

**COST OF INFORMAL CARE FOR DISABLED STROKE
SURVIVORS IN BANGKOK AND BURIRUM PROVINCE**

KANYARAT PONSOONGNERN

**A THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF SCIENCE IN PHARMACY
(PHARMACY ADMINISTRATION)
FACULTY OF GRADUATE STUDIES
MAHIDOL UNIVERSITY
2007**

COPYRIGHT OF MAHIDOL UNIVERSITY

Thesis
Entitled

**COST OF INFORMAL CARE FOR DISABLED STROKE
SURVIVORS IN BANGKOK AND BURIRUM PROVINCE**

.....
Miss Kanyarat Ponsoongnern
Candidate

.....
Assoc. Prof. Arthorn Riewpaiboon,
Ph.D. (Pharmacy)
Major-Advisor

.....
Mrs. Wachara Riewpaiboon,
M.D., M.sc.
Co-Advisor

.....
Prof. M.R. Jisnuson Svasti,
Ph.D.
Dean
Faculty of Graduate Studies

.....
Prof. Ampol Mitrevej,
Ph.D. (Pharmaceutics)
Chair
Master of Science in Pharmacy
Programme in Pharmacy Administration
Faculty of Pharmacy

Thesis
Entitled

**COST OF INFORMAL CARE FOR DISABLED STROKE
SURVIVORS IN BANGKOK AND BURIRUM PROVINCE**

was submitted to the Faculty of Graduate Studies, Mahidol University
for the degree of Master of Science in Pharmacy
(Pharmacy Administration)

on
May 14, 2007

.....
Miss Kanyarat Ponsoongnern
Candidate

.....
Mr. Yot Teerawattananon,
M.D., Ph.D. (Health Economics)
Chair

.....
Assoc. Prof. Arthorn Riewpaiboon,
Ph.D. (Pharmacy)
Member

.....
Mrs. Wachara Riewpaiboon,
M.D., M.sc.
Member

.....
Prof. M.R. Jisnuson Svasti, Ph.D.
Dean
Faculty of Graduate Studies
Mahidol University

.....
Prof. Ampol Mitrevej,
Ph.D. (Pharmaceutics)
Dean
Faculty of Pharmacy
Mahidol University

ACKNOWLEDGEMENT

The achievement of this thesis would never have happened without the support and valuable advice from many people who contributed to my valuable experience.

First of all, I would like to express my respectful gratitude and deep appreciation to my major advisor, Associate Professor Dr. Arthorn Riewpaiboon, for his guidance, supervision and continual encouragement.

Sincere and grateful appreciation is also expressed to Dr. Wachara Riewpaiboon, my co-advisor, for her helpful criticism, invaluable suggestion and kindness.

I am very grateful and wish to express my deep thanks to all staffs and participants of this study from Sirindhorn National Medical Rehabilitation Center (SNMRC), every hospitals, district public health officers, sub-district public health officers and primary health care units in Burirum province, for their assistance and facilitation in data collection.

A special acknowledgment is extended to all the graduate students at Pharmacy Administration program, Mahidol University, especially Miss Oraluck Pattanaprateep, Miss Krittaya Chunnruleum and everybody at Nongki Hospital for their helpfulness and encouragement.

Finally, my special word for thanks and love is due to my beloved parents, my brother and my sister for their encouragement, dedication, love and give continuous support throughout my life. Moreover, I would like to express my sincere appreciation to Mr. Mana Wisaitdee for his understanding, kindness support and care that inspired me to accomplish the degree of Master of Science in Pharmacy (Pharmacy Administration). I hope you get better soon.

Kanyarat Ponsoongnern

COST OF INFORMAL CARE FOR DISABLED STROKE SURVIVORS IN BANGKOK AND BURIRUM PROVINCE**KANYARAT PONSOONGNERN 4736939 PYPA/M****M.Sc. in Pharm. (PHARMACY ADMINISTRATION)****THESIS ADVISORS: ARTHON RIEWPAIBOON, Ph.D.(PHARMACY),
WACHARA RIEWPAIBOON, M.D., M.Sc.****ABSTRACT**

This study was a cross-sectional descriptive study. The objectives were to determine the cost of informal care for disabled stroke survivors registered at Sirindhorn National Medical Rehabilitation Center and Burirum Hospital from a societal perspective. Cost of informal care defined as cost of time forgone in order to provide care by family members, friends, neighbors of patients without financial compensation. The time cost of informal care was valued according to both opportunity and replacement cost. For opportunity cost, we categorized them into 2 types - productivity cost and time cost approach. The data collection was performed by interview conducted during 2006. Descriptive statistics were used to summarize demographic characteristics and costs. Stepwise multiple regression was employed to create cost function. In addition, sensitivity analysis was performed.

The sample consisted of one hundred and one disabled persons who had stroke at least six months prior to the interview, and had functional status score of less than 95 as measured by the Barthel Index. Data accumulation was retrospective over a 5 year period. Two thirds of the disabled persons, more likely to be male (53%), with a mean age of 66 years, were more than moderately disabled. About 149 caregivers, more likely to be female (61%), mean age of 46 years, worked as agriculturists (21%) and were mainly daughters (39%).

The average monthly informal care time was 94.55 hours, these times were classified into 4 types of activity of informal care – 1. Household activities of daily living 2. Health care activities 3. Activities of daily living 4. Instrumental activities of daily living, and classified types of time forgone for informal care into which had 3 types – 1. paid work 2. unpaid work 3. leisure time. The average monthly cost per case was 4,032 baht (productivity cost), 4,643 baht (time cost) and 3,944 baht (replacement cost). The sensitivity analysis was conducted by the variation of the method and wage, the cost decreased by 61% and increased by 33%. Based on the fitted model, the significant explanatory variables included occupation of caregiver, level of disability and geographic. The model could explain nearly thirty percent of the cases.

This study will be extrapolated and will forecast informal care costs of the registered disabled persons in 2005, the annual cost of GDP were estimated to be 24 billion baht. The information from this study could be beneficial for setup priorities of public health planning and management for disabled persons in Thailand.

**KEY WORDS : INFORMAL CARE / STROKE / COST / CAREGIVER /
DISABILITY**

129 P.

ต้นทุนการดูแลอย่างไม่เป็นทางการของผู้พิการจากโรคหลอดเลือดสมอง ในกรุงเทพมหานครและ
จังหวัดบุรีรัมย์ (COST OF INFORMAL CARE FOR DISABLED STROKE
SURVIVORS IN BANGKOK AND BURIRUM PROVINCE)

กันยารัตน์ ปนสูงเนิน 4736939 PYP/M

ภ.ม. (บริหารเภสัชกิจ)

คณะกรรมการควบคุมวิทยานิพนธ์: อาทร รวีไพบูลย์, Ph.D.(Pharmacy), วัชรารวีไพบูลย์,
M.D., M.Sc.

บทคัดย่อ

การศึกษานี้เป็นการศึกษาเชิงพรรณนาแบบภาคตัดขวาง มีวัตถุประสงค์เพื่อประเมินต้นทุนการดูแลอย่างไม่เป็นทางการในผู้พิการจากโรคหลอดเลือดสมองที่เป็นคนไข้ของศูนย์สรีนทรเพื่อการฟื้นฟูสมรรถภาพทางการแพทย์และโรงพยาบาลบุรีรัมย์ จังหวัดบุรีรัมย์ ในมุมมองของสังคม ต้นทุนการดูแลอย่างไม่เป็นทางการเป็นมูลค่าหรือต้นทุนของจำนวนเวลาที่ให้การดูแลโดยบุคคลในครอบครัว ญาติ เพื่อน หรือเพื่อนบ้าน ซึ่งไม่ได้รับ

ค่าตอบแทนในรูปของตัวเงิน มีการประเมินต้นทุนเป็น 2 วิธีคือ ต้นทุนเสียโอกาสและต้นทุนเปลี่ยนแปลง โดยในส่วนของต้นทุนเสียโอกาสมีการประเมินเป็น 2 แนวคิด คือ ต้นทุนผลิตภาพและต้นทุนเวลา เก็บข้อมูลโดยการสัมภาษณ์ ต้นทุนที่ประเมินเป็นมูลค่าของปี 2549 ใช้สถิติเชิงพรรณนาในการสรุปลักษณะของผู้พิการและต้นทุนที่เกิดขึ้น วิเคราะห์สมการต้นทุนโดยใช้การวิเคราะห์ความถดถอยเชิงพหุ รวมทั้งวิเคราะห์ความไวของผลการศึกษา

กลุ่มตัวอย่างได้แก่ผู้ป่วยโรคหลอดเลือดสมองที่ป่วยมาแล้วอย่างน้อย 6 เดือนและมีภาวะความพิการตามเกณฑ์การประเมิน Barthel Index น้อยกว่า 95 คะแนน จากการรวบรวมผู้ป่วยย้อนหลัง 5 ปี มีผู้พิการ 101 คน ส่วนใหญ่เป็นเพศชาย (53%) อายุเฉลี่ย 66 ปี ผู้พิการสองในสามมีระดับความพิการตั้งแต่ปานกลางขึ้นไป มีผู้ดูแล 149 คน ส่วนใหญ่เป็นเพศหญิง (61%) อายุเฉลี่ย 46 ปี ประกอบอาชีพเกษตรกรกรรม (21%) เกี่ยวข้องกับผู้พิการโดยเป็นบุตร-ธิดา (39%) เวลาเฉลี่ยที่ผู้พิการได้รับการดูแลคิดเป็นเดือนละ 94.55 ชั่วโมง เวลาเหล่านี้ได้จำแนกตาม

ลักษณะกิจกรรมเป็น 4 ประเภทได้แก่ กิจกรรมในบ้าน กิจกรรมการดูแลสุขภาพ กิจวัตรประจำวัน และ กิจกรรมนอกบ้าน นอกจากนี้จำแนกตามลักษณะเวลาของผู้ให้การดูแล เป็น 3 ประเภท คือ เวลาทำงานที่ได้รับค่าตอบแทนเป็นตัวเงิน เวลาทำงานที่ไม่ได้รับค่าตอบแทนเป็นตัวเงิน และเวลาพักผ่อน ในการแปลงเวลาเป็นต้นทุนในการดูแล ผู้พิการพบว่า ต้นทุนผลิตภาพมีมูลค่า 4,032 บาท/เดือน ต้นทุนเวลามีมูลค่า 4,643 บาท/เดือน ส่วนต้นทุนเปลี่ยนแปลงมีมูลค่า 3,944 บาท/เดือน ในการวิเคราะห์ความไวโดยการใช้วิธีการคำนวณและค่ามาตรฐานเวลาที่แตกต่างกัน ส่งผลให้มูลค่าต้นทุนเปลี่ยนแปลงตั้งแต่ -61% ถึง + 33% ในส่วนปัจจัยที่มีผลต่อต้นทุนได้แก่ อาชีพของผู้ดูแล ระดับความพิการของผู้พิการ และลักษณะชุมชน ปัจจัยเหล่านี้สามารถอธิบายการเกิดต้นทุนได้ประมาณร้อยละ 30

จากผลการศึกษาหากประมาณการณ่ว่าผู้พิการทั้งประเทศตามจำนวนที่จดทะเบียนในปี 2548 ได้รับการดูแลเท่ากับผู้พิการในการศึกษานี้ ประเทศจะสูญเสียผลผลิตมวลรวมภายในประเทศ ประมาณ สองหมื่นสี่พันล้านบาท ผลจากการศึกษานี้สามารถนำไปเป็นข้อมูลในการจัดลำดับความสำคัญของการแก้ปัญหาสุขภาพ และเป็นแนวทางในการปรับปรุงการจัดสวัสดิการแก่ผู้พิการ

CONTENTS

	Page
ACKNOWLEDGEMENT	iii
ABSTRACT (ENGLISH)	iv
ABSTRACT (THAI)	v
LIST OF TABLES	ix
LIST OF FIGURES	x
CHAPTER	
I INTRODUCTION	1
General objective	2
Specific objectives	2
Study location	2
Expected outcome and benefit	2
Definition of terms used in this study	3
II LITERATURE REVIEW	5
Stroke subtypes	5
Epidemiology of stroke	5
Informal care and health care system	7
Clinical perspective	7
Anthropological perspective	7
Economic perspective	8
Informal care	9
Activity of informal care	9
Determinant of informal care	10
Economic valuation of informal care	11
Valuation method for informal care	11
Method for measurement time of informal care	12
Cost of informal care for stroke	13
Wage rate in Thailand	18

CONTENTS (Continued)

		Page
	Disability measurement in stroke	18
III	METHODOLOGY	19
	Study design and perspective	19
	Conceptual framework	22
	Study population	23
	Study location	23
	Study procedure	24
	Selection criteria	24
	Sample calculation	24
	Study instrument	25
	Data collection method	25
	Data management	26
	Data analysis	26
IV	RESULTS	27
	Selection of sample	27
	Characteristic of disabled persons and caregivers	29
	Time spent of informal caregivers	45
	Opportunity cost and replacement cost of informal care	52
	Cost function of the time spent	59
	Sensitivity analysis	69
	Variation of the informal care cost	72
V	DISCUSSION	73
	Characteristic of the disabled persons and caregivers	73
	Types of the informal care time	74
	Cost of the informal care	74
	Opportunity cost of informal care	74
	Replacement cost of informal care	75

CONTENTS (Continued)

	Page
The variation of informal care cost	75
Generalization of the results	76
Cost function of the informal care	76
Limitation of the study	77
VI CONCLUSIONS AND RECOMMENDATIONS	78
Conclusions	78
Recommendations	79
REFERENCES	80
APPENDIX	87
BIOGRAPHY	129

LISTS OF TABLES

Table	Page
1 Economic valuation of informal care for stroke	17
2 Total participant who met selection criteria	28
3 Summary of disabled persons and caregivers	30
4 Characteristic of disabled persons	31
5 Characteristic of informal caregivers	40
6 Average informal care time among the persons actually received the care	46
7 Average informal care time among the total disabled persons	48
8 Types of informal care time	50
9 Adjusted average monthly time of informal care of the previous year	51
10 Cost of informal care according to activity and setting	53
11 Comparison of the time cost according to activity and setting	55
12 Comparison of the informal care cost according to disability level and setting	57
13 Potential explanatory variables in stepwise multiple regression analysis	61
14 Multiple regression model of informal care time	62
15 Multiple regression model of productivity cost	64
16 Multiple regression model of time cost type1	66
17 Multiple regression model replacement cost	68
18 Effect of income on the productivity cost (Baht per month)	70
19 Effect of income on the time cost type1 (Baht per month)	70
20 Effect of wage on the replacement cost (Baht per month)	71
21 Variation of informal care cost according by approach and setting	72

LIST OF FIGURES

Figure		Page
1	Disability care system for disabled stroke survivors	6
2	Conceptual framework of this study	22

CHAPTER I

INTRODUCTION

Cerebrovascular disease or stroke is a major public health problem associated with mortality and major cause of disability in the elderly people. Disabled stroke survivors, who depend on full time or part time care for their daily activities, can impose a significant social and economic burden on the society.

In Thailand, the Disability Adjusted Life Years; DALYs (a measurement for the estimation of the burden of disease due to loss from premature death and non fatal disability) was applied to measure the burden of diseases. Based on this measurement, in 1999, stroke was ranked second and third as the burden in women and men, respectively (1).

After stroke attack, some survivors have functional impairment and disability, rehabilitation is consequently important. However, the conventional hospital services have high costs. Therefore, home-based or community-based rehabilitation has been developed as an efficient alternative or compliment method (2, 3). The care provided by family, friend, acquaintances or neighbors of a patient without financially compensated, is known as “informal care” (3-6). Informal care plays an important role in the health system.

Regarding the Rehabilitation of Disabled Persons Act B.E. 2534, disabled persons receive 500 bath per month from the government welfare as an allowance. Additional allowance can be allocated by the local governmental authorities. The reimbursement of services for disabled persons from the National Health Security Office (NHSO) is still under development. Information on economics of informal care would be useful for health and welfare policy planning.

General objective

To conduct economic valuation of informal care for disabled stroke survivors registered at Sirindhorn National Medical Rehabilitation Center (SNMRC) and Burirum Hospital, in societal perspective.

Specific objectives

1. To determine time and cost of informal care for disabled stroke survivors registered at Sirindhorn National Medical Rehabilitation Center (SNMRC) and Burirum Hospital.

2. To formulate the time and cost function of informal care for disabled stroke survivors registered at Sirindhorn National Medical Rehabilitation Center (SNMRC) and Burirum Hospital.

Study location

Locations of this study are at Sirindhorn National Medical Rehabilitation Center (SNMRC) and Burirum Hospital, Burirum Province.

Expected outcome and Benefits

This study could provide the basic descriptive information about cost of informal care for disabled stroke survivors in societal perspective. The information resulted from this study could be beneficial for extrapolation and forecasting economic burden due to informal care in Thailand. These are pivotal in public health planning and management.

Definition of terms used in this study**Informal care**

In formal care is defined as a care that is provided by family members, friend, acquaintances or neighbors of patient without financial compensation. (4, 7)

Formal care

Formal care is defined as a care that is provided by public or privately hired helper or agency. (7)

Opportunity cost of the informal care

Opportunity cost of the informal care is the value of the informal caregiver's benefits forgone due to spending time on providing informal care. (8, 9)

Replacement cost of the informal care

Replacement cost of the informal care is the value of the informal caregiver's time spent on informal care at the (labor) market prices of a close market substitute. (8, 9)

Stroke

Stroke is defined by the World Health Organization (WHO) as "rapidly developing clinical signs of focal (or global) disturbance of cerebral function lasting more than 24 hours (unless interrupted by surgery or death) with no apparent cause other than of vascular origin". (10, 11)

Disabled stroke survivors

Disabled stroke survivors are defined as persons who are identified by the International Classification of Disease, 10th Revision (ICD-10) as I60-I69 and G81 (12). Furthermore, they have functional status based on the Barthel Index (BI) at level of less 96 of 100 scores (13, 14). This was measured after six months of the stroke attack. (15, 16). The stroke coding derived from the World Health Organization (WHO) as follows:

- G81 : Hemiplegia
- I60-I69 : Cerebrovascular disease
 - I60 : Subarachnoid haemorrhage
 - I61 : Intracerebral haemorrhage
 - I62 : Other nontraumatic intracranial haemorrhage
 - I63 : Cerebral infarction

- I64 : Stroke, not specified as haemorrhage
- I65 : Occlusion and stenosis of precerebral arteries, not resulting in cerebral infarction
- I66: Occlusion and stenosis of cerebral arteries, not resulting in cerebral infarction
- I67 : Other cerebrovascular disease
- I68 : Cerebrovascular disorders in disease classified elsewhere
- I69 : Sequelae of cerebrovascular disease
- I66 : Occlusion and stenosis of cerebral arteries, not resulting in cerebral infarction

Urban

Urban area is defined as the area where is a city or densely populated area and under the administration (of a country), government such as Sub-district Municipality or Bangkok Metropolitan. (17, 18)

Rural

Rural area is defined as the area where had characteristic of farming or country life and the area which the government did not classified to the urban area. (17, 18)

CHAPTER II

LITERATURE REVIEW

1. Stroke subtypes

Cerebrovascular disease or stroke (10, 11) is a sudden problem affecting the blood vessels of the brain. Symptoms depend on the part of the brain that is affected. People who survive a stroke often have weakness on one side of the body or trouble with moving, talking, or thinking. The recommended standard World Health Organization (WHO) stroke defined as “rapidly developing clinical signs of focal (or global) disturbance of cerebral function lasting more than 24 hours (unless interrupted by surgery or death) with no apparent cause other than of vascular origin. There are two major stroke sub groups (11, 19).

1.1 Ischemic stroke occurs when an artery in the brain becomes blocked. The most common type of stroke, accounting for almost 80 percent of all strokes, is caused by a clot or other blockage within an artery leading to the brain. Ischemic stroke can further be divided into two main types: Thrombotic and Embolic.

1.2 Hemorrhage stroke is caused by the sudden rupture of an artery within the brain. Blood is then released into the brain, compressing brain structure. Hemorrhage stroke can further be divided into two main types: Intracerebral hemorrhage and Subarachnoid hemorrhage.

2. Epidemiology of stroke

Globally, stroke is one of serious noncommunicable diseases (NCDs) that have huge consequences in terms of loss productivity, premature death and long term disability. In 2002, the American Stroke Association (ASA) that most of stroke was ischemic (88%) followed by intracerebral hemorrhage (9%) and subarachnoid hemorrhage (3%). The incidence rate in men was 1.25 times greater than that of women. Survivors from hemorrhagic stroke had more disability than those from the ischemic stroke (20, 21).

Regarding epidemiology of stroke in Thailand, a study showed that the stroke prevalence in persons over the age of 20 years in 1983 was about 690 per 100,000 population. Another study among people aged more than 60 years conducted 1994 to 1996 found that the prevalence rate was about 1,120 per 100,000 population. Furthermore the Bureau of Health Policy and Strategy, Ministry of Public Health reported that morbidity rate of stroke during 2002-2003 increased from 138.3 to 151.5 per 100,000 population. These implied that stroke was one of important health problems (10, 22, 23).

Disability care system, in overview, is shown as a diagram in Figure 1

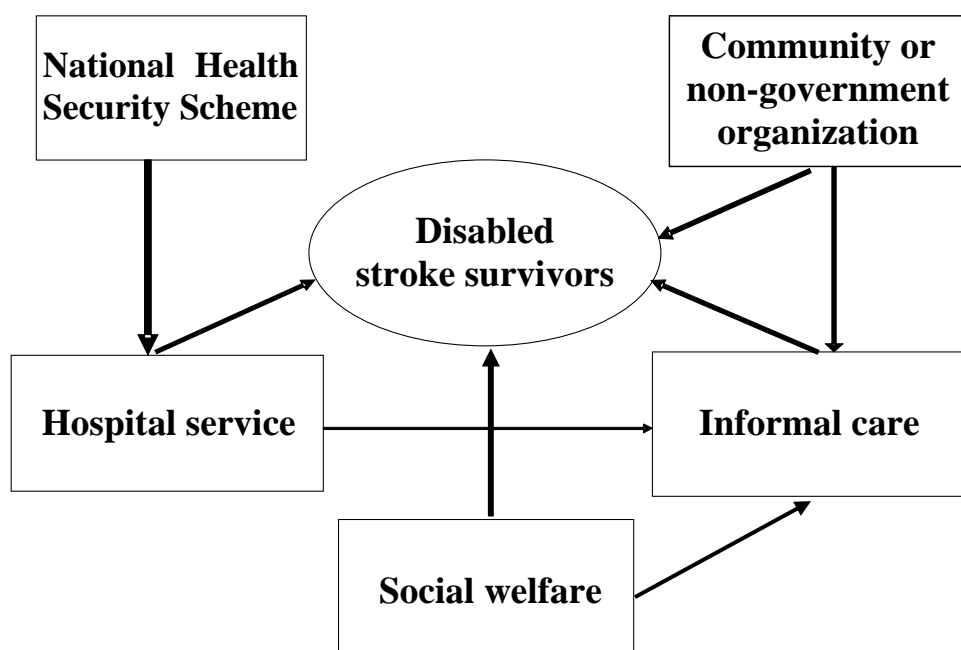


Figure 1 Disability care system for disabled stroke survivors

3. Informal care and health care system

Clinical perspective (19, 24)

Management of stroke starts from primary prevention through rehabilitation and secondary prevention. The steps of care include the following key components:

1. Primary prevention aims to reduce the occurrence of stroke. This covers the control of risk factors for example hypertension, diabetic etc.
2. Acute stroke treatment is an early management of acute stroke.
3. Supportive treatment is to monitor the acute phase which includes conscious level, blood pressure, pulse, blood glucose and hydration.
4. Rehabilitation or post-acute stroke management needs to be considered in all settings, not just that of the hospital. Rehabilitation helps increase independence and ability in all activities of daily living of stroke survivors.
5. Secondary prevention aims to prevent complications of further stroke or disability after first stroke attack.

The majority of patients will be managed in hospital initially and then transferred to home care. So caregivers are play an important role in informal care for disabled stroke survivors, especially in rehabilitation and secondary prevention in stroke care system, after discharge from hospital.

Anthropological perspective (25, 26)

When illness is occurred, an individual may use one or more type of health system to relive the problems. Arthur Kleinman, anthropologist, defined health care system as a local cultural system composed of three parts: the popular, professional, and folk sectors. Each sector is an arena in which cultural beliefs, roles, relationships, settings and institutions interact and, often, overlap to give meaning to and heal illness.

1. Popular sector

The popular health care sector is the largest part of any health care system and consists of the lay, non-professional, non-specialist arena. It is based on the family, but encompasses the general public. This sector can be conceptualized to contain many levels, including individual, family, social network, and community.

2. Folk sector

The folk health care sector is the non-professional, non-bureaucratic, specialist. Those people, who is engage in some sort of healing practice that is not part of an organized profession or subject to government regulation, such as the herbalist, shaman, etc.

3. Professional sector

The professional health sector is the organized, regulated, legally sanctioned health profession. In most countries this would refer to established Western medicine. The most obvious members of this sector are participants in allopathic medicine: medical doctors, the American medical, hospitals, medical schools and pharmaceutical companies.

When an individual became ill and received treatment, regardless of whether given by the popular, professional or folk sectors, but almost patients rely on the popular sector. In this sector informal care plays a substantial role for stroke survivors and those associated with the individual, i.e. family members.

Economic perspective (4, 27)

We may classify cost of informal care into two types as follows:

1. Direct cost : cost of consumed resources due to either the stroke or its treatment. These include not only cost of health care system but also from patients themselves and their relatives. We can divide direct cost into two subtypes.

1.1 Medical cost : fixed and variable cost associated directly with stroke care intervention, i.e. hospitalization, out patient visit, procedures and test, medical devices, home care, nursing care, etc.

1.2 Non-medical cost : non-medical cost associated with provision of medical services, i.e. transportation, home help, meals on wheels, adaptation to house or car, informal care, etc.

2. Indirect cost : cost related to loss of production, due to either the stroke or its treatment, which occur to society, i.e. sick leave, reduced productivity or work, premature death, etc.

4. Informal care

Informal care is the care provided by family members, friend, acquaintances or neighbors of patient without financial compensation (4, 7). However, while providing informal care entails giving up work time, leisure time, investing energy and making fewer social contacts. It is a part of clinical, anthropological, and economic issues. Informal caregivers are the backbone of the service provided to stroke survivors in rehabilitation and secondary prevention period after discharge from hospital in clinical perspectives. It can be referred to providing care in popular sector in anthropological perspective and direct non-medical cost as a part of cost of illness in economic perspective.

5. Activity of informal care

Informal care activity is an activity to care a patient or activity as substitution of the patient.

There are the studies about classification of informal care in different way such as:

- In Netherlands, 2004 (8) Van den Berg presented theory and classified activity of informal care into 5 parts :

1. Home keeping (the additional part) : cleaning, cooking.
2. Personal care : bathing, grooming.
3. Mobility : moving around within the house.
4. Administrative tasks (the additional part).
5. Socializing : financial matters.

- In Australia, 2002 (28) Dewey classified activity of informal care as follows:

1. Community-based activity

Advising on financial, “Checking up” on the patient, completing errands, e.g., collecting library books, posting mail, arranging services, providing transport or accompanying the patient to appointments, shopping.

2. Domestic activity

Gardening, handyman tasks, grounds and home maintenance, heavy housework (vacuuming, laundry, cleaning bathrooms), light housework (washing up,

meal preparation, medication supervision, supervision or assistance with walking outside).

3. Personal activity

Eating; grooming; bathing; dressing; toilet use; incontinence management; moving from bed to chair and chair to chair; walking inside the house, including stairs.

- In Netherlands, 2006 (9) Van Den Berg classified activity of informal care as follows:

1. Household activities of daily living (HDL)

Preparation of food and drinks, time investments in shopping, groceries etc. housecleaning, washing, ironing or sewing, caring for and playing with own children, chores, gardening.

