CURRENT PRACTICE, FINANCING AND POLICY ON TERMINALLY ILL PATIENTS IN THAILAND

CHUTIMA AKALEEPHAN

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University of East Anglia

School of Medicine, Health Policy and Practice
Faculty of Health

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ABSTRACT

Understanding the issue of mortality could better serve policies related to health and social services. Recently, major health care reform and population changes in the Thai context raised interest on this issue at the policy level. This research, therefore, aims to reveal and to explore the nationwide cost of treatment, utilisation and its disparity; current practice and coping mechanism of households; and important factors related to expenditure during the terminal period of life.

The research employed mixed quantitative and qualitative methods to explain characteristics of Thais dying between 2005 and 2006. Four studies encompassing this research were multivariate analyses of claimed data and household survey on last period expenditure and utilisation; in-depth interviews of terminally ill cancer patients and their care givers; and in-depth interviews of health professionals. Both multivariate analyses revealed that the main factors determining the inequality in access to and expenditure incurred by health insurance schemes and households for ambulatory care and acute care during the last period of life included age at death, health insurance scheme, cause of death and place of death. In addition, comorbidity and gender in claimed data also played a significant role in determining utilisaiton and claimed expenditure among decedents who sought acute care. Use of complementary medicine, being head of household, region, municipality, gender, occupation, education and living standards played significantly different roles on propensities and intensities of utilisation of and expenditure for those who sought both types of care. In-depth interviews of patients, care givers and health professionals confirmed the disparity across health insurance schemes. These findings revealed that differences among health insurance schemes strongly determined both utilisation and household expenditure and there was likely equality across different living standards.

It was indicated that home is likely the best place for caring and dying. Thus, strengthening comprehensive palliative care at home by informal care givers with support from a home health care team was recommended with occasional visits to conventional hospital care will improve the quality of care for the terminally ill patients. Financial constraint in the Universal Coverage Scheme related to access to pain relief substances requires further exploration.

CERTIFICATE OF ORIGINALITY

I certify that the work contained in the thesis submitted by me for the degree of Doctor of Philosophy is my original work except where due reference is made to other authors, and has not previously been submitted by me for a degree at this or any other University.

The thesis received official permission on access to specific variables in claimed data from the Comptroller General's Department and the National Health Security Office; data on death certification from Bureau of Policy and Strategy, Office of the Permanent Secretary, Ministry of Public Health. Records of decedents were matched and retrieved by the Central Office for Health Care Information. The thesis also got the permission on access to household survey data (7^{th} Survey of Population Change and the Survey on Healthcare Utilisations of and Household Health Expenditure for Decedents prior to Death 2005-2006) from the National Statistical Office.

Data analysis of both datasets was carried out by myself with technical guidance from my supervisors, Professor Miranda Mugford and Dr Paula Lorgelly, and statisticians, Dr Patrick Musonda at School of Medicine, Health Policy and Practice, University of East Anglia and Ms Saowalak Hunnangkul, a PhD candidate at London School of Hygiene and Tropical Medicine. Particular set of syntax on diagnostic test for GLM was recommended by Dr Paula Lorgelly and on Charlson comorbidity index was provided by Associate Professor Dr Supon Limwattananon. The interview records were transcribed by a short-term research assistant.

CHUTIMA AKALEEPHAN August 2010

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

ACC	Advanced Cancer Center
AD/HU	Alcohol dependence/harmful use
AMI	Acute myocardial infarction
ASR	Age-Standardized incidence Rate
BPS	Bureau of Health Policy and Strategy, Ministry of Public Health
CD	Chronic disease
CHD	Congenital heart diseases
CID	Citizen Identification Number
CM	Congenital malformation
COPD	Chronic obstructive pulmonary disease
CSI	Compulsory Social Insurance
CSMBS	Civil Servant Medical Benefit Scheme
CVD	Cerebrovascular diseases
DALY	Disability Adjusted Life Year
DD/HU	Drug dependence/harmful use
DRG	Diagnostic Related Group
DRG	Diagnosis Related Group
ECC	Excellent Cancer Center
GCC	General Cancer Center
GDP	Gross Domestic Product
HCS	Health Care Scheme
HT	Hypertension
ICD	International Classification of Diseases
ICD-10	10^{th} revision of the International Classification of Diseases and Health Problems
IHD	Ischemic heart disease
ISH	International self-harm

LBW	Low birth weight
LICS	Low Income Card Scheme
LRI	Lower respiratory infection
MAE	Mean Absolute Error
MoPH	Ministry of Public Health
MWS	Medical Welfare Scheme
na	Not available
NESDB	National Economics and Social Development Board
NESDP	National Economics and Social Development Plan
NHA	National Health Account
OLS	Ordinary Least Square
RI	Respiratory infections
RMSE	Root Mean Square Error
SHI	Social Health Insurance scheme, a part of the Social Security Scheme
SHUE	Survey on Health Utilisation of and Household Health Expenditure for Patients prior to Death in 2005-2006
SPC	Survey of Population Change
SPrEm	Social Health Insurance, Private Health Insurances and Employer Insurances
SSS	Social Security Scheme
TAI	Traffic Accident Insurance
TAs	Traffic Accidents
TB	Tuberculosis
THE	Total Health Expenditures
UC	Universal Coverage Health Insurance scheme
VS	Voluntary Scheme
WHO	World Health Organization
YLL	Year of Life Lost

ACKNOWLEDGEMENT

Herein this page, I would like to chronologically address my sincere thanks to all people involved as part of an impressive story in my life. I believe that decision on any movement in human life is based on the push and pull pressures in such circumstances.

During this marathon journey, I am grateful to Dr Viroj Tangcharoensathien and Dr Suwit Wibulpolprasert for their strong pushing and endless support, particularly their intentions to build capacity in human resources for health. This overseas studying came true with the scholarship from the Thai-European Health Care Reform Project initiated by Dr Sagnuan Nitayarumphong, the first Secretary-General of the National Health Security Office, Dr Pongpisut Jongudomsuk, Dr Thaworn Sakunphanit, the National Project Directors and Ms Daoporn Khamchinda. On the European side, the team led by Dr Ernst Tenambergen and Ms Monica M Burns, including the staffs of the International Labour Organization (ILO). I sincerely appreciate that financial support which helped me survive me in the UK and their kind facilitation. On the pull attraction, I must thank my supervisor, Professor Miranda Mugford. Without her generous and useful guidance, patience and moral support, I could not pass this big challenge. I learnt a great deal on the way of systematic thinking. I also thank the supervisory committee, Dr Paula Lorgelly, Dr Alexia Papageougiou, Dr David Wright, Dr Christopher Cowley, and Dr Viroj Tangcharoensathein for technical guidance. As a crucial part of research, the thesis would not even be formulated if there was no availability of data. I thank Dr Suchart Soranasathaporn and his team at Central Office for Health Care Information; Bureau of Claim Administration, National Health Security Office; Bureau of Policy and Strategy, Office of the Permanent Secretary, Ministry of Public Health; and the National Statistical Office in providing the invaluable claimed data and household survey. My particular gratitude goes to the terminally ill cancer patients and their care givers who kindly allowed me to obtain their informative perspectives on their illness and health services despite their illness. I also thank the physicians and other health staffs in Ubonrachthani province for their hands on coordination and helpful information.

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Last but not least, my perseverance in this marathon would come to nothing if without love and warmest support from my family. I am grateful to my mom, dad and my sisters in supporting me, always.

CHAPTER ONE

INTRODUCTION

This chapter aims to introduce the background of mortality in Thailand, the importance of death as a determinant of health and its societal meaning. These led to findings of the knowledge gap, the development of the research questions and purposes of the thesis.

1.1 The meaning of mortality to the health system

Death is unavoidable and affects society as a whole. Mortality, particularly premature mortality, is a social and health concern of every country around the world. This seems to be an important indicator for health assessment, both at population and individual levels. On one hand, five out of eight goals (goal numbers 1, 4, 5, 6 and 8) of the Millennium Development Goals (MDGs)[1] set by the United Nations and eight targets are directly related to health. Regarding death, the 4th goal aims to reduce child mortality, in particular the under-five mortality rate (U5MR), with the target of a two-third reduction, between 1990 and 2015. The 5th goal aims to improve maternity health with the target of a three-quarter reduction in maternal mortality ratio, over the same period. On the other hand, the Commission on Social Determinants of Health provides evidence on the health inequities and poor health including premature mortality of the poor, regardless of gender across and within countries. To some extent, mortality and inequity remain and both are related to health problems. The Commission also urged that it is time to tackle the inequitable distribution of power, money and resources by 'closing the gap in a generation' (World Health Organization 2004; Commission on Social Determinants of Health 2008). To achieve this task, countries should measure and understand their specific problem, take appropriate action and assess the impact of action.

[1] The international community in 2000 General Assembly has adopted a United Nations Millennium Declaration which its one aims is to eradicate poverty. In that regard, a Millennium Development Goals (MDGs) was developed with the theme as 'End poverty 2015, make it happen'. To achieve that, eights goal, eighteen targets and forty eight indicators have been stated United Nations (2000). Resolution adopted by the General Assembly, 55/2. United Nations Millennium Declaration. **A/RES/55/2**.

