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UNIT COST ANALYSIS OF PHNOM PENH HEART CENTER IN
CAMBODIA: THE FISCAL YEAR 2006



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**A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Science Program in Health Economics
Faculty of Economics**


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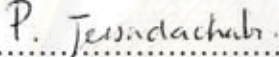
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วัตถุประสงค์การศึกษาเพื่อคำนวณและวิเคราะห์ต้นทุนและต้นทุนต่อหน่วยต่อการรับเข้ารักษาต่อการพักรักษาหนึ่งวัน และต่อครั้งของการเข้าพบแพทย์ที่ศูนย์หัวใจพนมเปญในปีงบประมาณ พ.ศ. 2549 พิจารณาจากต้นทุนของผู้ดำเนินการ จากนั้นเป็นการเปรียบเทียบกับแบบจำลอง WHO-CHOICE และตัวแปรบางตัวแปรจากการศึกษาในประเทศไทย เพื่อที่จะหาต้นทุนต่อหน่วยของผู้ป่วยในและนอกโรงพยาบาลหรือน้อยเกินไป สำหรับเป็นแนวทางในการกำหนดนโยบายของกระทรวงการคลังในการจัดสรรงบประมาณ

ต้นทุนประมาณการในมุมมองของผู้ดำเนินการต่อการเข้าพักรักษาคนไข้ที่ศูนย์หัวใจพนมเปญ คิดเป็น 38.1 ดอลลาร์สหรัฐ ต้นทุนต่อครั้งคิดเป็น 51.9 ดอลลาร์สหรัฐ และต้นทุนต่อการรับการรักษาคิดเป็น 308.1 ดอลลาร์สหรัฐ ต้นทุนตามแบบจำลองขององค์การอนามัยโลกคิดเป็น 3.39 ดอลลาร์สหรัฐต่อการรักษาผู้ป่วยนอก และคิดเป็น 12.89 ดอลลาร์สหรัฐสำหรับการผู้ป่วยในต่อหนึ่งวันพัก ต้นทุนเฉลี่ยต่อการเข้าพักรักษาผู้ป่วยศัลยกรรมที่โรงพยาบาลจุฬาลงกรณ์คิดเป็น 183.6 ดอลลาร์สหรัฐ ในขณะที่ต้นทุนเฉลี่ยต่อการเข้าพักรักษาผู้ป่วยศัลยกรรมที่ศูนย์หัวใจพนมเปญคิดเป็น 203.5 ดอลลาร์สหรัฐ

ผลการศึกษาพบว่าต้นทุนในมุมมองของผู้ดำเนินการสำหรับการรักษาคนไข้โรคหัวใจในศูนย์หัวใจพนมเปญมีส่วนทุนสูงสุดคือต้นทุนค่าวัสดุอุปกรณ์ทางการแพทย์ รองลงมาเป็นต้นทุนค่าแรงงานและต้นทุนค่าลงทุนในศูนย์หัวใจพนมเปญร้อยละของสัดส่วนต้นทุนทั้งหมดต่อต้นทุนค่าวัสดุอุปกรณ์ทางการแพทย์ ต้นทุนค่าลงทุน ต้นทุนค่าแรงงาน คิดเป็นร้อยละ 45.5 ร้อยละ 27.3 และร้อยละ 27.2 ของต้นทุนทั้งหมด ตามลำดับ ต้นทุนต่อหน่วยของทั้งผู้ป่วยนอกและผู้ป่วยในของศูนย์หัวใจพนมเปญมากกว่าต้นทุนต่อหน่วยของแบบจำลองทางเลือกขององค์การอนามัยโลก เนื่องจากต้นทุนของศูนย์หัวใจพนมเปญเป็นต้นทุนสำหรับการผ่าตัดศัลยกรรมซึ่งมีต้นทุนค่าอุปกรณ์ทางการแพทย์สูง ในขณะที่ต้นทุนต่อหน่วยตามแบบจำลองทางเลือกขององค์การอนามัยโลกนั้นไม่รวมถึงต้นทุนค่าจ้างหรือค่าแรงงานในแบบจำลอง นอกจากนี้แบบจำลองทางเลือกขององค์การอนามัยโลกเป็นการคำนวณสำหรับโรงพยาบาลส่วนใหญ่ในประเทศที่พัฒนาแล้วหรือประเทศที่กำลังพัฒนา ถึงแม้ว่าต้นทุนเฉลี่ยของศูนย์หัวใจพนมเปญมากกว่าต้นทุนตามแบบจำลองขององค์การอนามัยโลก ต้นทุนเฉลี่ยต่อการรักษาด้วยวิธีศัลยกรรมของผู้ป่วยในศูนย์หัวใจพนมเปญ (5,087.5 ดอลลาร์สหรัฐ) ก็ยังต่ำกว่าต้นทุนต่อการรักษาของโรงพยาบาลจุฬาลงกรณ์ในประเทศไทย (11,013.0 ดอลลาร์สหรัฐ)

ผลการศึกษาพบว่าที่มาของแหล่งเงินสำหรับการบริจาคคิดเป็นร้อยละ 24.8 ของค่าใช้จ่ายในการรักษา และมาจากเงินของผู้ป่วยเองร้อยละ 64.0 และมาจากรัฐบาลร้อยละ 11.2 ของต้นทุนทั้งหมด 1,992,766.6 ดอลลาร์สหรัฐ ที่มาของแหล่งเงินจากรัฐบาลนั้นไม่เพียงพอที่จะสนับสนุนการให้บริการทางด้านสาธารณสุขที่ศูนย์หัวใจพนมเปญจากการพิจารณาปีงบประมาณ พ.ศ. 2549

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ปีการศึกษา	2550	ลายมือชื่ออาจารย์ที่ปรึกษา.....
		ลายมือชื่ออาจารย์ที่ปรึกษาพร้อม.....

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BOLA KAN: UNIT COST ANALYSIS OF PHNOM PENH
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 SATHIRAKORN PONGPANICH, Ph.D., 151 pp.

The objective of this study was to calculate and analyze cost and unit cost per admission, per bed-day and per visit at Phnom Penh Heart Center in the fiscal year 2006, by focusing on providers' perspective. Then the result which was obtained from the calculation of the unit cost at Phnom Penh Heart Center was compared to WHO-CHOICE model and some available studies from Thailand to find whether the unit cost was unusually high or low in order to be a guideline for policy makers and Ministry of Finance in budget allocation purpose.

The estimated provider cost per patient day at Phnom Penh Heart Center (PPHC) was US\$38.1; cost per visit was US\$51.9 and cost per admission was US\$308.1. Unit cost of WHO-CHOICE model was US\$3.39 per visit at OPD and US\$12.89 per bed-day at IPD. The average cost per bed day of heart transplantation surgery unit at Chulalongkorn Memorial Hospital was US\$183.6 and the average cost per bed day of Phnom Penh Heart Center of Cambodia was US\$203.5.

This study also found that the provider cost for the treatment of heart disease of patients at PPHC- the maximum cost component was the material cost, following in order by the capital cost and labour cost. In PPHC, the percentage of cost shared by material, cost capital cost and labour cost was 45.5%, 27.3% and 27.2% of the total unit cost respectively. The unit cost of both OPD and IPD at PPHC was found higher than the unit cost of OPD and IPD of WHO-CHOICE because the PPHC was a heart surgery hospital. Hence, the cost includes the high cost of medical equipments, while the WHO-CHOICE model is not included the capital cost and salary or wage in the calculated model. In addition, the model of WHO-CHOICE was mainly calculated by all general hospitals in developed and developing countries. Even though the unit costs of PPHC was higher than the WHO-CHOICE project, the average cost per admission of surgery patients at PPHC (\$5,087.5) was found lower than the average cost per admission (\$11,013.0) of heart transplantation surgery unit at Chulalongkorn Memorial Hospital in Thailand.

This study found that sources of finance was 24.8% from donation part, 64.0% from out of pocket payment and 11.2% from the government budget out of the total cost of US\$1,992,766.6. The source of finance from the government part is therefore not enough to support the health service at PPHC in 2006.

Field of Study: Health Economics

Student's Signature.....

Academic Year: 2007

Principal Advisor's Signature

Co-advisor's Signature

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LIST OF ABBREVIATIONS

CBR	:	Crude Birth Rate
CC	:	Capital Cost
CDHS	:	Cambodian Demographic and Health Survey
CEO	:	Chief Executive Office
CIU	:	Cardiology Intervention Unit
CPI	:	Consumer Price Index
CSES	:	Secondary Analysis of Cambodian Socio-Economic Survey
GGHE	:	General Government Expenditure on Health
GDP	:	Gross Domestic Product
GNI	:	Gross National Income
Govt	:	Government
ICU	:	Incentive Care Unit
IMR	:	Infant Mortality Rate
IPD	:	In Patient Department (ICU and Inpatient ward)
LC	:	Labor Cost
MC	:	Material Cost
MoH	:	Ministry of Health
NHA	:	National Health Account
OA	:	Operating Area
OD	:	Operational District
OP	:	Operating Cost
OOP	:	Out of Pocket
OPD	:	Out Patient Department
PP	:	Phnom Penh
PPP	:	Purchasing Power Parity
PPHC	:	Phnom Penh Heart Center
PvtHE	:	Private Expenditure on Health
S.Fund	:	Source of Fund
THE	:	Total Expenditure on Health
WHO	:	World Health Organization

CHAPTER I

INTRODUCTION

Many developing countries share problems or difficulties in achieving sufficient resource allocation to health sector, mainly due to the resources are scarcity, country face with unfavorable economic, political and social factors. The most urgent problem for developing countries is that they lack funds to finance the health services urgently needed by their citizens. Health care services in developing countries are mostly financed by the donate counterpart; out of pocket payment, public sector and relatively small private investments are made in this area because private health care services are targeted at the wealthy groups in urban area, but not at the rural poor who are the vast majority of the population. Likewise, Cambodia now much depend on donation counterpart and slowly the developing of health infrastructure because of the other economic infrastructure are not yet well developed and inadequate of resources. Therefore, in term of the resources are scarce, there is one important reason for collecting data on the cost of resources used in the existing programme is that we can better predict what the future budgetary demand. It is very useful to have ideas of how much money would be required if contributions of particular resources are to decline or cease entirely (Creese & Parker, 1994).

1.1 Rationale and Problem

According to the figure 1.3 on page 2, the government expenditure on health as percentage of GDP and general government expenditure on health from year 2000 up to year 2005 are moving to the decreasing point. However, the external source expenditure on health as percentage of total expenditure on health keeps increasing from year to year. The figure reflects that the government expenditure on health in the future will shrink or immerse. It looks like high risk of health sector to sustain the service. These figures reflect that the source of fund flow to health sector is mostly depends on the donor or external source.

Figure 1.1 National Expenditure on Health

A. Select ratio indicator for expenditure on health	2000	2001	2002	2003	2004	2005
I. Expenditure Ratios						
Total expenditure on health (THE) as % of GDP	5.9	6.6	7.1	7.3	6.7	6.8
General government expenditure on health (GGHE) as % of THE	21.7	27.1	28.1	25.1	25.8	24.5
External source on health as % of THE	9.1	17.5	17.1	26.3	28.5	26.1
Private households' out of pocket payment as % of PvtHE	93.2	86.1	86.1	76.8	85.4	86.1

Source: Multiple WHO sources, figure 2005: Core Health Indicators

Referring to figures 1.2 below, the Phnom Penh Heart Center is one of the classic examples of the above problems because this center is much more depending on donation budget than government budget. The Phnom Penh Heart Center can process and sustain until today is because of the outside fund and out of pocket budget. These situation shows that in the future this center will get bankrupt because of the lack of fund to support the service. Therefore, the researcher, and hospital administration committee, must be aware of the cost and unit cost analysis are important for administrator to make decision for planning, budgeting, controlling, assessing the organization and to inform the government or policy makers know how much the hospital needs the budget in the future. This is the first time first time to study the cost and unit cost in this hospital.

Figure 1.2 Source of fund and expenditure statement of PPHC in 2005 and 2006

Description	2005	2006	% 2005	% 2006
Out of Pocket Payment	\$723,779.38	\$900,527.59	63.61%	61.53%
Donation Budget	\$366,000.0	\$515,000.0	32.17%	35.19%
Government Budget	\$47,928.9	\$47,928.9	4.22%	3.28%
Total	1,137,799.38	1,463,527.59	100.0%	100.0%

Source: Phnom Penh Heart Center, Cambodia

Cost information is essential to improve economic efficiency of health care if providers, purchasers and policy makers are to make informed decisions about health care. Costing can contribute to the efficient allocation of resources within the health system, and identify where cost reduction is feasible and justifiable. An important

illustration of prediction is budget. Budgets are documents that set out what activities are planned for the future and outline the expected future cost of the programmes. In term of planning the budget, planners have to know and understand the productivity or output of the program. For example, many government hospitals cannot manage the budget to achieve the goal with efficiency and effectiveness. Therefore, hospital administrators must be knowledgeable of actual costs of providing their various products and services. Hospital cost and unit cost of services can serve as a tool evaluation of the efficiency of utilization resources and providing standard services for the limited resource allocation. The total cost and the cost per service unit of hospital are the main data regarding controlling hospital activities using as criterion to determine standard cost of charging of services and treatment fairly and use for making decision of management the service of hospital's patients, particularly, for evaluating the efficiency of servicing that are necessary for states hospitals. The study of cost can be considered as significant for management of hospital enterprise seriously. Without of cost data per unit, the budgeting plan cannot arrange in accordance with the situation to get the budget allocation.

1.2 Research Questions

- (1) What is the unit cost of outpatient and inpatient of Phnom Penh Heart center?
- (2) Is the unit cost of inpatient and outpatient too high or too low?

1.3 General Objective

To calculate cost and unit cost of outpatient and inpatient for the Phnom Penh Heart Center and analyze its adequacy.

1.4 Specific Objectives

- 1) To calculate total direct cost (labor cost, material cost and capital cost) and total cost of each cost Center in Phnom Penh heart Center.
- 2) To analyze unit cost of out patient and in patient service of Phnom heart center, such as: unit cost of Inpatient day, unit cost of Inpatient admission, and unit cost of outpatient visit.
- 3) To compare the existing unit cost to see whether it is too much by comparing mainly with WHO-CHOICE project.

1.5 Scope of Study

- This research studied the cost in the fiscal year 2006 (January 1st, 2006 until December 31st, 2006).
- This research analyzed cost and unit cost of outpatients and inpatients by focusing on provider perspective's allocate cost from supporting cost center to out patient service and in patient service in Phnom Penh Heart Center.
- This research included the calculation of all three sources of existing cost in each cost center, such as cost from donation, government and out of pocket payment.
- Due to time constraint and for the sake of analysis, the estimated cost of the Heart Center was compared mainly to WHO-CHOICE of the Phnom Penh Heart Centers and average cost of heart Center from available study of Thailand.

1.6 Benefit of the Study

- Potential beneficiaries from the results of this study could be used to be the guideline for policy makers and Ministry of Economy and Finance in budget allocation purpose.
- Studying and collecting data on the cost of resources used in existing of hospital program, hospital managers and policy makers can better predict what the future budgetary demands are likely to be. In addition, study costing on hospital help policy makers to measure the cost of donated resources is that it can provide a useful indicator of the capacity of government resources to generate community or other donated contribution.
- This study would be very useful for hospital managers to monitor any outstanding expenditure items, such as labour cost, overtime payment, material cost, especially when compared to productivities it would be reflective efficiency of each cost Center.
- The hospital administrators will be able to identify how the resources are being utilized, thus reducing their wastage and improve hospital efficiency. It will also be an encouragement to hospital administrators to estimate the unit cost for different procedures and cost incurred to treat different disease, to strengthen their decision making process and help them in the decision of hospital service

pricings. It will also strengthen the hospital costing capacity and will be appropriate to apply this knowledge to all other hospitals of Cambodia.



สถาบันวิทยบริการ
จุฬาลงกรณ์มหาวิทยาลัย

CHAPTER II

BACKGROUND

2.1 Country Profile of Cambodia

Cambodia is an agricultural country located in Southeast Asia. It is bounded by Thailand to the west, Laos and Thailand to the north, the gulf of Thailand to the southwest, and Vietnam to the east. It has a total land area of 181,035 square kilometers (Cambodia Demographic and Health Survey, 2005). Cambodia is one of the poorest countries in South- East Asia, with very high mortality rate and disease prevalence (Ministry of Health, Cambodia, 2005). Currently, it is estimated that approximately 36.1 percent of the total population lives below the poverty line. The recent Cambodian Inter-Censal population is 14,080,653 Millions surveys 2006 (Ministry of Health, 2006). More than one million inhabitants (1,314 millions) are living in Phnom Penh (Ministry of Planning, 2006). Cambodia relies heavily upon foreign aid, which accounts for over half of its government budget. The United States is the third-largest foreign aid donor after Japan and Australia. Since 1996, the Consultative Group for Cambodia, a consortium of seven international financial organizations and 22 donor countries under the auspices of the World Bank, has met annually to set economic and political reform guidelines for the Cambodian government and to extend an aid package averaging \$500 million per year (Nicole .S & Thomas L, 2002).

2.2 Current Health Status of Cambodia

Health status in Cambodian people is among the lowest in the region. Government expenditures on Health still low and very slow. The government budget for health has been steadily increasing over recent years, reaching US\$ 6.8 per capita in 2005 (of which US\$ 4 was for the recurrent budget of the Ministry of Health). The challenge, however, lies not only in adequate finances, but also in allocation and management. Although overall disbursement at the end of budget execution is acceptable (around 98%), provinces and districts face irregular and untimely disbursement. Cambodia is

also still highly dependant on donor funding (US\$ 7 per capita in 2005) and the challenge is to coordinate action to cover national priorities. Despite the increasing investment in health from government and external sources, the largest portion of health expenditure comes from foreign aid and out-of-pocket sources and goes towards unregulated private health care. The World Bank Poverty Assessment 2006 estimated out-of-pocket expenditures to be US\$ 15 per capita per year (secondary analysis of Cambodian Socio-Economic Survey CSES, 2004), while the WHO NHA website estimates the figure at US\$ 18. More recent figures from the Cambodian Demographic and Health Survey (CDHS) 2005 seem to indicate even higher out-of-pocket spending, almost US\$ 25 per capita per year, with potential underreporting in CSES and over reporting in CDHS (Country Health information profiles, 2005). Those situation reflected Cambodia is still much relies on foreign aid in terms of supporting health services, infrastructure etc. The overall health system performance was ranked 174th among other member states of WHO (WHO, 2000) cited in (Chhim, 2002, p. 14). In 2005, it was estimated that male life expectancy at birth 58 years and female life expectancy at birth 64 years (Ministry of Health, 2006). Due to poverty, poor sanitation and inadequate health services, it was estimated that one in ten children die before their fifth birth birthday. Cambodia still faces with a large burden of communicable and non- communicable disease, such as HIV, Tuberculosis, and Malaria etc. Non-communicable disease, such as car accident, heart disease, and anemia etc. The patterns of morbidity and mortality have remained virtually not much change for years. The Ministry of Health 2006 reported that Infant Mortality Rate (IMR) 65 per 1,000 live births, Under 5 Mortality Ratio (U5MR) 83 per 1,000 live births, Maternal Mortality Ratio (MMR) 472 per 100,000 live births, and Crude Birth Rate (CBR) 25.6 per 1,000 population.

Figure2.1: Health Indicator

Official name of the country	Kingdom of Cambodia
Region	East Asia
Type of economy	Low income
Gross national income per capita (PPP international \$) (year 2005)	2,490
GDP per capita in international \$ in 2006	514
Total expenditure on health as % of GDP (2004):	6.7
Life Expectancy at birth m/f (years 2006)	Male: 58, Female: 64
Probability of dying under five (per 1 000 live births) (year 2005)	143
Probability of dying between 15 and 60 years (per 1 000 population) year 2005	Male: 429, Female: 297
Percentage of population below the national poverty line(year 2005)	36.1
Illiteracy rate (2000)	32

Sources of data: United Nations Population Division and Statistics Division

WHO: [World Health Statistics 2007](#)

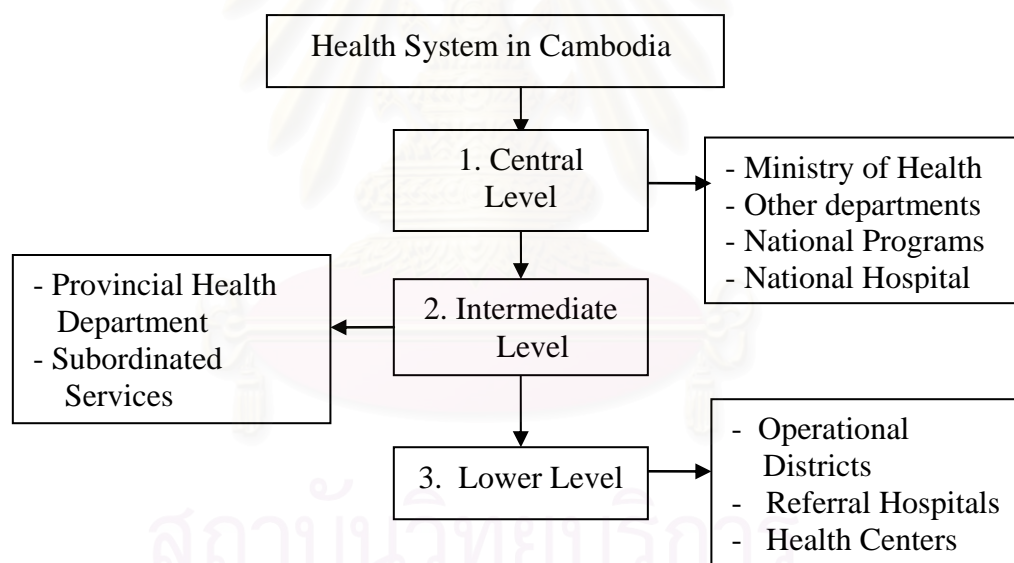
Ministry of Health, 2006

2.3 Health System in Cambodia

In the socialist inspiration of the era, health care was to be provided to the population for free by the government. However, health staff was extremely small government salaries. The present time, the salaries have not been much adjusted and are grossly inadequate to sustain basic living conditions. A typical government salary is around 15 to 30 USD per month, while an estimated 100 USD to 250 is required for family to live in a town. This situation understandably forces staff to developed “creative coping”. In reality this leads to disastrous consequences for the affordability of health care. The government assumed responsibility, as up to the present times, to provide all necessary medicines to every health facility, to be distributed to patients free of charge. The donations of medicines were irregular and insufficient, leading to frequent shortages. From this idealistic, but unsustainable commitment grew a public health services that is generally of poor quality and high cost for patients, leading to low utilization and gross inequity between income groups in regards to accessibility (National institute of statistic, Ministry of Planning, 2000). Ministry of Health initiated profound changes with the health sector reform in the mid 1990’s. Prior to 1995 the government policy was for one infirmary to serve one administrative commune and one hospital to serve every districts in Cambodia, which are more heavily populated than some provinces this has result in inefficient allocation of resources. Until 1995, the National Health system was organized into four levels: central, provincial district and commune. At all levels, the physical condition of the health infrastructure was poor. The central level consisted of the MOH Headquarters, two training institutions, four national institutes, one drug factory and eight national hospitals. The provincial level consisted of 22 provincial health departments and 22 provincial hospitals. There were four regional nursing schools located in four provinces. The district level consisted of district health offices and 164 districts hospitals. At commune level existed 1,267 commune clinics. In 1995 Ministry of Health improved a new system, health sector reform for the organization of health service based up on the redefinition of the criteria for location of health facility together with a definition of a basic minimum service package to be offered at each level. The new system is divided into three levels: Central, Provincial and Operational district. As of September 2000, at central level there the Ministry of Health (MoH) Headquarters with nine departments; two training institutions; two

national institutes, seven national centers, and eight national hospitals with 1,890 beds. The provincial level consisted of 24 provincial health departments and four regional training schools. The district level consisted of 73 Operational Districts (OD) with 66 Referral Hospital (RH) under different stage of development towards providing full Complementary Package of Activities (CPA), which encompassed 24 provincial hospitals; 113 former district hospitals, 565 centers and 433 commune clinics. Each operational district covers a population of 100-200,000 and includes referral hospital and 10-20 health centers with catchments areas of approximately 10,000. In the year 2006 up to the present, there are 68 regional hospitals, 965 health centers, and 8 National hospitals. There are 68 private clinics are opened in Phnom Penh city. At the same time, Phnom Penh heart center is one of the health center states in lower level among the three level of health system in Cambodia.

Figure 2.2: Three Level of Health System in Cambodia



Source: Ministry of Health, Cambodia

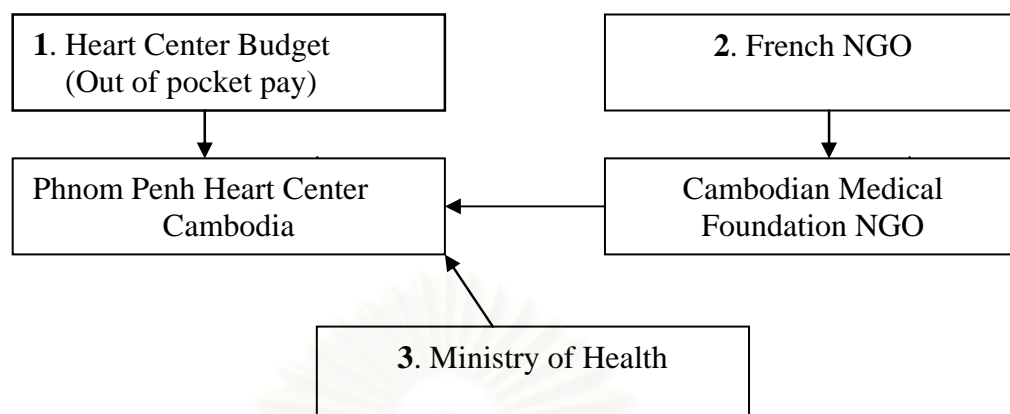
2.4 General Information related to Phnom Penh Heart Center

Phnom Penh Heart Center was initiated by the King of Cambodia. This Center was implemented in April, 2001 and received budgetary counterpart from Royal government of Cambodia in buying the land asset which was approved by Prime minister Hun Sen. The expenditure on building and decoration was helped by Chaine

de l'ESPOIR Organization. The Center is an autonomous legal entity created by the Cambodian Ministry of Health and La Chaîne de l'Espoir. The Center functions according to Cambodian law. The administration of the Center is independent of the Ministry of Health; however, its special status exempts it from all direct and indirect taxes. The CEO of the center is Cambodian Professor of medical doctor collaborated with Prof. Alain Deloche, MD, president of La Chaîne de L'Espoir, and member of Board of Surgeons of Hope Foundation. It was managed by a board of administrators and benefits from the advice of a consultative body on ethics and medical strategy. The administration is independent of both Ministry of Health and Chaîne de l'Espoir. The source of Finance in this hospital comes from 3 sites, Ministry of Health (as subsidy), donor (Chaîne de l'ESPOIR Organization) and rich patients (the patients who can afford for treatment). However, this center is much more depending on the budget from donation in term of both recurrent cost and capital cost. In recently, the source of finance from donor become decreasing since year 2004. This center has 50 beds, which is provided 20 beds for private hospitalization (provides for fee-paying patients) and provides 30 beds hospitalization for indigent patients with accommodations for family member. This center is a kind of tertiary care which provides service for regional and national care to the patients. The center has 14 cost centers, of which Administration Office, Kitchen, Warehouse, Security Unit, Technique service, Pharmacy Unit, Laboratory Unit, Radiology Unit, Interventional Cardiology Unit, Surgery Service, Consultation Unit, Emergency Room, and Inpatient Ward.

In year 2006, there were 15,539 visitors to consult doctor at outpatient department, 259 cases were emergency case and 3,804 patients were admitted in the center. The center is an autonomous hospital for non-profit provider and provides food two times per day for all personnel and three times per day for patients who hospitalized with performing surgery. However, the center does not provide medicine to patients. All patients have to buy medicine.

2.5 Source of Finance of Phnom Penh Heart Center

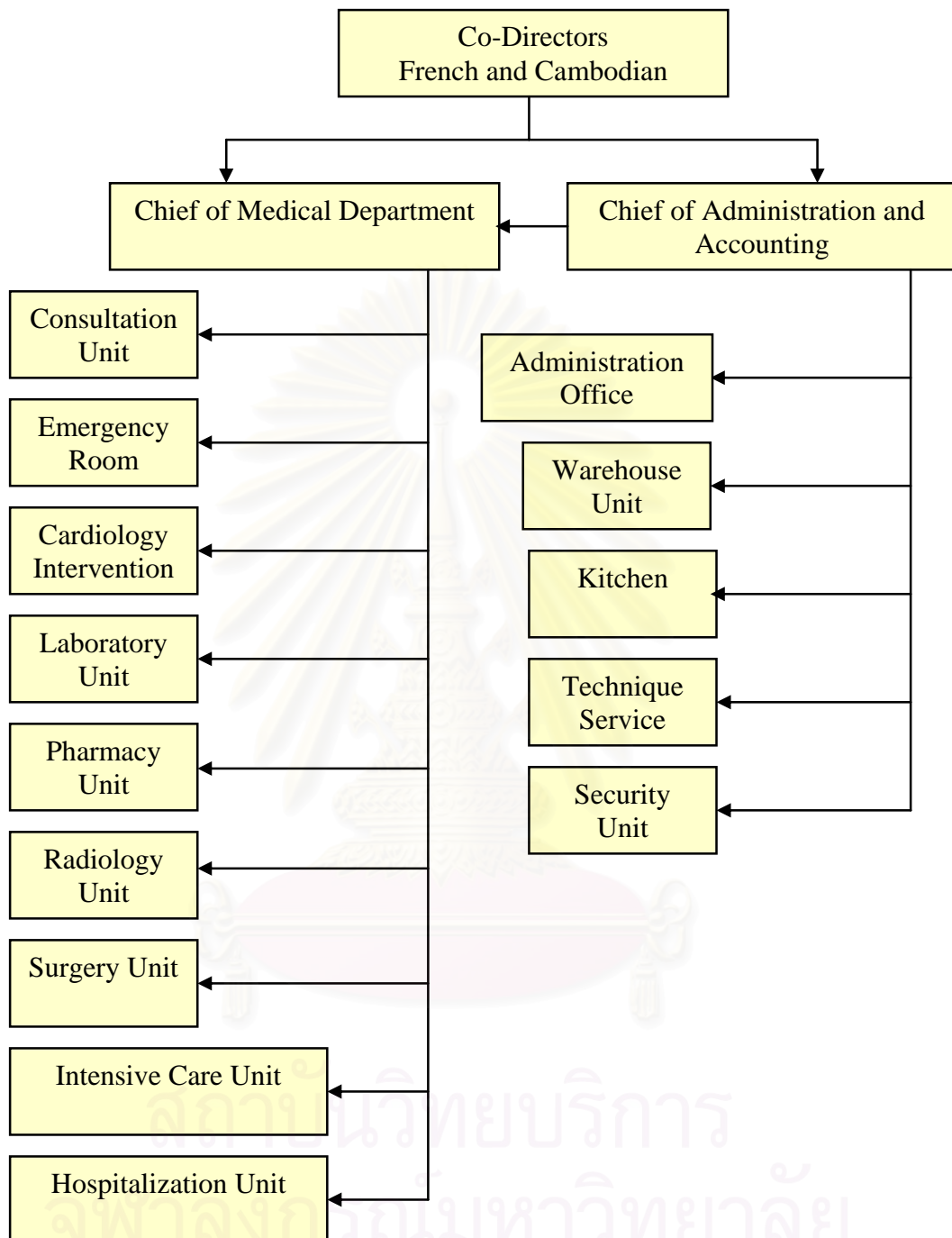


Information related to Cost Center at Phnom Penh Heart Center, 2006

Cost Centers:	Number of staff
1. Administration Office	16
2. Kitchen	6
3. Warehouse	1
4. Security Unit	9
5. Technique Service	4
6. Pharmacy Unit	2
7. Laboratory Unit	3
8. Radiology Unit	2
9. Angiography/ Cardiology Intervention Unit	3
10. Surgery Service (Operating Room)	17
11. Consultation (OPD)	17
12. Emergency Room (OPD).....	24
13. Intensive Care Unit (IPD)	15
14. Impatiens Ward (IPD)	18
Total staffs	137

(Source: Phnom Penh Heart Center, Cambodia)

Administration Structure and Cost Centers of Phnom Penh Heart Center



Source: Phnom Penh Heart Center, Cambodia

CHAPTER III

LITERATURE REVIEW

3.1 Cost Definitions and Classifications

Cost : the value of resources (human, physical, financial or intangible) consumed by a cost object. This can include both the direct resources consumed as well as an allocation of indirect cost to the cost object. Judgment is required to determine which costs to include and to what extent (Minister of Health Canada, 2007)

Cost: is an essential ingredient to guide policy as well as manage hospitals; it plays an important role in allocation of effective resources across hospitals. It is an input for assessing various type of relative efficiency of various types of treatment and treatment compared to prevention. Also identifies the resources necessary to undertake or sustain or scale up intervention (Adam and Evans, 2006) and Health Insurance Coverage (Tisayaticom et al, 2007).

According to Lucey (2002) cited in Mogyorosy and Smith (2005, p. 190) cost can be defined as the amount of expenditure (actual or nominal) incurred on or attributable to a particular good or activity. In other words it can be defined as resources (cash or other assets) that must be surrendered in order to achieve particular objective. The cost always relates to past activities (Mogyorosy and Smith, 2005).

Another definition refer to cost as the cost of goods and services as the value of resources spent for acquisition of those good or services that may be expressed in monetary or non monetary values (Mogyorosy and Smith, 2005). As economist always distinguish between accounting cost and opportunity cost or social cost (Carrin and Evlo, 1995).

Costing is the action taken to determine the cost information required for a purpose. It is tailored for the purpose for which the cost information will be used (Minister of Health Canada, 2007).

Accounting cost: are costs that are incurred to acquire resources (Mogyorosy and Smith, 2005). It can also be referred as the monetary values of actual expenditure for acquisition of goods and services (Carrin and Evlo, 1995). It is concern with measuring cost for financial planning, assessing decisions and reporting purposes from a particular organizational perspective (Mogyorosy and Smith, 2005).

Cost Accounting procedures: are used to accumulate and allocate all elements of manufacturing cost in a manner that will produce meaningful data for the internal used of management and for the preparation of external financial statements (Vanderbeck and Edward, 2005). In the theory of cost accounting Vanderbeck and Edward (2005) mentioned that costs were accumulated for one month. At the end of month, costs were divided by the total unit produced to determine the unit cost. The accomplished of cost accounting: the determination of product costs (both the total cost for the period and cost per unit).

Capital Cost: are inputs that last for more than one year (Creese and Parker,1994), including the cost of depreciation of all major equipments, machineries, buildings and other fixed assets (Tisayaticom et al, 2007). Estimation of capital cost employs the number of useful life years of the particular equipment, building or assets. The item of medical equipments purchase and used more than 10 years and the building constructed and used more than 30 years will not included in the capital cost estimates, even though they are still in the services (Tisayaticom et al, 2007).

Direct and indirect cost:

The cost of hospital services can be classified into “direct cost” and “indirect cost” Direct cost are directly linked to the use of particular resources or cost objects (Mogyorosy and Smith, 2005). Carrin and Evlo (1995) declared that direct cost can be defined in relation to a given activity, a medical service or a department of hospital. They also define indirect cost as cost of goods and services used jointly by several activities or several departments, therefore the totality of the cost cannot be attributed to one particular department, service or activity.

Economic Cost: Economist use the terms “Opportunity cost” or “Economic cost” to describe the approach of costing. It recognizes that, even if no money is spent, the

cost of using resources that could have been productively used elsewhere (Creese & Parker, 1994).