2. Activities of daily living (ADL)

Aiding patient with personal care, visiting the toilet, moving around within the house, eating and drinking.

3. Instrumental activities of daily living (IADL)

Aiding the patient in traveling outside the house, visiting and in excursions, contacting health care suppliers, organizing home adaptations, etc., financial matters (insurance, rent).

6. Determinant of informal care (29)

There are three main factors associated with informal care as follows:

1. Care-recipient

Dependency, age, gender, kinship, duration of stroke, employment status, comorbidity.

2. Caregiver.

Age, gender, kinship, education, marital status, employment status, living arrangement, duration of caring, time spent to care.

3. External support

Geographic setting, culture, religion, social support, family network, community or non-government service.

For example, geographic setting (30-32), is one of external variable. Caregivers living in rural and urban settings may provide different care. Rural caregivers can access fewer formal supports (e.g., respite care, home health care, rehabilitation, transportation services) than urban caregivers. This is because the formal services are more available in urban communities. Furthermore, race also has significant effects on the informal care. Results from a study indicated that Latinos receive significantly more hours of informal care than African Americans or non-Hispanic whites due to family culture.

7. Economic valuation of informal care

Cost of informal care is defined as cost of time forgone in order to provide care by family members, friend, acquaintances or neighbor of patient without financially compensation. This entails giving up work time, leisure time, investing energy and making fewer social contacts (4, 6, 8, 28).

8. Valuation method for informal care (8)

There are several methods for valuing time spent for informal care.

1. Revealed preference methods.

This method use real-life decision data to value informal care and may therefore be seen as revealed preference methods. This means that preferences of informal caregivers are deduced from informal caregivers' decisions or from decisions in the market for close substitutes of informal care. Revealed preference method include the following methods:

1.1 Opportunity costs

The informal caregiver's benefits forgone due to spending time on providing informal care. Value of informal care equals the market wage rate of the informal caregiver multiplied with the hours of time forgone or the hours spend on informal care. Opportunity cost is categorized into 2 types (33, 34)

1.1.1 Productivity cost approach

Opportunity cost is equal to real income loss of the all caregivers who works.

1.1.2 Time cost approach

Opportunity cost is equal to their real income loss for everyone. In cases of unemployed, minimum wage or Gross Domestic per capita (GDP per capita) is applied for the calculation.

1.2 Proxy good (Replacement cost or Market cost)

Replacement cost is valued time spent of informal care at the (labor) market prices of a close market substitute. This approach requires the availability of a market substitute for the nonmarket good, which is assumed to be almost perfect. The time spent on informal care is valued at the wage rate of a market substitute, which can differ for different tasks.

2. Stated preference methods

Stated preference methods are used to measure and value respondents' preferences mostly for nonmarket commodities through (oral or written) surveys. Often, the aim is to find a monetary valuation of a nonmarket commodity, such as informal care.

2.1 Contingent valuation

This method is expressed the effect of an intervention on an individual's well-being in money metric: compensating variation and equivalent variation such as willingness to pay (WTP) and willingness to accept (WTA).

Assessing the minimum amount of money an informal caregiver would need to receive to be willing to provide a certain or an additional amount of informal care.

2.2 Conjoint analysis

This is a method for the analysis of respondents' preferences for a set of multiattribute alternatives such as ranking, rating and discrete choice or choice experiments.

9. Method for measurement time of informal care (35)

1. Questionnaire

The caregivers are interviewed periodically during a year, such as interview at 3, 6 and 12 months using structure questionnaire. The weakness of this method is the prejudice that is born from forgetting or recall bias.

2. Home care journal

Home care journal or diary method is a method that requires caregiver to record daily activity on the informal care. The weakness of this method is low compliance.

10. Cost of informal care for stroke

Claesson et al. (36) examined resource utilization during a 12-month period after acute stroke in elderly patients aged over 70 years old in Sweden and classified unit cost for stroke patients as follows:

1. Initial hospitalization for index stroke

Stroke unit, general ward, geriatric ward

2. Acute hospitalizations after initial hospitalization

Medicine ward, cardiology ward, surgery ward, neurology ward etc.

3. Non-acute hospitalizations from discharge

Geriatric ward, post care unit

4. Institutionalized living from discharge

Nursing home, home for the elderly

5. Outpatient care from discharge

Physician visit, other medical visit, outpatient rehabilitation

6. Different kinds of support from discharge

Home assistance, taxi service

7. Other costs from discharge

Informal care

The number of hours of informal care is collected in the structured interview questionnaires at 3 and 12 months. Leisure time was valued at 35% of the wage rate used for the working time.

Hickenbottom et al. (37) determined cost of informal care for stroke survivors aged over 70 years in United States. Average annual cost for informal caregiving was calculated by opportunity cost at market price of an equivalent service. The price used in the calculation was national median wage for a home health aide.

Dewey et al. (28) estimated cost of informal care provided to stroke patients in Australia. They calculated the cost in the first year and lifetime. The cost was valued according to both the opportunity and replacement cost approaches.

1. Opportunity cost of time spent was equivalent to reduced leisure time. It was valued at one-third of the average Australian weekly wage. This was considered to be a conservative estimate of the opportunity cost of leisure.

2. Replacement cost approach valued productive activity according to the cost of substituting unpaid activity with a paid worker according to the Victorian Health and Community Services Industry Award. Personal care assistance was valued according to the hourly rate of nursing employees at level 2.

Patel et al. (38) identified resource use over 12 months after stroke onset in England and compared cost effectiveness of 3 stroke care strategies as follows:

1. Stroke unit

Patients were under the care of specialist stroke physician; guidelines for stroke management were in place; a multidisciplinary staff with specialist experience in stroke was available.

2. Stroke team

Patients were on general medical wards and under the care of general physicians. Assessments were done by a roving specialist stroke team that advised on management, investigation, and discharge planning; and nonspecialist nursing and therapy staff were available.

3. Domiciliary stroke care.

Patients were managed in their own homes under the joint care of a stroke physician and a general practitioner. Investigations were performed on an outpatient basis. Therapy was by handled by specialist staff; district nursing support was

available and personal care came from social services. Informal care is a part of this strategy. It was estimated by 2 different methods: 1 based on the UK minimum wage rate (£3.53/hour, the opportunity cost method) and 2 based on the unit cost of a social services home help worker (£10.61/hour, the replacement cost method) because of the controversy regarding appropriate methods for costing informal care inputs.

Van den Berg et al. (9) presented the cost of informal care by opportunity costs and proxy good methods in two caregiver populations in Netherlands.

There were informal caregivers of care recipients with stroke and caregivers of care recipients with rheumatoid arthritis (RA). They were indicated the different types of time forgone (paid work, unpaid work and leisure) in order to be able to provide care. Opportunity costs method to find out the reservation wage of the caregiver. The wage rate for what an individual is willing to supply at least 1 hour on the labor market in paid work. But, when caregivers e.g. derive disutility from work, the shadow price of unpaid work and leisure time were adopted. The proxy good method, it values time spent on caregiving at the (labor) market price of a close substitute. The value can differ per task e.g. housework valued at the market wage of a housekeeper and personal care valued at the market wage of a nurse. The activities were classified as follows:

1. Household activities of daily living (HDL) : preparation of food and drinks, housecleaning.
2. Activities of daily living (ADL) : aiding patient with personal care, visiting the toilet.
3. Instrumental activities of daily living (IADL) : aiding the patient in traveling outside the house, contacting health care suppliers and travel time.

In Thailand, based on our knowledge, economic burden of informal care for disabled stroke survivors has never been conducted. The only one study found was about anthropological aspects of the caregivers. Jullamate et al (39), describe the characteristics of Thai informal stroke caregivers and to identify the caregivers' needs while providing care to their stroke relatives at home. They used open-ended questions, interviewed 20 caregivers in Chonburi Province, found that the majority of

Thai informal stroke caregivers were female, mostly daughters, with the exception of 2 Thai primary stroke caregivers found to be nieces. The majority of caregivers provided care to their stroke relatives 24 hours per day. Assistance, information and social support were the three main needs of the caregivers of stroke survivors.

Table 1 Economic valuation of informal care for stroke

Study	Opportunity costs				Reference rate	Replacement cost Reference rate
	Paid work	Unpaid work	leisure	Not mention		
Claesson et al.(36)	-	-	√	-	35% of gross wage rate (38 SEK/hour)	-
Hickenbottom et al.(37)	-	-	-	√	national median wage for home health aid (\$8.20/hour)	
Dewey et al. (28)	-	-	√	-	35% of average Australian weekly wage (A\$5.86/hour)	* unqualified health care worker (A\$11.20/hour) * nursing employees at level 2 (A\$13.45/hour)
Patel et al.(38)	-	-	-	√	UK minimum wage rate (£3.53/hour)	social service home help worker (£10.61/hour)
Van den Berg et al.(9)	√	√	√	-	Caregiver's hourly wage and shadow price	Professional home care HDL : £8.53/hour, ADL, IADL : £32.67/hour

\$1.00 = £0.67, A\$1.32 (Australian dollar), 6.70SEK (Swedish crowns)

HDL : Household activities of daily living

ADL : Activities of daily living

IADL : Instrumental activities of daily living

11. Wage rate in Thailand

In Thailand, the Labour Standard Development Bureau, Department of Labour Protection and Welfare, Ministry of Labour, reported average wage, earning of private employee and hour of work in 2003 (40-42). The classification of Industrial and Occupation are as follows:

International Standard Industrial Classification (ISIC)

Category : N Health and social work

Category : P Private households with employed persons

International Standard Classification of Occupation, 1988 (ISCO-88)

Major group 5 : Service workers and shop and market sales workers

Sub Major group 51 Personal and protective services workers

Minor group 513 Personal care and related workers

Sub Major group 52 Models, salespersons and demonstrators

Major group 9 : Elementary occupations

Sub Major group 91 Sales and service elementary occupations

Minor group 913 Domestic and related helpers, cleaners and launderers

Sub Major group 92 Agricultural, fishery and related labourers

Sub Major group 93 Labourers in mining, construction, manufacturing and transport

12. Disability measurement in stroke

Disability assessment is normally conducted at least six months after the stroke attack (13, 14). The Barthel Index (BI) has also shown to be valid and reliable for assessing disability in stroke patients (15, 43-47). It evaluates the activities of daily living (ADL) using 10 items with weighted scores. The total BI is a cumulative 100 scores of the 10 items. The level of 100 scores refers to complete independence, while zero score refers to the total dependence.

CHAPTER III

METHODOLOGY

This chapter consists of 11 parts as follows:

1. Study design and perspective
2. Conceptual framework
3. Study population
4. Study location
5. Study procedure
6. Selection criteria
7. Sample calculation
8. Study instrument
9. Data collection method
10. Data management
11. Data analysis

1. Study design and perspective

This study was designed as a cost of illness focusing on an informal care from societal perspective (27). The study approach was bottom-up and cross-sectional descriptive study. The costs were valued at 2005 prices. The time cost of informal care was valued according to both of the opportunity cost and replacement cost.

1.1 Opportunity cost

The opportunity cost covers time of paid work, unpaid work and leisure time (9). Furthermore, caregivers were categorized by age level (48, 49), i.e. childhood (less than 15 years old), working age (15 - less than 60 years old), and retired age (60 years old and more). The opportunity cost was determined from two approaches as follows:

1.1.1 Productivity cost approach (33, 34)

This approach covers time of caregivers who still work. Real incomes were used in valuing. Pension was not included because it does not reflect the work at the study period. Minimum wage (184 baht/day and 144 baht/day for Bangkok and Buriram Province, respectively) (50) was used for unpaid workers.

1.1.2 Time cost approach (33, 34)

This approach covers time of all caregivers. Valuing covered three methods as follows:

- Time cost type 1: Real income was applied. In cases of unemployed, area minimum wages (184 and 144 baht/day for Bangkok and Buriram Province, respectively) (50) or pension was applied.
- Time cost type 2: National average minimum wage (154 baht/day) (50) was applied.
- Time cost type 3: Gross Domestic Product (GDP) per capita (380 baht/day) (51) was applied.

1.2 Replacement cost

This method values the time of informal care by wage rate of workers available in the labor markets. Classification of the informal care activities were modified from that of Van den Berg (9). Health care activities (HCA) were separated from the others as follows:

1.2.1 Household activities of daily living (HDL)

These include preparing food and drinks, shopping, doing a chore, taking care of children.

1.2.2 Health care activities (HCA)

These include preparing medication, doing rehabilitation, contacting health care provider and organizing home facilities for the patient.

1.2.3 Activities of daily living (ADL)

These include assistance such as toilet activities, moving around the house, eating and drinking.

1.2.4 Instrumental activities of daily living (IADL)

These include assistance such as traveling outside the house.

The wage rates used in the calculation were from a national survey in 2003 (41, 52). Consumer price index (53, 54) was applied to adjust average wage from 2003 to 2005 (the study year). According to the Labour Protection Act B.E. 2541 (55), the working time per week can not exceed forty-eight hours. Then the total working time per month (48 hours multiply 4 weeks = 192 hours) was used to calculate the hourly wage rate. Selected wage rates were matched with the activities as follows:

- Category N : Health and social work (183 and 55 baht/day for Bangkok and Buriram Province, respectively) was used for the health care activities (HCA) and activities of daily living (ADL).
- Category P : Household workers (157 and 127 baht/day for Bangkok and Buriram Province, respectively) was used for the household activities of daily living (HDL) and instrumental activities of daily living (IADL).

2. Conceptual framework

This study was conducted as the conceptual framework in Figure 2. The framework was modified from that of Van den Berg (9)

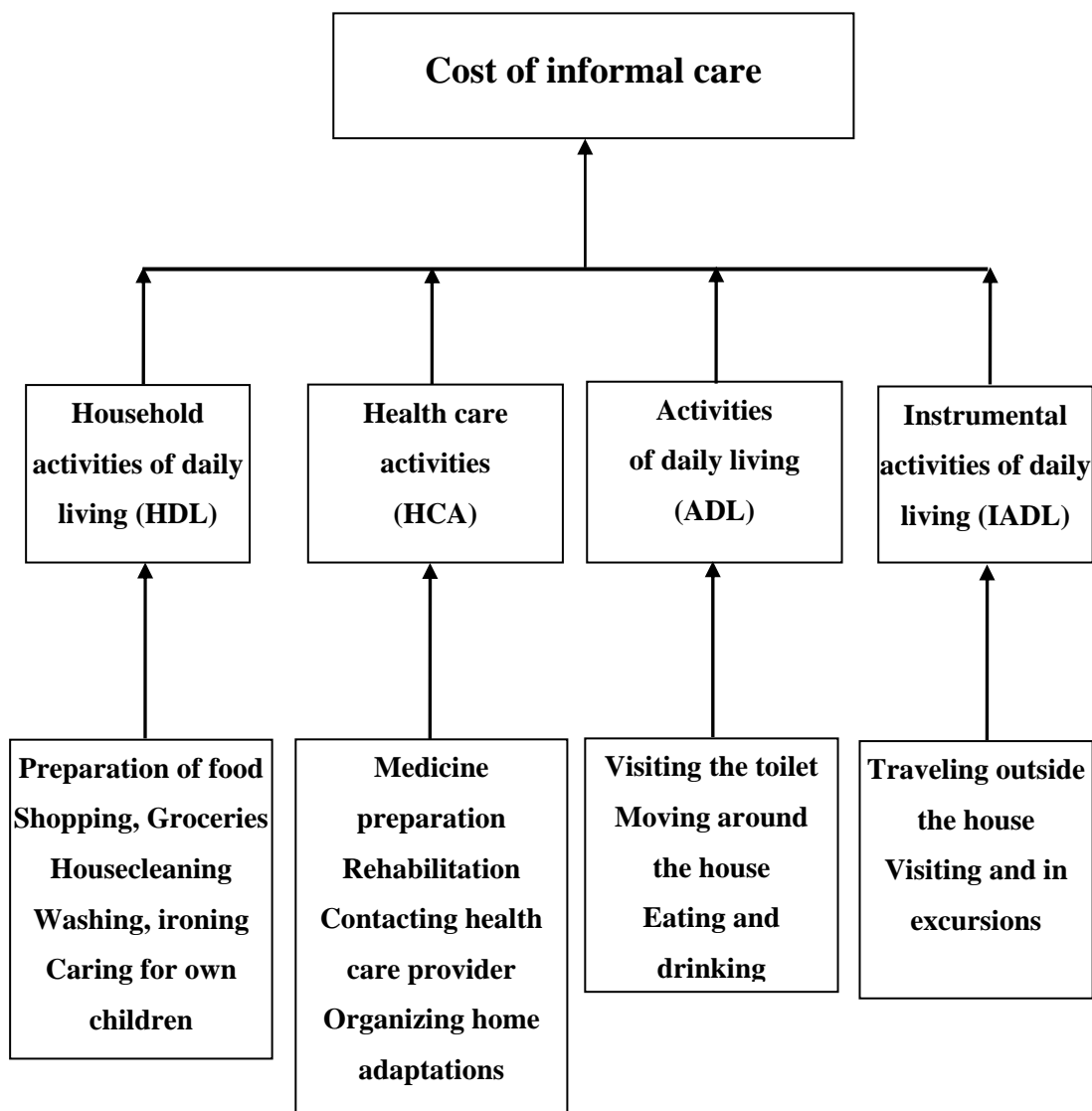


Figure 2 Conceptual frame work of this study

3. Study population

Study population was the informal caregivers of disabled stroke survivors who registered at hospitals during January 1, 2001 to December 31, 2005. The retrospective study period was extended to five years to have enough samples. The interview was conducted at least six months after this period because disability is normally determined after 6 months of the stroke (44-47).

4. Study location

Study location was selected based on convenience. First, the institution had good cooperation. Second, the institutions had medical record data bases. Third, field work of interview is feasible. Then, Sirindhorn National Medical Rehabilitation Center (SNMRC) and Burirum Hospital, Burirum Province were selected.

Sirindhorn National Medical Rehabilitation Center (SNMRC)

Sirindhorn National Medical Rehabilitation Center was a tertiary hospital with 48 patient-beds. It was under the responsibility of the Department of Medical Services, Ministry of Public Health. It locates in Nonthaburi Province, a nearby province of Bangkok. There were 9 physicians, 1 pharmacist, 6 physical therapists and 6 occupational therapists. In fiscal year 2005, the average length of stay was 48 days and the average outpatient was 109 visits per day.

Burirum Hospital, Burirum Province

Burirum Province has the area 10,393.945 square kilometers (6.11% of the Northeastern Region), and population of 1,532,286 (2.01% of Thailand). It consists of 21 districts and 2 sub-districts. There are one regional hospital, one provincial hospital, 19 community hospitals and 227 health centers.

Burirum Hospital is a 590 bed- regional hospital. There were 55 physicians, 8 dentists and 22 pharmacists. In fiscal year 2005, the average length of stay was 4.42 days (occupancy rate = 101.12%) and the average outpatient was 619 visits per day.

5. Study procedure

The study was composed of the following steps:

1. To review definition of the informal care, categories of informal care's activities and determinants of informal care.
2. To design questionnaires.
3. To test and improve the questionnaires.
4. To get approval from the ethics committees.
5. To select the sample.
6. To interview informal caregivers for time spent on providing the informal care.
7. To calculate costs of informal care.
8. To formulate cost model or cost function.

6. Selection criteria

Inclusion criteria

All informal caregiver of the patients with the following characteristic:

- Patients with diagnosis classified by the International Classification of Diseases, 10th Revision (ICD-10) code I60-I69 and G81. (12)
- Patients having had a stroke for at least 6 months.
- Patients having functional status of not more than 95 of 100 scores, measured by using the Barthel Index (BI). (15, 16)
- Patients receiving informal care at home or hospital.

Exclusion criteria

- Patients and caregivers were not available for the interview.
- Patients had been hospitalized for more than one week at the time of interview.

7. Sample calculation

This study included all cases that who met the selection criteria.

8. Study instrument

The structured questionnaire was used as the instrument of the study. It was divided into 5 parts as follows:

1. Ability assessment for daily living (Barthel index)
2. Demographics and service utilization of disabled persons
3. Social factors
4. Demographics of caregiver
5. Informal care activities

Content validity of the questionnaire was assessed by two experts. Then the questionnaire tested by interviewing 5 general people. Finally, it was tested with a case of patient and caregiver in Buriram Province.

9. Data collection method

Data collection method started from patient selection and then interview of patients and caregivers. Details are as follows:

1. Patient with ICD-10 code of I60-I69 and G81 receiving treatment during 1 January 2002 to 31 December 2006, were drawn from the hospital databases.
2. Life status and address were checked from the database of the National Health Security Office (NHSO).
3. Two interviewers were trained by the researcher.
4. The researcher and two interviewers conducted the interview.
5. The interview was conducted at the hospital if patients come to the hospital during one month interview period and the remainders were interviewed at patient's home.
6. If a disabled person had more than one caregiver, each of them was interviewed. In case all caregiver were not accessed, total caregiving time was collected from the first caregiver.

10. Data management

To control quality of the data, data management activities were performed as follows:

1. At the end of each interview, completeness of data collection was checked by the researcher.
2. To avoid human error on data entry, double data entry was done into the Microsoft-Excel files by different data enters. IF function of Microsoft Excel was used to check correspondence.
3. Some data were needed to be computed to create variables. In this regard, the functions of Microsoft Excel, such as Date and Time, Logistic, were applied.
4. To prepare data set for multiple regression analysis, patient and care giver records had to be merged. In case there was more than one caregiver for a patient, only a major caregiver was selected.

11. Data analysis

The analyses were divided into 3 parts as follows:

1. Descriptive statistics were employed to summarize all variables.
2. Cost function formulation.

Stepwise multiple regression analysis (56) was employed to analyze the relationship between time and cost of informal care and predictor variables. Model assumptions and tests were also performed (57).

3. Sensitivity analysis.

To analyze uncertainty of the results due to sample data and methodological method, one-way sensitivity analysis (56, 57) was performed. The calculation was repeated when the following variables were varied.

- Opportunity cost: percentile at 25th and 75th of caregiver's wage.
- Replacement cost: range of wage rates (market prices) available in

Thailand.

CHAPTER IV

RESULTS

The results of this study consist of 7 parts as follows:

1. Selection of the samples
2. Characteristics of disabled persons and caregivers
3. Time spent of the informal caregivers
4. Opportunity cost and replacement cost of informal care
5. Cost function of the time spent
6. Sensitivity analysis
7. Variation of the informal care cost

1. Selection of the samples

A group of 608 stroke patients was drawn from the hospital databases. These were composed of 311 from the Burirum Hospital and 297 from the SNMRC. Status of these patients was checked. Five hundred and seven patients were excluded from the study due to death, recovery, migration, having fulltime formal helper, hospitalization and refusing the interview. One hundred and one disabled persons were included in analysis as shown in Table 2.

Table 2 Total participant who met selection criteria

Hospital	Patients from database	Excluded patients				Included patients ¹
		Dead	Recovered	Migrated	Hospitalized >1 week	
BH	311	157	83	21	1	49 ²
SNMRC	297	53	73	87	2	52 ³
Total	608	210	156	108	3	101

¹ This study used “disabled persons” instead of “patient”, when patient were met the selection criteria.

² Patients had registered address in Buriram Province

³ Patients had registered address in Bangkok, Nonthaburi and Pathumtani Province

2. Characteristics of disabled persons and caregivers

The disabled persons and caregivers included in the study were 101 and 149 persons, respectively. Proportions of both disabled persons and caregivers in Burirum and Bangkok were similar (Table 3). Rate of caregiver per disabled person in Burirum (1.54 persons) was slightly higher than that of Bangkok (1.44 persons). In Burirum, there was one disabled person who did not have a caregiver. The characteristics of disabled persons are shown in Table 4. Most of the disabled persons were male (52.48%). Average age was 66 years. They had mildly disability (33.66%), moderately disability (28.71%), very severely disability (20.79%) and severely disability (16.83%). In terms of family, more than half had extended family. The average family member was 4.55 persons. Most of them (81%) still had medical services from hospitals. Three-fourths also received rehabilitation care from the caregivers. For health insurance, most of disabled persons were under the Universal Health Coverage, UC (48.51%).

Regarding the caregivers (Table 5), average age was 46 years. Most of them were more than 15 years old. Twenty-six percent was 60 or more years old. Most caregivers were female (61.10%), either daughters (38.93%) or spouses (36.24%) of the disabled persons. Approximately half had regular work followed by pensioners (18%), unemployed (15%), housewife (7%) and student (5%). The majority of caregivers (80.41%) had no experience about care before giving care to the disabled persons. Sixty-four percent received suggestions from the hospitals. Regarding caregiving time, approximately half of the caregivers spent the time similar to the annual average time of previous year.

Table 3 Summary of disabled persons and caregivers

Setting	Disabled persons (%)	Caregiver (%)	Disabled persons : caregiver
Burirum ¹	49 (48.51)	74 (49.67)	1 : 1.51
Bangkok ²	52 (51.49)	75 (50.33)	1 : 1.44
Total	101 (100.00)	149 (100.00)	1 : 1.48

¹ In Burirum, one disabled person didn't have a caregiver.

² Refer to samples stayed in Bangkok, Nonthaburi and Pathumtani provinces

Table 4 Characteristics of disabled persons

Characteristics	Buirum (N = 49)		Bangkok (N = 52)		Total (N = 101)	
	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)
Sex						
male	23 (46.94)	n/a	30 (57.69)	n/a	53 (52.48)	n/a
female	26 (53.06)	n/a	22 (42.31)	n/a	48 (47.52)	n/a
Age (years)	49	68.20 (65.07 - 71.34)	52	63.63 (60.90 - 66.37)	101	65.85 (63.74 - 67.96)
Age level						
15 - less than 60 years old	7 (14.29)	n/a	15 (28.85)	n/a	22 (21.78)	n/a
60 years old and more	42 (85.71)	n/a	37 (71.15)	n/a	79 (78.22)	n/a
Barthel Index score	49	46.73 (37.89 - 55.49)	52	59.62 (52.83 - 66.40)	101	53.37 (47.75 - 58.98)
Disable level **						
Very severely disabled	15 (30.61)	n/a	6 (11.54)	n/a	21 (20.79)	n/a
Severely disabled	10 (20.41)	n/a	7 (13.46)	n/a	17 (16.83)	n/a
Moderately disabled	9 (18.37)	n/a	20 (38.46)	n/a	29 (28.71)	n/a
Mildly disabled	15 (30.61)	n/a	19 (36.54)	n/a	34 (33.66)	n/a

Table 4 Characteristics of disabled persons (cont.)

Characteristics	Buirum (N = 49)		Bangkok (N = 52)		Total (N = 101)	
	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)
Religion						
Buddhist	49 (100.00)	n/a	52 (100.00)	n/a	101 (100.00)	n/a
Occupancy before having stroke*						
Unemployed	1 (2.04)	n/a	0	-	1 (0.99)	n/a
Housewife	0	-	2 (3.85)	n/a	2 (1.98)	n/a
Agriculturist	20 (40.82)	n/a	0	-	20 (19.80)	n/a
Labour/employee	2 (4.08)	n/a	1 (1.92)	n/a	3 (2.97)	n/a
Government's officer	1 (2.04)	n/a	10 (19.23)	n/a	11 (10.89)	n/a
Private company's officer	0	-	3 (5.77)	n/a	3 (2.97)	n/a
Owner	0	-	4 (7.69)	n/a	4 (3.96)	n/a
Commerce	0	-	6 (11.54)	n/a	6 (5.94)	n/a
Retired age	24 (48.98)	n/a	26 (50.00)	n/a	50 (49.50)	n/a
Monk	1 (2.04)	n/a	0	-	1 (0.99)	n/a
Ability to work at time of interview						
No	48 (97.96)	n/a	49 (49.00)	n/a	97 (96.04)	n/a

Table 4 Characteristics of disabled persons (cont.)