1.2 Change in Thai population structure to ageing and population indicators

1.2.1 The population changes to an ageing population

Like many developed countries nowadays, the population pyramid of Thailand is shifting to be a picture of an ageing society. Life expectancy at birth is increasing as data from 1974-6 and 2005-6 shows. Male life expectancy has increased from 58.0 to 69.9 and from 63.8 to 77.6 among women while the population size is growing slowly. Although figures doubled from 30 million in 1965 to 60 million in 1996, the 2006 de jure mid year Thai population is estimated to be 65.1 million. The natural growth rate of the Thai population has become smaller, compared to 30 to 40 years ago. Figure 1.1 and Table 1.1 illustrate the crude birth rate[2], crude mortality rate[3] and natural growth rate[4] during the past four decades since 1964; and proportion of the Thai population by age groups and dependency ratio[5], respectively, during the two past decades since 1985. As a result of the effective population policy and family planning campaign started in 1970, the natural growth rate of the country has now fallen to less than one percent annually. Birth rate decreases whereas mortality rate increases, so natural growth rate falls. Age-specific proportion of the population in Table 1.1 confirms the reduction trend in childhood (aged 0-14 years), adolescent (aged 15-19 years) and young adult (aged 20-39), and an upward trend in older age groups (Vapattanawong and Prasartkul 2006a; Economic and Social Statistics Bureau 2007).

Projections indicate that the Thai population is nearing zero or below zero growth rate and would stagnate at around 65 million within 15 years. Additionally, dependency ratio is falling because of a decreasing childhood dependency ratio. However, it was predicted that this ratio will increase in the next 25 to 30 years. This is due to the delay in marrying of fertile-aged women and the fall in child per woman, increasing life expectancy statistics and the increasing number of old-age people (Vapattanawong and Prasartkul 2006b; Economic and Social Statistics Bureau 2007).

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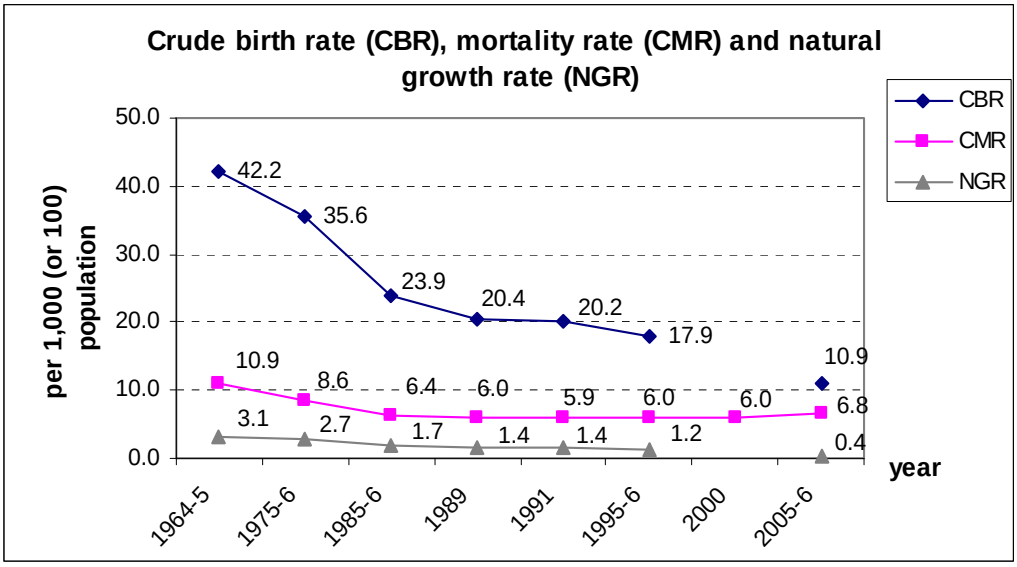
[2] Crude birth rate (CBR) is the number of births in a year per 1,000 population ignoring age and sex.
[3] Crude mortality rate (CMR) is the number of deaths in a year per 1,000 population ignoring age and sex.
[4] Natural growth rate (NGR) is the number of increase (or decrease) of population (the difference between birth and death) in a year per 100 population.
[5] Dependency ratio is the ratio of children (aged 0-15) and elderly (aged 60 and above) populations to working age (aged 15-59) population.
Source: Vapattanawong, P. and P. Prasartkul (2006b). Thai population in the future. Mortality... the reflection of population security. K. Archavanitkul and V. Thongthai. Bangkok, Plan Printing**:** 34-41, Economic and Social Statistics Bureau (2007). Report on the 2005-2006 Survey of Population Change. Bangkok, National Statistical Office, Ministry of Information and Communication Technology.

Figure 1.1 Changes in crude birth rate, crude mortality rate and natural growth rate in Thailand during 1964 to 2006



Note: 1) crude birth rate (CBR) per 1,000 population; crude mortality rate (CMR) per 1,000 population; and natural growth rate (NGR) per 100 population

2) no crude birth rate (CBR) and natural growth rate (NGR) data is available in the year 2000

Source: Population Survey Division (1977), Population Survey Division (1987), Population Survey Division (1990), Economic and Social Statistics Bureau (2007) and Faramnuayphol et al (n.d.a)

Table 1.1 Proportion of the Thai population by age groups and dependency ratio during the past decades (1985-2006)

Age group (years)	1985-1986[1/]	1995-1996[1/]	2000[2/]	2005-2006[1/]
0-14	34.4	27.2	24.4	23.1
15-19	11.4	9.0	66.1	7.6
20-29	18.3	17.3		13.4
30-39	13.3	16.8		16.3
40-49	9.2	12.3		16.7
50-59	6.9	8.1		12.0
≥ 60	6.5	9.3	9.5	10.9
Dependency ratio				
All age groups	69.3	57.5	51.2	51.4
Childhood (0-14)	58.3	42.9	36.8	34.9
Elderly (≥ 60)	11.0	14.6	14.4	16.5

[1/] estimation based on mid year population in Survey of Population Change in 1985-1986, 1995-1996 and 2005-2006 (Economic and Social Statistics Bureau 2007)

[2/] based on 2000 Census (National Statistical Office 2002)

1.2.2 Mortality variations and factors determined

In general, the statistical records illustrate changes in mortality rate over time indicating that pre-mature death in Thailand is falling. Figure 1.2 shows the age-specific mortality rate of the whole kingdom (A), of males (B) and of females (C) during the past four decades (1964 to 2006). There is a clear declining trend in the infant mortality rate, the under-five mortality rate and an increasing trend in mortality rate of the old age population. As a result, the U-shaped curve of the adjusted mortality rate gradually shifted to be a J-like curve. Death in adolescence and of young adults (10 to 34 years) has fewer alterations than other groups but men in all age groups have a higher mortality rate than women.

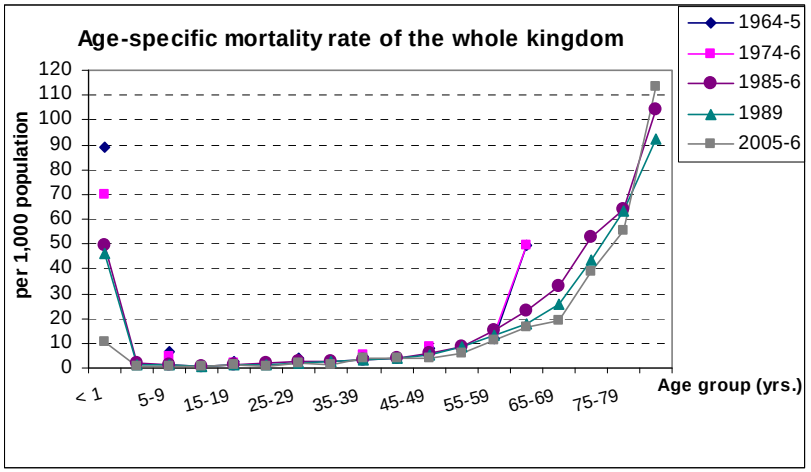
Mortality was found to be varied according to geography, demographics and socio-economics, for instance. Some population studies on death by geography, geographical-socioeconomics, and household-socioeconomics a few years ago show a disparity of mortality across gender, area and household income. The crude mortality rate in Table

1.2 revealed that during the past 20 years, people living in non-municipal (or rural) areas had a higher mortality rate than those living in municipal (urban) areas. People in the Northern part of Thailand had the highest mortality rate compared to other parts of Thailand, particularly in the latest 2005-2006 Survey of Population Change. As a result of a low birth rate and high mortality rate, the natural growth rate of the Northern part was lower than zero. However, naturally, older people die more, so in areas where there are more elderly people, the mortality rate is higher. Data for crude mortality rate is limited in geographical comparisons to areas with varied age structures. Apparently, municipal areas had less mortality rate than non-municipal areas. Faramnuayphol and Vapattanawong (n.d.) also found from 2000 census data that districts in the upper North of Thailand still had the highest standardized mortality ratio[6]. In addition, the 30-34 year old age group is the group with influence on the marked differences of mortality rates across provinces (Economic and Social Statistics Bureau 2007; Faramnuayphol and Vapattanawong).

[6] Standardized Mortality Ratio (SMR) is the indirect standardization for mortality rate. This ratio compares crude mortality rate to geographical age-adjusted expected death rate.

