing, and there is a steady declining trend. Timely detection of new cases and prompt treatment with multidrug therapy continue to be the cornerstones of the strategy to reduce the burden of leprosy further. In all endemic countries, multidrug therapy is provided free of charge to all registered patients. National programs have emphasized the provision of good-quality diagnostic and treatment service that are equitably distributed, affordable and easily accessible (WHO, 2006).

The Global Strategy[1] for further reducing the leprosy burden and sustaining leprosy control activities (2006-2010); has been widely implemented in all WHO regions with the aim of sustaining the gains achieved under the initiative to eliminate leprosy as a public health problem. All major international and national organizations working to control leprosy have endorsed the global strategy and the guidelines and with their active support, national programs in all endemic countries have been successful in sustaining activities to control leprosy. The emphasis is increasingly being put on maintaining the quality of services and improving the care of patients in order to prevent disability and provide rehabilitation. (WHO, 2006).

In almost all of the highly endemic countries, control activities have been integrated within the general health care system, although details of the integration process vary depending on the health infrastructure and availability of resources. WHO

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[1] Global Strategy is a plan of action designed to achieve a particular goal by WHO' s committees

promoted integration since 1978, the integration process has been strengthened further, and this has led to improvement being made in the quality of care, the expansion of service coverage and the ability to sustain activities, especially at the peripheral level.

Leprosy burden as shown in Table 1.1, the global registered prevalence of leprosy at the beginning of 2007 was 224,717 cases; the number of new cases detected during 2006 was 259,017. During 2006, the number of new cases detected fell globally by more than 40,019 cases (13.4%) when compared with 2005. The number of newly detected cases exceeds the number of registered cases because the number of registered cases is calculated at the end of the year which some PB cases whose treatment is only 6 months were not included.

Table 1.1 Leprosy situations by WHO region (excluding European Region)

WHO region	Registered prevalence at beginning of 2007 (PR: Prevalence Rate/10,000 population)	New cases detected during 2006 (DR: Detection Rate /100,000 population)
African	29,548 (0.55)	27,902 (5.15)
Americas	64,715 (0.76)	47,612 (5.58)
South-East Asia	116,663 (0.70)	174,118 (10.51)
Eastern Mediterranean	3,986 (0.09)	3,261 (0.71)
Western Pacific	9,805 (0.06)	6,124 (0.35)
Total	224,717	259,017

Source: WHO Weekly epidemiological record 22 June 2007 No. 25,2007,82, 225-232

As seen in Table 1.2, the annual global detection of cases continued to decline. As of June 2007, new case detection reports are still being collected from some important countries in the African Region, such as Ethiopia, Guinea and Sierra Leone. The situation in the Eastern Mediterranean Region is stable. In the Region of the Americas, the reported increase in new case detection is mainly the result of increase observed in Brazil.

Table1.2 Trend in the detection of new cases by WHO region

(Excluding the European Region), 2001-2006

WHO region	No. of new cases detected					
	2001	2002	2003	2004	2005	2006
African	39,612	48,248	47,006	46,918	45,179	27,902
Americas	42,830	39,939	52,435	52,662	41,952	47,612
South-East Asia	668,658	520,632	405,147	298,603	201,635	174,118
Eastern Mediterranean	4,758	4,665	3,940	3,392	3,133	3,261
Western Pacific	7,404	7,154	6,190	6,216	7,137	6,124
Total	763,262	620,638	514,718	407,791	299,036	259,017

Source: WHO Weekly epidemiological record 22 June 2007 No. 25,2007,82, 225-232

South East Asia has been known to be highly endemic for leprosy over the past century. This means that transmission of infection in the community has been very high in the general population of South East Asia.

Table1.3 Prevalence rates and case detection rates in 4 countries that have not
        eliminated leprosy, 2007

Country	Registered prevalence (PR: no. of cases /10 000 population)			No. of new cases detected (DR: no. of cases/100 000 population)		
	Beginning of 2005	Beginning of 2006	Beginning of 2007	2004	2005	2006
Brazil	30,693	27,313	60,567	49,384	38,410	44,436
	(1.7)	(1.5)	(3.21)	(26.9)	(20.6)	(23.53)
Democratic	10,530	9,785	8,261	11,781	10,737	8,257
republic of	(1.9)	(1.7)	(1.39)	(21.1)	(18.0)	(13.92)
Congo						
Mozambique	4,692	4,889	2,594	4,266	5,37	3,637
	(2.4)	(2.5)	(1.29)	(22.0)	(27.1)	(18.04)
Nepal	4,699	4,921	3,951	6,150	6,150	4,253
	(1.8)	(1.8)	(1.43)	(22.7)	(22.7)	(15.37)

Source: WHO Weekly epidemiological record 22 June 2007 No. 25,2007,82, 225-232

      At the beginning of 2007, the United Republic of Tanzania achieved the goal of eliminating leprosy as a public health problem (defined as having a registered prevalence rate of <1 case/10 000 population). As shown in Table1.3, only 4 countries (out of 122 countries in 1985, which originally considered as leprosy endemic) have yet to achieve the goal of eliminating leprosy. These 4 countries are Brazil, the Democratic Republic of the Congo, Mozambique and Nepal. Brazil reported a significant increase in the registered prevalence at the beginning of 2007. This may be explained by the prevalence detection rate (prevalence rate < 1/ 10,000 population, it is meant by eliminating leprosy as a public health problem) in Brazil, which was observed to be >1. (Brazil has a prevalence rate higher than 1/ 10,000 population because their detection rate is still quite high and some MB cases are treated with 24 months multi-drug therapy (MDT). However, the detection rate in Brazil is declining but it is slow and so it will take some additional years for them to reach the goal of elimination of leprosy as a public health problem.) Additional efforts will be made to strengthen activities in these

countries to support them in their efforts to eliminate leprosy in the next few years. New case detection has continued to decline in WHO are South-East Asia, Eastern Mediterranean and Western Pacific regions. It is important that the coverage of leprosy control activities and quality of service are maintained and improved to ensure that the disease burden declines in all endemic countries, not only in terms of statistical numbers but also in terms of the reduction of disabilities, cases occurring among children and leprosy-related stigma.

1.1.3 Leprosy situation in Thailand

The sources of budget for leprosy control program are mainly from the government and non-government organization (e.g.: The Netherlands Leprosy Relief (NLR), German Leprosy Relief Association (GLRA), and Raj Pracha Samasai Foundation). The budget for leprosy control program from 1999 to 2006 is shown in Table 1.4.

Table 1.4 Source of finance for the leprosy control program of Thailand from 1999-2003

Year	Recurrent costs[2]		Capital costs[3]		Total costs (Baht)	
	Govt.	NGO	Govt.	NGO	Govt.	NGO
1999	24,933,400	3,314,068	-	-	24,933,400	3,314,068
2000	27,778,065	1,393,987	550,000	-	28,328,065	1,393,987
2001	27,906,060	5,543,954	-	-	27,906,060	5,543,954
2002	26,757,200	3,766,684	-	-	26,757,200	3,766,684
2003	24,534,900	3,096,200	-	-	24,534,900	3,096,200

Source: Annual reports, Leprosy Division, Thailand, 1999 to 2003

In the years 2004 to 2006 annual reports and thus data were not available because of the government reform of the Leprosy Division and the Phrapradaeng hospital.

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[2] Recurrent costs contain salaries, traveling allowance, training fellowship, supplies, drug and others.

[3] Capital costs contain buildings, equipments and vehicles.

To achieve the objective of the leprosy control program, the case finding activity is very important among other activities because many hidden cases are present in the country. The situations in case finding activities are shown in Table 1.5.

Table 1.5 Mode of new case detection

Year	ACD		Total	PCD				Total	Total
	RVS	School exam.	ACD (%)	Voluntary report	Contact exam.	Transfer in[4]	unknown	PCD (%)	
1999	125	-	125 (14.47)	624	66	49	-	739 (85.53)	864
2000	111	1	112 (10.80)	769	76	53	27	925 (89.20)	1,037
2001	81	2	83 (10.00)	615	40	60	-	715 (89.00)	798
2002	185	-	185 (18.50)	684	44	87	-	815 (81.50)	1,000
2003	38	-	38 (5.00)	528	33	52	54	667 (94.00)	705
2004	108	-	108 (16.00)	425	55	48	16	544 (83.00)	652
2005	90	-	90 (14.11)	432	56	60	-	548 (85.89)	638
2006	89	-	89 (13.00)	475	36	55	10	576 (86.00)	665

Source: Annual report, Leprosy control program, Thailand, 1999-2006.

According to the above table, PCD detects more new cases than ACD. Although the percentage of passive case detection is decreasing year by year except for some years, it is still higher than those of active case detection. In general, active case detection can pick up more early cases than passive case detection. From an economic point of view, more emphasis on early case detection is desirable, because, if the cases are detected at an early stage before stigmatizing disability sets in, there will

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[4] Transfer in refers to patients transferred from another health institution where treatment was given.

be a reduction in economic burden which has a long term effect on the patients, program and the nation. From provider point of view, economic burden means expenditure necessary to take care of the cases disabled by leprosy. At the same time they are not fully productive. By preventing disability, productivity can be ensured and expenditure for taking care of the disabled avoided. Therefore, by doing economic evaluation of the program, we can assess which method of case finding activity has more cost effectiveness in term of the number of leprosy detected case when compared with cost incurred.

The World Health Organization (WHO) recognizes the importance of early detection and effective treatment as the keys to breaking the chain of transmission and eliminating leprosy (WHO,1998). Improvements in one or more of these outcomes would reduce the cost of individuals, the control program and the community. (Kaewsonthi,1995)

Although multidrug therapy has reduced the occurrence of disability, the proportion of treated patients who are disabled remains high in some areas because many patients are diagnosed after irreversible nerve damage has occurred. Early diagnosis and treatment are thus important in reducing the proportion of disabled patient.

1.2 Research Objectives

1.2.1 General objective:

- To identify the most cost-effective strategy for new case detection of leprosy in non-endemic and endemic areas of Thailand.

1.2.2 Specific objectives:

- To calculate the total costs of each case detection method (combined ACD and PCD and PCD alone), from a health provider as well as a consumer point of view.

- To analyze outcomes in terms of total number of new cases detected under each case detection method.

- To analyze the cost-effectiveness of each case detection method across endemic and non-endemic areas in Thailand.

1.3 Hypothesis

In endemic areas, the combined active and passive leprosy case detection method might be more cost effective than the passive case detection method. In non-endemic areas, however, the passive case detection method might be more cost effective than the combined active and passive leprosy case detection method, because few cases stay in these areas and doing active case detection is more costly.

1.4 Scope of the Study

This study focuses on provinces and districts in all regions of Thailand that implement both combined ACD and PCD as well as PCD alone methods (excluding region 12 due to it's an unrest area).

CHAPTER II

BACKGROUND INFORMATION

2.1 Country Profile

Thailand is situated in South-East Asia, covering an area of 514,000 square kilometers. With a total population of 62.83 million in 2007, 31.5% of the population lived in urban areas which reflect a significant urbanization compared to 18.7% in 1990. The administrative unit is divided into 76 provinces, 876 districts, 7,258 sub-districts, and 67,373 villages (MoPH, 2008).

2.2 Thai health care system

Health care is provided by public and private sectors in Thailand. The Ministry of Public Health (MoPH) is responsible for providing, controlling, and supporting all health activities in the country.

The majority of public hospital operates under the umbrella of MoPH, whilst some of them are provided by other Ministries such as Education, Defense, and Interior. In addition to the public sector, the private sector runs different levels of hospitals and clinics (MoPH, 2007). The numbers of health facilities are summarized in Table 2.1.

Table 2.1 Health facilities in Thailand, 2005

Type	Bangkok	Province level	District level	Sub-district level	Village
- Medical school	7	5	-	-	-
- Specialized hospital	19	40	-	-	-
- Regional hospital	-	-	724	-	-
- General hospital					
▪ Public	29	70	-	-	-
▪ Private	101	244	-	-	-
- Community hospital	5	-	-	-	-
- Private clinic	3,603	12,944	-	-	-
- Health center	82	-	214	9,720	-
- Primary health care center	-	3,108	-	-	66,223
- 1st class drug store	3,672	5,186	-	-	-
- 2nd class drug store	479	4,031	-	-	-
- Groceries	-	-	-	-	400,000

Source: MoPH, 2007

Most of the rural public facilities are under the central MoPH. The ratio of beds to population was 1:223 for Bangkok, and 1:468 for all provinces (MoPH, 2007). The physician to population ratio ranged from 1:867 in Bangkok to 1:7,015 in the Northern region, which reflect a significant mal-distribution of health workforces.

The structure of organization of MoPH is divided into 10 major departments/offices, namely:1) The Office of the Minister 2) The Department of Medical Science 3) The Office of the Permanent Secretary 4) The Department of Medicine 5) The Department of Mental Health 6) The Department of Health Service Support 7) The Department of Disease Control 8) The Department for Development of Thai Tradition & Alternative Medicine 9) The Department of Health and 10) The Office of Food and Drug Administration. (Figure 2.1)

All the above mentioned departments/offices give technical support to the provincial health offices in their responsible areas.

Figure 2.1 Organization of the Ministry of Public Health (Central Administration)
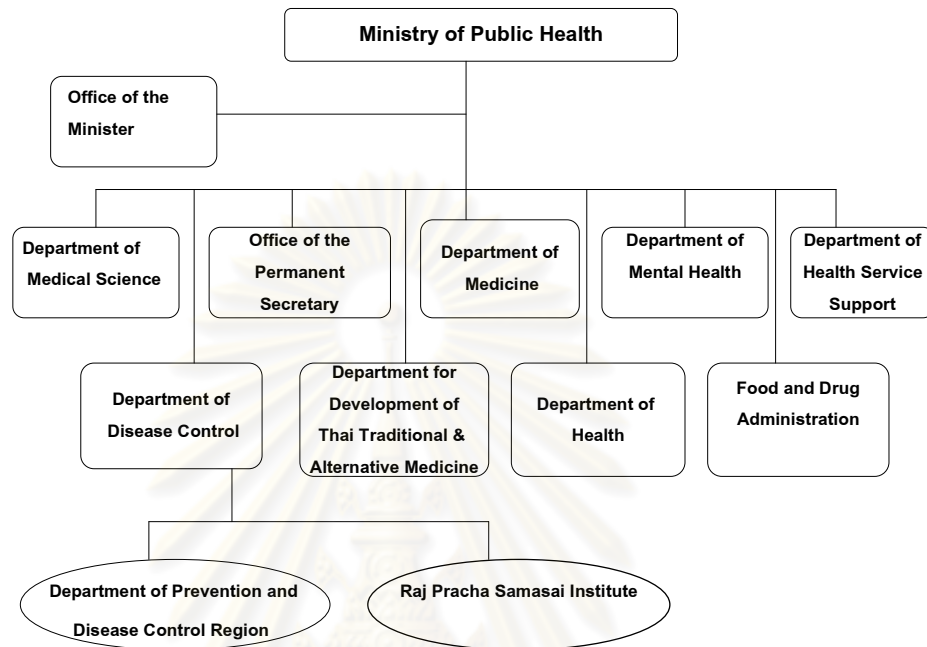
Source: MoPH, (2007)

The role and functions of each service level in rural areas are as follows:

Each of the provinces has a Provincial Chief Medical Officer (PCMO), who is responsible for both administration and support of all medical and health facilities in the province including the regional, general (provincial) hospital, and community (district) hospital. The PCMO is responsible to the permanent secretary for MoPH. At the same time, she/he is also administratively responsible to the governor, the senior civil administrator of the province who reports to the Ministry of Interior. The District Health Office (DHO) is directly responsible to the district officer who reports to the Ministry of Interior. Most of the DHO's technical and managerial support and supervision are coordinated by the Provincial Health Office. (Figure 2.2)

Figure 2.2 Provincial Administration
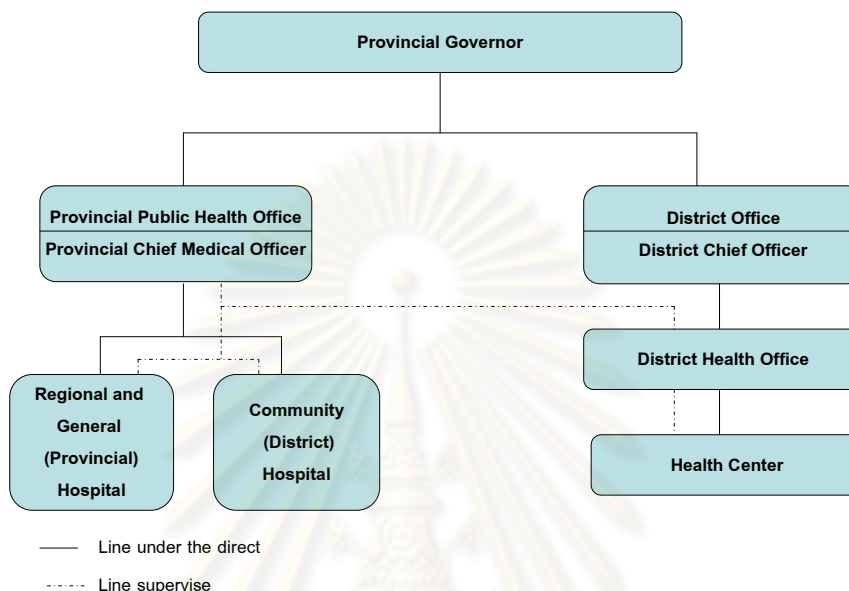
Source: MoPH, (2007)

2.3 Leprosy control in Thailand

Leprosy control based on case finding and dapsone domiciliary treatment was established in 1955 as a vertical programme[5]. To respond to the comprehensive health care and integration policy of the Third National Health and Development Plan, leprosy control was integrated into the general health system step by step since 1973 and completely done all over the country in 1998. Training was arranged during 1971-1976 in order to prepare general health staff for leprosy tasks.