Characteristics	Buirum (N = 49)		Bangkok (N = 52)		Total (N = 101)	
	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)
Yes	1 (2.04)	n/a	3 (3.00)	n/a	4 (3.96)	n/a
Occupancy at time of interview						
Government's officer	0 -		1 (33.33)	n/a	1 (25.00)	n/a
Owner	0 -		1 (33.33)	n/a	1 (25.00)	n/a
Commerce	1 (100.00)	n/a	1 (33.33)	n/a	2 (50.00)	n/a
Income by occupation (Bath/month)	1 3,000.00 (-)		3 11,500.00 (-54.03 – 23,054.03)		4 9,375.00 (204.67 – 18,545.33)	
Stroke's period (year)	49 3.32 (2.95 – 3.69)		52 2.91 (2.49 – 3.33)		101 3.11 (2.83 – 3.39)	
Number of disease (disease)	37 1.68 (1.34 – 2.01)		47 1.91 (1.64 – 2.19)		84 1.81 (1.60 – 2.02)	
Comorbidity ^(a)						
Diabetes	11 (29.73)	n/a	19 (40.43)	n/a	30 (35.71)	n/a
Hypertension	28 (75.68)	n/a	35 (74.47)	n/a	63 (75.00)	n/a
Hyperlipidemia	5 (13.51)	n/a	20 (42.55)	n/a	25 (29.76)	n/a
Heart disease	8 (21.62)	n/a	7 (14.89)	n/a	15 (17.86)	n/a
Asthma	1 (2.70)	n/a	1 (2.13)	n/a	2 (2.38)	n/a
Gout	2 (5.41)	n/a	2 (4.26)	n/a	4 (4.76)	n/a

Table 4 Characteristics of disabled persons (cont.)

Characteristics	Buirum (N = 49)		Bangkok (N = 52)		Total (N = 101)	
	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)
Renal failure	2 (5.41)	n/a	0 -		2 (2.38)	n/a
Psychosis	1 (2.70)	n/a	1 (2.13)	n/a	2 (2.38)	n/a
Epilepsy	2 (5.41)	n/a	4 (8.51)	n/a	6 (7.14)	n/a
Other	2 (5.41)	n/a	1 (2.13)	n/a	3 (3.57)	n/a
Number of family member (person)	49	4.16 (3.67 - 4.65)	52	4.92 (4.23 - 5.62)	101	4.55 (4.12 - 4.99)
Number of caregiver (person)	48 ¹	1.54 (1.35 - 1.73)	52	1.44 (1.28 - 1.61)	100	1.49 (1.36 - 1.62)
Family type						
Singled family	17 (34.69)	n/a	26 (50.00)	n/a	43 (42.57)	n/a
Extended family	32 (65.31)	n/a	26 (50.00)	n/a	58 (57.43)	n/a
Community type*						
Urban	9 (18.37)	n/a	51 (98.08)	n/a	60 (59.41)	n/a
Rural	40 (81.63)	n/a	1 (1.92)	n/a	41 (40.59)	n/a
Insurance*						
Government	7 (14.29)	n/a	27 (51.92)	n/a	34 (33.67)	n/a
Universal coverage	39 (79.59)	n/a	10 (19.23)	n/a	49 (48.51)	n/a

Table 4 Characteristics of disabled persons (cont.)

Characteristics	Buirum (N = 49)		Bangkok (N = 52)		Total (N = 101)		
	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)	
Social Security Scheme	0	-	3	(5.77)	3	(2.97)	n/a
Out of pocket	3	(6.12)	12	(23.08)	15	(14.85)	n/a
The disabled persons currently have a care from hospitals**							
No	14	(28.57)	5	(9.62)	19	(18.81)	n/a
Yes	35	(71.73)	47	(90.38)	82	(81.19)	n/a
Periodical of stop treatment (month)	14	22.86 (16.06 - 29.66)	5	18.80 (5.93 - 31.67)	19	21.79 (15.87 - 27.70)	
Frequency for visit the doctor (week)	35	6.40 (5.54 - 7.26)	47	6.77 (5.49 - 8.05)	82	6.61 (5.79 - 7.43)	
Rehabilitation** (a)							
Hospital's Physical therapist	0	-	20	(46.51)	20	(31.25)	n/a
Home's Physical therapist	0	-	5	(11.63)	5	(7.81)	n/a
Caregiver at home	15	(71.43)	34	(79.07)	49	(76.56)	n/a
Do it by yourself	6	(28.57)	1	(2.33)	7	(10.94)	n/a
Traditional therapy (a)							
Folk healers	3	(37.50)	12	(52.17)	15	(48.39)	n/a
Herbal medicine	5	(62.50)	11	(47.83)	16	(51.61)	n/a

Table 4 Characteristics of disabled persons (cont.)

Characteristics	Buirum (N = 49)		Bangkok (N = 52)		Total (N = 101)	
	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)
Acupuncture	1 (12.50)	n/a	8 (34.78)	n/a	9 (29.03)	n/a
Registering for disabled law						
No	28 (57.14)	n/a	38 (73.08)	n/a	66 (65.35)	n/a
Yes	21 (42.86)	n/a	14 (26.92)	n/a	35 (34.65)	n/a
The institute, where give the assistance ^(a)						
Social services	0	-	2 (33.33)	n/a	2 (4.44)	n/a
Sub-district Administrative Organization	27 (79.41)	n/a	0	-	27 (60.00)	n/a
Sub-district Municipality	1 (2.94)	n/a	0	-	1 (2.22)	n/a
Disabled foundation	0	-	1 (16.67)	n/a	1 (2.22)	n/a
Hospital	8 (23.53)	n/a	4 (66.67)	n/a	12 (26.67)	n/a
Social Security Office	0	-	1 (16.67)	n/a	1 (2.22)	n/a
Other	1 (2.94)	n/a	0	-	1 (2.22)	n/a
Type of social welfare ^(a)						
Elderly allowance	16 (47.06)	n/a	0	-	16 (40.00)	n/a

Table 4 Characteristics of disabled persons (cont.)

Characteristics	Buirum (N = 49)		Bangkok (N = 52)		Total (N = 101)	
	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)
Disabled allowance	7 (20.59)	n/a	2 (33.33)	n/a	9 (22.50)	n/a
Wheel chair	8 (23.53)	n/a	4 (66.67)	n/a	12 (30.00)	n/a
Food	3 (8.82)	n/a	0	-	3 (7.50)	n/a
Elderly and Disabled allowance	1 (2.94)	n/a	0	-	1 (2.50)	n/a
Other	2 (5.88)	n/a	2 (33.33)	n/a	4 (10.00)	n/a
Financial support*						
No	23 (46.94)	n/a	49 (94.23)	n/a	72 (71.29)	n/a
Once time	3 (6.12)	n/a	0	-	3 (2.97)	n/a
Continuity	23 (46.94)	n/a	3 (5.77)	n/a	26 (25.74)	n/a
Valuation of once time finance(Baht)	3 (794.21 - 3,072.46)	1,933.33	0	-	3 (794.21 - 3,072.46)	1,933.33
Valuation of continuity finance (Baht/month)	23 (261.10 - 361.37)	311.23	3 (-403.92 - 2,870.58)	1,233.33	26 (217.54 - 617.72)	417.63
Health care worker**						
No	49 (100.00)	n/a	43 (82.69)	n/a	92 (91.09)	n/a
Yes	0	-	9 (17.31)	n/a	9 (8.91)	n/a

Table 4 Characteristics of disabled persons (cont.)

Characteristics	Buirum (N = 49)		Bangkok (N = 52)		Total (N = 101)	
	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)
Wage rate of health care worker (Baht/month)	0	-	9	7,000.00 (5,868.39 - 8,131.61)	9	7,000.00 (5,868.39 - 8,131.61)
Servant**						
No	49	(100.00)	44	(84.62)	93	(92.08)
Yes	0	-	8	(15.38)	8	(7.92)
Wage rate of servant (Baht/month)	0	-	8 ²	4,550.00 (2,871.28 - 6,228.72)	8	4,550.00 (2,871.28 - 6,228.72)
The servant will take care disabled persons						
No	0	-	5	(62.50)	5	(62.50)
Yes	0	-	3	(37.50)	3	(37.50)
The servant will got more wage for take care disabled persons						
No	0	-	3	(100.00)	3	(100.00)
Yes	0	-	0	-	0	-
Government team visit at home**						
No	28	(57.14)	41	(78.85)	69	(68.32)
Within 3 months	6	(12.24)	2	(3.84)	8	(7.92)

Table 4 Characteristics of disabled persons (cont.)

Characteristics	Buirum (N = 49)		Bangkok (N = 52)		Total (N = 101)	
	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)
More than 3 month	15 (30.62)	n/a	9 (17.31)	n/a	24 (23.76)	n/a
Private team visit at home						
No	49 (100.00)	n/a	51 (98.08)	n/a	100 (99.01)	n/a
Within 3 months	0 -		0 -		0 -	
More than 3 months	0 -		1 (1.92)	n/a	1 (0.99)	n/a

¹ In part of Buirum1, one disabled person didn't have a caregiver.

² Wage rate of servant have both of temporary and monthly

a = able to answer more than 1 item

n/a = not applicable

* Chi-square test, Significant difference less than 0.001

** Chi-square test, Significant difference less than 0.05

Table 5 Characteristics of informal caregivers

Characteristics	Buirum (N = 74)		Bangkok (N = 75)		Total (N = 149)	
	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)
Sex						
Male	26 (35.14)	n/a	20 (26.67)	n/a	46 (30.90)	n/a
Female	48 (64.86)	n/a	55 (73.33)	n/a	103 (61.10)	n/a
Age (year)	74	46.24 (42.39 - 50.10)	75	46.48 (42.81 - 50.15)	149	46.36 (43.71 - 49.01)
Age level						
15 - less than 60 years old	56 (75.68)	n/a	54 (72.00)	n/a	110 (74.00)	n/a
60 years old and more	18 (24.32)	n/a	21 (28.00)	n/a	39 (26.00)	n/a
Religion						
Buddhist	74 (100.00)	n/a	75 (100.00)	n/a	149 (100.00)	n/a
Marital status						
Single	14 (18.92)	n/a	22 (29.33)	n/a	36 (24.16)	n/a
Married	59 (79.73)	n/a	52 (69.34)	n/a	111 (74.49)	n/a
Divorced/Widow	1 (1.35)	n/a	1 (1.33)	n/a	2 (1.342)	n/a
Education*						

Table 5 Characteristics of informal caregivers (cont.)

Characteristics	Buirum (N = 74)		Bangkok (N = 75)		Total (N = 149)	
	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)
Never go to school	5 (6.76)	n/a	2 (2.67)	n/a	7 (4.70)	n/a
Primary school	52 (70.27)	n/a	17 (22.67)	n/a	69 (46.30)	n/a
Secondary school	9 (12.16)	n/a	13 (17.33)	n/a	22 (14.77)	n/a
Certificate	4 (5.41)	n/a	16 (21.33)	n/a	20 (13.42)	n/a
Bachelor degree	3 (4.05)	n/a	23 (30.67)	n/a	26 (17.45)	n/a
Master degree or higher	1 (1.35)	n/a	4 (5.33)	n/a	5 (3.36)	n/a
Occupation*						
Unemployed	12 (16.22)	n/a	10 (13.33)	n/a	22 (14.77)	n/a
Housewife	1 (1.35)	n/a	10 (13.33)	n/a	11 (7.38)	n/a
Agriculturist	32 (43.24)	n/a	0	-	32 (21.48)	n/a
Labour/employee	7 (9.46)	n/a	2 (2.67)	n/a	9 (6.04)	n/a
Student	4 (5.41)	n/a	4 (5.33)	n/a	8 (5.37)	n/a
Government's officer	1 (1.35)	n/a	6 (8.00)	n/a	7 (4.70)	n/a
Private company's officer	1 (1.35)	n/a	11 (14.67)	n/a	12 (8.05)	n/a
Owner	0	-	8 (10.67)	n/a	8 (5.37)	n/a
Commerce	7 (9.46)	n/a	6 (8.00)	n/a	13 (8.72)	n/a
Retired age	9 (12.16)	n/a	18 (24.00)	n/a	27 (18.12)	n/a

Table 5 Characteristics of informal caregivers (cont.)

Characteristics	Buirum (N = 74)		Bangkok (N = 75)		Total (N = 149)	
	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)
Income (Bath/month)	48	6,609.98 (490.43 - 12,729.53)	40	21,708.83 (15,106.05 - 28,311.62)	88	13,473.10 (8,776.02 - 18,170.17)
Relationship to disabled persons**						
Father/Mother	1 (1.35)	n/a	1 (1.33)	n/a	2 (1.34)	n/a
Husband/wife	23 (31.08)	n/a	31 (41.33)	n/a	54 (36.24)	n/a
Son/daughter	27 (36.49)	n/a	31 (41.33)	n/a	58 (38.93)	n/a
Male in law	11 (14.86)	n/a	1 (1.33)	n/a	12 (8.05)	n/a
Brother/Sister	2 (2.70)	n/a	5 (6.67)	n/a	7 (4.70)	n/a
Grandson	8 (10.81)	n/a	5 (6.67)	n/a	13 (8.72)	n/a
Friend/Neighbors	2 (2.70)	n/a	1 (1.33)	n/a	3 (2.01)	n/a
Dwelling						
Same house	68 (91.90)	n/a	65 (86.67)	n/a	133 (89.26)	n/a
Another house	6 (8.10)	n/a	10 (13.33)	n/a	16 (10.74)	n/a
Type of travel (if another house)						
By walking	6 (100.00)	n/a	4 (40.00)	n/a	10 (62.50)	n/a
By driving	0 -		3 (30.00)	n/a	3 (18.75)	n/a

Table 5 Characteristics of informal caregivers (cont.)

Characteristics	Buirum (N = 74)		Bangkok (N = 75)		Total (N = 149)	
	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)
By bus	0	-	3 (30.00)	n/a	3 (18.75)	n/a
Travel time (minute/visit)	6	12.33 (7.23 - 17.44)	9 ¹	78.44 (26.97 - 129.92)	15	52.00 (17.36 - 86.64)
Travel expense (Baht/month)	0		3	124.67 (-5.47 - 254.80)	3	124.67 (-5.47 - 254.80)
Experience of care						
No	56 (75.68)	n/a	63 ¹	(85.14)	119	(80.41) n/a
Yes	18 (24.32)	n/a	11 (14.86)	n/a	29	(19.59) n/a
Training of care**						
No	36 (48.65)	n/a	17 ¹	(22.97)	53	(35.81) n/a
Yes	38 (51.35)	n/a	57 (77.03)	n/a	95	(64.19) n/a
Periodical of care (years)	74	3.16 (2.86 - 3.45)	75	2.80 (2.44 - 3.17)	149	2.98 (2.74 - 3.22)
The change of the informal care time						
Same time	28 (37.84)	n/a	40 ¹	(54.05)	68	(45.95) n/a

Table 5 Characteristics of informal caregivers (cont.)

Characteristics	Buirum (N = 74)		Bangkok (N = 75)		Total (N = 149)	
	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)	No. (%)	mean (95% CI)
More time	21 (28.38)	n/a	10 (13.51)	n/a	31 (20.95)	n/a
Less time	25 (33.78)	n/a	24 (32.43)	n/a	49 (33.10)	n/a
Change proportion of the time take care (%)						
Increase	20 ¹	86.00 (77.13 - 94.70)	10	54.00 (41.20 - 66.80)	30	75.33 (66.38 - 84.28)
Decrease	25	51.40 (44.21 - 58.59)	24	55.20 (48.81 - 61.60)	49	53.27 (48.46 - 58.07)

¹missing 1 case

n/a = not applicable

* Chi-square test, Significant difference less than 0.001

** Chi-square test, Significant difference less than 0.05

3. Time spent of informal caregivers

The quantity of informal care time was shown into 2 types – 1. Average time among the persons actually received the care. 2. Average time among the total disabled persons.

The informal care time among the persons actually received the care is shown in Table 6. Focusing on the whole sample group, the average informal care time of the total disabled persons is shown in Table 7. The disabled person received the informal care accounted for 94.55 hours per month. Most of the time was for ADL tasks (38.13 hours/month) followed by HDL tasks (29.24 hours/month). When compared between the settings, the disabled persons in Bangkok had more informal care time than those of Burirum (96.70 hours/month and 92.21 hours/month, respectively). In Bangkok, most of the time was for HCA tasks followed by ADL tasks (39.16 hours/month and 39.13 hours/month, respectively). Whereas in Burirum, most of the time was for HDL tasks followed by ADL tasks (44.74 hours/month and 37.05 hours/month, respectively).

Types of time of the informal care time are shown in Table 8. Most of the time spent (38.74%) was from the unpaid work time of the caregivers (36.63 hours/month). Comparing between the settings, caregivers in Bangkok provided most of the care (42.56%) from leisure time (41.15 hours/month), whereas those of Burirum were paid work time (38.9 hours/month).

To calculate annual cost, average monthly time spent of the previous year was estimated by adjusting the time from the one-month recall interview. The results are shown in Table 9. The average time spent was 89.43 hours/month. This was less than that of the one-month recall interview.

Table 6 Average informal care time among the persons actually received the care

Time (hour/month)	Buriram			Bangkok			Total		
	No.	Median	Mean (95% CI)	No.	Median	Mean (95% CI)	No.	Median	Mean (95% CI)
Household activities of Daily living (HDL)									
House cleaning	12	11.50	18.33 (8.14 - 28.53)	9	15.00	17.22 (5.35 - 29.10)	21	15.00	17.86 (10.31 - 25.40)
Food preparation	23	45.00	50.87 (37.45 - 64.29)	12	20.63	21.55 (10.87 - 32.23)	35	30.00	40.82 (30.27 - 51.36)
Dish washing	8	8.75	10.31 (4.57 - 16.05)	8	10.00	15.49 (2.23 - 28.75)	16	10.00	12.90 (5.80 - 20.00)
Laundry, ironing	16	20.00	21.40 (14.10 - 28.69)	13	15.00	14.73 (9.03 - 20.43)	29	15.00	18.41 (13.56 - 23.25)
Chores, gardening	7	12.00	21.81 (6.99 - 36.63)	4	4.00	6.25 (0.46 - 12.04)	11	12.00	16.15 (5.71 - 26.59)
Shopping	0		-	4	3.00	5.50 (-0.78 - 11.78)	4	3.00	5.50 (-0.78 - 11.78)
Child care	2	90.00	90.00 (31.20 - 148.80)	0		-	2	90.00	90.00 (31.20 - 148.80)
Total HDL	32	58.75	67.11(45.73 - 88.49)	17	33.00	45.65 (26.56 - 64.73)	49	39.83	59.66 (44.07 - 75.26)
Health care activities (HCA)									
Medication supervision	20	3.00	4.86 (2.12 - 7.61)	39	3.75	4.83 (3.11 - 6.56)	59	3.00	4.84 (3.39 - 6.30)
Rehabilitation	16	5.00	8.38 (3.70 - 13.05)	31	12.00	16.20 (10.52 - 21.87)	47	10.00	13.54 (9.36 - 17.71)
Contacting doctor	33	4.00	3.69 (2.81 - 4.57)	46	2.33	8.52 (2.55 - 14.49)	79	3.00	6.50 (2.98 - 10.02)
Home adaptations	1	28.00	28 (-)	12	8.00	79.46 (-5.31 - 164.22)	13	8.00	75.50 (-2.86 - 153.86)

Table 6 Average informal care time among the persons actually received the care (cont.)

Time (hour/month)	Buriram			Bangkok			Total		
	No.	Median	Mean (95% CI)	No.	Median	Mean (95% CI)	No.	Median	Mean (95% CI)
Total HCA	39	7.00	9.77 (6.04 - 13.51)	50	12.21	40.72 (17.08 - 64.36)	89	8.00	27.16 (13.46 - 40.86)
Activities of daily living (ADL)									
Eating	11	30.00	41.59 (20.58 - 62.60)	7	15.00	20.93 (10.62 - 31.23)	18	27.50	33.56 (19.55 - 47.56)
Bathing	37	10.00	15.48 (11.21 - 19.76)	43	15.00	15.52 (12.59 - 18.45)	80	15.00	15.50 (12.99 - 18.02)
Toilet	37	7.50	17.92 (9.29 - 26.55)	36	10.00	20.14 (8.97 - 31.31)	73	10.00	19.02 (12.03 - 26.00)
Moving	11	3.00	7.72 (1.15 - 14.29)	19	10.00	26.10 (7.58 - 44.61)	30	5.00	19.36 (7.08 - 31.63)
Total ADL	39	34.00	45.60 (30.98 - 60.23)	46	25.42	44.23 (30.68 - 57.79)	85	30.00	44.86 (34.98 - 54.74)
Instrumental activities of daily living (IADL)									
Visiting and in excursions	21	1.00	2.31 (1.13 - 3.49)	13	1.00	4.96 (-0.09 - 10.01)	34	1.00	3.32 (1.26 - 5.39)
Traveling outside the house	5	2.00	14.15 (-8.48 - 36.78)	20	4.00	5.86 (3.65 - 8.07)	25	4.00	7.52 (2.84 - 12.20)
Other	0		-	0		-	0		-
Total IADL	23	1.00	5.19 (0.11 - 10.27)	28	4.00	6.49 (3.77 - 9.21)	51	2.50	5.90 (3.19 - 8.61)
Total time	48	80.50	92.21 (68.77 - 115.66)	52	68.17	96.70 (67.41 - 126.00)	100	71.58	94.55 (75.70 - 113.40)

Table 7 Average informal care time among the total disabled persons

Time (hour/month)	Buriram (N = 48)		Bangkok (N = 52)		Total (N = 100)	
	Median	Mean (95% CI)	Median	Mean (95% CI)	Median	Mean (95% CI)
Household activities of Daily living (HDL)						
House cleaning	0.00	4.58 (1.23 - 7.94)	0.00	2.98 (0.33 - 5.63)	0.00	3.75 (1.64 - 5.86)
Food preparation	0.00	24.38 (14.72 - 34.03)	0.00	4.97 (1.53 - 8.42)	0.00	14.29 (8.99 - 19.58)
Dish washing	0.00	1.72 (0.30 - 3.14)	0.00	2.38 (-0.08 - 4.85)	0.00	2.06 (0.62 - 3.51)
Laundry, ironing	0.00	7.13 (3.39 - 10.87)	0.00	3.68 (1.45 - 5.91)	0.00	5.34 (3.19 - 7.49)
Chores, gardening	0.00	3.18 (0.19 - 6.17)	0.00	0.48 (-0.12 - 1.08)	0.00	1.78 (0.29 - 3.26)
Shopping	0.00	-	0.00	0.42 (-0.16 - 1.01)	0.00	0.22 (-0.08 - 0.52)
Child care	0.00	3.75 (-1.68 - 9.18)	0.00	-	0.00	1.8 (-0.82 - 4.42)
Total HDL	22.17	44.74 (27.93 - 61.55)	0.00	14.92 (6.44 - 23.40)	0.00	29.24 (19.63 - 38.84)
Health care activities (HCA)						
Medication supervision	0.00	2.03 (0.71 - 3.34)	2.50	3.63 (2.21 - 5.04)	1.00	2.86 (1.88 - 3.84)
Rehabilitation	0.00	2.79 (0.90 - 4.69)	2.38	9.66 (5.65 - 13.66)	0.00	6.36 (4.00 - 8.72)
Contacting doctor	2.00	2.54 (1.76 - 3.32)	2.00	7.54 (2.21 - 12.86)	2.00	5.14 (2.31 - 7.96)
Home adaptations	0.00	0.58 (-0.56 - 1.73)	0.00	18.34 (-2.69 - 39.36)	0.00	9.82 (-1.22 - 20.85)
Total HCA	4.75	7.94 (4.72 - 11.16)	10.98	39.16 (16.33 - 61.98)	7.84	24.17 (11.87 - 36.47)

Table 7 Average informal care time among the total disabled persons (cont.)

Time (hour/month)	Buriram (N = 48)		Bangkok (N = 52)		Total (N = 100)	
	Median	Mean (95% CI)	Median	Mean (95% CI)	Median	Mean (95% CI)
Activities of daily living (ADL)						
Eating	0.00	9.53 (2.71 - 16.35)	0.00	2.82 (0.47 - 5.17)	0.00	6.04 (2.50 - 9.58)
Bathing	7.50	11.94 (8.16 - 15.71)	10.00	12.83 (9.93 - 15.74)	10.00	12.40 (10.05 - 14.75)
Toilet	5.00	13.81 (6.84 - 20.78)	6.25	13.94 (5.83 - 22.05)	5.00	13.88 (8.53 - 19.24)
Moving	0.00	1.77 (0.05 - 3.49)	0.00	9.54 (2.04 - 17.03)	0.00	5.81 (1.77 - 9.84)
Total ADL	18.38	37.05 (24.15 - 49.95)	23.50	39.13 (26.54 - 51.72)	22.00	38.13 (29.16 - 47.10)
Instrumental activities of daily living (IADL)						
Visiting and in excursions	0.00	1.01 (0.40 - 1.62)	0.00	1.24 (-0.12 - 2.60)	0.00	1.13 (0.37 - 1.89)
Traveling outside the house	0.00	1.47 (-0.99 - 3.94)	0.00	2.25 (1.11 - 3.40)	0.00	1.88 (0.56 - 3.20)
Other	0.00		0.00		0.00	
Total IADL	0.00	2.48 (-0.03 - 5.00)	0.33	3.50 (1.79 - 5.20)	0.05	3.01 (1.52 - 4.50)
Total time	80.50	92.21 (68.77 - 115.66)	68.17	96.70 (67.41 - 126.00)	71.58	94.55 (75.70 - 113.40)

Table 8 Types of informal care time

Time (hour/month)	Buriram			Bangkok			Total					
	Paid work (%)	Unpaid work (%)	Leisure time (%)	Total (%)	Paid work (%)	Unpaid work (%)	Leisure time (%)	Total (%)	Paid work (%)	Unpaid work (%)	Leisure time (%)	Total (%)
HDL	18.83 (42.09)	17.3 (38.67)	8.61 (19.24)	44.74 (100.00)	1.44 (9.68)	4.73 (31.70)	8.74 (58.60)	14.92 (100.00)	9.79 (33.49)	10.77 (36.82)	8.68 (29.68)	29.23 (100.00)
HCA	4.34 (54.66)	2.97 (37.41)	0.63 (7.93)	7.94 (100.00)	12.84 (32.80)	14.77 (37.72)	11.55 (29.49)	39.15 (100.00)	8.77 (36.29)	9.09 (37.63)	6.30 (26.08)	24.17 (100.00)
ADL	14.96 (40.39)	15.35 (41.44)	6.73 (18.17)	37.04 (100.00)	4.37 (11.17)	14.82 (37.87)	19.94 (50.95)	39.13 (100.00)	9.46 (24.80)	15.08 (39.54)	13.60 (35.66)	38.13 (100.00)
IADL	0.78 (31.31)	1.70 (68.18)	0.01 (0.51)	2.49 (100.00)	0.55 (15.62)	2.11 (60.66)	0.84 (23.89)	3.50 (100.00)	0.67 (22.19)	1.92 (63.84)	0.42 (13.97)	3.01 (100.00)
Total	38.93 (42.22)	37.14 (40.28)	16.14 (17.50)	92.21 (100.00)	19.38 (20.04)	36.17 (37.41)	41.15 (42.56)	96.69 (100.00)	28.77 (30.43)	36.63 (38.74)	29.15 (30.83)	94.54 (100.00)

Table 9 Adjusted average monthly time of informal care of the previous year

Time (hour/month)	Buriram (N = 48)		Bangkok (N = 52)		Total (N = 100)	
	Median	Mean (95% CI)	Median	Mean (95% CI)	Median	Mean (95% CI)
HDL	23.25	36.62 (23.77 - 49.46)	0.00	12.50 (5.03 -19.97)	0.00	24.08 (16.45 - 31.71)
HCA	3.08	8.14 (4.23 - 12.05)	10.19	34.08 (12.28 -55.88)	6.56	21.63 (9.91 - 33.35)
ADL	12.50	49.39 (27.28 - 71.50)	19.00	32.94 (21.30 -44.58)	17.75	40.83 (28.57 - 53.09)
IADL	0.00	2.45 (-0.06 - 4.96)	0.33	3.29 (1.48 -5.11)	0.05	2.89 (1.36 - 4.41)
Total	57.63	96.59 (64.43 - 128.75)	45.65	82.82 (55.33 -110.30)	51.71	89.43 (68.46 - 110.40)

4. Opportunity cost and replacement cost of informal care

Time spent for informal care was valued according to opportunity cost and replacement cost. For opportunity cost, it was calculated from both productivity cost and time cost. In terms of time cost, it was calculated from different wage rates. The type 1 used real income. Type 2 used national minimum wage rate. Type 3 used Gross Domestic Product per capita.