Labor cost: is defined as the salary, overtime payment of all the personnel in all the departments of the hospital. In estimating labor cost, the working hours personnel spend on different department must be considered. For this full time equivalent could be used to reflect number of full time staff contribute to each department (Tisayaticom et al, 2007).

Material cost: is the cost of all the medical goods and supplies and other related non medical supplies incurred in the operation of activity or department. It consists of office supply, housekeeping, maintenance expenses, public utilities (such as electricity, postal services, and telecommunication services), gasoline, laboratory chemicals etc. (Tisayaticom et al, 2007).

Opportunity cost/economic cost: is the total value of benefit foregone because of alternative use of resources (including money) or the sacrifice of best alternative use of resources. Therefore, measurement of opportunity cost or true cost could be difficult as it includes implicit cost such as cost of time and capital. It should not be taken as a special type of cost accounting or costing system, but rather as a particular approach to decision making under resource scarcity (Mogyorosy and Smith, 2005).

Standard Cost: Costs that would be incurred under efficient operating conditions and are forecast before the manufacturing process begins (Vanderbeck and Edward, 2005).

Unit Cost: *is a kind of simple average:* cost per unit of output or outcome. It applies to many sorts of things in the analysis of Primary Health Care (PHC). The basic calculation of a unit cost (often called “average cost” where the total cost (TC) and the quantity (Q) of output have been found (Creese & Parker, 1994).

Classification of costs by inputs:

Recurrent Cost or operating cost Creese & Parker (1994) mentioned the following:

- **Personnel** (all types): supervisors, health workers, administrators, technicians, consultants, casual labor.
- **Vehicles, purchase:** bicycles, motorcycles, four-wheel-drive vehicles, trucks
- **Supplies:** drugs, vaccines, syringes, small equipment (unit cost of under US\$100)
- **Vehicles- operation and maintenance:** petrol, diesel, lubricants, tires, spare parts, registration, insurance.
- **Buildings- operation and maintenance:** electricity, water, heating, fuel, telephone, telex, insurance, cleaning, painting, repairs of electricity, plumbing, roofing and heating.
- **Training:** -recurrent (e.g., short in-service courses)
- **Social mobilization:** operating costs
Other operating costs not included above

Capital Cost Creese & Parker (1994) mentioned the following:

- **Equipment** : refrigerators, sterilizers, manufacturing machinery, scales, and other equipment with a unit cost (price) of \$100 or more
- **Buildings- space:** health centers, hospitals, training facilities, administrative offices, storage facilities.
- **Training- non recurrent:** training activities for health personnel that occur only once or rarely.
- **Social mobilization- Non Recurrent:** Social mobilization activities (e.g., promotion, publicity campaign) that occur only once or rarely.

Mogyorosy and Smith (2005, p. 33) identified the purposes of costing of services as the following:

- 1) Pricing new services for an internal market
- 2) pricing new services for cost border care
- 3) Pricing services for non-insured (private) patients
- 4) Cost comparison between different providers
- 5) Cost comparison between different providers in different regions

- 6) Cost comparison between different countries
- 7) Cost comparison with other mutually exclusive services
- 8) Benchmarking for services/providers
- 9) Identify areas of cost reduction / cost containment
- 10) Assessing whether a particular service is good value for money
- 11) Making formal coverage policy decisions/ reimbursement decision
- 12) Fine- tuning (upgrading) incentives/ payment policies
- 13) Developing local cost conscious clinical guidelines
- 14) Other decisions

3.2 Basic Principles of Costing Methodologies

According to Vanij (2007), there are four major steps for hospital cost analysis:

- (1) Cost Center identification and grouping
- (2) Total Direct Cost determination
- (3) Indirect cost allocation
- (4) Unit Cost allocation

1) Cost Center Identification and grouping

According to Tisayaticom et al. (2007), there are four categories of cost identification, which mention the following:

- Non Revenue Producing Post Center (NRPCC):

The cost centers are responsible for management and supporting the operation of other departments in the hospital. Their services usually do not generate tangible revenue to the hospital, for example general administration, nursing administration, financial and accounting department, security, maintenance unit, supply and logistics department, technical/academic department, central sterile supply department and medical record.

- Revenue Producing Cost Center: (RPCC):

The cost centers are responsible for providing medical or ancillary service direct to patients both in outpatient and inpatient units. These cost centers usually can generate revenue to the hospital by charging a fee from patients. However, the actual income of the hospital can be cashed directly by the patients at point of service or can be credit

for reimbursement from the third party. For example, Radiology department operating room, pharmacy department, clinical laboratory department, Clinical pathology, department etc. Note that usually these cost centers support clinical services to outpatients department and inpatient ward, they may or may not provide services to outpatient department and inpatient ward, they may or may not provide services to NRPCC.

- Patient Service cost Center (PS):

These cost centers provide direct patient care, for example, out patient departments, dental services and inpatient wards.

- Non Patient Services cost Center (NPS):

In some hospitals, these cost centers are responsible for providing other related activities, for example, health education to client e.g. health promotion unit, disease prevention and control, mobile and outreach services, school based health services, teaching, teaching of medical and nursing students. Their function does not deal with day to day out patients and in patients.

2) Total direct cost determinant

The total direct cost of each cost Center in the four groups {NRPCC, RPCC, PS and NPS} consists of three components Tisayaticom et al (2007) mentioned that:

$$\begin{array}{l}
 - \text{ Labor Cost (LC)} \\
 - \text{ Material Cost (MC)} \\
 - \text{ Capital Cost (CC)}
 \end{array}
 \left. \vphantom{\begin{array}{l} \\ \\ \end{array}} \right\} \text{ Total direct Cost (TDC) = LC + MC + CC}$$

3) Indirect cost allocation or over head cost allocation

Indirect costs allocation is the method allocated to cost centers by using cost allocation criteria that determines from relationship between cost centers. This step is to find the appropriate allocation method for determine full cost of absorbing cost center (Tisayaticom et al, 2007).

Based on Drummond (2005), there are four steps of cost allocation methods:

- Direct allocation (ignores interaction of overhead departments)

- Step-down allocation (partial adjustments for interaction of overhead departments)
- Step-down allocation with interactions/ double distribution method (full adjustment for interaction of overhead departments).
- Simultaneous equation technique allocation (full adjustment for interaction of overhead department)

Based on the experience that we have learned so far, step down allocation method is an applicable method because the overhead departments are allocated in step-wise fashion to all of the remaining overhead departments and to the final cost centers. In addition, the WHO-CHOICE also mentions that a step down method is more accurate of estimating costs (Adam and Evans, 2006).

4) Unit Cost allocation

The allocation of cost from Non Revenue Producing Cost Center (NRPCC) and Revenue Producing Cost Center (RPCC) to the Patient Service (PS) and Non Patient Service (NPS) have been done by using step down allocation method. In step down allocation there are two principles, they are first sequencing of cost centers. The cost center which serves most other cost centers is ranked highest. The second is there is no upward allocation from lower cost centers to the cost centers above them.

To determine the unit cost for patient services and non patient services, the total sum of total direct cost which is allocated to NPS and PS from NRPCC and RPCC and its own direct cost will be divided by the number of inpatient admissions and outpatient visits respectively. The unit cost is the ratio of full operating cost or full direct costs and outputs of Patient Services and Non Patient Services (Tisayaticom et al, 2007).

$$\text{Unit Cost of OPD} = \frac{\text{Full Cost of OPD}}{\text{Number of OPD visit}}$$

$$\text{Unit Cost of IPD} = \frac{\text{Full Cost of IPD}}{\text{Number of admissions (IPD) /days}}$$

3.3 Studies related on Cost and Unit Cost Analysis

Collection and analysis of data on program costs and provide considerable useful information on primary health service of all kind. In addition to indicate the amount of funds (from all resources) likely to be require to continue programs, they can help to access the use of personnel in delivering health service and the efficiency of putting supply, transport resource and other inputs to work. (Creese & Parker, 1994).

Information on the unit cost of inpatient and outpatient care is an essential element for costing, budgeting and economic-evaluation exercises (Adam et al, 2003).

According to Adam et al. (2003), information on hospital unit costs is valuable to health decision-makers and researchers for the assessment of hospital efficiency and the assessment, by means of either cost-benefit or cost-effectiveness analysis, of the efficiency of different health interventions. Hospital costs are an example. They are a key requirement for many types of policy decisions and are used, for example, as an input to assessing the relative efficiency of various types of treatment, and of treatment compared to prevention. They are also essential for budgeting and planning exercises, to identify the resources necessary to undertake or sustain or scale up interventions (Adam and Evans, 2006). WHO also mention about the cost and unit cost analyze of inpatient about patients visit of the Disease Control Priority Project (DCPP) by regional classification, such as East Asia and Pacific (EAP). In addition, as part of the project, WHO has a set of standardized regional unit costs have been estimated for a range of health care resource inputs and to extend the program to other low and middle-income countries.

Panannanunt (1995) analyzed cost of heart transplantation in heart transplant- ation unit at Chulalongkorn Hospital in Thaland. Her study was a retrospective costing principles determination of direct cost for heart transplantation through the individual consumable of cost categories and the appointment of resource area costs. She used direct allocation method for the cost allocation technique. She calculated the total provider cost of heart transplantation from the day of operation to the day of discharge. Her study found that the average length of stay of 12 patients equal 725 days. So she calculated the average length of stay of 12 heart transplantation patients was 60 days with average costs 288,262 Bahts per case and per bed day costs

4,771.23 bahts in 1994's price. The component of total cost of surgery patients was included only the internal cost that incur directly to provide the service of heart transplantation from the day of operation to the day of discharge which was included with the three area of the patient stay which shown as the following case:

- Operating room
- Intensive care unit
- Surgical ward
- Direct expenditure for personnel, drugs, supplies, diagnostic laboratory test, and others special treatment and the cost categories were retrieved from each patient's medical record about treatment

The capital cost, she included medical equipment, 3 main building cost centers (inpatient ward, surgery ward and ICU) and vehicle in the area of heart transplantation unit. For recurrent cost, she included, cost of personnel surgeon, cost of operating time and all drugs and medical supplies. She calculated all cost of input, such as personnel cost, material cost and capital cost in to the average cost. Her study found that the total recurrent cost was 91% and the total capital cost was only 9% of the total cost of heart transplantation. This means that the largest portion of cost was existed in the material cost (the cost of medical supplies) and labor cost.

Tasilasathean (2001) analyzed cost of two community hospitals in Buri Ram under Thailand's universal coverage system. The first objective of her study was to calculate the unit cost of two community hospitals by using step down method. Her study found that the average cost or unit cost of outpatient services of one community hospital (Lampraimach) is higher than Krasung Community hospital. However, the average cost or unit cost of inpatient services of Lampraimach hospital is higher than that Krasung hospital. The average cost or unit cost of outpatient services and the average cost or unit cost of overall inpatient services of Lampraimach hospital is equal to 280.79 Baht per visit and 1,213.00 Baht per day or 3,813.65 Baht per case and Krasung community hospital is equal to 137.87 Baht per visit and 769.99 Baht per day or 3,276 Baht per case.

Laekawipat (2004) analyzed the cost and unit cost of Rongkwang Hospital Phrae province for fiscal year 2003. She analyzed unit cost by using Simultaneous equation

method. Her study revealed that the total direct cost of all operations was 36,823,964.50 Baht and the percentage of labor cost was 36.86%, material cost was 25.75% and capital cost was 10.39% respectively. Her study found that the unit cost of outpatient department was 235.17 Baht per visit, comprising 144.63 Baht in routine service cost and 90.54 Baht in medical care cost. And the unit cost of inpatients department was 2,549.95 Baht per admission, comprising 2,008.56 Baht in routine service cost and 541.39 Baht in medical care cost. This study recommends decreasing hospital cost through awareness, thus improving efficiency and promoting community health care.

At the same time, there are many studies applied to health care cost. For example, The Health Canada Costing Policy establishes the Department's framework for Costing by:

- Promoting the efficient and effective use of Government resources by ensuring that the most appropriate costing information is available for effective decision making;
- Promoting the consistent application of an Activity-Based Costing Methodology that is aligned with the Department's Program Activity Architecture (PAA);
- Supporting effective Activity-Based Management practices through ensuring a consistent and transparent approach to the costing of activities;
- Supporting the Department's financial and fiscal responsibilities with respect to the Financial Administrations Act, Federal Accountability Act and the Management Accountability Framework; and supporting internal and external audit requirements through promoting transparent and justifiable costing practices.

Health Canada has adopted an Activity-Based Costing (ABC) methodology to support the Activity-Based Management philosophy behind the Program Activity Architecture (PAA). The costing methodology aligns with the activities, sub-activities and sub-sub-activities defined in Health Canada's Program Activity Architecture (PAA). All costing initiatives undertaken by the Department must follow this activity based approach.

Another study is a study of recurrent unit cost of primary health care services in a sample of Bolivian Ministry of Health facilities in USA, as part of the activities of the Latin America and Caribbean Health and Nutrition Sustainability Contract (LAC HNS) (Olave, M. et al, 1992).

The purpose of their study was to:

- Facilitate institutional strengthening and greater efficiencies in the Child Survival Project districts;
- Provide accurate information on health care delivery costs and cost recovery efforts in the sample facilities;
- Demonstrate a methodology by which this analysis might be extended to other facilities and geographical areas; and
- Provide a tool for policy dialogue and management control which will enhance MOH decision-making on the allocation of resources and the design of cost recovery programs.

The study involved two 3-month samples permitting a comparison between costs in 1990 and 1991, to a degree, demonstrating trends. Two urban Health Centers in Santa Cruz, one from the Ministry of Health (MOH), and the other from PROSALUD were also studied, allowing a limited comparison between urban health centers. Data were collected using 4 questionnaires, and total costs were allocated according to 6 major programs which were in turn sub-divided into principal activities within those programs. Within each program and activity, costs were estimated for 4 major cost categories: personnel, medicines, other direct, and indirect. The result found that, the total costs of the Health Centers are significantly greater than those of the Health Posts. This is due to the increased volume and complexity of services, and other factors. These are, of course, averages, and disguise some variations within each category. Nevertheless, the sample suggests that these average increases are reasonably representative of each District. While individual facilities demonstrate a range of cost increases between 1990 and 1991, the general increase was remarkably uniform at between 14 %-18%. The only exception in the sample was the smaller Health Posts in the Valles Cruceños District which had considerably lower costs than their Altiplano Sur counterparts in 1990 (Olave, M. et al, 1992).

Approaches for Price/ Cost Assessments in Denmark by Ankjær-Jensen and Bild (2005) introduced through the slide presentation about overview and brief outline of payment and costing and Payment systems, costing and pricing in the hospital sector (in-patient and day case care). Their study was mention the steps of costing process for calculation of tariffs based on national cost database containing cost information from all hospitals in Denmark, of which the first step was allocation from intermediate cost Center to final cost Center by using step down process and using relevant allocation keys depending on information available. This study also mentioned the definition of cost centers with the following:

- Final cost centers: output can be linked to a specific patients
- Intermediate cost Center: output cannot be linked to a specific patient
- Which cost centers to be defined depends on responsibility centers
- Which is final/intermediate will vary among hospitals according to information systems

3.4 The Studies related to Cost comparison with Selected a Benchmark States

In 2002, the Michigan Economic Development Corporation (MEDC) commissioned SRI International to perform a study on a number of high-level factors that could affect the business climate and competitiveness of Michigan. In the study, Michigan was compared with 17 similar (“benchmark”) states. The study identified Michigan’s employer paid health insurance premiums for singles in 1999 as the highest of the benchmark states (Bologna, 2004).

An evident from WHO has recently undertaken an extensive effort to collect and collate data on the unit cost of hospitals and health centers have been assemble from 49 countries with various years during the period 1973-2000. The data covers a total of 2,173 country-years observations in a particular for developing countries. These data were used to predict unit cost in different countries in a standardize way for which data are not yet available by using a modeling exercise from a series of models used to estimate unit costs for the WHO-CHOICE project. The method and the result of the model of their study are used to predict unit cost for different types of countries-specific unit costs. The choice explanatory variable is used GDP per capita in international dollars is used as a proxy for level of technology, occupancy rate as a

proxy for level of capacity utilization; and hospital level as a proxy for case mix. The results of unit costs are expected to be correlated positively with GDP per capita and case mix and negatively with capacity utilization (Adam et al, 2003). This work, known as WHO-CHOICE, started in 1998 with the development of standard tools and methods and represents the first systematic attempt to estimate unit costs at both the patient and program level for health interventions in all countries and regions of the world. This makes it possible to generate unit costs that are not only consistent across interventions within one country, but also allows for comparison across countries with similar determinants such as background epidemiology and socioeconomic factors, as well as estimating the cost of scaling up interventions to different coverage levels by varying capacity utilization. One key finding from this work is that unit costs of many health inputs vary substantially both between and within countries. This implies that basing cost and cost-effectiveness studies for a region or country on the results of a study of a single facility, or even a small group of facilities, is likely to be misleading (Adam et al, 2003).

Adam & Evans (2006) also mentioned about determinants of variation in the relationship between the cost of outpatient visits and inpatient days from 832 hospitals in 28 countries are used by estimated relationship to calculate average cost of inpatient and outpatient stays for country where data are not yet available. The ratio of inpatient to outpatient unit costs varies with GDP per capita, hospital size, ownership, and occupancy rate. They show how the estimated relationship can be used to calculate a mean cost of inpatient stays and outpatient visits. They suggested this method might well be preferable to basing policy advice on the results of costing studies that cover only one, or few hospitals, which might well be outliers.

In addition to cross-country datasets, there also exist numerous national datasets of unit costs within high income countries. The most comprehensive cost data come from the United States where efficiency concerns within the publicly financed Medicare program for the elderly led to new methods for measuring costs on a diagnosis basis (Glick et al, 2001) cited in (Bologna et al, 2001, p. 2) . In the United States, sources of cost data include: hospital charges adjusted using cost to charge ratios; data from internal hospital costing systems; diagnosis related group payments

for hospitalizations. This has involved the development of models to predict unit costs in different countries based on key macroeconomic indicators such as GDP per capita.

Concerning about the appropriateness of transferability of unit costs from single studies, or even groups of studies, we can apply use the results of the models developed by WHO-CHOICE to calculate for unit cost for individual countries like Cambodia.



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CHAPTER IV

RESEARCH METHODOLOGY

4.1 Research Design

This study is a descriptive study by using secondary data which was recorded from hospital in year 2006 and some of primary data, such as interview the key and long experience person who work in Phnom Penh Heart Center. This research studied by means of provider's perspective. The secondary data included the following:

- 1) Capital Cost (CC) from donation, government and out of pocket payment.
- 2) Labor Cost (LC) from donation, government and out of pocket payment.
- 3) Material Cost (MC) from donation, government and patient who pay of pocket payment.
- 4) Total Cost from donation, government and patients who pay for services.
- 5) To calculate the economic cost of capital items on an "annualized" basis, the following five approached have been used (Creese and Parker, 1994).

- Current Value: $C_{2006} = C_t (1 + r)^{2006-t}$

- Useful Life

- Discount rate: Base on Ministry of Economy and Finance (2005), discount rate used 50 % for car, and office supplies with life time 5 years. Computers, discount rate 25% with life time 4 years. Long term asset, such as medical equipments used discount rate 20% with life time 5 years. For buildings, 5% discount rate with life time of 20 years. However, in this study, we assumed to calculate all material cost, office supplies and medical equipments with 15% by based on different use full life time of the reference of Ministry of Economy and Finance in Cambodia.

- Annualization Factor

- Calculation of annual economic cost by dividing the current value of the item by the annualization factor obtained from the standard table of Creese and Parker, 1994.

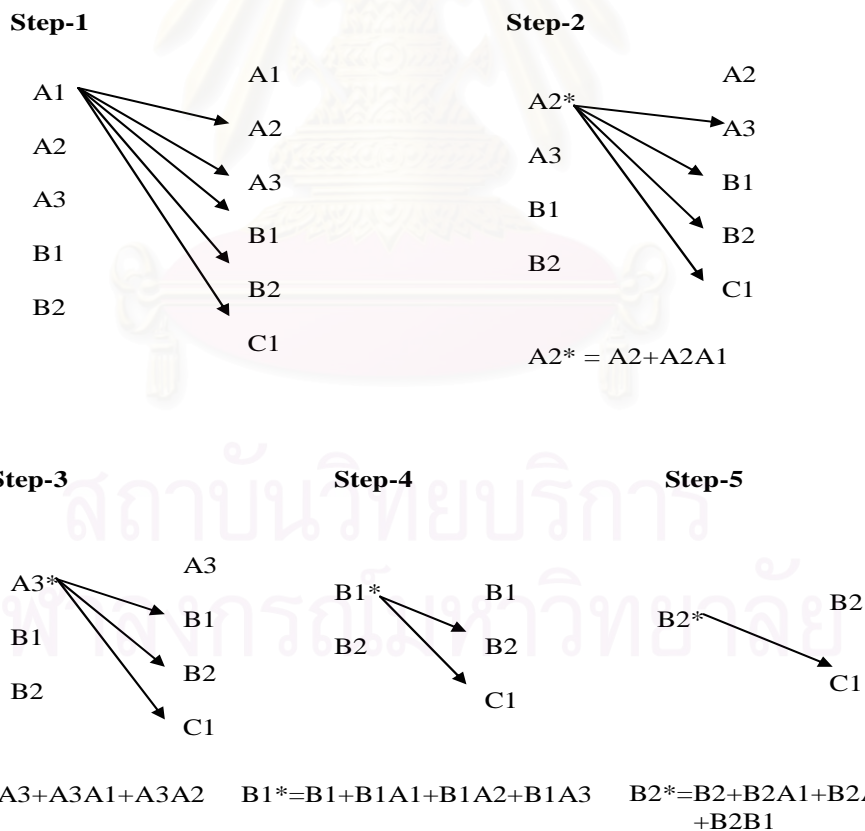
Annual Economic Cost = Current Value / Annualization Factor

Where:

- C_{2006} = the value of capital in year 2006
- C_t = the purchase value of buying or spending in year t
- r = discount rate during the period of study (15%)
- t = the year that capital was bought, completed or renovated.

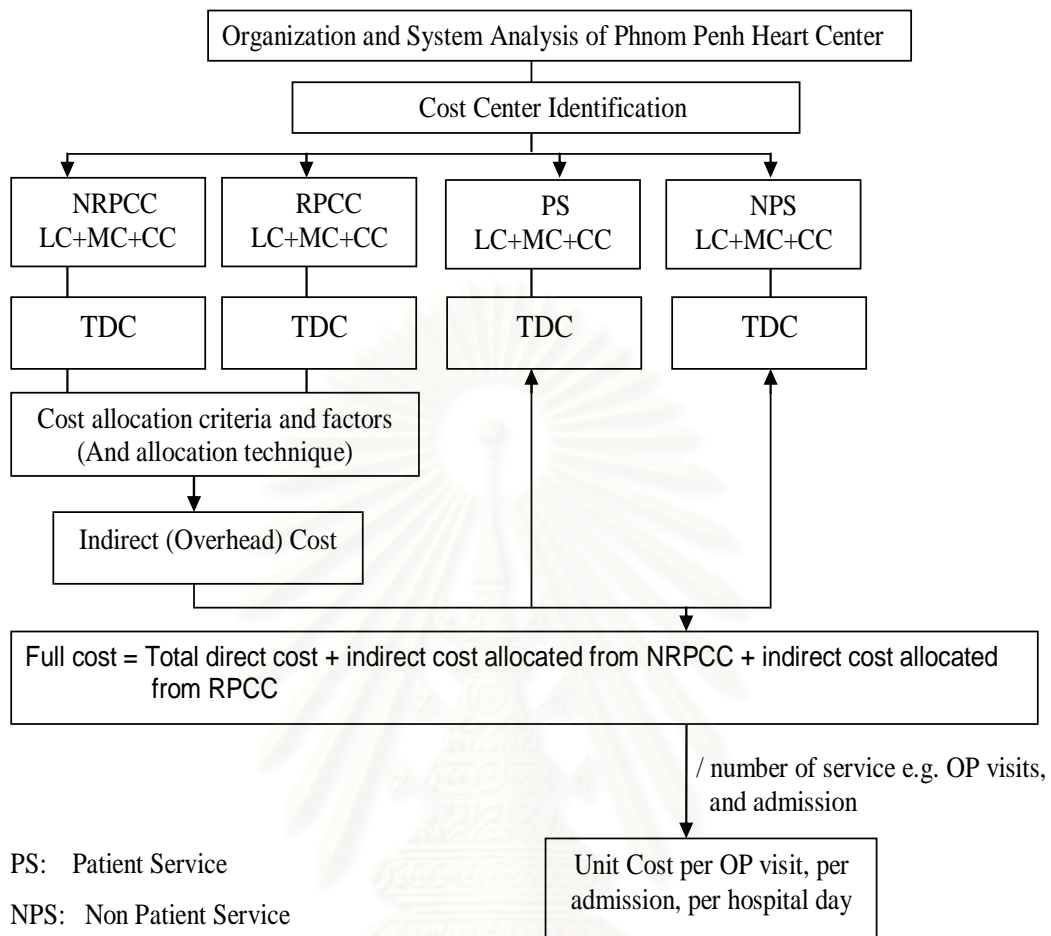
- This study uses step down method to allocate cost from indirect cost center to cost Center.
- This research is a theory related cost accounting.
- This study included economical basis (implicit costs) such as opportunity cost could be estimated by using **15% and 5% discount rate** in order to find the annual economic cost of material cost, equipments and building.
- The currency in Cambodia is Riel, but in this study used USD because (Riel) and (USD) free circular in Cambodia, which is 1 USD = 4,100 Riels (Value in 2006).

4.1.1 Step-down Allocation technique (Tisayaticom et al, 2007)



A denotes NRPC, B denotes RPCC and C denote PS.

4.2 Conceptual Framework



These following formulas used to calculate the unit cost in Phnom Penh Heart Center.

Total Direct Cost (Total Cost) = Labor Cost + Material Cost + Capital Cost

$$\text{Unit Cost of OPD} = \frac{\text{Full Cost of OPD}}{\text{Number of OPD visit}}$$

$$\text{Unit Cost of IPD} = \frac{\text{Full Cost of IPD}}{\text{Number of admission (IPD)/ days}}$$

4.3 Data Analysis

- **Labor Cost** data were collected from the key person with long experience by interviewing and with hard copy as well. This data included salary, bonus and guard service. Labor Cost in this Center, there were no doctor or nurse working more than one cost centers because in every different cost center, there were different specialist doctor and nurse work in different responsibility and function. That is why, number of staff in that center seem to be in large amount. All nurses and doctors suspended their job at the government office to work full time in PPHC. That is why, there were no labor cost was supported by the government.

(Attached in appendix D)

- **Material Costs:** material cost collected by using material cost collecting form and calculated in excel by classifying in line-item one by one, such as office material, maintenance material, Household material, was dispensed from administration department to other cost centers. These data were collected from dispensed record at the administration office.

- **Drug and Medical Supplies:** the values of drug and medical supplies dispensed from central pharmacy unit. These data were collected from dispensed record at the pharmacy unit.

- **Public Utility Cost,** such as cable TV, garbage services and mailing were considered in to administration cost center. However, electricity, water, telephone, and internet were distributed to other cost centers by using appointment criteria, by the area space and number of staff in each cost center. These data collected from administration office.

- **Fuel** collected from administration office by using percentage of fuel use in different service of cost center. In this study the fuel distributed only two cost centers Laboratory Unit and Administration Office.

(All the result of material cost attached in appendix D)

4.3.1 Calculation Capital Cost

Capital costs calculated by capital cost collecting form. To calculate annual capital costs, such as:

- (1) Determine its construction or renovation price (Ct)
- (2) Find out the interest rate in the period of the study (r) (2006)
- (3) Estimated life time span of the asset (n)

According to Ministry of Economy and Finance (2005), Cambodia, compiling capital cost (long term assets) in this study depreciated into useful life time as the following:

Description	Use full life time	Percentage (Discount rate)
Building	20 years	5%
Computers & related equipments	4 years	25%
Vehicle, office supplies and furniture	5 years	50%
Long term Assets (Major equipments)	5 years	20%

However, we assumed to calculate all material cost and medical supplies with 15% with different use full life time according to the above useful life time because the value of annuity factor in Creese and Parker (1994) available only 15% discount rate is the highest.

1) Cost of Building

Cost of building were valued included every cost center that serves the hospitals. Cost to be included were the total cost to build the building now and the estimated of cost per square meter (m²). The cost of building, such as toilets, corridor, walk way, staircases or storage room were no included in this study.

2) Cost of Equipments

All equipment used in this center was list in the tables. Some equipment provided by government and some others by donors. It was impossible to get all information for equipment at this center, in particularly, the major equipments from donation. These equipments were all non-commercial goods and there were no inventory list. Some of equipment was evaluated out-of-work and had no value, and some other were evaluated as in bad condition, but they were still in use and had value at the time of study. Thus, all equipments in uses were used in the calculation to get annual

economic cost of equipment in that center. The working life span of all equipment depended on the Cambodian taxation law, 2005. In order to get annual economic cost of any capital cost, it must be followed two steps of economic cost calculation method:

$$(1) \text{ Calculation of Current Value} = C_{2006} = C_t (1+r)^{2006-t}$$

$$(2) \text{ Calculation of Annual Economic Cost} = \text{Current Value}/\text{Annualization Factor}$$

3) Cost of Vehicle

There was only one vehicle cost which was Jeep car to be included in this study. Cost of Jeep car was the donation cost received in year 2001 and nearly out of calculated in the value of capital cost, but it still in use and had value at the time of study. The working life span of vehicle was depending on the Ministry of Economy and Finance, Cambodian Taxation Law, 2005.

4) Cost of Land

The cost of land in this study was supported by the Cambodian government, and calculated by based on the inflation rate 5% in study year 2006 in Cambodia.

(The detail of calculated capital data are shown in appendix C)

4.3.2 Calculation of Recurrent Cost

Recurrent Cost (RC) or Operating Costs is the main category of resources which used up in the course of a new year and are usually paid or purchased regularly (every year). Two main categories of recurrent cost are included in this study; include cost of personnel (Labor Costs) and Material Costs.

1) Cost of personnel or labor costs

To estimate the cost of personnel of Phnom Penh Heart Center in year 2006, there are three components of labor cost to be included in this study, salary, and bonus and guard services. Bonus in this study is the out of office work. These cost components are the single largest cost item in health care programme. In this study labor cost calculated two sources of fund, such as labor cost of donation (French) and labor cost of PPHC (Cambodian).

(The detail data is shown in appendix D)

2) Material Cost

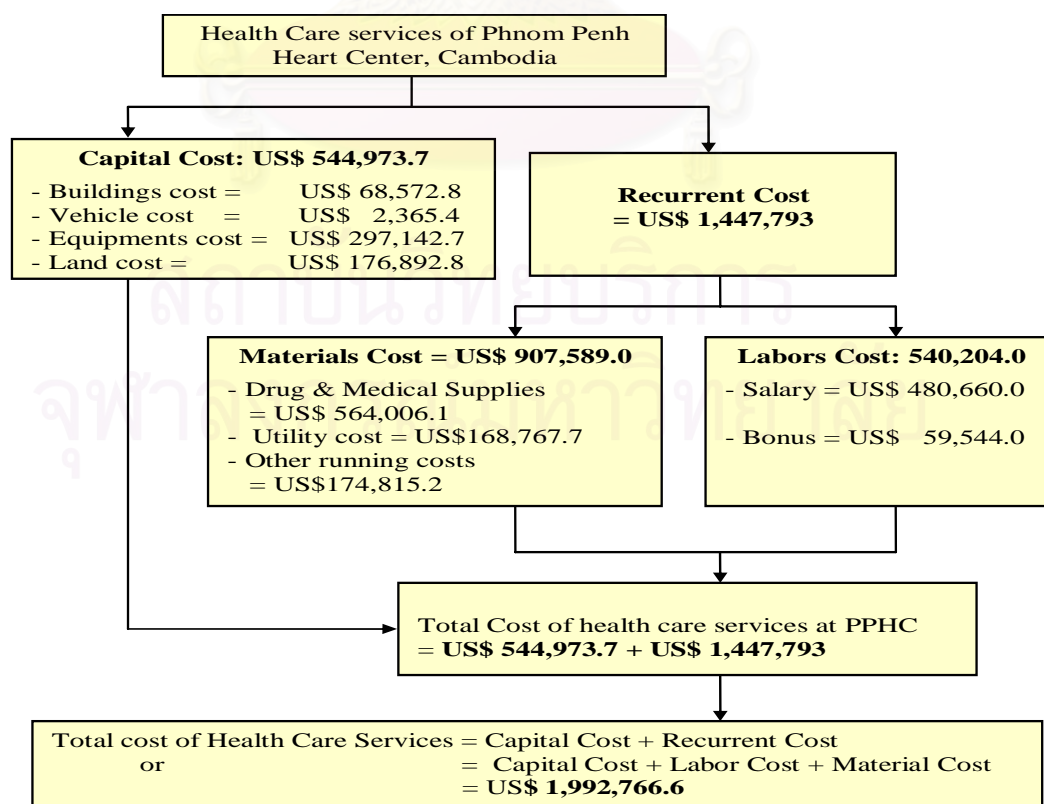
This category is for materials used up in the course of one year, as direct input to the principle activity performed by the hospital, and other items purchased during the year. The material cost represents many items including drugs and medical supplied, operating and maintenance of building and patient, equipments, food and patient supplies, stationery and other operating cost item, etc. The received cost of supplied from providers or donors as well as the amount spent during the year had been included in this study. The costs of all the material consumed and the entire amount spent, that appear on the monthly and annually income and expenditure statement of the hospital have been recorded.

(The detail of calculated material data are shown in appendix C)

4.3.3 Total Cost

In the total cost of Phnom Penh Heart Center calculated by adding up recurrent cost (Labor cost and material cost) plus capital cost. To facilitate the data collection process and analyze the result of total cost of Phnom Penh Heart Center, the summary of data and its sources collected is shown in the following diagram.

Figure: 4.1 Diagram of the of TC of Health Care Services at PPHC in 2006



The methodology of this study is based on cost analysis using step down method. According to Tisayaticom et al. (2007), there are four main steps to involve in the standard costing methodology.

Step-1 (Cost Center Identification)

First an analysis has done on hospitals organization structure and function of all departments. This has done through careful evaluation of hospital organogram and in depth discussion with the hospital administrators, directors, accountant and department heads. With all information at hand the departments have been classified into four categories of cost centers. They were Non–Revenue Producing Cost Centers (NRPCC), Revenue Producing Cost Centers (RPCC), Patient Services (PS) and Non-Patient Services (NPS).

- NRPCC included cost centers like, Administration, Kitchen, Technique Services, Warehouse, and Security unit.
- RPCC: included; Laboratory unit, Radiology unit, Pharmacy unit, Cardiology Intervention unit and Surgery service.
- PS: included; out patient department, such as emergency, Consultation, Intensive Care Unit (ICU) and Inpatient department.
- NPS: Have not been included because PPHC did not have separate service like health education program or health outreach program. All visitors had been educated while they consult doctor at the consultation unit.

Step-2 (Compiling the Total Direct Operating Cost)

The focus will be on compiling of Material Cost and Labor Cost and Capital Cost of all cost centers of the hospital separately. By the end of this step the total direct cost and operating cost for the hospital have been obtained.

- Labor cost; comprised of salary, bonus, and fringe benefits of all hospital staffs.
- Material Cost; comprised of medicines, chemical solutions, small equipments, instruments, office materials, general cleaning and maintenance supplies and public utility cost like water, electricity, telecommunication services etc.
- Capital Cost; compromised of major equipments, vehicles, machineries, buildings and land asset.

Step-3 (Defining Allocation Criteria)

Allocation criteria based on services and activities of which the NRPC and RPCC provide their services to other cost Center, PS. Therefore, appropriate portion of cost from both NRPC and RPCC have been allocated to PS. The criteria have been used based on service statistics or activity statistics which the higher costing Center provides to the rest of the centers. These data were obtained through a very qualitative approach of interviewing and discussions with key peoples of the hospital, through hospital registers, log books, account sheets etc. To estimate labor cost of staff, the actual contribution of the staff to different cost centers full time equivalent (FTE) has been used.