Since 2001, under new health policy, all Thai people have been encouraged to seek treatment in health facilities nearby their places. To get treatment from public health units with minimal fee (initially 30 baht/1 visit), clients have to firstly visit health centers (primary care unit) before being transferred to secondary care if further treatment is needed. Leprosy care is provided as free of charges service as usual.

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[5] A vertical programme i.e. the exclusive undertaking of all the activities against the disease down to the community level in specialized settings.(WHO,1998)

2.3.1 Multi-drug Therapy (MDT) implementation and leprosy elimination

MDT has been implemented in Thailand since 1984, started in the Northeastern endemic region. One hundred percent geographical coverage (by province) and 100% registered case coverage were achieved in 1989 and 1994 respectively. The target of elimination of leprosy as a public health problem at national level was attained in 1994. As of 30 September 2005, 59,965 leprosy patients had been cured by MDT.

The plan of action for elimination of leprosy in Thailand (1994-1996) was established with the target of reducing the prevalence of leprosy in every province to be less than 1 case/10,000 population. All essential control activities were expected to be maintained by the existing provincial, district and primary health care systems. Training, supervision, monitoring, epidemiological, surveillance and supplementary activities were assisted by the 12 regional offices of Disease Prevention and Control and Raj Pracha Samasai Institute (Former Leprosy Division and Prapradaeng Hospital). In order to accelerate the achievement of the elimination goal at sub-national level, promotion and intensification of different supportive activities were implemented both in high and low prevalence provinces (Raj Pracha Samasai Institute, 2006).

2.3.2 Special interventions in Thailand to strengthen and sustaining leprosy services

Leprosy Elimination Campaigns (LEC$_s$) have been conducted 3 times during the period of 1996 to 2002.

1st LEC

To accelerate case detection in the community and to celebrate the special occasion of the Fiftieth Anniversary of His Majesty the King's Accession to the Throne, a National Leprosy Elimination Campaign was carried out all over the country from 9 June 1996 to 16 January 1998. The objectives were to promote community awareness and participation, and to encourage remaining undetected cases to identify themselves for MDT treatment and receive better rehabilitative care. Extensive Information Education and Communication (IEC) activities at all levels of the communities had been regularly organized and operated. Some 47 000 health volunteers had been trained to detect new cases, especially hidden cases at peripheral levels. As a result of the campaigns, a number of 2,134 new cases were detected, 20% higher than that of the previous year, 62% of them were from the Northeastern region. The proportions of

children, of grade 2 disability and of multibacillary leprosy among new cases were 4%, 13.6%, and 55.4% respectively. Regarding the mode of detection, 39% of the patients were self-reporting and 41.5% were detected by health volunteers.

2nd LEC

This campaign was implemented in 2000 to mark the 72nd birthday anniversary of His Majesty the King. The objective and the implementation of this campaign were the same as the first LEC but more emphasize on 124 districts (of 36 provinces) of which the prevalence rate was higher than 1 cases/10,000 population. As a result of the campaigns, a number of 738 new cases were detected, 20% higher than that of the previous year, and the number of endemic districts reduced to be 79 districts (of 25 provinces)

3rd LEC

The Leprosy Elimination Campaign was implemented again in 2001 to celebrate his Majesty the King's birthday. The campaigns aim to strengthen new case finding by encouraging communities to participate in new case finding. The campaign focused on 93 districts (of 32 provinces) of which prevalence rate were more than 1 / 10,000 population. Monetary incentives were given to new cases and health volunteers who actively participated in case finding. This incentive was supported by Raj Pracha Samasai Foundation under the royal patronage. The campaign was completed in 2002 with a number of 935 newly detected cases, 27% higher than that of the previous year.

4st LEC

The focus LEC was implemented again in 2005. To accelerate case detection in the community and to celebrate the special occasion of the Sixtieth Anniversary of His Majesty the King's Accession to the Throne, National Leprosy Elimination Campaigns had been carried out all over the country from 16 January 2005 to 5 June 2007. The objectives were to promote community awareness and participation, and to encourage remaining undetected cases to identify themselves for MDT treatment and receive better rehabilitative care. Extensive Information Education and Communication (IEC) activities at all levels of the communities were organized and operated every year. As a result of the campaigns, a number of 506 new cases were detected, and the number of endemic districts (prevalence rate was higher than 1

case/10 0000 population) reduced to 17 districts (of 11 provinces), 74% lower than that of the previous year.

In order to gain information to be used for further operation, Leprosy Elimination Monitoring (LEM) were conducted.

1st LEM

Monitoring and evaluating leprosy elimination programmes, based on WHO guidelines regarding key indicators for monitoring the elimination of leprosy at provincial level, was conducted in 32 provinces during 1998-1999.

The objectives were to evaluate the achievement of elimination goal, monitor the leprosy situation at provincial level and the quality of control activities conducted by local health staff. The results revealed that the ability of local health staff on case detection, case management and prevention of disability need to be improved and strengthened. Therefore, during 1998-1999 training courses were conducted for Provincial Leprosy Coordinator (PLC), who were general health staff working at provincial level. These training programmes resulted in the better understanding of PLC in their own tasks and better coordination between national, regional and provincial levels. (MoPH,2005)

At the end of the 10th health development plan (2007-2011), the achievements of elimination goal at district levels are also expected, except in Narathiwat province because of unrest area.

2.3.3 Current situation and trend analysis

As of 31 December 2006, there were 1,157 cases registered for treatment, with a national prevalence rate of 0.19/ 10,000 population. There were 23 districts in 15 provinces where the leprosy prevalence was still higher than 1 case/ 10,000 population. During the period of January to December 2006, 665 new cases had been detected. The detection rate was 1.07 cases/100,000 population. Of this, the proportion of newly detected cases with grade 2 disability was 14.29% and the rate of newly detected cases 4.51% for children. Since the implementation of MDT in 1984, the prevalence rate showed steady decline. After 14 years of MDT, the prevalence was reduced by 95%. The annual detection rate had sharply declined during 1984-1989 and then gradually decreased between 1990 -1993 and became constant from 1993 on ward.

The grade 2 disability rate among newly detected cases has been fluctuated from 9% to 14% from 1984 until now.

Figure 2.3 Leprosy Situation in Thailand, 1956-2006
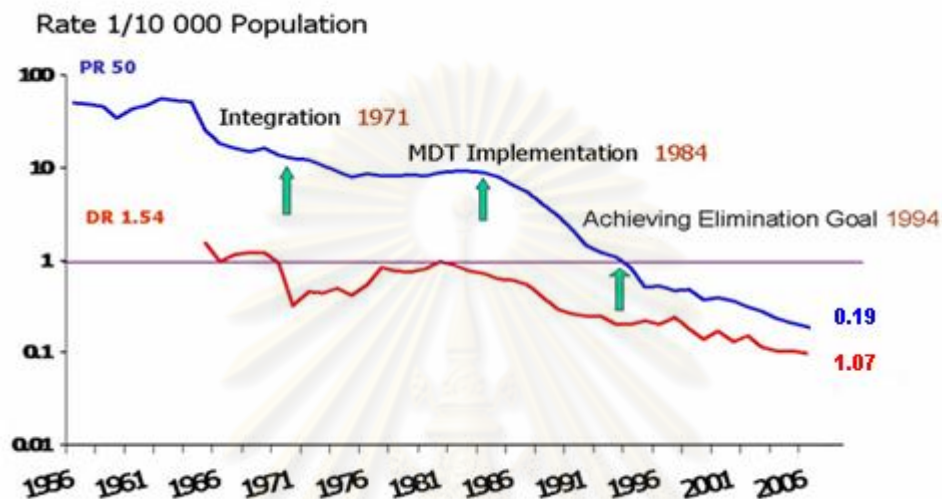
From figure 2.3, Show the prevalence rate and detection rate in 1956-2006. Since the implementation of MDT in 1984, the prevalence rate showed steady decline. After 14 years of MDT, the prevalence was reduced by 95%. The annual detection rate had sharply declined during 1984-1989 and then gradually decreased between 1990 - 1993 and became constant from 1993 onward.

2.3.4 Leprosy related organizations in Thailand

The organizations which are responsible for leprosy may be classified into two groups. 1) Specialized: Raj Pracha Samasai Institute, 12 Disease Control Regional Offices. 2) Integrated: Provincial Health Infrastructure.

- Raj Pracha Samasai Institute is responsible for policy formulation, planning, supervision, monitoring, and evaluation of the national leprosy control programme. It serves as a technical guidance for 12 Disease Control Regional Offices and Provincial Health Offices.

- The 12 Disease Control Regional Offices are responsible mainly for providing necessary technical guidance, supervision, epidemiological and operational assessment, monitoring and evaluating the provincial health infrastructure.

- The Provincial Health Infrastructure including provincial hospitals, district hospitals and health centers are responsible for all leprosy control activities within their responsible areas. (Figure 2.4)

Figure 2.4 The organizations which are responsible for leprosy

……….. Line supervise

_____ Line under the direct
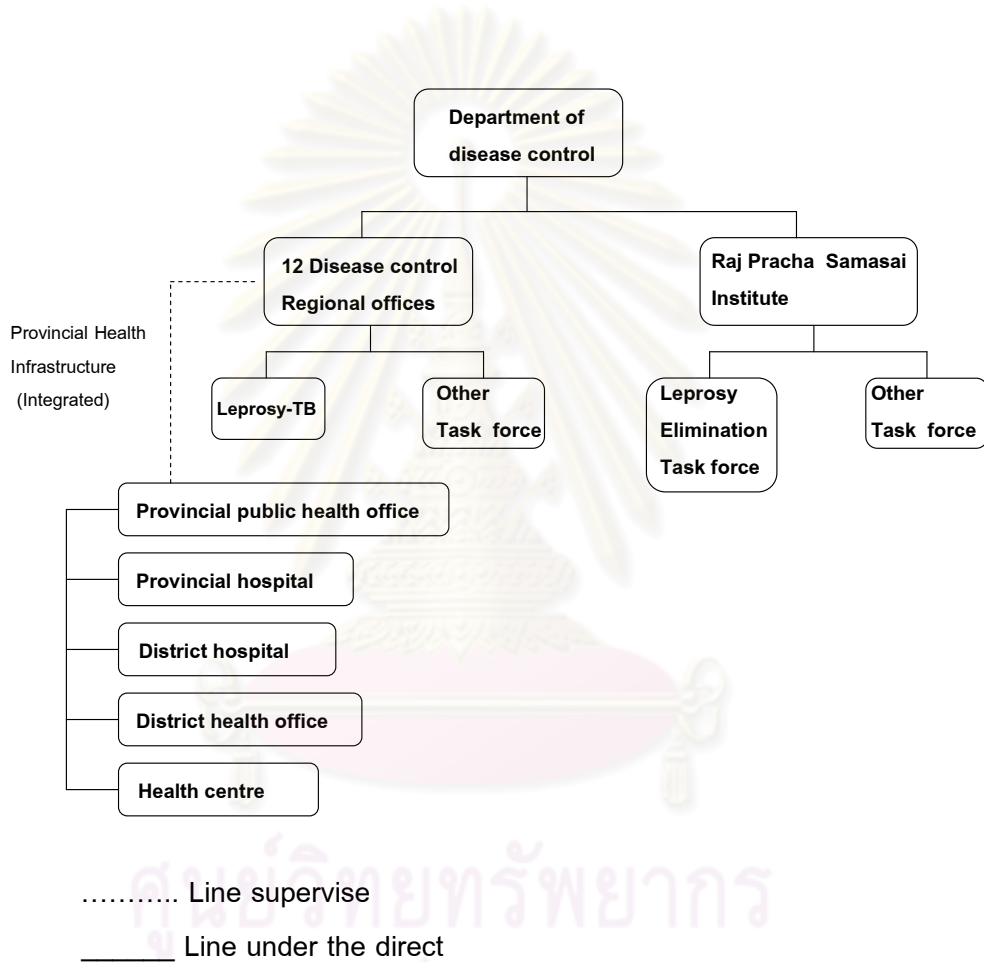
Source: Adapted from Pirayavaraporn, C. (1996)

CHAPTER III

LITERATURE REVIEW

This chapter reviews the prior works and literature dealing with Leprosy Control Program (LCP) for other countries and LCP for Thailand, literature dealing with economic evaluation about leprosy and other communicable diseases and cost analysis including cost benefit analysis.

3.1 Leprosy Control Program in Thailand and other countries

In Thailand, from 1965 to 2005 the trend of case detection steadily decreased. Myint & Htoon reported that the factors contributing to this decline were improved access to diagnosis and treatment with MDT, increased socioeconomic development leading to greatly improved living conditions, and high rates of coverage with Bacille Calmette-Guerin vaccine. These findings are supported by Myint & Htoon (1996) who studied the epidemiological situation of leprosy in Myanmar. They concluded that the trend continued to decline because of increased coverage of MDT

Regarding case detection activities, Sukumaran (1988) reviewed the status of leprosy control in Malaysia. He found that 20% of cases were detected by ACD, 80% of cases by PCD, and found that ACD method reduced the pool of infectious carriers and allowed early detection. Tiendrebeogo and others (1999) compared two methods of leprosy case finding in the Circle of Kita in Mali (West Africa). It was shown that the active detection rate (4.31 per 10,000) was threefold higher than the passive rate (1.5 per 10,000) and allowed them to find earlier cases of leprosy. Active case finding identified children and single-lesion disease whereas the passive method did not. Sukumaran and Tiendrebeogo's findings are supported by Schreuder and others (2002) who compared detected methods between rapid village survey (RVS) and LEC_s in districts of East Java, Indonesia. They founded that the RVS prevalence rate of 12 per 10,000 was more than twice the known prevalence rate of 5 per 10,000. The LEC_s prevalence rate was less than the rate found by RVS (or ACD). Many children and disability grade 2 of newly detected cases were found by RVS and they mentioned that there is still a serious delay in detecting new cases under the routine program.

3.2 Economic Evaluation on leprosy and other communicable diseases.

3.2.1 ACD vs. PCD

There are several studies concerned with the cost-effectiveness analysis of the active and passive leprosy case finding.

In an early study, Kaewsonthi (1993) raised but left unanswered, a number of important questions concerning the economics of leprosy control. These are relevant to this study:

1. What are the costs per case detected through out-reach services compared to those detected through passive services?

2. What would be the most cost effective method for early case detection when the incidence of leprosy is low?

3. How could costs per detected case be contained and/or minimized?

4. How can resource utilization be improved within the leprosy control system?

All these questions should be answered for efficient utilization of scarce resources within the program. Later Kaewsonthi et.al. studied the economic of early leprosy case detection in Thailand (1995) and analyzed comparison of costs of actions for one year and cost saving through disabled life time by using cost models and cost saving (benefit) models. They explained that there are three potential impacts of early case detection namely: effect of early detection on transmission, effect of early detection on the number of disabled cases, and effect of early case detection on relapse. They also identified the six possible actions which could affect earlier case detection i.e. 1. Strengthen health education, 2. RVS, 3 Contact survey, 4. School survey, 5. Improved referral practice through training of staff and paying the travel expenses of referral patients to attend specialized diagnostic service. And they found that RVS and contact survey are viable actions, economically, to detect cases early. In a similar study Aye (1996) conducted a cost-benefit analysis of case finding activities in Myanmar. The author concluded that benefits in terms of cost savings for early case detection were used to find out which method of case finding activity was better in the sense that more early cases are detected. ACD activities are more emphasized than PCD activities especially in high endemic areas. Case detection methods also compared by Kyaw, T.W. (1999), who studied the cost-effectiveness analysis of routine case detection and LECs in Myanmar. The author mentioned that LECs activities are

more cost effectiveness than Routine Case Detection activities. LECs activities are 1.7 to 2.3 times more cost effective than Routine Case Detection activities. These findings are supported by Tiendrebeogo and others (1999). They compared two methods of leprosy case finding in the Circle of Kita in Mali (West Africa), and found that cost for finding a new case was estimated at 72 US$ by mobile team detection (ACD) and 36 US$ by passive case finding (PCD). Again, it is enough to introduce abbreviations once. Although the active method looked more expensive than the passive one, it was the only effective strategy to detect leprosy patients in remote and difficult-to-access areas. For the elimination of leprosy, the two case finding strategies should be combined in most leprosy endemic countries.

In Thailand, a comparison of different cases detection methods was carried out by Manitsirikul and others (2001). They did a comparison of the cost-effectiveness of new leprosy case finding between the rapid village survey and by community leaders in Huayrat district, Buriram Province, Thailand. They found that the RVS method was more cost-effectiveness. Pinitsoontorn and others (1996) studied rapid village survey to determine the size of the leprosy problem in Khon Kaen province, Thailand. They found that the RVS method is more effective than the Total village survey (TVS) method.