The average monthly of productivity cost, time cost type1 (conservative estimation of opportunity cost) and replacement cost was 4,031.87 baht, 4,642.55 baht and 3,943.95 baht, respectively. Those of Bangkok were higher than those of Buriram (Table 10). Among types of time cost, type-one cost was highest (4,642.87 baht) followed by that of type 3 (4,491.07 baht) and that of type 2 (1,815.20 baht, respectively (Table 11).

The costs according to disability levels and settings are presented in Table 12. Costs for very severely disabled persons were highest only for calculations based on type 1 and type 2 time costs. Costs of informal care were not positively related to level of disability.

Table 10 Cost of informal care according to activity and setting

Activity	Productivity cost (Bath/month)		Time cost 1 (Bath/month)		Replacement cost (Bath/month)	
	Median	Mean (95% CI)	Median	Mean (95% CI)	Median	Mean (95% CI)
Burirum (n = 48)						
HDL	138.59	1,251.67 (163.42 - 2,339.91)	270.00	1,382.92 (285.31 - 2,480.53)	390.10	787.35 (491.44 - 1,083.27)
HCA	41.44	314.44 (-100.61 - 729.48)	62.57	346.69 (-67.96 - 761.33)	111.56	186.46 (110.87 - 262.04)
ADL	213.19	709.89 (161.74 - 1,258.03)	266.93	786.51 (242.21 - 1,330.81)	431.55	870.16 (567.21 - 1,173.11)
IADL	0.00	1,008.97 (-920.21 - 2,938.15)	0.00	1,012.85 (-916.18 - 2,941.87)	0.00	43.73 (-0.58 - 88.03)
Total Burirum	602.96	3,284.96 (-135.27 - 6,705.19)	981.98	3,528.96 (115.15 - 6,942.77)	1,737.75	1,887.69 (1,415.75 - 2,359.64)
Bangkok (n = 52)						
HDL	0.00	857.81 (144.82 - 1,570.80)	0.00	970.76 (248.08 - 1,693.44)	0.00	376.77 (156.62 - 596.93)
HCA	460.07	1,321.69 (757.89 - 1,885.49)	703.13	1,587.89 (936.49 - 2,239.30)	806.33	2,703.50 (1,040.67 - 4,366.34)

Table 10 Cost of informal care according to activity and setting (cont.)

Activity	Productivity cost (Bath/month)		Time cost 1 (Bath/month)		Replacement cost (Bath/month)	
	Median	Mean (95% CI)	Median	Mean (95% CI)	Median	Mean (95% CI)
ADL	467.42	2,392.31 (630.91 - 4,153.70)	764.38	2,916.54 (1,122.88 - 4,710.19)	1,456.75	2,674.38 (1,788.96 - 3,559.80)
IADL	0.00	149.52 (40.97 - 258.07)	22.90	195.30 (81.69 - 308.91)	8.14	87.37 (43.49 - 131.24)
Total Bangkok	2,074.4 1	4,721.33 (2,470.56 - 6,972.10)	2,820.94	5,670.48 (3,429.40 - 7,911.57)	2,615.85	5,842.03 (3,744.47 - 7,939.58)
Total (n = 100)						
HDL	0.00	1,046.86 (408.47 - 1,685.26)	0.00	1,168.60 (523.55 - 1,813.64)	0.00	573.85 (387.92 - 759.78)
HCA	118.99	838.21 (471.83 - 1,204.59)	197.47	992.11 (582.55 - 1,401.71)	270.58	1,495.32 (599.02 - 2,391.62)
ADL	284.38	1,584.74 (621.95 - 2,547.54)	536.04	1,894.12 (907.58 - 2,880.67)	966.53	1,808.35 (1,296.06 - 2,320.65)
IADL	0.00	562.06 (-364.45 - 1,488.56)	0.86	587.72 (-338.51 - 1,513.95)	0.86	66.42 (35.09 - 97.74)
Total cost	945.98	4,031.87 (2,021.21 - 6,042.53)	1,627.09	4,642.55 (2,631.20 - 6,653.91)	2,009.02	3,943.95 (2,768.87 - 5,119.02)

Table 11 Comparison of the time cost according to activity and setting

Activity	Time cost 1 (Bath/month)		Time cost 2 (Bath/month)		Time cost 3 (Bath/month)	
	Median	Mean (95% CI)	Median	Mean (95% CI)	Median	Mean (95% CI)
Buriram						
HDL	270.00	1,382.92 (285.31 - 2,480.53)	425.57	858.93 (536.12 - 1,181.75)	1,052.92	2,125.13 (1,326.44 - 2,923.82)
HCA	62.57	346.69 (-67.96 - 761.33)	91.19	152.42 (90.63 - 214.21)	225.63	377.11 (224.24 - 529.99)
ADL	266.93	786.51 (242.21 - 1,330.81)	352.77	711.32 (463.67 - 958.96)	872.81	1,759.90 (1,147.18 - 2,372.61)
IADL	0.00	1,012.85 (-916.18 - 2,941.87)	0.00	47.70 (-0.63 - 96.03)	0.00	118.02 (-1.55 - 237.60)
Total Buriram	981.98	3,528.96 (115.15 - 6,942.77)	1,545.48	1,770.37 (1,320.32 - 2,220.43)	3,823.75	4,380.16 (3,266.66 - 5,493.67)
Bangkok						
HDL	0.00	970.76 (248.08 - 1,693.44)	0.00	286.50 (123.71 - 449.29)	0.00	708.85 (306.07 - 1,111.62)
HCA	703.13	1,587.89 (936.49 - 2,239.30)	210.70	751.74 (313.56 - 1,189.92)	521.31	1,859.91 (775.80 - 2,944.03)
ADL	764.38	2,916.54 (1,122.88 - 4,710.19)	451.17	751.23 (509.56 - 992.91)	1,116.25	1,858.67 (1,260.71 - 2,456.62)

Table 11 Comparison of the time cost according to activity and setting (cont.)

Activity	Time cost 1 (Bath/month)		Time cost 2 (Bath/month)		Time cost 3 (Bath/month)	
	Median	Mean (95% CI)	Median	Mean (95% CI)	Median	Mean (95% CI)
IADL	22.90	195.30 (81.69 - 308.91)	6.40	67.10 (34.46 - 99.75)	15.83	166.02 (85.25 - 246.80)
Total Bangkok	2,820.94	5,670.48 (3,429.40 - 7,911.57)	1,308.70	1,856.58 (1,294.23 - 2,418.92)	3,237.92	4,593.45 (3,202.12 - 5,984.77)
Total						
HDL	0.00	1,168.60 (523.55 - 1,813.64)	0.00	561.27 (376.82 - 745.71)	0.00	1,388.66 (932.32 - 1,845.01)
HCA	197.47	992.11 (582.55 - 1,401.71)	150.39	464.07 (227.89 - 700.25)	372.09	1,148.17 (563.82 - 1,732.52)
ADL	536.04	1,894.12 (907.58 - 2,880.67)	422.37	732.07 (559.92 - 904.23)	1,045.00	1,811.26 (1,385.32 - 2,237.20)
IADL	0.86	587.72 (-338.51 - 1,513.95)	0.94	57.79 (29.13 - 86.45)	2.31	142.98 (72.07 - 213.89)
Total	1,627.09	4,642.55 (2,631.20 - 6,653.91)	1,374.30	1,815.20 (1,453.34 - 2,177.06)	3,400.21	4,491.07 (3,595.78 - 5,386.36)

Table 12 Comparison of the informal care cost according to disability level and setting

Cost (Baht/month)	Very severely disabled			Severely disabled			Moderately disabled			Mildly disabled		
	Median	Mean (95% CI)	Mean (95% CI)	Median	Mean (95% CI)	Mean (95% CI)	Median	Mean (95% CI)	Mean (95% CI)	Median	Mean (95% CI)	Mean (95% CI)
Buriram												
Productivity cost	918.00	2,972.57 (-458.16 - 6403.29)	1,540.25 (851.51 - 2,228.98)	1,654.36	1,563.35 (895.49 - 2,231.20)	377.60	801.16 (268.17 - 1,334.16)	369.43	6,462.62 (-4,773.34 - 17,698.58)	369.43	6,532.05 (-4,693.11 - 17,757.21)	6,462.62 (-4,773.34 - 17,698.58)
Time cost type1	1,494.00	(-32.25 - 6,740.18)	1,809.81	1,654.36	1,584.77	618.06	1,584.77	369.43	1,072.26	369.43	1,072.26	1,072.26
Time cost type2	1,663.87	(1,577.07 - 3,436.97)	1,983.85	1,983.85	4,477.73 (1,134.99 - 2,484.63)	1,107.12	3,920.95 (325.39 - 2,844.14)	703.15	2,652.93 (491.27 - 1,653.25)	703.15	2,652.93 (491.27 - 1,653.25)	2,652.93 (491.27 - 1,653.25)
Time cost type3	4,116.67	(3,901.90 - 8,503.57)	4,908.33	4,908.33	1,932.59 (2,808.13 - 6,147.33)	2,739.17	1,580.25 (805.07 - 7,036.82)	1,739.69	1,080.53 (1,215.48 - 4,090.39)	1,739.69	1,080.53 (1,215.48 - 4,090.39)	1,080.53 (1,215.48 - 4,090.39)
Replacement cost	1,949.30	(1,790.53 - 3,800.65)	1,984.83	1,984.83	1,229.02 (1,229.02 - 2,636.15)	1,176.75	395.01 (395.01 - 2,765.50)	789.53	512.23 (512.23 - 1,648.83)	789.53	512.23 (512.23 - 1,648.83)	512.23 (512.23 - 1,648.83)
Bangkok												
Productivity cost	3,141.42	5,761.64 (-191.34 - 11,714.61)	3,088.83	3,088.83	3,611.05 (474.86 - 6,747.24)	2,479.75	7,321.99 (2,129.83 - 12,514.16)	690.67	2,064.32 (716.40 - 3,412.24)	690.67	2,064.32 (716.40 - 3,412.24)	2,064.32 (716.40 - 3,412.24)
Time cost type1	4,452.42	(634.84 - 12,074.93)	3,088.83	3,088.83	4,956.28 (912.47 - 9,000.09)	3,423.94	8,439.17 (3,357.19 - 13,521.14)	1,805.94	2,803.08 (1,452.79 - 4,153.37)	1,805.94	2,803.08 (1,452.79 - 4,153.37)	2,803.08 (1,452.79 - 4,153.37)
Time cost type2	3,330.15	(1,123.74 - 4,949.40)	1,366.30	1,366.30	2,656.03 (-370.07 - 5,682.13)	1,646.28	2,236.10 (1,534.27 - 2,937.93)	627.15	789.92 (589.73 - 990.11)	627.15	789.92 (589.73 - 990.11)	789.92 (589.73 - 990.11)
Time cost type3	8,239.27	(2,780.29 - 12,245.54)	3,380.42	3,380.42	6,571.40 (-915.61 - 14,058.41)	4,073.13	5,532.44 (3,796.01 - 7,268.87)	1,551.67	1,954.37 (1,459.08 - 2,449.67)	1,551.67	1,954.37 (1,459.08 - 2,449.67)	1,954.37 (1,459.08 - 2,449.67)
Replacement cost	11,168.56	(3,473.22 - 18,576.58)	2,431.03	2,431.03	9,842.19 (-2,201.00 - 21,885.38)	4,594.31	6,280.09 (4,170.01 - 8,390.16)	2,150.85	2,270.47 (1,548.12 - 2,992.81)	2,150.85	2,270.47 (1,548.12 - 2,992.81)	2,270.47 (1,548.12 - 2,992.81)

Table 12 Comparison of the informal care cost according to disability level and setting (cont.)

Cost (Baht/month)	Very severely disabled		Severely disabled		Moderately disabled		Mildly disabled	
	Median	Mean (95% CI)	Median	Mean (95% CI)	Median	Mean (95% CI)	Median	Mean (95% CI)
Total								
Productivity cost	1,146.92	(816.28 - 6,722.60)	1,886.72	(1,005.45 - 3,780.40)	1,672.40	(1,571.37 - 9,025.20)	585.94	(-856.61 - 8,717.14)
Time cost type1	1,665.63	(1,309.08 - 7,113.67)	1,976.27	(1,132.30 - 4,788.57)	1,874.50	(2,532.09 - 9,935.62)	976.56	(-380.95 - 9,151.08)
Time cost type2	1,782.42	(1,818.83 - 3,497.81)	1,980.65	(890.85 - 3,425.65)	1,564.68	(1,414.61 - 2,653.32)	627.15	(638.61 - 1,180.79)
Time cost type3	4,409.98	(4,500.04 - 8,654.10)	4,900.41	(2,204.09 - 8,475.57)	3,871.25	(3,499.95 - 6,564.70)	1,551.67	(1,580.01 - 2,921.46)
Replacement cost	2,164.75	(2,457.36 - 7,836.28)	2,068.73	(71.11 - 10,307.86)	2,503.47	(3,131.30 - 6,511.73)	1,597.04	(1,249.73 - 2,281.56)

5. Cost function of time spent

To perform the equation of time spent and informal care, stepwise multiple regression analysis was employed. To have specific models, equations or cost functions were performed for the quantity of time, productivity cost, time cost type1 and replacement cost separately. Four types of models were formulated.

5.1 Quantity of the time spent

The potential explanatory variables included in this analysis are shown in Table 13. Dummy variables were created when explanatory variables were qualitative variables.

Assessing normality of dependent variable is pre-analysis procedure. The quantity of informal care time as the dependent variable was not normally distributed (appendix B). Therefore, a natural logarithmic transformation was undertaken resulting in an approximately normal distribution. For other assessments, the results indicated that there were outliers. The outliers were deleted because they had influence on fitted values and the regression coefficient. After that, the model was re-fitted. However, the new model was not selected because the adjusted R^2 of the new model was less than that of the first model. On the other hand, the first model could explain the variation of dependent variable or the quantity of informal care time better than the new model. Therefore, the outlier records were kept.

Ten variables were entered and checked the assumptions. Regarding the test of normal distribution of standardized residual, the normal probability plot of residuals is illustrated in appendix B. The chart indicated that the distribution of standardized residual was normal. For the independence of residuals test, the Durbin-Watson value was 1.769 (cut-points is between 1.5 and 2.5). It indicated that the model met the independent variance assumption. The results stated that the variance inflation factor (VIF) < 1.031 (cut-point is less than 10), tolerance > 0.884 (cut-points is more than 0.1), and the condition index < 2.787 (cut-points is equal to or less than 30). Then, there was no multicollinearity of explanatory variables in the model.

In addition, model diagnosis for checking the fitted model, were also tested. The results stated that the leverage statistics was 0.040 ($h_{ii} < 2p$ when $p =$ number of regression parameters including the intercept term, $n =$ sample size, in this study cut-points is less than 0.2) and SDRESID was between -3.00 – 2.67 (cut-point is less than

± 4). It indicated that the model had no outliers in X and Y, respectively. In influential observations checking, DFFITS was -0.033 (cut-point is less than 1) and Cook's distance was 0.009 (cut-point is less than 1) so the model was fitted (57).

Table 13 Potential explanatory variables in stepwise multiple regression analysis

Variable	Variable definition	Value definition
Dependent :		
Ln_Time	Natural logarithm of time (hour/month)	
Ln_Op1	Natural logarithm of productivity cost (baht/month)	
Ln_Op2	Natural logarithm of time cost1 (baht/month)	
Ln_Re	Natural logarithm of replacement cost (baht/month)	
Independent :		
BI_level	Level of disability	Reference : mildly disabled
Very severely disabled	Very severely disabled	1 = yes, 0 = no
Severely disabled	Severely disabled	1 = yes, 0 = no
Moderately disabled	Moderately disabled	1 = yes, 0 = no
Urban	Urban community	1 = yes, 0 = no
Occu2	Occupation of caregiver	Reference : unemployed and housewife
Agriculturist	Agriculturist	1 = yes, 0 = no
Employee/Labour	Employee or Labour	1 = yes, 0 = no
Student	Student	1 = yes, 0 = no
Government/State enterprise/Company	Government or State enterprise or Company's officer	1 = yes, 0 = no
Owner/Commerce	Owner or Commerce	1 = yes, 0 = no
Retired age	Retired age	1 = yes, 0 = no

Table 14 presents the fitted explanatory model with adjusted $R^2 = 0.169$, probability-value of F statistics < 0.005 . This can be explained that 16.9 percent of the variation of informal care time could be predicted by the variables entered in the model together i.e. very severely disabled, moderately disabled and retired age. Details of multiple regression analysis were illustrated in appendix B.

Table 14 Multiple regression model of informal care time

Variables Entered	Unstandardized Coefficients		Standardized Coefficients (Beta)	t	p-value
	B	Std. Error			
(Constant)	3.900	0.151		25.776	0.000
Student	-2.748	0.994	-0.255	-2.764	0.007
Very severely disabled	0.756	0.257	0.287	2.945	0.004
Moderately disabled	0.516	0.230	0.218	2.242	0.027
Retired age	-0.490	0.231	-0.195	-2.119	0.037

Adjusted $R^2 = 0.169$, probability-value of F statistics < 0.005

Therefore, all significant variables could be expressed this equation as below:

$$\text{Ln_Time} = 3.900 - 2.748 \text{ Student} + 0.756 \text{ Very severely disabled} + 0.516 \text{ Moderately disabled} - 0.490 \text{ Retired age}$$

Where;Ln_Time	=	Natural logarithm of informal care time
Student	=	Student (1 = yes, 0 = no)
Very severely disabled	=	Very severely disabled (1 = yes, 0 = no)
Moderately disabled	=	Moderately disabled (1 = yes, 0 = no)
Retired age	=	Retired age (1 = yes, 0 = no)

5.2 Productivity cost of informal care

The potential explanatory variables included in this analysis are shown in Table 13. Dummy variables were created when explanatory variables were qualitative variables.

Assessing normality of dependent variable is pre-analysis procedure. The productivity cost as the dependent variable was not normally distributed (appendix C). Therefore, a natural logarithmic transformation was undertaken resulting in an approximately normal distribution. For other assessments, the results indicated that there were outliers. The outliers were deleted because they had influence on fitted values and the regression coefficient. After that, the model was re-fitted. However, the new model was not selected because the adjusted R^2 of the new model was less than that of the first model. On the other hand, the first model could explain the variation of dependent variable or the productivity cost better than the new model. Therefore, the outlier records were kept.

Ten variables were entered and checked the assumptions. Regarding the test of normal distribution of standardized residual, the normal probability plot of residuals is illustrated in appendix C. The chart indicated that the distribution of standardized residual was normal. For the independence of residuals test, the Durbin-Watson value was 1.767 (cut-points is between 1.5 and 2.5). It indicated that the model met the independent variance assumption. The results stated that the variance inflation factor (VIF) < 1.038 (cut-point is less than 10), tolerance > 0.967 (cut-points is more than 0.1), and the condition index < 1.902 (cut-points is equal to or less than 30). Then, there was no multicollinearity of explanatory variables in the model.

In addition, model diagnosis for checking the fitted model, were also tested. The results stated that the leverage statistics was 0.036 ($h_{ii} < 2p$ when p = number of regression parameters including the intercept term, n =sample size, in this study cut-points is less than 0.2) and SDRESID was between -2.87 and 2.77 (cut-point is less than ± 4). It indicated that the model had no outliers in X and Y, respectively. In influential observations checking, DFFITS was between -0.256 and 0.306 (cut-point is less than 1) and Cook's distance was 0.010 (cut-point is less than 1) so the model was fitted (57).

Table 15 presents the fitted explanatory model with adjusted $R^2 = 0.313$, probability-value of F statistics < 0.001 . This can be explained that 31.3 percent of the variation of productivity cost could be predicted by the variables entered in the model together i.e. owner/commerce, government/state enterprise/company and employee/labour. Details of multiple regression analysis were illustrated in appendix C.

Table 15 Multiple regression model of productivity cost

Variables Entered	Unstandardized Coefficients		Standardized Coefficients (Beta)	t	p-value
	B	Std. Error			
(Constant)	6.646	0.171		38.886	0.000
Owner/Commerce	2.010	0.374	0.497	5.368	0.000
Government/State enterprise/Company	2.120	0.554	0.353	3.827	0.000
Employee/Labour	1.393	0.554	0.232	2.515	0.014

Adjusted $R^2 = 0.313$, probability-value of F statistics < 0.001

Therefore, all significant variables could be expressed this equation as below:

$$\text{Ln_Op1} = 6.646 + 2.010 \text{ Owner/Commerce} + 2.120 \text{ Government/State enterprise/Company} + 1.393 \text{ Employee/Labour}$$

Where; Ln_Op1 = Natural logarithm of productivity cost
 Owner/Commerce = Owner/Commerce (1 = yes, 0 = no)
 Government/State enterprise/Company = Government/State enterprise/Company (1 = yes, 0 = no)
 Employee/Labour = Employee/Labour (1 = yes, 0 = no)

5.3 Time cost type1 of informal care

The potential explanatory variables included in this analysis are shown in Table 13. Dummy variables were created when explanatory variables were qualitative variables.

Assessing normality of dependent variable is pre-analysis procedure. The time cost type1 as the dependent variable was not normally distributed (appendix D). Therefore, a natural logarithmic transformation was undertaken resulting in an approximately normal distribution. For other assessments, the results indicated that there were outliers. The outliers were deleted because they had influence on fitted values and the regression coefficient. After that, the model was re-fitted. However, the new model was not selected because the adjusted R^2 of the new model was less than that of the first model. On the other hand, the first model could explain the variation of dependent variable or the time cost type1 better than the new model. Therefore, the outlier records were kept.

Ten variables were entered and checked the assumptions. Regarding the test of normal distribution of standardized residual, the normal probability plot of residuals is illustrated in appendix D. The chart indicated that the distribution of standardized residual was normal. For the independence of residuals test, the Durbin-Watson value was 1.907 (cut-points is between 1.5 and 2.5). It indicated that the model met the independent variance assumption. The results stated that the variance inflation factor (VIF) < 1.081 (cut-point is less than 10), tolerance > 0.925 (cut-points is more than 0.1), and the condition index < 2.193 (cut-points is equal to or less than 30). Then, there was no multicollinearity of explanatory variables in the model.

In addition, model diagnosis for checking the fitted model, were also tested. The results stated that the leverage statistics was 0.040 ($h_{ii} < 2p$ when p = number of regression parameters including the intercept term, n =sample size, in this study cut-points is less than 0.2) and SDRESID was between -2.61 and 2.32 (cut-point is less than ± 4). It indicated that the model had no outliers in X and Y, respectively. In influential observations checking, DFFITS was between -0.254 and 0.306 (cut-point is less than 1) and Cook's distance was 0.008 (cut-point is less than 1) so the model was fitted (57).

Table 16 presents the fitted explanatory model with adjusted $R^2 = 0.316$, probability-value of F statistics < 0.001 . This can be explained that 31.6 percent of the variation of time cost type1 could be predicted by the variables entered in the model together i.e. agriculturist, owner/commerce and government/state enterprise/company. Details of multiple regression analysis were illustrated in appendix D.

Table 16 Multiple regression model of time cost type1

Variables Entered	Unstandardized Coefficients		Standardized Coefficients (Beta)	t	p-value
	B	Std. Error			
(Constant)	7.307	0.162		45.112	0.000
Agriculturist	-1.095	0.312	-0.303	-3.509	0.001
Owner/Commerce	1.350	0.355	0.328	3.804	0.000
Government/State enterprise / Company	1.462	0.525	0.236	2.785	0.006
Student	-3.019	1.234	-0.204	-2.447	0.016

Adjusted $R^2 = 0.316$, probability-value of F statistics < 0.001

Therefore, all significant variables could be expressed this equation as below:

$$\text{Ln_Op2} = 7.307 - 1.095 \text{ Agriculturist} + 1.350 \text{ Owner/Commerce} + 1.462 \text{ Government/State enterprise/Company} - 3.019$$

Where; Ln_Op2 = Natural logarithm of time cost type1
 Agriculturist = Agriculturist (1 = yes, 0 = no)
 Owner/Commerce = Owner/Commerce (1 = yes, 0 = no)
 Government/State enterprise/Company = Government/State enterprise/Company (1 = yes, 0 = no)

5.4 Replacement cost of informal care

The potential explanatory variables included in this analysis are shown in Table 13. Dummy variables were created when explanatory variables were qualitative variables.

Assessing normality of dependent variable is pre-analysis procedure. The replacement cost as the dependent variable was not normally distributed (appendix E). Therefore, a natural logarithmic transformation was undertaken resulting in an approximately normal distribution. For other assessments, the results indicated that there were outliers. The outliers were deleted because they had influence on fitted values and the regression coefficient. After that, the model was re-fitted. However, the new model was not selected because the adjusted R^2 of the new model was less than that of the first model. On the other hand, the first model could explain the variation of dependent variable or the replacement cost better than the new model. Therefore, the outlier records were kept.

Ten variables were entered and checked the assumptions. Regarding the test of normal distribution of standardized residual, the normal probability plot of residuals is illustrated in appendix E. The chart indicated that the distribution of standardized residual was normal. For the independence of residuals test, the Durbin-Watson value was 1.662 (cut-points is between 1.5 and 2.5). It indicated that the model met the independent variance assumption. The results stated that the variance inflation factor (VIF) < 1.394 (cut-point is less than 10), tolerance > 0.718 (cut-points is more than 0.1), and the condition index < 4.591 (cut-points is equal to or less than 30). Then, there was no multicollinearity of explanatory variables in the model.

In addition, model diagnosis for checking the fitted model, were also tested. The results stated that the leverage statistics was 0.050 ($h_{ii} < 2p$ when p = number of regression parameters including the intercept term, n =sample size, in this study cut-points is less than 0.2) and SDRESID was between -3.50 and 2.77 (cut-point is less than ± 4). It indicated that the model had no outliers in X and Y, respectively. In influential observations checking, DFFITS was between -0.242 and 0.191 (cut-point is less than 1) and Cook's distance was 0.010 (cut-point is less than 1) so the model was fitted (57).

Table 17 presents the fitted explanatory model with adjusted $R^2 = 0.312$, probability-value of F statistics < 0.001 . This can be explained that 31.2 percent of the variation of replacement cost could be predicted by the variables entered in the model together i.e. urban, student, very severely disabled, moderately disabled and severely disabled. Details of multiple regression analysis were illustrated in appendix E.