Step-4 (Full Cost and Unit Cost Estimation)

The allocations of cost from NRPC and RPCC to the PS have been done by using step down allocation method.

In step down allocation there are two principles, they are first sequencing of cost center. The cost Center which serves most other cost centers is ranked highest. The second is there is no upward allocation from lower cost centers to the cost centers above them.

To determine the unit cost for patient services and non patient services, the total sum of operating cost which is allocated to these centers from NRPC and RPCC and its own direct cost have been divided by the number of Inpatient admissions and Outpatient visits respectively. The unit cost is the ratio of the full operating cost or full direct costs and outputs of Patient Services and Non patient Services.

The following formulas used to calculate unit cost OPD and IPD and cost per bed day:

$$\text{Unit Cost of OPD} = \frac{\text{Full Cost of OPD}}{\text{Number of OPD visit}}$$

$$\text{Unit Cost of IPD} = \frac{\text{Full Cost of IPD}}{\text{Number of admissions (IPD) /days}}$$

4.3.4 Allocation Criteria

Code	Cost Center	Criteria for cost allocation
A ₁	Administration Office	Number of personnel in each cost center
A ₂	Kitchen	Service provided daily meal in 1 year
A ₃	Warehouse	Number of staffs' cloth provided in 1 year
A ₄	Security Unit	Percentage of patient visited in cost centers 1 year
A ₅	Technique Unit	Service repaired in each cost center in 1 year
B ₁	Pharmacy Unit	Number of patient visit in each services in 1 year
B ₂	Laboratory Unit	Number of patient visit Lab in 1 year
B ₃	Radiology Unit	Number of patient visit X-ray in 1 year
B ₄	Cardiology Intervention Unit	Number of patient visit CIU unit in 1 year
B ₅	Surgery Service	Number of patient operated cardiac surgery 1 year

4.3.5 Unit Cost Calculation:

- IPD in this study included all cost of hospitalization and intensive care unit.
- OPD in this study included all cost of emergency service and consultation unit.
- The component to calculate unit cost of surgery patients in this study included full cost of surgery service, full cost of ICU and full cost of inpatients ward.

Then to calculate unit cost of out patients, inpatients service cost center and cost per bed-ay, the following formulas have been applied in this study:

$$\text{Cost per visit of Emergency} = \frac{\text{Full Cost of Emergency}}{\text{Number of visitors visited in emergency}}$$

$$\text{Cost per visit of consultaion} = \frac{\text{Full Cost of Consultation Unit}}{\text{Number of visitors visited at Consulation Unit}}$$

$$\text{Cost per case of OPD} = \frac{\text{Full Cost of OPD (emergency + consultation)}}{\text{Number of OPD visit (emergency + consultation)}}$$

$$\text{Cost per bed - day of IPD} = \frac{\text{Full Cost of IPD}}{\text{Total days of patients admitted in IPD}}$$

$$\text{Cost per case of IPD} = \frac{\text{Full Cost of IPD (ICU + Inpatient ward)}}{\text{Number of patients admitted in IPD}}$$

$$\text{Costpercaseof surgery} = \frac{\text{FullCostof surgy(ICU+ Inpatientward+ suregryservice)}}{\text{Numberof surgerypatients}}$$

$$\text{Costpercaseof surgery} = \frac{\text{FullCostof surgy(ICU+ Inpatientward+ suregryservice)}}{\text{Totaldayof surgerypatientsadmittedin thehospital}}$$

4.4 Sources of Data

4.4.1 Primary Data

- Primary data is kinds of data come from interview (Technician, Head of each sectors, medical doctor. Primary data interviewed base on the key person who had as long experience of work in the hospital and outside hospital. The information were collected by interviewing consisted of the following:
 - Labor cost (salary and bonus), (attached in appendix D)
 - Cost of some major equipment and material cost
 - Capital cost information obtained from both interviewed and record sheet.
 - Cost of building in each cost centers were interviewed the architecture who was not constructed that building, but he was the one who had long experience of constructing building.
 - Technique service: by interviewed technician.

Sampling design for primary data:

How many times per year do you repair medical equipment in the emergency cost center, surgery service, consolation unit, inpatient ward etc.?

1time 2 times 3 times

How may staff working in each cost Center?

2 staffs 5 staffs 10 staffs 15 staffs 20 staffs

How much salary do you earn per month?

How many hours do you work per day?

Do you have any bonus when you work out of office time and how much do you get?

How much salary does the head of office earn per month?

How much salary do the nurses earn per month?

How much salaries does the medical doctor earn per month?

How much salary do the technicians earn per month?

How much salary do the pharmacists earn per month?

When did you use this equipment?

Does the hospital provide drug for patients? Yes No

Does the hospital provide food for inpatients?

Yes No

What is level of the hospital?

Tertiary Care Primary Care Secondary Care

What is the ownership of the hospital?

It is autonomous hospital-not-for-profit

It is private for-for-profit

It is public hospital

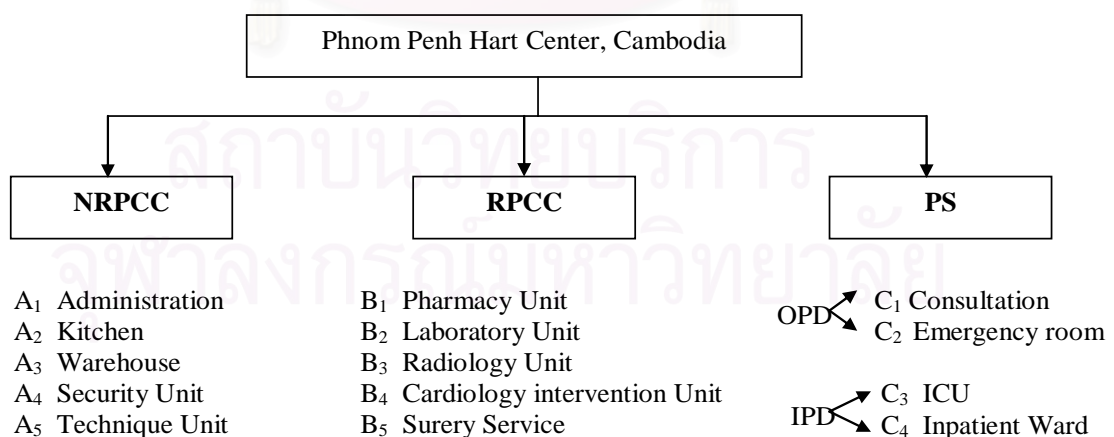
4.4.2 Secondary Data:

Secondary data included the following:

- GDP of Cambodia in study year 2006
 - GDP per capita was US\$ 514.
- Population of Cambodia in study year 2006
 - Total population in year 2006 was 14,200,000 millions.
- Total number of beds of the hospital in study year 2006
 - There were 50 beds in PPHC.
- Total inpatient-days at the hospital in study year 2006 (Occupancy rate)
 - There were 3,804 inpatient/ (50 beds x 365 days) x 100 = 21% patients occupied beds in year 2006
- The organogram of the hospital
- Medical supplies information was obtained from accounting sheet and Pharmacy Unit at Phnom Penh Heart Center in year 2006.
- Office supply and other general supply cost information were obtained at Phnom Penh Heart Center from hard copies of bills and invoices.
- Hospital Revenue and Expenditure statement in year 2006
- Floor space or operating area was measured in square feet at the hospital by calculated on the hard copy of building space document.

- The allocation criteria defined through the analysis of hospital department functions, activity statistics of different departments through log books.
- The number of output services like number of admissions, length of stay and number of OPD visits were obtained from the log books of respective departments of the hospital.
- Out put like number of surgeries, number of X -rays, laboratory test of the services was obtained from those respective departments and administration.
- Structure of the hospital organization was examined, in order to identify cost center and to provide guideline to collect data of each cost center.
- All cost centers were classified in to four groups as follows:
 - (1) Non Revenue Producing Cost Centers (NRPCC) are departments that support operation of other departments; starting with “A” and followed by a number.
 - (2) Revenue Producing Cost Center (RPCC) are departments that generate revenues from their services or activities; starting with “B” and followed by a number.
 - (3) Patient Service areas (PS) are departments that directly services to the patients; starting with “C” and followed by a number or activities
 - (4) Phnom Penh Heart Center does not have non patients service (NPS).

The identification of cost center is shown the following:



Remarks:

NRPCC = Non Revenue Producing Cost Center

RPCC = Revenue Producing Cost Center

PS = Patients Service

4.5 Tools and Instruments for Collecting Data

Data collection in this study based on samples recording forms in the following aspects:

- Data recording form for salaries and bonus of labor cost (LC)
- Data Recording form of material cost (MC)
- Data recording form for material cost (Medical Supplies.....)
- Data recording forms for supplies MC (Non Medical supplies.....)
- Data recording form for material cost (Office Supply)
- Data recording form for public utility cost, like water, electricity, internet,
- Data recording form for capital cost, such as building, vehicle, land etc.
- Record form for allocation of cost
- Record form for total recurrent cost and total capital cost
- Data recording forms for output services
- Microsoft Excel program for analysis

(All data recording forms are attach in the appendix A at the back page)

4.6 Comparison

After Estimation of step down method, the result of unit cost of inpatient and outpatient of Phnom Penh Heart Center which is an actual calculation have been compared with the calculated unit cost of WHO-CHOICE Project (Adam et al, 2003) and (Adam & Evans, 2006).

Adam et al. (2003) has recently undertaken an extensive effort to collect and collate data on the unit cost of inpatient (cost per bed day) of hospital and each health centers from 49 developed and developing countries with various years database covers a total of 2,173 countries-years of observation which used GDP per capita, occupancy rate, level of hospital and ownership as a proxy for econometric model. In addition, Adam & Evans (2006) identified determinants of variation in the relationship between the cost of outpatient visits and inpatients days then used the estimated relationship to calculate average costs of inpatient and outpatient stay from 832 hospitals in 28 developed and developing countries to calculate a mean cost of inpatient stays and outpatients visits and the ratio of inpatient to outpatient unit costs varies with GDP per capita, hospital size, ownership and occupancy rate.

Concerning about the appropriateness of transferability of unit costs from single studies, or even groups of studies, we can apply use the results of the models developed by WHO-CHOICE to calculate for unit cost for individual countries like Cambodia. Therefore, the following formulas which were calculated by WHO-CHOICE, then used to calculate the unit cost for comparison from this study with following:

First Equation: (Unit Cost of Inpatient)

$$\text{LnUCIP} = -2.5036 + 0.7624 \text{ LnGDP} - 0.2318 \text{ LnOR} + 0.6410 \text{ DRUG} + 0.2116 \text{ FOOD} \\ - 0.5777\text{LEV1} - 0.3118\text{LEV2} - 0.2722\text{PUB} + 0.2444 \text{ PRIV} + 1.7471 \text{ USA}$$

$$\text{LnUCIP} = \alpha_0 + \sum \alpha_i X_i + e_i$$

Second Equation: (Unit Cost of Outpatient)

$$\text{Ln(UCOP/UCIP)} = -2.2698 + 0.1303 \text{ LnGDP} - 0.1683 \text{ LnOR} + 0.0884 \text{ LnBED} \\ - 0.4890 \text{ PUB} + 0.1985 \text{ FOOD}$$

$$\text{Ln(UCOP/UCIP)} = \alpha_0 + \sum \beta_i \ln X_i + e_i$$

Where:

GDP : GDP per capita in the study year = US\$514

OR : Occupancy rate: Total inpatient-days per year / (number of bed x 365) x 100

BED : Number of beds in the hospital in the study/research year

DRUG: $\left\{ \begin{array}{l} \text{dummy of drug} \\ \mathbf{DRUG = 1} = \text{the hospital provides drugs to the patient.} \\ \mathbf{0} = \text{otherwise} \end{array} \right.$

FOOD: $\left\{ \begin{array}{l} \text{dummy of food} \\ \mathbf{FOOD = 1} = \text{the hospital provides food to inpatients.} \\ \mathbf{0} = \text{otherwise} \end{array} \right.$

LEV1 : $\left\{ \begin{array}{l} \text{dummy level of hospital} \\ \mathbf{LEV1 = 1} = \text{Primary-level hospital} \\ \mathbf{0} = \text{otherwise} \end{array} \right.$

LEV2 : $\left\{ \begin{array}{l} \text{dummy level of hospital} \\ \mathbf{LEV2 = 1} = \text{Secondary-level hospital} \\ \mathbf{0} = \text{otherwise} \end{array} \right.$

PUB : { dummy of hospital
PUB = 1 = the hospital is government owned
0 = otherwise

PRIV : { dummy of hospital ownership
PRIV = 1 = Private hospital for Profit
0 = otherwise

USA : { dummy of countries
USA = 1 = study/ research cost in USA
0 = otherwise

(Please refer to the appendix B for the detail the definition of hospital level)



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CHAPTER V

THE RESULTS

5.1 General Data

Details in operating areas and number of staffs for each cost center at Phnom Penh Heart Center in fiscal year 2006 are shown in table 5.3 to the next pages. According to table 5.3, total operating area was equal to 2,225.4 m². The operating area of inpatients ward was the largest which equal to 463 m² or 20.8 percents of total operating area. The number of staff in Phnom Penh Heart Center was 137 persons, including 2 of Heart Center, 4 senior nurses, 51 secondary nurses, 5 surgery doctors, 27 doctors, 12 administration staffs, 6 kitchen staffs, 9 security staffs, 1 warehouse staff, 14 cleaners, 4 technicians, 1 pediatric teacher and 1 driver. Among 137 staffs, 23.2 percents were supported by donation and 76.8 percent were supported by out of pocket payment. The highest percentage of staffs was 17.4 percents equal to 24 persons at the emergency room. Base on the table 5.1 on page 44, total expenditure on labor cost equal to US\$540,204 per year, salary was the highest percentage of labor cost which equal to US\$481,320 (89.1%), while bonus equal to US\$58,884 (10.9%). At the same time, in table 5.1 to the next page 44 shows that, the source of finance come from out of pocket payment spent on labor cost equal to US\$437,076 (80.9%) of total labor cost, while donation budget was shared on expenditure of labor cost about US\$103,128.0 (19.1%) of the total labor cost in 2006.

According to table 5.1 on page 43, material cost equal to US\$795,449.9 (87.6%) was supported by out of pocket budget and US\$64,210.2 (7.1%) was supported by donation budget, while US\$47,928.9 (5.3%) was subsidized by the government budget on electricity cost.

Referring to table 4.7 to the next page, there were three sources of fund supported capital costs, include donation source, government budget and out of pocket payment. The highest percentage equal to US\$ 326,017.3 (88.6%) was supported by donation budget, while the second source was donated by government equal to US\$ 176,892.8 (32.5%) and the last equal to US\$ 42,063.5 (11.4%) was supported by out of pocket payment.

Table: 5.1 LC, MC and CC at Phnom Penh Heart Center in 2006

Items	Labor Cost (US\$)	%
Salary	480,660.0	89.0%
Other benifit	59,544.0	11.0%
Total LC	540,204.0	100%
Staff supported by out of pocket budget	437,076.0	80.9%
Staff supported by donation budget.	103,128.0	19.1%
Items	Material Cost (US\$)	%
Utility Cost	168,767.7	18.6%
Cost of drug & medical supplies	564,006.1	62.1%
Cost of office supplies & other material costs	174,815.2	19.3%
Total MC	907,589.0	100.0%
MC supported by government budget	47,928.9	5.3%
MC supported by donation budget.	64,210.2	7.1%
MC supported by out of pocket budget.	795,449.9	87.6%
Items	Capital Cost (US\$)	%
Depreciation of building	68,572.8	13 %
Depreciation of land asset	176,892.8	32 %
Depreciation of long term assets (ME&OE)	297,142.7	55%
Depreciation of vehicle	2,365.4	0.005%
Total CC	544,973.7	100.0%
CC supported by out of pocket budget	42,063.5	8%
CC supported by donation budget.	326,017.3	60%
CC supported by government budget	176,892.8	32%
Total LC, MC and CC	1,992,766.6	

According to table 5.2 blow, in fiscal year 2006, there were 15,539 visitors visit consultation unit and 259 cases were emergency cases. There were 3,804 inpatients admitted in the Phnom Penh Heart Center (PPHC). Among 3,804 inpatients, there were 459 cases were admitted by performing surgery. Among 459, there were 308 cases admitted with open heart surgery. There were 3,345 admitted without performing the surgery. The total occupancy rate in PPHC in year 2006 was 21 percents.

Table 5.2 Information of patients' record at Phnom Penh Heart Center in 2006

Descriptions	Number of inpatients	Length of stay		
		ICU	Inpatients ward	Total
Surgery patients	459	4		1,836
- Coronary	151		18	2,654
- Open heart	200		22	4,400
- Open heart	108		19	2,052
Total day of all surgery patients admitted				10,942
Non-surgery patients	3,345			16,915
	450		3	1,350
	545		7	3,815
	2,350		5	11,750
Total days of all admitted patients(surgery & non surgery)				27,857
Description				Quantity
Number of beds				50 beds
Occupancy rate = 3,804 patients/ (50beds x 365 days) x 100				21%
Number of Patients visited				15,539
Number of Emergency cases				259
Number of admitted with surgery patients				459
Number of patients admitted (non surgery patients)				3,345
Total number of inpatient admitted in 2006				3,804
Total days of surgery patients admitted				10,942days
Total days of non-surgery patients admitted				16,915days
Total days of all admitted patients (3,804 patients)				27,857days
Number of open heart surgery patients				308
Average length of stay of open heart surgery patients				25 days
Average length of stay of non-surgery patients				5.06 days

5.2 Total Direct Cost of Each Cost Center

Total Direct Cost (TDC) of each department comprised labor cost, material cost and capital cost, which are shown in detail in table 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, and 5.9 to the next page. Total labor costs equal to US\$ 540,204.0. Labor costs comprised of salary equal to US\$ 480,660 (89.0%) and other benefit equal to US\$ 59,544 (11.0%) of total labor cost. The largest portion of labor cost was in the surgery service equal to US\$ 126,900 (23.5%) and the smallest portion equal to US\$2,232 (0.4 %) was in warehouse unit. According to table 5.5 on page 49, there were only two source of fund supported labor cost. The priority amount of the supporter come from out of pocket budget equal to US\$437,076.0 (80.9%) and the last supporter was the donation budget equal to US\$103,128.0 (19.1%) of the total labor cost.

The total material cost equal to US\$ 907,589 which comprised of utility cost, drug and medical supplies. The utility cost equal to US\$ 168,767.7 (18.6%), cost of drug and medical supplies equal to US\$ 564,006.1 (62.1%) and office and other material cost equal to US\$ 174,815.2 (19.3%) of the total cost. The largest portion of total material cost equal to US\$ 167,510.9 (18.5%) at surgery service, while the smallest portion equal to US\$ 1,060.1 (0.1%) was in warehouse unit. Base on table 5.6 on page 50 shows that the source of finance to support material cost, such as utility cost, office supplies, and other drug and medical supplies cost come from three source, include government budget US\$ 48,000.0 (5.3%) subsidized on electricity, donation budget US\$ 64,210.2 (7.2%) to support medical cost and out of pocket budget US\$ 795,449.9 (87.6%) to support all running cost in each cost centers.

The total capital cost equal to US\$544,973.7, of which depreciation of building equal to US\$ 68,572.8 (13%), depreciation of long term assets, such as office and medical equipment equal to US\$ 297,142.7 (55%), depreciation of land asset equal to 176,892.8 (32%) which was donated by government and depreciation of vehicle equal to US\$ 2,365.4 (0.005%) which was donated by French. The largest portion of total capital cost was US\$ 127,309.6 (20.2 %) at emergency room, the second largest was in inpatient ward equal to US\$116,870.5 (7.3%) and the smallest portion was in security unit and warehouse equal to only 1% of the total capital cost. Referring to table 5.9 to on page 53, there are three sources of finance to support capital cost in PPHC, include government budget US\$176,892.35 (32.5%), gout of pocket budget

US\$ 42,063.5 (7.7%) and donation budget US\$ 326,017.3 (59.8%) of the total capital cost in 2006.

Table 5.3 Areas and number of staffs of each cost centers at PPHC in 2006

Code	Cost Center	Operating areas		Number of staffs and share of percentage					
		(m2)	%	Donation	Cambodia	Total	% Donor	% Cambodi	Total %
A1	Administration Office	273.0	12.3%	7	9	16	5.1%	7.2%	12.3%
A2	Kitchen	31.5	1.4%	3	3	6	2.2%	2.2%	4.3%
A3	Warehouse	14.7	0.7%	0	1	1	0.0%	0.7%	0.7%
A4	Security Unit	12.0	0.5%	0	9	9	0.0%	6.5%	6.5%
A5	Technique Unit	151.0	6.8%	0	4	4	0.0%	2.9%	2.9%
B1	Pharmacy Unit	31.6	1.4%	1	1	2	0.7%	0.7%	1.4%
B2	Laboratory Unit	24.5	1.1%	1	2	3	0.7%	1.4%	2.2%
B3	Radiology Unit	15.7	0.7%	1	1	2	0.7%	0.7%	1.4%
B4	Angiography Unit	90.0	4.0%	0	3	3	0.0%	2.2%	2.2%
B5	Surgery Services	400.4	18.0%	5	12	17	3.6%	8.7%	12.3%
C1	Consultation Unit	365.8	16.4%	2	15	17	1.4%	10.9%	12.3%
C2	Emergency room	148.0	6.7%	0	24	24	0.0%	17.4%	17.4%
C3	ICU	203.9	9.2%	5	10	15	2.9%	8.0%	10.9%
C4	Inpatient Ward	463.3	20.8%	8	10	18	5.8%	7.2%	13.0%
	Total	2,225.4	100.0%	33	104	137	23.2%	76.8%	100.0%

According to the above table, the largest amount of staffs is in emergency room (24 staffs), the second largest amount of staffs is in inpatient ward (18 staffs), the third largest is in surgery and consultation unit (17 staffs), the fourth is in administration office (16 staffs) and the smallest amount of staff is in warehouse.

Table 5.4 Distribution of labor cost of PPHC in 2006

Code	Cost Center	personnel	Salary		Bonus		Total LC	
			US\$	%	US\$	%	US\$	%
A1	Administration Office	17	92,280.0	19.2%	1,044.0	1.8%	93,324.0	17.3%
A2	Kitchen	6	8,640.0	1.8%	0.0	0.0%	8,640.0	1.6%
A3	Warehouse	1	2,160.0	0.4%	72.0	0.1%	2,232.0	0.4%
A4	Security Unit	9	13,380.0	2.8%	648.0	1.1%	14,028.0	2.6%
A5	Technique Unit	4	13,800.0	2.9%	2,088.0	3.5%	15,888.0	2.9%
B1	Pharmacy Unit	2	5,280.0	1.1%	144.0	0.2%	5,424.0	1.0%
B2	Laboratory Unit	3	7,200.0	1.5%	0.0	0.0%	7,200.0	1.3%
B3	Radiology Unit	2	4,080.0	0.8%	144.0	0.2%	4,224.0	0.8%
B4	Angiography Unit	3	23,400.0	4.9%	6,816.0	11.4%	30,216.0	5.6%
B5	Surgery Services	17	100,680.0	20.9%	26,220.0	44.0%	126,900.0	23.5%
C1	Consultation Unit	17	54,720.0	11.4%	9,984.0	16.8%	64,704.0	12.0%
C2	Emergency room	24	73,680.0	15.3%	6,888.0	11.6%	80,568.0	14.9%
C3	ICU	15	37,440.0	7.8%	1,260.0	2.1%	38,700.0	7.2%
C4	Inpatient Ward	18	43,920.0	9.1%	4,236.0	7.1%	48,156.0	8.9%
	Total	138	480,660.0	100.0%	59,544.0	100.0%	540,204.0	100.0%

Cost and percentage of salary and bonus

Items	Labor Cost	%
Salary	480,660.0	89.0%
Bonus	59,544.0	11.0%
Total	540,204.0	100.0%

Referring to the above tables, the highest using labor cost is in surgery service, labor cost in administration office has 2.4% higher than emergency room, where the emergency room has 24 staffs and administration office has only 16 staffs. The consultation unit is the third highest using labor cost after the emergency service.

Table 5.5 Distribution of Labor Cost at Phnom Penh Heart Center in 2006

Code	Cost Center	Salary		Bonus		Total Labor Cost		Grand Total
		Donor Budget (US\$)	Out of Pocket Budget (US\$)	Donor Budget (US\$)	Out of Pocket Budget (US\$)	Donor (US\$)	Out of pocket (US\$)	
A1	Administration Office	13,080.0	79,200.0	744.0	300.0	13,824.0	79,500.0	93,324.0
A2	Kitchen	4,320.0	4,320.0	0.0	0.0	4,320.0	4,320.0	8,640.0
A3	Warehouse	0.0	2,160.0	0.0	72.0	0.0	2,232.0	2,232.0
A4	Security Unit	0.0	13,380.0	0.0	648.0	0.0	14,028.0	14,028.0
A5	Technique Unit	0.0	13,800.0	0.0	2,088.0	0.0	15,888.0	15,888.0
B1	Pharmacy Unit	2,640.0	2,640.0	72.0	72.0	2,712.0	2,712.0	5,424.0
B2	Laboratory Unit	2,400.0	4,800.0	0.0	0.0	2,400.0	4,800.0	7,200.0
B3	Radiology Unit	2,040.0	2,040.0	72.0	72.0	2,112.0	2,112.0	4,224.0
B4	Angiography Unit	0.0	23,400.0	0.0	6,816.0	0.0	30,216.0	30,216.0
B5	Surgery Services	28,440.0	72,900.0	7,140.0	18,420.0	35,580.0	91,320.0	126,900.0
C1	OPD (Consultation)	7,200.0	47,520.0	1,344.0	8,640.0	8,544.0	56,160.0	64,704.0
C2	Emergency room	0.0	73,680.0	0.0	6,888.0	0.0	80,568.0	80,568.0
C3	ICU	12,240.0	25,200.0	360.0	900.0	12,600.0	26,100.0	38,700.0
C4	Inpatient Ward (IPD)	18,720.0	25,200.0	2,316.0	1,920.0	21,036.0	27,120.0	48,156.0
	Total	91,080.0	390,240.0	12,048.0	46,836.0	103,128.0	437,076.0	540,204.0

Share in percentage of donation budget and out of pocket payment budget

Items	TLC (US\$)	%
Donation Budget	103,128.0	19.1
Out of pocket budget	437,076.0	80.9
Total	540,204.0	100.0

Base on the above table, there is no source of finance from government to support labor cost at PPHC in 2006. There are only two sources of fund from donation part and out of pocket payment to support labor cost, of which out of pocket payment supported the highest 80.9%, while donation source supported 19.1% of the total labor cost. Because of the PPHC is an autonomous hospital, nurses and medical doctors suspended their work at the government office to earn higher salary at PPHC. That is why, there is no source from the government to support labor cost at PPHC.

Table 5.6 Material Cost of each cost Center at Phnom Penh Heart Center in 2006

Code	Cost Center	Utility Cost		Cost of Drug and Medical Supplies		Office & Other Material Costs		Total Material Cost	
		US\$	%	US\$	%	US\$	%	US\$	%
A1	Administration Office	24,631.2	14.6%	0.0	0.0	24,186.5	13.8%	48,817.7	5.4%
A2	Kitchen	6,229.5	3.7%	0.0	0.0	17,752.0	10.2%	23,981.4	2.6%
A3	Warehouse	1,031.1	0.6%	0.0	0.0	29.0	0.0%	1,060.1	0.1%
A4	Security Unit	12,349.4	7.3%	0.0	0.0	416.6	0.2%	12,766.0	1.4%
A5	Technique Unit	4,291.4	2.5%	0.0	0.0	333.6	0.2%	4,625.0	0.5%
B1	Pharmacy Unit	2,076.5	1.2%	0.0	0.0%	62,132.6	35.5%	64,209.1	7.1%
B2	Laboratory Unit	5,810.9	3.4%	141,582.5	25.1%	301.5	0.2%	147,694.9	16.3%
B3	Radiology Unit	2,076.5	1.2%	8,708.9	1.5%	25.6	0.0%	10,811.0	1.2%
B4	Angiography Unit	3,107.6	1.8%	144,789.1	25.7%	3,880.3	2.2%	151,776.9	16.7%
B5	Surgery Services	19,743.0	11.7%	133,504.4	23.7%	14,263.5	8.2%	167,510.9	18.5%
C1	Consultation Unit	17,643.0	10.5%	0.0	0.0%	1,184.5	0.7%	18,827.5	2.1%
C2	Emergency room	28,920.0	17.1%	30,627.3	5.4%	1,830.7	1.0%	61,378.0	6.8%
C3	ICU	17,385.7	10.3%	18,771.4	3.3%	39.6	0.0%	36,196.7	4.0%
C4	Inpatient Ward	23,472.0	13.9%	86,022.5	15.3%	48,439.3	0.3	157,933.8	17.4%
	Total	168,767.7	100.0%	564,006.1	100.0%	174,815.2	100.0%	907,589.0	100.0%

Share in percentage of Material Cost

Items	TMC (US\$)	%
Utility Cost	168,767.7	18.6%
Drugs & Medical Supplies	564,006.1	62.1%
Other material cost	174,815.2	19.3%
Total	907,589.0	100.0%

In 2006, drug and medical supplies were the highest percentage (62.1%) of using material cost, the second highest of using material cost is other material cost (office supplies) was nearly 20% and the last utility cost was almost 19 % of the total material cost.

Table 5.7 Material Cost of each cost Center at Phnom Penh Heart Center in 2006

Code	Cost Center	Material Cost			Total				
		Government Budget (US\$)	Out of pocket budget (US\$)	Donation Budget (US\$)	Material Cost (US\$)	% of Govt. Budget	% of Out of Pocket Budget	% of Donation Budget	Total %
A1	Administration Office		48,817.7		48,817.7	0.0%	5.4%	0.0%	5.4%
A2	Kitchen		23,981.4		23,981.4	0.0%	2.6%	0.0%	2.6%
A3	Warehouse	988.8	71.3		1,060.1	0.1%	0.0%	0.0%	0.1%
A4	Security Unit		12,766.0		12,766.0	0.0%	1.4%	0.0%	1.4%
A5	Technique Unit		4,625.0		4,625.0	0.0%	0.5%	0.0%	0.5%
B1	Pharmacy Unit		64,209.1		64,209.1	0.0%	7.1%	0.0%	7.1%
B2	Laboratory Unit	2,980.1	144,714.8		147,694.9	0.3%	15.9%	0.0%	16.3%
B3	Radiology Unit	1,991.3	8,819.7		10,811.0	0.2%	1.0%	0.0%	1.2%
B4	Angiography Unit	2,980.1	147,296.8	1,500.0	151,776.9	0.3%	16.2%	0.2%	16.7%
B5	Surgery Services		167,510.9		167,510.9	0.0%	18.5%	0.0%	18.5%
C1	Consultation Unit		18,827.5		18,827.5	0.0%	2.1%	0.0%	2.1%
C2	Emergency room	23,882.1	37,495.9		61,378.0	2.6%	4.1%	0.0%	6.8%
C3	ICU	15,106.5	21,090.2		36,196.7	1.7%	2.3%	0.0%	4.0%
C4	Inpatient Ward		95,223.7	62,710.2	157,933.9	0.0%	10.5%	6.9%	17.4%
	Total	47,928.9	795,449.9	64,210.2	907,589.0	5.3%	87.6%	7.1%	100.0%

Base on the above result in table 5.7, there were three source of fund support material cost at PPHC in 2006. The main supporter was the source from out of pocket payment around 87.6%, the second supporter was the source of donation budget 7.1% and the last supporter was government budget was only 5.3% which was subsidized on electricity cost.

Table 5.8 Capital Costs of each cost Center at PPHC in 2006

Code	Cost Center	Depreciation of Building		Depreciation of Land Asset		Depreciation of long term Asset (office & medical supplies)		Depreciation of Vehicle		Total Capital Cost	
		US\$	%	US\$	%	US\$	%	US\$	%	US\$	%
A1	Administration Office	8,412.1	12.3%	21,700.2	12.3%	9,762.6	3.3%	2,365.4	100.0%	42,240.4	7.8%
A2	Kitchen	970.6	1.4%	2,503.9	1.4%	686.9	0.2%	0.0	0.0%	4,161.4	0.8%
A3	Warehouse	453.0	0.7%	1,168.5	0.7%	242.8	0.1%	0.0	0.0%	1,864.2	0.3%
A4	Security Unit	369.8	0.5%	953.9	0.5%	193.8	0.1%	0.0	0.0%	1,517.4	0.3%
A5	Technique Unit	4,652.9	6.8%	12,002.7	6.8%	8,631.2	2.9%	0.0	0.0%	25,286.8	4.6%
B1	Pharmacy Unit	973.7	1.4%	2,511.8	1.4%	960.9	0.3%	0.0	0.0%	4,446.4	0.8%
B2	Laboratory Unit	754.9	1.1%	1,947.5	1.1%	14,324.9	4.8%	0.0	0.0%	17,027.3	3.1%
B3	Radiology Unit	483.8	0.7%	1,248.0	0.7%	16,685.2	5.6%	0.0	0.0%	18,417.0	3.4%
B4	Angiography Unit	2,773.2	4.0%	7,153.9	4.0%	24,928.9	8.4%	0.0	0.0%	34,856.1	6.4%
B5	Surgery Services	12,337.8	18.0%	31,827.0	18.0%	15,647.7	5.3%	0.0	0.0%	59,812.5	11.0%
C1	Consultation Unit	11,271.6	16.4%	29,076.7	16.4%	23,904.9	8.0%	0.0	0.0%	64,253.2	11.8%
C2	Emergency room	4,560.4	6.7%	11,764.2	6.7%	110,984.9	37.4%	0.0	0.0%	127,309.6	23.4%
C3	ICU	6,283.0	9.2%	16,207.6	9.2%	4,420.3	1.5%	0.0	0.0%	26,910.9	4.9%
C4	Inpatient Ward	14,276.0	20.8%	36,826.8	20.8%	65,767.7	22.1%	0.0	0.0	116,870.5	21.4%
	Total	68,572.8	100.0%	176,892.8	100.0%	297,142.7	100.0%	2,365.4	100.0%	544,973.7	100.0%

According to the above result in table 5.8, total capital cost at PPHC in 2006 is US\$544,973.7, the highest capital cost is exist in depreciation of office and medical supplies (US\$ 297,142.7), followed by depreciation of land asset US\$ 176,892.8 and depreciation of building US\$ 68,572.8.