From findings mentioned earlier, could be concluded that ACD are more likely effective than PCD. However, Utami and others (2007) who studied effectiveness analysis of the active and passive case finding effort of the new leprosy patients using cost effectiveness analysis method at Dungkek Public Health Center in Sumenep Regency in Indonesia, and concluded that the passive was more cost effective than the active case finding, by the calculation of CER (cost effective ratio). But, when they use the calculation with the number of DALY and years lived with a disability (YLD) parameter, they found that ACD was more cost effective than PCD.

3.2.2 Cost analysis of leprosy control

World Bank Group (2006) analyzed costs associated with leprosy control include case detection, treatment, prevention of disability, and rehabilitation. The authors calculate the incremental health service cost to arrive at the average cost of curing a patient with leprosy. Their estimates are based on the limited published cost data available, program expenditure data, and expert opinion, although costs are likely to differ substantially by country. As case detection rates decrease, the average cost of detecting one case increases. The authors estimated a cost of US$ 2 per case

detected based on a case detection rate of about 300 per 100,000. The case detection rates are now considerably lower in most countries. Many leprosy control programs now rely on voluntary case finding supported by information, education, and communication activities to raise or maintain people's awareness of the early signs and symptoms of leprosy. They estimate the cost of this approach to be about US$ 1 per case detected. Nevertheless, if active methods are still used in areas where case detection rates are low, the cost of case detection may be as high as US$ 108.

However, there is cost associated with leprosy that could not be calculated such as cost results from consequences of stigma. Consequences of stigma are discrimination that leads to loss of marriage opportunity, loss of self esteem, and loss of economic status. (Boonmongkon, 1994; W.H. van Brakel, 2006)

From reviewing the above studies, it is found that ACD by the RVS method or LECs are more cost effective than PCD method or routine case detection activities. Especially, when they calculated with the number of DALY and YLD.

3.2.3 Costs and Cost-Effectiveness Analysis

Economic evaluation is the comparative analysis of alternative course of action in terms of both their costs and consequences. Therefore the basic tasks of any economic evaluation will be to identify, measure, value and compare the costs and consequences of the alternatives being considered. The effect will be translated into days of disability avoided, years of life gained, medical complications avoided and so on. The effect resulting from a particular service or program is expressed in terms of their dollar benefits to facilitate a comparison with program cost. (Drummond et al,2005)

Creease, A. and Parker, D. (1994) stated that to estimate a health program's costs, calculation of their components is necessary. The program's costs can be classified as many ways namely: classification by inputs, classification by function/activity, classification by level and classification by source. There are three main things for choosing costs classification: it must be relevant to the particular situation, the categories must not overlap and it must cover all the possibilities. A among the different ways of classification mentioned in the earlier, classification by input is widely applicable and useful.

It involves a manageable number of categories and these categories are general enough that they can be applied to any health program. It distinguishes two important categories of resource – these that are used up in the course of a year and are usually purchased regularly (i.e., recurrent costs) and those that last longer than one year, such as buildings, vehicles and equipment (i.e., capital costs). And the authors also mentioned that, cost effective analysis will be comparing at least two alternatives – for instance, two ways to organize the program (or activity) or two different packages of inputs to conduct it.

In the past, the benefit of the health output of a project is based on the economic returns to society obtained from better health of the population involved. The identification is known as the 'human capital' approach. This approach is strongly criticized for discriminating against the elderly who no longer offer production gain. The 'value of life' approach to identify the health outcome was developed in order to rectify this problem. Expanding length of life and improving quality of life become the latest operational definition in the economic evaluation. This gives rise to two key concepts: DALY and Quality Adjusted Life Years (QALY). (Drummond et al, 2005)

Disease costing studies provide broad estimates of the total potential benefits to be derived from the prevention or cure of particular disease. Economic analysis is also required, at a more detailed level, to determine the most economical and effective means of obtaining these benefits. Evidence on the distribution of costs and benefits is therefore required if the health ministry is to bargain effectively for scarce resources within the public sector (Report on a WHO working group, 1982)

From reviewing the prior works, it is found that early case detection can prevent disability which has undesirable consequences on economy but there is only one study about economic evaluation of case finding activity of the leprosy control program in Thailand. Manitsirikul and others (2001) studied comparison of the cost-effectiveness of new leprosy case finding between RVS and by community leaders in only one province but I will study cost-effectiveness analysis of combined ACD and PCD versus PCD alone method in 11 regions in Thailand. The program should be evaluated, so as to identify which method of case finding activity has the highest effectiveness in terms of the number of leprosy cases detected when compared with cost incurred.

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
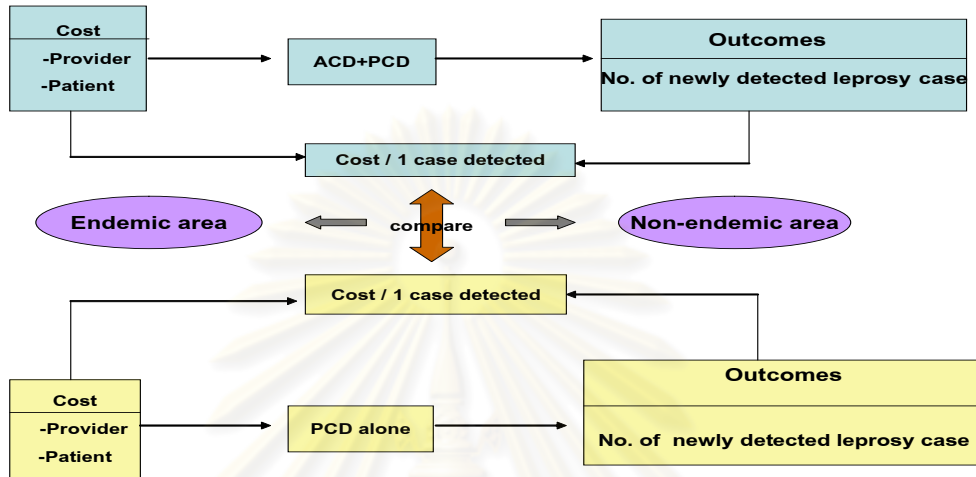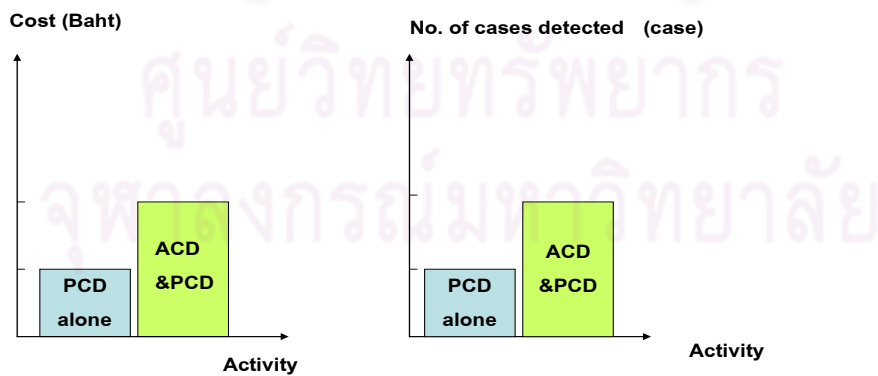

Figure 4.2 Incremental Cost Analysis of combined active and passive versus passive leprosy case detection alone

$$ICA = \frac{\text{Cost of ACD+PCD} - \text{Cost of PCD alone}}{\text{No. of cases detected from ACD+PCD} - \text{No. of cases detected from PCD alone}}$$

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.
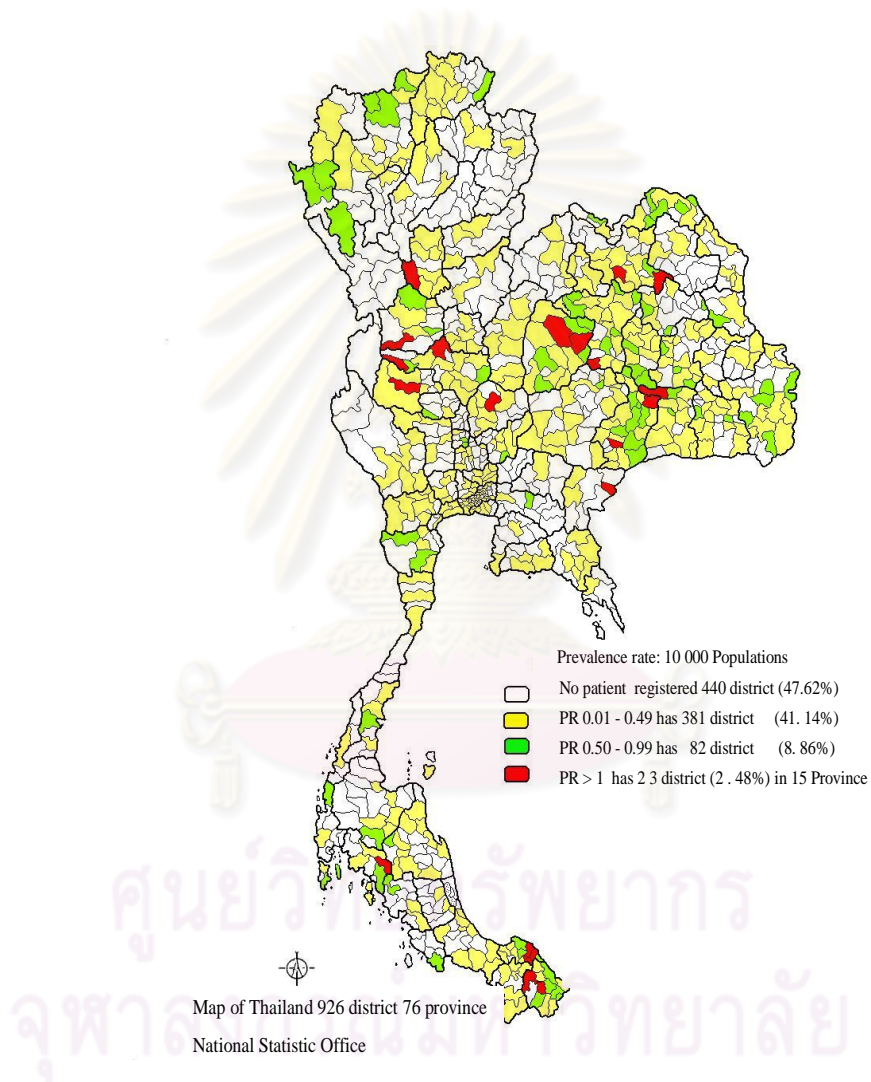
Table 4.1 Different Endemic Areas of Thailand

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 /
	Male	Female	Grade 2	Male	Female	Grade 2	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]

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[8] The author would like to thank Ms. Oraphin Mathew for valuable comments and suggestions.

Figure 4.4 Diagram of study areas selection
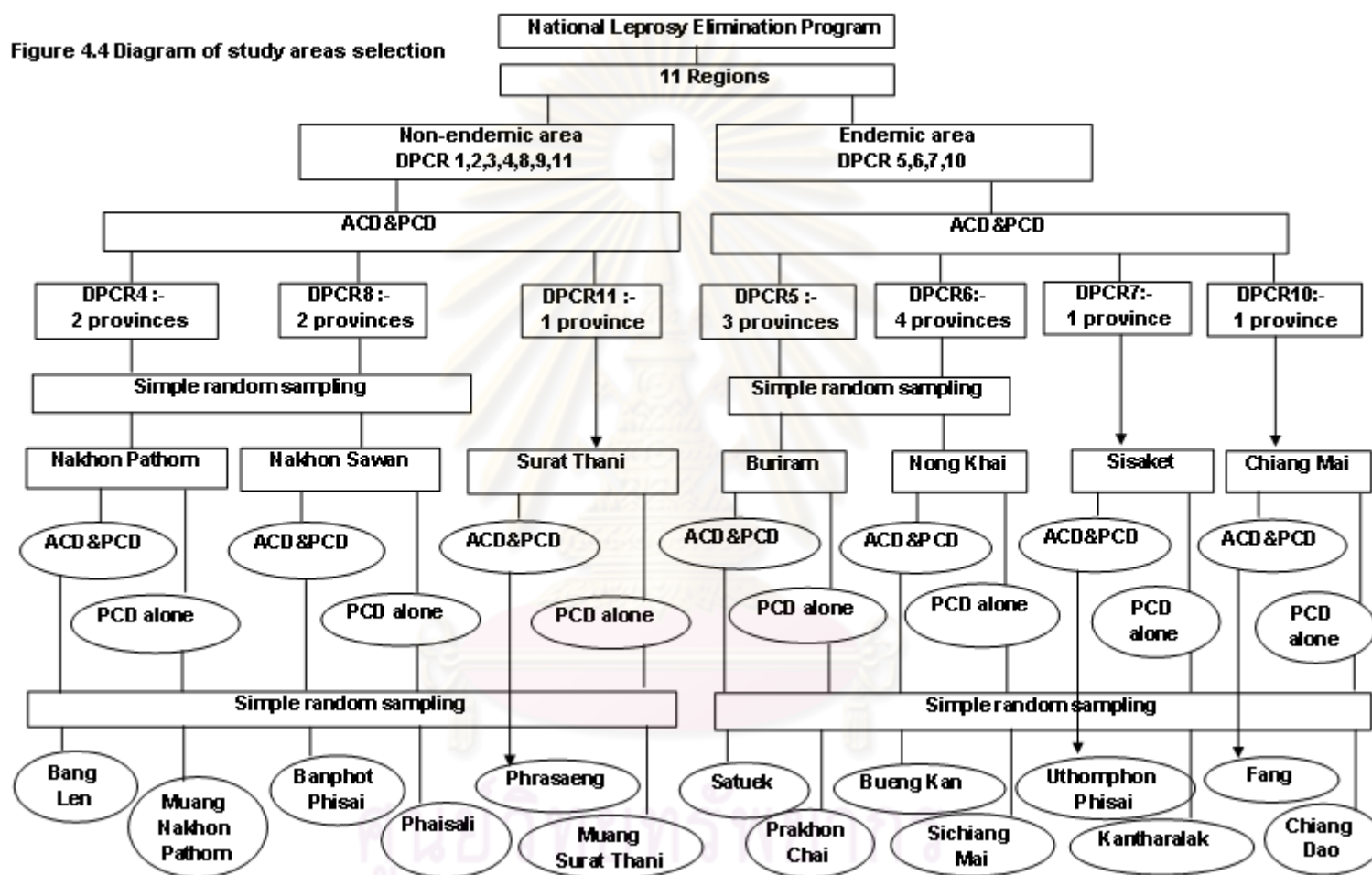
4.4.2 Data collection

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 method	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:			
■ $TC_{pt.PCD}$	■ 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
- $TC_{t.re}$	- 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 visible deformity	- no eye problem - no visual loss
	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

- 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)

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

    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)

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

    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)

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

    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

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

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

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

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

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

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

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

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:

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

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.

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

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:

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

Where: C_{RVS} = Costs for RVS implementation

i = No. of village in selected area; i = 1……, 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)

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

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 <u>Unit Cost of Provider Side for Each Method of Case Finding Activities</u>.

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 $_{pr.\ PCD}$)

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

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.

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

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

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

$\quad\quad\quad i$ = No. of patient; i = 1…... 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).

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

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.

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

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).

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

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 <u>Total Patient Costs for Each Method of Case Detection Activities</u>

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)

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

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)

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

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 <u>Unit Cost of Patient Side for Each Method of Case Detection Activities</u>

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

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

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 ($AC_{pt.PCD}$)

$$AC_{pt.PCD} = TC_{pt.PCD} / N_{PCD} \dots\dots\dots\dots (19)$$

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.

CHAPTER V

RESULTS AND DISCUSSIONS

In this study the costs for each method of case finding activity and effectiveness in terms of newly cases detected are analyzed from the provider's perspective as well as patient's perspective. The results are calculated from endemic and non endemic areas of the country. There are seven regions selected from endemic and non endemic areas of the country. DPCR 4, 8 and 11 as non-endemic and DPCR 5, 6, 7 and 10 as endemic areas. Actually the DPCR 12 is endemic area but it was not included the study area because of its unrest situation. These endemic areas are selected based on the number of newly detected leprosy cases.

Bang Len district as combined ACD and PCD, Muang Nakhon Pathom district as PCD alone of Nakhon Pathom province from DPCR 4. Banphot Phisai district as combined ACD and PCD, Phaisali district as PCD alone of Nakhon Sawan province from DPCR 8. Phrasaeng district as combined ACD and PCD, Muang SuratThani district as PCD alone of SuratThani province from DPCR 11. Satuek district as combined ACD and PCD, Prakhon Chai district as PCD alone of Burirum province from DPCR 5. Bueng Kan district as combined ACD and PCD, Si Chiang Mai district as PCD alone of Nong Khai province from DPCR 6. Uthumphon Phisai district as combined ACD and PCD, Kantharalak district as PCD alone of Sisaket province from DPCR 7. Fang district as combined ACD and PCD, Chiang Dao district as PCD alone of Chiang Mai province from DPCR 10. The selected areas are shown in Table 5.1.

Table 5.1 The selected 7 regions from endemic and non endemic areas of the country.				
Area	DPCR	Province	District	
			Combined ACD &PCD	PCD alone
Non-endemic	4	Nakhon Pathom	Bang Len	Muang Nakhon Pathom
	8	Nakhon Sawan	Banphot Phisai	Phaisali
	11	Surat Thani	Phrasaeng	Muang Surat Thani
Endemic	5	Buriram	Satuek	Prakhon Chai
	6	Nong Khai	Bueng Kan	Si Chiang Mai
	7	Sisaket	Uthumphon Phisa	Kuntharalak
	10	Chiang Mai	Fang	Chiang Dao

The general characteristics of the selected districts are shown in Table 5.2.