Table 17 Multiple regression model of replacement cost

Variables Entered	Unstandardized Coefficients		Standardized Coefficients (Beta)	t	p-value
	B	Std. Error			
(Constant)	6.317	0.233		27.061	0.000
Urban	1.108	0.212	0.453	5.224	0.000
Student	-2.718	1.017	-0.226	-2.673	0.009
Very severely disabled	1.218	0.290	0.414	4.205	0.000
Moderately disabled	0.922	0.257	0.349	3.593	0.001
Severely disabled	0.723	0.303	0.226	2.387	0.019

Adjusted $R^2 = 0.312$, probability-value of F statistics < 0.001

Therefore, all significant variables could be expressed this equation as below:

$$\text{Ln_Re} = 6.317 + 1.108 \text{ Urban} - 2.718 \text{ Student} + 1.218 \text{ Very severely disabled} + 0.922 \text{ Moderately disabled} + 0.723 \text{ Severely disabled}$$

Where;Ln_Re	=	Natural logarithm of replacement cost
Urban	=	Urban (1 = yes, 0 = no)
Student	=	Student (1 = yes, 0 = no)
Very severely disabled	=	Very severely disabled (1 = yes, 0 = no)
Moderately disabled	=	Moderately disabled (1 = yes, 0 = no)
Severely disabled	=	Severely disabled (1 = yes, 0 = no)

6. Sensitivity analysis

To analyze robustness of the results due to methodological method and sample data, sensitivity analysis was employed.

6.1 Effect of income on the opportunity cost

Individual real incomes used in the calculation of opportunity cost were in wide range. Therefore, real incomes at the 25th and 75th percentiles (2,408.33 and 15,000.00 baht/month, respectively) were used in the re-analyses. The results are as follows:

- Productivity cost

Average productivity cost was yield between 944.81 – 5,884.46 baht /month. They decreased by 76.57% and increased by 45.95%. Details are presented in Table 18.

- Time cost type 1

Average time cost type 1 was yield between 1,251.59 – 9,479.47 baht/month. They are decreased by 73.04% and increased by 104.19%. Details are presented in Table 19.

6.2 Effect of market wages on the replacement cost

Market prices of wages were varied through out the country. Minimum and maximum rates were used in the re-analyses. For category N: health and social work, minimum or maximum wage was 4,003.60 and 14,048.60 baht/month, respectively. For Category P: household works, minimum or maximum wage was 2,528.70 and 4,510.7 baht/month, respectively. Average replacement cost was yield between 1,912.46 – 5,866.98 baht/month and the variation of those cost occurred in the same way as replacement cost. They are decreased by 51.51% and increased by 48.76%. Details are presented in Table 20.

Table 18 Effect of income on the productivity cost (Baht per month)

Cost	Productivity cost	25 th percentile		75 th percentile	
		Cost	Variation (%)	Cost	Variation (%)
Total	403,187.13	94,480.87	-76.57	588,445.87	45.95
Mean	4,031.87	944.81	-76.57	5,884.46	45.95
Standard Deviation (SD)	10,258.49	1,026.20	-90.00	6,391.40	-37.70
95% CI for mean; Lower Bound	1,996.36	741.19	-62.87	4,616.27	131.23
95% CI for mean; Upper Bound	6,067.38	1,148.43	-81.07	7,152.65	17.89
Median	945.98	644.44	-31.88	4,013.68	324.29

Table 19 Effect of income on the time cost type1 (Baht per month)

Cost	Time cost type1	25 th percentile		75 th percentile	
		Cost	Variation (%)	Cost	Variation (%)
Total	464,255.19	125,159.15	-73.04	947,947.24	104.19
Mean	4,642.55	1,251.59	-73.04	9,479.47	104.19
Standard Deviation (SD)	10,262.02	1,272.97	-87.60	9,641.41	-6.05
95% CI for mean; Lower Bound	2,606.34	999.01	-61.67	7,566.41	190.31
95% CI for mean; Upper Bound	6,678.76	1,504.18	-77.48	11,392.54	70.58
Median	1,627.09	947.59	-41.76	7,176.95	341.09

Table 20 Effect of wage on the replacement cost (Baht per month)

Cost	Replacement cost	Minimum rate		Maximum rate	
		Cost	Variation (%)	Cost	Variation (%)
Total	394,394.67	191,246.10	-51.51	586,698.44	48.76
Mean	3,943.95	1,912.46	-51.51	5,866.98	48.76
Standard Deviation (SD)	5,995.28	2,052.94	-65.76	6,904.99	15.17
95% CI for mean; Lower Bound	2,754.35	1,505.11	-45.36	4,496.89	63.26
95% CI for mean; Upper Bound	5,133.54	2,319.81	-54.81	7,237.08	40.98
Median	2,009.02	1,400.24	-30.30	3,424.16	70.44

7. Variation of the informal care cost

Cost of informal care was valued according to 5 approaches as follows:

1. Productivity cost
2. Time cost type1 (real income)
3. Time cost type2 (national minimum wage rate)
4. Time cost type3 (GDP per capita)
5. Replacement cost.

Productivity cost was used as the reference for the comparison. Time cost type 1 and 3 had higher cost than that of the reference while the time cost type 2 and replacement cost has lower cost than that of the reference. Details are presented in Table 21.

Table 21 Variation of informal care cost according by approach and setting

Setting	Reference	Variation (%)			
	Productivity cost	Time cost type1	Time cost type 2	Time cost type3	Replacement cost
Burirum	3,284.96	7.43	-46.11	33.34	-42.54
Bangkok	4,721.33	19.47	-60.68	-2.71	23.74
Totall	4,031.87	15.15	-54.98	11.39	-2.18

CHAPTER V

DISCUSSION

The discussion is divided into 5 parts as follows:

1. Characteristics of the disabled persons and caregivers
2. Types of the informal care time
3. Cost of the informal care
4. Generalization of the results
5. Cost functions of the informal care
6. Limitations of the study

1. Characteristics of the disabled persons and caregivers

The disabled persons were male more than female whereas caregivers were female more than male. The caregivers were mainly daughters or wives of the disabled persons. These characteristics were similar to previous studies (9, 28, 39). According to gender of the caregivers, one possible explanation is related to the Thai family culture. Men commonly work outside the home to earn for the family members. Meanwhile women are mainly responsible for the household tasks and taking care of all the members including the sick or disabled persons.

There were different characteristics of both disabled persons and caregivers between the two settings. The difference was, for example, income, family type, living style, community type. Based on community's definition from the Ministry of Interior (18), the whole Bangkok is defined as an urban area. While Buriram is categorized as a rural area. In fact, some parts of Bangkok are still rural area and some parts of Buriram are urban. Therefore, comparison of the characteristics by provinces was not valid.

2. Types of the informal care time

From literature review, most studies indicated that caregivers spent their leisure time to provide care. This is different from our study which caregivers spent unpaid-work time for the informal care, because most of them were female who were responsible for housework and had to work all the time. Thus when there was a disabled person within the family, it affected the unpaid-work time more than the leisure time.

Comparing among two settings, the major proportion of the time in Bangkok was the leisure time whereas that of Burirum was the paid-work time. This might be explained that major caregivers in Bangkok (24%) were retired persons. While most of caregivers in Burirum (43%) worked as agriculturists. They might work up to 12 hours a day. They had very little leisure time. Therefore, they had to sacrifice working time for the informal care more than the leisure time.

3. Cost of the informal care

The study found that caregivers in Bangkok spent 5 percent more time than in those of the Burirum. This is because, as mentioned earlier, major caregivers in Bangkok were retired persons. They stayed at home with the disabled persons nearly all the time. Therefore, they had more time to take care the disabled persons than those of the Burirum. When converted to monetary term, the difference of proportion of the cost was much higher than that of the time, for example, the replacement cost was 44% different. This is because the real incomes and wage rates of market price of caregivers in Bangkok were much higher than those of the Burirum.

3.1 Opportunity cost of the informal care

Most of the previous studies calculated the opportunity cost employing minimum, average and median of the wage rates (28, 36-38). We found only one study that employed real income of caregiver for calculation of the opportunity cost (9). There are arguments that using the real income was conflicted with ethics (34) because high-income caregivers resulting high informal care cost will reflect on unfair ranking of the priorities. In this study, we conducted four 4 methods to estimate the opportunity cost. This is to demonstrate variations of the costs from different methods. Time cost type1 (real income) was the most expensive (4,643 bath/month)

followed by time cost type3 (GDP per capita) and productivity cost (4,491 and 4,032 baht/month, respectively). Whereas, time cost type2 (national minimum wage rate) was the cheapest (1,815 baht/month). When compared between Bangkok and Burirum, the costs were much different. This is because the average income in Bangkok was 21,709 baht/month while that of Burirum was only 6,610 baht/month.

3.2 Replacement cost of the informal care

In this study, the replacement cost was 3,944 baht/month. It was lower than most of the opportunity costs. The replacement cost was lower than the time cost type1 (real income), productivity cost and time cost type3 (GDP per capita) but higher than the time cost type2 (national minimum wage rate). This is because average earning of marketed care workers is less than those of other occupations in the society but more than the unskilled labors.

Previously, Dewey et al and Patel et al (28, 38) showed that the opportunity cost was lower than replacement cost because they valued the opportunity cost by one-third of the average wage or minimum wage rate. This is because they considered that the time for informal care was from the leisure time. Then they valued cost of the leisure time by about one-thirds of the working time. This is contrast from our study that we valued leisure time and working time equally in terms of utility. This concept is corresponded to the studies Hickenbottom et al (37) Patel et al (38) and Van den Berg et al (9).

3.3 The variation of informal care cost

The variation of informal care cost use productivity cost as a reference approach because this method is valued resource in its next best use to society. The information from the variation could help to select the appropriate method for evaluate informal care cost and set up budget in Thailand such as if we use time cost type2 (national minimum wage rate). It does not reflect the real cost (productivity cost) because it was underestimated approximately 55 percent.

Comparing between setting, in Bangkok, replacement cost was higher than productivity cost. This result makes people interpreted that caregiver in Bangkok have low socioeconomic. In fact these caregiver were retired age (Table 5) and not working, thus they did not include in productivity cost approach. In addition, Bangkok has high market price or wage that affected replacement cost is higher than

opportunity cost. But Burirum is in the opposite direction because caregiver worked as agriculturist all day then opportunity cost is higher than replacement cost.

4. Generalization of the results

Results from this study were used to estimate the country economic burden due to the informal care for the disabled persons. Based on reports of the Bureau of Empowerment for Persons with Disabilities (58), there were 446,614 registered disabled people in 2005. If these disabled persons received the informal care similar to those of in this study, the country would lose 2,005,743,474 baht/month (two billion baht/month) or annual cost was 24,068,921,688 baht/month (twenty-four billion baht/month). The estimation was from the opportunity cost using GDP per capita (4,491 baht/month). The country cost might be under estimated because there were some unregistered disabled people.

In terms of cost of illness study, it is interesting to combine the cost of informal care to the other major costs. Youngkong et al (59) estimated the economic costs of cerebral infraction at Prasat neurological institute in 1999. It found that the average cost was 14,960 baht/month (adjusted to 2005 prices). The study included direct medical costs and indirect cost but not included the informal care cost. If we added the informal care cost (4,491 baht/month) to the cost of stroke, the total cost was approximately 19,451 bah/month. The informal care cost accounted for 23% or one-fourths of the total cost. Hence, ignoring the informal care cost would result in a huge underestimation of the cost of stroke.

Regarding the welfare system, currently, disabled persons receive 500 baht per month as an allowance. Comparing to the replacement cost (3,944 baht per month), it indicated that the social welfare allowance was much less than that supposed to paid. Therefore, the results from this study could be empirical evidence for the welfare planning.

5. Cost function of the informal care

A multiple regression model was developed for prediction of the time and cost of informal care. All models had power of determination in a rage of 16.9% to 31.6%. These are not powerful models. There are limitations to generalize the

models to predict the costs in future or other settings. However, we can explain the fitted models. Based on the fitted model, the significant explanatory variables included disabled persons characteristics (level of disability), caregiver characteristics (occupation) and community type. For example, disability level had positive effect to informal care time. This means informal care time was longer when disability level was more severe. Different characteristics of caregivers also effect on time spent for disabled. Students or elderly has less time than the unemployed, since students have to study and elderly health may not be good enough. The last variable is caregiver's income. We found that caregivers who were owner, government or office employer had more positive effect on the cost comparing to the unemployed. This was due to a simply reason that the unemployed had less income.

6. Limitation of the study

The study included 101 disabled persons. Comparing to number of potential predictor variables, distribution of the sample in some values of some variables might be small. In addition, other factors associated with the informal care e.g. believe, norm, culture were not covered. These resulted in low power of determination of the predicting cost models.

The estimation of informal care cost was based on the actual time of the care provided. The study did not cover needs, satisfaction or the clinical outcomes. Therefore, magnitude the cost does not reflect the health outcomes.

CHAPTER VI

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

One hundred and one disabled persons that have had stroke for at least 6 months and have functional status less than 95 score, measured by the Barthel Index. Disabled persons, more likely to be male (53%), mean age was 66 years, two thirds of them were more moderately disabled. One hundred and forty-nine caregivers were interviewed. Most of them were female (61%) and daughters of the disabled persons (39%). The mean age was 46 years. They worked as agriculturist (21%).

The average monthly informal care time per case was 95.44 hours. Most caregiver performed ADL tasks follow by HDL tasks (38.13 hours/month and 29.24 hours/month, respectively). Major time for the informal care was from the unpaid work time (36.63 hours/month or 38.74% of the total informal care time). Time spent for informal care in Bangkok was about 5% higher than in Burirum.

Comparing proportion of time spent in one-month recall and that of the average of previous year, the average time spent in the previous year was 89.43 hours/month. This was less than that of the one-month recall interview (95.44 hours/month).

Regarding cost of the informal care, the average monthly of productivity cost was 4,031.87 baht. Time cost type1 (conservative estimation of opportunity cost) was 4,642.87 baht. Time cost type2 was 1,815.20 baht. Time cost type3 was 4,491.07 baht and replacement cost was 4,031.87 baht. In total, Bangkok indicated higher cost than Burirum.

In summary, informal care plays a substantial role in the total care provided especially in the stroke. This has high impact on both family and society i.e. economy. Informal care cost is significant hidden cost to the society

Recommendations

Recommendations to the responsible institutes

1. MOPH: time and cost data can clarify the actual problems of disability. This can be pivotal information for developing policies related to the disability.

2. Ministry of Social Development and Human Security: the results from this study can be inputs for the improvement of the welfare system for the disabled people.

3. Sub-district Administrative Organization : suitable benefit for disabled and people in community can be evaluated, by the education support from hospital.

4. Hospitals: these results can make hospital administrators have more concerns on the disability care. The hospital may provide training services for caregivers to improve quality and efficiency of the informal care. The consequence is might be less institutional care for the disable people resulting in savings of the hospitals.

Recommendations to the further studies

1. Future studies should cover more details about informal care satisfaction and quality of life of disabled persons.

2. Effects of providing informal care of caregivers should be studied.

3. Possible methods to increase effectiveness and efficiency of informal care are also interesting.

REFERENCES

1. The Thai Working group on Burden of Disease and Injuries. Burden of disease and injuries in Thailand. Available from:
<http://203.157.19.191/BURDEN.pdf>. [Accessed 16 June 2005].
2. Anderson C, Ni Mhurchu C, Brown PM, Carter K. Stroke rehabilitation services to accelerate hospital discharge and provide home-based care: an overview and cost analysis. *Pharmacoeconomics* 2002;20(8):537-52.
3. Anderson C, Mhurchu CN, Rubenach S, Clark M, Spencer C, Winsor A. Home or hospital for stroke rehabilitation? Results of a randomized controlled trial : II: cost minimization analysis at 6 months. *Stroke* 2000;31(5):1032-7.
4. Drummond M, McGuire A. *Economic evaluation in health care : merging theory with practice*. Oxford: Oxford University Press Inc.; 2001.
5. Drummond MF, O'Brien BJ, Stoddart GL, Torrance GW. *Methods for the economic evaluation of health care programmes*. second ed. New York: Oxford University Press, Inc.; 1997.
6. อาทรรีวไพบูลย์. การวิเคราะห์ต้นทุนในการบริการฟื้นฟูสมรรถภาพทางการแพทย์. กรุงเทพมหานคร: คณะเภสัชศาสตร์ มหาวิทยาลัยมหิดล; 2548.
7. Porter JE, Ganong H L, Drew N, Lanes I T. A new typology of home-care helpers. *The Gerontologist* 2004;44(6):750-59.
8. Van den Berg B, Brouwer WB, Koopmanschap MA. Economic valuation of informal care. An overview of methods and applications. *Eur J Health Econ* 2004;5(1):36-45.
9. Van den Berg B, Brouwer W, Van Exel J, Koopmanschap M, Van den Bos A.M. G, Rutten FF. Economic valuation of informal care: Lessons from the

application of the opportunity costs and proxy good methods. *Social Science&Medicine* 2006;62:835-45.

10. นิพนธ์ พวงนรินทร์. โรคหลอดเลือดสมอง STROKE. กรุงเทพฯ: โรงพิมพ์เรือนแก้วการพิมพ์; 2534.
11. The WHO STEPwise approach to STROKE Surveillance. Available from: http://www.who.int/ncd_surveillance/steps/stroke/stepsstrokev2.pdf. [Accessed 12 October 2005].
12. World Health Organization. International Classification of Disease 10th: Bureau of Health Policy and Planning, MOPH.; 1998.
13. Schiemanck SK, Kwakkel G, Post MWM, Kappelle LJ, Prevo AJH. Predicting long-term independency in activities of daily living after middle cerebral artery stroke does information from MRI have added predictive value compared with clinical information? *Stroke* 2006;37:1050-4.
14. Bonita R, Beaglehole R. Recovery of motor function after stroke. *Stroke* 1988;19:1497-1500.
15. Mahoney F, Barthel D. Functional evaluation: The Barthel Index. *Maryland State Medical Journal* 1965;14:56-61.
16. สถาบันประสาทวิทยา กรมการแพทย์ กระทรวงสาธารณสุข. แนวทางการฟื้นฟูสมรรถภาพผู้ป่วยโรคหลอดเลือดสมอง : Clinical Practice Guideline for Stroke Rehabilitation. กรุงเทพมหานคร: กระทรวงสาธารณสุข; 2545.
17. ความหมายของ“ชุมชน” “เมือง” “ชนบท” “ชุมชนเมือง” “ชุมชนบท” “สิ่งแวดล้อม” และ “สิ่งแวดล้อมชุมชน” ที่ได้มีผู้ศึกษาไว้. Available from: http://www.onep.go.th/uap/link/def_table.htm. [Accessed 19 July 2006].

18. พระราชบัญญัติ กองทุนหมู่บ้านและชุมชนเมืองแห่งชาติ พ.ศ.2547. Available from:
<http://www.villagefund.thaigov.go.th/main.afp>. [Accessed 15 July 2005].
19. เนติ สุขสมบุญรณ์, สุวัฒนา จุฬาวัดนพล, ปรีชา มณฑกานติกุล. Advances in pharmaceutical care and pharmacotherapeutics 3. กรุงเทพฯ: สาขาวิชาเภสัชกรรมคลินิก ภาควิชาเภสัชกรรม คณะเภสัชศาสตร์ มหาวิทยาลัยมหิดล; 2547.
20. Heart Disease and Stroke Statistics - 2005 Update. Available from:
<http://www.americanheart.org/downloadable/heart/1105390918119HDSStats2005Update.pdf>. [Accessed 9 September 2005].
21. Sturm JW, Dewey HM, Donnan GA, Macdonell RAL, McNeil JJ, Thrift AG. Handicap after stroke: how does it relate to disability, perception of recovery, and stroke subtype? The North East Melbourn Stroke Incidence Study (NEMESIS). *Stroke* 2002;33:762-8.
22. Viriyavejakul A, Senanarong V, Prayoonwiwat N, Praditsuwan R, Chaisevikul R, Pongvarin N. Epidemiology of stroke in the elderly in Thailand. *J Med Assoc Thai* 1998;7(81):497-505.
23. Viriyavejakul A. Stroke in Asia: an epidemiological consideration. *Clin Neuropharmacol* 1990;13 Suppl 3:S26-33.
24. Schwamm LH, Pancioli A, Goldstein LB, Zorowitz RD, Shephard TL, Moyer P, et al. Recommendations for the establishment of stroke systems of care *Stroke* 2005;36:690-703.
25. ลือชัย ศรีเงินยวง, กัณฑ์ร์ วิวัฒน์พานิชย์. สังคมวิทยาและมานุษยวิทยาการแพทย์.
กรุงเทพมหานคร: มหาวิทยาลัยสุโขทัยธรรมมาธิราช; 2547.
26. Kleinman A. Patient and healers in the context of culture. London: University of California Press, Ltd; 1981.
27. Kobelt G. Health economics : an introduction to economic evaluation. Second ed. London: Office of Health Economics; 2002.

28. Dewey HM, Thrift AG, Mihalopoulos C, Carter R, Macdonell RAL, McNeil JJ, et al. Informal care for stroke survivors: results from the North East Melbourne Stroke Incidence Study (NEMESIS). *Stroke* 2002;33(4):1028-1033.
29. Bedard M, Koivuranta A, Stuckey A. Health impact on caregivers of providing informal care to a cognitively impaired older adult: rural versus urban settings. *Can J Rural Med* 2004;9(1):15-23.
30. Li LW, Fries BE. Elderly disability as an explanation for racial differences in Informal Home care. *The Gerontologist* 2005;45(2):206-15.
31. Navaie-Waliser M, Feldman PM, Gould DA, Levin C, N. KA, Donelan K. The experiences and challenges of informal caregivers: common themes and differences among Whites, Blacks, and Hispanics. *The Gerontologist* 2001;41(6):733-41.
32. Weiss CO, Gonzalez HM, Kabeto MU, Langa KM. Differences in amount of informal care received by non-Hispanic whites and latinos in a nationally representative sample of older Americans. *J Am Geriatr Soc* 2005;53(1):146-51.
33. Weinstein MC, Siegel JE, Garber AM, Lipscomb J, Luce BR, Manning WG, et al. Productivity costs, time costs and health-related quality of life: A response to the eramus group. *Health Economics* 1997;6:505-10.
34. Pritchard C, Sculpher M. Productivity costs: principles and practice in economic evaluation. London: Office of Health Economics; 2000.
35. Van den Berg B, Spauwen P. Measurement of informal care: an empirical study into the valid measurement of time spent on informal caregiving. *Health Economics* 2006;15:447-60.
36. Claesson L, Gosman-Hedstrom G, Johannesson M, Fagerberg B, Blomstran C. Resource utilization and cost of stroke unit care integrated in a care continuum : A 1-year controlled, prospective, randomized study in elderly patients *Stroke* 2000;31:2569-77.

37. Hickenbottom SL, Langa KM, Kutcher JS, Kabeto MU, Fendrick AM, Katz SJ. A national study of the quantity and cost of informal caregiving for the elderly with stroke. *Neurology* 2002;58:1754-9.
38. Patel A, Knapp M, Perez I, Evans A, Kalra L. Alternative strategies for stroke care cost-effectiveness and cost-utility analyses from a prospective randomized controlled trial. *Stroke* 2004;35:196-204.
39. Jullamate P, Azeredo de Z, Paul C, Subgranon R. Thai stroke patient caregivers: who they are and what they need. *Cerebrovascular Disease* 2006;21:128-33.
40. กรมสวัสดิการและคุ้มครองแรงงาน กระทรวงสาธารณสุข. รายงานผลการวิเคราะห์ค่าจ้าง รายได้ และชั่วโมงทำงาน ปี 2546. กรุงเทพมหานคร: บริษัท บพิชการพิมพ์ จำกัด; 2547.
41. กรมจัดหางาน กระทรวงแรงงาน. โครงสร้างและรายละเอียดมาตรฐานอุตสาหกรรม. Available from: <http://www.doe.go.th/vgnew/standard/tsic/index.asp>. [Accessed 13 January 2006].
42. สำนักงานสถิติแห่งชาติ สำนักนายกรัฐมนตรื. การจัดประเภทอาชีพตามมาตรฐานสากล. Available from: <http://service.nso.go.th/nso/knowledge/knowledge10/isco.pdf>. [Accessed 11 January 2006].
43. Stroke Scales Overview Available from: <http://www.strokecenter.org/trials/scales/scales-overview.htm>. [Accessed 28 November 2005].
44. Van Swieten JC, Koudstaal PJ, Visser MC, Schouten HJA, Van Gijn J. Interobserver agreement for the assessment of handicap in stroke patients. *Stroke* 1998;19:604-07.
45. Loewen SC, Anderson BA. Predictors of stroke outcome using objective measurement scales. *Stroke* 1990;21:78-81.

46. Kwon S, Hartzema AG, Duncan PW, Lai S. Disability measures in stroke relationship among the Barthel Index, the functional independence measure, and the Modified Rankin Scale. *Stroke* 2004;35:918-23.
47. Uyttenboogaart M, Stewart R, Vroomen P, Keyser J, Luijckx G. Optimizing cutoff scores for the Barthel Index and the Modified Rankin Scale for defining outcome in acute stroke trials. *Stroke* 2005;36:1984-7
48. สำนักงานสถิติแห่งชาติ กระทรวงเทคโนโลยีสารสนเทศและการสื่อสาร. โครงการสำรวจภาวะการทำงานของประชากร. Available from:
<http://service.nso.go.th/nso/knowledge/knowledge04/lfs.html>. [Accessed 17 November 2006].
49. สำนักงานสถิติแห่งชาติ กระทรวงเทคโนโลยีสารสนเทศและการสื่อสาร. สรุปผลการสำรวจภาวะการทำงานของประชากร เดือนกันยายน พ.ศ. 2549. Available from:
http://service.nso.go.th/nso/g_service/lfs49/lfssep.pdf. [Accessed 17 November 2006].
50. กระทรวงแรงงาน. อัตราค่าจ้างขั้นต่ำ (ฉบับ6). Available from:
<http://www.labour.go.th/news/file/WageRate.pdf>. [Accessed 23 October 2006].
51. Office of The National Economic and Social Development Board. GROSS DOMESTIC PRODUCT : Q3/2006. Available from: [Accessed 13 March 2007].
52. กรมสวัสดิการและคุ้มครองแรงงาน กระทรวงแรงงาน. รายงานผลการวิเคราะห์ค่าจ้าง รายได้ และชั่วโมงทำงาน ปี 2546. กรุงเทพมหานคร: บริษัท บพิชการพิมพ์ จำกัด; 2547.
53. อาทรรีวีไพบูลย์. การวิเคราะห์ต้นทุนในการดูแลสุขภาพ. กรุงเทพมหานคร: คณะเภสัชศาสตร์ มหาวิทยาลัยมหิดล; 2545.

54. Office of the Permanent Secretary of Ministry of Commerce MoCaOotNE, Social Development Board OotPM. Producer price index, Consumer price index, Inflation rate and Growth rate of GDP deflator: 1999 - 2005

Available from: http://service.nso.go.th/nso/g_indicator/eco_49T.pdf. [Accessed 21 November 2006].

55. Department of Labour Protection and Welfare MoL. Labour Protection Act B.E. 2541 (1998)

Available from: <http://www.labour.go.th/webimage/images/load/file/2541.pdf>. [Accessed 23 October 2006].

56. Altman DG. Practical statistics for medical research. London: Chapman & Hall; 1991.

57. Cohen J, Cohen P, West SG, Aiken LS. Applied multiple regression/ correlation analysis for the behavioral sciences Third ed. New Jersey: Lawrence Erlbaum Associates, Inc.; 2003.

58. สำนักส่งเสริมและพิทักษ์คนพิการ. สถิติการดำเนินงานจดทะเบียนคนพิการทั่วประเทศ.

Available from: <http://www.oppd.opp.go.th/regist/home.html>. [Accessed 7 September 2005].

59. Youngkong S. Cost of cerebral infarction from societal perspective : a case study at Prasat Neurological insititue [M.S. Thesis in Pharmacy (Pharmacy Administration)]. Bangkok: Mahidol university; 2001.

APPENDIX

Appendix A : Questionnaire

แบบสอบถามต้นทุนการดูแลอย่างไม่เป็นทางการของผู้พิการจากโรคหลอดเลือดสมอง

วันที่สัมภาษณ์.....

ผู้สัมภาษณ์.....

สถานพยาบาล.....

สถานที่สัมภาษณ์.....