Table: 5.9 Source of Capital Cost of each Cost Center at PPHC in 2006

Code	Cost Center	Capital Cost			Total				
		Out of Pocket (US\$)	Government budget (US\$)	Donation Budget (US\$)	Total Capital Cost (US\$)	% of Govt.	% of Donation	% of out of pocket budget	Total%
A1	Administration Office	3,140.7	21,700.2	17,399.5	42,240.4	4.0%	3.2%	0.6%	7.8%
A2	Kitchen	401.4	2,503.9	1,256.0	4,161.3	0.5%	0.2%	0.1%	0.8%
A3	Warehouse	0.0	1,168.5	695.8	1,864.3	0.2%	0.1%	0.0%	0.3%
A4	Security Unit	60.0	953.9	503.5	1,517.4	0.2%	0.1%	0.0%	0.3%
A5	Technique Unit	128.0	12,002.7	13,156.1	25,286.8	2.2%	2.4%	0.0%	4.6%
B1	Pharmacy Unit	941.4	2,511.8	993.2	4,446.4	0.5%	0.2%	0.2%	0.8%
B2	Laboratory Unit	13,955.5	1,947.5	1,124.3	17,027.3	0.4%	0.2%	2.6%	3.1%
B3	Radiology Unit	9,435.3	1,248.0	7,733.7	18,417.0	0.2%	1.4%	1.7%	3.4%
B4	Angiography Unit	204.4	7,153.9	27,497.6	34,855.9	1.3%	5.0%	0.0%	6.4%
B5	Surgery Services	1,451.2	31,827.0	26,534.4	59,812.6	5.8%	4.9%	0.3%	11.0%
C1	Consultation Unit	821.1	29,076.7	34,355.3	64,253.2	5.3%	6.3%	0.2%	11.8%
C2	Emergency room	5,706.2	11,764.2	109,839.1	127,309.6	2.2%	20.2%	1.0%	23.4%
C3	ICU	195.6	16,207.6	10,507.7	26,910.9	3.0%	1.9%	0.0%	4.9%
C4	Inpatient Ward	5,622.7	36,826.8	74,421.0	116,870.5	6.8%	13.7%	1.0%	21.4%
	Total	42,063.5	176,892.8	326,017.3	544,973.7	32.5%	59.8%	7.7%	100.0%

According to the above table on page 52 and page 53, the source of fund from donation and government part was the main supporter to support capital cost at Phnom Penh Heart Center in 2006, while the out of pocket payment budget was the smallest part only 7.7% to support capital cost in 2006. The donation budget supported medical equipment and building and the government part supported land asset.

Total Direct Costs shows in table 5.10 bellow, total direct costs or total cost of PPHC in 2006 were the summation of Labor Cost (LC), Material Cost (MC) and Capital Cost (CC). The total Direct cost in 2006 equal to US\$1,992,766.6. The highest cost was material cost, of which almost 50% of the total cost and followed by capital cost and labor cost.

Table 5.10 Total Direct Cost of Phnom Penh Heart Center in 2006

Items	Total Direct Cost (US\$)	Percentages (%)
Labor Costs	540,204.0	27.2
Material Cost	907,589.0	45.5
Capital Cost	544,973.7	27.3
Total	1,992,776.6	100.0

Figure 5.1 Percentages of LC, MC, and CC of PPHC in 2006

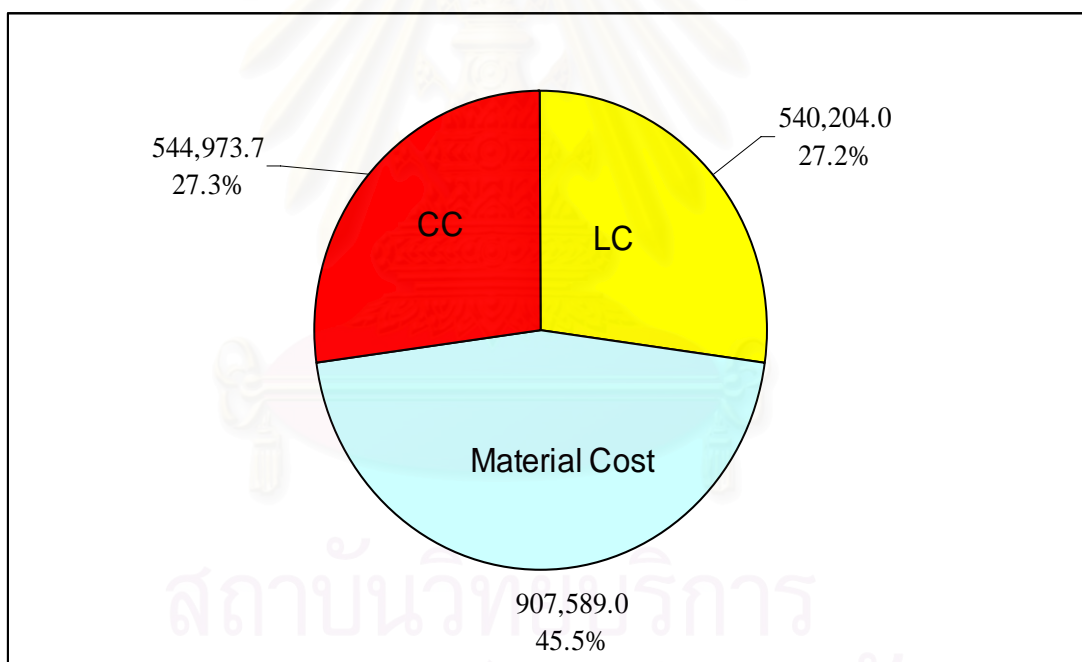


Table 5.11 Total Direct Cost of Each Cost Center at PPHC in 2006

Code	Cost Center	Labor Cost		Material Cost		Capital Cost		Total Direct Cost	
		US\$	%	US\$	%	US\$	%	US\$	%
A ₁	Administration Office	93,324.0	17.3%	48,817.7	5.4%	42,240.4	7.8%	184,382.1	9.3%
A ₂	Kitchen	8,640.0	1.6%	23,981.4	2.6%	4,161.3	0.8%	36,782.8	1.8%
A ₃	Warehouse	2,232.0	0.4%	1,060.1	0.1%	1,864.3	0.3%	5,156.4	0.3%
A ₄	Security Unit	14,028.0	2.6%	12,766.0	1.4%	1,517.4	0.3%	28,311.4	1.4%
A ₅	Technique Unit	15,888.0	2.9%	4,625.0	0.5%	25,286.8	4.6%	45,799.7	2.3%
B ₁	Pharmacy Unit	5,424.0	1.0%	64,209.1	7.1%	4,446.4	0.8%	74,079.5	3.7%
B ₂	Laboratory Unit	7,200.0	1.3%	147,694.9	16.3%	17,027.3	3.1%	171,922.1	8.6%
B ₃	Radiology Unit	4,224.0	0.8%	10,811.0	1.2%	18,417.0	3.4%	33,452.0	1.7%
B ₄	Angiography Unit	30,216.0	5.6%	151,776.9	16.7%	34,855.9	6.4%	216,848.9	10.9%
B ₅	Surgery Services	126,900.0	23.5%	167,510.9	18.5%	59,812.6	11.0%	354,223.4	17.8%
C ₁	Consultation Unit	64,704.0	12.0%	18,827.5	2.1%	64,253.2	11.8%	147,784.8	7.4%
C ₂	Emergency room	80,568.0	14.9%	61,378.0	6.8%	127,309.6	23.4%	269,255.5	13.5%
C ₃	ICU	38,700.0	7.2%	36,196.7	4.0%	26,910.9	4.9%	101,807.6	5.1%
C ₄	Inpatient Ward	48,156.0	8.9%	157,933.9	17.4%	116,870.5	21.4%	322,960.4	16.2%
	Total	540,204.0	100.0%	907,589.0	100.0%	544,973.7	100.0%	1,992,766.6	100.0%

According to the above table, largest portion of total direct cost equal to US\$354,223.4 (17.8%) was in surgery service, while the smallest portion equal to US\$3,987.9 (0.2%) was in warehouse. This center spent 27.2% on labor cost, 27.3% on material cost and 45.5 % on capital cost of the total hospital cost in fiscal year 2006.

Table 5.12 Value of LC, MC and CC of PPHC in 2006

Code	Department/ Unit	LC(US\$)	MC (US\$)	CC(US\$)	TDC(US\$)	% LC	% MC	% CC	Total (US\$)
A1	Administration Office	93,324.0	48,817.7	42,240.4	184,382.1	4.7%	2.4%	2.1%	9.3%
A2	Kitchen	8,640.0	23,981.4	4,161.3	36,782.8	0.4%	1.2%	0.2%	1.8%
A3	Warehouse & Laundry	2,232.0	1,060.1	1,864.3	5,156.4	0.1%	0.1%	0.1%	0.3%
A4	Security Unit	14,028.0	12,766.0	1,517.4	28,311.4	0.7%	0.6%	0.1%	1.4%
A5	Technique Unit	15,888.0	4,625.0	25,286.8	45,799.7	0.8%	0.2%	1.3%	2.3%
B1	Pharmacy	5,424.0	64,209.1	4,446.4	74,079.5	0.3%	3.2%	0.2%	3.7%
B2	Laboratory Unit	7,200.0	147,694.9	17,027.3	171,922.1	0.4%	7.4%	0.9%	8.6%
B3	Radiology Unit	4,224.0	10,811.0	18,417.0	33,452.0	0.2%	0.5%	0.9%	1.7%
B4	Angiography Unit	30,216.0	151,776.9	34,855.9	216,848.9	1.5%	7.6%	1.7%	10.9%
B5	Surgery Services	126,900.0	167,510.9	59,812.6	354,223.4	6.4%	8.4%	3.0%	17.8%
C1	Consultation Unit	64,704.0	18,827.5	64,253.2	147,784.8	3.2%	0.9%	3.2%	7.4%
C2	Emergency room	80,568.0	61,378.0	127,309.6	269,255.5	4.0%	3.1%	6.4%	13.5%
C3	ICU	38,700.0	36,196.7	26,910.9	101,807.6	1.9%	1.8%	1.4%	5.1%
C4	Inpatient Ward	48,156.0	157,933.9	116,870.5	322,960.4	2.4%	7.9%	5.9%	16.2%
	Total	540,204.0	907,589.0	544,973.7	1,992,766.6	27.1%	45.5%	27.3%	100.0%

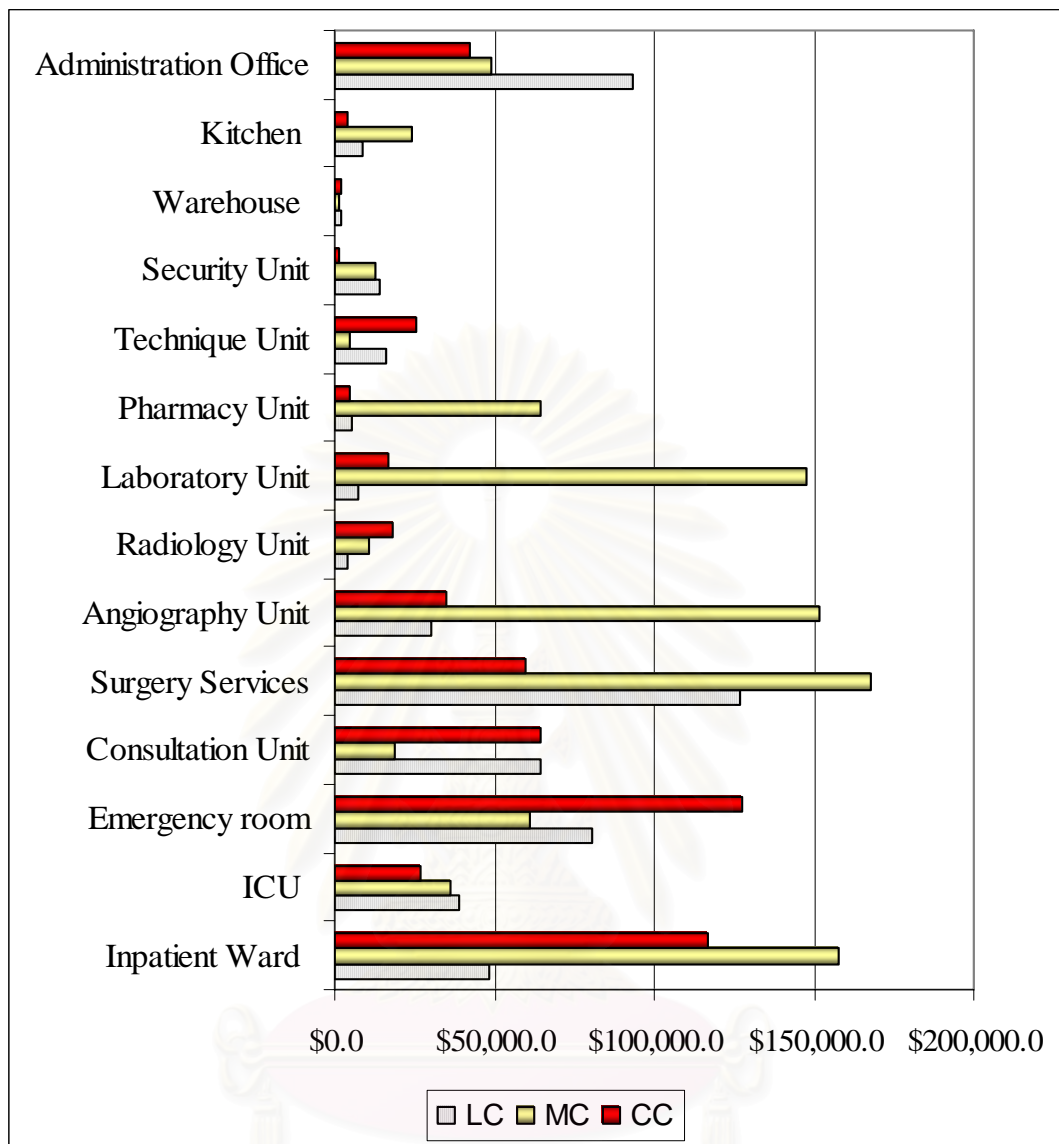
Total Direct Costs shows in table 5.10 bellow, total direct costs or total cost of PPHC in 2006 were the summation of Labor Cost (LC), Material Cost (MC) and Capital Cost (CC). In 2006, total direct cost equal to US\$1,992,766.6. The highest cost was material cost, of which almost 50% of the total cost and followed by capital cost and labor cost.

Table 5.13 Full Cost of each Cost Center at PPHC in 2006

Code	Cost Center	TDC		IDC		Full Cost	
		US\$	%	US\$	%	US\$	%
A ₂	Kitchen	36,782.8	1.8%	9,142.9	0.7%	45,925.7	1.5%
A ₃	Warehouse	5,156.4	0.3%	1,913.8	0.2%	7,070.2	0.2%
A ₄	Security Unit	28,311.4	1.4%	15,832.4	1.2%	44,143.7	1.4%
A ₅	Technique Unit	45,799.7	2.3%	7,903.2	0.6%	53,702.9	1.7%
B ₁	Pharmacy Unit	74,079.5	3.7%	3,951.6	0.3%	78,031.1	2.5%
B ₂	Laboratory Unit	171,922.1	8.6%	12,325.0	1.0%	184,247.2	6.0%
B ₃	Radiology Unit	33,452.0	1.7%	22,209.3	1.7%	55,661.3	1.8%
B ₄	Angiography Unit	216,848.9	10.9%	7,061.9	0.6%	223,910.8	7.3%
B ₅	Surgery Services	354,223.4	17.8%	40,982.2	3.2%	395,205.6	12.8%
C ₁	Consultation Unit	147,784.8	7.4%	339,051.6	26.6%	486,836.4	15.8%
C ₂	Emergency room	269,255.5	13.5%	64,571.8	5.1%	333,827.4	10.8%
C ₃	ICU	101,807.6	5.1%	42,234.8	3.3%	144,042.4	4.7%
C ₄	Inpatient Ward	322,960.4	16.2%	705,100.1	55.4%	1,028,060.5	33.4%
	Total	1,992,766.6	100.0%	1,272,280.5	100.0%	3,080,665.1	100.0%

Inpatient ward received the highest of indirect cost from revenue and non-revenue producing cost center. The second highest was in consultation unit and the third highest was in surgery ward and last highest was in emergency room. The least received indirect cost from revenue and non-revenue producing cost center was warehouse.

Figure 5.2 Graphic of LC, MC and CC by components.



Referring to the above table, surgery service comprised the highest of labor cost and capital cost. Inpatient ward comprised the highest of material cost followed by angiography and laboratory. Administration has higher labor cost than the other cost Center after the surgery cost centers. The emergency cost Center has the highest of capital cost. Inpatient ward was the second highest of comprising capital cost. Consultation is third of existing high labor cost. Consultation unit has equal cost of labor and capital cost.

5.3 Result of the Source of Finance at Phnom Penh Heart Center in 2006

According to the table 5.14 below, the result of source of finance come from three sources, of which source of finance come from government was US\$224,821.7 (11.2%), the source of fund come from donor, US\$493,355.6 (24.8%) and the last equal to US\$1,274,589.4 (64 %) was the source of finance come from out of pocket payment.

Table 5.14 Source of Fund and Expenditure of PP Heart Center in 2006

Spending Source of Fund	Total Expenditure							
	Labor Cost (US\$)	Material Cost (US\$)	Capital Cost (US\$)	Total (US\$)	% of Labor Cost	% of Material Cost	% of Capital Cost	Total %
Govt. Budget	0.0	47,928.9	176,892.8	224,821.7	0.0%	2.3%	8.9%	11.2%
Donation Budget	103,128.0	64,210.2	326,017.3	493,355.6	5.2%	3.2%	16.4%	24.8%
OOP Budget	437,076.0	795,449.9	42,063.5	1,274,589.4	21.9%	39.9%	2.1%	64.0%
Total	540,204.0	907,589.0	544,973.7	1,992,766.6	27.2%	45.5%	27.3%	100%

Figure 5.3 Share in budget of Government, Donation and Out of pocket payment at PPHC in 2006

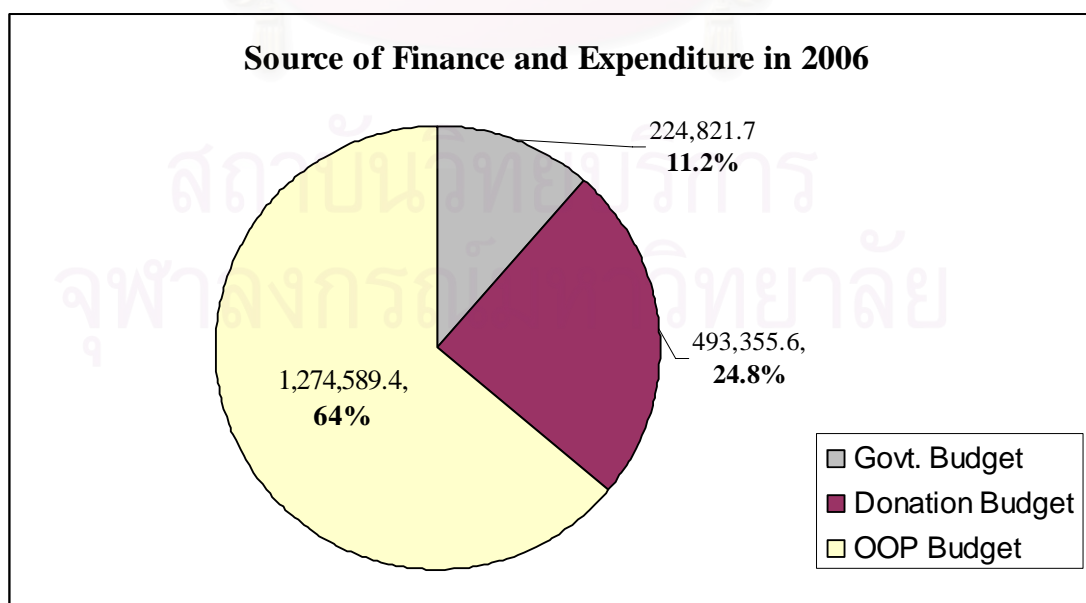
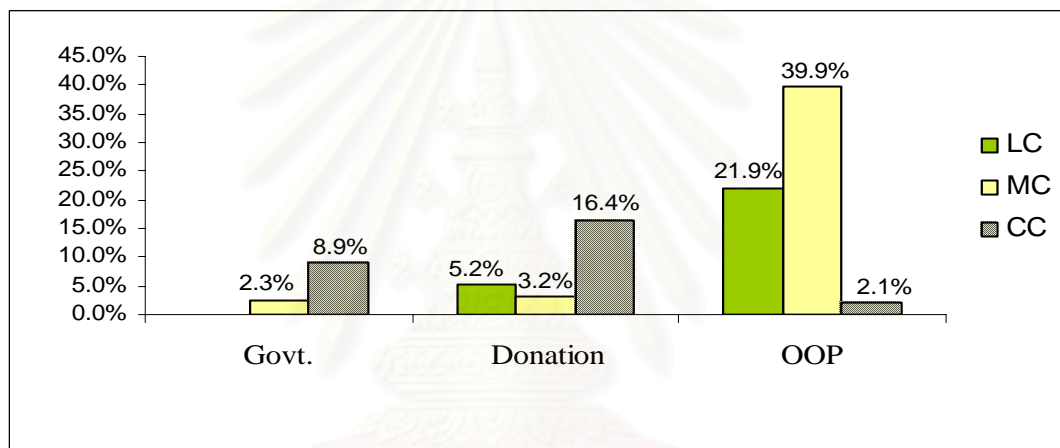
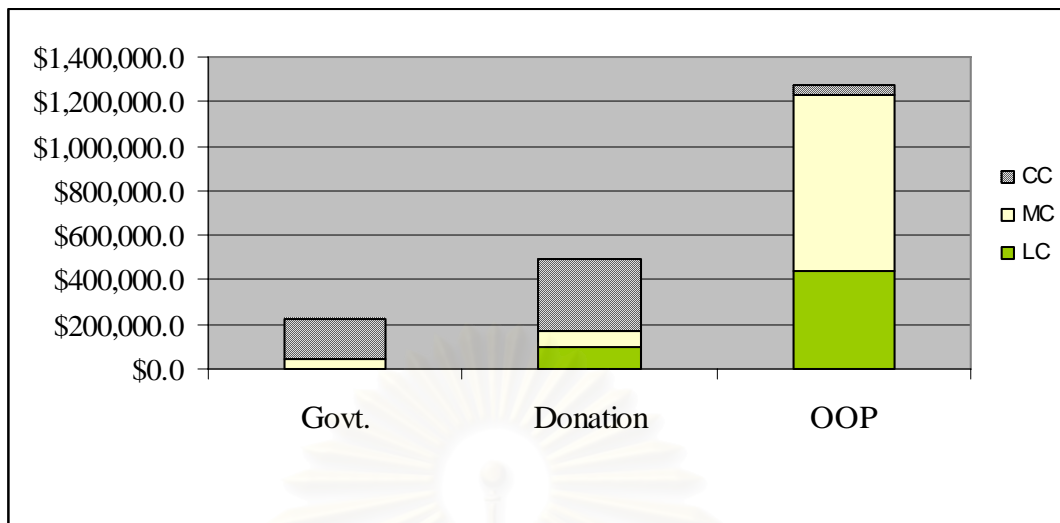


Figure 5.4 Source of fund supported health service at PPHC in 2006



Referring to the above figures, among the three source of fund out of pocket payment, donation, and government, the highest percentage support material cost come from out of pocket payment about 39.9%, followed by donation budget 3.2% and the last equal 2.3% come from government budget. Donation budget and government budget were the major source to support capital cost. There were only two sources of fund donation and out of pocket payment support labor cost.

5.4 Step Down Allocation

The first step is to allocated cost related space to all of cost centers that use area space. This allocation base on the real of sqm^2 of each cost Center.

The second step is to allocate the administration cost to all other cost centers, include (Non Revenue Producing Cost Center), Revenue Producing Cost Center (RPCC) and Patient Services (PS). This allocation considers the number of personnel as the unit of measurement for the allocation criteria. After this cost center (administration cost center) has finished its allocation to the other cost center, the administration cost center is considered to be close and no further cost allocated to it.

The third step is to allocate the kitchen cost that now include indirect cost from administration or a portion of administration cost to all remaining cost center, such as warehouse, security unit, technique service, pharmacy unit, laboratory unit, radiology unit, angiography unit, surgery services and patent services. This allocation considers the service of providing meal to patients and staffs as the unit of measurement for the allocation criteria. After this allocation has been done, the kitchen cost center is considered to be closed.

The fourth step is warehouse step down which is now include indirect cost from administration and kitchen cost then start to allocate to security unit, technique service, pharmacy unit, laboratory unit, radiology unit, angiography unit, surgery services and patent services. This allocation considers the number of patients' cloth as the unit of measurement for the allocation criteria. After this allocation has been done, the warehouse cost center is considered to be closed.

The fifth steps is security cost center that now include indirect cost from 3 cost centers (administration, kitchen, and warehouse) then star to allocate to technique service, pharmacy unit, laboratory unit, radiology unit, angiography unit, surgery services and patent services. This allocation considers the service of patients' visited as the unit of measurement for the allocation criteria. After this allocation has been performed, the security cost center is considered to be closed.

The sixth steps is started to allocate from non revenue producing cost center of technique service which is now include indirect cost from 4 cost centers (administration, kitchen, warehouse and security unit) then start to allocate to revenue producing cost center, such as pharmacy unit, laboratory unit, radiology unit, angiography unit, surgery services and patent services. This allocation considers the service of repaired in year as the unit of measurement for the allocation criteria. After this allocation has been performed, the technique cost center is considered to be closed.

The seventh step is allocate from RPCC of pharmacy unit which now include indirect cost from all NRPCCC, such as administration, kitchen, warehouse, security unit and technique service cost center to all Revenue Producing Cost Center (RPCC), such as laboratory, radiology , angiography, surgery service and Patients Services (PS), such as OPD and IPD . This allocation considers the service of patients' visited in year as the unit of measurement for the allocation criteria. After this allocation has been done, the pharmacy cost center is considered to be closed.

The eighth steps is start to allocate from laboratory unit which is now include indirect cost from all non revenue producing cost center and revenue producing cost center, then start allocate to radiology, angiography, surgery service, OPD and IPD. This allocation considers the service of patients' visited in year as the unit of measurement for the allocation criteria. After this allocation has been done, the laboratory cost center is considered to be closed.

The ninth steps is start to allocate from radiology unit which is now include indirect cost from all non revenue producing cost center and revenue producing cost center, then start allocate to angiography, surgery service, OPD and IPD. This allocation considers the service of patients' visited in year as the unit of measurement for the allocation criteria. After this allocation has been done, the radiology cost center is considered to be closed.

The tenth steps is start from angiography cost Center which now include indirect cost from all non revenue producing cost center and revenue producing cost center, then start allocate to surgery service, OPD and IPD. This allocation considers the service

of patients' visited in year as the unit of measurement for the allocation criteria. After this allocation has been done, the angiography cost center is considered to be closed.

The last step is start to allocate from surgery service to all patients service cost center, such as OPD (consultation), emergency service and IPD (inpatient ward) and intensive care unit. After this allocation has been performed, the surgery cost center is considered to be closed. At the end of this step, we get the full cost of each Patients Service Cost Center (PSCC), and then we will calculate to find out the unit cost of each PSCC by using the following formula:

$$\text{Unit Cost of OPD} = \frac{\text{Full Cost of OPD}}{\text{Number of OPD visit}}$$

$$\text{Unit Cost of IPD} = \frac{\text{Full Cost of IPD}}{\text{Number of admission (IPD)/ days}}$$

The detail of step down allocation and indirect cost data are shown in appendix (C).

Table 5.15 Total cost of each patients service cost Centers at PPHC

PSCC	LC (US\$)	MC (US\$)	CC (US\$)	IDC (US\$)	Total cost
Consultation unit	64,704.0	18,827.5	64,253.2	339,051.58	486,836.28
Emergency unit	80,568.0	61,378.0	127,309.6	64,571.84	333,827.44
Inpatients ward	48,156.0	157,933.9	116,870.5	705,100.08	1,028,060.48
Intensive care unit	38,700.0	36,196.7	26,910.9	42,234.75	144,042.35

Table 5.16 Unit cost per case of each patients service cost Centers at PPHC

PSCC	Total/ Full Cost (US\$)	Number of patients	Unit cost (US\$)
Consultation unit	486,836.4	15,539	31.3
Emergency unit	333,827.4	259	1,288.9
Total OPD	820,663.7	15,798	51.9
Inpatients ward	1,028,060.5	3,345	307.3
Intensive care unit	144,042.4	459	313.8
Total IPD	1,061,880.0	3,804	308.1
Total(OPD &IPD)	1,992,766.6	19,602.0	

Table 5.17 Average length of stay and cost per bed-day at PPHC in 2006

Patient Service Cost Center	Days admitted	Number of inpatients	Average Length of stays
Inpatients Ward (non-surgery)	16,915.0 days	3,345	5.1 days
Inpatient (surgery)	10,942.0 days	459	23.9 days
Total	27,857days	3,804	7.3 days
Patient Service Cost Center	Total/ Full Cost (US\$)	Days admitted	Cost per bed day
Inpatients Ward (non-surgery)	1,028,060.48	16,915.0 days	\$60.78
Inpatient in ICU (surgery)	144,042.35	1,836 days	\$78.45
Total	1,061,880.0	27,857.0 days	\$38.1

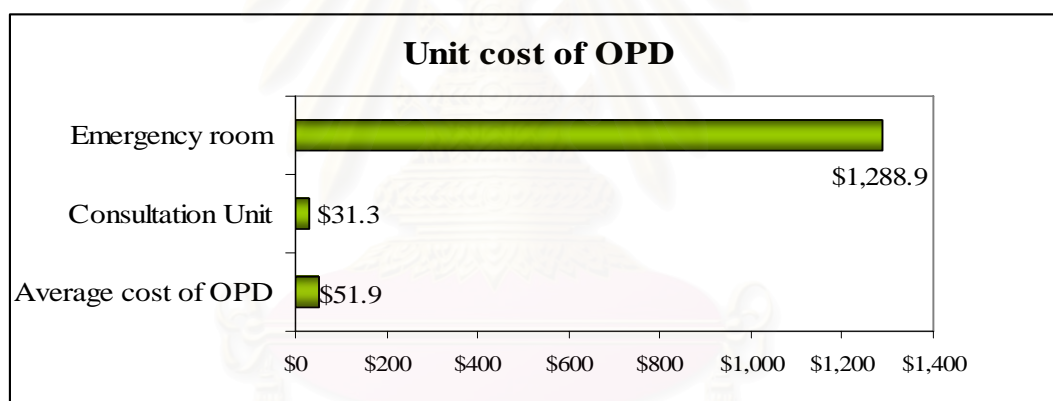
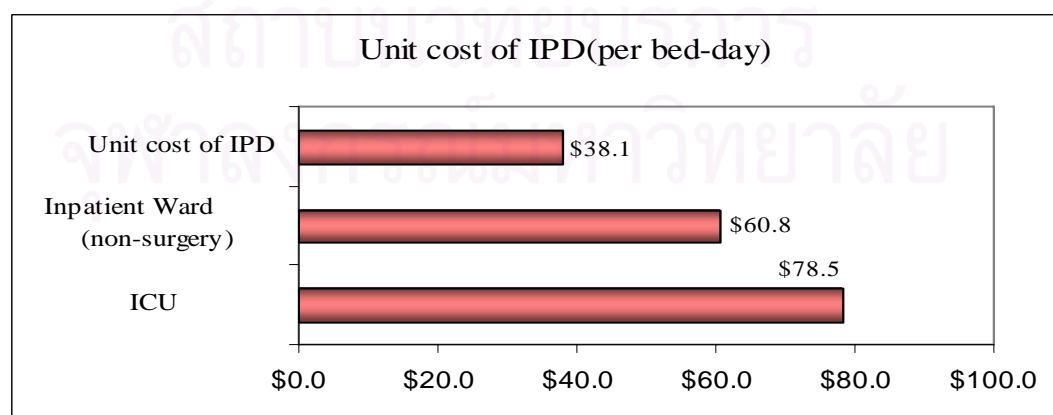
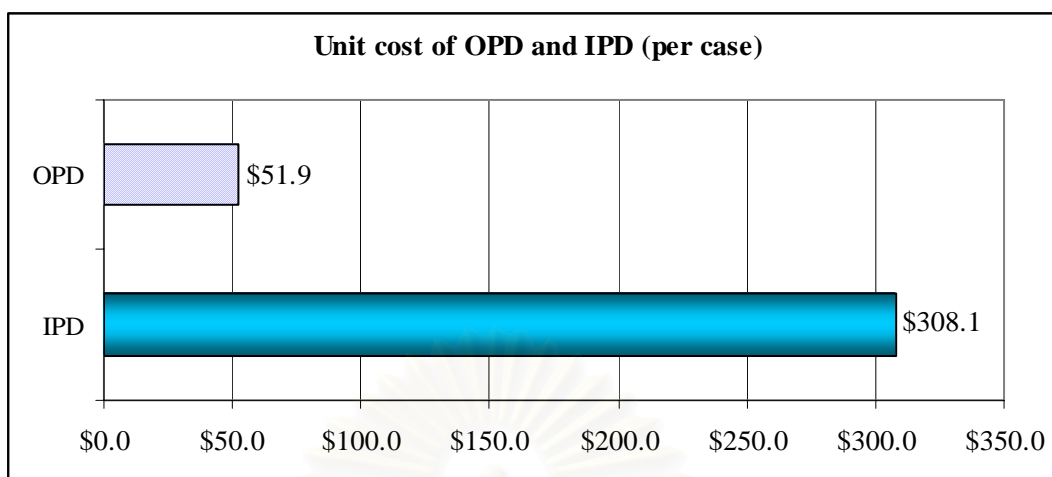
Figure 5.5 Graphic Description of unit cost of OPD at PPHC in 2006**Figure 5.6 Graphic description of unit cost of IPD at PPHC in 2006**

Figure 5.7 Graphic description of unit cost of OPD & IPD at PPHC in 006



According to the above figure 5.5 on page 64, the result which was getting from the real calculation after using step down allocation method, the result shows that, there are three kind of unit cost exist in OPD, include unit cost of emergency, unit cost of consultation, and average unit cost of OPD. Unit cost of emergency is the highest US\$1,288.9 per visit. Unit cost of consultation is US\$ 31.3 per visit. The study find the average cost of OPD is US\$51.9.

Base on figure 5.6 on page 64 and the above figure 5.7 the unit cost of IPD comprises two of unit cost, of which unit cost per bed-day and unit cost per case. Unit cost per bed-day of Phnom Penh Heart Center is US\$38.1 per day, unit cost per admission or per case is US\$ 308.1. If we look at unit cost of IPD (cost per bed-day) and unit cost of OPD at PPHC, unit cost per bed-day is cheaper than unit cost of OPD because unit cost of OPD comprises of high emergency case.

5.5 Calculate Cost and Unit Cost of Surgery Patients at PPHC

The component costs of surgery patient are included of three components of cost centers, Surgery service, Inpatient ward and ICU cost. All the components of those three cost center included, labor cost, material cost and capital cost which shows as the following table:

Table 5.18 Unit cost of open heart surgery patient at PPHC in 2006

Cost centers	Full cost	Number of open heart surgery	Total days admitted	Average length of stay	Unit cost per bed-day	Unit cost per case
Surgery service	\$395,205.6					
ICU	\$144,042.4					
Inpatient ward	\$1,028,060.5					
Total	\$1,567,308.5	308	7,684.0	25	\$203.5	\$5,088.7

According to table 5.18, unit cost of surgery patients (open-heart surgery) patients at PPHC in 2006 is US\$ 203.5 per bed-day and unit cost per case is US\$5,088.7 with the average length of stay 25 days.