Figure 1.2 Age-specific mortality rate between 1964 and 2006

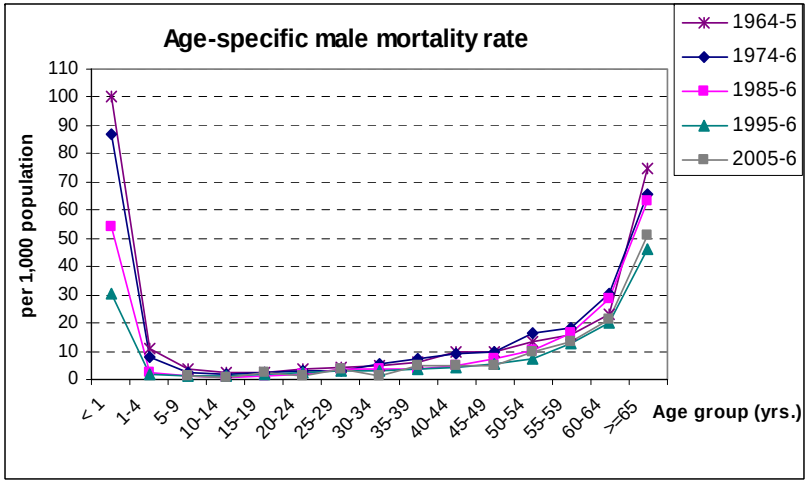
A: The whole kingdom



Note: Mortality rates of children under 5 in 2005-6 was unable to be estimated by gender (Economic and Social Statistics Bureau 2007)

Source: (Population Survey Division 1966; Population Survey Division 1977; Population Survey Division 1987; Population Survey Division 1990; Economic and Social Statistics Bureau 2007)

B: Male



C: Female

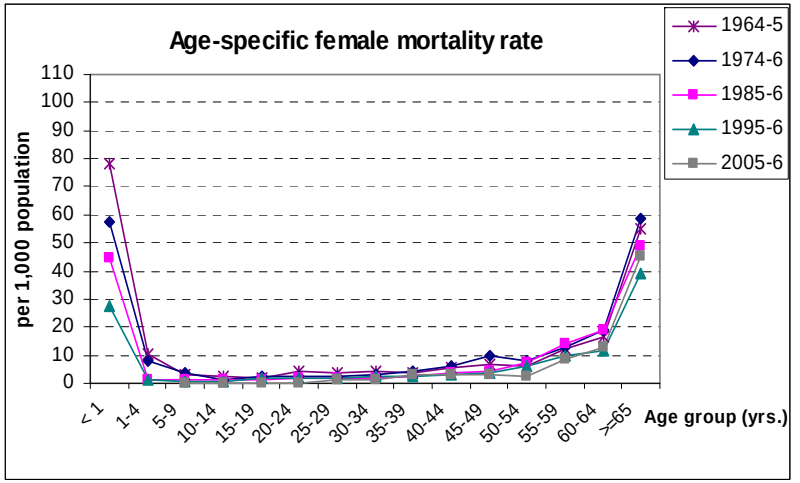


Table 1.2 Age specific mortality rate by municipality

Age group	Year											
	1964-5		1974-6		1985-6		1989		1995-6		2005-6	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
< 1	65.3	90.8	29.7	74.3	30.5	52.5	26.9	49.4	15.8	31.7	7.5	11.4
1-4		1.3	2.4	5.1	1.5	1.8	1.1	1.3	1.2	1.4	0.3	1.2
5-9					0.5	1.4	0.4	1.2	0.8	1.0	0.3	0.8
10-14		2.5	1.0	2.0	0.2	1.0	0.4	0.9	0.7	0.9	0.2	0.6
15-19					0.5	1.7	0.6	1.5	1.3	1.8	0.9	1.3
20-24		4.1	1.4	2.7	1.4	1.8	1.4	1.7	1.3	2.5	1.0	0.8
25-29					1.5	2.8	1.5	1.9	1.5	2.8	0.8	3.1
30-34		5.0	2.4	5.4	2.2	2.8	1.7	2.7	2.3	3.0	1.7	1.0
35-39					2.6	3.2	2.2	3.3	2.6	3.1	1.8	4.8
40-44	5.4	8.2	7.2	8.8	2.7	4.5	2.5	4.3	2.7	3.9	3.0	4.1
45-49					3.3	6.3	3.1	5.7	3.0	4.9	3.1	4.0
50-54	7.8	11.9	13.9	13.7	7.4	9.1	6.5	9.3	5.2	7.1	6.1	5.7
55-59					9.3	16.3	8.8	13.9	8.3	11.9	10.1	11.3
60-64	38.6	50.4	60.3	47.6	12.8	25.3	11.3	18.9	14.5	15.7	15.4	17.0
65-69					20.4	35.2	18.1	27.3	19.8	22.2	16.9	20.1
70-74					46.1	54.3	29.6	46.2	36.9	37.7	28.5	42.2
75-79					43.6	67.6	41.9	67.6	61.1	62.7	47.8	58.0
>=80					77.9	109.2	58.6	100.2	66.8	82.7	99.7	118.4

Source: (Population Survey Division 1966; Population Survey Division 1977; Population Survey Division 1987; Population Survey Division 1990; Economic and Social Statistics Bureau 2007)

Disparities in mortality are found multifactorially. Geographical distribution of age-adjusted mortality rate at district level was estimated using 2000 census data. Death caused by traces of 12 diseases, both communicable and non-communicable diseases and injuries were selected for the study. The researchers categorized such diseases into 4 groups by various factors such as geography, epidemiological data and transportation profiles. The first group represented distribution of mortality related to epidemiological characteristics, including liver cancer which is predominant in north-eastern Thailand, and chronic obstructive pulmonary disease (COPD) in northern Thailand. The second group is related to multifactored distribution including accessibility to health services and death from diabetes mellitus or renal failure. The third group represents death from leukemia which is unrelated to any geographical characteristics because of its scattered distribution. The final group is death from traffic accidents which is higher in some

provinces and is linked to traffic load, law enforcement and road behaviour of residents in such areas. This research suggested that policy for these public health problems should be specific to each of these 4 characteristics. In addition, the authors undertook further studies on mortality rates and geographical socioeconomics. It was suggested that geographical socioeconomics has both positive and negative effects to mortality rate. Good economics increases health risks as well as increases health resources for services and its accessibility. Mortality from some diseases, for example, HIV/AIDS, cardiovascular diseases and chronic obstructive pulmonary disease is prone to wealthier areas. Meanwhile, mortality from liver cancer becomes small in those areas. However, the socioeconomics impact is neutral to death from leukemia, renal failure and drowning (Faramnuayphol and Vapattanawong; Faramnuayphol and Vapattanawong). The authors recommended that further studies on the effects of underpinned multifactors of geographical socioeconomics and multilevels of socioeconomics (e.g. provincial and household socioeconomics) were required.

1.3 Cause of death and place of death are important determinants

1.3.1 Cause of death is important but divergent

One crucial factor influencing death and motivating household reaction and change is illness which was concluded as a major cause of death of household members. Illness and external causes leading to mortality or *'cause of death'* differ and vary by specificage groups, gender, geography, country, and income level, etc. The World Health Organization reported in 2004 that people in low-income countries predominantly died from infectious diseases, i.e. lung infections, diarrhoeal diseases, HIV/AIDS, tuberculosis and malaria, as well as complications during pregnancy and childbirth leading to mortality in infanthood and motherhood. More than one-third of decedents were aged less than 14 years old. In contrast to low income countries, people in high-income countries, with longer lives, substantially died from chronic diseases, i.e. cardiovascular disease, chronic obstructive pulmonary disease, cancers, diabetes or dementia. Like low-income countries, tuberculosis and road traffic accidents were leading causes of death in middle-income countries. However, similarly to high-income countries, chronic diseases are a major cause of death as well. Besides, a study on global patterns of mortality in young people (10 to 24 years) in the 2004 data of Global Burden of Diseases revealed that low and middle-income countries had a mortality rate that was

nearly four times higher than that of high-income countries across WHO regions. Africa and Southeast Asia in which countries are low-income and middle-income accounted for two-thirds of the global youth mortality rate while accounting for only 42 percent of the youth population. Maternal causes, communicable diseases, mainly HIV/AIDS and tuberculosis, including nutritional disorders accounted for the highest proportion (48 percent) of young female mortality, particularly in Africa and Southeast Asia regions in which member states are low- and middle-incomes. However, these causes of death accounted for only 4 percent of mortality in high-income countries. Traffic accidents, suicide and violence were the major causes in both male and female death in high-income countries (World Health Organization 2008; Patton, Coffey et al. 2009).

Cause of death is reported annually in Thailand by the Bureau of Policy and Strategy[7], Office of the Permanent Secretary, Ministry of Public Health, on the basis of WHO International Classification of Diseases, and the coding and selection rules and tabulation list[8](Bureau of Health Policy and Planning 1998). Data has been retrieved from death certificates in civil registration database held by the Bureau of Registration Administration, Department of Provincial Administration, Ministry of Interior, since 1996. It was found that in 2006 the top three ranking causes of death were: cancers, accidents and poisoning, hypertension and cerebrovascular diseases with mortality rates at 83.1, 59.8 and 24.2 per 100,000 population, respectively. This cancer mortality rate is increasing yearly. However, the data also revealed 30 to 40 percent of ill-defined causes. Among known causes, some errors were found as mode of death was reported instead of cause of death and that diminished the quality and accuracy of the data. This is due in part to inadequacies of the current death certificate system, especially with regard to death outside health facilities, and registrars having limited health-related knowledge. Some national and area-specific studies tried to correct such errors and limitations found in the death certificate database as well as to improve the guidelines for verbal autopsy (Chooprapawan, Porapakkham et al. 2000; Pimsab 2002; Sublon, Chaithum et al. 2007; Thai working Group on Burden of Disease and Injuries 2007; Project on Setting Priorities Using Information on Cost-Effectiveness (SPICE 2004-2009)).