คำชี้แจง

การศึกษานี้เป็นการสัมภาษณ์ผู้ดูแลผู้ป่วย (ในที่นี่จะใช้คำว่า "ผู้ป่วย" แทนคำว่า "ผู้พิการ") โดยที่ผู้ดูแลนั้นๆ จะต้องไม่ได้รับค่าตอบแทนเป็นตัวแทนเงินจากการดูแลผู้ป่วย ในแบบสอบถามจะเก็บข้อมูลของจำนวนเวลาที่ผู้ดูแลใช้ไปในการดูแลผู้ป่วย โดยจะวัดเฉพาะเวลาในส่วนเพิ่มขึ้นเมื่อมีผู้ป่วยในครอบครัว และการดูแลนั้นจะทำให้เวลาของการทำงาน-ประกอบอาชีพ-พักผ่อน หรือกิจกรรมทางสังคมลดลงหรือขาดหายไป

แบบสอบถาม แบ่งออกเป็น 5 ส่วน ดังนี้

ส่วนที่ 1 แบบประเมินความสามารถในการทำกิจวัตรประจำวัน (Barthel Index)

ส่วนที่ 2 ข้อมูลทั่วไปของผู้ป่วย

ส่วนที่ 3 ปัจจัยภายนอก

ส่วนที่ 4 ข้อมูลทั่วไปของผู้ดูแล

ส่วนที่ 5 กิจกรรมการดูแลอย่างไม่เป็นทางการของผู้ดูแล

เกณฑ์การคัดเลือกผู้เข้าร่วมวิจัย (ต้องมีครบทุกข้อ)

ผู้ดูแลผู้ป่วยจากโรคหลอดเลือดสมอง (Stroke) โดยที่ผู้ป่วยนั้นจะต้องมีลักษณะดังต่อไปนี้

1. เป็นผู้ป่วยจากโรคหลอดเลือดสมอง (ICD 10 รหัส I60.0 - I69.8 และ G81.0 - G81.9)
2. ผู้ป่วยมีอาการของโรคหลอดเลือดสมอง (stroke attack) มาแล้วระหว่าง 6 เดือน ถึง 5 ปี
3. มีคะแนนจากการประเมินความสามารถในการทำกิจวัตรประจำวันของผู้ป่วยด้วย Barthel Index น้อยกว่าหรือเท่ากับ 95 คะแนน จากคะแนนเต็ม 100 คะแนน
4. ช่วงเวลาที่สัมภาษณ์นั้น ผู้พิการอาจได้รับการรักษาที่โรงพยาบาลหรืออยู่ที่บ้าน

เกณฑ์การคัดออก

1. ไม่สามารถติดตามขอสัมภาษณ์ผู้ดูแลผู้ป่วยได้
2. ขณะสัมภาษณ์ถ้าผู้พิการเข้ารับการรักษาตัวในโรงพยาบาล โดยช่วงเวลาที่พักรักษาตัวนั้นเกิน 1 สัปดาห์

ส่วนที่ 1 แบบประเมินความสามารถในการทำกิจวัตรประจำวัน (Barthel Index)

ลำดับที่	กิจกรรม	คะแนน
1	Feeding (การรับประทานอาหารเมื่อเตรียมสำหรับไว้ให้เรียบร้อยต่อหน้า) 0 = ไม่สามารถดักอาหารเข้าปากได้ ต้องมีคนป้อนให้ 5 = ช่วยใช้ช้อนตักเตรียมไว้ให้ หรือตัดให้เป็นชิ้นเล็ก ๆ ไว้ล่วงหน้า 10 = ดักอาหารและช่วยตัวเองได้เป็นปกติ	
2	Transfers (ลุกนั่งจากที่นอนหรือจากเตียงไปยังเก้าอี้) 0 = ไม่สามารถนั่งได้ (นั่งแล้วจะล้มเสมอ) 5 = สามารถนั่งได้ แต่ต้องการความช่วยเหลืออย่างมาก จากคน 1-2 คน พยุง หรือดันขึ้นมาจึงจะนั่งได้ 10 = ต้องการความช่วยเหลือบ้าง เช่น บอกให้ทำตามหรือช่วยพยุงเล็กน้อย 15 = ทำได้เอง รวมทั้งสามารถถือครกเข็นและยกที่วางเท้าขึ้น	
3	Grooming (ล้างหน้า หวีผม แปรงฟัน โกนหนวดในระยะ 24-48 ชั่วโมงที่ผ่านมา) 0 = ต้องการความช่วยเหลือ 5 = ทำได้เอง (รวมทั้งที่ทำได้เองถ้าเตรียมอุปกรณ์ไว้ให้)	
4	Toilet Use (การใช้ห้องส้วม) 0 = ช่วยตัวเองไม่ได้ 5 = ต้องการความช่วยเหลือ แต่สามารถทำบางอย่างได้เอง 10 = ช่วยตัวเองได้ดี (ขึ้นนั่งและลงจากโถส้วมได้เอง ทำความสะอาดแล้วสามารถใส่เสื้อผ้าได้เรียบร้อย)	
5	Bathing (การอาบน้ำ) 0 = ต้องมีคนช่วยหรือทำให้ 5 = อาบน้ำได้เอง (อาบน้ำฝักบัวได้เอง)	
6	Mobility (การเคลื่อนที่ภายในห้องหรือบ้าน) 0 = นั่งบนรถเข็น แต่ไม่สามารถเคลื่อนที่ไปไหนได้ 5 = นั่งบนรถเข็นแล้วเคลื่อนรถเข็นเองได้ ไม่ต้องมีคนเข็นให้ และจะต้องเข้าออกมุมห้องหรือประตูได้ 10 = เดินหรือเคลื่อนที่ได้โดยมีคนช่วย 1 คน โดยบอกให้ทำตามหรือช่วยพยุง 15 = เดินหรือเคลื่อนที่ได้เอง (อาจใช้อุปกรณ์ช่วยเดิน)	
7	Stairs (การขึ้นลงบันได) 0 = ไม่สามารถทำได้ 5 = ต้องการคนช่วยเหลือ 10 = ขึ้นลงได้เอง(ถ้าต้องใช้อุปกรณ์ช่วยเดินเช่น Walker จะต้องเอาขึ้นลง ได้ด้วย)	
8	Dressing (การสวมใส่เสื้อผ้า) 0 = ต้องมีคนสวมใส่ให้ ช่วยตัวเองไม่ได้เลยหรือได้น้อย 5 = ช่วยตัวเองได้ราวร้อยละ 50 ที่เหลือต้องมีคนช่วย 10 = ช่วยตัวเองได้ดี รวมทั้งการติดกระดุม รูดซิปหรือใส่เสื้อผ้าให้เหมาะสมได้	

ส่วนที่ 1 แบบประเมินความสามารถในการทำกิจวัตรประจำวัน (Barthel Index)

ลำดับที่	กิจกรรม	คะแนน
9	Bowels (การกลั้นอุจจาระในระยะ 1 สัปดาห์ที่ผ่านมา) 0 = กลั้นไม่ได้ 5 = กลั้นไม่ได้เป็นบางครั้ง (น้อยกว่า 1 ครั้ง/สัปดาห์) หรือต้องช่วยโดยการสวนหรือเหน็บยา 10 = กลั้นได้เป็นปกติ สามารถใช้การสวนหรือเหน็บยาเมื่อต้องการ	
10	Bladder (การกลั้นปัสสาวะในระยะ 1 สัปดาห์ที่ผ่านมา) 0 = กลั้นไม่ได้ หรือใส่สายสวนปัสสาวะแต่ไม่สามารถดูแลเองได้ 5 = กลั้นไม่ได้เป็นบางครั้ง (น้อยกว่าวันละ 1 ครั้ง) 10 = กลั้นได้เป็นปกติ	
	คะแนนรวม	

การแปลผลคะแนน

0	-	20	= ระดับพิการมากที่สุด
25	-	45	= ระดับพิการมาก
50	-	70	= ระดับพิการปานกลาง
75	-	95	= ระดับพิการเล็กน้อย
100			= ไม่มีระดับความพิการ

ส่วนที่ 2 ข้อมูลทั่วไปของผู้ป่วย

ลำดับที่	แบบสอบถาม	Variable code
11	<p>ปัจจุบันผู้ป่วยใช้สิทธิใดในการรักษาพยาบาล (สิทธิหลัก)</p> <p><input type="checkbox"/> 1. ข้าราชการ <input type="checkbox"/> 2. บัตรทอง 30 บาท</p> <p><input type="checkbox"/> 3. ประกันสังคม <input type="checkbox"/> 4. จ่ายเอง</p> <p><input type="checkbox"/> 5. ทหารผ่านศึก <input type="checkbox"/> 6. ประกันชีวิต</p> <p><input type="checkbox"/> 7. รัฐวิสาหกิจ <input type="checkbox"/> 8. อื่นๆ ระบุ.....</p>	Insurance []

ส่วนที่ 3 ปัจจัยภายนอก

ลำดับที่	แบบสอบถาม	Variable code
1	จำนวนสมาชิกในครอบครัวที่อาศัยอยู่ร่วมกันมีทั้งหมด.....คน	Member [] []
2	<p>ผู้ที่ให้การดูแลผู้ป่วยเป็นประจำอย่างต่อเนื่อง เช่น ทุกวัน/ทุกสัปดาห์ มี.....คน</p> <p>คนที่ 1 ชื่อ-สกุลเกี่ยวข้องกับผู้ป่วยคือ.....</p> <p>คนที่ 2 ชื่อ-สกุลเกี่ยวข้องกับผู้ป่วยคือ.....</p> <p>คนที่ 3 ชื่อ-สกุลเกี่ยวข้องกับผู้ป่วยคือ.....</p>	No_Carer [] []
3	<p>มีการอยู่อาศัยร่วมกันของสมาชิกภายในครอบครัวอย่างไร</p> <p><input type="checkbox"/> 1. มีเฉพาะ พ่อ-แม่-ลูก <input type="checkbox"/> 2. มีพ่อ-แม่-ลูก และญาติๆ</p>	Family []
4	<p>ที่ตั้งของบ้านอยู่ที่ใด</p> <p><input type="checkbox"/> 1. อยู่ในเขตกรุงเทพฯ หรือในเขตเทศบาล</p> <p><input type="checkbox"/> 2.อยู่นอกเขตเทศบาล</p>	Geographic []
5	<p>ปัจจุบันผู้ป่วยยังรับการรักษาแบบแผนปัจจุบันอยู่หรือไม่ (ทั้งภาครัฐและเอกชน)</p> <p><input type="checkbox"/> 1. เลิกรักษาแล้ว พบแพทย์ครั้งสุดท้ายเมื่อ เดือน.....ปี.....</p> <p><input type="checkbox"/> 2. พบแพทย์ ทุกเดือน</p>	Treatment []
6	<p>ใน 1 เดือนที่ผ่านมา มีการฟื้นฟูสมรรถภาพ หรือ ทำกายภาพบำบัดให้ผู้ป่วยหรือไม่</p> <p><input type="checkbox"/> 1. ไม่มี (ข้ามไปข้อ 8) <input type="checkbox"/> 2. มี</p>	Rehab []

ส่วนที่ 3 ปัจจัยภายนอก

ลำดับที่	แบบสอบถาม	Variable code
7	ใครเป็นผู้ทำกายภาพบำบัดให้ผู้ป่วย <input type="checkbox"/> 1. ไปทำกายภาพบำบัดโดยเจ้าหน้าที่ที่โรงพยาบาล <input type="checkbox"/> 2. มีเจ้าหน้าที่มาทำกายภาพบำบัดให้ที่บ้าน <input type="checkbox"/> 3. ผู้ดูแลทำกายภาพบำบัดให้ผู้ป่วยเองที่บ้าน	Rehab_who []
8	ใน 1 เดือนที่ผ่านมา มีการรักษาแบบพื้นบ้านหรือไม่ <input type="checkbox"/> 1. ไม่มี <input type="checkbox"/> 2. หมอพื้นบ้าน / หมอนวด / หมอเป่า <input type="checkbox"/> 3. นวดประคบสมุนไพร, ยาหม้อ <input type="checkbox"/> 4. อื่นๆ ระบุ.....	Tradition []
9	ผู้ป่วยมีบัตรประจำตัวผู้พิการหรือมีการขึ้นทะเบียนผู้พิการหรือไม่ <input type="checkbox"/> 1. ไม่มี <input type="checkbox"/> 2. มี	Register []
10	ผู้ป่วยได้รับความช่วยเหลือทั้งสิ่งของหรือตัวเงินจากที่ใดบ้าง (ตอบได้มากกว่า 1 ข้อ) <input type="checkbox"/> 1. ไม่ได้ได้รับความช่วยเหลือใดๆ <input type="checkbox"/> 2. ประชาสงเคราะห์ ระบุ..... <input type="checkbox"/> 3. อบต. ระบุ..... <input type="checkbox"/> 4. เทศบาล ระบุ..... <input type="checkbox"/> 5. กองทุนผู้พิการ ระบุ..... <input type="checkbox"/> 6. อื่นๆ ระบุ.....	Social 1 [] 2 [] 3 [] 4 [] 5 [] 6 []
11	หากได้รับเงินสงเคราะห์หรือเงินช่วยเหลืออื่นๆ จากภาครัฐ มีการช่วยเหลืออย่างไร <input type="checkbox"/> 1. ได้ครั้งเดียว/ครั้งแรก เป็นจำนวนเงิน.....บาท <input type="checkbox"/> 2. ได้ประจำ ต่อเนื่อง เป็นจำนวนเงิน.....บาท ต่อ..... เดือน / ปี	Finance 1 [] [] [] [] [] [] 2 [] [] [] [] [] [] / [] / []
12	มีการจ้างคนมาดูแลผู้ป่วยเป็นพิเศษ หรือไม่ <input type="checkbox"/> 1. ไม่มี <input type="checkbox"/> 2. มีอัตราจ้าง.....บาทต่อ(วัน/เดือน)	Health_worker [] 2 [] [] [] [] [] [] / [] / []
13	ในครอบครัวมีลูกจ้างทำงานบ้านหรือคนรับใช้ หรือไม่ <input type="checkbox"/> 1. ไม่มี (ข้ามไปข้อ 16) <input type="checkbox"/> 2. มีอัตราจ้าง.....บาทต่อ(วัน/เดือน)	Employee [] 2 [] [] [] [] [] [] / [] / []
14	เมื่อมีผู้ป่วยภายในบ้าน ลูกจ้างทำงานบ้านหรือคนรับใช้ จะต้องดูแลผู้ป่วย เช่น =อาบน้ำ, พาเข้าห้องน้ำ, พาไปพบแพทย์ ฯลฯ หรือไม่ <input type="checkbox"/> 1. ไม่ต้อง (ข้ามไปข้อ 16) <input type="checkbox"/> 2. ต้องดูแลผู้ป่วยด้วย	Employ_care []

ส่วนที่ 3 ปัจจัยภายนอก

ลำดับที่	แบบสอบถาม	Variable code
15	ในกรณีที่ลูกจ้างทำงานบ้านหรือคนรับใช้จะต้องดูแลผู้ป่วยด้วย ลูกจ้างหรือคนรับใช้นั้นได้รับค่าตอบแทนหรือค่าจ้าง เพิ่มขึ้น หรือไม่ <input type="checkbox"/> 1. ไม่ได้ <input type="checkbox"/> 2. ได้เพิ่มขึ้น.....บาทต่อ(วัน/เดือน)	Employ_compens [] 2 [] [] [] [] [] / [] / []
16	มีเจ้าหน้าที่จากภาครัฐ เช่น โรงพยาบาล, สถานีนอนามัย มาเยี่ยมบ้านหรือไม่ <input type="checkbox"/> 1. ไม่มี <input type="checkbox"/> 2. มี ครั้งสุดท้ายเมื่อ.....	Gov_team [] 2 [] / []
17	มีเจ้าหน้าที่องค์กรเอกชนหรือกลุ่มช่วยเหลืออื่นๆ มาเยี่ยมผู้ป่วยหรือไม่ <input type="checkbox"/> 1. ไม่มี <input type="checkbox"/> 2. มี ครั้งสุดท้ายเมื่อ.....	Private_team [] 2 [] / []

ส่วนที่ 4 ข้อมูลผู้ดูแล คนที่..... ชื่อ-สกุล.....

ลำดับที่	แบบสอบถาม	Variable code
1	อายุ.....ปี	Age2 [] [] [] []
2	เพศ <input type="checkbox"/> 1. ชาย <input type="checkbox"/> 2. หญิง	Sex 2 []
3	ศาสนา <input type="checkbox"/> 1. พุทธ <input type="checkbox"/> 2. คริสต์ <input type="checkbox"/> 3. อิสลาม <input type="checkbox"/> 4. อื่นๆ ระบุ.....	Religion2 []
4	ระดับการศึกษาสูงสุดของท่าน คือ <input type="checkbox"/> 1. ไม่ได้เรียนหนังสือ <input type="checkbox"/> 2. ประถมศึกษา <input type="checkbox"/> 3. มัธยมศึกษาหรือเทียบเท่า <input type="checkbox"/> 4. อนุปริญญาหรือประกาศนียบัตร <input type="checkbox"/> 5. ปริญญาตรี หรือเทียบเท่า <input type="checkbox"/> 6. ปริญญาโท หรือสูงกว่า <input type="checkbox"/> 7. อื่นๆ	Education []
5	สถานภาพสมรส <input type="checkbox"/> 1. โสด <input type="checkbox"/> 2. แต่งงาน/อยู่กินด้วยกัน <input type="checkbox"/> 3. หย่าร้าง/หม้าย <input type="checkbox"/> 4. แยกทางกัน	Married []

ส่วนที่ 4 ข้อมูลผู้ดูแล คนที่..... ชื่อ-สกุล.....

ลำดับที่	แบบสอบถาม	Variable code
13	ผู้ดูแลเคยดูแลผู้ป่วยคนอื่นๆมาก่อนหรือไม่ <input type="checkbox"/> 1. ไม่เคย <input type="checkbox"/> 2. เคย ระบุ.....	Experience_care []
14	ผู้ดูแลเคยได้รับการอบรมหรือคำแนะนำเรื่องการดูแลผู้ป่วยมาก่อน หรือไม่ <input type="checkbox"/> 1. ไม่เคย <input type="checkbox"/> 2. เคย	Train []
15	เริ่มให้การดูแลผู้ป่วย ตั้งแต่ เดือน.....ปี.....	T_care [/]
16	คุณคิดว่าในช่วงเวลา 1 เดือนที่ผ่านมาที่ให้การดูแลผู้ป่วย คุณใช้เวลาดูแลผู้ป่วย เพิ่มขึ้น หรือ ลดลง หรือ เท่าเดิม เมื่อเปรียบเทียบกับเวลาดูแลผู้ป่วยเฉลี่ยต่อเดือน ของช่วงเวลาที่ผ่านมา หรือใน 1 ปี ที่ผ่านมา (หากดูแลมาแล้วเกิน 1 ปี) <input type="checkbox"/> 1. เท่าเดิม (ไม่ต้องถามข้อ 17) <input type="checkbox"/> 2. เพิ่มขึ้น <input type="checkbox"/> 3. ลดลง	T_change []
17	หากช่วงเวลาดังกล่าวแตกต่างจากเดิม จะคิดเป็นเพิ่มขึ้นหรือลดลงกี่เปอร์เซ็นต์ (%) โดยกำหนดให้เวลาดูแลเฉลี่ยต่อเดือนของช่วงเวลาที่ผ่านมา หรือ ใน 1 ปีที่ผ่านมา คิดเป็น 100 ส่วน แล้วใน 1 เดือนที่ผ่านมาเวลาที่ใช้ดูแลผู้ป่วย <input type="checkbox"/> 1. เพิ่มขึ้น.....ส่วน <input type="checkbox"/> 2. ลดลง.....ส่วน	% T_change 1 [][][] 2 [][][]

ส่วนที่ 5 กิจกรรมการดูแลอย่างไม่เป็นทางการ ผู้ดูแล คนที่..... ชื่อ-สกุล.....

คำถามต่อไปนี้จะให้ผู้ดูแลประเมินว่ากิจกรรมใดบ้างที่ผู้ป่วยปฏิบัติได้ทั้งก่อนและหลังป่วย แล้วให้ระบุว่าหลังป่วยแล้วผู้ดูแลจะต้องช่วยเหลือในกิจกรรมใดบ้าง ใช้เวลาเท่าใด พร้อมระบุความถี่ในการช่วยเหลือในการศึกษาที่แบ่งประเภทกิจกรรมการดูแลอย่างไม่เป็นทางการ เป็น 4 ประเภท ดังนี้

1. กิจกรรมในบ้าน เช่น ทำความสะอาดบ้าน, ล้างจาน, ซักเสื้อผ้า ฯลฯ
2. กิจกรรมการดูแลรักษา เช่น การเตรียมยา, การทำกายภาพบำบัด ฯลฯ
3. กิจกรรมประจำวัน เช่น การรับประทานอาหาร, การอาบน้ำ-แต่งตัว, การขับถ่าย ฯลฯ
4. กิจกรรมนอกบ้าน เช่น การไปธนาคาร, การไปพบแพทย์, การไปท่องเที่ยว ฯลฯ

ช่วงเวลาที่ผู้ดูแลใช้ไปในการดูแลผู้ป่วย แบ่งเป็น 3 ประเภท ดังนี้

1. เวลาทำงานหรือประกอบอาชีพของผู้ดูแลที่ได้รับค่าตอบแทนเป็นเงิน เช่น การทำไร่นา, การค้าขาย, การทำงานในบริษัท ฯลฯ
2. เวลาทำงานของผู้ดูแลที่ไม่ได้รับค่าตอบแทนเป็นเงิน เช่น การทำบ้าน, การดูแลเด็ก ฯลฯ
3. เวลาพักผ่อนของผู้ดูแล เช่น การนอนหลับ, การอ่านหนังสือ, การดูทีวี, การฟังเพลง ฯลฯ

ตัวอย่าง แนวทางในการสัมภาษณ์ผู้ดูแล สำหรับแต่ละกิจกรรมการดูแลอย่างไม่เป็นทางการ

- (1) เริ่มจากการถามกิจกรรมต่างๆ ที่ผู้ป่วยเคยปฏิบัติได้ ก่อนป่วยเป็นโรคหลอดเลือดสมอง
- (2) หลังจากนั้นจะถามเฉพาะกิจกรรมที่ผู้ป่วยเคยปฏิบัติได้ แล้วจะต้องให้ผู้ดูแลช่วยเหลือในกิจกรรมเหล่านั้นหรือไม่
- (3) ถ้าต้องให้ผู้ดูแลช่วยเหลือจะใช้เวลาประมาณกี่ชั่วโมง ต่อ กี่วัน/สัปดาห์/เดือน เพื่อช่วยผู้ป่วยในกิจกรรมนั้นๆ
- (4) ให้ระบุประเภทเวลาของผู้ดูแลที่ใช้ในการทำกิจกรรมแทนผู้ป่วย เช่น หากท่านไม่ต้องทำความสะอาดบ้านแทนผู้ป่วย ท่านจะใช้เวลาช่วงนั้นทำอะไร เช่น ทำงานประจำ ทำงานบ้าน นอนหลับพักผ่อน หรือไม่ได้ (กรณีผู้ป่วยไปพบแพทย์ หากผู้ดูแลต้องลงงานให้คิดจำนวนเวลาตามเวลาที่ลงงาน เช่น ครึ่งวัน /เต็มวัน)

การตอบคำถามเหล่านี้ ขอให้ผู้ดูแลเด็กตอบย้อนหลัง เพื่อประเมินระยะเวลาที่ใช้ในการดูแลผู้ป่วยโดยเฉลี่ยในรอบ 1 เดือนที่ผ่านมา

ควรเติมเครื่องหมายในช่องว่างให้ครบทุกช่อง และในกรณีที่ไม่ได้ใช้เวลาในการทำกิจกรรมใดๆ ให้ใส่ เลขศูนย์ (0) ในช่องนั้นๆ

ลำดับ ที่	กิจกรรม	(1) ก่อนป่วย ผู้ป่วยทำกิจกรรมนี้ ได้หรือไม่ (√,×)	(2) หากเคยทำได้ หลังป่วยผู้ดูแลต้อง ช่วยเหลือหรือไม่ (√,×)	(3) หากผู้ดูแลต้อง ช่วยเหลือ ใช้เวลานานเท่าใด (นาที/ชั่วโมง)	(3) ให้ระบุความถี่ ในการช่วยเหลือ เช่น ทุกวัน, ทุก 2 เดือน	(4) ให้ระบุประเภทเวลาของผู้ดูแลที่ใช้ในการช่วยเหลือผู้ป่วย			
						เวลาทำงานปกติ	เวลาทำงานบ้าน หรือดูแลเด็ก	เวลาพักผ่อน	รวมไม่ได้
1	กิจกรรมในบ้าน								
1.1	การทำตามสะอาดบ้าน เช่น กวาด บ้าน, ถูบ้าน, ล้างห้องน้ำ, ดูฝุ่น				ทุกวัน / สัปดาห์ / เดือน				
1.2	การเตรียมอาหาร-ทำกับข้าว				ทุกวัน / สัปดาห์ / เดือน				
1.3	การล้างจานหรือภาชนะในการ ประกอบอาหาร				ทุกวัน / สัปดาห์ / เดือน				
1.4	การซัก-รีด เสื้อผ้า, ซักแห้ง				ทุกวัน / สัปดาห์ / เดือน				
1.5	การทำสวนรอบบ้าน, ดูแลความ เรียบร้อยรอบบ้าน				ทุกวัน / สัปดาห์ / เดือน				
1.6	การซื้อของใช้สำหรับใช้ภายในบ้าน				ทุกวัน / สัปดาห์ / เดือน				

การตอบคำถามเหล่านี้ ขอให้ผู้ดูแลนิเทศฯ ย้อนหลัง เพื่อประเมินระยะเวลาที่ใช้ในการดูแลผู้ป่วยโดยเฉลี่ยในรอบ 1 เดือนที่ผ่านมา

ควรเติมเครื่องหมายในช่องว่างให้ครบทุกช่อง และในกรณีที่ไม่ได้ใช้เวลานี้ในการทำกิจกรรมใดๆ ให้ใส่ เลขศูนย์ (0) ในช่องนั้นๆ

ลำดับ ที่	กิจกรรม	(1) ก่อนป่วย ผู้ป่วยทำกิจกรรมนี้ ได้หรือไม่ (√,×)	(2) หากเคยทำได้ หลังป่วยผู้ดูแลต้อง ช่วยใจหรือไม่ (√,×)	(3) หากผู้ดูแลต้อง ช่วยเหลือ ใช้เวลานานเท่าใด (นาที/ชั่วโมง)	(3) ให้ระบุความถี่ ในการช่วยเหลือ เช่น ทุกวัน, ทุก 2 เดือน วัน / สัปดาห์ / เดือน	(4) ให้ระบุประเภทเวลาของผู้ดูแลที่ใช้ในการช่วยเหลือผู้ป่วย			
						เวลาทำงานปกติ ประกอบอาชีพ (√,×)	เวลาทำงานบ้าน หรือดูแลเด็ก (√,×)	เวลาพักผ่อน ดูหนัง/ฟังเพลง (√,×)	ระบุไม่ได้
1.7	การดูแลเด็ก				ทุก 2 เดือน	(√,×)	(√,×)	(√,×)	
2	กิจกรรมการดูแลสุขภาพ								
2.1	การจัดเตรียมยาให้ผู้ป่วย เช่น ยาจาก รพ., ยาต้ม-ยาหม้อ				วัน / สัปดาห์ / เดือน				
2.2	การทำกายภาพบำบัดให้ผู้ป่วย หรือ นวดประคบ				วัน / สัปดาห์ / เดือน				
2.3	การไปพบแพทย์, ไปโรงพยาบาล*				วัน / สัปดาห์ / เดือน				
2.4	การช่วยปรับปรุงบ้านเพื่อผู้ป่วย เช่น ทำราวจับช่วยพยุง				วัน / สัปดาห์ / เดือน				
3	กิจกรรมประจำวัน								
3.1	การรับประทานอาหาร				วัน / สัปดาห์ / เดือน				