Table 5.2 The general characteristics of the 14 selected districts.

District	Pop.	Area (sq-km.)	Pop.[10] density	No of Sub-district	No. of Village	Health Center	Community Hospital
Non-endemic:							
DPCR 4							
- Bang Len	90,620	588.836	153.90	15	180	18	1
- Muang							
Nakhon Pathom	270,498	417.44	648	25	217	31	1
DPCR 8							
-Banphot Phisai	87,669	909.9	96	13	117	17	1
-Phaisali	71,136	979	73	8	101	15	1
DPCR 11							
-Phrasaeng	62,833	980	66	7	72	13	1
-Muang	171,387	337.550	508	11	59	13	1
Surat Thani							
Endemic:							
DPCR 5							
-Satuek	109,438	803	136	12	190	18	1
-Prakhon Chai	132,720	890.121	149	16	182	16	1
DPCR 6							
-Bueng Kan	84,902	791.9	107	12	131	14	1
-Si Chiang Mai	31,183	198	157	4	43	6	1
DPCR 7							
-Uthumphon Phisai	108,104	407.9	265	19	232	21	1
-Kuntharalak	197,944	1,236.6	160	20	276	33	1

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[10] Population density is the measure of the number per unit area. It is commonly represented as people per square mile (or square kilometer), which is derived simply by dividing total area population / land area in square miles (or square kilometers).(Geography.about.com, 6 July 2005)

District	Pop.	Area (sq-km.)	Pop. density	No of Sub-district	No. of Village	Health Center	Community Hospital
DPCR 10							
-Fang	123,487	888.164	139.04	8	102	15	1
-Chiang Dao	87,922	1,882.1	46.71	7	83	12	1

Source: 1. http://th.Wikipedia.org. Based upon the census of 2006. (6 October 2005)

2. Report on Health Resources, Bureau of Health Policy and Plan, MoPH.

From Table 5.2, as of the year 2006, in non-endemic area, the population density is the lowest and the highest between 66 to 648, the number of sub district is between 7 to 25, the number of village is between 59 to 217, the number of health center is between 13 to 31. In endemic area, the population density is the lowest and the highest between 47 to 265, the number of sub district is between 4 to 20, the number of village is between 83 to 276,the number of health center is between 6 to 33.Each district has only 1 community hospital in both areas. Obviously, the population density in non-endemic area is higher than in endemic area. This is because in non-endemic area is the urban area (most of township), and in endemic is the rural communities.

The number of sub-districts and villages in each study area is shown in Table 5.3.

Table 5.3 Number of sub-districts and villages in each study area

Area	Province	District ACD+PCD	No. of sub-district/ village by combined ACD & PCD		District PCD alone	No. of sub-district /village by PCD alone
			ACD	PCD		
Non- endemic:						
-DPCR 4	-Nakhon Pathom	-Bang Len	2 /2	15 /18	-Muang NakhonPathom	25 / 31
- DPCR 8	-Nakhon Sawan	-Banphot Phisai	13 /17	13 /17	-Phaisali	8 /15
- DPCR11	-Surat Thani	-Phrasaeng	2/2	7 /13	-Muang Surat Thani	11 /13
Endemic:						
- DPCR 5	-Buriram	-Satuek	5 / 8	12 /18	-Prakhon Chai	16 /16
- DPCR 6	-Nong Khai	-Bueng Kan	1 / 1	12 /14	-Si Chiang Mai	4 / 6
- DPCR 7	-Sisaket	-Uthumphon Phisai	1 / 3	19 / 21	-Kantharalak	20 /33
- DPCR10	-Chiang Mai	-Fang	1 / 2	8 / 15	-Chiang Dao	7 /12

From Table 5.3, in non-endemic area, the number of sub district and village of combined ACD and PCD method, consist of Bang Len district in Nakhon Pathom province has 17 sub districts and 20 villages, Banphot Phisai district in Nakhon Sawan province has 26 Sub districts and 34 villages, and Phrasaeng district in Surat Thani province has 9 sub districts and 15 villages. In PCD alone method, consist of Muang Nakhon Pathom has 25 sub districts and 31 villages, Phaisali district in Nakhon Sawan province has 8 sub districts and 15 villages, and Muang Surat Thani has 11 sub districts and 13 villages. In endemic area, the number of sub district and village of combined ACD and PCD method, consist of Satuek district in Buriram province has 17 sub districts and 26 villages, Bueng Kan district in Nong Khai province has 13 Sub districts and 15 villages, Uthumphon Phisai district in Sisaket province has 20 sub districts and 24 villages, and Fang district in Chiang Mai province has 9 sub districts and 17 villages. In PCD alone method, consist of Prakhon Chai district in Buriram

province has 16 sub districts and 16 villages, Si Chiang Mai district in Nong Khai province has 4 sub districts and 6 villages, Kantharalak district in Sisaket province has 20 sub districts and 33 villages, and Chiang Dao district in Chiang Mai province has 7 sub districts and 12 villages.

The number of newly detected case in each study areas are expressed in Table 5.4.

Table 5.4 The number of new case detection and the number of new case detection with disability grade 2 for study areas during the year of 2006

Area	Combined ACD and PCD		PCD alone		Total
	No. of newly detected case	No. of Grade 2	No. of newly detected case	No. of Grade 2	
Non-endemic:					
DPCR 4	2 (Bang Len)	1 (PCD)	2 (Muang Nakhon Pathom)	0	4
DPCR 8	9 (Banphot Phisai)	1 (RVS)	3 (Phaisali)	1	12
DPCR 11	5 (Phrasaeng)	0	3 (Muang Surat Thani)	1	8
Total	16	2	8	2	24
Endemic:					
DPCR 5	4 (Satuek)	0	4 (Prakhon Chai)	0	8
DPCR 6	0 (Bueng Kan)	0	0 (Si Chiang Mai)	0	0
DPCR 7	8 (Uthumphon Phisai)	1 (RVS)	3 (Kantharalak)	0	11
DPCR 10	7 (Fang)	2 (PCD)	1 (Chiang Dao)	0	8
Total	19	3	8	0	27

Source: Annual report and direct interview from Regional Leprosy Coordinator (RLC) &
Provincial Leprosy Coordinator (PLC)

From Table 5.4 Most of combined ACD and PCD method was two times higher than PCD alone method. During RVS, 8.33% of all RVS new cases (24 cases) already had disability grade 2. The newly detected case with disability grade2 was

14.3% and 12.5% in combined ACD and PCD method and PCD alone method respectively. We had to know whether the newly detected cases were associated to the endemic of the area or not.

Chi-square test:

Area	Combined ACD and PCD (cases)	PCD alone (cases)	Total (cases)
Non-endemic	16 (66.7%)	8 (33.3%)	24
Endemic	19 (70.4%)	8 (29.6%)	27
Total	35	16	51

H_O = Case detection of combined ACD and PCD method is not associated with endemic area

H_a = Case detection of combined ACD and PCD method is associated with endemic Area

$$X^2 = \sum \frac{(O - E)^2}{E} = \sum \frac{(16-8)^2}{8} = 8 \quad ....(\text{non-endemic})$$

$$X^2 = \sum \frac{(O - E)^2}{E} = \sum \frac{(19-8)^2}{8} = 15.13 \quad ....(\text{endemic})$$

Where: O = Observed (combined ACD and PCD)

E = Expected (PCD alone)

degree of freedom = (n-1)

$$X^2_{cal} = 23.13 [11]$$

The table value for Chi-square in the correct box of *1 df* and *p= 0.05*0, level of significance is 3.84.

So we rejected the null hypothesis, accepted the alternative hypothesis. Therefore case detection of combined ACD and PCD method is associated with endemic area.

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[11] The calculation is shown in Appendix 8

5.1 Analyzing costs and effectiveness (Provider's perspective)

5.1.1. Calculation of costs for each method of case finding activities.

Total costs in each method of case finding activity is shown in Table 5.5 and Table 5.6. The detailed calculation of total costs for case finding activity from provider perspective is shown in Appendix 5

Table 5.5 The personnel cost, the number of village, and time spent in each DPCR which carried out combined ACD&PCD and PCD alone

Area	Combined ACD&PCD			PCD alone		
	Personnel cost / year (baht)	No. of village	Time spent/year (hr.)	Personnel cost / year (baht)	No. of village	Time spent/year (hr.)
Non-endemic:						
DPCR 4	269,276	18	540	259,215	31	528**
DPCR 8	119,997	17	308	95,038	15	288**
DPCR 11	145,674	13	306	353,087	13	528
Total	534,147	48	1,154	707,340	59	1,344
Endemic:						
DPCR 5	156,249	18	336	139,647	16	288
DPCR 6	132,778	14	294	122,388	6	288
DPCR 7	156,137	21	297	146,272	33	288
DPCR 10	138,295	15	297	124,857	12	288
Total	583,459	68	1,224	533,164	67	1,152

** Time spent of provincial hospital is 528 hrs. , time spent of community hospital is 288 hrs.

The personnel costs differ depend on the income while time spent remains the same because the personnel cost in each area are different. Especially, in DPCR4 (Muang Nakhon Pathom hospital) and DPCR11 (Muang Surat Thani hospital) are provincial hospital, it's different of time spent between provincial and community

hospital, and different level of salary and fringe benefit of the dermatologist higher than the general medical practitioner in community hospital.

Table 5.6 Total costs of case finding activities for each area.

(Provider's perspective)

Area	Total costs (Baht)	
	Combined ACD and PCD	**PCD alone**
Non-endemic:		
DPCR 4	279,268.00	266,311.00
DPCR 8	163,734.00	112,825.60
DPCR 11	237,336.40	361,368.80
Total	680,338.40	740,508.40
Endemic:		
DPCR 5	203,113.07	148,283.20
DPCR 6	159,691.00	123,467.00
DPCR 7	185,139.60	167,358.00
DPCR 10	199,518.16	160,613.60
Total	747,461.83	599,721.80

From Table 5.6 in non-endemic area, the total cost of combined ACD and PCD was higher than the total cost of PCD alone in DPCR 4 and 8. The total cost of combined ACD and PCD was lower than the total cost of PCD alone in DPCR11, because the personnel cost of staffs in provincial hospital (different level of salary and fringe benefit) that higher than those of the other region and different of time spent between the community hospital and provincial hospital were more than the cost of combined ACD and PCD. In endemic area the total cost of combined ACD and PCD was higher than the total cost of PCD alone in DPCR 5, 6, 7 and 10. When we compared the total cost from provider perspective among endemic area, the combined ACD & PCD in endemic was 1.1 times higher than non-endemic area and the PCD alone in non-endemic was 1.23 times higher than endemic area.

5.1.2. Calculation of cost-effectiveness for each method of case finding activity (Provider's perspective)

The cost-effectiveness ratio calculated by dividing the total costs for each method by number of new cases detected by each method (the number of new cases detected by each method is given in Table 5.4) is shown in Table 5.7.

Table 5.7 Cost effectiveness of case finding activities for each DPCR

(Provider's perspective)

(1 US$ = 39.69 baht)

Area	Combined ACD & PCD			PCD alone		
	C/E ratio (baht)	No. of case	US$	C/E ratio (baht)	No. of case	US$
Non-endemic:						
DPCR 4	139,634.00	2	3,518.12	133,155.50	2	3,354.89
DPCR 8	18,192.67	9	458.37	37,608.53	3	947.56
DPCR 11	47,467.28	5	1,195.95	120,456.27	3	3,034.93
Total[12]	42,521.15	16	1,071.33	92,563.55	8	2,332.16
Endemic:						
DPCR 5	50,778.27	4	1,279.37	37,070.80	4	934.01
DPCR 6	-	0	-	-	0	-
DPCR 7	23,142.45	8	583.08	55,786.00	3	1,405.54
DPCR 10	28,502.59	7	718.13	160,613.60	1	4,046.70
Total	39,340.10	19	991.18	74,965.23	8	1,888.77
Grand total[13]	**40,794.29**	**35**	**1,027.82**	**83,764.39**	**16**	**2,110.47**

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[12] Calculated from the total cost of each methods divided by the number of newly detected case of each methods in each areas.

[13] Calculated from the total cost of both endemic areas in each methods divided by the number of newly detected case in each methods.

From Table 5.7, in combined ACD and PCD method, the cost-effectiveness ratio of DPCR8 was lowest among them. It depends on the total number of newly detected case and personnel cost. In PCD alone method, the cost-effectiveness ratio of DPCR5 was lowest among them. It depends on the number of newly detected case and personnel cost. We already proved that the case detection of combined ACD&PCD is associated with endemic area.

When we analyze the cost-effectiveness ratio of combined ACD and PCD versus PCD alone method, the cost-effectiveness ratio of PCD alone method was 2.07,2.54,2.41 and 5.64 times higher than the cost-effectiveness ratio of combined ACD and PCD method in DPCR8, DPCR11, DPCR7, and DPCR 10 respectively. Except for DPCR4 and DPCR5 the cost-effectiveness ratio of combined ACD and PCD method is 1.05 and 1.37 times higher than PCD alone. It depends on the number of newly detected case. In DPCR6, we could not calculate the cost-effectiveness ratio because no new cases were detected. Therefore, most of the cost-effectiveness ratio of PCD alone was higher than the cost-effectiveness ratio of combined ACD and PCD method.

When analyzing the cost-effective ratio of combined ACD and PCD versus PCD alone method in each endemic area, then we found out. In non-endemic areas, the cost-effective ratio of PCD alone is 2.2 times higher than that of combine ACD and PCD, and the cost-effective ratio of PCD alone in endemic area is 1.9 times higher than that of combine ACD and PCD. It means that the combined ACD and PCD method more effective than PCD alone method in both endemic areas.

5.2 Incremental cost analysis of combined ACD and PCD versus PCD alone

The incremental cost analysis calculated by dividing the total cost of combined ACD and PCD minus the total cost of PCD alone by the number of newly case detected from combined ACD and PCD minus the number of newly case detected from PCD alone is shown in Table 5.8.

Table 5.8 Incremental cost analysis of combined ACD and PCD vs. PCD alone

Area	Combined ACD & PCD		PCD alone		ICA	US$
	Total cost	No. of new case	Total cost	No. of new case	(Baht)	
Non-endemic:						
DPCR 4	279,268.00	2	266,311.00	2	-	-
DPCR 8	163,734.00	9	112,825.60	3	8,484.73	213.78
DPCR 11	237,336.40	5	361,368.80	3	-62,016.20	-1,562.51
Total	680,338.40	16	740,508.40	8	-7,521.25	-189.50
Endemic:						
DPCR 5	203,113.07	4	148,283.20	4	-	-
DPCR 6	159,691.00	0	123,467.00	0	-	-
DPCR 7	185,139.60	8	167,358.00	3	3,556.32	89.60
DPCR 10	199,518.16	7	160,613.60	1	6,484.09	163.37
Total	747,461.83	19	599,721.80	8	13,430.91	338.40

The results in DPCR4 and 5, ICA ratio were 0. This is because they are the same number of newly detected case in both combinations. But in DPCR4, the total cost of combined ACD and PCD method was higher than the total cost of PCD alone was 12,957 Baht, it mean that if the leprosy program would to detect 1 case, the leprosy program would need to pays 12,957 Baht more than PCD alone method. In DPCR6, ICA ratio was 0, because no newly case was detected. But the total cost of combined ACD and PCD method was 159,691 Baht, and the total cost of PCD alone method was 123,467 Baht. It means that in combined ACD and PCD method if the leprosy program pay 159,691 Baht may not be found the new patient. In PCD alone method if the leprosy program pay 123,467 Baht may not be found the new patient.

The results in DPCR8, ICA ratio was 8,484.73 Baht, it mean that if the leprosy program want to detect additional 1 new case, the combined ACD and PCD method would need to pay 8,484.73 Baht. In DPCR11, ICA ratio was -62,016.20 Baht. It means that, if the leprosy program wants to detect additional 1 new case, the PCD alone method need to pay 62,016.20 Baht more than the combined ACD and PCD

method. In DPCR7 and DPCR10, ICA ratio was 3,556.32 Baht and 6,484.09 Baht; it means that if the leprosy program wants to detect additional 1 new case, the combined ACD and PCD method would need to pay 3,556.32 Baht and 6,484.09 Baht respectively. When we analyze the ICA ratio between non-endemic and endemic areas, in non-endemic areas, ICA ratio was –7,521.25 Baht, it means that, if the leprosy program wants to detect additional 1 new case, the PCD alone method would need to pay 7,521.25 Baht more than the combined ACD and PCD method. In endemic area, ICA ratio was 13,430.91 Baht, it means that if the leprosy program wants to detect additional 1 new case, the combined ACD and PCD method would need to pay 13,430.91 Baht.

If we now assume that the population of each area is the same 100,000 populations, in which two case finding methods are implemented. The cost-effectiveness analysis of combined ACD and PCD, and PCD alone in the non-endemic and endemic area is shown in Table 5.9 and Table 5.10.

Table 5.9 The cost-effectiveness analysis of the combined ACD&PCD, and PCD alone in non-endemic area.