[7] Previously, the Bureau of Policy and Planning
[8] The latest version is the Tenth Revision (ICD-10)

1.3.2 Leading causes of death in Thailand

After the corrections, the top ranking causes of death in the Thai population were summarized in Table 1.3, which was compiled from 3 studies from the past decade. Causes of death were reported in inconsistent age-specific classifications, level of disease classifications, unit of mortality measurements, i.e. as mortality rate per population and percentage to all leading causes of death. Nevertheless, such ranking indicated trends by two different dimensions, age and time horizon. According to age, from infancy (<1 year) to childhood (1-14 years) and young adult (15-49 years), data shows that leading causes of death gradually moved from communicable diseases and congenital malformation to external causes of death, e.g. drowning and traffic accidents. Later from adult to old age, dying from external causes of death shifted to non-communicable diseases or chronic diseases, such as hypertension and cerebrovascular disease, neoplasms or cancers, and chronic obstructive pulmonary disease. According to the latter dimension, a decade later from 1997 to 2005, the first leading causes of death gradually shifted from communicable diseases, i.e. HIV/AIDS, to chronic diseases, i.e. stroke. Neoplasms were still in the top ten even though they were disaggregated into specific-sited cancers, particularly the liver and lung cancer (Chooprapawan, Porapakkham et al. 2000; Pattaravanich and Jarassit 2006; Thai working Group on Burden of Disease and Injuries 2007).

Table 1.3 Top ranking causes of death by age and gender between 1997 and 2005

Age-specific	Cause of death					
	1997-1998 Study on cause of death in Thailand*		2004 Burden of disease[$]		2005 SPICE-BOD[§]	
	Male	Female	Male	Female	Male	Female
Overall	1. CD (HIV/AIDS, TB) 2. External causes (TAs) 3. Neoplasms 4. Blood circulation 5. LRI	1. Blood circulation 2. Neoplasms 3. CD (HIV/AIDS, TB) 4. Diabetes 5. External causes (TAs)	1. HIV/AIDS 2. Stroke 3. TAs 4. Liver & bile duct cancer 5. COPD 6. IHD 7. Bronchus & lung cancer 8. Diabetes 9. Cirrhosis 10. LRIs	1. Stroke 2. Diabetes 3. IHD 4. HIV/AIDS 5. Liver & bile duct cancer 6. LRIs 7. COPD 8. Nephritis & nephrosis 9. TAs 10. Cervix uteri cancer	1. Stroke 2. TAs 3. HIV/AIDS 4. IHD 5. COPD 6. Cirrhosis 7. ill-defined 8. Lung cancer 9. Diabetes 10. Emphysema	1. Stroke 2. Diabetes 3. IHD 4. ill-defined causes 5.HIV/AIDS 6. chronic renal failure 7. Emphysema 8. Cervix cancer 9. Liver cancer 10. Hypertension
Pre-school children	0-4 yrs. 1. CD 2. Accidents 3. CM		Na		0-15 yrs. 1. Birth trauma & asphysia 2. TAs 3. Drowning	
Children	5-14 yrs. 1. Accidents (traffic, drowning) 2. CD (dengue hemorrhagic fever, HIV/AIDS) 3. na					
Young adult	15-24 yrs. 1. Accident (traffic) 2. ISH & assaults 3. CD (HIV/AIDS)				15-49 yrs. 1. HIV/AIDS 2. TAs 3. Liver cirrhosis	15-49 yrs. 1. HIV/AIDS 2. TAs 3. Cervical cancer
Adult	25-44 yrs. 1. CD (HIV/AIDS, TB malaria) 2. Accidents (traffic) 3. Neoplasms					

Table 1.3 Top ranking causes of death by age and gender between 1997 and 2005 (cont.)

Age-specific	Cause of death					
	1997-1998 Study on cause of death in Thailand*		2004 Burden of disease[$]		2005 SPICE-BOD[§]	
	Male	Female	Male	Female	Male	Female
Older adult	45 – 59 yrs. 1. Neoplasms 2. HT-CVD 3. CD (HIV/AIDS, TB)		Na		50 – 74 yrs. 1. Stroke 2. IHD 3. Liver cancer	50 – 74 yrs. 1. Diabetes 2. Stroke 3. IHD
Elderly	60 – 74 yrs. 1. Neoplasms 2. HT-CVD 3. COPD					
Older elderly	75+ yrs. 1. Senility 2. HT-CVD 3. COPD				75+ yrs. 1. Stroke 2. COPD 3. IHD	75+ yrs. 1. Stroke 2. IHD 3. Diabetes

Sources: (Chooprapawan, Porapakkham et al. 2000; Thai working Group on Burden of Disease and Injuries 2007; Project on Setting Priorities Using Information on Cost-Effectiveness (SPICE 2004-2009) 2009)

CD = communicable diseases; TAs = traffic accidents; RI = respiratory infections; LRI = lower respiratory tract infection; CM = congenital malformation; LBW = low birth weight; CHD = congenital heart disease; DD/HU = drug dependence/harmful use; AD/HU = alcohol dependence/harmful use; ISH = Intentional self-harm; HT = hypertension; CVD = cerebrovascular disease; TB = tuberculosis; COPD = chronic obstructive pulmonary disease; IHD = ischemic heart disease; na = not available

* mortality rate (per 100,000 population); [$]% of numbers of death to all causes; [§] % share of numbers of death among all leading causes

Disease in parenthesis is majority of such core cause of death

1.3.3 Place of death, another important determinant to heath care for terminally ill patients

Place for end-stage care or place of death plays some role in the health service provided to terminally ill patients and in acute care hospitals. At the same time, such health service is affected by health financing policies and hospital service for all patients in general. Terminally ill patients require comprehensive care through palliative care and further advanced terminal care at the end of patients' lives. The patients who are likely to die in hospital usually have long hospitalisation periods. As a result, to some extent, bed occupancy in acute care hospitals by this patient group affects other patients who may need hospitalized intensive services by the same group of health professionals. Policy makers as well as hospitals do need policies, planning and ability to serve such hospitalized terminal stage patients. Otherwise, policies for alternative place of care and place of death should be taken into account.

There were two concepts mentioned in determinating place of death. One facet is that people have rights and dignity to choose their preferred place, even at the end of their lives. With this respect, Thailand first provided citizens with legal rights in respect to health in the National Health Act B.E.2550 (2007). The Act includes the right to refuse any health services used to prolong a terminal stage of life[9]. Another is that a patient home is believed to be the best place for dying. At home, patients feel most comfortable in a familiar environment among their beloved families until the end of their lives.

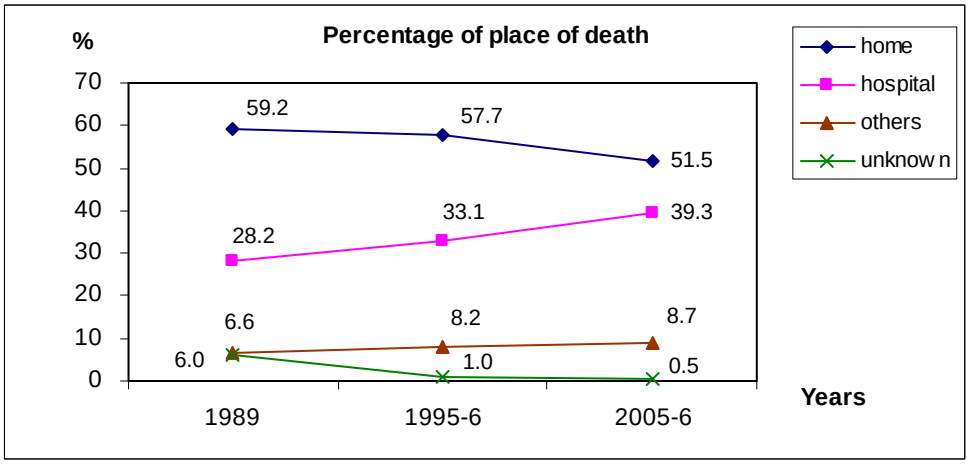
Nonetheless, many studies reveal variations in place of death, depending on country. For instance, in some developed countries, like Canada, during 1992 to 1997, trends in adults with cancers dying out-of-hospital in Nova Scotia rose from 19.9 percent to 30.2 percent. Patients who are more likely to die out-of-hospital include women; the elderly aged more than 75 years; those in a palliative care programmes and those living longer than 60 days after diagnosis (Burge, Lawson et al. 2003). Similarly, a descriptive data analysis of the death certificate database of the USA shows declining trends of in-hospital deaths from 54 percent in 1980 to 41 percent in 1998. In contrast, upward

[9] *'Section 12. A person shall have the right to make a living will in writing to refuse the public health service which is provided merely to prolong his/her terminal stage of life or to make a living will to refuse the service as to cease the severe suffering from illness. ...'(2007). National Health Act B.E. 2550 (2007). The Kingdom of Thailand.*

trends were found in home deaths, from 17 percent to 22 percent, and in nursing home deaths, from 16 percent to 22 percent. Furthermore, different tendencies were noted in the race and region subgroup of causes of death. Unlike strokes, COPD, AMI and heart disease, death from cancers shows a marked decrease in in-hospital deaths from 70 percent in 1980 to 37 percent in 1998 (Flory, Young-Xu et al. 2004). Across the Atlantic in England, there was a slight change found in the percentage of cancer deaths at home from 27 percent in 1985 to 26.6 percent in 1994. Cancer patients aged less than 75 years were more likely to die at home than older patients. More men died at home than women in all 9 regions across England. In addition, compared to other specific types of cancers, patients with breast cancer or lymphatic cancer or cancer of the haematological system were less likely to die at home. This may be due to the nature of the illness and the treatments (Higginson, Astin et al. 1998). In Asia, Yang L, et al analysed trends of home deaths of Japanese, vital statistics during the five past decades, between 1951 and 2002. Generally, the proportion of deaths at home dropped from 82 percent in 1951 to 13 percent in 2002; meanwhile, the percentage of in-hospital deaths increased. Trends in dying-at-home, of three leading causes of death, i.e. cerebrovascular disease, heart disease and cancer as well as in all elderly groups (65-74 years, 75-84 year and older than 85 years) decreased over time.