การตอบคำถามเหล่านี้ ขอให้ผู้ดูแลนิเทศฯ ย้อนหลัง เพื่อประเมินระยะเวลาที่ใช้ในการดูแลผู้ป่วยโดยเฉลี่ยในรอบ 1 เดือนที่ผ่านมา

การเติมเครื่องหมายในช่องว่างให้ครบทุกช่อง และในกรณีที่ไม่ได้ใช้เวลาในการทำกิจกรรมใดๆ ให้ใส่ เลขศูนย์ (0) ในช่องนั้นๆ

ลำดับ ที่	กิจกรรม	(1) ก่อนป่วย ผู้ป่วยทำกิจกรรมนี้ ได้หรือไม่ (√,×)	(2) หากเคยทำได้ หลังป่วยผู้ดูแลต้อง ช่วยใจหรือไม่ (√,×)	(3) หากผู้ดูแลต้อง ช่วยเหลือ ใช้เวลาเท่าใด (นาที/ชั่วโมง)	(3) ให้ระบุความถี่ ในการช่วยเหลือ เช่น ทุกวัน, ทุก 2 เดือน วัน / สัปดาห์ / เดือน	(4) ให้ระบุประเภทเวลาของผู้ดูแลที่ใช้ในการช่วยเหลือผู้ป่วย			
						เวลาทำงานปกติ ประกอบอาชีพ (√,×)	เวลาทำงานบ้าน หรือดูแลเด็ก (√,×)	เวลาพักผ่อน ดูหนัง/ฟังเพลง (√,×)	ระบุไม่ได้ (√,×)
3.2	การอาบน้ำหรือแต่งตัว				วัน / สัปดาห์ / เดือน				
3.3	การขับถ่ายหรือเข้าห้องน้ำ				วัน / สัปดาห์ / เดือน				
3.4	การเคลื่อนไหวดังกล่าว เช่น ขยับตัว, เดิน, วิ่ง				วัน / สัปดาห์ / เดือน				
4	กิจกรรมนอกบ้าน								
4.1	การจัดการรูปร่าง เช่น ไปตัดต่อ สถานที่ต่างๆ (ธนาคาร, ไปรษณีย์, อำเภอ, สำนักงานเขต)				วัน / สัปดาห์ / เดือน				
4.2	การไปเที่ยวตามสถานที่ต่างๆหรือ พบปะเพื่อนฝูง,ญาติ				วัน / สัปดาห์ / เดือน				
4.3	อื่นๆ				วัน / สัปดาห์ / เดือน				

Appendix B : Informal care time for disabled stroke survivors

Figure B-1 Normal Q-Q plot of total time of informal care

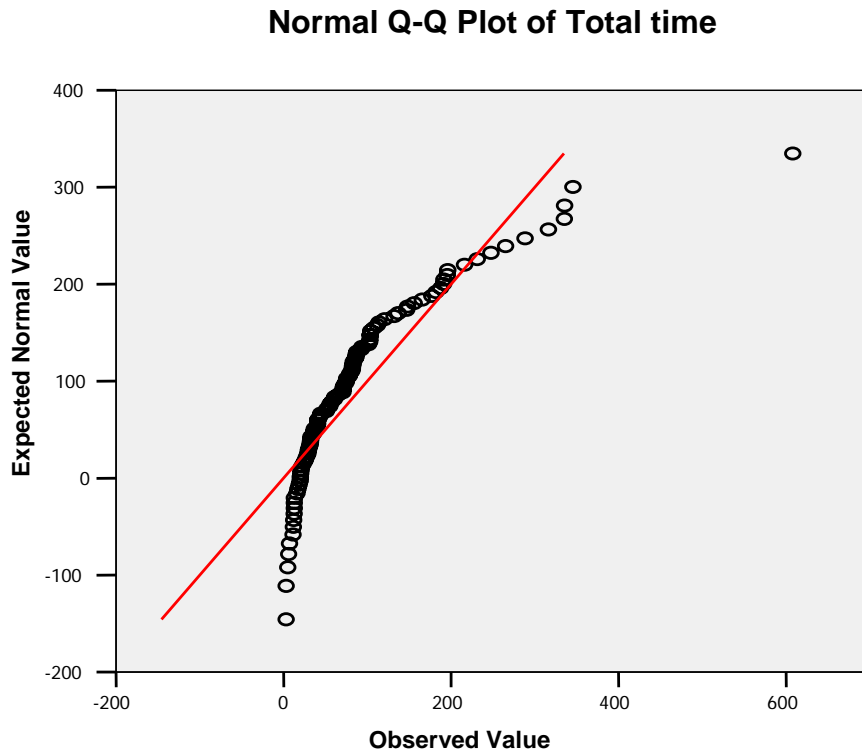


Figure B-2 Normal Q-Q plot of natural log form of total time of informal care

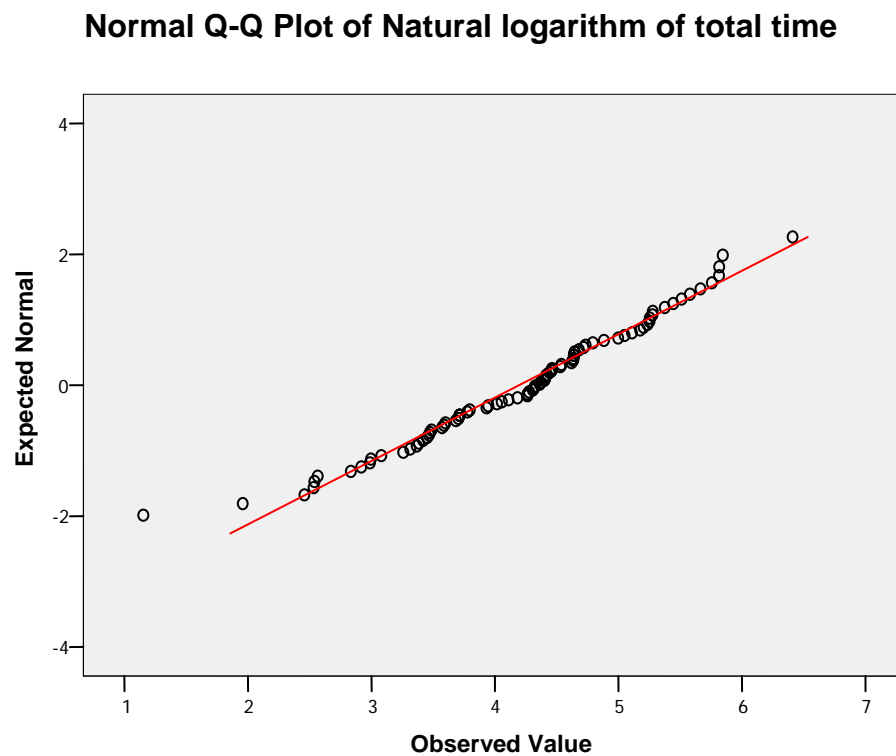


Figure B-3 Normal Q-Q plot of residual of natural log form of total time of informal care

Normal P-P Plot of Regression Standardize Residual

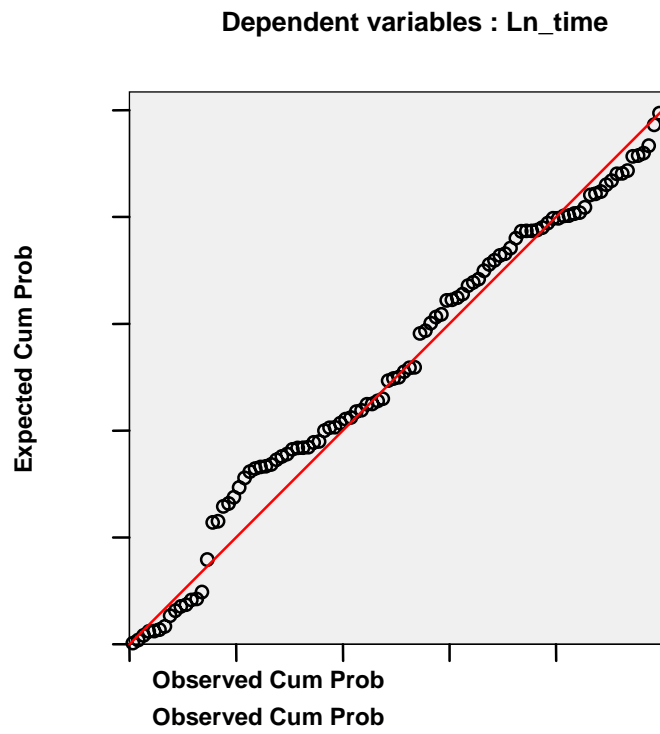


Table B-1 Descriptive of variables in stepwise multiple regression analysis

Descriptive Statistics

	Mean	Std. Deviation	N
Natural logarithm of total time	4.0639	1.07799	100
Very severely disabled	.21	.409	100
Severely disabled	.17	.378	100
Moderately disabled	.29	.456	100
Urban	.60	.492	100
Agriculturist	.21	.409	100
Employee/Labour	.06	.239	100
Student	.01	.100	100
Government/Stateenterprise/Company	.06	.239	100
Owner/Commerce	.15	.359	100
Retired agee	.24	.429	100

Table B-2 Descriptive of variables selected in the fitted model

Variables Entered/Removed(a)

Model	Variables Entered	Variables Removed	Method
1	Student	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	Very severely disabled	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
3	Moderately disabled	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
4	Retired agee	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a Dependent Variable: Natural logarithm of total time

Table B-3 Model summary of stepwise multiple regression analysis

Model Summary(e)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics			Durbin-Watson	
					R Square Change	F Change	Sig. F Change		
1	.273(a)	.074	.065	1.04239	.074	7.879	1	98	.006
2	.354(b)	.125	.107	1.01844	.051	5.662	1	97	.019
3	.407(c)	.165	.139	1.00018	.040	4.576	1	96	.035
4	.450(d)	.203	.169	.98247	.038	4.492	1	95	.037

a Predictors: (Constant), Student

b Predictors: (Constant), Student, Very severely disabled

c Predictors: (Constant), Student, Very severely disabled, Moderately disabled

d Predictors: (Constant), Student, Very severely disabled, Moderately disabled, Retired agee

e Dependent Variable: Natural logarithm of total time

Table B-4 ANOVA test of stepwise multiple regression analysis

ANOVA(e)

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.561	1	8.561	7.879	.006(a)
	Residual	106.484	98	1.087		
	Total	115.045	99			
2	Regression	14.434	2	7.217	6.958	.002(b)
	Residual	100.611	97	1.037		
	Total	115.045	99			
3	Regression	19.011	3	6.337	6.335	.001(c)
	Residual	96.034	96	1.000		
	Total	115.045	99			
4	Regression	23.347	4	5.837	6.047	.000(d)
	Residual	91.698	95	.965		
	Total	115.045	99			

a Predictors: (Constant), Student

b Predictors: (Constant), Student, Very severely disabled

c Predictors: (Constant), Student, Very severely disabled, Moderately disabled

d Predictors: (Constant), Student, Very severely disabled, Moderately disabled, Retired agee

e Dependent Variable: Natural logarithm of total time

Table B-5 Residual statistic of multiple regression analysis

Residuals Statistics(a)

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	1.1527	4.6560	4.0639	.48562	100
Std. Predicted Value	-5.995	1.219	.000	1.000	100
Standard Error of Predicted Value	.151	.982	.202	.088	100
Adjusted Predicted Value	3.3644	4.7652	4.0936	.39073	99
Residual	-2.80185	2.50971	.00000	.96242	100
Std. Residual	-2.852	2.554	.000	.980	100
Stud. Residual	-2.886	2.585	.000	1.005	99
Deleted Residual	-2.86994	2.57069	-.00027	1.00867	99
Stud. Deleted Residual	-3.006	2.667	-.003	1.018	99
Mahal. Distance	1.359	98.010	3.960	9.630	100
Cook's Distance	.000	.117	.009	.016	99
Centered Leverage Value	.014	.990	.040	.097	100

a Dependent Variable: Natural logarithm of total time

Table B-6 Coefficients of stepwise multiple regression analysis

Coefficients(a)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Correlations			Collinearity Statistics			
	B	Error Std.				Beta	Lower	Upper	Zero-order	Partial	Part	Tolerance	VIF	
1 (Constant)	4.093	0.105		39.072	0.000	3.885	4.301							
Student	-2.941	1.048	-0.273	-2.807	0.006	-5.020	-0.862	-0.273	-0.273	-0.273	-0.273	1.000	1.000	
2 (Constant)	3.967	0.115		34.401	0.000	3.738	4.196							
Student	-2.814	1.025	-0.261	-2.746	0.007	-4.849	-0.780	-0.273	-0.269	-0.261	-0.261	0.997	1.003	
Very severely disabled	0.596	0.250	0.226	2.380	0.019	0.099	1.093	0.240	0.235	0.226	0.226	0.997	1.003	
3 (Constant)	3.781	0.143		26.459	0.000	3.497	4.064							
Student	-2.628	1.010	-0.244	-2.601	0.011	-4.633	-0.622	-0.273	-0.257	-0.243	-0.243	0.990	1.010	
Very severely disabled	0.782	0.261	0.297	2.998	0.003	0.264	1.300	0.240	0.293	0.280	0.280	0.886	1.129	
Moderately disabled	0.501	0.234	0.212	2.139	0.035	0.036	0.966	0.130	0.213	0.199	0.199	0.885	1.130	
4 (Constant)	3.900	0.151		25.776	0.000	3.600	4.201							
Student	-2.748	0.994	-0.255	-2.764	0.007	-4.721	-0.774	-0.273	-0.273	-0.253	-0.253	0.987	1.013	
Very severely disabled	0.756	0.257	0.287	2.945	0.004	0.246	1.265	0.240	0.289	0.270	0.270	0.884	1.131	
Moderately disabled	0.516	0.230	0.218	2.242	0.027	0.059	0.974	0.130	0.224	0.205	0.205	0.884	1.131	
Retired age	-0.490	0.231	-0.195	-2.119	0.037	-0.948	-0.031	-0.186	-0.212	-0.194	-0.194	0.992	1.008	

a Dependent Variable: Natural logarithm of total time

Table B-7 Collinearity diagnostics of stepwise multiple regression analysis

Collinearity Diagnostics(a)

Model	Dimension	Eigenvalue	Condition Index	(Constant)	Student	Variance Proportions		
						Very severely disabled	Moderately disabled	Retired age
1	1	1.100	1.000	0.450	0.450			
2	2	0.900	1.106	0.550	0.550			
3	1	1.469	1.000	0.265	0.015	0.256		
4	2	1.000	1.212	0.000	0.942	0.036		
5	3	0.531	1.663	0.735	0.042	0.708		
6	1	1.714	1.000	0.143	0.006	0.084	0.104	
7	2	1.000	1.309	0.000	0.904	0.052	0.002	
8	3	1.000	1.309	0.000	0.057	0.360	0.269	
9	4	0.286	2.449	0.857	0.034	0.504	0.625	
10	1	2.049	1.000	0.083	0.002	0.044	0.067	0.090
11	2	1.012	1.423	0.002	0.370	0.246	0.143	0.018
12	3	1.000	1.431	0.000	0.585	0.208	0.065	0.000
13	4	0.675	1.742	0.019	0.004	0.044	0.217	0.770
14	5	0.264	2.787	0.895	0.038	0.458	0.508	0.123

a Dependent Variable: Natural logarithm of total time

Appendix C : Productivity cost of informal care

Figure C-1 Normal Q-Q plot of productivity cost of informal care

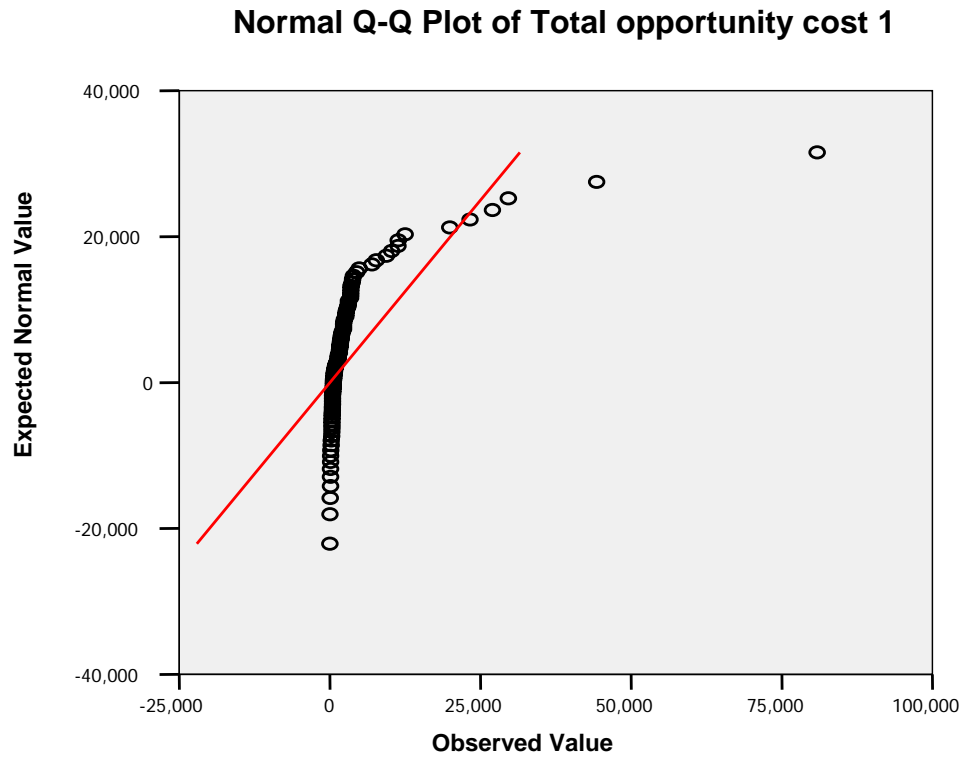


Figure C-2 Normal Q-Q plot of productivity cost of informal care

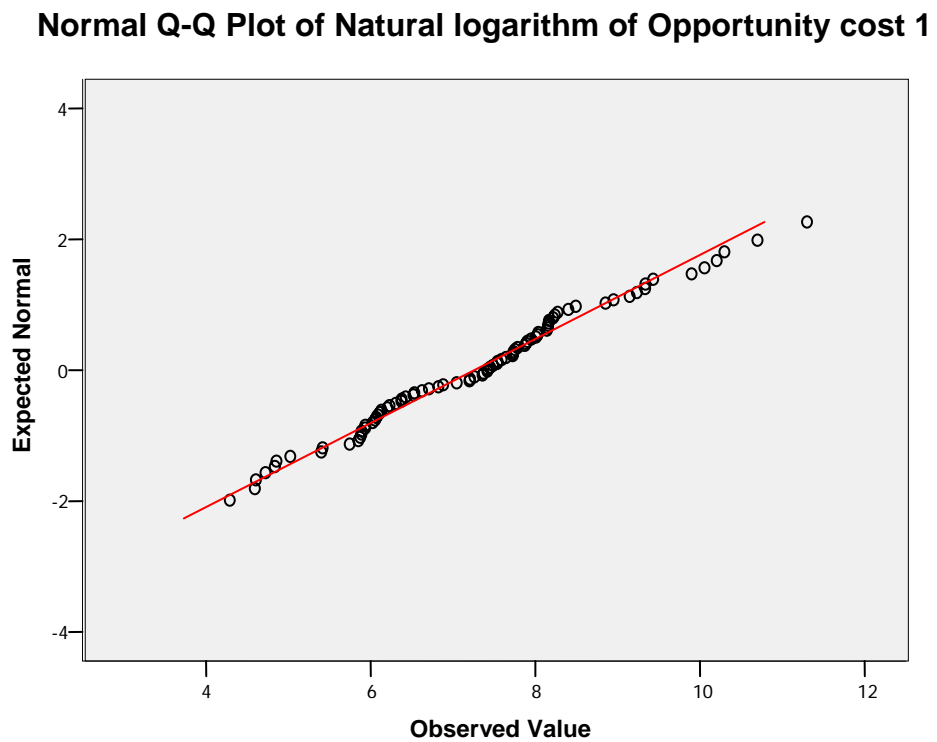


Figure C-3 Normal Q-Q plot of residual of productivity cost of informal care

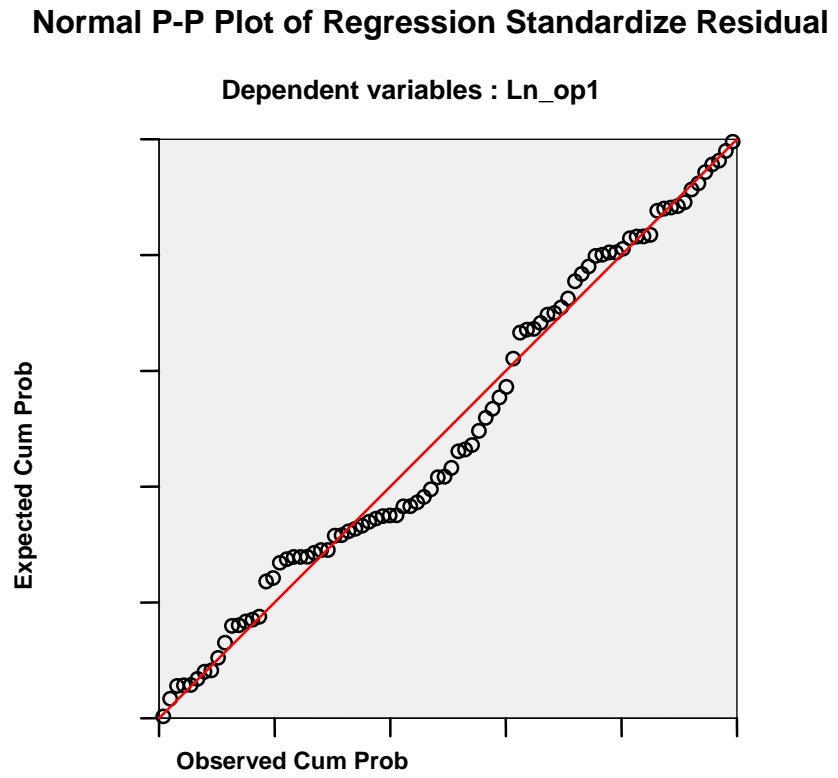


Table C-1 Descriptive of variables in stepwise multiple regression analysis

Descriptive Statistics

	Mean	Std. Deviation	N
Natural logarithm of Opportunity cost 1	7.2564	1.55692	84
Very severely disabled	.21	.413	84
Severely disabled	.18	.385	84
Moderately disabled	.30	.460	84
Urban	.61	.491	84
Agriculturist	.25	.436	84
Employee/Labour	.07	.259	84
Student	.01	.109	84
Government/State enterprise/Company	.07	.259	84
Owner/Commerce	.18	.385	84
Retired age	.13	.339	84

Table C-2 Descriptive of variables selected in the fitted model

Variables Entered/Removed(a)

Model	Variables Entered	Variables Removed	Method
1	Owner/Commerce	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	Government/State enterprise/Company	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
3	Employee/Labour	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a Dependent Variable: Natural logarithm of Opportunity cost 1

Table C-3 Model summary of stepwise multiple regression analysis

Model Summary(d)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics			Durbin-Watson
					R Square Change	F Change	Sig. F Change	
1	.422(a)	.178	.168	1.42014	17.757	1	82	.000
2	.534(b)	.286	.268	1.33217	12.187	1	81	.001
3	.581(c)	.338	.313	1.29043	6.326	1	80	.014

a Predictors: (Constant), Owner/Commerce

b Predictors: (Constant), Owner/Commerce, Government/State enterprise/Company

c Predictors: (Constant), Owner/Commerce, Government/State enterprise/Company, Employee/Labour

d Dependent Variable: Natural logarithm of Opportunity cost I

Table C-4 ANOVA test of stepwise multiple regression analysis

ANOVA(d)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	35.813	1	35.813	17.757	.000(a)
	Residual	165.378	82	2.017		
	Total	201.191	83			
2	Regression	57.442	2	28.721	16.184	.000(b)
	Residual	143.750	81	1.775		
	Total	201.191	83			
3	Regression	67.975	3	22.658	13.607	.000(c)
	Residual	133.216	80	1.665		
	Total	201.191	83			

a Predictors: (Constant), Owner/Commerce

b Predictors: (Constant), Owner/Commerce, Government/State enterprise/Company

c Predictors: (Constant), Owner/Commerce, Government/State enterprise/Company, Employee/Labour

d Dependent Variable: Natural logarithm of Opportunity cost 1

Table C-5 Residual statistic of multiple regression analysis

Residuals Statistics(a)

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	6.6465	8.7661	7.2564	.90497	84
Std. Predicted Value	-.674	1.668	.000	1.000	84
Standard Error of Predicted Value	.171	.527	.251	.129	84
Adjusted Predicted Value	6.5856	9.0222	7.2564	.90815	84
Residual	-3.51100	3.40805	.00000	1.26689	84
Std. Residual	-2.721	2.641	.000	.982	84
Stud. Residual	-2.745	2.665	.000	1.001	84
Deleted Residual	-3.57369	3.46891	.00000	1.31787	84
Stud. Deleted Residual	-2.866	2.774	.001	1.013	84
Mahal. Distance	.468	12.845	2.964	4.341	84
Cook's Distance	.000	.084	.010	.016	84
Centered Leverage Value	.006	.155	.036	.052	84

a Dependent Variable: Natural logarithm of Opportunity cost 1

Table C-6 Coefficients of stepwise multiple regression analysis

Coefficients(a)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Correlations			Collinearity Statistics		
	B	Std. Error				Beta	Lower	Upper	Zero-order	Partial	Part	Tolerance	VIF
1 (Constant)	6.952	0.171		40.663	0.000	6.612	7.292						
Owner/Commerce	1.705	0.405	0.422	4.214	0.000	0.900	2.510	0.422	0.422	0.422	1.000	1.000	1.000
2 (Constant)	6.779	0.168		40.391	0.000	6.445	7.113						
Owner/Commerce	1.878	0.383	0.465	4.906	0.000	1.116	2.639	0.422	0.479	0.461	0.983	1.017	1.017
Government/State enterprise/Company	1.987	0.569	0.331	3.491	0.001	0.855	3.119	0.271	0.362	0.328	0.983	1.017	1.017
3 (Constant)	6.646	0.171		38.886	0.000	6.306	6.987						
Owner/Commerce	2.010	0.374	0.497	5.368	0.000	1.265	2.756	0.422	0.515	0.488	0.964	1.038	1.038
Government/State enterprise/Company	2.120	0.554	0.353	3.827	0.000	1.017	3.222	0.271	0.393	0.348	0.974	1.026	1.026
Employee/Labour	1.393	0.554	0.232	2.515	0.014	0.291	2.495	0.140	0.271	0.229	0.974	1.026	1.026

a Dependent Variable: Natural logarithm of Opportunity cost1

Table C-7 Collinearity diagnostics of stepwise multiple regression analysis

Collinearity Diagnostics(a)