Variables	Combined ACD&PCD	PCD alone
• Effectiveness		
- population	241,122	513,021
- newly case detected	16	8
- expected no. of newly case detected if populations are 100,000	(100,000*16)/241,122= 6.64	(100,000*8)/513,031= 1.56
• Costs (Baht)	680,338.40/241,122=	740,508.40/513,021=
- unit cost per person	2.82	1.44
- total cost	282,000	144,000
• C/E ratio (Baht)	17,625	18,000
• US$	444.07	453.51

Table 5.10 The cost-effectiveness analysis of the combined ACD&PCD, and PCD alone in endemic area.

Variables	Combined ACD&PCD	PCD alone
● Effectiveness		
- population	425,931	449,769
- newly case detected	19	8
- expected no. of newly case detected if populations are 100,000	(100,000*19)/425,931= 4.46	(100,000*8)/449,769= 1.78
● Costs (Baht)		
- unit cost per person	747,461.83/425,931= 1.75	599,721.80/449,769= 1.33
- total cost	175,000	133,000
● C/E ratio (Baht)	9,210.53	16,625
● US$	232.06	418.87

In Tables 5.9 and Table 5.10, if the population is the same, 100,000 population and expected number of newly case detected and cost-effectiveness ratio are calculated. In this case, the result of non-endemic and endemic areas not changed significant, the C/E ratio of combined ACD&PCD in non-endemic area is 1.9 times higher than endemic area and the C/E ratio of PCD alone in non-endemic area is 1.1 times higher than endemic area.

Cost-effectiveness analysis of case finding activities from provider' perspective

In this study, cost of each method of case finding activities is calculated from the provider's perspective as well as the patient's perspective.

The total cost of combined ACD and PCD and PCD alone method from the provider' perspective in each area is shown in Table 5.6

The total costs of combined ACD and PCD method are higher than the total costs of PCD alone method in all DPCRs, except in DPCR11, where the total cost of PCD alone is higher than the total cost of combined ACD and PCD. This is because the personnel cost of staffs in provincial hospital (different level of salary and fringe benefit)

is higher than that of the other regions and differences in time spent between the community hospital and the provincial hospital.

When I analyze the C/E (cost-effectiveness is a form of economic analysis that compares the relative costs and outcomes (effect) of two case finding methods. C/E ratio calculated by dividing the total costs for each method by number of new cases detected by each method) ratio of combined ACD and PCD versus PCD alone method between non-endemic and endemic areas, I found that in non-endemic areas it is higher than in endemic areas. The reason is that, in endemic areas many case stay in that area and the cases are detected easily by doing PCD alone method, but in non-endemic areas, even though the leprosy program finds the case actively, the cases are not as many as are found in endemic areas, because many case did not stayed in that area.

The number of newly detected cases and the number of newly detected cases with disability grade 2 for study areas during the year of 2006 is shown in Table 5.4. The cost effectiveness of case finding activities for each DPCR from provider's perspective is shown in Table 5.7

According to the data, newly detected cases from combined ACD and PCD is 2.2 times higher than the total cost of PCD alone method. It indicates that combined ACD and PCD successfully detected a large number of cases. Especially the ACD method (by using rapid village survey) found earlier cases of leprosy with no disabilities, backlog cases, and a <u>fast method of case finding with in a relatively short period </u>of time and increase awareness of the disease in the community.

5.3 Analyzing costs and effectiveness (Patient's perspective).

5.3.1. Calculation of costs for each method of case finding activities.

Total cost for each method of case finding activities are shown in Table 5.11. The detailed calculation of total costs for case finding activities from patient's perspective is shown in Appendix 6.

Table 5.11 Total costs of case finding activity in each area. (Patient's perspective)

Area	Total costs	
	Combined ACD and PCD (Baht)	PCD alone (Baht)
Non-endemic:		
DPCR 4	1,220	520
DPCR 8	976	1,096
DPCR 11	3,149	1,380
Total	5,345	2,996
Endemic:		
DPCR 5	60	2,108
DPCR 6	0	0[14]
DPCR 7	160	340
DPCR 10	1,049	0[15]
Total	1,269	2,448

5.3.2. Calculation of cost-effectiveness for each method of case finding activities (Patient's perspective).

The costs and effectiveness for each method of case finding activity from patient point of view is calculated by equation explained in chapter 4.

The cost-effectiveness of different case finding activities across different areas is shown in Table 5.12.

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[14] DPCR 6: No newly detected case may be due to: 1. their carried out by RVS in last year (2005) in the same district, [it is target of core leprosy control activity for RVS (DDC, 2005): every village is any indicator of leprosy epidemiological, survey 1 time/year consecutive 5 year, i.e. the survey is repeated the same area for 5 consecutive years as a result in some years may not newly detected case] 2. No case stays in area. 3. Providing health education and public relation did not cover the target group. 4. Inadequate skill of health provider in screening of suspected case. 5. Unreported cases because of stigma.(Brakel WH Van,2006)

[15] DPCR 10: 1 newly detected case in PCD alone but not interviewed because she went to other province, therefore; we could not calculate the patient's cost.

Table 5.12 Cost-effectiveness of case finding activities in each area

Area	Method	Cost (Baht)	Poverty line* (Baht/person/ month)	No. of patient interviewed	C/E (Baht)	US$
Non-endemic:						
DPCR 4	- Combined ACD&PCD	1,220	Nakhon Pathom 1,434	2	610	15.37
	- PCD alone	520		1	520	13.10
DPCR 8	- Combined ACD&PCD	976	Nakhon Sawan 1,267	8	122	3.07
	- PCD alone	1,096		3	365.33	9.20
DPCR 11	- Combined ACD&PCD	3,149	Surat Thani 1,388	5	629.80	15.87
	- PCD alone	1,380		3	460	11.59
Total	- Combined ACD&PCD	5,345		15	1,361.18	34.31
	- PCD alone	2,996		7	1,345.33	33.90
Endemic:						
DPCR 5	- Combined ACD&PCD	60	Buriram 1,215	2	30	0.76
	- PCD alone	2,108		3	702.67	17.70
DPCR 6	- Combined ACD&PCD	0	Nong Khai 1,248	0	0	0
	- PCD alone	0		0	0	0
DPCR 7	- Combined ACD&PCD	160	Sisaket 1,209	6	26.67	0.67
	- PCD alone	340		3	113.33	2.86
DPCR 10	- Combined ACD&PCD	1,049	Chiang Mai 1,320	6	174.83	4.40
	- PCD alone	0		0	0	0

Area	Method	Cost (Baht)	Poverty line* (Baht/person/ month)	No. of patient interviewed	C/E (Baht)	US$
Total	- Combined ACD&PCD	1,269		14	231.50	5.83
	- PCD alone	2,448		6	816	20.56

* Source: Office of the National Economic and Social Development Board

Table 5.12 shows the cost of patients for case finding activities compared with the poverty line (a level of personal income defining the state of poverty) in each province.

In DPCR4, the poverty line of Nakhon Pathom province is 1,434 Baht/person/month, the cost effectiveness of patient for case finding activities in combined ACD and PCD was 610 Baht (42.5% of poverty line), in PCD alone was 520 Baht (36.26% of poverty line). The cost effectiveness of patient for case finding activities in combined ACD and PCD is higher than PCD alone method. This is because the patient's time cost of combined ACD and PCD is higher than PCD alone method.

In DPCR8, the poverty line of Nakhon Sawan province is 1,267 Baht/person/month, the cost effectiveness of patient for case finding activities in combined ACD and PCD was 122 Baht (9.6% of poverty line), in PCD alone was 365.33 Baht (28.8% of poverty line). The cost effectiveness of patient for case finding activities in PCD alone is higher than in combined ACD and PCD method. This is because the patient's traveling cost of PCD alone is higher than combined ACD and PCD method.

In DPCR11, the poverty line of Surat Thani province is 1,388 Baht/person/month, the cost effectiveness of patient for case finding activities in combined ACD and PCD was 629.8 Baht (45.4% of poverty line), in PCD alone was 460 Baht (33.2% of poverty line). The cost effectiveness of patient for case finding activities in combined ACD and PCD is higher than in PCD alone method. This is because the patient's traveling cost of combined ACD and PCD is higher than PCD alone method.

In DPCR5, the poverty line of Buriram province is 1,215 Baht/person/month, the cost effectiveness of patient for case finding activities in combined ACD and PCD was 30 Baht (2.5% of poverty line), in PCD alone was 702.67 Baht (57.8% of poverty line). The cost effectiveness of patient for case finding activities in PCD alone is higher than in combined ACD and PCD method. This is because the patient's time cost, the patient's traveling cost, the relative's time cost, and the relative's traveling cost of PCD alone are higher than combined ACD and PCD method.

In DPCR6, the poverty line of Nong Khai province is 1,248 Baht/person/month, we can not calculate the cost effectiveness because no newly detected case.

In DPCR7, the poverty line of Sisaket province is 1,209 Baht/person/month, the cost effectiveness of patient for case finding activities in combined ACD and PCD was 26.67 Baht (2.2% of poverty line), in PCD alone was 113.3 Baht (9.4% of poverty line). The cost effectiveness of patient for case finding activities in PCD alone is higher than in combined ACD and PCD method. This is because the patient's traveling cost of PCD alone is higher than combined ACD and PCD method.

In DPCR10, the poverty line of Chiang Mai province is 1,320 Baht/person/month, the cost effectiveness of patient for case finding activities in combined ACD and PCD was 174.83 Baht (13.2% of poverty line), in PCD alone was 0 Baht because no patient interviewed.

The cost effectiveness ratio of combined ACD and PCD method in DPCR11 (Surat Thani province), is higher than other region; this is because the patients went to the hospital by private vehicle, most of them are wealthy people, who own rubber plantations. In DPCR5 (Buriram province), the cost effectiveness ratio of PCD alone method is higher than other region; the reason is the patients went to the hospital by the hired car in the village, and preferred to travel to provincial hospital more than health center because of their confidence in diagnosis and treatment of provincial hospital.

In each area, intangible costs (stigma of leprosy) are excluded as mentioned earlier.

Cost-effectiveness analysis of case finding activities from patient's perspective

When I analyze the cost-effectiveness of combined ACD and PCD method versus PCD alone method, in DPCR 8, 5, and 7 the cost-effectiveness of PCD alone was 3, 23.4, and 4.2 times higher than combined ACD and PCD method. In DPCR4 and 11 the cost-effectiveness of combined ACD and PCD was 1.2 and 1.4 times higher than PCD alone method respectively. For DPCR6, we could not analyze cost-effectiveness because no newly case detected. In DPCR10, we could not calculate the patient' cost because 1 newly detected case in PCD alone method but not interviewed, because she went to other province When we compare the cost-effectiveness from patient perspective among endemic area, in non-endemic area the cost-effectiveness was 2.6 times higher than endemic area. It depends on income of patient and relative.

5.4 Sensitivity Analysis of social mobilization

In this study, the social mobilization (during Raj Pracha Samasai week or National leprosy awareness week) covers 9% to 24% by the total number of villages in one district. <u>These numbers are only made by assumption</u> (from the providers interviewed). Therefore, we need to do a sensitivity analysis. If we change the number of villages which are covered by social mobilization, there will be a change in cost-effectiveness ratio in each area from provider perspective. Detailed cost calculation is shown in Appendix 7. The cost-effectiveness ratio of combined ACD and PCD method is shown in Table 5.13, and PCD alone method, is shown in Table 5.14.

Table 5.13 Sensitivity analysis of social mobilization in combined ACD and PCD

The coverage of village	Cost-effectiveness ratio (Baht)						
	Non-endemic			Endemic			
	DPCR4	DPCR8	DPCR11	DPCR5	DPCR6	DPCR7	DPCR10
50%	142,813	20,634	63,505	59,565	-	24,007	28,849
75%	144,850	22,377	76,438	65,057	-	24,535	29,103
100%	146,888	24,121	89,372	70,549	-	25,062	29,358

Table 5.14 Sensitivity analysis of social mobilization in PCD alone

The coverage of village	Cost-effectiveness ratio (Baht)						
	Non-endemic			Endemic			
	DPCR4	DPCR8	DPCR11	DPCR5	DPCR6	DPCR7	DPCR10
50%	137,931	41,377	123,120	41,219	-	67,945	187,474
75%	141,342	44,142	125,680	43,748	-	75,944	207,224
100%	144,753	46,910	128,241	46,277	-	83,944	226,974

The social mobilization (during Raj Pracha Samasai week or National leprosy awareness week) covers 9% to 24% of the total number of villages in one district; the total cost and cost-effectiveness ratio for provider's perspective.

In the combined ACD and PCD method

If we expanded the coverage of the village by social mobilization up to 50% in each area, then in non-endemic areas, DPCR4, DPCR8, and DPCR11, 142,813 Baht, 20,634 Baht, and 63,505 Baht / detected case would be needed respectively. In endemic areas, DPCR5, DPCR7, and DPCR10, 59,565 Baht, 24,007 Baht, and 28,849 Baht / detected case would be needed respectively. It means that if we want to expand the coverage of village by social mobilization up to 50% in combined ACD and PCD method, we have to pay 142,813 baht more in DPCR4, 20,634 baht more in DPCR8, 63,505 baht more in DPCR 11, 59,565 baht more in DPCR5, 24,007 baht more in DPCR7, and 28,849 baht more in DPCR 10 per detected case.

If we expanded the coverage of the village by social mobilization from 50% to 75% in each area, then in non-endemic areas, DPCR4, DPCR8, and DPCR11, 144,850 Baht, 22,377 Baht, and 76,438 Baht / detected case would be needed respectively. In endemic areas, DPCR5, DPCR7, and DPCR10 65,057 Baht, 24,535 Baht, and 29,103 Baht/ detected case would be needed respectively. It means that if we want to expand the coverage of village by social mobilization up to 75% in combined ACD and PCD method, we have to pay 144,850 baht more in DPCR4, 22,377 baht more in DPCR8, 76,438 baht more in DPCR 11, 65,057 baht more in DPCR5, 24,535 baht more in DPCR 7, and 29,103 baht in DPCR10 per detected case.

If we expanded the coverage of the village by social mobilization from 75% to 100% in each area, then in non-endemic areas, DPCR4, DPCR8, and DPCR11, 146,888 Baht, 24,121 Baht, and 89,372 Baht / detected case would be needed respectively. In endemic areas, DPCR5, DPCR7, and DPCR10, 70,549 Baht, 25,062 Baht, and 29,358 Baht / detected case would be needed respectively. If we want to expand the coverage of village by social mobilization up to 100% in combined ACD and PCD method, we have to pay 146,888 baht more in DPCR4, 24,121 baht more in DPCR8, 89,372 baht more in DPCR 11, 70,549 baht more in DPCR5, 25,062 baht more in DPCR 7, and 29,358 baht in DPCR10 per detected case.

In PCD alone method

If we expanded the coverage of the village by social mobilization up to 50% in each area, then in non-endemic areas, DPCR4, DPCR8, and DPCR11, 137,931 Baht, 41,377 Baht, and 123,120 Baht / detected case would be needed respectively. In endemic areas, DPCR5, DPCR7, and DPCR10, 41,219 Baht, 67,945 Baht, and 187,474 Baht / detected case would be needed respectively. It mean that if we want to expand the coverage of village by social mobilization up to 50% in PCD alone method, we have to pay 137,931 baht more in DPCR4, 41,377 baht more in DPCR8, 123,120 baht more in DPCR 11, 41,219 baht more in DPCR5, 67,945 baht more, and 187,474 baht more in DPCR 10 per detected case.

If we expanded the coverage of the village by social mobilization from 50% to 75% in each area, then in non-endemic areas, DPCR4, DPCR8, and DPCR11, 141,342 Baht, 44,142 Baht, and 125,680 Baht / detected case would be needed respectively. In endemic areas, DPCR5, DPCR7, and DPCR10, 43,748 Baht, 75,944 Baht, and 207,224 Baht / detected case would be needed respectively. It mean that if we want to expand the coverage of village by social mobilization up to 75% in PCD alone method, we have to pay 141,342 baht more in DPCR4, 44,142 baht more in DPCR8, 125,680 baht more in DPCR 11, 43,748 baht more in DPCR5, 75,944 baht more in DPCR 7, and 207,224 baht in DPCR10 per detected case.

If we expanded the coverage of the village by social mobilization from 75% to 100% in each area, then in non-endemic areas, DPCR4, DPCR8, and DPCR11, 144,753 Baht, 46,910 Baht, and 128,241 Baht / detected case would be needed respectively. In endemic areas, DPCR5, DPCR7, and DPCR10, 46,277 Baht, 83,944

Baht, and 226,974 Baht / detected case would be needed respectively. It mean that if we want to expand the coverage of village by social mobilization up to 100% in PCD alone method, we have to pay 144,753 baht more in DPCR4, 46,910 baht more in DPCR8, 128,241 baht more in DPCR 11, 46,277 baht more in DPCR5, 83,944 baht more in DPCR 7, and 226,974 baht in DPCR10 per detected case.

For DPCR6, we could not calculate the cost-effectiveness ratio because no newly case detected.

Therefore; the health providers can use the solution for proper and efficient planning in the social mobilization activities as described in Section 6.3.

5.5 Weighted calculation of cost-effectiveness ratio of combined ACD & PCD versus PCD alone.

When we use weighed calculation as shown in Appendix9, in which two case finding methods are implemented, the cost-effectiveness analysis of combined ACD and PCD versus. PCD alone method in non-endemic areas, endemic areas and region level are shown in Table 5.16.

The detailed calculation of the cost-effectiveness of total cost for case finding activities from patient's perspective and provider's perspective is shown in Appendix 9.

Table 5.15 The cost-effectiveness ratio of case finding activities for each region before use weight calculation.