Place of death of Thai people was reported in a series of the Surveys of Population Change. Figure 1.3 illustrates trends in place of death over the past 15 years. Apparently, the percentage of home deaths is falling from 59.2 percent in 1989 to 51.5 percent in 2005-6 while the trend in in-hospital deaths is upward (Population Survey Division 1990; Social Statistics Division 1997; Economic and Social Statistics Bureau 2007). To compare with other studies mentioned earlier, further subgroup analysis by cause of death is required.

Figure 1.3 Place of death percentages during 1989 to 2006



Source: (Population Survey Division 1990; Social Statistics Division 1997; Economic and Social Statistics Bureau 2007)

1.4 The impacts of mortality to households and health facilities

Death may well impact households strongly. Once a household member dies, change in the livelihood of individuals, change in household size and composition or even household dissolution, and household financial stress can be found. Significantly, a critical reduction in household size is affected by the death of working-aged, male household heads and the death of working-aged female household heads/spouses. By contrast, partial coping of household size was noted with the death of other household members at working age. It was also reported that household heads aged less than 60 years or small households were prone to household dissolution within one year after death of the heads (Urassa, Boerma et al. 2001; Yamano and Jayne 2004).

It is debatable whether the death of a household member, especially the head of household, really affects the income and socioeconomic status of households. However, in small-scale farm households in Kenya between 1997 and 2000, there was a 68 percent reduction found in the net value of crop production related to the death of a male household head aged between 16 and 59 years. Small animals and farm equipment are assets that households have to commonly sell to cope with the mortality of a working-aged member. Death of a working-aged male head causes suffering in off-farm income to the household. In addition, loss in those household assets and incomes from mortality of working-aged male heads has a considerable negative impact on poor

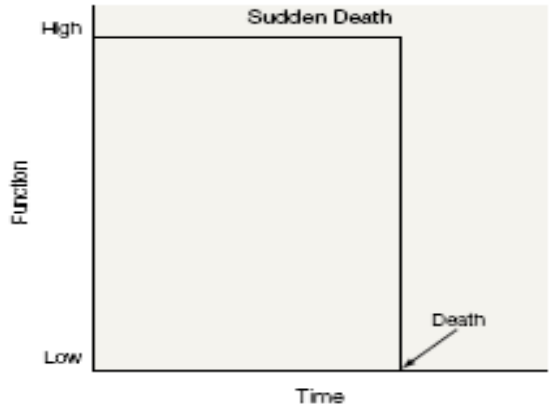
households (Yamano and Jayne 2004). In Thailand, Ford K, et al explored the relationship between the death of a household member, household income and its change in Kanchanaburi province. The 2001 and 2002 panel data shows that age at death and the decedent's relationship to the head of household influenced changes in household income. In the case of a decedent who needed intensive care from household members prior to death, household income would increase after his/her death because such household members could earn money afterwards. On the other hand, if the decedent was the breadwinner, the household would lose income after his/her death. As a result of premature death of the adult head of household, household income declined (Ford, Rakumnuaykit et al. 2006).

Health facilities are also affected by mortality, in their responsibility of health care services as well as health expenditure. In general, health services should facilitate care and improve the quality of life for patients but should not be a 'one size fits all' service. Near the end of life, illness can be theoretically classified into 4 patterns, i.e. physical function over time, mostly in the last year of life. This classification of so called 'theoretical trajectories of dying' was initiated by Glaser and Strauss (1968) cited in Lunney et al (2002). It aims to facilitate health professionals to provide tailor-made health services, specifically palliative care to terminal stage patients. In addition, in understanding the natural deterioration of activities of daily living and cognitive function due to diseases, and increasing in dependency, both sides, i.e., health professionals, and patients and carers probably facilitate a practical care plan for a 'good' death. Figure 1.4 depicts the pattern of four types of trajectories demonstrated in Davies and Higginson (2004), Lunney et al (2002), Lunney et al (2003) and Murray et al (2005). The first trajectory, is sudden death (panel A) in which the patient's function is substantially normal and independent when approaching death. The second represents terminal illness (panel B); cancer is typically the most suitable. These are patients in a clear terminal phase in which they have no response to treatment but rather require increasing palliative care, and suffer a rapid decline in physical function. This phase usually includes the last few months to the last six weeks of life. The third group, organ failure, patients at the end stage of chronic heart failure or chronic obstructive pulmonary disease follows the pattern of this trajectory (panel C). Patients experience deterioration of functional status which is dependently related to hospitalisation and intensive treatment. In the meantime, acute exacerbation of the organ function

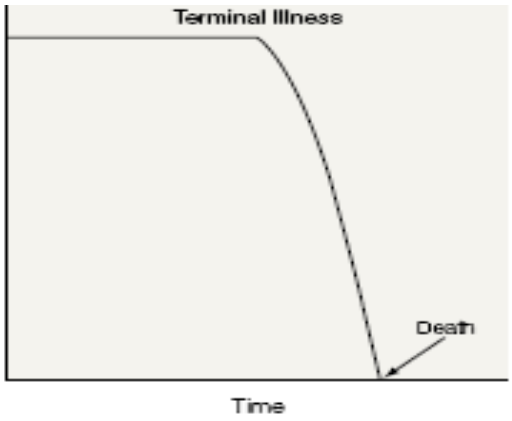
occasionally troubles severity and probably results in death. The prognosis of this group is uncertain. Finally, frailty (panel D), members of this fourth trajectory includes patients with dementia, stroke, or generalized frailty of multiple organ system. Patients encounter slow progressive disabilities and die from acute complications such as pneumonia during the last 3 months of lives (Lunney, Lynn et al. 2002; Murray, Kendall et al. 2005). Lunney et al (2003) confirmed these theoretical trajectories of dying with a study on physical functions of elderly during their last year of life in some area of the U.S. (Lunney, Lynn et al. 2003).

Figure 1.4 Theoritical trajectories of dying

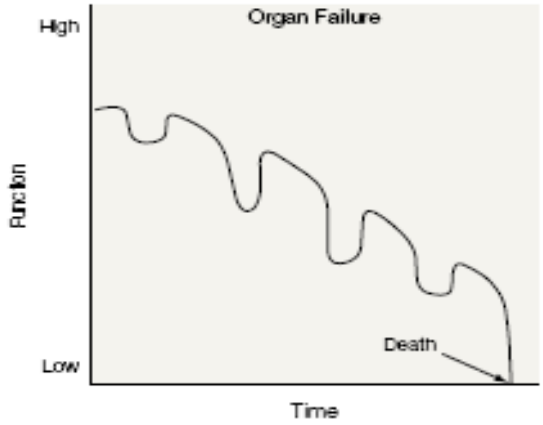
A: Sudden death



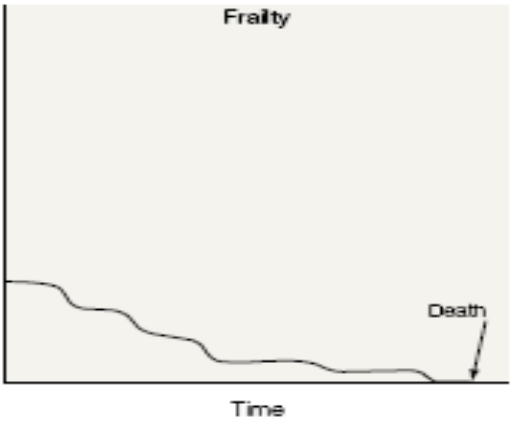
B: Terminal illness



C: Organ failure



D: Frailty



Source: (Lunney, Lynn et al. 2003)

1.5 Knowledge gap

The information presented in the previous sections highlights that mortality is crucial to health at both international and national levels. It illustrates potential impacts to the whole population and individuals of households/families. It is also an indicator to monitor the quality of the public health of a country, healthcare service of health facilities, and as a monitor for population change. By understanding this issue, policies related to health service and other social services can better serve the population. It could be said that mortality has impacts to both population level and individual level. At population level, the related factors underpinned and reflected in this interesting issue mostly include socio-economics, demography and geography at different scales of interest, i.e. the world, region, economy level of country groups. At individual level which refers to the decedent and his/her household or family, apart from socio-economics and geography of the decedent, cause of death, place of death and position in the household are mentioned in many studies. In addition, expenditure for caring for terminal stage patients might be a burden to the health system, i.e. health purchasers, providers and households. Some studies focusing on the last year of old-aged people lives revealed that the cost of care incurred by the U.S. federal health insurance programme 'Medicare' shared 27 percent to 30 percent of its overall expense, between 1976 and 1988 (Lubitz and Riley 1993). The 2004 data shows that such last year of life per capita is four times greater than in any other year of the beneficiary's life (The Henry J. Kaiser Family Foundation 2007).

Looking back to Thailand, this significant cost might be overlooked in budget estimations for health service since the estimation is partially based on the data of the Health and Welfare Survey[10]. This survey is a routine national survey which is related to health and household payment. It is aimed at every household member but disregards decedents whom are already absent during the survey period. As a result, such budget estimation might be underestimated. In addition, no research or information of expenditure during the last period of life has been found in Thailand.

[10] The Health and Welfare Survey is a national survey on health and expenditure on the biennium or annual basis. It focuses on the Thai people accessibility to and utilisation to health service, out of pocket payment and morbidity rate related to health insurances. The survey conducted by the National Statistical Office with close consultation with the Ministry of Public Health.