5.6 Unit Cost of WHO-CHOICE Model

After estimation of step down method, the result of unit cost of inpatient and outpatient of Phnom Penh Heart Center which is an actual calculation have been compared with the calculated unit cost of WHO-CHOICE Project Adam et al. (2003) and Adam & Evans (2006) with the following formula:

5.6.1 Unit cost of inpatient service (unit cost per bed-day)

First formula to calculate unit cost per bed-day

$$\begin{aligned} \text{LnUCIP} = & -2.5036 + 0.7624 \text{ LnGDP} - 0.2318 \text{ LnOR} + 0.6410 \text{ DRUG} + 0.2116 \\ & \text{FOOD} - 0.5777\text{LEV1} - 0.3118\text{LEV2} - 0.2722\text{PUB} + 0.2444 \text{ PRIV} \\ & + 1.7471 \text{ USA} \end{aligned}$$

$$\text{LnUCIP} = \alpha_0 + \sum \alpha_i X_i + e_i$$

Where:

GDP : GDP per capita in the study year = US\$ 514

OR : Occupancy rate = 21%

DRUG : { dummy of drug
DRUG = 1 = hospital provide drug to patients
0 = otherwise

FOOD : { dummy of food
FOOD = 1 = the hospital provides food to inpatients.
0 = otherwise

LEV1 : { dummy level of hospital
LEV1 = 1 = Primary-level hospital
0 = otherwise

LEV2 : { dummy level of hospital
LEV2 = 1 = Secondary-level hospital
0 = otherwise

PUB : { dummy of hospital
PUB = 1 = the hospital is government owned
0 = otherwise

PRIV : { dummy of hospital ownership
PRIV = 1 = the hospital is private for profit
0 = otherwise

USA : { dummy of countries
USA = 1 = study/ research cost in USA
0 = otherwise

According to the above variable, we can calculate unit cost per bed day as the following:

$$\begin{aligned} \text{LnUCIP} &= -2.5036 + 0.7624 \text{Ln}(\$514) - 0.2318 \text{Ln}(0.21) + 0.6410(0) + 0.2116(1) \\ &\quad - 0.5777(0) - 0.3118(0) - 0.2722(1) + 0.2444(0) + 1.7471(0) \\ &= -2.5036 + 0.7624(6.24) - 0.2318(-1.56) + 0.2116 - 0.2722 \\ &= -2.5036 + 4.759 + 0.3618 + 0.2116 - 0.2722 \end{aligned}$$

$$\text{LnUCIP} = 2.56$$

According to Studenmund. H. A. (2006), a log (or logarithm) is the exponent to which a given base must be taken in order to produce a specific number. While logs come in more than one variety, we will use only natural logs (logs to the base e).

So $\ln(x) = b$ means that $(2.56)^b = x$

or, more simply $\ln(x) = b$ means that $e^b = x$ (Studenmund, H. A., 2006).

Therefore, the result of unit cost of inpatient from WHO-CHOICE = $\ln UCIP = 12.56$ means $UCIP = e^{12.56} = 12.89$

So, unit cost of in patient of WHO-CHOICE is **US\$ 12.89 per bed day.**

5.6.2 Unit cost of out patient service (unit cost per visit)

Second equation to calculate unit cost per visit.

$$\begin{aligned} \ln(UCOP/UCIP) &= -2.2698 + 0.1303 \ln GDP - 0.1683 \ln OR + 0.0884 \ln BED \\ &\quad - 0.4890 \text{ PUB} + 0.1985 \text{ FOOD} \\ \ln(UCOP/UCIP) &= \alpha_0 + \sum \beta_i \ln X_i + e_i \end{aligned}$$

Where

BED : Number of beds in the hospital in the study/research year = 50 beds

GDP : GDP per capita in the study year = US\$ 514

OR : Occupancy rate = 21%

PUB : $\begin{cases} \text{dummy of hospital} \\ \mathbf{PUB} = \mathbf{1} = \text{the hospital is government owned} \\ \mathbf{0} = \text{otherwise} \end{cases}$

DRUG : $\begin{cases} \text{dummy of drug} \\ \mathbf{DRUG} = \mathbf{1} = \text{hospital provides drug to patients} \\ \mathbf{0} = \text{otherwise} \end{cases}$

Referring to the above variable, we can calculate unit cost of out patient (per visit) as the following:

$$\begin{aligned} \ln(UCOP/UCIP) &= -2.2698 + 0.1303 \ln GDP - 0.1683 \ln OR + 0.0884 \ln BED \\ &\quad - 0.4890 \text{ PUB} + 0.1985 \text{ FOOD} \\ &= -2.2698 + 0.1303 \ln(\$514) - 0.1683 \ln(0.21) + 0.0884 \ln(50) \\ &\quad - 0.4890(1) + 0.1985 (1) \\ &= -2.2698 + 0.1303(6.24) - 0.1683(1.24) + 0.0884(3.91) - 0.4890 \\ &\quad + 0.1985 \\ &= -2.2698 + 0.81 - 0.21 + 0.35 - 0.4890 + 0.1985 \end{aligned}$$

$$\ln(UCOP/UCIP) = -1.61$$

$$\ln(UCOP/UCIP) = -1.61 \text{ means } UCIP = e^{-1.61} = 0.26$$

Therefore $UCOP/UCIP = 0.26$, which means that the unit cost of out patient visit is only 26% of the unit cost of inpatient bed-days. This means that if unit cost of inpatient bed-day is US\$12.89, the unit cost of outpatient visit is **US\$3.39.**

Then we can also calculate the unit cost of outpatient visit by the following:

→ UCOP = UCIP × 0.26 , base on the first result of UCIP = US\$ 12.89 per bed-day

→ UCOP = US\$12.89 × 0.26 = US\$3.39per visit.

So, unit cost of in patient of WHO-CHOICE is **US\$3.39 per visit**

Table 5.18 Unit cost of PPHC and WHO-CHOICE

No.	Description	Phnom Penh Heart Center			WHO-CHOICE	
		Cost per admission (US\$)	Cost per bed-day (US\$)	Cost per visit (US\$)	Cost per bed-day (US\$)	Cost per visit (US\$)
1	IPD	308.1	38.1		12.89	
2	OPD			51.9		3.39

Figure 5.8

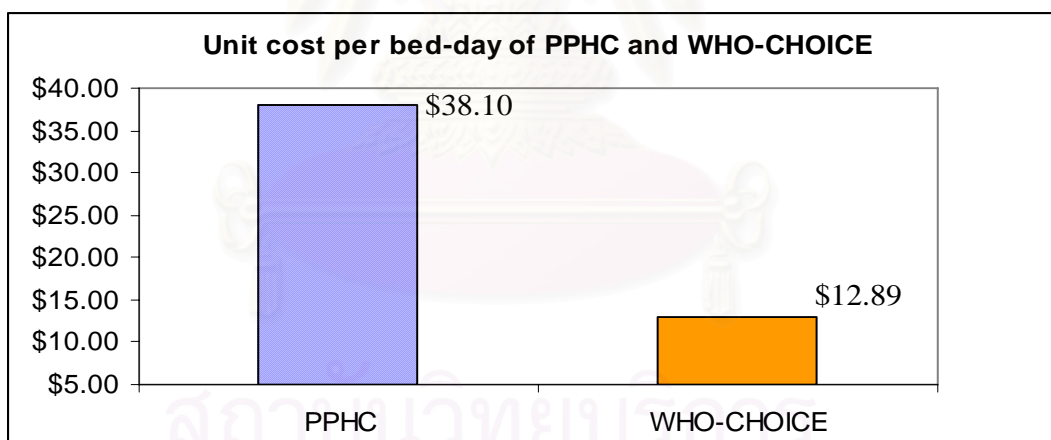
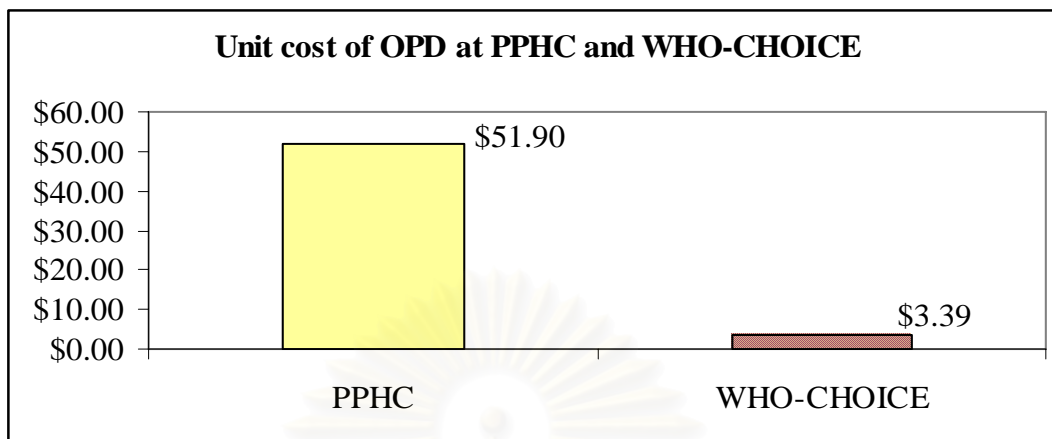


Figure 5.9

According to the above results in table 5.18 and figure 5.8, unit cost per bed-day of PPHC is US\$25.21, about three times higher than unit per bed-day of WHO-CHOICE. Not only unit cost per bed-day is higher, but also unit cost per visit at PPHC is US\$ 48.51, about more than 15 times higher than unit cost per visit of WHO-CHOICE. These result shows that both unit cost of IPD and OPD of PPHC is almost incomparable with WHO-CHOICE model. On the contrary, if we look at each variable of WHO-CHOICE which has been already calculated on page 66 and 67 and 68, the variable to calculate the unit cost per bed-day mentioned only the operating cost, such as GDP per capita, occupancy rate, drug cost, and foot cost. In addition, the variable operating or recurrent cost in the variable of WHO-CHOICE did not concern with the labor cost, such as salary, wage, bonus or any allowance for staffs. These different of results can be raised by the following reasons:

- 1) If we look at the labor cost in Phnom Penh Heart center followed by material cost. It was true those labor cost affected the result of unit cost calculation. In particularly, the far different between the unit cost of WHO-CHOICE and the unit cost of Phnom Penh Heart Center. The average cost of salary in Phnom Penh Heart Center was US\$291 per staff per month. Whereas, the average of salary of the other general public hospitals staffs in Cambodia was only US\$20 to US\$40. These averages of salary shown that, the characteristic of Phnom Penh Heart hospital was not the same as the other public hospitals in Cambodia.

- 2) According to the source of Finance in Phnom Penh Heart Center in year 2006, the source of government budget was only 11.2% of the total cost in Phnom Penh Heart Center, where the remaining budget was funded by donation about 24.8% and out of pocket payment about 64%. These flow of budgets shown that, the characteristic of the Phnom Penh Heart Center seem like the private own, even though it was own by the government.
- 3) Base on the organization management in Phnom Heart Center and the above source of Finance, it reflected that the characteristic of the donor management always supported with the high quality of caring and curing patients as an input an output. That is why, the high cost of care absolutely include in all cost of patient services.
- 4) Referring to the real situation in Phnom Penh Heart Center, most medical equipment and medicines were imported from France. In addition, if we compare the medical equipment and technical staffs, specialist staffs with the general public hospitals in Cambodia, Phnom Penh Heart Center was the first and the high standard of covering with modern of medical equipments.
- 5) In Cambodia, there was only Phnom Penh Heart Center provided food to hospitalization.
- 6) The real calculation unit cost of outpatient and inpatient at PPHC was include all fix cost, variable cost, such as labor cost, material cost, capital cost, food, major medical equipments, medical cost and others small materials cost.
- 7) Base on the interviewing the key person and the data source, heart hospital is absolutely different from the general out patient department because in outpatient department of heart hospital, every patient whenever they consult or visit doctor, the doctor need to spend longer time to examine their symptom than to check up the general symptom. On the contrary, for example, general out patient like asthma, visitors have got a cold, diarrhea, malaria etc. Those visitors, they do not need to pay for the technical check up equipments. They just only pay for the consultation with doctor.

- 8) WHO-CHOICE model was studied and estimated in the general hospitals in developed and developing countries. So the result of the unit cost base on WHO-CHOICE, calculated, there maybe the sample of the hospitals of all developed and developing countries were the general public hospitals, while the PPHC is an exceptional one. Phnom Penh Heart Center was considered as the tertiary care Center.

According to Barnum and Kutzin (1993) mentioned that Tertiary-level hospital was a kind of hospital has highly specialized staff and technical equipment, e.g., cardiology, ICU and specialized imaging units; clinical services are highly differentiated by function; may have teaching activities; bed capacity ranges from 300 to 1,500 beds; often referred to as central, regional or tertiary-level hospital. However, Phnom Penh Heart Center has only 50 beds capacity. Even though Phnom Penh Heart Center has only 50 beds, Phnom Penh Heart Center was one kind of hospital considered as a central, regional and tertiary-level hospital which has highly specialized staffs and technical equipment, e.g., cardiology, ICU, cardiology intervention, ordinary open heart, coronary surgery and specialized imaging units; clinical services are highly differentiated by function; have some teaching activities; 50 beds capacity. That is why; the tertiary level hospital will spend higher cost on those medical equipments as well as hiring specialist staffs than the primary and the secondary hospital.

All these above reasons reflect that the unit cost of outpatient of and inpatient of WHO-CHOICE absolutely different and lower than unit cost of out patient at PPHC. To sum up, base on the above reasons, despite of the real unit cost of OPD and IPD of Phnom Penh Heart Center far above from the unit cost of WHO-CHOICE, let compare with the unit cost per bed-day and the average cost per admission of surgery patients at Phnom Penh Heart Center with the Chulalongkorn Unit and see how much it would be a different from Phnom Penh Heart Center and WHO-CHOICE in order to have an ideas on those results so as to guide the Ministry of Economy Finance and policy makers whether the government can afford all those cost at the Phnom Penh Heart Center in the future.

5.7 Comparison the average cost per bed-day and per admission of PPHC with Chulalongkorn unit of Thailand

There were one existed studies of unit cost analysis of heart transplantation at Chulalongkorn unit. Panananunt, S., (1995) studied about cost analysis of heart transplantation at Chulalongkorn unit which was selected 12 patients from 1987 to 1994 as a sample. All the cost of her study based on the price in 1994. The objective of her study was to calculate cost of heart transplantation from the day of surgery to the day of discharge. The component of total cost of surgery patients was included only the internal cost that insecure directly to provide the service of heart transplantation from the day of operation to the day of discharge which was included with the three area of the patient stay and the cost categories were retrieved from each patient's medical record about treatment which shown as the following case:

- Operating room
- Intensive care unit
- Surgical ward
- Direct expenditure for personnel, direct expenditure for drugs, direct expenditure for supplies, direct expenditure for diagnostic laboratory test, and others special treatment.

The capital cost she included, medical equipment, building (include only building of surgery ward) and vehicle. For recurrent cost, she included, cost of personnel surgeon, cost of operating time and all drugs and medical supplies. She calculated all cost of input, such as personnel cost, material cost and capital cost in to the average cost. Her study found that the total recurrent cost was 91% and the total capital cost was only 9% of the total cost of heart transplantation. This means that the largest portion of cost was existed in the material cost (the cost of medical supplies) and labor cost.

Table 5.19 Information related to PPHC and Chulalongkorn Unit

Phnom Penh Heart Center	Chulalongkorn Unit
<ul style="list-style-type: none"> -Using Step-down allocation method - Average length of stay 25 days. - Average Labor cost \$291 per staff per month - Did not calculate the cost of operating time in the surgery service - Include foot cost - Total operating cost: \$1,447,793 (73%) - Total capital cost = \$544,933.7 (27%) 	<ul style="list-style-type: none"> - Using direct allocation method - Average length of stay 60 days - Average Labor cost US\$788.77 per staff per month (US\$ 497.7 higher than PPHC) - Include cost of operating time of surgery. - Not include cost of food - Total operating cost = \$10,067.68 (91%) - Total capital cost = \$945.09 (9%)

Table 5.20 Results of PPHC and Chulalongkorn Unit

Description	Phnom Penh Heart Centre			Chulalongkorn hospital		
	ALOS	CPD	CPC	ALOS	CPD	CPC
Surgery patients	25 days	\$203.5	\$5,087.5	60 days	\$183.6	\$11,013.0
Note: ALOS = Average length of stay , CPD = Cost per bed-day, CPC = Cost per case						

Remarks: Chularlongkorn unit was studied in 1994. So the unit cost per day and per admission have already been calculated and adjusted to the base fiscal year 2006 by using consumer price index (CPI) data from Bureau of Trade and Economic Indices, Ministry of Commerce of Thailand and convert the value of Thai Baht to US\$ base on the currency of exchange rate from Central Bank of Thailand in 2006 by downloading from this address: www.bot.or.th/bothomepage/index/index_e.a sp and calculate with the following:

Consumer price index in 1994 = 77.5, Consumer price index in 2006 = 105.8

Currency exchange rate of Thai Baht in to US\$ in 2006, 1 US\$ = 35.8601 Baht

Unit cost of Chula hospital from 1994 to 2006

= 105.8/ 77.5 (288,262 Baht)

= 1.37 (288,262 Baht) = 394,927 Bahts per case, adjust Baht to US\$ by calculating
with the following:

$$= \frac{394,927.16}{35.8601} = \$11,013.0 \text{ per case}$$

$$= \$11,013.0 / 60 \text{ days} = \$183.55 \text{ per day}$$

Figure 5.10 Graphic average cost per bed-day of Chula and PPHC.

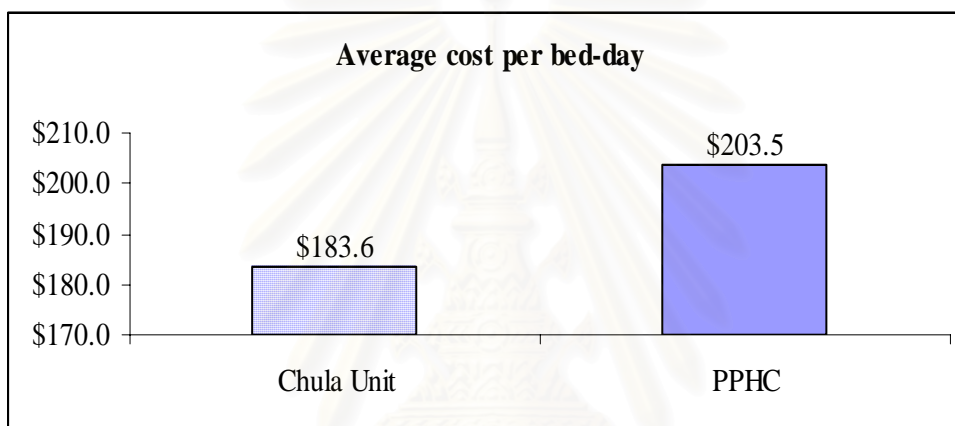


Figure 5.11 Graphic average cost per admission of Chula and PPHC

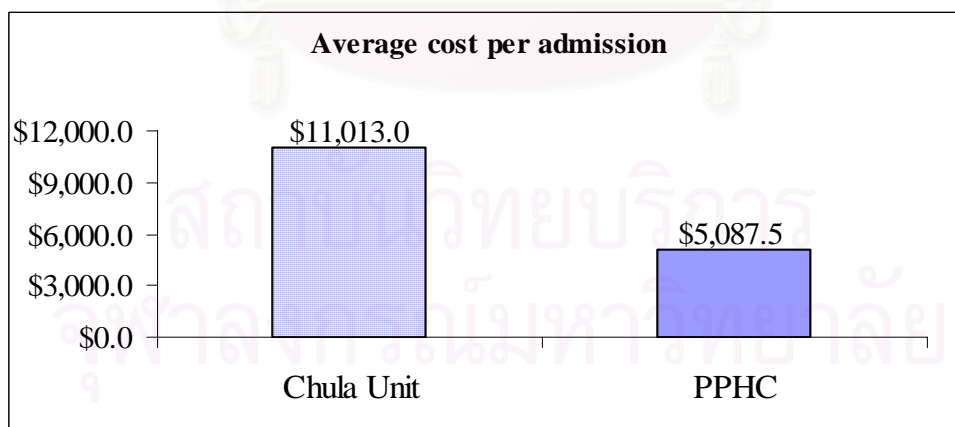
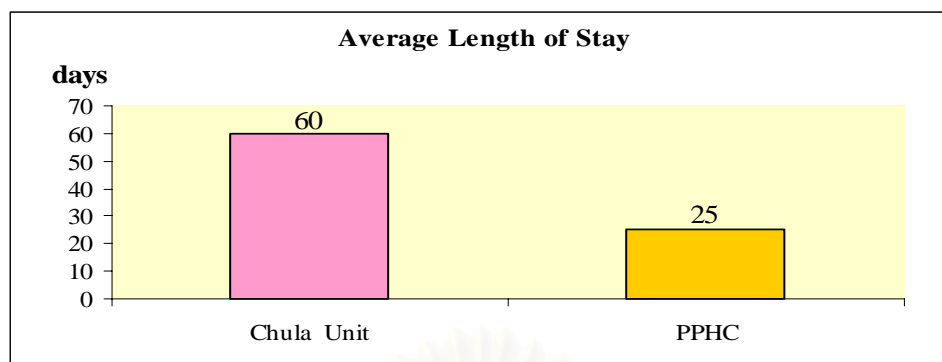


Figure 5.12 Average Length of stay of PPHC and Chulalongkorn Unit

According to the above result of surgery patients, the length of stay of Chulalongkorn unit was 60days; the length of stay at Phnom Penh Heart Center was 25 days. This means the length of stay at Chula. Unit had 35 days longer than the length of stay of Phnom Penh Heart Center. Cost per be day of Phnom Penh Heart Center is US\$203.5 and unit cost per bed-day of Chulalongkorn was US\$183.6. These results shows cost per bed-day of PPHC is higher than Chulalongkorn hospital about US\$20 per day. Phnom Penh Heart Center is appropriately 5.2% higher than Chulalongkorn hospital. The average cost per admission at Chulalongkorn Unit was US\$ 11,013.0 and the average cost per admission at Phnom Penh Heart Center was US\$5,087.5. These results of cost per admission of both PPHC and Chula Unit reflect the average cost per admission of Chulalongkorn hospital is higher than the average cost per admission of PPHC about \$5,925.5. It is almost 37% higher than Phnom Penh Heart Center.

According to table 5.19 on page 74 in the list summary of different cost components between Chula and PPHC, it reflects that even though the cost of surgery per be day at PPHC is higher than Chula Unit, the average cost per be-day at PPHC include cost of food, while the Chula Unit did not include that kind of cost. If we look at the average length of stay at Phnom Penh Heart Center and Chula Unit, usually, the average cost of patient's day will be fall as the length of stay will be longer, while the Phnom Penh Heart Center in Cambodia has only 25 days, which is appropriately nearly half shorter than Chula hospital. That is why, it is normal that the cost per be-day at Phnom Penh heart center is higher than Chula hospital during the length of stay exist only 25 days. The average personnel cost of Chula Unit was US\$788.77 per staff per month, where the average salary at PPHC was only US\$291 per staff per

month. In addition, the study at Chula Unit used direct allocation method for allocation technique where the PPHC uses step down allocation method, of which step-down allocation method is more accurate and compensate for one weakness in the direct appointment method that non revenue producing cost Center does provide services to other-revenue cost centers and patients service cost centers.

Base on the above results, the Phnom Penh Heart Center in Cambodia appropriately has an average cost of surgery per admission about 36.8% lower than the Chulalongkorn Unit in Thailand. Even though the PPHC has average cost per admission about 36.8% lower than Chulalongkorn Unit, it may not be comparable because it is different case mix. For example, Phnom Penh Heart center dealing with the ordinary heart operation, Coronary Artery bypass Grafting and complex Genital Heart, such as replace the heart valve operation, mitral valve replacement, atrial valve repair, atrail septal defect, ventricular septal defect, tetralogy of fallot and bypass anastomosis for heart revascularilzation. Whereas, Chulalongkorn Unit dealing with heart transplantationthe services which probability cannot be compared.

The Chulalongkorn Unit in Thailand also has higher cost per bed-day than the WHO-CHOICE project about ($\$183.6 - \$12.9 = \$170.7$) higher than the unit cost per bed-day of WHO-CHOICE project.

5.8 GNI per capita and GDP per capita in 2006

Description	Cambodia	Thailand
GNI per capita	\$480	\$2,990
GDP per capita	\$514	\$3,179
Cost per admission	\$5,088	\$11,013

Figure 5.13

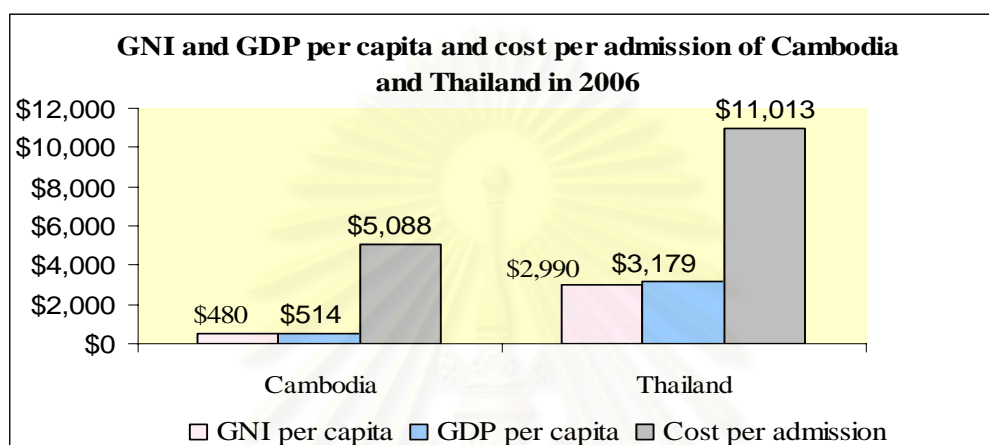
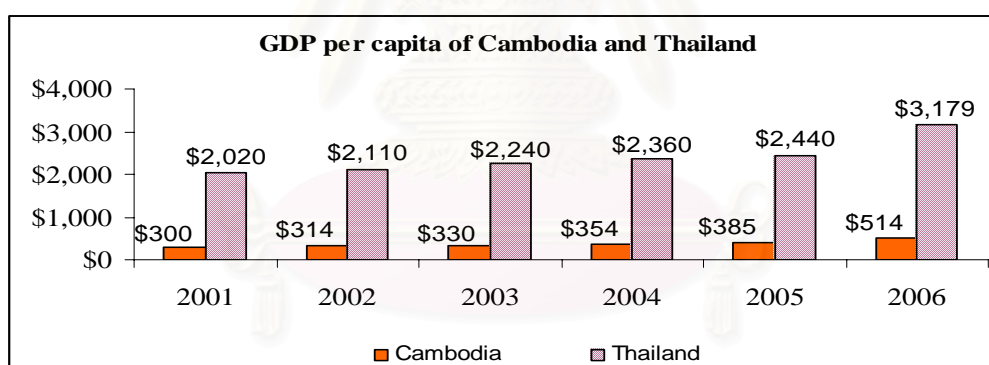


Figure 5.14



GNI = Gross National Income

GDP = Gross Domestic Product

Source :Thailand Investment review, volum17

• Economic estimation department, Ministry of Finance, Cambodia.

Available at: http://www.boi.go.th/english/download/publication_investment/72/March_07.pdf

(Detail information of GNI and GDP by years; please refer to the appendix B)

According to the above table and figures, it reflects that both GDP and GNI of Thailand are higher than Cambodia. It shows that Thailand is richer than Cambodia. Even though Thailand is richer than Cambodia, Thailand also spends a higher cost on health care than Cambodia. Despite Cambodia having a lower income than Thailand, Cambodia spends less cost on health care than Thailand.

5.9 Inadequate Source of Budget to Support PPHC

The result in chapter 5 after calculate unit cost of inpatient and out patient, we have the real total cost of all outpatients visit is US\$ 820,663.72 and total cost of all inpatients admitted is US\$ 1,172,102.91 in 2006. Hence, the total cost of inpatient and outpatients at Phnom Penh Heart Center in 2006 is US\$1,992,766.6 equal to 8,170,343,181.2 Riels. Referring to the study found that the budget allocation which was supported by the government in 2006 was 11.2% equal to US\$224,821.7 of the total cost. This amount of budget showed that the government budget was not enough to support health service at Phnom Penh Heart Center in 2006. Hence, the donation part responsible for 24.8% equal to US\$493,355.6 and out of pocket payment part was 64% equal to US\$1,274,584.4 of the total cost.

Then these results of unit costs of OPD and IPD can be guidance to government and policy maker by multiply with the number of visitor (15,539) and hospitalization (3,804) in year 2006 for the budget allocation in the future with the following:

US\$ 51.9 x 15,798 visitors = US\$ 819,916.2 total cost of OPD in 2006

US\$ 308.1 x 3,804 patients = US\$ 1,172,012.4 total cost of IPD in 2006.

The total cost of OPD and IPD = US\$ 1,991,928.6 in 2006

CHAPTER VI

SUMMARY AND CONCLUSIONS

6.1 Summary and Conclusions

This study is a descriptive study, using the secondary and primary data by focusing on provider perspective. The main objective of this study first, is to calculate and analyze unit cost per admission, per-day, and per visit at Phnom Penh Heart Center, which is an autonomous health facility providing tertiary health care to the people all national and regional people. Second, this study found out the sources of fund to support health service at Phnom Penh Heart Center in year 2006. Third the results getting from the real calculation of both unit costs per visit and per bed-day have been compared with the WHO-CHOICE project and available study from Thailand. The study found that both results of real calculation of unit cost per bed-day and per visit from Phnom Penh Heart Center are higher than unit cost per be-day and per visit of WHO-CHOICE project. On the other hand, the variable of WHO-CHOICE model mentioned only the operating cost, while the PPHC include all type of cost (operating cost and capital cost). The comparison of PPHC with WHO-CHOICE model may be considered as incomparable.

The comparison with Thailand, Cambodia had higher cost per bed-day about US\$58.8 than Thailand. However, the average cost per admission at PPHC in Cambodia was about 36.8% lower than Chulalongkorn hospital in Thailand. Even though the PPHC has average cost per admission about 36.8% lower than Chulalongkorn Unit, its probability cannot be compared because it is different case mix. The Phnom Penh Heart center was provided the ordinary heart operation service, such as Coronary Artery bypass Grafting and complex Genital Heart. On the other hand, the Chulalongkorn Unit was provided heart transplantation services.

After calculation and analyzing of all unit of OPD and IPD at Phnom Penh Heart Center and comparison with WHO-CHOICE and Chulalongkorn Unit, this study found that there were three sources of finance supported PPHC in the fiscal year 2006, of which came from the out of pocket payment about 64%, donation was about

24.8% and government was subsidized 11.2%. The total cost of Phnom Penh Heart Center in 2006 was US\$ 1,992,766.6. Comparing hospital cost with hospital income, it was found that Phnom Penh Heart Center cost was equal to the source of finance because all cost or expenditures were financed by out of pocket budget, donation budget and subsidy from the government. However, the most interesting point was the source of finance from donation part was the second supporter after the out of pocket budget, while the government budget was the smallest supporter only 11.2 % of the total cost. This information showed that 64% of patients have to pay by their own pocket and 24.8% have to depend on donation part in order to cure their heart symptom. If we look at figure 5.7 page 50, the largest portion of material cost was supported by out of pocket payment, donation was the main part to support capital cost of medical equipments about 16.4 % and 8.9% from the government to support capital cost of land asset. For labor cost and material cost, 21.9% supported by out of pocket payment about and 5.2% supported by donation part. Government part was supported only a bit of material cost which was subsidized on electricity cost equal to 2.3% of the total material cost.

According to the result in chapter 5, this study found that total cost of Phnom Penh Heart Center in the fiscal year 2006 was US\$ 1,992,766.6. The ratio of labor cost was 27.2 %, material cost was 45.5% and capital cost 27.3%. Material cost of the hospital was the highest, capital cost was the second, and labor cost was the third because in surgery service, inpatient ward and ICU absorbed much the medical cost, in particular, in the surgery ward.

The highest percentage of labor was in surgery service was 23.5%. The second was 17.3% at administration office and the third was emergency room about 14.9%. In patient service cost center and the consultation unit (OPD) received the highest indirect cost from the non revenue and revenue producing cost center. Inpatient ward had the highest of full cost about 33.4% followed by the consultation unit about 15.8% of the total cost.

Material Cost:

The highest of using material cost was in surgery service about 18.5%, the second highest was in inpatient ward about 17.4% and the third highest was angiography unit and laboratory which was about 16.7% and 16.3%. The highest using material cost was in the surgery service because this cost center used much of special medicines and oxygen while they performed the surgery. Out of pocket budget was the major source to support material cost about 87.6%, shared with donation budget 7.1% and government budget subsidy 5.3% on electricity. High used of material cost while that cost center has much patient occupied was possible to accept. However, high used of material cost while that cost center has not much patients' occupied work was also one kind of noticeable thing that need to readjust that cost, there may be inappropriate prescription of drug to inpatient. Laboratory unit, the material cost is the third high after inpatient ward because this cost center did not have their own major medical equipment to diagnose blood test. This cost center need to spend much more on the laboratory and medical service cost to other institutes outside hospital for diagnose blood.

Labor Cost:

Base on the result related to labor cost in chapter 5, graphic 5.2, the interesting point was labor cost of administration office was higher than emergency service, inpatient ward and consultation, of which emergency has 24 staffs, inpatient ward has 18 staffs and consultation has 18 staffs, while both cost centers inpatient ward and consultation have 2 staffs higher than administration office has only 16 staffs. In this situation the administration office and the hospital director should be aware of quantitative between input and output and productivity within the resource used. It is better to recheck the staffs' activity in that area, otherwise, hospital will be loose with large amount of the resources. The larger of output or input is the more efficient of the service.

Capital Cost and its Source:

Donation budget was the main body to supporter on capital cost of medical equipment about 59.8% and the government was the main part to support the land asset before this center was constructed about 32.5% and out of pocket payment about 7.7% of the total capital cost in 2006. Among the all component of cost in PPHC, such as labor

cost (LC), material cost (MC) and capital cost (CC), the LC was the lowest percentage of cost.

In conclusion, the results in Chapter 5 have already shown the amount of unit cost of OPD and IPD and the total cost of the Phnom Penh Heart Center need in 2006. Referring to those results and the comparisons with WHICH-CHOICE model and Thailand, in particularly the result of GDP and GNI per capital between Thailand and Cambodia is very far above. Thailand has higher income than Cambodia about 6 times. Those results show that it may be impossible for the Cambodian government to afford all cost nearly two million USD (US\$1,992,766.6) of the PPHC in the future. Even though Thailand is richer than Cambodia, Thailand also spends higher cost on health care than Cambodia. In this case, it is better to make a consideration, if the government able to afford all those cost of Phnom Penh Heart Centre, the government would also save the large amount of the hospital's output, such as the number visitors and hospitalization in the future year.

6.2 Limitation of the Study

There were no separate utility bills or charges for different cost centers so the utility cost had to be divided into different cost centers according to their operating space and number of staff worked. Therefore it might not be 100% accurate.

Since this study was conducted under the timeframe constraint, some data and information were not available as per needed, especially for capital items; some assumptions were made for data collection and analyzed. There was not much information system to record all major equipments. Many assumptions had been applied in order to calculate cost, such as some of capital costs, and labor cost.

6.3 Policy Implications

This study found that in 2006, the PPHC was depended on out of pocket payment about US\$1,274,584.4(64%) and donation budget about US\$493,355.6 (24.8%) and government budget US\$224,821.7 (11.2%) of the total budget. In addition, with the

real calculation of each unit cost of OPD and IPD by multiplied with the number of visitors and number of inpatient showed that, the government budget was not enough to support hospital expenditure because the real need was US\$1,992,766.6, but the government had been supported only US\$224,821.7. That is why, the centre need with in this amount of budget US\$1,767,944.9 more from the government.

With the results of unit cost of inpatients and outpatients of Phnom Penh Heart Center have already been calculated and found, the government will be able use this result as the unit of measurement to measure budget allocation for the future years. For example, if the numbers of outpatient increase from 17,597 to 21,116 about 20% and the number of inpatient decreased from 3,804 to 3,000 about 21%, the government can use this existing unit cost to calculate and prepare budget for the future years.

In term the scarcity of resources use, policies makers can use the allocation criteria to improve or upgrade budget allocation factor by finding and using the appropriate unit of measurement to allocate budget in the whole country of Cambodia, such as using number of activities in the areas of allocation, number of staffs work, space of field work, related service, output of the program or activity, and productivity the program.

Productivity, output and outcome of the program are very important to be considered before allocation the budget because the larger of output and outcome, the more efficient of the allocation is.

For the allocation criteria, administration department in the hospital should readjust what the appropriate criteria to be allocated to others cost center. It was not only base on the real need, but also base on square feet, activities of each service, such as number of the activities, and time spent on activities.