Area	Studied provinces	Studied districts				No. of Patients interviewed (N = n)				Total of patients interviewed	Cost/1 case (Baht)	
		ACD&PCD		PCD alone		ACD&PCD		PCD alone			ACD&PCD	PCD alone
		N	n	N	n	N	n	N	n			
Non-endemic: (7Regions)												
DPCR4	Nakhon Pathom	2	1	7	1	2	2	1	1	3	140,244	133,676
DPCR8	Nakhon Swan	2	1	15	1	8	8	3	3	11	18,314	37,974
DPCR11	Surat Thani	1	1	19	1	5	5	3	3	8	48,098	120,916
Total	**3 provinces**	**5**	**3**	**41**	**3**	**15**	**15**	**7**	**7**	**22**	**206,656**	**292,566**
Endemic: (4 Regions)												
DPCR5	Buriram	8	1	23	1	2	2	3	3	5	50,808	37,773
DPCR6	Nong Khai	4	1	17	1	0	0	0	0	0	-*	-*
DPCR7	Sisaket	1	1	22	1	6	6	3	3	9	23,169	55,899
DPCR10	Chiang Mai	1	1	24	1	6	6	0	0	6	28,678	160,614
Total	**4 provinces**	**14**	**4**	**86**	**4**	**14**	**14**	**6**	**6**	**20**	**102,655**	**254,286**
Grand Total	**7 Provinces**	**18**	**7**	**127**	**7**	**29**	**29**	**13**	**13**	**42**	**309,311**	**546,852**

* DPCR6: no newly detected case, but the total cost of provider's perspective in ACD&PCD is 159,691 Baht; in PCD alone is 123,467 Baht.

Table 5.16 The cost-effectiveness ratio of two case finding method in each level by use weighed calculation.

Level	C/E ratio	
	ACD & PCD (Baht)	**PCD alone** (Baht)
Non-endemic	73,041.20	92,749.90
Endemic	78,362.50	93,630.60
Region	74,976.22	93,070.15

In Table 5.16, we use weighted calculation the number of newly case detected and cost-effectiveness ratio are calculated. In this case, both non-endemic and endemic area, the C/E ratio of PCD alone is 1.3 times and 1.2 times higher than combined ACD & PCD method respectively. In region level, the C/E ratio of PCD alone is 1.24 times higher than combined ACD & PCD method.

When we use weighted calculation, results from the used weight found that the previous result do not differ from those used weight. Namely, before used weight calculation, both non-endemic and endemic area, the C/E ratio of PCD alone is 2.2 times and 1.9 times higher than combined ACD & PCD method respectively. When we use weighted calculation, both non-endemic and endemic area, the C/E ratio of PCD alone is 1.3 times and 1.2 times higher than combined ACD & PCD method respectively.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions:

The total cost from provider perspective of combined ACD and PCD method was 1,427,800.23 Baht. The number of 35 newly detected cases was found. The cost-effectiveness ratio was 40,794.29 Baht. The total cost from provider perspective of PCD alone method was 1,340,230.20 Baht, it found out 16 newly detected cases. The cost-effectiveness ratio was 83,764.39 Baht. A study of the cost-effectiveness of new leprosy case finding between the rapid village survey and by community leaders in Huayrat district, Buriram province and Thailand by Manitsirikul S. et.al., (2001) indicates that the total cost of RVS at 58,586.95 Baht for 3 newly detected leprosy cases (1 case per 19,528.90 Baht), the total cost of case finding method by community leaders at 16,409 Baht but could not find new case. This finding may increased the cost from inflation with yet another reason.

I analyzed the cost-effectiveness ratio (from provider perspective) of combined ACD and PCD versus. PCD alone method between non-endemic and endemic areas. In non-endemic areas, the cost-effective ratio of PCD alone is 2.2 times higher than the cost-effective ratio of combined ACD and PCD method, and the cost-effective ratio of PCD alone in endemic area is 1.9 times higher than the cost-effective ratio of combined ACD and PCD method, because the number of newly detected cases in endemic areas is more than the number of newly detected case in non-endemic areas.

The total costs from a patient perspective are similar in both methods. In non-endemic areas, they are 2.2 times higher than in endemic areas. The cost-effectiveness ratio of the combined ACD and PCD method in non-endemic areas and in endemic areas was 1,361.18 Baht and 231.50 Baht respectively. The cost-effectiveness ratio of the PCD alone method in non-endemic areas was 1,345.33 Baht and in endemic areas 816 Baht.

When I use a weighed calculation, in non-endemic area, the cost-effectiveness ratio of combined ACD & PCD is 73,041.20 Baht and of PCD alone is 92,749.90 Baht. In endemic area, the cost-effectiveness ratio of combined ACD & PCD is 78,362.20 Baht and of PCD alone is 93,630.60 Baht. At the regional level, the cost-effectiveness ratio of combined ACD and PCD is 74,976.22 Baht and PCD alone is 93,070.15 Baht. It mean that the cost-effectiveness ratio of PCD alone method is 1.27, 1.19, and 1.24 times is higher than combined ACD & PCD method in non-endemic area, endemic area, and region level respectively.

Therefore the study concludes that the combined ACD and PCD method successfully detected more number of cases than PCD alone method. At the time of detecting by ACD, 8.7% cases had disability grade 2. This may be a reflection of a delay in case detection of PCD alone method. This result is similar to the study by Schreuder, P.A.M. et al. (2002), who studied a comparative of rapid village survey and Leprosy Elimination Campaign detected methods in districts of East Java, Indonesia. They found that "There is still a serious delay in detecting new cases under the routine programme". And the report on the economics of early leprosy case detection using the data from Thailand by Kaewsonthi and others (1995), found that rapid village survey and contact survey are viable actions, economically, to finding early case detection.

6.2 Limitation of the study:

The facts are the weakness of this methodological study because of some constraints in the real situation.

- Since this study was conducted under the time frame constraint, some data and information were not available as per needed, especially for capital item. There was not much information system to record all major equipments, building cost and vehicle cost. Because most of the health center are more than 20-30 year duration.

- The cost incurred by national leprosy program to provide supervision and monitoring was not calculated in this study.

- Recall bias of the primary data from patient and provider side.

- The two compared methods; combined ACD and PCD and PCD alone method; were carried out under different setting.

- We can not measure intangible costs (stigma of leprosy).

- The study result is difficult to be generalized.

- Some data are still missing. I have to omit some data, for example, in the case of capital cost, purchased dates or values of equipment or building are not recorded.

- Lack of a good data collection system.

6.3 Policy implication:

The study concludes that the combined ACD and PCD method is more cost-effective than the PCD alone method. According to the results explained earlier, the combined ACD and PCD method should be given more priority especially in endemic areas. Therefore, the allocation of the budget for case finding activities should take endemicity of targeted areas into consideration.

There is no doubt that the combined ACD and PCD method is the cost-effectiveness case finding activity to find out backlog (hidden cases) (such as ignorance of the signs and symptoms of disease, lack of skill among general medical practitioners in diagnosing leprosy, the social stigma attached to the disease, low accessibility and affordability of health services, and certain cultural beliefs and practices) in the community.

The policy maker of national leprosy programme should use the solution provided in this study as reference information to conduct the social mobilization activities (during Raj Pracha Samasai week or National leprosy awareness week). Important in this respect are the results from the sensitivity analysis, which show that if the social mobilization is carried out in all villages (100%) coverage, the cost will be higher than conducting only 50% or 75% of the all villages.

Therefore, authorities concerned may consider covering only 50% or 75% of the target areas. But it should be kept in mind that the outcome of this activity is not only the number of newly detected leprosy case but also the leprosy awareness of the community.

6.4 Possible Extensions

The following studies are recommended to fill the gap of information and to strengthen research activity.

- Study for productivity loss due to disability caused by leprosy in Thailand.

- Study the costs and benefits therefore the benefit is in term of cost saving for early case detection of supplier side and consumer side.

- Study cost-effectiveness analysis by using DALY, to measure of the burden of disease.

- The economic evaluation of community based rehabilitation to the care of leprosy patient with disability.

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APPENDICES

Appendix 1

Check List for Determining Provider Costs

Part I Check List for data collection at National level, Disease Prevention and Control

Region (DPCR).

(A) Costs for Building

1. Building price ………Baht
2. Expected years of useful life ………Years
3. Maintenance costs for building ………Baht/Year
4. Number of total OPD patient …….No./Year
5. Number of leprosy patient who were diagnosed at OPD ……..No./Year

(B) Costs for Equipment

6. Equipment price ……... Baht
7. Expected years of useful life …….. Years
8. Maintenance costs for equipment ………Baht/Year

(C) Costs for Vehicle

9. Vehicle price ……... Baht
10. Expected years of useful life …….. Years
11. Maintenance costs for vehicle ………Baht/Year

Health Personnel ID…………………

Place…………………………………

Part II   Health Personnel Costs

1. How much salary have you received? …... Baht/month
2. How much fringe benefit have you got other than salary?……. Baht/year

3. How many minutes do you spend for diagnosis of leprosy

 patient for doing PCD activities? …… min./patient

4. How many hours have you spent for doing contact examination? …….hr./year

5. How many hours have you spent for doing school examination? …….hr./year

6. How many hours have you spent for doing rapid village survey? …….hr./year

7. How much traveling costs for doing contact examination activity? …….Baht/day

8. How many days have you done contact examination within one

 year? …….days/year

9. How much traveling costs for doing school examination within one

 year? …….Baht/year

10. How much traveling costs for doing rapid village survey within one

 year? …….Baht/year

Part III   Material Costs

1. Did the patients need to be diagnosed by microscope? [   ]

 (1) No

 (2) Yes

 If yes,

2. How many numbers of material used for the diagnosis of leprosy with in one

 year?

 2.1 Glass slide ………..No./year

 2.2 Reagent ………..No./year

 2.3 Sterile knife ………..No./year

3. How many times used for diagnosis with microscope for various control activities?

 3.1 Leprosy ………times/year

 3.2 Tuberculosis ………times/year

 3.3 Other diseases ………times/year

4. How many paper used for diagnosis of leprosy

 (number of paper / patient)? ………..No./patient

5. How many pens used for out patient clinic? [   ]

 5.1 One pen/10 patients

 5.2 One pen/15 patients

 5.3 One pen/20 patients

Part IV Costs for Training program

   1.   Costs for per diem (person x days)   ……Baht/Year

   2.   Traveling allowance   …….Baht/Year

   3.   Costs for training material   …….Baht/Year

Part V Costs for Social Mobilization

   1. Costs for posters and pamphlets   ………Baht/Year

   2. Costs for giving health education about leprosy   ………Baht/Year

      (i.e. cost for car rent, cost of screening for village health volunteer, etc.)

   3. How much did you spend for traveling to give health education about

      leprosy? (personnel from control program only)   ………Baht/year

   4. How often did you give health education?   ………times/year

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Source: Aye SS.(1996)

Questionnaire for Patient Interview

Patient ID ……………………………

Interviewer's name ……………………………………………….

Place …………………………………………………………………………………...

I. General Information

1. Sex   [   ]

   (1) Male

   (2) Female

2. Age (complete year)   [   ]

3. Level of education   [   ]

4. Occupation   [   ]

   (1) Dependent

   (2) Manual worker

   (3) Private business

   (4) Government service personnel

5. Distance between your residence and the clinics (in kilometer)   [   ]

II. Costs Information

- **For the patients who diagnosed by PCD method**

  1. How much patients who pay for traveling to the clinic to seek diagnosis of the disease?   …………Baht

  2. How much do you have to pay for your registration in this clinic?   …………Baht

  3. How much have you spent for food while you are traveling to the clinic and seeking diagnosis in this clinic?   …………Baht

  4. Have you taken a leave of absence from your work?   [   ]

     (1) No

     (2) yes

If yes,

5. What is your income? ………Baht/month

6. Do you go there alone or with another person accompanying? [　]

(1) Alone

(2) Accompanied

If you come with accompanying person,

7. How much did he/she pay for traveling to the clinic? ………..Baht

8. How much did he/she spend for food while traveling to the clinic and while you are seeking diagnosis in this clinic? ………..Baht

9. Did he/she take a leave of absence from his/her work? [　]

(1) No

(2) Yes

If yes,

10. What is his/her income? …….Baht/month

11. Do you have to pay the person for accompanying with you for diagnosis of the disease? [　]

(1) No

(2) Yes

If yes,

12. How much have you spent for paying that person? ………..Baht

- **For the patients who diagnosed by ACD method**

1. By which method of ACD had the patient been diagnosed? [　]

(1) RVS

(2) Contact examination

(3) School examination

- **For the patients who were diagnosed by RVS**

2. How much did you spend for traveling to that area? ………….Baht

3. How much did you spend for food while you were traveling to that area and seeking diagnosis for the disease? ………………..Baht

4. Had you taken a leave of absence from your work? [　]

(1) No

(2) Yes

If yes,

5. What is your income? ………Baht/month

6. Do you go there alone or with another person accompanying? [ ]

    (1) Alone

    (2) Accompanied

If you come with accompanying person,

7. How much did he/she pay for traveling to the clinic? ………..Baht

8. How much did he/she spend for food while traveling to the clinic and

    while you are seeking diagnosis in this clinic? ………..Baht

9. Did he/she take a leave of absence from his/her work? [ ]

    (1) No

    (2) Yes

If yes,

10. What is his/her income? …….Baht/month

11. Do you have to pay the person for accompanying with you for diagnosis

    of the disease? [ ]

    (1) No

    (2) Yes

If yes,

12. How much have you spent for paying that person? ………..Baht

- **For the patients who were diagnosed by contact examination.**

    13. Had you taken a leave of absence from your work? [ ]

        (1) No

        (2) Yes

If yes,

14. What is your income? ………Baht/month

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Appendix 3

Consent Form

(For patient)

Explanation:

My name is Weena Primkaew. I'm studying Master of Science in Health Economic at Chulalongkorn University. May I interview you about health expenditure in order to determine about "Cost-effectiveness analysis of combined active and passive versus passive leprosy case detection alone in Thailand". The information from this study will benefit to the policy maker. According to the results of the study, they can decide most efficient way of resource allocation for case detection activities in Leprosy Elimination Program.

I promise to follow these messages:

1. Your information, I keep it as the top secret.
2. You have the right to change your mind at any time which this study is operating, including after your signed this form.
3. I confirm that your information are not impact or risk to you.

If you have problem, contact:

Miss Weena Primkaew

Raj Pracha Samasai Institute, Department of disease control,

Muang district, Nonthaburi 11000

Phone number : 02 5903330

Confirmation of consent: Date ………/………………/………….

I understand the explanation about the objectives, methodology and benefit of this study.

The researcher answers the doubtful point with willingly, no hidden until I satisfied.

I joined this study voluntarily. And may terminate or withdraw from the study at any time. In any case, I will not participate or withdraw from the study of this later. It will not affect to prevention and treatment of disease.

Ensure that the research will collect information about me to disclose confidential information in a summary of research. Or disclosure of the related support functions / monitoring this study only.

I have read a description in the consent form of this study, and the researcher answered the doubtful point with willingly, no hidden until I satisfied. I understand all the reasons that it has signed and agree with satisfaction.

Signed……………………………………….The consent

Signed……………………………………….The researcher

Signed……………………………………….Witness

I'm illiterate, the researcher explained the content of this study, including the consent form and I understand the doubtful points. I have a good understanding have all signed and assigned representatives signed a consent form willingly.

Signed……………………………………….The consent/the representative

Signed……………………………………….The researcher

I am immature. Dependent parents have read or the researchers, who have explained the content and the consent form of this study, agree with willingness and answer to all questions fully with understanding all and signed to agree for participating with this study willingly.

Signed……………………………………….The parent/parent in law

Signed……………………………………….The researcher

Signed……………………………………….Witness

****

Appendix 4

Consent Form

(For health provider)

Explanation:

My name is Weena Primkaew. I'm studying Master of science in Health Economic at Chulalongkorn University. May I interview you about costs of leprosy case finding activities in order to determine about "Cost-effectiveness analysis of combined active and passive versus passive leprosy case detection alone in Thailand". The information from this study will benefit to the policy maker. According to the results of the study, they can decide most efficient way of resource allocation for case detection activities in Leprosy Elimination Program.

I promise to follow these messages:

1. Your information, I keep it as the top secret.

2. You have the right to change your mind at any time which this study is operating, including after your signed this form.

3. I confirm that your information is not impact or risk to you.

If you have problem, contact:

Miss Weena Primkaew

Raj Pracha Samasai Institute, Department of disease control,

Muang district, Nonthaburi 11000

Phone number : 02 5903330

Confirmation of consent: Date ………/………………/………….

I understand the explanation about the objectives, methodology and benefit of this study.

The researcher answers the doubtful point with willingly, no hidden until I satisfied.

I joined this study voluntarily. And may terminate or withdraw from the study at any time. In any case, I will not participate or withdraw from the study of this later. It will not affect on me any.

Ensure that the research will collect information about me to disclose confidential information in a summary of research. Or disclosure of the related support functions / monitoring this study only.

I have read a description in the consent form of this study, and the researcher answers the doubtful point with willingly, no hidden until I satisfied. I understand all the reasons that it has signed and agree with satisfaction.