An overview of international studies further reflects what is going on in the Thai health system regarding mortality. Some research groups have followed mortality related to a group of population in view of geographical, demographical and socio-economic factors. A longitudinal study on the impact of a household member's death to the household in a province of Thailand is an example of the relationship between mortality of a member and some of such factors. However, no research on factors determined at the individual level was found. Specific to the recent major health care reform in Thailand, among other concerns as a lower-middle income country with scarcity of financial resources, health expenditure and cost containment are also a concern for policy makers. Many queries have been raised, for instance, the expenditure for the last period of life in the Thai context, the magnitude that the households pay out of pocket, and the cost incurred to health facilities and insurance companies. Additionally, the Thai context is changing, i.e. the old-age population as well as mortality is in an upward trend, and the changing patterns of causes of death from communicable diseases to chronic diseases. Death from chronic diseases might require more health resources and longer term health services than death from serious communicable diseases.

Owing to the many research questions mentioned previously, this thesis, therefore, focuses on some specific issues described in the following research questions (section 1.6.1). The thesis is the first cross-sectional study on expenditure on the last period of life in Thailand, during 2005 to 2006. This period is three to four years after a major health care reform (details of this event are presented in the next Chapter). As it was recommended that policy for health service to terminally ill patients should fit to a specific trajectory pattern, death from cancers is an example for this circumstance. As a consequence of such recommendation, cancers have most clear terminal stage among four patterns of trajectory, so it was selected for further study on policy recommendation. The qualitative study among the stakeholders provided that whether, and to what extent the current service should be improved.

1.6 Research questions, purposes and content of the thesis

1.6.1 Research questions of the study

1) Is there any inequity among Thai people in health care during the end of life period?

2) What are the factors influencing that inequity?

3) How do terminally ill cancer patients and their families cope with financing and their preferences for healthcare during that period?

4) What new policy directions need to be developed or changes need to be made in the current policy and practices in Thailand?

1.6.2 Purpose of the thesis

In order to focus on some issues within the research questions, the thesis mainly aims to explore the equity in terms of expenditure, in a particular, the period before death. The objectives, therefore, include:

1) To estimate costs of treatment prior to death to the health system (3 main insurance schemes), i.e., UC, SSS[11], CSMBS during 2004 and 2005. In particular, to investigate:

- disparity of the cost among the three schemes
- admission episode and cost comparison of decedents and the general population

2) To estimate household health expenditure (direct medical cost, indirect medical cost and indirect non-medical cost) of the last three months for outpatient care and last six months for inpatient care prior to death of Thai decedents during 2005-2006 (2006 Thai fiscal year) and the proportion to household incomes. In particular, to investigate:

- expenditure not covered by health insurance schemes; UC, SSS, CSMBS, private and uninsured decedents
- expenditure and health seeking behaviour prior to death categorized by five household incomes quintiles

[11] Dataset of SSS may not be able to access by this study.

3) To explore current practice on disclosure of diagnosis, preferences on quality of life or care, place for dying and perception on advance directive among health professionals, terminally ill patients and the patients' relatives

4) To explore factors considered important when people are dying

5) To describe health service for terminally ill patients at several types of health facilities

6) To recommend, accompanied with cost and consequences from quantitative studies; views of health professionals, terminally ill patients and the patients relatives from a qualitative approach; and policy makers perspectives, policy options for improving healthcare services for terminally ill patients

1.6.3 Contents of the thesis

The thesis comprises of nine chapters. The following chapters start with a background of the Thai healthcare system. This second chapter provides an overview of: the Thai healthcare service system, the history on healthcare reform in Thailand, three major health insurance schemes and the health service specific to cancer patients. Chapter Three reviews literature linked to theory related to equity from a health perspective; healthcare cost and expenditure on the last year of life which may be different from the expenditure on other periods of life; and the definition of terminal care and end of life care and palliative care, particularly for cancer patients; . Chapter Four reveals the methodology of the thesis. This thesis consists of four studies, i.e. two quantitative studies on expenditure of health insurances and households and two qualitative studies on current practice among health professionals, patients and their carers including the preferences of the patients. This chapter starts with the conceptual framework and is followed by available sources of data, general quantitative and qualitative methods used in the four studies of the thesis.

The results are separately presented through the four studies, accordingly, i.e. Chapter Five, Six, Seven and Eight. Chapter Five presents the expenditure of the health insurance schemes or hospital charges, while Chapter Six provides details of health seeking behaviour and household expenditure for the decedents. Chapter Seven reports the patients' perspective on cancers and their preferences and how the households and patients accommodate to patients illness. Chapter Eight looks at current practice among health professionals in telling the truth about the illness of and the health services provided to the terminally ill patients. These two chapters probably revealed the reasons

underpinning the findings from the two quantitative studies as well as further comprehension of the patients and health professionals understanding and practice. The overall main findings of the separate research studies reported in this thesis are discussed in light of the previous literature, in Chapter Nine. Finally, the recommendations for improving policy on health service, in particular for cancer patients and future researches are presented in this chapter.

CHAPTER TWO

BACKGROUND OF THE THAI HEALTH SYSTEM

In order to better understand Thailand and its health system, this chapter provides a brief overview of the country's location and population characteristics as well as background information on the Thai health system. The health system in this thesis refers to its composition of policy, infrastructure and service delivery, manpower and financing which is presented in detail. The focus was on updated information of the current system and the era of last health system reform during 2001-2002. This Chapter, however, also notes the situation a few decades prior to this reform. In addition, the thesis aims to provide a view of terminal phase of lives with a particular picture of a selected disease that is cancer, with the last section of this chapter presenting the health system for cancer in Thailand.

2.1 Overview information of the Kingdom of Thailand: *location, the population and economics*

Briefly, Thailand is a democratic country with a constitutional monarchy and a King as the Head of State. Among the Southeast Asian nations, Thailand is the third largest country with a population of 65.1 million in 2006. Approximately, 94.5 percent of the population is Buddhist followed by 4.5 percent Muslim and 0.7 percent Christian. Ninety eight percent of residents are Thai nationals and the rest from China, Myanmar and Laos. The country is administrated by 3 levels of government: central, provincial and local. With Bangkok as the capital, Thailand is divided into 75 provinces, 796 districts and 81 minor districts, 7,255 sub-districts or 'tumbons' and 74,944 villages. Twenty five provinces (not including Bangkok) are located in the Central region; 17 provinces in the North; 19 provinces in the North-east; and 14 provinces in the South. In 2006, the majority of the population (21.953 million) resides in the north-eastern region (Ekachampaka and Taverat 2008).

Since 1987, Thailand has been classified as a lower middle income country[12] with an average economic growth rate of 7.8 during the past three decades. However, the

[12]During the period of 1 July 2009 to 1 July 2010, the World Bank classification considers 2008 gross national income (GNI) per capita. Four groups of countries are low income, $975 or less; lower middle income, $976–3,855; upper middle income, $3,856–11,905; and high income, $11,906 or more (www.worldbank.org; accessed 28/09/2009)

country faced an economic crisis during 1996-1997, and as a result, the growth rate dropped to -10.8 percent in 1998 but 1-2 years later, it rebounded to more than 4 percent during 1999 and 2000. In 2007, the economic growth rate was approximately 4.5-5 percent. The gross domestic product (GDP) per capita in market price has increased from 2,239 Baht in 1960 to 124,997 Baht in 2006. The Thai economy comprises of 3 sectors, agricultural, industrial and service, with the biggest proportion of GDP earned from the service sector (Ekachampaka and Taverat 2008).

Poverty in Thailand is a major governmental concern. Starting from 57.0 percent in 1962, there has been a downward trend of people living in poverty over the past four decades though this was interrupted twice due to two economic crises. In 2006, the poverty prevalence was as low as 9.6 percent. Even though the proportion was obviously promising, poverty in rural areas was three times greater than in urban areas, and the gap between the rich and the poor has been widening. During 1996-2006, on average, the wealthiest group (5^{th} quintile) shared 56.5 percent of the national income meanwhile the poorest group (1^{st} quintile) shared 4.2 percent. In 2006, the income disparity between both groups was 14.8 times, representing the highest figure among south-east Asian countries (Ekachampaka and Wattanamano 2008).

The economic situation has affected and is closely related to health financing and policies. Inequity in health had been reported, however, with no alteration to the economy, for instance, health expenditure has been in an upward trend, increasing from 3.8 percent of GDP in 1980 to 6.1 percent in 2005 but inequity has remained the same. The 2004 national health account also indicated that the burden of health expenditure (the out of pocket payment in relative to income) of the poor was 2.1 times higher than that of the rich (Ekachampaka and Wattanamano 2008). Further information on health expenditure is presented in subsection 2.2.4.2.

Improvements in education in terms of literacy, learning and reading rates were rapid. In 1970, the literacy rate of the Thai population aged 15 years and above was 78.6 percent, but, in 2005, it rose markedly to 93.5 percent. In addition, it is estimated to grow to 97 percent by the year 2010. The learning rate, however, was only 60.0 percent in 2005 and disparities were found across regions and municipalities. Reading rates as in regular reading were also low at 61.2 percent in 2003, but this figure improved slightly to 69.1 percent in 2005 (Ekachampaka and Wattanamano 2008).

Health is also a right of Thais stated in the Constitution. The two recent Constitutions, the 1997 and the 2007, indicate that the individual Thai has the equity in receiving appropriate and stardard health services. The public sector has the responsibility to ensure the access to health services of the Thai (1997; 2007).