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions					
				(Constant)	Owner/Commerce	Government/State enterprise/Company	Employee/Labour		
1	1	1.423	1.000	0.289	0.289				
	2	0.577	1.570	0.711	0.711				
2	1	1.500	1.000	0.250	0.192	0.087			
	2	1.000	1.225	0.000	0.231	0.652			
3	3	0.500	1.732	0.750	0.577	0.261			
	1	1.567	1.000	0.217	0.140	0.064	0.064		
2	2	1.000	1.252	0.000	0.072	0.683	0.140		
	3	1.000	1.252	0.000	0.280	0.021	0.564		
4	4	0.433	1.902	0.783	0.508	0.232	0.232		

a Dependent Variable: Natural logarithm of Opportunity cost I

Appendix D : Time cost type1 of informal care

Figure D-1 Normal Q-Q plot of time cost type1 of informal care

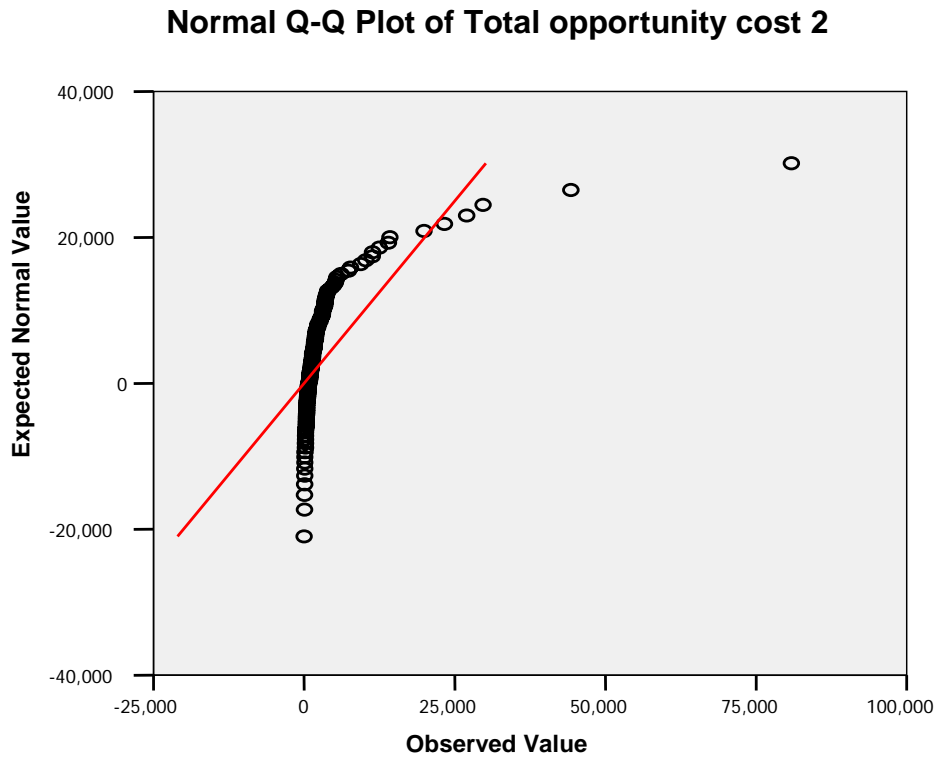


Figure D-2 Normal Q-Q plot of time cost type1 of informal care

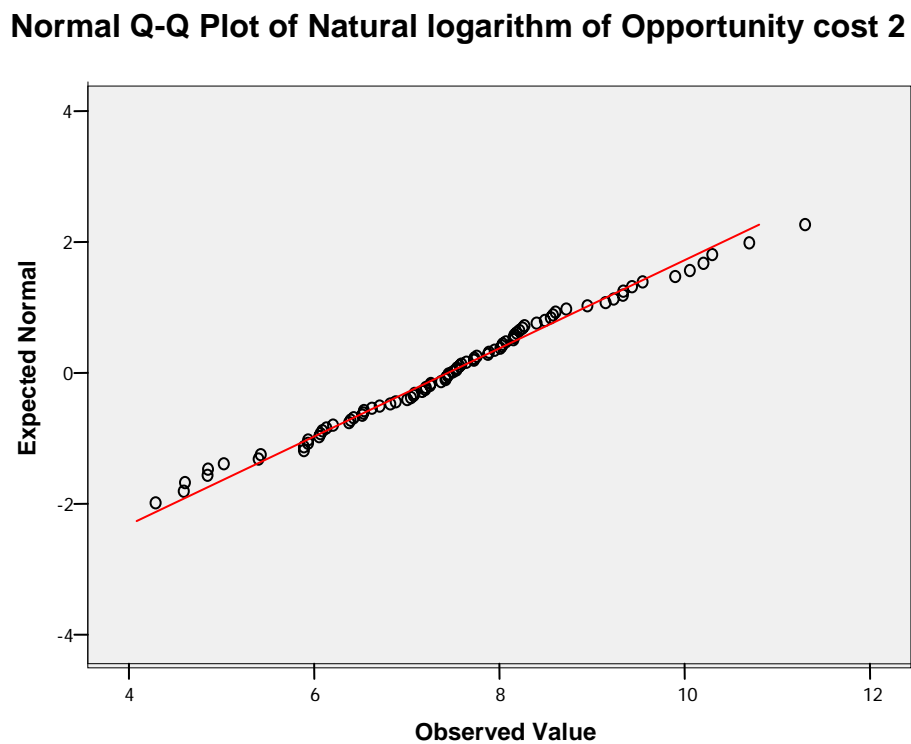


Figure D-3 Normal Q-Q plot of residual of time cost type1 of informal care

Normal P-P Plot of Regression Standardize Residual

Dependent variables : Ln_op2

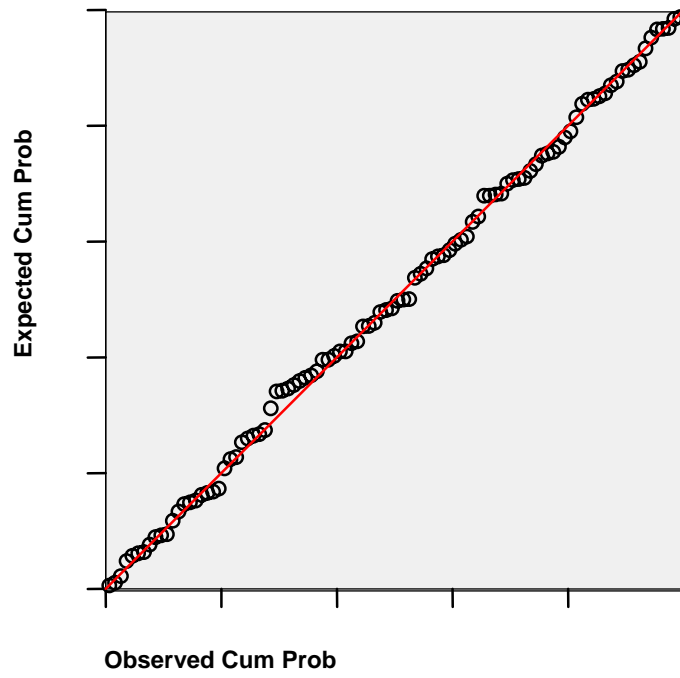


Table D-1 Descriptive of variables in stepwise multiple regression analysis

Descriptive Statistics

	Mean	Std. Deviation	N
Natural logarithm of Opportunity cost 2	7.3369	1.47858	100
Very severely disabled	.21	.409	100
Severely disabled	.17	.378	100
Moderately disabled	.29	.456	100
Urban	.60	.492	100
Agriculturist	.21	.409	100
Employee/Labour	.06	.239	100
Student	.01	.100	100
Government/State enterprise/Company	.06	.239	100
Owner/Commerce	.15	.359	100
Retired age	.24	.429	100

Table D-2 Descriptive of variables selected in the fitted model

Variables Entered/Removed(a)

Model	Variables Entered	Variables Removed	Method
1	Agriculturist	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	Owner/Commerce	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
3	Government/State enterprise/Company	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
4	Student	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a Dependent Variable: Natural logarithm of Opportunity cost 2

Table D-3 Model summary of stepwise multiple regression analysis

Model Summary(e)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics			Durbin-Watson	
					R Square Change	F Change	Sig. F Change		
1	.394(a)	.156	.147	1.36566	.156	18.049	1	98	.000
2	.495(b)	.245	.229	1.29820	.089	11.449	1	97	.001
3	.550(c)	.302	.280	1.25422	.058	7.922	1	96	.006
4	.586(d)	.344	.316	1.22285	.041	5.989	1	95	.016

a Predictors: (Constant), Agriculturist

b Predictors: (Constant), Agriculturist, Owner/Commerce

c Predictors: (Constant), Agriculturist, Owner/Commerce, Government/State enterprise/Company

d Predictors: (Constant), Agriculturist, Owner/Commerce, Government/State enterprise/Company, Student

e Dependent Variable: Natural logarithm of Opportunity cost 2

Table D-4 ANOVA test of stepwise multiple regression analysis

ANOVA(e)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	33.661	1	33.661	18.049	.000(a)
	Residual	182.771	98	1.865		
	Total	216.433	99			
2	Regression	52.956	2	26.478	15.711	.000(b)
	Residual	163.476	97	1.685		
	Total	216.433	99			
3	Regression	65.418	3	21.806	13.862	.000(c)
	Residual	151.015	96	1.573		
	Total	216.433	99			
4	Regression	74.373	4	18.593	12.434	.000(d)
	Residual	142.060	95	1.495		
	Total	216.433	99			

a Predictors: (Constant), Agriculturist

b Predictors: (Constant), Agriculturist, Owner/Commerce

c Predictors: (Constant), Agriculturist, Owner/Commerce, Government/State enterprise/Company

d Predictors: (Constant), Agriculturist, Owner/Commerce, Government/State enterprise/Company, Student

e Dependent Variable: Natural logarithm of Opportunity cost 2

Table D-5 Residual statistic of multiple regression analysis

Residuals Statistics(a)

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	4.2881	8.7687	7.3369	.86674	100
Std. Predicted Value	-3.517	1.652	.000	1.000	100
Standard Error of Predicted Value	.162	1.223	.238	.135	100
Adjusted Predicted Value	6.0975	9.0226	7.3676	.81713	99
Residual	-3.07274	2.74868	.00000	1.19789	100
Std. Residual	-2.513	2.248	.000	.980	100
Stud. Residual	-2.535	2.268	.000	1.004	99
Deleted Residual	-3.12761	2.83249	.00000	1.25316	99
Stud. Deleted Residual	-2.612	2.319	.000	1.014	99
Mahal. Distance	.747	98.010	3.960	10.188	100
Cook's Distance	.000	.075	.008	.014	99
Centered Leverage Value	.008	.990	.040	.103	100

a Dependent Variable: Natural logarithm of Opportunity cost 2

Table D-6 Coefficients of stepwise multiple regression analysis

Coefficients(a)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Correlations			Collinearity Statistics		
	B	Std. Error				Lower	Upper	Zero-order	Partial	Part	Toleranc	VIF	
1	(Constant)	7.636	0.154	49.698	0.000	7.331	7.941						
	Agriculturist	-1.424	0.335	-4.248	0.000	-2.090	-0.759	-0.394	-0.394	-0.394		1.000	1.000
2	(Constant)	7.397	0.162	45.581	0.000	7.075	7.719						
	Agriculturist	-1.185	0.326	-3.630	0.000	-1.833	-0.537	-0.394	-0.346	-0.320		0.953	1.049
	Owner/Commerce	1.260	0.372	3.384	0.001	0.521	1.999	0.377	0.325	0.299		0.953	1.049
3	(Constant)	7.255	0.165	44.052	0.000	6.928	7.582						
	Agriculturist	-1.043	0.319	-3.266	0.002	-1.677	-0.409	-0.394	-0.316	-0.278		0.929	1.076
	Owner/Commerce	1.402	0.363	3.859	0.000	0.681	2.123	0.377	0.366	0.329		0.935	1.070
	Government/State enterprise/Company	1.514	0.538	2.815	0.006	0.446	2.582	0.246	0.276	0.240		0.964	1.037
4	(Constant)	7.307	0.162	45.112	0.000	6.985	7.628						
	Agriculturist	-1.095	0.312	-3.509	0.001	-1.715	-0.476	-0.394	-0.339	-0.292		0.925	1.081
	Owner/Commerce	1.350	0.355	3.804	0.000	0.645	2.054	0.377	0.364	0.316		0.931	1.074
	Government/State enterprise/Company	1.462	0.525	2.785	0.006	0.420	2.504	0.246	0.275	0.232		0.963	1.039
	Student	-3.019	1.234	-2.447	0.016	-5.468	-0.570	-0.208	-0.244	-0.203		0.993	1.007

a Dependent Variable: Natural logarithm of Opportunity cost 2

Table D-7 Collinearity diagnostics of stepwise multiple regression analysis

Collinearity Diagnostics(a)

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions					
				(Constant)	Agriculturist	Owner/Commerce	Government/State enterprise/Company	Student	
1	1	1.458	1.000	0.271	0.271				
	2	0.542	1.641	0.729	0.729				
2	1	1.600	1.000	0.200	0.137	0.105			
	2	1.000	1.265	0.000	0.314	0.473			
	3	0.400	2.000	0.800	0.549	0.422			
3	1	1.648	1.000	0.176	0.111	0.086	0.039		
	2	1.000	1.284	0.000	0.163	0.000	0.705		
	3	1.000	1.284	0.000	0.204	0.511	0.072		
4	4	0.352	2.164	0.824	0.522	0.403	0.184		
	1	1.656	1.000	0.172	0.108	0.083	0.038	0.007	
	2	1.000	1.287	0.000	0.158	0.000	0.332	0.411	
	3	1.000	1.287	0.000	0.191	0.516	0.068	0.012	
5	4	1.000	1.287	0.000	0.025	0.000	0.379	0.537	
	5	0.344	2.193	0.828	0.518	0.401	0.183	0.033	

a Dependent Variable: Natural logarithm of Opportunity cost 2

Appendix E : Replacement cost of informal care

Figure E-1 Normal Q-Q plot of replacement cost of informal care

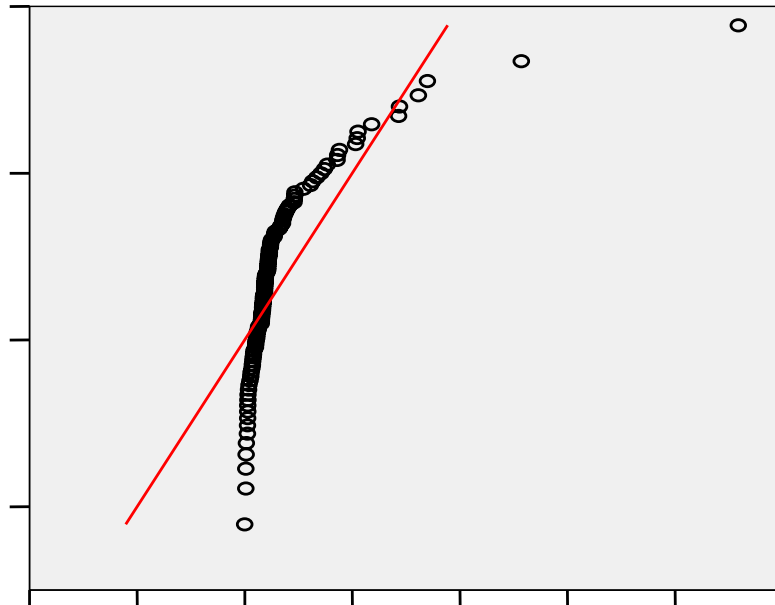


Figure E-2 Normal Q-Q plot of replacement cost of informal care

Normal Q-Q Plot of Natural logarithm of replacement cost

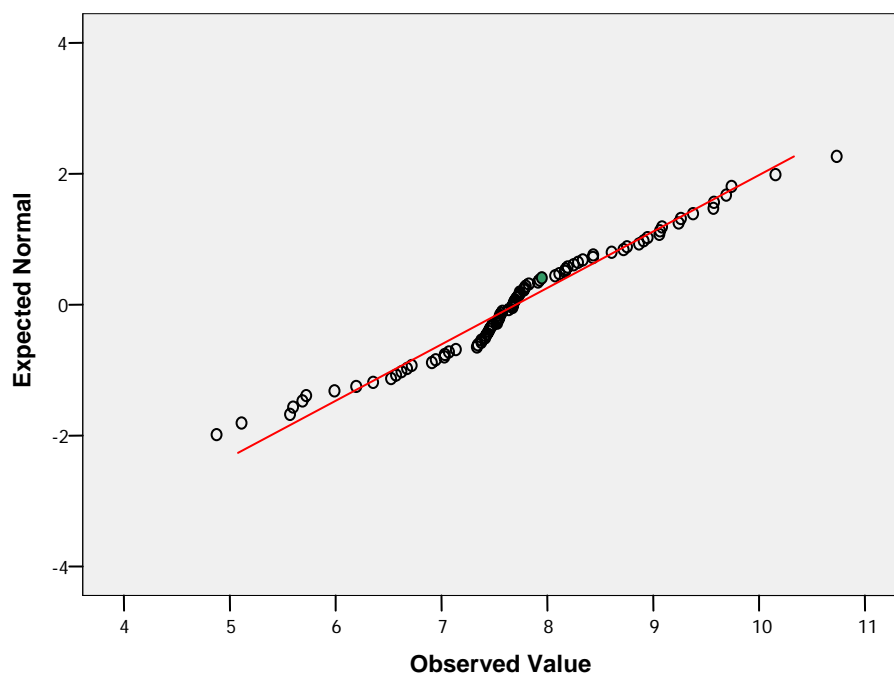


Figure E-3 Normal Q-Q plot of residual of replacement cost of informal care

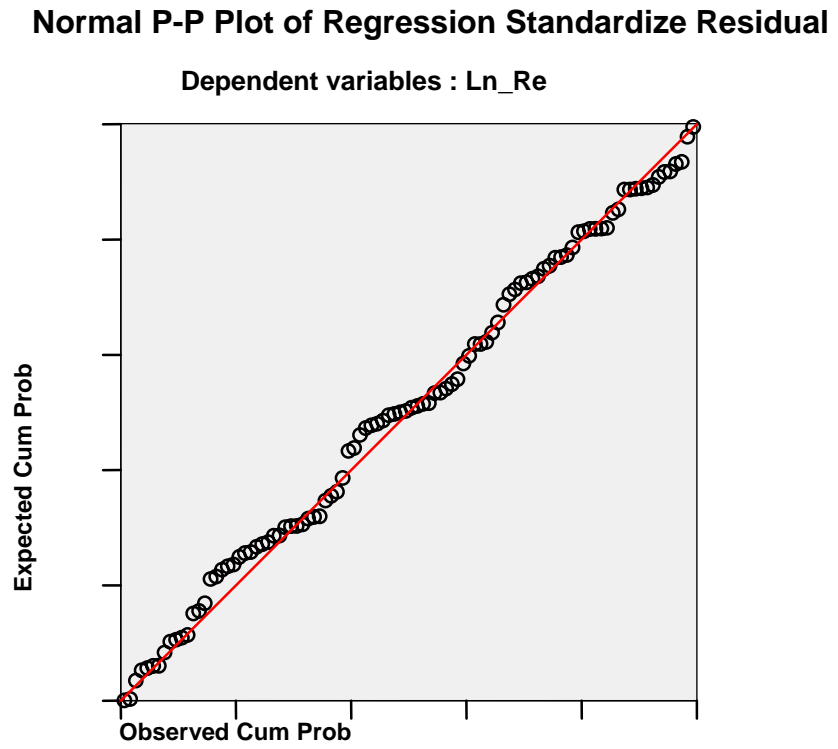


Table E-1 Descriptive of variables in stepwise multiple regression analysis

Descriptive Statistics

	Mean	Std. Deviation	N
Natural logarithm of replacement cost	7.6007	1.20499	100
Very severely disabled	.21	.409	100
Severely disabled	.17	.378	100
Moderately disabled	.29	.456	100
Urban	.60	.492	100
Agriculturist	.21	.409	100
Employee/Labour	.06	.239	100
Student	.01	.100	100
Government/State enterprise/Company	.06	.239	100
Owner/Commerce	.15	.359	100
Retired age	.24	.429	100

Table E-2 Descriptive of variables selected in the fitted model

Variables Entered/Removed(a)

Model	Variables Entered	Variables Removed	Method
1	Urban	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
2	Student	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
3	Very severely disabled	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
4	Moderately disabled	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).
5	Severely disabled	.	Stepwise (Criteria: Probability-of-F-to-enter <= .050, Probability-of-F-to-remove >= .100).

a Dependent Variable: Natural logarithm of replacement cost

Table E-3 Model summary of stepwise multiple regression analysis

Model Summary(f)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics			Durbin-Watson	
					R Square Change	F Change	Sig. F Change		
1	.349(a)	.122	.113	1.13486	.122	13.614	1	98	.000
2	.443(b)	.196	.179	1.09151	.074	8.939	1	97	.004
3	.500(c)	.250	.226	1.06006	.053	6.841	1	96	.010
4	.554(d)	.307	.278	1.02422	.057	7.837	1	95	.006
5	.589(e)	.346	.312	.99979	.040	5.700	1	94	.019

a Predictors: (Constant), Urban

b Predictors: (Constant), Urban, Student

c Predictors: (Constant), Urban, Student, Very severely disabled

d Predictors: (Constant), Urban, Student, Very severely disabled, Moderately disabled

e Predictors: (Constant), Urban, Student, Very severely disabled, Moderately disabled, Severely disabled

f Dependent Variable: Natural logarithm of replacement cost

Table E-4 ANOVA test of stepwise multiple regression analysis

ANOVA(f)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	17.533	1	17.533	13.614	.000(a)
	Residual	126.215	98	1.288		
	Total	143.748	99			
2	Regression	28.183	2	14.092	11.828	.000(b)
	Residual	115.565	97	1.191		
	Total	143.748	99			
3	Regression	35.870	3	11.957	10.640	.000(c)
	Residual	107.878	96	1.124		
	Total	143.748	99			
4	Regression	44.091	4	11.023	10.508	.000(d)
	Residual	99.657	95	1.049		
	Total	143.748	99			
5	Regression	49.788	5	9.958	9.962	.000(e)
	Residual	93.960	94	1.000		
	Total	143.748	99			

a Predictors: (Constant), Urban

b Predictors: (Constant), Urban, Student

c Predictors: (Constant), Urban, Student, Very severely disabled

d Predictors: (Constant), Urban, Student, Very severely disabled, Moderately disabled

e Predictors: (Constant), Urban, Student, Very severely disabled, Moderately disabled, Severely disabled

f Dependent Variable: Natural logarithm of replacement cost

Table E-5 Residual statistic of multiple regression analysis

Residuals Statistics(a)

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	4.7065	8.6434	7.6007	.70916	100
Std. Predicted Value	-4.081	1.470	.000	1.000	100
Standard Error of Predicted Value	.187	1.000	.231	.083	100
Adjusted Predicted Value	6.2004	8.8345	7.6306	.65323	99
Residual	-3.27318	2.58593	.00000	.97421	100
Std. Residual	-3.274	2.586	.000	.974	100
Stud. Residual	-3.393	2.680	.000	1.008	99
Deleted Residual	-3.51500	2.77698	-.00063	1.03785	99
Stud. Deleted Residual	-3.602	2.774	-.003	1.025	99
Mahal. Distance	2.456	98.010	4.950	9.486	100
Cook's Distance	.000	.142	.010	.020	99
Centered Leverage Value	.025	.990	.050	.096	100

a Dependent Variable: Natural logarithm of replacement cost

Table E-6 Coefficients of stepwise multiple regression analysis

Coefficients(a)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Correlations			Collinearity Statistics		
	B	Std. Error				Lower	Upper	Zero-order	Partial	Part	Tolerance	VIF	
1 (Constant)	7.088	0.179		39.501	0.000	6.732	7.444						
	Urban	0.855	0.232	3.690	0.000	0.395	1.314	0.349	0.349	0.349	0.349	1.000	1.000
2 (Constant)	7.088	0.173		41.069	0.000	6.745	7.430						
	Urban	0.910	0.224	4.069	0.000	0.466	1.353	0.349	0.382	0.370	0.993	1.007	1.007
Student	-3.291	1.101	-0.273	-2.990	0.004	-5.476	-1.106	-0.243	-0.290	-0.272	0.993	1.007	1.007
	(Constant)	6.860	0.189		36.330	0.000	6.486	7.235					
Urban	1.042	0.223	0.426	4.674	0.000	0.600	1.485	0.349	0.431	0.413	0.942	1.062	1.062
	Student	-3.196	1.070	-0.265	-2.988	0.004	-5.319	-1.073	-0.243	-0.292	-0.264	0.992	1.008
Very severely disabled	0.700	0.268	0.238	2.615	0.010	0.169	1.231	0.153	0.258	0.231	0.946	1.057	1.057
	(Constant)	6.611	0.203		32.572	0.000	6.208	7.014					
Urban	1.041	0.215	0.425	4.833	0.000	0.613	1.469	0.349	0.444	0.413	0.942	1.062	1.062
	Student	-2.946	1.037	-0.244	-2.840	0.006	-5.005	-0.887	-0.243	-0.280	-0.243	0.985	1.015
Very severely disabled	0.949	0.273	0.323	3.471	0.001	0.406	1.492	0.153	0.336	0.297	0.845	1.183	1.183
	Moderately disabled	0.672	0.240	0.254	2.799	0.006	0.195	1.148	0.194	0.276	0.239	0.885	1.130
(Constant)	6.317	0.233		27.061	0.000	5.853	6.780						
	Urban	1.108	0.212	0.453	5.224	0.000	0.687	1.529	0.349	0.474	0.436	0.925	1.081
Student	-2.718	1.017	-0.226	-2.673	0.009	-4.738	-0.699	-0.243	-0.266	-0.223	0.976	1.024	1.024
	Very severely disabled	1.218	0.290	0.414	4.205	0.000	0.643	1.794	0.153	0.398	0.351	0.718	1.394
Moderately disabled	0.922	0.257	0.349	3.593	0.001	0.413	1.432	0.194	0.348	0.300	0.737	1.357	1.357
	Severely disabled	0.723	0.303	0.226	2.387	0.019	0.122	1.324	0.010	0.239	0.199	0.773	1.294

a Dependent Variable: Natural logarithm of replacement cost

Table E-7 Collinearity diagnostics of stepwise multiple regression analysis

Collinearity Diagnostics(a)

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions							
				(Constant)	Urban	Student	Very severely disabled	Moderately disabled	Severely disabled		
1	1	1.775	1.000	0.113	0.113						
2	2	0.225	2.806	0.887	0.887						
2	1	1.807	1.000	0.106	0.106	0.021					
	2	0.968	1.366	0.010	0.006	0.976					
	3	0.225	2.835	0.884	0.888	0.003					
3	1	2.030	1.000	0.067	0.068	0.009	0.067				
	2	1.007	1.420	0.001	0.003	0.841	0.094				
	3	0.778	1.615	0.010	0.108	0.149	0.610				
	4	0.185	3.315	0.922	0.821	0.001	0.229				
4	1	2.341	1.000	0.041	0.052	0.004	0.027	0.052			
	2	1.016	1.518	0.002	0.005	0.153	0.416	0.115			
	3	1.000	1.530	0.000	0.000	0.779	0.040	0.088			
	4	0.482	2.204	0.006	0.307	0.063	0.184	0.565			
	5	0.161	3.813	0.951	0.636	0.001	0.333	0.180			
5	1	2.461	1.000	0.028	0.046	0.003	0.018	0.034			0.020
	2	1.017	1.556	0.001	0.005	0.158	0.318	0.118			0.008
	3	1.000	1.569	0.000	0.000	0.774	0.039	0.067			0.001
	4	1.000	1.569	0.000	0.000	0.000	0.072	0.067			0.478
	5	0.405	2.464	0.001	0.489	0.055	0.086	0.356			0.162
	6	0.117	4.591	0.970	0.460	0.009	0.468	0.358			0.330

a Dependent Variable: Natural logarithm of replacement cost

BIOGRAPHY

NAME	Miss Kanyarat Ponsoongnern
DATE OF BIRTH	June 18, 1978
PLACE OF BIRTH	Nakhonratchasima, Thailand
INSTITUTIONS ATTENDED	Srinakharinwirot University, 2000-2004: Bachelor of Science in Pharmacy Mahidol University, 2007: Master of Science in Pharmacy (Pharmacy Administration)
POSITION & OFFICE	Nongki Hospital, Burirum, Thailand Position: Pharmacist Tel. 0-44-653314-5#105 E-mail: teay002@yahoo.com