Signed…………………………………..The consent

Signed…………………………………….The researcher

Signed…………………………………….Witness

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Appendix 5

Calculation of costs for each method of case finding activity

(Provider perspective)

The total costs for each method of case finding activity are calculated by equation explained in Chapter 4. The total provider costs for combined ACD and PCD, and PCD alone are found out by using equation 7 and 8 respectively. In this study, we calculated only the recurrent costs, because of time constraint and limitation of data available.

Personnel Costs for doing combined ACD and PCD

This cost item is calculated from equation1 which is explained in Chapter 4. The total annual income of health personnel got from summation of annual salary fringe benefit (received salaries and fringe benefit from the government). The data for annual salary available from secondary data source. For fringe benefit primary data source. The number of health personnel got from manpower list in that area.

In combined ACD and PCD method, there are two activities, one is ACD and another one is PCD. In this case, the calculated time spent is following:

The proportion time spent on doing ACD is calculated by following

Total working hour for one year
6 hours*22 days* 12 month = 1584 hours

For RVS.

DPCR4: The health personnel (everybody) spent only 12 hours per year. They have also done this activity only once per year.

$$p = \frac{12}{1584} = 0.0076$$

p = Proportion time spent on doing ACD

DPCR8: The health personnel spent only 20 hours per year. They have also done this activity only once per year.

$$p = \frac{20}{1584} = 0.0126$$

p = Proportion time spent on doing ACD

DPCR11: The health personnel spent only 18 hours per year. They have also done this activity only once per year.

$$p = \frac{18}{1584} = 0.0114$$

p = Proportion time spent on doing ACD

DPCR5: The health personnel spent only 48 hours per year. They have also done this activity only once per year.

$$p = \frac{48}{1584} = 0.0303$$

p = Proportion time spent on doing ACD

DPCR6: The health personnel spent only 6 hours per year. They have also done this activity only once per year.

$$p = \frac{6}{1584} = 0.0038$$

p = Proportion time spent on doing ACD

DPCR7: The health personnel spent 3 hours per year for first phase and 6 hours per year for second phase. They have also done this activity only once per year.

$$p = \frac{9}{1584} = 0.0057$$

p = Proportion time spent on doing ACD

DPCR10: The health personnel spent only 9 hours per year. They have also done this activity only once per year.

$$p = \frac{9}{1584} = 0.0057$$

p = Proportion time spent on doing ACD

Personnel costs for doing PCD

The method of cost calculation is same as ACD. Calculation for proportion of time spent (q) is following.

For provincial hospital:

The health personnel open the clinic every day and assumed that they used 2 hour per day for OPD activity.

2 hours * 22 days * 12 months = 528 hours

$$q = \frac{528}{1584} = 0.33$$

q = Proportion time spent on doing PCD

For community hospital:

The health personnel open the clinic 3 day per week and assumed that they used 2 hour per day for OPD activity.

6 hours * 3 days * 4 weeks *12 months = 288 hours

$$q = \frac{228}{1584} = 0.14$$

q = Proportion time spent on doing PCD

<u>Total costs for material supplies</u>

This cost item contained costs for glass slide, reagent, disposable knife for slit skin smear, paper and pen.

The routine program, there are 100% need to confirm the diagnosis by slit skin smear.

	<u>Combined ACD and PCD</u>	<u>PCD alone</u>
Non-endemic:		
DPCR 4	2 cases * 100% = 2	2 cases * 100% = 2
DPCR 8	9 cases * 100% = 9	3 cases * 100% = 3
DPCR 11	5 cases * 100% = 5	3 cases * 100% = 3
Endemic:		
DPCR 5	4 cases * 100% = 4	4 cases * 100% = 4
DPCR 6	0 case * 100% = 0	0 case * 100% = 0
DPCR 7	8 cases * 100% = 8	3 cases * 100% = 3
DPCR 10	7 cases * 100% = 7	1 case * 100% = 1

For calculation of paper cost, they used 3 pieces of paper per 1 patient to fill up the registered form, Prevention of disability recording form.

For pen, they used roughly 1 piece per 20 patients.

<u>Total cots for training program/ workshop and meeting</u>

This costs item contained per diem cost, traveling allowance and costs for training material from RPSI (national level),DPCR (regional level), and provincial level.

Total cost for training program/ workshop/ meeting

• Area	Training program	Cost for ACD+PCD (baht)	Cost for PCD alone (baht)
DPCR 4:	- by RPSI	6,870	6,870
	- by DPCR*	-	-
Total		6,870	6,870
DPCR 8:	- by RPSI	3,751	3,751
	- by DPCR	23,533	10,533
Total		27,284	14,284
DPCR11:	- by RPSI	3,232	3,232
	- by DPCR*	-	-
Total		3,232	3,232
DPCR 5:	- by RPSI	1,899	1,899
	- by DPCR	251	4,428
Total		2,150	6,327
DPCR 6:	- by RPSI	2,385	2,385
	- by DPCR*	-	-
Total		2,385	2,385
DPCR7:	- by RPSI	466	466
	- by DPCR	9,332	9,332
Total		9,798	9,798
DPCR10:	- by RPSI	17,522	17,522
	- by provincial	7,161	7,161
Total		24,683	24,683

* In 2006, DPCR 4, 6, and 11, no provided the budget for leprosy training/workshop/meeting.

Total costs for social mobilization (Raj Pracha Samasai week or National leprosy awareness week)

This costs item contained costs for transporting educational material and costs for providing health education by leprosy control personnel from RPSI (national level), DPCR (regional level), provincial level and district level.

Area	item	Cost for ACD&PCD (baht)	Cost for PCD alone (baht)
DPCR 4:	-media	1,734	2,034
	-transp. media	59	59
	-provi. health ed.	-	2,000
Total		1,793	4,093
DPCR 8:	-media	1,177	1,177
	-transp. media	38	38
	-provi. health ed.	8,200	4,100
Total		9,415	5,315
DPCR11 :	-media	846	846
	-transp. media	29	29
	-provi. health ed.	48,322	6,500
Total		49,147	7,375
DPCR 5:	-media	600	600
	-transp. media	24	24
	-provi. health ed.	8,163	3,018
Total		8,787	3,642
DPCR 6:	-media	774	774
	-transp. media	29	29
	-provi. health ed.	10,000	-
Total		10,803	803
DPCR7:	-media	691	691
	-transp. media	22	22
	-provi. health ed.	806	10,806
Total		1,519	11,519
DPCR10 :	-media	619	619
	-transp. media	21	21

	-provi. health ed.	500	12,000
Total		1,140	12,640

Total cost for RVS implementation

Area	item	Cost for ACD+PCD (baht)
DPCR 4:	-advocacy meeting	900
	-fuel	1,600
	-per diem of mobile team	1,176
	-drug	1,520
Total		5,196
DPCR 8:	-advocacy meeting	1,626
	-fuel	1,500
	-per diem of mobile team	5,624
	-drug	-
Total		8,750
DPCR11:	-advocacy meeting	25,822
	-fuel	5,600
	-per diem of mobile team	10,152
	-drug	-
Total		41,574
DPCR 5:	-advocacy meeting	18,036
	-fuel	9,000
	-per diem of mobile team	10,224
	-drug	-
Total		37,260
DPCR 6:	-advocacy meeting	6,538
	-fuel	4,200
	-per diem of mobile team	5,096
	-drug	-
Total		15,834
DPCR7:	-advocacy meeting	13,448
	-fuel	1,500

	-per diem of mobile team	1,884
	-drug	1,000
Total		17,832
DPCR10:	-advocacy meeting	26,800
	-fuel	2,765
	-per diem of mobile team	7,300
	-drug	-
Total		36,865

Personnel costs for case detection activities

Combined ACD and PCD : ACD (n=46)						
Area	No. of provider	Annual salary	Fringe benefit	Total	p	TC ACD
DPCR 4: Bang Len	4	1,194,240	129,434	1,323,674	0.0076	10,061
DPCR 8: Banphot Phisai	6	1,703,880	155,245	1,859,125	0.0126	23,425
DPCR11: Phrasaeng	9	2,314,680	111,636	2,426,313	0.0114	27,660
DPCR 5: Sateuk	5	969,960	98,504	1,068,464	0.0303	32,374
DPCR 6: Bueng Kan	7	1,626,840	223,250	1,850,090	0.0038	7,030
DPCR7: Uthumphon Phisai	10	2,560,480	171,228	2,731,708	0.0057	15,571
DPCR10: Fang	5	1,176,016	166,913	1,342,929	0.0057	7,655

Source: From primary data, author's calculation

Combined ACD and PCD: PCD						
Area	No. of provider	Annual salary	Fringe benefit	Total	q	TC
DPCR 4: Bang Len	2	612,000	183,000	795,000	0.14	111,300.00
DPCR 8: Banphot Phisai	2	492,000	197,800	689,800	0.14	96,572.00
DPCR11: Phrasaeng	2	587,760	255,200	842,960	0.14	118,014.40
DPCR 5: Sateuk	2	458,360	426,460	884,820	0.14	123,874.80
DPCR 6: Bueng Kan	2	648,000	250,200	898,200	0.14	125,748.00

| DPCR7: UthumphonPhisai | 2 | 524,040 | 480,000 | 1,004,040 | 0.14 | 140,565.60 |
| DPCR10: Fang | 2 | 459,840 | 473,304 | 933,144 | 0.14 | 130,640.16 |

Source: From primary data, author's calculation

PCD alone						
	No. of provider	Annual salary	Fringe benefit	Total	q	TC
DPCR 4: Muang NakhonPathom	2	756,000	29,500	785,500	0.33	259,215.00
DPCR 8: Phaisali	2	315,840	363,000	678,840	0.14	95,037.60
DPCR11: Muang SuratThani	2	777,960	292,000	1,069,960	0.33	353,086.80
DPCR 5: Prakhon Chai	2	597,480	400,000	997,480	0.14	139,647.20
DPCR 6: Si Chiang Mai	2	504,000	370,200	874,200	0.14	122,388.00
DPCR 7: Kantharalak	2	588,000	456,800	1,044,800	0.14	146,272.00
DPCR10: Chiang Dao	2	291,840	600,000	891,840	0.14	124,857.60

Source: From primary data, author's calculation

Total personnel cost for doing combined ACD and PCD, and PCD alone method

Area	Total personnel cost for Combined ACD and PCD	Total personnel cost for PCD alone
Non-endemic:		
DPCR 4:	269,276.00	259,215.00
DPCR 8:	119,997.00	95,037.60
DPCR11:	145,674.40	353,086.80*
Total	**534,947.40**	**707,339.40**
Endemic:		
DPCR 5:	156,248.80	139,647.20
DPCR 6:	132,778.00	122,388.00
DPCR 7:	156,136.60	146,272.00
DPCR10:	138,295.16	124,857.00
Total	**583,458.56**	**533,164.20**

  * Total personnel cost for **PCD alone** of DPCR 11 is highest; depend on the personnel cost of staffs (different level of salary and fringe benefit) that higher than those of the other regions and different of time spent between a provincial and community hospital.

Total cost for material supplies

Area	item	Unit cost (baht)	No. of ACD+PCD	No. of PCD alone	Total ACD+ PCD	Total PCD alone
DPCR 4:	-glass slide	.50	2	2	1	1
	- reagent	.50	2	2	1	1
	- disp. Knife	5.00	2	2	10	10
	- paper	10.50	2	2	21	21
	- pen	.50	2	2	1	1
Total					34.00	34.00
DPCR 8:	-glass slide	.50	9	3	4.50	1.50
	- reagent	.50	9	3	4.50	1.50
	- disp. Knife	5.00	9	3	45.00	15.00
	- paper	10.50	9	3	94.50	31.50
	- pen	.50	9	3	4.50	1.50

Total					150.00	51.00
DPCR11:	-glass slide	.50	5	3	2.50	1.50
	- reagent	.50	5	3	2.50	1.50
	- disp. Knife	5.00	5	3	25.00	15.00
	- paper	10.50	5	3	52.50	31.50
	- pen	.50	5	3	2.50	1.50
Total					85.00	51.00
DPCR 5:	-glass slide	.50	4	4	2.00	2.00
	- reagent	.50	4	4	2.00	2.00
	- disp. Knife	5.00	4	4	20.00	20.00
	- paper	10.50	4	4	42.00	42.00
	- pen	.50	4	4	2.00	2.00
Total					68.00	68.00
DPCR 6:	-glass slide	.50	0	0	0	0
	- reagent	.50	0	0	0	0
	- disp. Knife	5.00	0	0	0	0
	- paper	10.50	0	0	0	0
	- pen	.50	0	0	0	0
Total					0	0
DPCR7:	-glass slide	.50	8	3	4.00	1.50
	- reagent	.50	8	3	4.00	1.50
	- disp. Knife	5.00	8	3	40.00	15.00
	- paper	10.50	8	3	84.00	31.50
	- pen	.50	8	3	4.00	1.50
Total					136.00	51.00
DPCR10:	-glass slide	.50	7	1	3.50	.50
	- reagent	.50	7	1	3.50	.50
	- disp. Knife	5.00	7	1	35.00	5.00
	- paper	10.50	7	1	73.50	10.50
	- pen	.50	7	1	3.50	.50
Total					119.00	17.00

Items	Non-endemic			Endemic			
Total provider's cost of combined ACD and PCD method in each area:							
	DPCR 4	DPCR 8	DPCR11	DPCR 5	DPCR 6	DPCR 7	DPCR10
- Training/workshop/meeting	2,969	25,422	856	749	276	9,516	23,099
- Social mobilization (Raj Pracha Samasai week)	1,793	9,415	49,147	8,787	10,803	1,519	1,140
- Material supply	34	150	85	68	0	136	119
- RVS implementation	5,196	8,750	41,574	37,260	15,834	17,832	36,865
- personnel cost	269,276.00	119,997.00	145,674.40	156,248.80	132,778.00	156,136.60	138,295.16
Total provider cost	279,268.00	163,734.00	237,336.40	203,113.07	159,691.00	185,139.60	199,518.16
Newly detected case	2	9	5	4	0	8	7
Cost-effectiveness Ratio (Baht)	139,634.00	18,192.67	47,467.28	50,778.27	-	23,142.45	28,502.59
US$	3,518.12	458.37	1,195.95	1,279.37	-	583.08	718.13

Total provider's cost of PCD alone method in each area:

Items	Non-endemic			Endemic			
	DPCR 4	DPCR 8	DPCR11	DPCR 5	DPCR 6	DPCR 7	DPCR10
- Training/workshop/meeting	2,969	12,422	856	4,926	276	9,516	23,099
- Social mobilization (Raj Pracha Samasai week)	4,093	5,315	7,375	3,642	803	11,519	12,640
- Material supply	34	51	51	68	0	51	17
- personnel cost	259,215.00	95,037.60	353,086.80	139,647.20	122,388.00	146,272.00	124,857.60
Total provider cost	266,311.00	112,825.60	361,368.80	148,283.20	123,467.00	167.358.00	160,613.60
Newly detected case	2	3	3	4	0	3	1
Cost-effectiveness Ratio (Baht)	133,155.50	37,608.53	120,456.20	37,070.80	-	55,786.00	160,613.60
US$	3,354.89	947.56	3,034.92	934.01	-	1,405.54	4,046.70

Calculation of total costs for patient perspective

For combined ACD and PCD

There are two activities, one is active case detection (most of RVS activity) and another one is passive case detection activity.

For PCD alone

The direct costs contained traveling cost and time costs for patient. The time costs are calculated from their average wages (Only who leave and absenteeism).

Indirect costs contained traveling costs and time costs for relative who accompany with patient.