Material cost was the main interesting because nearly 50% of the total cost was spent on material cost, this situation the hospital should have a better recording file in each cost centers every moth or rearrange the routine work because some time there may be inappropriate prescribing of drug to inpatient or idling use of office supplies, electricity etc.

To reduce the wastage of the hospital, especially in the portion of labor cost, it is essential to evaluate and analyze the factors affecting these conditions and try to reduce cost accordingly. Conditions, such as personnel salary because it seems far different between secondary nurses, doctors and the head of office. Number of staffs was also one thing that the hospital has to consider, some staffs can work different cost centers by allocated sharing time in order to reduce some large spending on labor cost. The hospital should think which area should reduce and has better quality. Otherwise, there will be an existed wastage use of resources while the resources are scarcity.

The information system of the hospital should be readjusted or redeveloped to be use in routine operation in the hospital, if financial data and all equipments of medical cost, material cost should have well record in the computer system, the result will be useful and more accurate for resource allocation, financial planning, decision making and controlling the hospital cost.

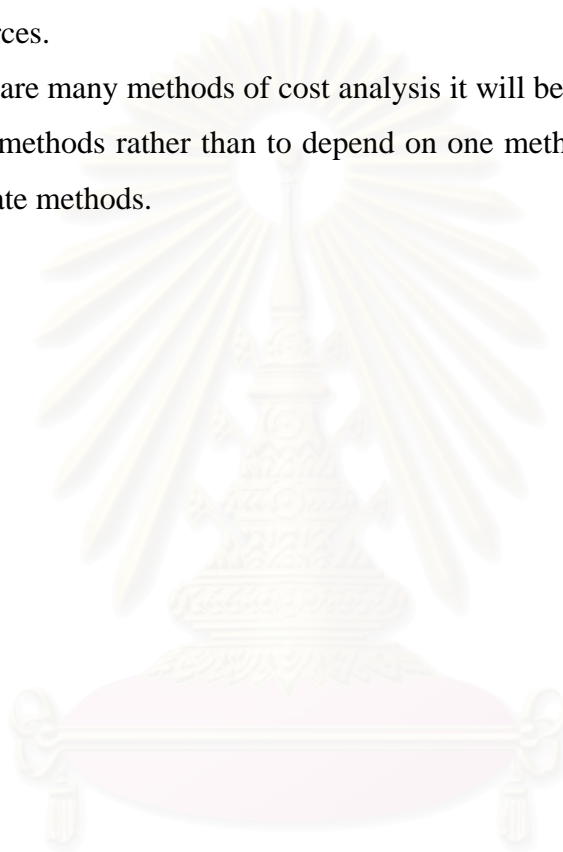
6.4 Recommendations for Further Researchers

Since the data were collected retrospectively, many costs of major medical equipments were estimated because most medical equipments were donated and non commercial goods. In particularly, the actual data were not available.

Labor cost data was interviewed with the long experience person at the administration office, such as salary, bonus and other benefit and time allocation because the labor cost data sheet was not available to collect. Then there are many things need to be done to improve the determination of the future unit cost:

- 1) If there was a detail of labor sheet in each cost center, it would be more accurate to calculate labor cost.
- 2) If there was an inventory list of recording all material cost and equipment cost, the way calculating unit cost would be more accurate result.
- 3) The existing inventory of the hospital can be developed further, with more information such as useful life years, the year purchased, purchasing price, which is very vital to bring about evidences in cost information.

- 4) The unit cost should be studied under the team of staff from the hospital. This team should be understood structure, function and work interrelation among departments in hospital. Some staffs at PPHC, they don't know what the supporting cost centers are. So far, they just allocate all materials cost and office supply base on the real need. They don't use any measurement in order to get appropriate allocation. In addition, they don't know what result of productivity and output are in term of allocating the resources.
- 5) There are many methods of cost analysis it will be a challenge to explore the other methods rather than to depend on one method, as there may be more accurate methods.



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REFERENCES

- Adam et al. (2003). Econometric estimation of country-specific hospital Costs: Global programme on Evidence for Health Policy (GPE/EQC), World Health Organization. Available from <http://www.resource-allocation.com/content/1/1/3> (Retrieved on 28th January, 2008)
- Adam, T. and Evans, D. (2006). Determinants of variation in the cost of inpatient stay versus outpatient visits in hospital: A multi country analysis, *Social Science and Medicine*, 63, 1700-1710. WHO, Geneva, Switzerland. Available from: http://www.who.int/choice/publications/p_2006_cost_variations.pdf (Retrieved on 28th January, 2008)
- Ankjær-Jensen, A. & Bild, L. (2005). Approaches for Price/Cost Assessments in Denmark: DSI Danish Institute for Health Services Research, Health Basket project, SP21-2004-501588, Available from: http://www.ehma.org/_fileupload/File/Projects/WP6_Denmark.pdf (Retrieved on 28th January, 2008)
- Bank of Thailand (2008). International currency exchange rate. Available from: www.bot.or.th/bothomepage/index/index_e.asp (Retrieved on 26th April, 2008)
- Barnum, H. and Kutzin, J. (1993). *Public Hospitals in Developing Countries: Resource Use, Cost, Financing*, Johns Hopkins University Press for the World Bank, Baltimore.
- Bologna, J. et al. (2004). *Healthcare Costs and Premiums: Michigan Compared With Selected Benchmark States*. Ann Arbor, Michigan 48105
- Bureau of Trade and Economic Indices, Ministry of Commerce, Thailand: Consumer Price Index. Available from: www.bot.or.th/bothomepage/index/index_e.asp (Retrieved on 25th April, 2008)
- Carrin, G. and Evlo, K. (1995). *A methodology for the calculation of health care costs and their recovery*, WHO Document, Switzerland.

- Cambodia Demographic and Health Survey (2005). National Institute of Public Health and National Institute of Statistics Phnom Penh, Cambodia.
- Chhim, S. (2001). Cost Effectiveness of Hospital under the new deal vs conventional system in Cambodia: Master's thesis of Science in Health Economics, Chulalongkorn University.
- Country Health Information profiles (2005). Available from: <http://www.wpro.who.int/NR/rdonlyres/BED34D62-D904-43B7-9CEC-ADA3CE991459/0/8Cambodia07.pdf>, (Retrieved on 3rd March, 2008).
- Creese, A. & Parker, D. (1994). Cost Analysis in Primary Health Care: A training manual for Program Mangers. World Health Organization.
- Drummond, M. et al. (2005). Method for Economics Evaluation of Health Care Program. 3rd ed. Oxford: University Press.
- Glick, H. (2001). Trial-based economic evaluations: an overview of design and analysis. In: Drummond M, McGuire A (eds). Economic Evaluation in Health Care: merging theory with practice. Oxford University Press.
- Laekawipat, S. (2004). Unit Cost Analyze of Rongkwang Hospital Phrase Province: Master 's Thesis of Science (Public Health), Mahidol University.
- Lucy, T. (2002). Costing. Sixth edition. Thompson Learning. United Kingdom.
- Ministry of Economy and Finance (2005). Taxation Law of Cambodia: Remark for Financial Statement on 31 December, 2005 for depreciation of ABC CoLtd.
- Ministry of Health (2005). Master plan for health insurance in Cambodia.
- Ministry of Health (2006). Joint Annual Performance Review 2006, Cambodia.
- Ministry of Planning (2006). A statistical Year Book: National Institute of Statistic.
- Minister of Health Canada (2007). Health Canada: Costing Policy. Available from: http://hc-sc.gc.ca/ahc-asc/index_e.html (Retrieved on 28th January, 2008)

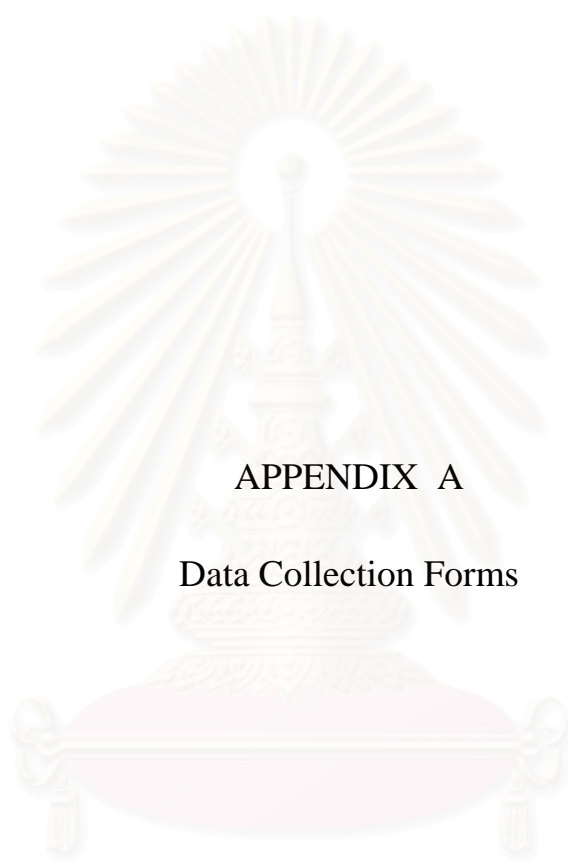
- Mogyorosy, Z. and Smith, P. (2005). The main methodological issues in costing health care services: A literature review. Center for health Economics: the University of York, United Kingdom.
- Nicole, S. & Thomas, L. (2002). Cambodia Background and U.S. Relations: Analysts in Asian Affairs, Foreign Affairs, Defense, and Trade Division, order Code S21289.
- Olave, M. et al. (1992, December). A study of the recurrent unit cost of Primary health care services in a sample of BOLIVIAN Ministry of Health facilities, 1990-1991, No. LAC-0657-C-00-005 1-00 LAC: Health and Nutrition Sustainability University Research Corporation/International Science and Technology Institute 1129 20th Street, N.W. Suite 706, Washington, D.C. 20036
- Pannananunt S. (1995). Cost Analysis of Heart Transplantation at Chularongkorn Hospital: Master thesis of Science in Health economics, Department of Economics, Chulalongkorn University.
- Phnom Penh Heart Center, Cambodia (2005). Available from: <http://www.surgeonsofhope.org/training-hospitals/phnom-penh-heart-center/> (Retrieved on 20th January, 2008)
- Planning Department of Phnom Penh Municipality (2004). Profiles of Phnom Penh City June 2004.
- Shepard, D. et al. (1998). Analysis of hospital costs: a manual for managers. WHO, Geneva, Switzerland.
- Studenmund, H. A. (2006). Using Econometrics: A practical guide, fifth edition, Occidental College.
- Tasilasathean, M. (2001). Cost Analysis of two communities hospitals in Buri Ram: Master thesis of Science in Health economics, Department of Economics, Chulalongkorn University.

- Thailand Investment Review (2007). volume 17: GDP per capita at constant price. Available from: http://www.boi.go.th/english/download/publication_investment/72/March_07.pdf. (Retrieved on 4th May, 2008)
- Tisayaticom, K. et al. (2007). Hospital Costing Manual: An application for Vietnamese setting. Evidence For Health Policy; IHPP, Thailand.
- United Nations Population Division and Statistics Division (2003). Cambodia basic Country data. Available from: <http://devdata.worldbank.org> (Retrieved on 18th Jan, 2008)
- Vanderbeck and Edward, J. (2005). Principles of Cost Accounting: Introduction to Cost Accounting. Thomson Corporation.
- Vanij, P. P (2007). Cost Analysis: Economic Analysis and Evaluation of Health Care Services.
- WHO: [World Health Statistics \(2007\)](#). National expenditure on Health, Available from <http://www.who.int/countries/khm/en/>. (Retrieved on 2nd August, 2007)
- WHO: Health in the Americas (1998). Available from: <http://www.paho.org/English/DD/PUB/HIA1998-p161-174.pdf>. (Retrieved on 18th Jan, 2008)
- World Bank Group (2008). Gross National Income per capita by region. Available from: <http://www.doingbusiness.org/ExploreEconomies/?economyid=3>. Available from: <http://www.bls.gov/bls/other.htm>. (Retrieved on 1st May, 2008)



APPENDICES

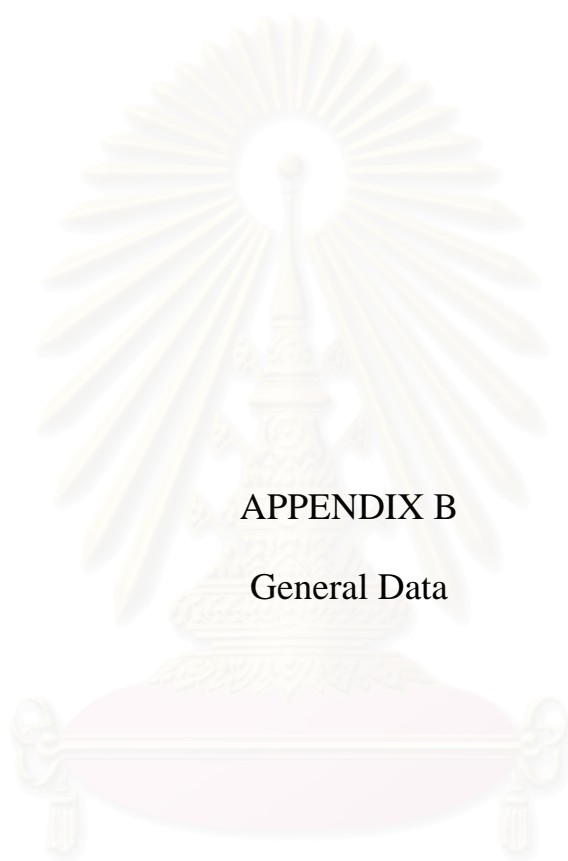
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APPENDIX A

Data Collection Forms

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APPENDIX B

General Data

สถาบันวิทยบริการ
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Table B-1 Annualization Factor

Expected useful life in years	Discount Rate										
	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%
1	0.952	0.943	0.935	0.926	0.917	0.909	0.901	0.893	0.885	0.877	0.870
2	1.850	1.833	1.808	1.783	1.759	1.736	1.713	1.690	1.668	1.647	1.629
3	2.723	2.673	2.624	2.577	2.531	2.987	2.444	2.402	2.361	2.322	2.282
4	3.546	3.465	3.387	3.312	3.240	3.170	3.102	3.037	2.974	2.914	2.855
5	4.329	4.212	4.100	3.993	3.890	3.791	3.696	3.605	3.517	3.433	3.352
6	5.076	4.917	4.767	4.623	4.486	4.355	4.231	4.111	3.998	3.889	3.784
7	5.786	5.582	5.389	5.206	5.033	4.868	4.712	4.564	4.423	4.288	4.160
8	6.463	6.210	5.971	5.747	5.535	5.335	5.146	4.968	4.799	4.639	4.487
9	7.108	6.802	6.515	6.247	5.995	5.759	5.535	5.328	5.132	4.946	4.772
10	7.722	7.360	7.024	6.710	6.418	6.145	5.889	5.650	5.426	5.216	5.019
11	8.306	7.887	7.499	7.139	6.805	6.495	6.206	5.938	5.687	5.453	5.234
12	8.863	8.364	7.943	7.536	7.161	6.814	6.492	6.194	5.918	5.660	5.421
13	9.394	8.853	8.358	7.904	7.487	7.103	6.750	6.424	6.122	5.842	5.583
14	9.899	9.295	8.745	8.244	7.786	7.367	6.982	6.628	6.302	6.002	5.724
15	10.380	9.712	9.108	8.559	8.061	7.606	7.191	6.811	6.462	6.142	5.847
16	10.838	10.106	9.447	8.851	8.313	7.824	7.379	6.974	6.604	6.265	5.954
17	11.274	10.477	9.763	9.122	8.544	8.002	7.549	7.120	6.729	6.373	6.047
18	11.690	10.828	10.059	9.372	8.756	8.201	7.702	7.250	6.840	6.467	6.128
19	12.085	11.158	10.336	9.604	8.950	8.365	7.839	7.366	6.938	6.550	6.198
20	12.462	11.470	10.594	9.818	9.129	8.514	7.963	7.469	7.025	6.623	6.259
21	12.821	11.764	10.836	10.017	9.292	8.649	8.075	7.562	7.102	6.687	6.312
22	13.163	12.042	11.061	10.201	9.442	8.772	8.176	7.645	7.170	6.743	6.539
23	13.489	12.303	11.272	10.371	9.580	8.883	8.266	7.718	7.230	6.792	6.399
24	13.799	12.550	11.469	10.529	9.707	8.985	8.348	7.784	7.230	6.835	6.434
25	14.094	12.783	11.654	10.675	9.823	9.077	8.422	7.843	7.330	6.873	6.464
26	14.375	13.003	11.826	10.810	9.929	9.161	8.488	7.896	7.372	6.906	6.491
27	14.643	13.211	11.987	10.935	10.027	9.237	8.548	7.943	7.409	6.935	6.514
28	14.898	13.406	12.137	11.051	10.116	9.307	8.602	7.984	7.441	6.961	6.534
29	15.141	13.591	12.278	11.158	10.198	9.370	8.650	8.022	7.470	6.983	6.551
30	15.372	13.765	12.409	11.258	10.274	9.427	8.694	8.055	7.496	7.003	6.566

Source Creese & Parker, 1994

Table B-2 Exchange rate of US\$ between 1st January and 30 December 2006

Baht/1 USD

Date	Average buying rate		Average selling rate
	Sight Bill	Telex transfer	
Jan 3, 2006	40.7594	40.8553	41.0411
Jan 4, 2006	40.3750	40.4725	40.6626
Jan 5, 2006	40.1541	40.2505	40.4443
Jan 6, 2006	40.0171	40.1134	40.3030
Jan 9, 2006	39.5994	39.6956	39.8878
Jan 10, 2006	39.6516	39.7483	39.9391
Jan 11, 2006	39.6806	39.7773	39.9791
Dec 21, 2006	36.1363	36.2341	36.5172
Dec 22, 2006	36.2380	36.3360	36.6349
Dec 25, 2006	36.1613	36.2566	36.5608
Dec 26, 2006	36.1500	36.2476	36.5324
Dec 27, 2006	36.0990	36.1954	36.4722
Dec 28, 2006	36.0231	36.1204	36.3961
Dec 29, 2006	35.8601	35.9555	36.2308

Source: The Central Bank of Thailand, 2006

Available from: www.bot.or.th/bothermepage/index/index_e.asp
 (Retrieved on 26th April, 2008)

Table B-3 Consumer price index by group

Table : Consumer Price Index by Group
(2002=100)

Line	Weights	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	
1		100	75.1	79.4	84.1	88.8	96	96.2	97.8	99.4	100	101.8	104.6	109.3	114.4	117
2		36.06	73.3	79.2	86.2	92.2	101	100.2	99	99.7	100	103.7	108.3	113.7	118.9	123.7
3		2.68	65.2	67.8	79.1	102	127.2	108.7	111.3	108.9	100	109.8	118.8	118	121.8	132
4		5.32	73.9	81.7	88.1	93.4	97.1	100.4	98.4	99.8	100	100.6	109.9	118.6	123	122.8
5		4.77	80.6	91.9	97.5	94.7	104.7	94.9	90.5	94.2	100	119.7	132.2	154	179.1	200.4
6		2.23	79.9	81.9	86.6	88.7	101.2	101.3	96.6	99.3	100	99.4	108.4	113.6	110.5	114.7
7		1.79	89.7	90.4	92.6	95.7	104.7	107.1	99.9	98.5	100	103.7	105.1	105.3	109.4	113.7
8		1.56	78.8	80.6	85.5	89.2	97.7	100.5	98.8	99.2	100	100.4	100.7	101.2	105.6	108.2
9		7.03	n.a.	n.a.	n.a.	n.a.	98.6	99.9	99.8	99.9	100	101.6	103.2	105.4	107	109.5
10		10.68	n.a.	n.a.	n.a.	n.a.	97.2	99.2	99.7	99.8	100	100.2	100.8	102.6	104.2	105.1
11		63.94	76.8	80.1	83	86.8	93.1	94	97	99.2	100	100.7	102.4	106.8	111.7	113
12		3.4	79.5	83.3	86.4	89.9	96.5	97.7	98.6	99.6	100	100.1	100.3	100.7	100.9	101.1
13		23.86	82.3	86.2	89	91.8	96.9	97	98.4	100	100	99.5	100	101.3	103.3	103.4
14		6.04	77.5	80.3	82	84.6	91.7	94.6	96.9	98.9	100	100.9	102.4	104.2	105.8	106.6
15		21.99	75	76	77.2	80.8	87.1	88.1	95.8	98.7	100	103.1	107.4	118	128.7	131.5
16		5.82	76.4	81.4	88.1	93.2	98	98.4	98.1	99.1	100	99.9	101.5	102.5	103.3	104.5
17		2.83	59.1	62.3	65.5	74.7	88.6	91.6	92.3	97.9	100	99.4	98.6	100.3	108.8	110.5
18		75.95	77.3	81.3	85.5	89.5	95.9	97.6	98.4	99.6	100	100.2	100.6	102.2	104.5	105.6
19		24.05	68.7	74.3	80.1	87	96.7	92.3	96.4	99.2	100	106.9	116.8	131.2	144.9	152
20		15	72.5	79.1	86.2	93.6	105.4	100.4	98.2	99.7	100	107.8	117.9	128.5	138.2	147.2
21		9.05	61.3	64.6	66.6	73	81.3	77.7	94	99.2	100	105.7	115.2	135.6	156	159.7
22		100	73.8	78.7	83.8	88.9	96.7	97.3	97.7	99.1	100	101.7	104.8	109.4	114.7	117.8
23		46.08	72.1	78.6	85.5	91.8	101.1	100.5	98.8	99.3	100	103	108	113.7	119.6	124.9
24		53.92	75.9	79.2	82.6	86.6	93.3	94.7	96.8	99	100	100.7	102.3	106	110.6	111.8
25		100	71.8	76.4	81.7	88.1	97.8	97.7	97.8	99.2	100	101.9	106.7	113.5	120.7	125.6
26		43.59	67.7	74.4	82	91.9	104.1	101.7	98.6	99.1	100	103	111.5	121.5	131.8	140.6
27		56.41	75.6	78.5	81.8	85.3	92.8	94.6	97.2	99.2	100	101.1	103	107.3	112.2	114.1

1/ Weights and selected items are derived from a socio-economic survey conducted only in urban areas in 2002 among families of one to five persons , with monthly income ranging from Baht 3,000 to Baht 60,000.

The new general consumer price index (2002= 100) has replaced the old series from January 2005 onwards.

2/ The core consumer price index excludes raw food and energy items from the consumer price index basket.

3/ The MOC has published a new series of low income consumer price index (2002=100) from January 2005 onwards by using selected items and weights derived from socio-economic survey conducted in urban areas in 2002 among families of one to five persons , with monthly income ranging from Baht 3,000 to Baht 15,000.

4/ Weights and selected items are derived from a socio-economic survey conducted in sanitary districts in 2002 among families of two or more persons but not over six, with monthly income ranging from Baht 2,000 to baht 25,000.

Source : Bureau of Trade and Economic Indices, Ministry of Commerce

Source : Bureau of Trade and Economic Indices, Ministry of Commerce of Thailand
Available from: www.bot.or.th/bothomepage/index/index_e.asp

Table B-4 Income per capita by regions in 2006

No.	Region or Economy	Region	Income category	GNI per capita (US\$)	Population
1	Bhutan	South Asia	Low income	1410	648766
2	Cambodia	East Asia & Pacific	Low income	480	14,350,856
3	China	East Asia & Pacific	Lower middle income	2,010	1,311,797,691
5	Indonesia	East Asia & Pacific	Lower middle income	1,420	223,041,631
6	Lao PDR	East Asia & Pacific	Low income	500	5,759,402
7	Malaysia	East Asia & Pacific	Upper middle income	5,490	25,766,595
8	Maldives	South Asia	Lower middle income	2,680	336,981
9	Nepal	South Asia	Low income	290	27,658,148
10	Philippines	East Asia & Pacific	Lower middle income	1,420	84,589,763
11	Thailand	East Asia & Pacific	Lower middle income	2,990	64,724,421
12	Vietnam	East Asia & Pacific	Low income	690	84,108,100

Source: The World Bank Group, All Rights Reserved, 2008

Available from : <http://www.doingbusiness.org/ExploreEconomies/?economyid=3>

<http://www.bls.gov/bls/other.htm>

Note: GNI = Gross National Income

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Table B-5 GDP per capita and GNI per capita of Cambodia and Thailand

Year	Cambodia		Thailand	
	GDP per capita	GNI per capita	GDP per capita	GNI per capita
2001	\$300	\$1,790	\$2,020	\$6,230
2002	\$314	\$735	\$2,110	\$1,416
2003	\$330	\$2,060	\$2,240	\$7,450
2004	\$354	\$825	\$2,360	\$3,255
2005	\$385	\$2,490	\$2,440	\$8,440
2006	\$514	\$480	\$3,179	\$2,990

Note: GDP per capita at constant price

GNI per capita at Purchasing Power Parity (PPP)

Source:

World perspective, 2008

World Development Indicators database, World Bank, 2002,2003,2004,2005,2006,2007

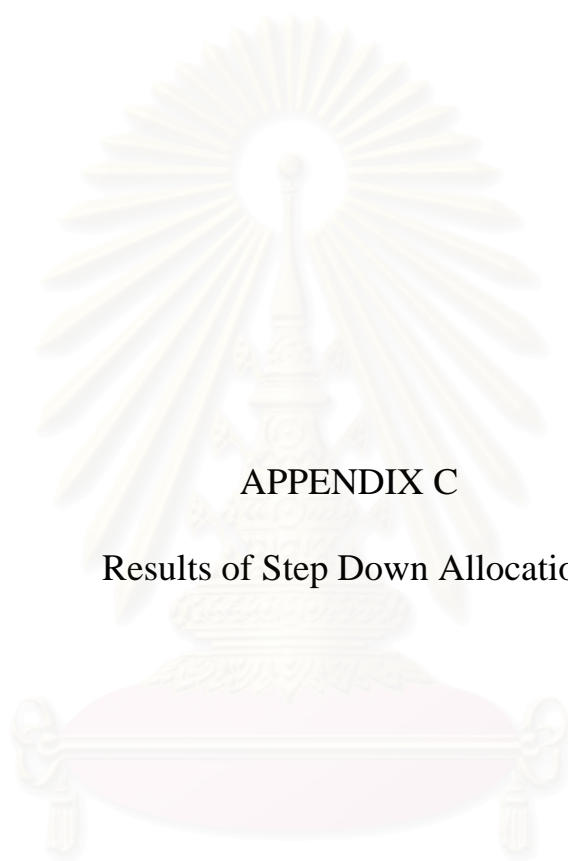
Ministry of Economy and Finance,2007, Cambodia

Available from :<http://worldperspective.usherbrooke.ca/bilan/servlet/BMTendanceStatPays?langue>

Table B-6 Definition of facility types as coded in the unit cost database

Facility type	Description
Primary-level hospital	Has few specialities, mainly internal medicine, obstetrics-gynecology, pediatrics, and general surgery, or only general practice; limited laboratory services are available for general but not for specialized pathological analysis; bed capacity ranges from 30 to 200 beds; often referred to as a district hospital or first-level referral.
Secondary-level hospital	Highly differentiated by function with five to ten clinical specialities; bed capacity ranging from 200-800 beds; often referred to as provincial hospital.
Tertiary-level hospital	Highly specialized staff and technical equipment, e.g., cardiology, ICU and specialized imaging units; clinical services are highly differentiated by function; may have teaching activities; bed capacity ranges from 300 to 1,500 beds; often referred to as central, regional or tertiary-level hospital.

These definitions of hospital levels (adapted from Barnum and Kutzin 1993 (2))



APPENDIX C

Results of Step Down Allocation

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Appendix C Step down Allocation Method

1. Allocated from space related cost to centre to all cost centers

Code	Cost Center	TDC (US\$)	Unit of Measurement (sqm ²)	Cost allocate (US\$)	Total (US\$)
	Space related Cost centre	176,892.8	-	-	-
A ₁	Administration Office	162,681.9	273.0	21,700.2	184,382.1
A ₂	Kitchen	34,278.9	31.5	2,503.9	36,782.8
A ₃	Warehouse	3,987.9	14.7	1,168.5	5,156.4
A ₄	Security Unit	27,357.5	12.0	953.9	28,311.4
A ₅	Technique Unit	33,797.0	151.0	12,002.7	45,799.7
B ₁	Pharmacy Unit	71,567.7	31.6	2,511.8	74,079.5
B ₂	Laboratory Unit	169,974.7	24.5	1,947.5	171,922.1
B ₃	Radiology Unit	32,204.0	15.7	1,248.0	33,452.0
B ₄	Angiography Unit	209,695.0	90.0	7,153.9	216,848.9
B ₅	Surgery Services	322,396.4	400.4	31,827.0	354,223.4
C ₁	Consultaion Unit	118,708.0	365.8	29,076.7	147,784.8
C ₂	Emergency room	257,491.3	148.0	11,764.2	269,255.5
C ₃	ICU	85,600.0	203.9	16,207.6	101,807.6
C ₄	Inpatient Ward	286,133.6	463.3	36,826.8	322,960.4
	Total	1,992,766.6	2,225.4	176,892.8	1,992,766.6

Note: Land was calculated by using inflation rate in Cambodia in 2006 was 5% and the value of annuity factor was 5% with 5 years adapted from standard table of Creese and Parker, 1994.

Appendix C (Cont'd)**2. Allocated from Administration office to others NPCC, RPCC, and PSCC**

Code	Cost Center	TDC (US\$)	Unit of Measurement # of personnel	Cost allocate (US\$)	Total (US\$)
A ₁	Administration Office	184,382.1	0.0	0.0	0.0
A ₂	Kitchen	36,782.8	6.0	9,142.9	45,925.7
A ₃	Warehouse	5,156.4	1.0	1,523.8	6,680.2
A ₄	Security Unit	28,311.4	9.0	13,714.4	42,025.7
A ₅	Technique Unit	45,799.7	4.0	6,095.3	51,895.0
B ₁	Pharmacy Unit	74,079.5	2.0	3,047.6	77,127.1
B ₂	Laboratory Unit	171,922.1	3.0	4,571.5	176,493.6
B ₃	Radiology Unit	33,452.0	2.0	3,047.6	36,499.6
B ₄	Angiography Unit	216,848.9	3.0	4,571.5	221,420.3
B ₅	Surgery Services	354,223.4	17.0	25,904.9	380,128.4
C ₁	Consultaion Unit	147,784.8	17.0	25,904.9	173,689.7
C ₂	Emergency room	269,255.5	24.0	36,571.7	305,827.2
C ₃	ICU	101,807.6	15.0	22,857.3	124,664.9
C ₄	Inpatient Ward	322,960.4	18.0	27,428.7	350,389.2
	Total	1,992,766.6	121.0	184,382.1	1,992,766.6

3. Allocated from Kitchen to others NPCC, RPCC, and PSCC

Code	Cost Center	TDC (US\$)	Unit of Measurement # of day meal service	Cost allocate (US\$)	Total (US\$)
A ₂	Kitchen	45,925.7		0.0	0.0
A ₃	Warehouse	6,680.2	730.0	390.0	7,070.2
A ₄	Security Unit	42,025.7	6,570.0	3,509.6	45,535.3
A ₅	Technique Unit	51,895.0	2,920.0	1,559.8	53,454.8
B ₁	Pharmacy Unit	77,127.1	1,460.0	779.9	77,907.1
B ₂	Laboratory Unit	176,493.6	1,460.0	779.9	177,273.5
B ₃	Radiology Unit	36,499.6	1,460.0	779.9	37,279.5
B ₄	Angiography Unit	221,420.3	2,190.0	1,169.9	222,590.2
B ₅	Surgery Services	380,128.4	12,410.0	6,629.2	386,757.6
C ₁	Consultaion Unit	173,689.7	12,410.0	6,629.2	180,318.9
C ₂	Emergency room	305,827.2	17,520.0	9,358.8	315,186.0
C ₃	ICU	124,664.9	12,327.0	6,584.8	131,249.8
C ₄	Inpatient Ward	350,389.2	14,517.0	7,754.7	358,143.9
	Total	1,992,766.6	85,974.0	45,925.7	1,992,766.6

Appendix C (Cont'd)**4. Allocated from warehouse to others NPCC, RPCC, and PSCC**

Code	Cost Center	TDC (US\$)	Unit of Measurement # of Cloth	Cost allocate (US\$)	Total (US\$)
A ₃	Warehouse	7,070.2	0	0.0	0.0
A ₄	Security Unit	45,535.3	18	558.2	46,093.5
A ₅	Technique Unit	53,454.8	8	248.1	53,702.9
B ₁	Pharmacy Unit	77,907.1	4	124.0	78,031.1
B ₂	Laboratory Unit	177,273.5	6	186.1	177,459.5
B ₃	Radiology Unit	37,279.5	4	124.0	37,403.5
B ₄	Angiography Unit	222,590.2	6	186.1	222,776.3
B ₅	Surgery Services	386,757.6	34	1,054.3	387,811.9
C ₁	Consultaion Unit	180,318.9	34	1,054.3	181,373.2
C ₂	Emergency room	315,186.0	48	1,488.5	316,674.5
C ₃	ICU	131,249.8	30	930.3	132,180.1
C ₄	Inpatient Ward	358,143.9	36	1,116.3	359,260.2
	Total	1,992,766.6	228	7,070.2	1,992,766.6

5. Allocated from Security Unit to others NPCC, RPCC, and PSCC

Code	Cost Center	TDC (US\$)	Unit of Measurement % of patients visited	Cost allocate (US\$)	Total (US\$)
A ₄	Security Unit	46,093.5	0	0.0	0.0
A ₅	Technique Unit	53,702.9	0	0.0	53,702.9
B ₁	Pharmacy Unit	78,031.1	0	0.0	78,031.1
B ₂	Laboratory Unit	177,459.5	0	0.0	177,459.5
B ₃	Radiology Unit	37,403.5	0	0.0	37,403.5
B ₄	Angiography Unit	222,776.3	0	0.0	222,776.3
B ₅	Surgery Services	387,811.9	0	0.0	387,811.9
C ₁	Consultaion Unit	181,373.2	79%	36,413.8	217,787.0
C ₂	Emergency room	316,674.5	1%	460.9	317,135.4
C ₃	ICU	132,180.1	0	0.0	132,180.1
C ₄	Inpatient Ward	359,260.2	20%	9,218.7	368,478.9
	Total	1,992,766.6	100%	46,093.5	1,992,766.6

Appendix C (Cont'd)**6. Allocated from Technique Unit to others RPCC, and PS**

Code	Cost Center	TDC (US\$)	Unit of Measurement # of services repaired	Cost allocate (US\$)	Total (US\$)
A ₅	Technique Unit	53,702.9	0	0.0	0.0
B ₁	Pharmacy Unit	78,031.1	0	0.0	78,031.1
B ₂	Laboratory Unit	177,459.5	1	5,967.0	183,426.5
B ₃	Radiology Unit	37,403.5	1	5,967.0	43,370.5
B ₄	Angiography Unit	222,776.3	0	0.0	222,776.3
B ₅	Surgery Services	387,811.9	1	5,967.0	393,778.9
C ₁	Consultaion Unit	217,787.0	3	17,901.0	235,688.0
C ₂	Emergency room	317,135.4	2	11,934.0	329,069.4
C ₃	ICU	132,180.1	0	0.0	132,180.1
C ₄	Inpatient Ward	368,478.9	1	5,967.0	374,445.9
	Total	1,992,766.6	9	53,702.9	1,992,766.6