2.2 Health system

Starting in the nineteenth century, alongside traditional medicine, western medicine has played a role in Thai healthcare since 1828. The first health related law, sanitation, was enacted in 1870 with the first western hospital, Siriraj Hospital, being established a year later. Following the support of Prince Mahidol of Songkla—who is considered the father of modern medicine and public health in Thailand, infrastructures and education in western medicine, i.e. government medical stock, departments and ministries, various schools for health professionals were established and developed. By 1950, there was a hospital in every province (Ekachampaka, Taverat et al. 2008; Bureau of Health Policy and Strategy 2009).

It was defined that a well functioning health system comprises of six domains, i.e. leadership and governance, health inforamtion systems, health financing, human resources for health, essential medical products and technologies, and service delivery (World Health Organization 2010). Currently, the Thai health system is mainly run by the government with, to some extent, a public-private mix which is described later. The public sector includes several organizations, i.e. the medical schools under the Ministry of Education, the Ministry of Interior, local administrative organisations, for instance. However, the Ministry of Public Health is the main authority and is the focal point for national health policy and planning, in particular relating to public health.

2.2.1 National health plan

Health has been an issue included in the country's development plan which the health plan is a part of. As a road map for economic development of Thailand, the national development plan was commenced in 1961. This operational plan aimed for development in many aspects including health. The plan included social development since the 4th plan, and as a result, the plan was renamed and is now known as the "National Economic and Social Development Plan" (NESDP). This medium term plan is now in the fourth year of the 10th plan, 2007-2011. In the health section of the

NESDP, this national health plan gears for the development of all six components of the health system depending on its priority during the period of each plan.

Among the health plans, the first three were mainly aimed at infrastructure development and included some major health programmes, for example, the sanitization and hygine, elimination of epidemic communicable disease. The period of the Fourth and Fifth Plans coincided with two global health policies, i.e. the 'Health for All by the Year 2000' in 1977 and 'Declaration of Alma Ata' in 1978[13]. As a consequence, both health development plans stated that primary health care is the strategy for the goal of the 'Health for All'. The Sixth Plan responded to the transition of the population structure, from pyramid to a bell shape, and the increase in non-communicable diseases. Meanwhile the Seventh Plan aims shifted to the health financing and health economics. Owing to the economic crisis, the Eighth Plan was an era of a major health care reform followed by the Ninth Plan which emphasised on a people-centred approach. The philosophy of a '*sufficiency economy*' was adapted to a '*health sufficiency system*' in the Tenth Plan. The key features of all 10 health development plans as part of the NESDP (Anonymous 2005; Ekachampaka and Taverat 2008; Bureau of Health Policy and Strategy 2009; National Economic and Social Development Board 2009) are outlined below.

First Plan, 1961 – 1966: This plan focused on improving capacity of existing health centres and controlling the epidemic of malaria and other communicable diseases. Existing hospitals were improved in services, numbers of beds and numbers of health personnel were increased; provincial hospitals were upgraded to regional hospitals and new district hospitals and health centres were established. Improvements in the efficiency of supplies for medicines were another action undertaken.

Second Plan, 1967 – 1971: This continued the projects of the first plan by expanding and developing health facilities and in controlling communicable diseases.

Third Plan, 1972 – 1976: This plan placed an emphasis on expanding new health centers and their responsibility over the country. In order to reduce morbidity and mortality, the plan continued to be aimed at the prevention and eradication of some communicable diseases. It included improving sanitisation and increasing clean water

[13] Health for All by the Year 2000 is aimed to protect and promote the health for all the people of the world.

supplies in rural areas, the promotion of family planning and birth control, expanding maternal and child healthcare services, and strengthening local capacity in medicine production and improving laboratory diagnostics.

Fourth Plan, 1977 – 1981: Due to concerns about the population in rural areas, this plan highlighted increasing numbers and strengthening the capacity of the health workforce, particularly village health volunteers and village health communicators, improving efficiency and expanding the coverage of services for maternal and child healthcare, improving plans for medicines and pharmaceutical administration. In addition, other projects from previous plans were also carried on.

Fifth Plan, 1982 – 1986: Fostering primary health care as well as the continuation of constructing a health centre in every sub-district and a district hospital in every district were the principal tasks in this health development plan. On the other hand, the plan did not ignore reducing morbidity and mortality rates from preventable communicable diseases, children immunization, capacity strengthening of the health workforce, medicine supplies and pharmaceutical administration, clean water supply and sanitisation, and maternal & child health and child malnutrition.

Sixth Plan, 1987 – 1991: The plan continued to target the main focuses of the last plan but each target was more quantitatively figured out.

Seventh Plan, 1992 – 1996: In order to improve quality of life, both physically and mentally for 'health for all', the plan concentrated on coverage, equity, harmonisation, flexibility and self-reliance of the individual and community. It aimed to support the continuation of primary health care in rural areas, and improving the quality and efficiency of health facilities at every level. In addition, its aim was to promote and support health insurance in special populations, i.e. low income groups, labourers, elderly, children, handicapped and other vulnerable groups. The amendment of health related legislations was mentioned in this plan.

Eighth Plan, 1997 – 2001: People were the target of this five-year development plan instead of the economy. This human centred plan changed the previous segmented development into integrated development. The aims in the plan were related to behavior for good health; decreasing morbidity and mortality from risk behaviour and preventable diseases; health insurance and accessibility to efficient and good quality

health services; consumer protection; pleasant and safe environment for living and working; special protection for pregnant women and children; and health for the elderly.

Ninth Plan, 2002-2006: This gave attention to all stakeholders' participation in strategy determination. The plan comprised of 4 factors, i.e. concepts of health development, linkage between the vision of the NESDP and Health Development Plan, the vision and strategies of health development, and the guidelines of management and monitoring. The ten goals targeted in this plan emphasised health promotion and prevention, health insurance for ensuring accessibility and equity, decentralisation, capacity strengthening, fostering primary health care, improving quality of service system and promoting intellectual and knowledge of Thai medicines.

Tenth Plan, 2007 – 2011: This plan still follows the main direction of the previous one but it was prioritized according to the new concept of health, unity of the health system and holistic health. The philosophy of a 'sufficiency economy' was adapted to be a 'health sufficiency system' as the concept of this plan. Ten development goals were highlighted as balanced and sustainable unity and good governance in health system, proactive health promotion, holistic health, strong health community and primary care network, efficient health system, equitable and quality universal health insurance, strengthening of health system against disease and health impact, variation in alternative medicines and self care, knowledge management and research supported health system, and care for the poor and vulnerable groups regarding their dignity.

2.2.2 Health infrastructure and its service delivery

Health infrastructure focuses on health facilities for modern medicines. In fact, there are complementary medicines, and its facilities are the same as traditional medicines and alternative medicines. However, these are out of the scope of this review.

2.2.2.1 Level of care and types of health facilities

This subsection focuses on hospitals, health centres as well as clinics and pharmacies/drug stores in the perspective of administrative level, level of health facilities, and geographical distribution. The following information is mostly based on the Thailand Health Profile 2005-2007 (Anonymous 2005; Faramnuayphol, Ekachampaka et al. 2008).

Health services are provided by many organisations, for example, the Ministry of Public Health (MoPH), the Ministry of Education, the Ministry of Interior, the Ministry of Defence, state enterprises, local administrative organisations and private sector. Health services are classified into 5 levels of care. Self care is the fundamental level of individual capacity in self prevention and protection from harmful substances to health. Primary health care level is the services provided in the community by individuals, village health volunteers or non-governmental volunteers. The care is mostly health promotion, disease prevention rehabilitative care and simple curative care.

Next, the primary care level is provided by health personnel. At present, holistic care is promoted to be a suitable primary care for Thais. This level comprises of four types of units, i.e. community health posts; health centres and primary care units; health centres of local administrative organisation, private clinics and outpatient departments of hospitals; and pharmacies or drugstores. At present, a community health post in a village, mostly in remote areas is operated by a community health worker. Services include health promotion, disease prevention and simple curative care. Health centres and primary care units are usually located in sub-districts or 'tambons'; one health centre for one sub-district. Services are provided by a technical nurse, a midwife and a health worker including a dental nurse. Additionally, a professional nurse and a health specialist are available in the large health centres. These front line units provide similar services as mentioned earlier but their health programme follows the MoPH practice guideline and standard operational procedures accordingly. Besides, the units are under supervision of community hospitals. Services at health centres of local administrative organisations, outpatient departments and private clinics are provided by physicians, likely to be general practitioners and other health professionals. Pharmacies and drugstores are also units where pharmacists or staffs with basic training provide primary care.

Fourth, secondary care is operated by medical and health professionals with intermediate level of specialisation. Service provided by doctors and other health professionals is rather curative care than prevention and health promotion. Hospitals providing this service include community hospitals, general or regional hospitals or other large public hospitals, and private hospitals. Finally, the tertiary care level is medical services for curative care provided with all fields of medical specialties and super-specialties, for example, hematology and oncology. Health facilities which serve

tertiary care include large general or provincial hospitals, regional hospitals, medical school hospitals and specialised institutes. There is no clear boundary between levels of care, however. Tertiary care hospitals could provide primary as well as secondary care. In addition, secondary care hospitals could be upgraded to upper level of care in condition of numbers of beds, doctor specialties, health technologies provided and requirement in geographical distribution.