In combined ACD and PCD, 71.43 % of the patients are from ACD, and 28.57 % of the patients are from PCD (self reporting) according to primary data and secondary data from annual report of leprosy control program. The detailed calculation is the following:

Total cost for patient's perspective

DPCR 4:

- **Combined ACD and PCD**

- Direct cost ACD patient's time cost	=	1,000	baht
- Direct cost ACD patient's traveling cost	=	0	baht
- Direct cost PCD patient's time cost	=	100	baht
- Direct cost PCD patient's traveling cost	=	120	baht
- Indirect cost PCD relative's time cost	=	0	baht
- Indirect cost PCD relative's traveling cost	=	0	baht
Total	=	1,220	baht
No. of patient interviewed	=	2	cases
C/ E ratio	=	610	baht

PCD alone

- Direct cost PCD patient's time cost	=	200	baht
- Direct cost PCD patient's traveling cost	=	160	baht
- Indirect cost PCD relative's time cost	=	0	baht
- Indirect cost PCD relative's traveling cost	=	160	baht
Total	=	520	baht
No. of patient interviewed	=	1	cases
C/ E ratio	=	520	baht

DPCR 8:

Combined ACD and PCD

- Direct cost ACD patient's time cost	=	766	baht
- Direct cost ACD patient's traveling cost	=	110	baht
- Direct cost PCD patient's time cost	=	0	baht
- Direct cost PCD patient's traveling cost	=	100	baht
- Indirect cost PCD relative's time cost	=	0	baht
- Indirect cost PCD relative's traveling cost	=	0	baht
Total	=	976	baht
No. of patient interviewed	=	8	cases
C/ E ratio	=	122	baht

PCD alone

- Direct cost PCD patient's time cost	=	66	baht
- Direct cost PCD patient's traveling cost	=	830	baht
- Indirect cost PCD relative's time cost	=	200	baht
- Indirect cost PCD relative's traveling cost	=	0	baht
Total	=	1,096	baht
No. of patient interviewed	=	3	cases
C/ E ratio	=	365.33	baht

DPCR 11:

Combined ACD and PCD

- Direct cost ACD patient's time cost	=	333	baht

- Direct cost ACD patient's traveling cost	=	182	baht
- Direct cost PCD patient's time cost	=	667	baht
- Direct cost PCD patient's traveling cost	=	1,800	baht
- Indirect cost PCD relative's time cost	=	167	baht
- Indirect cost PCD relative's traveling cost	=	0	baht
Total	=	3,149	baht
No. of patient interviewed	=	5	cases
C/ E ratio	=	629.80	baht

- **PCD alone**

- Direct cost PCD patient's time cost	=	1,200	baht
- Direct cost PCD patient's traveling cost	=	180	baht
- Indirect cost PCD relative's time cost	=	0	baht
- Indirect cost PCD relative's traveling cost	=	0	baht
Total	=	1,380	baht
No. of patient interviewed	=	3	cases
C/ E ratio	=	460	baht

DPCR 5:

- **Combined ACD and PCD**

- Direct cost ACD patient's time cost	=	0	baht
- Direct cost ACD patient's traveling cost	=	0	baht
- Direct cost PCD patient's time cost	=	0	baht
- Direct cost PCD patient's traveling cost	=	60	baht
- Indirect cost PCD relative's time cost	=	0	baht
- Indirect cost PCD relative's traveling cost	=	0	baht
Total	=	60	baht
No. of patient interviewed	=	2	cases
C/ E ratio	=	30	baht

- **PCD alone**

| - Direct cost PCD patient's time cost | = | 350 | baht |
| - Direct cost PCD patient's traveling cost | = | 1,524 | baht |

- Indirect cost PCD relative's time cost	=	84	baht
- Indirect cost PCD relative's traveling cost	=	150	baht
Total	=	2,108	baht
No. of patient interviewed	=	3	cases
C/ E ratio	=	702.67	baht

DPCR 6:

- **Combined ACD and PCD**

- Direct cost ACD patient's time cost	=	0	baht
- Direct cost ACD patient's traveling cost	=	0	baht
- Direct cost PCD patient's time cost	=	0	baht
- Direct cost PCD patient's traveling cost	=	0	baht
- Indirect cost PCD relative's time cost	=	0	baht
- Indirect cost PCD relative's traveling cost	=	0	baht

- **PCD alone**

- Direct cost PCD patient's time cost	=	0	baht
- Direct cost PCD patient's traveling cost	=	0	baht
- Indirect cost PCD relative's time cost	=	0	baht
- Indirect cost PCD relative's traveling cost	=	0	baht
Total	=	0	baht
No. of patient interviewed	=	0	cases
C/ E ratio	=	0	baht

DPCR 7:

- **Combined ACD and PCD**

- Direct cost ACD patient's time cost	=	0	baht
- Direct cost ACD patient's traveling cost	=	0	baht
- Direct cost PCD patient's time cost	=	0	baht
- Direct cost PCD patient's traveling cost	=	160	baht
- Indirect cost PCD relative's time cost	=	0	baht
- Indirect cost PCD relative's traveling cost	=	0	baht
Total	=	160	baht

No. of patient interviewed	= 6	cases
C/ E ratio	= 26.67	baht

- **PCD alone**

- Direct cost PCD patient's time cost	= 0	baht
- Direct cost PCD patient's traveling cost	= 340	baht
- Indirect cost PCD relative's time cost	= 0	baht
- Indirect cost PCD relative's traveling cost	= 0	baht
Total	= 340	baht
No. of patient interviewed	= 3	cases
C/ E ratio	= 113.33	baht

DPCR 10:

- **Combined ACD and PCD**

- Direct cost ACD patient's time cost	= 0	baht
- Direct cost ACD patient's traveling cost	= 0	baht
- Direct cost PCD patient's time cost	= 100	baht
- Direct cost PCD patient's traveling cost	= 341	baht
- Indirect cost PCD relative's time cost	= 267	baht
- Indirect cost PCD relative's traveling cost	= 341	baht
Total	= 1,049	baht
No. of patient interviewed	= 6	cases
C/ E ratio	= 175	baht

- **PCD alone**

- Direct cost PCD patient's time cost	= 0	baht
- Direct cost PCD patient's traveling cost	= 0	baht
- Indirect cost PCD relative's time cost	= 0	baht
- Indirect cost PCD relative's traveling cost	= 0	baht
Total	= 0	baht
No. of patient interviewed	= 0	cases
C/ E ratio	= 0	baht

Estimation of Social Mobilization for Sensitivity Analysis

In this study, PCD method covers the 9% to 24% by of the total number of villages. These numbers are only made by assumption. Therefore, we need to do sensitivity analysis. If we change the coverage of the PCD method, there will be a change in cost-effectiveness ratio in each area from provider perspective. (The number of case detected no change.)

If we change the percentage of coverage by PCD method from 9 - 24% to 50%, 75% and up to 100%, the number of villages is shown in Table A7.

Table A7: The number of village which coverage by social mobilization

Area / District	No. of village which coverage by social mobilization			
	Estimate	50%	75%	100%
Non-endemic:				
DPCR 4:				
- Bang Len	18 (11%)	90	135	180
- Muang Nakhon Pathom	31 (15%)	108	162	217
DPCR 8:				
- Banphot Phisai	17 (15%)	58	88	117
- Phaisali	15 (16%)	50	76	101
DPCR11:				
- Phrasaeng	13 (19%)	36	54	72
- Muang Surat Thani	13 (24%)	30	44	59
Endemic:				
DPCR 5:				
- Sateuk	18 (10%)	96	143	190
- Prakhon Chai	16 (9%)	92	137	182
DPCR 6:				
- Bueng Kan	14 (12%)	66	98	131
- Si Chiang Mai	6 (16%)	22	32	43

Area / District	No. of village which coverage by social mobilization			
	Estimate	50%	75%	100%
DPCR7:				
- Uthumphon Phisai	21 (9%)	116	174	232
- Kantharalak	33 (12%)	138	207	276
DPCR10:				
- Fang	15 (16%)	52	77	102
- Chiang DAO	12 (16%)	42	62	83

Sensitivity analysis of social mobilization in each area, 50% coverage village

Table A7.1:

Total provider's cost of combined ACD and PCD method in each area:							
Items	Non-endemic			Endemic			
	DPCR 4	DPCR 8	DPCR11	DPCR 5	DPCR 6	DPCR 7	DPCR10
- Training/workshop/meeting	2,969	25,422	856	749	276	9,516	23,099
- Social mobilization (Raj Pracha Samasai week)	8,150	31,383	129,334	43,935	45,013	8,439	3,563
- Material supply	34	150	85	68	0	136	119
- RVS implementation	5,196	8,750	41,574	37,260	15,834	17,832	36,865
- personnel cost	269,276.00	119,997.00	145,674.40	156,248.80	132,778.00	156,132.60	138,295.16
Total provider cost	285,625.00	185,702.00	317,523.40	238,260.80	193,901.00	192,055.60	201,941.16
Newly detected case	2	9	5	4	0	8	7
Cost-effectiveness Ratio (Baht)	142,812.50	20,633.56	63,504.68	59,565.20	-	24,006.95	28,848.74
US$	3,598.20	519.87	1,600.02	1,500.76	-	604.86	726.85

Sensitivity analysis of social mobilization in each area, 75% coverage village

Table A7.2:

Total provider's cost of combined ACD and PCD method in each area:							
Items	**Non-endemic**			**Endemic**			
	DPCR 4	**DPCR 8**	**DPCR11**	**DPCR 5**	**DPCR 6**	**DPCR 7**	**DPCR10**
- Training/workshop/meeting	2,969	25,422	856	749	276	9,516	23,099
- Social mobilization (Raj Pracha Samasai week)	12,225	47,075	194,001	65,902	67,519	12,658	5,344
- Material supply	34	150	85	68	0	136	119
- RVS implementation	5,196	8,750	41,574	37,260	15,834	17,832	36,865
- personnel cost	269,276.00	119,997.00	145,674.40	156,248.80	132,778.00	156,132.60	138,295.16
Total provider cost	289,700.00	201,394.00	382,190.40	260,227.80	216,407.00	196,278.60	203,722.16
Newly detected case	2	9	5	4	0	8	7
Cost-effectiveness Ratio (Baht)	144,850.00	22,377.11	76,438.08	65,056.95	-	24,534.83	29,103.17
US$	3,649.53	563.80	1,925.88	1,639.13	-	618.16	733.26

Sensitivity analysis of social mobilization in each area, 100% coverage village

Table A7.3:

Total provider's cost of combined ACD and PCD method in each area:							
Items	Non-endemic			Endemic			
	DPCR 4	DPCR 8	DPCR11	DPCR 5	DPCR 6	DPCR 7	DPCR10
- Training/workshop/meeting	2,969	25,422	856	749	276	9,516	23,099
- Social mobilization (Raj Pracha Samasai week)	16,300	62,767	258,668	87,870	90,025	16,878	7,125
- Material supply	34	150	85	68	0	136	119
- RVS implementation	5,196	8,750	41,574	37,260	15,834	17,832	36,865
- personnel cost	269,276.00	119,997.00	145,674.40	156,248.80	132,778.00	156,132.60	138,295.16
Total provider cost	293,775.00	217,086.00	446,857.40	282,195.80	238913.00	200,498.60	205,503.16
Newly detected case	2	9	5	4	0	8	7
Cost-effectiveness Ratio (Baht)	146,887.50	24,120.67	89,371.48	70,548.95	-	25,062.33	29,357.59
US$	3,700.87	607.73	2,251.74	1,777.70	-	631.45	739.67

Sensitivity analysis of social mobilization in each area, 50% coverage village

Table A7.4:

Total provider's cost of PCD alone method in each area:							
Items	Non-endemic			Endemic			
	DPCR 4	DPCR 8	DPCR11	DPCR 5	DPCR 6	DPCR 7	DPCR10
- Training/workshop/meeting	2,969	12,422	856	4,926	276	9,516	23,099
- Social mobilization (Raj Pracha Samasai week)	13,643	16,609	15,365	20,233	2,509	47,996	39,500
- Material supply	34	51	51	68	0	51	17
- personnel cost	259,215.00	95,037.60	353,086.80	139,647.20	122,388.00	146,272.00	124,857.60
Total provider cost	275,861.00	124,129.60	369,358.80	164,874.20	125,173.00	203,835.00	187,473.60
Newly detected case	2	3	3	4	0	3	1
Cost-effectiveness Ratio (Baht)	137,930.50	41,376.53	123,119.60	41,218.55	-	67,945.00	187,473.60
US$	3,475.20	947.56	3,034.92	1,038.51	-	1,711.89	4,723.45

Sensitivity analysis of social mobilization in each area, 75% coverage village

Table A7.5:

Items	Non-endemic			Endemic			
Total provider's cost of PCD alone method in each area:							
	DPCR 4	DPCR 8	DPCR11	DPCR 5	DPCR 6	DPCR 7	DPCR10
- Training/workshop/meeting	2,969	12,422	856	4,926	276	9,516	23,099
- Social mobilization (Raj Pracha Samasai week)	20,465	24,914	23,047	30,350	3,764	71,994	59,250
- Material supply	34	51	51	68	0	51	17
- personnel cost	259,215.00	95,037.60	353,086.80	139,647.20	122,388.00	146,272.00	124,857.60
Total provider cost	282,683.00	132,424.60	377,040.80	174,991.20	126,428.00	227,833.00	207,223.60
Newly detected case	2	3	3	4	0	3	1
Cost-effectiveness Ratio (Baht)	141,341.50	44,141.53	125,680.27	43,747.80	-	75,944.33	207,223.60
US$	3,561.14	947.56	3,166.54	1,102.24	-	1,913.44	5,221.05

Sensitivity analysis of social mobilization in each area, 100% coverage village

Table A7.6:

Total provider's cost of PCD alone method in each area:							
Items	**Non-endemic**			**Endemic**			
	DPCR 4	**DPCR 8**	**DPCR11**	**DPCR 5**	**DPCR 6**	**DPCR 7**	**DPCR10**
- Training/workshop/meeting	2,969	12,422	856	4,926	276	9,516	23,099
- Social mobilization (Raj Pracha Samasai week)	27,287	33,219	30,729	40,467	5,019	95,992	79,000
- Material supply	34	51	51	68	0	51	17
- personnel cost	259,215.00	95,037.60	353,086.80	139,647.20	122,388.00	146,272.00	124,857.60
Total provider cost	289,505.00	140,729.60	384,722.80	185,108.20	127,683.00	251,831.00	226,973.60
Newly detected case	2	3	3	4	0	3	1
Cost-effectiveness Ratio (Baht)	144,752.50	46,909.87	128,240.93	46,277.05	-	83,943.67	226,973.60
US$	3,647.08	1,181.91	3,231.06	1,165.96	-	2,114.99	5,718.66

Chi-square test

H_O = Case detection of combined ACD and PCD method is not associated with endemic area

H_a = Case detection of combined ACD and PCD method is associated with endemic area

Chi-square test:

Area	ACD &PCD (Observed)	PCD alone (Expected)	(O-E)	$(O-E)^2$	$\dfrac{(O-E)^2}{E}$
Non-endemic	16	8	8	64	8
Endemic	19	8	11	121	15.13

$$X^2 = 23.13$$

$$X^2 = \sum \frac{(O - E)^2}{E}$$

Where: O = Observed

E = Expected

degree of freedom = (n-1)

$$X^2_{cal} = 23.13 ,$$

The table value for Chi-square in the correct box of *1 df* and p= 0.05,

level of significance is 3.84.

So we rejected the null hypothesis, accepted the alternative hypothesis. Therefore case detection of combined ACD and PCD method is associated with endemic area

Weighted calculation of the cost-effectiveness ratio of combined ACD & PCD vs. PCD alone method in each level

- **In non-endemic area** (N=7 regions, n=3 regions)

Area	ACD&PCD	PCD alone
DPCR4	140,244*	133,676*
DPCR8	18,314*	37,974*
DPCR11	48,098*	120,916*
Total	$\dfrac{140{,}244X2 + 18{,}314X2 + 48{,}098X1}{5} = \textbf{73,041.20**}$	$\dfrac{133{,}676X7 + 37{,}974X15 + 120{,}916X19}{41} = \textbf{92,749.90***}$

* cost/1case before weighted calculation in each DPCR

** the sum of cost/1case in each DPCR multiplied by no. of total district which carried out combined ACD&PCD method in each DPCR

divided by no. of total district in combined ACD&PCD method (N=5).

*** the sum of cost/1case in each DPCR multiplied by no. of total district which carried out PCD alone method in each DPCR divided by no.

of total district in PCD alone (N=41).

- **In endemic area** (N=4 regions, n=4 regions)

Area	ACD&PCD	PCD alone
DPCR5	50,808*	37,773*
DPCR6	-**	-**
DPCR7	23,169*	55,899*
DPCR10	28,678*	160,614*
Total	$\dfrac{50,808 \times 8 + 159,691^{**} \times 4 + 23,169 \times 1 + 28,678 \times 1 = \textbf{78,362.50}^{***}}{14}$	$\dfrac{37,773 \times 23 + 123,467^{**} \times 17 + 55,899 \times 22 + 160,614 \times 24 = \textbf{93,630.60}^{****}}{86}$

* cost/1case before weighted calculation in each DPCR

** DPCR6: no newly detected case, but the total cost of provider's perspective in combined ACD & PCD is 159,691 Baht, in PCD alone is 123,467 Baht.

*** the sum of cost/1case in each DPCR multiplied by no. of total district which carried out combined ACD&PCD method in each DPCR divided by no. of total district in combined ACD&PCD (N=14).

**** the sum of cost/1case in each DPCR multiplied by no. of total district which carried out PCD alone method in each DPCR divided by no. of total district in PCD alone (N=86).

- **Region level**

Level	ACD&PCD	PCD alone
Region	$\dfrac{73{,}041.2 \times 7 + 78{,}362.5 \times 4}{11} = \textbf{74{,}976.22*}$	$\dfrac{92{,}749.90 \times 7 + 93{,}630.60 \times 4}{11} = \textbf{93{,}070.15**}$

* cost/1case of combined ACD&PCD method in non-endemic area x 7 regions + cost/1case of combined ACD&PCD method in endemic

area x 4 regions divided by the no. of total regions (non-endemic area: N=7, endemic area: N=5)

** cost/1case of PCD alone method in non-endemic area x 7 regions + cost/1case of PCD alone in endemic area x 4 regions divided

by the no. of total regions (non-endemic area: N=7, endemic area: N=5)

Appendix 10

List of abbreviations

Notation	definition
M.ACD+PCD	Material costs for doing combined ACD and PCD
M.PCD	Material costs for doing PCD
P	Personnel
Pr	Provider
Pt	Patient
pr.ACD+PCD	Provider for doing combined ACD and PCD
p. ACD+PCD	Personnel costs for doing combined ACD and PCD
p.PCD	Personnel costs for doing PCD
pr.PCD	Provider for doing PCD
pt.ACD+PCD	Patients for diagnosing leprosy by combined ACD & PCD
pt.PCD	Patients for diagnosing leprosy by PCD method
re	Relative
SM	Social mobilization
t.ACD+PCD	Time costs for patients by combined ACD and PCD
t.pt	Time costs for patients
t.re	Time costs for relatives
TP	Training program
tr.pt	Traveling costs for patients
tr.	Traveling costs for relatives

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- Health seeking behavior of leprosy patient (2002)
- Behaviors contributing to stigma against leprosy in Nadoon district, Mahasarakham province (2007)