7. Allocated from Pharmacy Unit to others RPCC, and PS

Code	Cost Center	TDC (US\$)	Unit of Measurement # of patients visit in each service	Cost allocate (US\$)	Total (US\$)
B ₁	Pharmacy Unit	78,031.1	0	0.0	0.0
B ₂	Laboratory Unit	183,426.5	264.0	820.6	184,247.2
B ₃	Radiology Unit	43,370.5	3,954.0	12,290.8	55,661.3
B ₄	Angiography Unit	222,776.3	365.0	1,134.6	223,910.8
B ₅	Surgery Services	393,778.9	459.0	1,426.8	395,205.6
C ₁	Consultaion Unit	235,688.0	15,539.0	48,302.0	283,990.0
C ₂	Emergency room	329,069.4	259.0	805.1	329,874.5
C ₃	ICU	132,180.1	459.0	1,426.8	133,606.8
C ₄	Inpatient Ward	374,445.9	3,804.0	11,824.5	386,270.4
	Total	1,992,766.6	25,103	78,031.1	1,992,766.6

Appendix C (cont'd)**8. Allocated from Laboratory Unit to others RPCC, and PS**

Code	Cost Center	TDC (US\$)	Unit of Measurement # of patients visit in each service	Cost allocate (US\$)	Total (US\$)
B ₂	Laboratory Unit	184,247.2	0.0	0.0	0.0
B ₃	Radiology Unit	55,661.3	0.0	0.0	55,661.3
B ₄	Angiography Unit	223,910.8	0.0	0.0	223,910.8
B ₅	Surgery Services	395,205.6	0.0	0.0	395,205.6
C ₁	Consultaion Unit	283,990.0	15,539.0	146,057.4	430,047.4
C ₂	Emergency room	329,874.5	259.0	2,434.4	332,308.9
C ₃	ICU	133,606.8	0.0	0.0	133,606.8
C ₄	Inpatient Ward	386,270.4	3,804.0	35,755.3	422,025.7
	Total	1,992,766.6	19,602	184,247.2	1,992,766.6

9. Allocated from Radiology Unit to others RPCC, and PS

Code	Cost Center	TDC (US\$)	Unit of Measurement # of patients visit	Cost allocate (US\$)	Total (US\$)
B ₃	Radiology Unit	55,661.3	0.0	0.0	0.0
B ₄	Angiography Unit	223,910.8	0.0	0.0	223,910.8
B ₅	Surgery Services	395,205.6	0.0	0.0	395,205.6
C ₁	Consultaion Unit	430,047.4	0.0	0.0	430,047.4
C ₂	Emergency room	332,308.9	102.0	1,518.4	333,827.4
C ₃	ICU	133,606.8	701.0	10,435.6	144,042.4
C ₄	Inpatient Ward	422,025.7	2,936.0	43,707.3	465,733.0
	Total	1,992,766.6	3,739	55,661.3	1,992,766.6

Appendix C (cont'd)

10. Allocated from Angiography Unit to RPCC, and PS

Code	Cost Center	TDC (US\$)	Unit of Measurement # of patients visit	Cost allocate (US\$)	Total (US\$)
B₄	Angiography Unit	223,910.8	0.0	0.0	0.0
B ₅	Surgery Services	395,205.6	0.0	0.0	395,205.6
C ₁	Consultaion Unit	430,047.4	105.0	56,789.0	486,836.4
C ₂	Emergency room	333,827.4	0.0	0.0	333,827.4
C ₃	ICU	144,042.4	0.0	0.0	144,042.4
C ₄	Inpatient Ward	465,733.0	309.0	167,121.9	632,854.9
	Total	1,992,766.6	414	223,910.8	1,992,766.6

11. Allocated from Surgery Service to Patients Service

Code	Cost Center	TDC (US\$)	Unit of Measurement # of patients visit	Cost allocate (US\$)	Total (US\$)
B₅	Surgery Services	395,205.6	0.0	0.0	0.0
C ₁	Consultaion Unit	486,836.4	0.0	0.0	486,836.4
C ₂	Emergency room	333,827.4	0.0	0.0	333,827.4
C ₃	ICU	144,042.4	0.0	0.0	144,042.4
C ₄	Inpatient Ward	632,854.9	459.0	395,205.6	1,028,060.5
	Total	1,992,766.6	459	395,205.6	1,992,766.6

Appendix C (Cont'd)

12. Full Cost and Unit Cost of OPD and IPD of Phnom Penh Heart Center

Cost Center	Total Cost (US\$)	# of Patients Visit	# of Patients admitted	Unit cost per case (US\$)
Emergency room	333,827.4	259.0		1,288.9
Consultaion Unit (OPD)	486,836.4	15,539.0		31.3
ICU	144,042.4		459	313.8
Inpatient Ward (IPD)	1,028,060.5		3,345.0	307.3
Total	1,992,766.6	15,798.0	3,804.0	1,941.4

13. Unit cost of OPD and IPD of Phnom Penh Heart Centre

Code	Cost Center	Total cost (US\$)	Unit of Measurement #	Unit cost per case (US\$)
C ₁	OPD	820,663.72	15,798	51.9
C ₂				
C ₃	IPD	1,172,102.91	3,804	308.1
C ₄				
Total		1,992,766.6	19,602	

14. Unit cost of surgery patients (open heart surgery) of PPHC (Cost per bed-day and per case)

Code	Cost centre	Full cost (US\$)	# of surgery patients	Average length of stay	Unit cost per case (US\$)	Unit cost per bed-day (US\$)
B ₅	Surgery Service	395,205.6				
C ₃	ICU	144,042.4				
C ₄	Inpatents ward	1,028,060.5				
	Total	1,567,308.5	308.0	25.0	5,087.5	203.5

Table D-3 Patient Service Cost Centers received cost allocated from Non Revenue and Revenue Producing Cost Center

Cost Center	NRPCC (US\$)					RPCC (US\$)					Indirect Cost (US\$)
	A ₁	A ₂	A ₃	A ₄	A ₅	B ₁	B ₂	B ₃	B ₄	B ₅	
• Consultaion Unit	25,904.9	6,629.2	1,054.3	36,413.8	17,901.0	48,302.0	146,057.4	0.0	56,789.0	0.0	339,051.6
• Emergency room	36,571.7	9,358.8	1,488.5	460.9	11,934.0	774.6	2,434.4	1,518.4	0.0	0.0	64,541.4
• ICU	22,857.3	6,584.8	930.3	0.0	0.0	1,426.8	0.0	10,435.6	0.0	0.0	42,234.8
• Inpatient Ward	27,428.7	7,754.7	1,116.3	9,218.7	5,967.0	11,824.5	35,755.3	43,707.3	167,121.9	395,205.6	705,100.1
Total	112,762.6	30,327.6	4,589.4	46,093.5	35,801.9	62,327.9	184,247.2	55,661.3	223,910.8	395,205.6	1,150,927.8

Cost Center	NRPCC (%)					RPCC (%)					Indirect Cost (US\$)
	A ₁	A ₂	A ₃	A ₄	A ₅	B ₁	B ₂	B ₃	B ₄	B ₅	
• Consultaion Unit	7.6%	2.0%	0.3%	10.7%	5.3%	14.2%	43.1%	0.0%	16.7%	0.0%	100.0%
• Emergency room	56.7%	14.5%	2.3%	0.7%	18.5%	1.2%	3.8%	2.4%	0.0%	0.0%	100.0%
• ICU	54.1%	15.6%	2.2%	0.0%	0.0%	3.4%	0.0%	24.7%	0.0%	0.0%	100.0%
• Inpatient Ward	3.9%	1.1%	0.2%	1.3%	0.8%	1.7%	5.1%	6.2%	23.7%	56.0%	100.0%
Total	9.8%	2.6%	0.4%	4.0%	3.1%	5.4%	16.0%	4.8%	19.5%	34.3%	100.0%

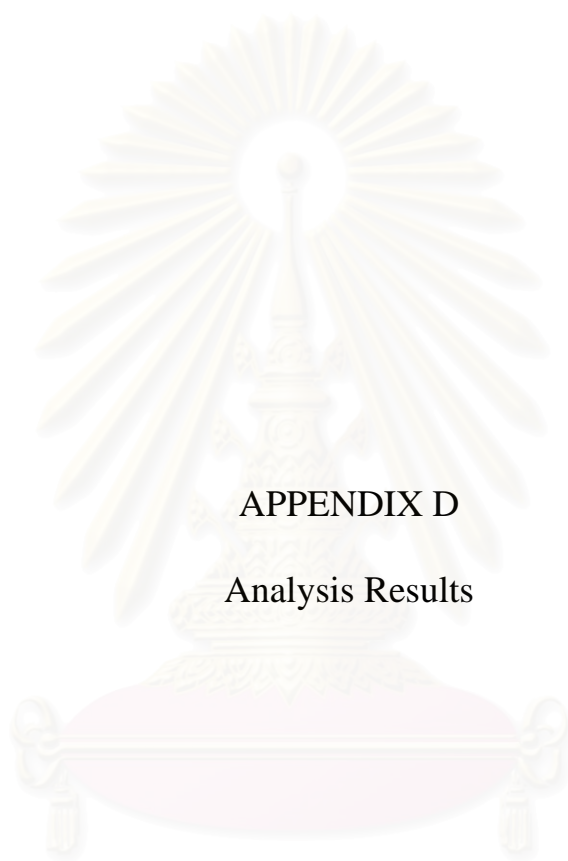
Remarks: The above results were calculated from the left hand side to → the right hand side.

- All the percentage result in the second table was calculated from the first table by taking each amount of each cost center divide by the total amount of indirect cost of each patient service.
- A₁: Administration • B₁: Pharmacy Unit
- A₂: Kitchen • B₂: Laboratory Unit
- A₃: Warehouse • B₃: Radiology Unit
- A₄: Security Unit • B₄: Angiology Cardiological Intervention Unit
- A₅: Technique Unit • B₅: Surgery Service
- NRPC = Non Revenue Producing Cost Center, RPCC = Revenue Producing Cost Center.

Table C-3 Total direct cost and indirect of each cost centre at PPHC in 2006

Code	Cost Center	TDC		IDC		Full Cost	
		US\$	%	US\$	%	US\$	%
A ₁	Administration	162,681.9	9.0%	21,700.2	1.5%	184,382.1	5.6%
A ₂	Kitchen	34,278.9	1.9%	11,646.8	0.8%	45,925.7	1.4%
A ₃	Warehouse	3,987.9	0.2%	3,082.2	0.2%	7,070.2	0.2%
A ₄	Security Unit	27,357.5	1.5%	18,736.0	1.3%	46,093.5	1.4%
A ₅	Technique Unit	33,797.0	1.9%	19,905.9	1.4%	53,702.9	1.6%
B ₁	Pharmacy Unit	71,567.7	3.9%	6,463.4	0.4%	78,031.1	2.4%
B ₂	Laboratory Unit	169,974.7	9.4%	14,272.5	1.0%	184,247.2	5.6%
B ₃	Radiology Unit	32,204.0	1.8%	23,457.3	1.6%	55,661.3	1.7%
B ₄	Angiography Unit	209,695.0	11.5%	14,215.9	1.0%	223,910.8	6.9%
B ₅	Surgery Services	322,396.4	17.8%	72,809.2	5.0%	395,205.6	12.1%
C ₁	Consultation Unit	118,708.0	6.5%	368,128.3	25.4%	486,836.4	14.9%
C ₂	Emergency room	257,491.3	14.2%	76,336.1	5.3%	333,827.4	10.2%
C ₃	ICU	85,600.0	4.7%	58,442.4	4.0%	144,042.4	4.4%
C ₄	Inpatient Ward (IPD)	286,133.6	15.8%	741,926.9	51.1%	1,028,060.5	31.5%
	Total	1,815,873.8	100.0%	1,451,123.1	100.0%	3,266,996.9	100.0%

Remarks: TDC = Total Direct Cost
 IDC = Indirect Cost



APPENDIX D

Analysis Results

สถาบันวิทยบริการ
จุฬาลงกรณ์มหาวิทยาลัย

Table D-1 Equipment Cost of Phnom Penh Heart Center in 2006

Equipments	Quantities	Life time (n year)	Purchased price in (C) (US\$)	Received Year (t)	Value in Year 2006 (15%)	Annualization Factor	Annual Economic Cost (US\$)
TCC of Equipments & Vehicle			961,634.50		998,226.28		299,508.20
Medical Supplies			926,389.50		941,822.26		280,973.23
• Slide marchine for diagnos the symptom	5	5	500.00	2001	1,010.00	(15%) 3.352	301.31
• Sario for medicine	9	5	80.00	2001	161.60	(15%) 3.352	48.21
• O2 tube (on the wall)	12	5	1,000.00	2001	2,020.00	(15%) 3.352	602.63
• O2 tube (on the wall)	9	5	1,400.00	2005	1,610.00	(15%) 3.352	480.31
• O2's can	1	5	50.00	2001	101.00	(15%) 3.352	30.13
• O2 tube (for bed)	2	5	50.00	2001	101.00	(15%) 3.352	30.13
• Scop ECG (big)	13	5	2,500.00	2001	5,050.00	(15%) 3.352	1,506.56
• Scop Tention (Colin Brand)	2	5	2,550.00	2003	3,876.00	(15%) 3.352	1,156.32
• Scop Tention (Colin Brand)	4	5	2,811.00	2006	2,811.00	(15%) 3.352	838.60
• Scop patients monitors (Simen Brand)	3	5	4,890.00	2001	9,877.80	(15%) 3.352	2,946.84
• Scop (Datex Brand)	2	5	2,550.00	2001	5,151.00	(15%) 3.352	1,536.69
• Scops' stand	4	5	150.00	2001	303.00	(15%) 3.352	90.39
• Iron stand on the head of bed	11	5	125.00	2005	143.75	(15%) 3.352	42.88
• Iron stand for keeping patients document	4	5	150.00	2005	172.50	(15%) 3.352	51.46
• Iron for hanging sirom	1	5	14.00	2006	14.00	(15%) 3.352	4.18
• Tambour	3	5	40.00	2006	40.00	(15%) 3.352	11.93
• Iron table with wheel for keeping monoitor	1	5	250.00	2005	287.50	(15%) 3.352	85.77
• Plastic stand with wheel for keeping Scanner	1	5	50.00	2005	57.50	(15%) 3.352	17.15
• Ventilation machine	6	5	5,000.00	2001	10,100.00	(15%) 3.352	3,013.13
• Chest pick up marchine	2	5	1,850.00	2001	3,737.00	(15%) 3.352	1,114.86
• Sario for emergency	1	5	45.00	2001	90.90	(15%) 3.352	27.12
• Sario for keeping scop	4	5	35.00	2001	70.70	(15%) 3.352	21.09
• Sario for ventolin & chest pick up	2	5	50.00	2001	101.00	(15%) 3.352	30.13
• Sario Chariot (for keeping goods)	7	5	35.00	2001	70.70	(15%) 3.352	21.09

Table D-1 (Cont.) Equipment Cost of Phnom Penh Heart Center in 2006

• Injection marchine (V brand)	1	5	98.00	2001	197.96	(15%)	3.352	59.06
• Sario for ECG	2	5	50.00	2001	101.00	(15%)	3.352	30.13
• Digital blood pressure	2	5	30.00	2001	60.60	(15%)	3.352	18.08
• Digital blood pressure	4	5	45.00	2006	45.00	(15%)	3.352	13.42
• Baloon (small)	3	5	230.00	2005	264.50	(15%)	3.352	78.91
• Baloon (Big)	3	5	400.00	2005	460.00	(15%)	3.352	137.23
• Wheel table for patients' meal & doctors' document	33	5	42.00	2001	84.84	(15%)	3.352	25.31
• Cardiac echology marchine	2	5	21,000.00	2001	42,420.00	(15%)	3.352	12,655.13
• Electric sirang (Vial medical)	9	5	1,500.00	2001	3,030.00	(15%)	3.352	903.94
• Wheel chair for patients	1	5	100.00	2006	100.00	(15%)	3.352	29.83
• Sirom bucky	5	5	14.00	2001	28.28	(15%)	3.352	8.44
• Bucky stand	1	5	250.00	2004	332.50	(15%)	3.352	99.19
• UV protection mirror	1	5	150.00	2006	150.00	(15%)	3.352	44.75
• Film dry equipment	1	5	550.00	2004	731.50	(15%)	3.352	218.23
• Water tank for washing film	2	5	670.00	2006	670.00	(15%)	3.352	199.88
• Printer marchine for putting patients' name on the film	1	5	190.00	2006	190.00	(15%)	3.352	56.68
• Cadio Echology machine (TOSHIBA Brand)	3	5	21,000.00	2001	42,420.00	(15%)	3.352	12,655.13
• Grid	1	5	190.00	2006	190.00	(15%)	3.352	56.68
• Film light Box	3	5	57.00	2006	57.00	(15%)	3.352	17.00
• Film Papers	5							
- Size 35 x 35	2	5	65.00	2006	65.00	(15%)	3.352	19.39
- Size 36 x 43	1	5	83.00	2006	83.00	(15%)	3.352	24.76
- Size 24 x 30	2	5	55.00	2006	55.00	(15%)	3.352	16.41
• Plegm absorbing Equipment	4	5	1,550.00	2001	3,131.00	(15%)	3.352	934.07
• ECG machine	2	5	1,250.00	2001	2,525.00	(15%)	3.352	753.28
• Examine tables	11	5	250.00	2001	505.00	(15%)	3.352	150.66

Table D-1 (Cont.) Equipment Cost of Phnom Penh Heart Center in 2006

• Red lamp for using in the dark room	1	5	325.00	2001	656.50	(15%)	3.352	195.85
• Lamp for killing bacterial	1	5	324.00	2006	324.00	(15%)	3.352	96.66
• Ceiling Light for operating	2	5	3,580.00	2001	7,231.60	(15%)	3.352	2,157.40
• Cart for Oxygen tank	1	5	65.00	2001	131.30	(15%)	3.352	39.17
• Operating table	2	5	1,800.00	2001	3,636.00	(15%)	3.352	1,084.73
• Surgical equipment boxes	11	5	560.00	2001	1,131.20	(15%)	3.352	337.47
• Echodopler machine	1	5	35,000.00	2001	70,700.00	(15%)	3.352	21,091.89
• Laboratory equipment (mix-small)	Mix	5	150.00	2001	303.00	(15%)	3.352	90.39
• Closet for keeping medicine and medicine equipment	4	5	200.00	2001	404.00	(15%)	3.352	120.53
• Angiography machine	1	5	730,000.00	2006	730,000.00	(15%)	3.352	217,780.43
• Chest pick up machine	1	5	2,890.00	2001	5,837.80	(15%)	3.352	1,741.59
• X-ray machine (Brand Philip)	4	5						
- Simen Brand	1	5	13,500.00	2002	23,625.00	(15%)	3.352	7,048.03
- Amx 4 Brand	1	5	11,500.00	2006	11,500.00	(15%)	3.352	3,430.79
- Philip	2	5	7,550.00	2006	7,550.00	(15%)	3.352	2,252.39
• X-ray table (wooden)	1	5	550.00	2004	731.50	(15%)	3.352	218.23
• Stress test machine	1	5	18,970.00	2001	21,854.03	(15%)	3.352	6,519.70
• Chamber pot cleaning machine	1	5	2,850.00	2001	5,757.00	(15%)	3.352	1,717.48
• Mop Cart for cleaning	1	5	284.00	2002	497.00	(15%)	3.352	148.27
• Headlight (standing) small	1	5	250.00	2006	250.00	(15%)	3.352	74.58
• Headlight (standing) Big	2	5	550.00	2001	1,111.00	(15%)	3.352	331.44
• Iron closet for keeping film	14	5	85.00	2001	171.70	(15%)	3.352	51.22
• Iron closet for keeping film	15	5	105.00	2006	105.00	(15%)	3.352	31.32
• Auto Clave	1	5	8,950.00	2001	18,079.00	(15%)	3.352	5,393.50
• Platter for steril medical equipment	7	5	20.00	2001	40.40	(15%)	3.352	12.05
• Closet with mirror for keeping medicine	2	5	350.00	2005	402.50	(15%)	3.352	120.08
• Iron closet for keeping shoes	8	5	65.00	2006	65.00	(15%)	3.352	19.39
• Ice producing marchine (Scotman brand)	1	5	2,500.00	2001	5,050.00	(15%)	3.352	1,506.56

Table D-1(Cont.) Equipment Cost of Phnom Penh Heart Center in 2006

• Dress closet for patients (small)	19	5	80.00	2001	161.60	(15%)	3.352	48.21
• Shelf on wall for keeping marchine	8	5	50.00	2001	101.00	(15%)	3.352	30.13
• Shelf for keeping patients'document	2	5	50.00	2001	101.00	(15%)	3.352	30.13
• Chamber pot (bed)	19	5	5.00	2001	10.10	(15%)	3.352	3.01
• Chamber pot (bed)	19	5	10.00	2005	11.50	(15%)	3.352	3.43
• Scale and Height measurment	2	5	28.00	2001	56.56	(15%)	3.352	16.87
• Scale and Height measurment	5	5	45.00	2006	45.00	(15%)	3.352	13.42
• Matress	56	5	35.00	2001	70.70	(15%)	3.352	21.09
• Patients Beds	50	5	300.00	2001	606.00	(15%)	3.352	180.79
• Pillows	8	5	2.00	2001	4.04	(15%)	3.352	1.21
• Pillows	42	5	3.50	2006	3.50	(15%)	3.352	1.04
• Shoes for wearing inside Angiography	14	5	2.50	2006	2.50	(15%)	3.352	0.75
• Long lamp (m) in Surgery room	17	5	5.00	2001	10.10	(15%)	3.352	3.01
• Gas de sand machine	1	5	6,800.00	2006	6,800.00	(15%)	3.352	2,028.64
• Cartouche	6,000	5	6.50	2006	6.50	(15%)	3.352	1.94
Office supplies			27,245.00		46,164.02			16,169.53
• Computer (Out of calculation)	1	4	90.00	2001	181.80	(15%)	2.855	63.68
• Computer	Set 1	4	580.00	2002	1,015.00	(15%)	2.855	355.52
• Computer (Out of calculation)	Set 1	4	550.00	2001	1,111.00	(15%)	2.855	389.14
• Computer	1	4	125.00	2004	166.25	(15%)	2.855	58.23
• Computer	Set 1	4	610.00	2005	701.50	(15%)	2.855	245.71
• Computer	3	4	150.00	2005	172.50	(15%)	2.855	60.42
• Computer	1	4	180.00	2006	180.00	(15%)	2.855	63.05
• Computer	Set 1	4	650.00	2006	650.00	(15%)	2.855	227.67
• Key board (Out of calculation)	1	4	25.00	2001	50.50	(15%)	2.855	17.69
• Key board	1	4	40.00	2004	53.20	(15%)	2.855	18.63
• Key board	1	4	45.00	2005	51.75	(15%)	2.855	18.13
• Printer (Out of calculation)	2	4	55.00	2001	111.10	(15%)	2.855	38.91
• Printer	4	4	85.00	2005	97.75	(15%)	2.855	34.24
• Printer	1	4	95.00	2006	95.00	(15%)	2.855	33.27

Table D-1 (Cont.) Equipment Cost of Phnom Penh Heart Center in 2006

• Information board Pin	1	5	12.00	2006	12.00	(15%)	3.352	3.58
• Wheel Chair/ Office Chairs	14	5	18.00	2001	36.36	(15%)	3.352	10.85
• Wheel Chair/ Office Chairs	1	5	25.00	2004	33.25	(15%)	3.352	9.92
• Wheel Chair/ Office Chairs	1	5	29.00	2005	33.35	(15%)	3.352	9.95
• Wheel Chair/ Office Chairs	1	5	35.00	2006	35.00	(15%)	3.352	10.44
• Wooden closet for keeping document	1	5	350.00	2001	707.00	(15%)	3.352	210.92
• Inox and mattress chair (big)	10	5	45.00	2001	90.90	(15%)	3.352	27.12
• Inox and mattress chair (big)	3	5	60.00	2005	69.00	(15%)	3.352	20.58
• Inox and mattress chair (medium)	3	5	15.00	2001	30.30	(15%)	3.352	9.04
• Inox and mattress chair (medium)	8	5	17.00	2004	22.61	(15%)	3.352	6.75
• Inox and mattress chair (medium)	4	5	19.00	2005	21.85	(15%)	3.352	6.52
• Inox and mattress chair (medium)	7	5	25.00	2006	25.00	(15%)	3.352	7.46
• Inox and mattress chair (round)	1	5	5.00	2001	10.10	(15%)	3.352	3.01
• Inox and mattress chair (round)	5	5	8.00	2006	8.00	(15%)	3.352	2.39
• Lee co table has mirrow	9	5	115.00	2001	232.30	(15%)	3.352	69.30
• Lee co table has mirrow	3	5	135.00	2003	205.20	(15%)	3.352	61.22
• Lee co table has mirrow	3	5	155.00	2004	206.15	(15%)	3.352	61.50
• Lee co table has mirrow	3	5	175.00	2005	201.25	(15%)	3.352	60.04
• Lee co table has mirrow	1	5	205.00	2006	205.00	(15%)	3.352	61.16
• Lee co table has no mirrow	8	5	205.00	2006	205.00	(15%)	3.352	61.16
• White board	2	5	12.00	2006	12.00	(15%)	3.352	3.58
- Small white board	3	5	7.00	2005	8.05	(15%)	3.352	2.40
• Tray in and out	1	5	10.50	2006	10.50	(15%)	3.352	3.13
• Plastic Chairs	39	5	5.00	2004	6.65	(15%)	3.352	1.98
• Wheel Chair/ Office Chairs (round and small)	1	5	5.00	2001	10.10	(15%)	3.352	3.01
• Flexible Chair	3	5	8.50	2001	17.17	(15%)	3.352	5.12
• Plastic shoes shelf	10	5	15.00	2005	17.25	(15%)	3.352	5.15
• Wall Clock	5	5	2.50	2004	3.33	(15%)	3.352	0.99
• Wall Clock	9	5	3.50	2005	4.03	(15%)	3.352	1.20

Table D-1(Cont.) Equipment Cost of Phnom Penh Heart Center in 2006

• Wall Clock	4	5	5.00	2006	5.00	(15%)	3.352	1.49
• Slide cloth	1	5	175.00	2005	201.25	(15%)	3.352	60.04
• Wheel whiteboard	1	5	250.00	2005	287.50	(15%)	3.352	85.77
• Photocopy machine (Gestetner Brand)	1	5	280.00	2006	280.00	(15%)	3.352	83.53
• Refrigerator (medium size)	7	5	150.00	2001	303.00	(15%)	3.352	90.39
• Refrigerator (Big size)	2	5	300.00	2001	606.00	(15%)	3.352	180.79
• Electricity cooking rice (Biggest)	1	5	150.00	2004	199.50	(15%)	3.352	59.52
• Electric hot water tank	4	5	25.00	2005	28.75	(15%)	3.352	8.58
• Big soup pot	2	5	18.00	2006	18.00	(15%)	3.352	5.37
• Small soup pot	3	5	13.00	2006	13.00	(15%)	3.352	3.88
• Round iron table	3	5	20.00	2004	26.60	(15%)	3.352	7.94
• Gas kitchen (Big)	1	5	80.00	2004	106.40	(15%)	3.352	31.74
• Gas kitchen (Small)	1	5	15.00	2004	19.95	(15%)	3.352	5.95
• Pot for keeping rice	2	5	2.00	2004	2.66	(15%)	3.352	0.79
• Cold water tank	1	5	150.00	2001	303.00	(15%)	3.352	90.39
• Electricity machine	1	5	8,500.00	2001	17,170.00	(15%)	3.352	5,122.32
• Electricity automatic System Machine	1	5	1,200.00	2001	2,424.00	(15%)	3.352	723.15
• Cleaning water machine	1	5	200.00	2001	404.00	(15%)	3.352	120.53
• Pump water machine	1	5	150.00	2001	303.00	(15%)	3.352	90.39
• Paper grinding machine	1	5	60.00	2006	60.00	(15%)	3.352	17.90
• Over Head Projector	1	5	350.00	2004	465.50	(15%)	3.352	138.87
• TV 14 inch	6	5	130.00	2001	262.60	(15%)	3.352	78.34
• TV 14 inch	2	5	190.00	2006	190.00	(15%)	3.352	56.68
• Table telephone	8	5	55.00	2001	111.10	(15%)	3.352	33.14
• Table telephone	1	5	65.00	2003	111.80	(15%)	3.352	33.35
• Table telephone	2	5	75.00	2004	99.75	(15%)	3.352	29.76
• Table telephone	1	5	85.00	2005	97.75	(15%)	3.352	29.16
• Table telephone	1	5	102.00	2006	102.00	(15%)	3.352	30.43
• Rattan salon	2	5	300.00	2001	606.00	(15%)	3.352	180.79
• Rattan round table	2	5	50.00	2005	57.50	(15%)	3.352	17.15

Table D-1(Cont.) Equipment Cost of Phnom Penh Heart Center in 2006

• Wooden salon	5	5	350.00	2001	707.00	(15%)	3.352	210.92
• High wooden chair	1	5	25.00	2003	38.00	(15%)	3.352	11.34
• Ceiling Fan (big)	18	5	85.00	2001	171.70	(15%)	3.352	51.22
• Small Fan (on the wall)	3	5	35.00	2001	70.70	(15%)	3.352	21.09
• Small Fan (on the wall)	14	5	45.00	2003	68.40	(15%)	3.352	20.41
• AC (big)	37	5	300.00	2001	606.00	(15%)	3.352	180.79
• AC (Small) 1.5 sess	29	5	220.00	2001	444.40	(15%)	3.352	132.58
• AC (Small) 1.5 sess	1	5	280.00	2004	372.40	(15%)	3.352	111.10
• AC (Small) 1.5 sess	3	5	365.00	2006	365.00	(15%)	3.352	108.89
• Standing fan	1	5	36.50	2006	36.50	(15%)	3.352	10.89
• Big cloth closet (wood)	4	5	250.00	2001	505.00	(15%)	3.352	150.66
• Wooden table (guest)	3	5	150.00	2001	303.00	(15%)	3.352	90.39
• Iron safety closet	1	5	1,200.00	2003	1,824.00	(15%)	3.352	544.15
• Iron closet for keeping document	4	5	105.00	2001	212.10	(15%)	3.352	63.28
• Wooden closet for keeping document	8	5	150.00	2001	303.00	(15%)	3.352	90.39
• Long wooden table for meeting	2	5	350.00	2001	707.00	(15%)	3.352	210.92
• Long wooden table for meeting (4 metters)	1	5	650.00	2001	1,313.00		3.352	391.71
• Wooden table for doctors work	3	5	150.00	2001	303.00	(15%)	3.352	90.39
• Wooden chair (medium)	138	5	12.00	2001	24.24	(15%)	3.352	7.23
• Wooden chair (medium)	1	5	20.00	2005	23.00	(15%)	3.352	6.86
• Wooden bed	3	5	120.00	2001	242.40	(15%)	3.352	72.32
• Wooden table	4	5	105.00	2001	212.10	(15%)	3.352	63.28
• Wooden table	1	5	170.00	2006	170.00	(15%)	3.352	50.72
• Small Wooden table	2	5	35.00	2001	70.70	(15%)	3.352	21.09
• Flexible Bed	3	5	60.00	2006	60.00	(15%)	3.352	17.90
• Carpet (large size)	4	5	250.00	2001	505.00	(15%)	3.352	150.66
• Table Lamp	5	5	25.00	2001	50.50	(15%)	3.352	15.07
• Cloth curtain (big)	9	5	15.00	2001	30.30	(15%)	3.352	9.04
• Hanging cloth (wood)	2	5	25.00	2001	50.50	(15%)	3.352	15.07
• Small stairway (iron)	1	5	35.00	2001	70.70	(15%)	3.352	21.09
• Movable curtain	2	5	14.00	2001	28.28	(15%)	3.352	8.44

Table D-1(Cont.) Equipment Cost of Phnom Penh Heart Center in 2006

• Movable curtain	2	5	25.00	2006	25.00	(15%)	3.352	7.46
• Cloth curtain (window)	20	5	4.50	2001	9.09	(15%)	3.352	2.71
• Cloth curtain (window)	7	5	6.50	2003	9.88	(15%)	3.352	2.95
• Cloth curtain (window)	3	5	10.00	2006	10.00	(15%)	3.352	2.98
• Plastic curtain	1	5	15.00	2005	17.25	(15%)	3.352	5.15
• Small wooden closet for keeping photocopy machine	1	5	50.00	2005	57.50	(15%)	3.352	17.15
• Small wooden closet with mirror	1	5	200.00	2001	404.00	(15%)	3.352	120.53
• Wooden table (VIP)	4	5	270.00	2001	545.40	(15%)	3.352	162.71
• HP scanner	1	5	150.00	2005	172.50	(15%)	3.352	51.46
• Cloth closet has 6 sections	1	5	90.00	2001	181.80	(15%)	3.352	54.24
• Cloth closet has 6 sections	1	5	145.00	2005	166.75	(15%)	3.352	49.75
• Cloth cart with iron wheel	1	5	235.00	2005	270.25	(15%)	3.352	80.62
• Cloth hanging on the wall	1	5	2.50	2001	5.05	(15%)	3.352	1.51
• Iron closet has two sections	1	5	98.00	2001	197.96	(15%)	3.352	59.06
• Iron closet has two sections	1	5	115.00	2002	201.25	(15%)	3.352	60.04
• Iron closet has two doors (2001)	15	5	170.00	2001	273.70	(15%)	3.352	81.65
• Iron closet has two doors (2002)	2	5	190.00	2002	279.30	(15%)	3.352	83.32
• Iron closet (12 sections)	2	5	170.00	2001	462.40	(15%)	3.352	137.95
• Iron closet (12 sections)	11	5	250.00	2005	287.50	(15%)	3.352	85.77
• Iron closet (6 sections)	29	5	140.00	2001	380.80	(15%)	3.352	113.60
• Iron closet (6 sections)	1	5	145.00	2005	166.75	(15%)	3.352	49.75
• Iron closet (6 sections)	3	5	250.00	2006	250.00	(15%)	3.352	74.58
• Iron table (medium size)	2	5	50.00	2001	101.00	(15%)	3.352	30.13
• Long lamp (1.2 m)	259	5	2.00	2001	4.04	(15%)	3.352	1.21
• Long lamp (1.2 m)	4	5	3.50	2005	4.03	(15%)	3.352	1.20
• Round lamp (egg lamp) 4 rows	12	5	5.00	2001	10.10	(15%)	3.352	3.01
• Round lamp on the wall	49	5	8.00	2001	16.16	(15%)	3.352	4.82
• Round lamp on the wall	5	5	10.00	2003	15.20	(15%)	3.352	4.53
• Round lamp on the wall	2	5	13.00	2005	14.95	(15%)	3.352	4.46
• Lamp (0.6 m)	40	5	1.00	2001	2.02	(15%)	3.352	0.60
• Lamp (0.6 m)	12	5	1.50	2005	1.73	(15%)	3.352	0.51

Table D-1(Cont.) Equipment Cost of Phnom Penh Heart Center in 2006

• Plastic table for keeping medical equipment (6 sections)	1	5	175.00	2001	353.50	(15%)	3.352	105.46
• Stand lamp	3	5	325.00	2001	656.50	(15%)	3.352	195.85
• Sewing machine	1	5	75.00	2001	151.50	(15%)	3.352	45.20
• Out smelling fan	6	5	25.00	2001	50.50	(15%)	3.352	15.07
• Out smelling fan	2	5	40.00	2005	46.00	(15%)	3.352	13.72
Vehicle:			8,000.00		10,240.00			2,365.44
•Jeep car	1	5	8,000.00	2001	10,240.00	(5%)	4.329	2,365.44

Notes:

1. Life time and discount rate of these equipments were based on Taxation Law 2005, Ministry of Economy & Finance, Cambodia.
2. The figures of annualization factor at 15% were based on Creese & Parker,1994.
3. The current value (value in 2006) of these buildings were calculated using following formular $C_{2006} = C_t(1 + 0.15)^{2006-t}$
4. Annual economic cost of these capital items were calculated by dividing the current value (value in year 2006) of these items by annualization factor extracted from standard tables of Creese & Parker, 1994.
5. Mostly the Furnitures and other major medical equipments were donated asset (non- commercial goods) and did not have price on the inventory list. Therefore the purchased price in these calculation were base on interviewing the old eperience staff at the Heart Center. There were only some of materials cost (Non medical asset) had beend recorded by a new accountant at the center. That is why, the price of material cost, such as office supply and non medical supply have been calculatied base on some records at Heart Center and some information from Ministry of Economy and Finance, Cambodia.

Table D-2 Basic Building Cost of Phnom Penh Heart Center in 2006

No.	Building	Space (m ²)	Life time (n) year	Cost (Ct) (US\$)	Year of construction	Value in 2006 (5%)(US\$)	Annualization Factor (5%)	Annual Economic Cost (US\$)
1	Aministration Unit	273.0	20	81,900	2001	104,832.0	12.462	8,412.1
2	Kitchen Unit	31.5	20	9,450	2001	12,096.0	12.462	970.6
3	Technique Service	151.0	20	45,300	2001	57,984.0	12.462	4,652.9
4	Security Unit	12.0	20	3,600	2001	4,608.0	12.462	369.8
5	Warehouse & Laundry	14.7	20	4,410	2001	5,644.8	12.462	453.0
6	Pharmacy Unit	31.6	20	9,480	2001	12,134.4	12.462	973.7
7	Laboratory Unit	24.5	20	7,350	2001	9,408.0	12.462	754.9
8	Radiology Unit	15.7	20	4,710	2001	6,028.8	12.462	483.8
9	Angiography Unit	90.0	20	27,000	2001	34,560.0	12.462	2,773.2
10	General Consultation Unit	280.3	20	84,090	2001	107,635.2	12.462	8,637.1
11	VIP Consultation	85.5	20	25,650	2001	32,832.0	12.462	2,634.6
12	Emergency Unit	148.0	20	44,400	2001	56,832.0	12.462	4,560.4
13	Surgery Ward	400.4	20	120,120	2001	153,753.6	12.462	12,337.8
14	ICU room	203.9	20	61,170	2001	78,297.6	12.462	6,282.9
15	Hospitalization Unit (IPU)	318.3	20	95,490	2001	122,227.2	12.462	9,808.0
17	Pediatric Hospitalization	145.0	20	43,500	2001	55,680.0	12.462	4,468.0
	Total	2,225.4		667,620		854,553.6		68,572.7

Notes: 1. Life time and discount rate of building and vehicle were based on Taxation Law 2005, Cambodia.

2. Cost of building 1 m² = US\$ 300 by asking the architecture in Cambodia.

3. The figures of annualization factor at 5% & 15% were based on Creese & Parker, 1994.

4. The current value (value in 2006) of these buildings were calculated using following formula: $C_{2006} = C_t(1+r)^{2006-t}$

5. Annual economic cost of these capital items were calculated by dividing the current value (value in year 2006) of these items by annualization factor extracted from standard tables of Creese & Parker, 1994.

Table D-3 Basic land cost of PPHC in 2006

No.	Land	Space (m ²)	Cost of land (Ct)	Total cost of purchased land in (Ct)	Year of purchased	Value in 2006 (inflation rate 5%)	Annualization Factor (5%)	Annual Economic Cost
1	Aministration Unit	273.0			2001			
2	Kitchen Unit	31.5			2001			
3	Technique Service	151.0			2001			
4	Security Unit	12.0			2001			
5	Warehouse & Laundry	14.7			2001			
6	Pharmacy Unit	31.6			2001			
7	Laboratory Unit	24.5			2001			
8	Radiology Unit	15.7			2001			
9	Angiography Unit	90.0			2001			
10	General Consultation Unit	280.3			2001			
11	VIP Consultation	85.5			2001			
12	Emergency Unit	148.0			2001			
13	Surgery Ward	400.4			2001			
14	ICU room	203.9			2001			
15	General Hospitalization Unit	112.0			2001			
16	VIP Hospitalization	206.3			2001			
17	Pediatric Hospitalization	145.0			2001			
Total		2,225.4		\$600,000.0		\$765,768.9	4.329	\$176,892.8

Remark: The cost of land is calculated by using inflation rate in Cambodia in 2006. If the land was bought in 2006, the cost will be calculated in to the current value in 2006 by $C_{2006} = C_t (1+0.05)^{2006-t}$
 Annual economic cost of land asset is calculated by dividing the current value (value in year 2006) of land asset by annualization factor extracted from standard tables of Creese & Parker, 1994.

Source of inflation rate was adapted from <http://globaledege.msu.edu/countryinsights/statistics.asp?countryID=16®ionID=3>

Table D-4 Source of fund and total expenditure at PPHC in 2006

	Items	Total (US\$)	Government Budget (US\$)	Donor Budget (US\$)	Out of pocket (US\$)
	Total Expenditure	1,992,766.7	224,821.7	493,355.6	1,274,589.4
I.	Recurrent Cost	1,447,793.0	47,928.9	167,338.2	1,232,525.9
	1 Labor Cost	540,204.0		103,128.0	437,076.0
	- Salary	481,320.0		91,080.0	390,240.0
	- Bonus	58,884.0		12,048.0	46,836.0
	2 Material Cost	907,589.0	47,928.9	64,210.2	795,449.9
	* Public utility	160,545.9	47,928.9		112,617.0
	• Gabage service	600.0			600.0
	• Electricity Cost	137,439.9	47,928.9		89,511.0
	• Water supply Cost	7,515.0			7,515.0
	• Telephone & Fax	10,041.0			10,041.0
	• Internet Cost (US\$)	4,200.0			4,200.0
	• Cable TV	600.0			600.0
	• Buy Ampoule mètre	150.0			150.0
	• Other utility Cost	0.0			0.0
	* Office Supplies	17,436.0			17,436.0
	• Printer inkport	450.0			450.0
	• Computer inkport	3,800.0			3,800.0
	• Photocopy inkport (Toner copy)	160.0			160.0
	• Inkport (Toner copy) for Gestetner machine	128.0			128.0
	• Mainternent Contract	110.0			110.0
	• Battery 9 Volt	263.9			263.9
	• Battery 1.5 Volt	143.0			143.0
	• Monitor	620.0			620.0
	• Chrono	123.0			123.0

Table D-4 (Cont.)

• Pens		1,128.6		1,128.6
• Feut for CD (Feut permanent)		782.8		782.8
• Feut tableau (whiteboard' s feut)		643.5		643.5
• Highlight		107.0		107.0
• Correction pens		154.0		154.0
• Scot		23.9		23.9
• Glues		646.0		646.0
• Casio		190.5		190.5
• Stapler		55.5		55.5
• A4 paper		2,095.0		2,095.0
• A3 paper		200.0		200.0
• Cahier journal (record book)		259.2		259.2
• Yellow page book		60.0		60.0
• Paper fastener		222.0		222.0
• Hole punch		110.5		110.5
• CD		1,587.5		1,587.5
• CD cover		1,750.0		1,750.0
• Disquette		130.0		130.0
• Chemise paper		16.2		16.2
• Envelops (large)		338.6		338.6
• Bulletin analyze papers (books)	Books	810.0		810.0
• Seal Tampomg		4.9		4.9
• Shaver blade		172.5		172.5
• Scissors		62.0		62.0
• Plastic dusbin		88.0		88.0

Table D-4 (Cont.)

	*Medical Supplies	472,577.3		472,577.3
	• Sond entrandement	1,500.0		1,500.0
	• Pace maker	84,000.0		84,000.0
	• Pontage cost	69,000.0		69,000.0
	• Angioplastie	45,500.0		45,500.0
	• Laboratory service cost	141,582.0		141,582.0
	• Medicine & medical supply cost		64,210.2	130,995.3
	*Non-Medical Supplies	189,440.3		189,440.3
	• Plastic hanging cloth (stand)	15.0		15.0
	• Plastic tanks	21.0		21.0
	• Iron tanks	4.5		4.5
	• Rice plate	20.0		20.0
	• Soup bowl	20.0		20.0
	• Spoon & Fork	10.5		10.5
	• Small dishes	10.0		10.0
	• Fry laddle	3.0		3.0
	• Soup laddle	5.0		5.0
	• Rice laddle	1.0		1.0
	• Iron trays	6.0		6.0
	• Frying pan	26.0		26.0
	• Rice tank (plastic)	10.0		10.0
	• Big knives	6.0		6.0
	• Small knife	6.0		6.0
	• Ingredient carrying equipments	18.0		18.0
	• Dish washing liquid	63.0		63.0
	• Hand washing liquid	135,675.4		135,675.4
	• Soap powder (Viso)	149.6		149.6
	• Soap and Shampoo	312.6		312.6
	• Toothbrush & toothpaste	115.0		115.0
	• Liquid for cleaning brick	235.0		235.0
	• Frying oil	164.7		164.7

Table D-4 (Cont.)

• Sugar	54.0		54.0
• Sugar & Milk	118.1		118.1
• Coffee & Tea	38.3		38.3
• Palm sugar	60.0		60.0
• Soup powder	60.0		60.0
• Fish sauce	100.0		100.0
• Maggy sauce	100.0		100.0
• Garlic	75.0		75.0
• Gas fee (15kg)	798.0		798.0
- Gas fee (small can)	2,860.0		2,860.0
• Rice (phkakhgney) 100kg/sack	7,000.0		7,000.0
• Food payment	2,000.0		2,000.0
• Rice package	108.0		108.0
• Scot for sticking dish	900.0		900.0
• Car wheels	102.0		102.0
• Round boards	3.8		3.8
• Toilet tissues	70.0		70.0
• Hand tissues	65.1		65.1
• Mouth cleaning tissue	241.0		241.0
• Liquid for cleaning concret	37.5		37.5
• Gabage bags	719.0		719.0
• Brooms	111.8		111.8
• Brush	10.5		10.5
• Mob & mob equipment	24.0		24.0
• Foot mate	26.0		26.0
• Plastic glove	105.0		105.0
• Spray for killing mosquito	295.0		295.0
• Spray for reducing smell	115.0		115.0

Table D-4 (Cont.)

• Duck liquid product for cleaning toilet	321.0		321.0
• Osavel liquid	282.0		282.0
• Pure Water	3,611.0		3,611.0
• Hanging cloth (on wall)	30.0		30.0
• Wooden hanging cloth (stand)	15.0		15.0
• Gabage can (Inox)	45.0		45.0
• Towel	10.0		10.0
• Hand cleaning solution	180.0		180.0
• Laundry cost	18,000.0		18,000.0
• Nurses uniform	416.0		416.0
• Doctors uniform	140.0		140.0
• Technicians uniform	144.0		144.0
• Administrators uniform	420.0		420.0
• Securities uniform	32.0		32.0
• Patients uniform	700.0		700.0
• O2 expenditure	12,000.0		12,000.0
Petroleum:	3,379.2		3,379.2
• Oil (80%) pay for Laboratory	2,703.4		2,703.4
• Oil (20%) for mission (pay at admin)	675.8		675.8

Table D-4 (Cont.)

II	Capital Cost	544,973.7	176,892.8	326,017.3	42,063.6
	* Medical Supplies	243,740.4		221,151.5	22,589.0
	• Slide marchine for diagnos the symptom	1,506.5		1,506.5	
	• Sario for medicine	433.9		433.9	
	• O2 tube (on the wall)	11,554.4		11,554.4	
	• O2's can	30.1		30.1	
	• O2 tube (for bed)	60.3		60.3	
	• Scop ECG (big)	19,585.3		19,585.3	
	• Scop Tention (Colin Brand)	5,667.1		4,510.8	1,156.3
	• Scop patients monitors (Simen Brand)	2,946.8			2,946.8
	• Scop (Datex Brand)	3,073.4		3,073.4	
	• Scops' stand	361.6		361.6	
	• Iron stand on the head of bed	471.7		471.7	
	• Iron stand for keeping patients document	205.8		205.8	
	• Iron for hanging sirom	4.2		4.2	
	• Tambour	11.9			11.9
	• Iron table with wheel for keeping monoitor	85.8			85.8
	• Plastic stand with wheel for keeping Scanner	17.2			17.2
	• Ventilation machine	3,013.1		3,013.1	
	• Chest pick up marchine	2,229.7		2,229.7	
	• Sario for emergency	27.1		27.1	
	• Sario for keeping scop	84.4		84.4	
	• Sario for ventolin & chest pick up	60.3		60.3	
	• Sario Chariot (for keeping goods)	147.6		147.6	
	• Injection marchine (V brand)	59.1		59.1	
	• Sario for ECG	60.3		60.3	

Table D-4 (Cont.)

• Digital blood pressure	36.2		36.2
• Digital blood pressure	53.7		53.7
• Baloon (small)	236.7		236.7
• Baloon (Big)	411.7		411.7
• Wheel table for patients' meal & doctors' document	835.2		835.2
• Cardiac echology marchine	63,275.7		63,275.7
• Electric sirang (Vial medical)	8,135.4		8,135.4
• Wheel chair for patients	29.8		29.8
• Sirom bucky	42.2		42.2
• Bucky stand	99.2		99.2
• UV protection mirror	44.7		44.7
• Film dry equipment	218.2		218.2
• Water tank for washing film	399.8		399.8
• Printer marchine for putting patients' name on the film	56.7		56.7
• Grid	56.7		56.7
• Film light Box	131.0		131.0
• Film Papers	0.0		0.0
- Size 35 x 35	38.8		38.8
- Size 36 x 43	24.8		24.8
- Size 24 x 30	32.8		32.8
• Plegm absorbing Equipment	3,736.3		3,736.3
• ECG machine	1,506.6		1,506.6
• Examine beds (wooden)	1,807.9		1,807.9
• Red lamp for using in the dark room	195.9		195.9
• Lamp for killing bacterial	96.7		96.7
• Ceiling Light for operating	4,314.8		4,314.8
• Cart for Oxygen tank	39.2		39.2
• Operating table	2,169.5		2,169.5

Table D-4 (Cont.)

• Surgical equipment boxes	3,712.2		3,712.2	
• Echodopler machine	21,091.9		21,091.9	
• Laboratory equipment (mix-small)	241.5			241.5
• Closet for keeping medicine and medicine equipment	482.1		482.1	
• Chest pick up machine	1,741.6		1,741.6	
• X-ray machine (Brand philip)	0.0		0.0	
- Simen Brand	7,048.0		7,048.0	
- Amx 4 Brand	3,430.8		3,430.8	
- Philip	4,504.8		4,504.8	
• X-ray table (wooden)	218.2			218.2
• Stress test machine	6,519.7			6,519.7
• Chamber pot cleaning machine	1,717.5		1,717.5	
• Mop Cart for cleaning	148.3		148.3	
• Headlight (standing)	737.5		737.5	
• Iron closet for keeping film	1,506.9		62.6	1,444.3
• Auto Clave	5,393.5		5,393.5	
• Platter for steril medical equipment	84.4		84.4	
• Closet with mirror for keeping medicine	240.2		240.2	
• Iron closet for keeping shoes	155.1			155.1
• Ice producing marchine (Scotman brand)	1,506.6		1,506.6	
• Dress closet for patients (small)	916.0		916.0	
• Shelf on wall for keeping marchine	241.1		241.1	
• Shelf for keeping patients'document	60.3		60.3	
• Chamber pot (bed)	179.5		57.0	122.4
• Scale and Height measurment	129.5		45.1	84.4
• Scale and Height measurment	13.4			13.4
• Mattress	1,181.1		1,181.1	

Table D-4 (Cont.)

• Patients Bed	10,248.2		10,248.2	
• Pillows	54.5		37.7	16.8
• Shoes for wearing inside Angiography	10.4			10.4
• Long lamp (m) in Surgery room	136.9		136.9	
• Gas de sand machine	2,028.6			2,028.6
• Cartouche	2,028.6			2,028.6
*Office equipments	50,023.1		33,927.7	16,095.4
• Computer	1,117.5		889.8	227.7
• Computer	360.8		63.1	297.7
• Computer	355.0			355.0
• Key board	54.4			54.4
• Printer	209.1		33.3	175.8
• Information board Pin	3.6			3.6
• Wheel Chair/ Office Chairs	163.4		163.4	
• Wheel Chair/ Office Chairs	42.5		42.5	
• Wooden closet for keeping document	210.9		210.9	
• Inox and mattress chair (big)	332.9		332.9	
• Inox and mattress chair (medium)	190.2		190.2	
• Inox and mattress chair (round)	13.5		13.5	
• Lee co table has mirrow	1,112.7		1,112.7	
• Lee co table has mirrow	305.5		305.5	
• Lee co table has no mirrow	489.3			489.3
• White board	10.7			10.7
- Small white board	11.8			11.8
• Tray in and out	3.1			3.1
• Plastic Chairs	77.4			77.4

Table D-4 (Cont.)

• Wheel Chair/ Office Chairs (round and small)	3.0		3.0	
• Flexible Chair	10.2		10.2	
• Plastic shoes shelf	51.5		51.5	
• Wall Clock	31.7		4.5	27.3
• Slide cloth	60.0			60.0
• Wheel whiteboard	85.8			85.8
• Photocopy machine (Gestetner Brand)	83.5			83.5
• Refrigerator (medium size)	903.9		180.8	723.1
• Refrigerator	632.8		632.8	
• Electricity cooking rice (Biggest)	59.5			59.5
• Electric hot water tank	34.3			34.3
• Big soup pot	10.7			10.7
• Small soup pot	11.6			11.6
• Round iron table	23.8			23.8
• Gas kitchen (Big)	31.7			31.7
• Gas kitchen (Small)	6.0			6.0
• Pot for keeping rice	1.6			1.6
• Cold water tank	90.4		90.4	
• Electricity machine	5,122.3		5,122.3	
• Electricity automatic System Machine	723.2		723.2	
• Cleaning water machine	120.5		120.5	
• Pump water machine	90.4		90.4	
• Paper grinding machine	17.9			17.9
• Over Head Projector	138.9		138.9	
• TV 14 inch	686.8		340.1	346.7
• Table telephone	1,676.7		1,245.4	431.3

Table D-4(Cont.)

	• Rattan salon	1,527.6		1,166.0	361.6
	• Rattan round table	112.2		75.0	37.2
	• Wooden salon	3,574.4		1,963.5	1,610.9
	• High wooden chair	44.6		33.3	11.3
	• Ceiling Fan (big)	3,385.3		2,463.3	922.0
	• Small Fan (on the wall)	349.0		265.2	83.8
	• AC (big)	6,689.1			6,689.1
	• AC (Small) 1.5 sess	3,709.2		3,271.6	437.6
	• Standing fan	10.9			10.9
	• Big cloth closet (wood)	602.6		602.6	
	• Wooden table	271.2		271.2	
	• Iron safety closet	544.2			544.2
	• Iron closet for keeping document	253.1		253.1	
	• Wooden closet for keeping document	723.2		723.2	
	• Long wooden table for meeting	421.8		421.8	
	• Long wooden table for meeting (4 metters)	391.7		391.7	
	• Wooden table for doctors	271.2		271.2	
	• Wooden chair (medium)	997.9		997.9	
	• Wooden chair (medium)	6.9		6.9	
	• Wooden bed	216.9		216.9	
	• Wooden table	303.8		303.8	
	• Small Wooden table	42.2		42.2	
	• Flexible Bed	353.7		353.7	
	• Carpet (large size)	602.6		602.6	
	• Table Lamp	75.3		75.3	
	• Cloth curtain (big)	81.4		81.4	
	• Hanging cloth (wood)	30.1		30.1	
	• Small stairway (iron)	21.1		21.1	
	• Movable curtain	31.8			31.8

Table D-4 (Cont.)

• Cloth curtain (window)	83.2			83.2
• Plastic curtain	5.1		5.1	
• Small wooden closet for keeping photocopy machine	17.2			17.2
• Small wooden closet with mirror	120.5		120.5	
• Wooden table (VIP)	650.8		650.8	
• HP scanner	51.5			51.5
• Cloth closet has 6 sections	104.0		104.0	
• Cloth cart with iron wheel	80.6		80.6	
• Cloth hanging on the wall	1.5			1.5
• Iron closet has two sections	119.1		59.1	60.0
• Iron closet has two doors (2001)	1,229.8		1,229.8	
• Iron closet has two doors (2002)	248.3			248.3
• Iron closet (12 sections)	1,219.4		275.8	943.6
• Iron closet (6 sections)	2,237.0		2,014.0	223.0
• Iron closet (6 sections)	149.2		149.2	
• Iron table (medium size)	60.3			60.3
• Long lamp (1.2 m)	315.8		310.6	5.2
• Round lamp (egg lamp) 4 rows	36.2		36.2	
• Round lamp on the wall	218.5		218.5	
• Round lamp on the wall	117.0		117.0	
• Lamp (0.6 m)	29.1		29.1	
• Plastic table for keeping medical equipment (6 sections)	105.5		105.5	
• Stand lamp	1,242.4		1,242.4	
• Sewing machine	45.2		45.2	
• Out smelling fan	117.8		117.8	
Vehicle:	2,365.4		2,365.4	
• Jeep car	2,365.4		2,365.4	
Building	68,572.7		68,572.7	
Land Asset		176,892.8		
% of out of pocket payment				64.0%
% of donation fund			24.8%	
% of government budget		11.3%		
Total Expenditure as %	100.0%			

Table D-4 Monthly Labor cost of Phnom Penh Heart Centre in 2006

Cost Center			Cambodian Staffs	Staffs of donor	Working Hours (8 hours)		% of staff work in different cost centers	Salary (US\$)	Bonus (US\$)	Guard (US\$)	Total		
					Day work	Night work					Donor Budget	Own PPHC Budget	TLC (US\$)
Code	No.	Total	104	33			99.28%	40,055	4,290	672	8,594	36,423	45,017
A ₁		Administration Office					11.59%	7,690	75	12	7staffs	10 staffs	16 staffs
	1	Head of Heart Center(Cambodian)	•		√			2,000					
	2	Head of Heart Center (French)	•		√			2,000					
	3	Chief of Admin & Accounting	•		√			1,400					
	4	Cashier	•		√			200	5				
	5	Cashier	•		√			200	5				
	6	Admin Staff (nurse)	•		√			200	5				
	7	Admin Staff (nurse)	•			√		200	5				
	8	Cashier	•			√		200	5				
	9	Admin Staff		x		√		200	5				
	10	Admin Staff		x	√			150	5				
	11	Admin Staff		x	√			150	5				
	12	Admin Staff		x	√			150	5				
	13	Pediatric Teacher		x	√			200					
	14	Driver	•		√			200					
	15	Cleaner		x	√			120	15	6			
	16	Cleaner		x	√			120	15	6			
In admin. Office donor's budget supported US\$1,151 Own budget of Heart Center US\$6,625 per month.													

Note: Bonus means staffs who work out of office time
Guard means allowance for all staffs who guard at the night time.

Table D-4 (Cont.) Monthly labor cost of Phnom Penh Heart Centre in 2006

A₂		Kitchen Unit				4.35%	720	0	0	3 staffs	3 staffs	6 staffs
	1	Staff in Kitchen		x	√		120					
	2	Staff in Kitchen		x	√		120					
	3	Staff in Kitchen		x	√		120					
	4	Staff in Kitchen	•		√		120					
	5	Staff in Kitchen	•		√		120					
	6	Staff in Kitchen	•		√		120					
	In Kitchen unit, donor's budget supported US\$360 and own budget of Heart center supported US\$360 per month.											
A₃		Technique Service				2.90%	1,150	150	24	0	4 staffs	4 staffs
	1	Chief of technician	•		√		400	100	6			
	2	Technician	•		√		250	50	6			
	3	Technician	•		√		250		6			
	4	Technician	•		√		250		6			
A₄		Security Unit				6.52%	1,115	0	54	0	9 staffs	9 staffs
	1	Chief of Security	•		√		185		6			
	2	Deputy- chief of Sec	•		√		160		6			
	3	Security staff	•		√		110		6			
	4	Security staff	•		√		110		6			
	5	Security staff	•		√		110		6			
	6	Security staff	•		√		110		6			
	7	Security staff	•		√		110		6			
	8	Security staff	•		√		110		6			
	9	Security staff	•		√		110		6			
A₅		Warehouse & Laundry				0.72%	180	0	6	0	1 staffs	1 staffs
	1	Warehouse staff	•		√		180		6			
B₁		Pharmacy Unit				1.45%	440	0	12	1	1 staff	2 staffs
	1	Secondary nurse		x	√		220		6			
	2	Secondary nurse	•		√		220		6			
	In pharmacy unit, donor's budget support US\$226 and own budget of Heart Center support US\$226 per month											

Table D-5 (Cont.) Monthly labor cost of Phnom Penh Heart Centre in 2006

A₅		Warehouse & Laundry				0.72%	180	0	6	0	1 staffs	1 staffs	
	1	Warehouse staff	•		√		180		6				
B₁		Pharmacy Unit				1.45%	440	0	12		1 staff	1 staff	2 staffs
	1	Secondary nurse		x	√		220		6				
	2	Secondary nurse	•		√		220		6				
		In pharmacy unit, donor's budget support US\$226 and own budget of Heart Center support US\$226 per month											
B₂		Laboratory Unit				2.17%	600				1 staff	2 staffs	3 staffs
	1	Secondary nurse		x	√		200						
	2	Secondary nurse	•		√		200						
	3	Secondary nurse	•		√		200						
		In laboratory, donor's budget supported US\$200 and own budget of Heart Center supported US\$400 per month.											
B₃		Radiology Unit				1.45%	340	0	12	0	2 staffs	2 staffs	
	1	Radiology technician	•		√		170		6				
	2	Radiology technician		x	√		170		6				
		In radiology, donor's budget supported US\$176 and own budget of Heart Center supported US\$176 per month.											
B₄		Angiography Unit				2.17%	1,950	550	18	0	3 staffs	3 staffs	
	1	Surgery doctor	•		√		1,400	450	6				
	2	Doctor	•		√		350	100	6				
	3	Secondary nurse	•		√		200		6				

Table D-5 (Cont.) Monthly labor cost of Phnom Penh Heart Centre in 2006

B₅	Surgery Service					12.32%	8,390	2,080	90	5 staffs	12 staffs	17 staffs
1	Surgery Doctor		x	√			1,400	350	6			
2	Surgery Doctor	•		√			1,400	350	6			
3	Surgery Doctor	•		√			1,400	350	6			
6	Surgery Doctor	•		√			1,400	400	6			
7	Hypnotic Doctor		x	√			250	50	6			
8	Hypnotic Doctor		x	√			250	50	6			
9	Hypnotic Doctor	•		√			250	50	6			
10	Hypnotic Doctor	•		√			250	50	6			
11	Hypnotic Doctor	•		√			250	50	6			
12	Hypnotic Doctor	•		√			250	50	6			
13	Doctor		x	√			350	100	6			
14	Doctor	•		√			350	100	6			
15	Doctor	•		√			350	100	6			
16	Cleaner	•		√			120	15	6			
17	Cleaner	•	x	√			120	15	6			
In surgery service, donor's supported US\$3,131 and own budget of PPHC supported US\$7,595 per month.												
C₁	General Consultaion					10.87%	3,960	630	90	2 staffs	13 staffs	15 staffs
1	Doctor	•		√			400	100	6			
2	Doctor	•		√			400	100	6			
3	Doctor	•		√			400	100	6			
4	Doctor	•		√			400	100	6			
5	Doctor	•		√			400	100	6			
6	Doctor		x	√			400	100	6			
7	Secondary nurse		x	√			200		6			
8	Secondary nurse	•		√			200		6			
9	Secondary nurse	•		√			200		6			
10	Secondary nurse	•		√			200		6			
11	Secondary nurse	•		√			200		6			
12	Secondary nurse	•		√			200		6			
13	Cleaner	•		√			120		6			
14	Cleaner	•		√			120	15	6			
15	Cleaner	•		√			120	15	6			
In General consultaion unit, donor's supported US\$712 and own budget of PPHC supported US\$3,968 per month.												

Table D-5 (Cont.) Monthly labor cost of Phnom Penh Heart Centre in 2006

C₂		VIP Consultaion					1.45%	600	100	12		2 staff	2 staffs
	1	Doctor	•		√			400	100	6			
	2	Senior nurse	•		√			200		6			
C₃		Emergency Unit					17.39%	6,140	430	144		24 staffs	24 staffs
	1	Doctor	•		√			400	100	6			
	2	Doctor	•		√			400	100	6			
	3	Doctor	•		√			400	100	6			
	4	Doctor	•		√			400	100	6			
	5	Senior nurse	•		√			400		6			
	6	Senior nurse	•		√			400		6			
	7	Senior nurse	•		√			350		6			
	8	Senior nurse	•		√			350		6			
	9	Secondary nurse	•		√			200		6			
	10	Secondary nurse	•		√			200		6			
	11	Secondary nurse	•		√			200		6			
	12	Secondary nurse	•		√			200		6			
	13	Secondary nurse	•		√			200		6			
	14	Secondary nurse	•		√			200		6			
	15	Secondary nurse	•		√			200		6			
	16	Secondary nurse	•		√			200		6			
	17	Secondary nurse	•		√			200		6			
	18	Secondary nurse	•		√			200		6			
	19	Secondary nurse	•		√			200		6			
	20	Secondary nurse	•		√			200		6			
	21	Secondary nurse	•		√			200		6			
	22	Secondary nurse	•		√			200		6			
	23	Cleaner	•		√			120	15	6			
	24	Cleaner	•		√			120	15	6			

Table D-5 (Cont.) Monthly labor cost of Phnom Penh Heart Centre in 2006

C₄		ICU Room				10.87%	3,120	30	90	5 staffs	10 staffs	15 staffs	
	1	Doctor control ICU		x	√		300		6				
	2	Doctor control ICU	•		√		300		6				
	3	Doctor control ICU	•		√		280		6				
	4	Secondary nurse		x	√		200		6				
	5	Secondary nurse		x	√		200		6				
	6	Secondary nurse		x	√		200		6				
	7	Secondary nurse	•		√		200		6				
	8	Secondary nurse	•		√		200		6				
	9	Secondary nurse	•		√		200		6				
	10	Secondary nurse	•		√		200		6				
	11	Secondary nurse	•		√		200		6				
	12	Secondary nurse	•		√		200		6				
	13	Secondary nurse	•		√		200		6				
	14	Cleaner	•		√		120	15	6				
	15	Cleaner		x	√		120	15	6				
		In ICU room, donor's supported US\$1,065 and own budget of PPHC supported US\$2,175 per month.											
C₅		General Inpatients (IPD)				7.25%	2,100	100	60	0	10 staffs	10 staffs	
	1	Doctor	•		√		450	100	6				
	2	Secondary nurse	•		√		200		6				
	3	Secondary nurse	•		√		200		6				
	4	Secondary nurse	•		√		200		6				
	5	Secondary nurse	•		√		200		6				
	6	Secondary nurse	•		√		200		6				
	7	Secondary nurse	•		√		200		6				
	8	Secondary nurse	•		√		150		6				
	9	Secondary nurse	•		√		150		6				
	10	Secondary nurse	•		√		150		6				

Table D-5 (Cont.) Monthly labor cost of Phnom Penh Heart Centre in 2006

C₆	Pediatric Inpatient					5.80%	1,560	145	48	8 staffs		8 staffs
1	Doctor		x	√			400	100	6			
2	Secondary nurse		x	√			200		6			
3	Secondary nurse		x	√			200		6			
4	Secondary nurse		x	√			200		6			
5	Secondary nurse		x	√			200		6			
6	Cleaner		x	√			120	15	6			
7	Cleaner		x	√			120	15	6			
8	Cleaner		x	√			120	15	6			
In pediatric Inpatient, donor's supported US\$1,753 per month.												

Note: Bonus means the staffs who work out of office time (not include guarding time)

Bonus was provided only doctors, surgery doctors, senior nurses, hypnotic doctors, some admin staffs and cleaners.

Almost all staffs were guarded at the center 8 days per month. All guard staffs receive money \$0.75 per day.

There are 137 staffs of which 2 managers of Heart Center, 5 Senior nurses, 49 nurse, 5 surgery doctors, 26 doctors, 14 admin staffs, 6 kitchen staffs, 9 security staffs, 1 warehouse staff, 14 cleaners, 4 technicians, 1 pediatric teacher and 1 driver.

The study found that every month, there were 19.0% = US\$ 8,594 of labor cost were supported by French donation and 81.0% = \$36,423 were supported by the own budget of Phnom Penh Heart Center.

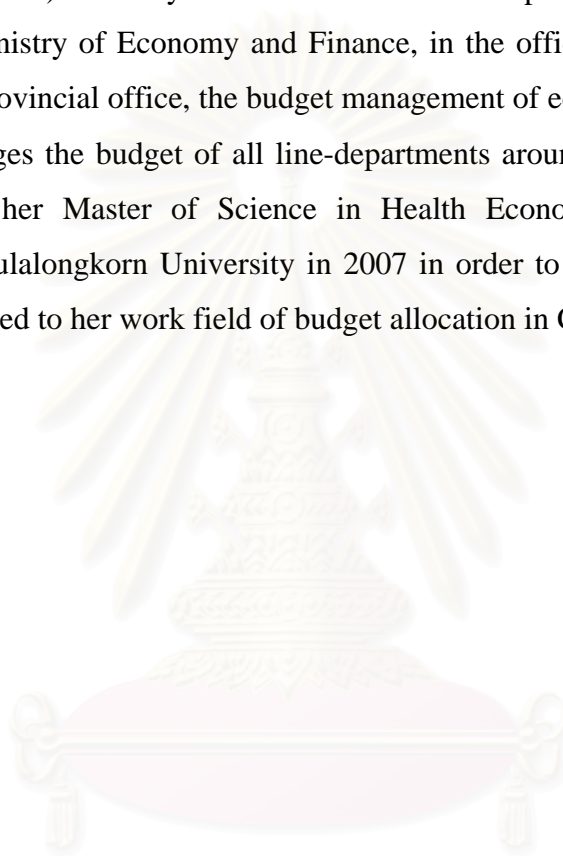
Average salary = US\$ 291 per month.

Table D-6 Share of Labor cost at Phnom Penh heart centre in 2006

Code	Cost Center	Staff supporter		Labor Cost		Total	
		Donor	Cambodia	Donor (US\$)	Cambodia (US\$)	Staffs	Labor Cost
A1	Administration Office	7	9	13,824.0	79,500.0	16	93,324.0
A2	Kitchen	3	3	4,320.0	4,320.0	6	8,640.0
A3	Warehouse	0	1	0.0	2,232.0	1	2,232.0
A4	Security Unit	0	9	0.0	14,028.0	9	14,028.0
A5	Technique Unit	0	4	0.0	15,888.0	4	15,888.0
B1	Pharmacy Unit	1	1	2,712.0	2,712.0	2	5,424.0
B2	Laboratory Unit	1	2	2,400.0	4,800.0	3	7,200.0
B3	Radiology Unit	1	1	2,112.0	2,112.0	2	4,224.0
B4	Angiography Unit	0	3	0.0	30,216.0	3	30,216.0
B5	Surgery Services	5	12	35,580.0	91,140.0	17	126,720.0
C1	Consultation Unit	2	15	8,544.0	56,160.0	17	64,704.0
C2	Emergency room	0	24	0.0	80,568.0	24	80,568.0
C3	ICU	5	10	12,780.0	26,100.0	15	38,880.0
C4	Inpatient Ward	8	10	21,036.0	27,120.0	18	48,156.0
	Total	33	104	103,308.0	436,896.0	137	540,204.0

BIOGRAPHY

Mrs. Bola Kan was born on 17th May, 1979. She graduated from Royal University of Phnom Penh, Bachelor of Education in 2004, had certificate of small business and administration. She worked in administration office at Council for the Development of Cambodia (CDC) for one year and since 2004 till the present she worked in budget department, Ministry of Economy and Finance, in the office of budget management for cities and provincial office, the budget management of economic and social sector. Her duty manages the budget of all line-departments around Phnom Penh City. She has continued her Master of Science in Health Economics, Faculty of Health Economics, Chulalongkorn University in 2007 in order to reinforce and expand her knowledge related to her work field of budget allocation in Cambodia.



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