A community hospital is situated in a district town or minor-district with the number of beds ranging from 10 to 150 but more than half are 30-bed hospitals. A general or provincial hospital is located in a provincial city or downtown of a big district. The hospital is usually 200 to 500-beds and its medical service is provided by doctors with main specialties, i.e. surgery, pediatrics, medicines and obstetrics and gynecology. A regional or a large public hospital, one with 500-beds or above, is also located in provincial city centres. Besides providing services to local people in these provinces, the hospitals take responsibility as regional hubs of more advanced care for neighbouring provincial hospitals. Each level of care is linked together by a referral system in both directions from a simple level to a more advanced level and vise versa.

2.2.2.2 Agencies and distribution of health facilities

As of 2007, Thailand has 1,338 hospitals with 140,007 beds and 41,983 other health facilities for a population of approximately 65 million. The largest hospital in Thailand is Siriraj Hospital, the 2,600-bed, oldest medical school hospital located in Bangkok. Table 2.1 shows that the MoPH is the main in-patient service provider, i.e. 882 hospitals (66 percent of hospitals), followed by the private sector and other ministries. In 2007, under the MoPH, 51 specialised hospitals/institutes, 25 regional hospitals, 70 general/provincial hospitals, 730 community/district hospitals and 9,758 health centres are distributed over the country. Whilst almost all of MoPH hospitals serve people residing outside Bangkok, private hospitals and others mainly serve people living in Bangkok and in the central region. In addition, private hospitals play a role in offering services for people in urban areas and foreign patients. Table 2.2 illustrates the geographical distribution of most types of health facilities classified by level of care. From one-third to half of tertiary care hospitals, i.e. medical school, specialized hospitals/institutes, general hospital and private hospitals including a quarter of primary care, i.e. private clinics and pharmacies/drug stores are located in Bangkok. More

MoPH tertiary hospitals, i.e. 36 regional hospitals and general hospitals are located in the central region with 25 provinces meanwhile more secondary hospitals, i.e. 267 community/district hospitals are located in the north. In contrast, the north-east has the greatest numbers of health centres or health facilities for primary care.

Table 2.1 Geographical distribution of hospitals by agencies in 2007

Agency	Total	Bangkok	Region			
			Central	North	North-east	South
MoPH	882	12	225	192	296	157
Other ministries	121	19	37	23	22	20
State enterprises	2	2	-	-	-	-
Autonomous public organization	5	1	4	-	-	-
local administration	10	9	-	1	-	-
Private sector	318	89	105	50	42	32
Total	1,338	132	371	266	360	209

Source: Bureau of Health Policy and Strategy (2007)

Table 2.2 Geographical distribution of health facilities by level of care in 2007

Type of care	Bangkok	Region			
		Central	North	North-east	South
Medical schools	5	2	2	1	1
Specialized hospital/institutes	14	47			
MoPH regional hospitals	-	9	5	6	5
General hospital under other Ministries and state enterprises	22	60			
MoPH general/provincial hospitals	4	27	14	15	14
MoPH community/district hospitals	-	174	267	163	129
Private hospitals	89	105	50	42	32
Health centres (branch)	68 (77)	2,556	2,228	3,464	1,510
Private clinics*	3,687	13,113			
Pharmacies/drug stores**	8,960		2,179	2,751	1,535

Note: *data in 2006; **data in 2005

Source: Department of Medical Services (2005), Bureau of Health Policy and Strategy (2007) and Faramnuayphol et al (2008)

Table 2.3 illustrates population per bed ratios of all hospitals and of MoPH hospitals across the country. The figures partially support previous information that people living in Bangkok have better access to hospitals than people living outside. People in the north-eastern region have the highest ratio which indirectly indicates the least accessibility to hospital care. However, these ratios view only provinces/regions and people residing there. In fact, as a result of the referral system, health facilities with advanced care have responsibility beyond their local patients. Regional hospitals, specialised institutes and medical school hospitals, particularly in Bangkok may get patients referred from other less advanced hospitals. Therefore, these ratios indicate partial loads only. The data also indicates that within MoPH hospitals, people in the central region have been served by regional hospitals and general/provincial hospitals than the rest. On the contrary, people in the north-east are provided by community/district hospitals than regional hospitals and general/provincial hospitals.

Table 2.3 Population per bed ratios by levels of hospital in 2007

Level of hospital	Bangkok	Region			
		Central	North	North-east	South
Total	196	386	490	723	497
Ministry of Public Health					
▪ Regional hospital	-	2,647	3,234	4,154	2,807
▪ General/provincial hospital	-	1,748	2,172	4,030	2,017
▪ Community/district hospital	-	1,852	1,639	1,704	1,649

Note: no available data for hospitals under other agencies
Source: Bureau of Health Policy and Strategy (2007)

2.2.3 Health manpower

This section focuses on medical doctors and professional nurses who play a crucial role in the function of health services delivery. Updated cross-sectional information on geographical distribution as well as distribution across level of care and agency are described below. This information depicts health professionals who are a key factor in the health system.

2.2.3.1 Medical doctors

To respond to the health needs of Thais and the insufficiency of doctors in rural areas, the Royal Thai Government launched a policy on compulsory government services for new medical graduates from the public universities in 1965. The first batch started providing health services since 1971. These medical graduates were mandated to work at least 3 years in community/district hospitals. Later, this policy was extended to nurses, dentists and pharmacists. Despite a deficiency of doctors in rural areas remains, the severity was alleviated. Up to now, this policy has played a crucial role in the recent major health system reform (Anonymous 2005; Faramnuayphol, Ekachampaka et al. 2008; Prakongsai, Limwattananon et al. 2009).

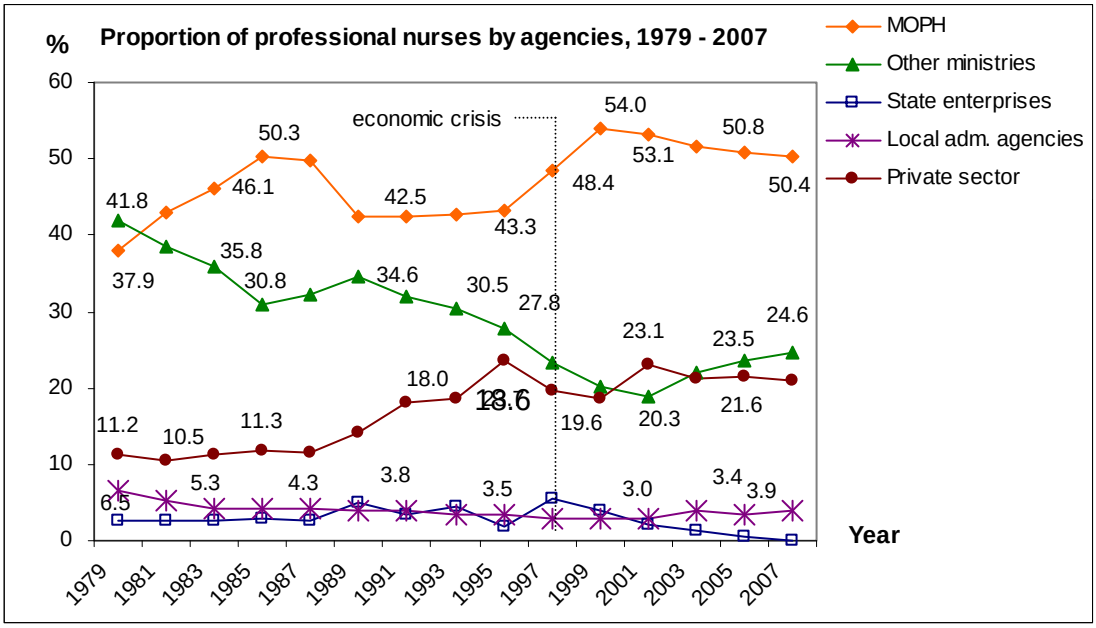
Currently, there are 14 medical schools in which thirteen are public and one is private. Among other policies including national education, the Ministry of Public Health and the Higher Education Commission established a 20-year 'Collaborative Project to Increase Production of Rural Doctors'. As a result, approximately 1,300 to 1,500 new students are admitted per year (Collaborative Project to Increase Production of Rural Doctor; Faramnuayphol, Ekachampaka et al. 2008).

Doctors provide medical services in various health facilities under the 5 groups of agency. Similar to health facilities in subsection 2.2.2, MoPH is the main agency of doctors. Figure 2.1 illustrates the proportion of medical doctors among the five agencies during the past thirty years. During first decade, the proportion of doctors in MoPH and other ministries fluctuated in opposite directions. Later on, however, it was not until the economic crisis in 1997 that the proportional trend of doctors in other ministries was secondly downward but the proportion of doctors in private sector rose markedly. The proportion among these three main agencies changed again during the two years after the crisis. That is, the proportion of MoPH doctors rose but the proportion of doctors in other ministries and private sector dropped. In 2001, the proportions of other ministries and private sector are trough and peak, respectively, and their trends have been in an opposite direction since then. The proportion trend of the MoPH dropped from the peak in 1999. Fluctuation of the proportion of such agencies along the pre- and post-economic recession might partly be due to the internal brain drain during the economic boom of the country including the increase of new hospitals and demand on health

services and a policy promoting medical hub in private sector and the reverse brain drain, thereafter.

As of 2007, half of all doctors are working in health facilities under the MoPH. Nearly a quarter of them are working in other ministries and one-fifth is working in the private sector. Approximately 3 percent of doctors work in local administrative agencies and nearly 1 percent works in health facilities of state enterprises (Anonymous 2005; Bureau of Health Policy and Strategy 2007; Faramnuayphol, Ekachampaka et al. 2008).

Figure 2.1 Proportion of medical doctors by five agencies between 1979 and 2007



Source: (Anonymous 2005; Bureau of Health Policy and Strategy 2007; Faramnuayphol, Ekachampaka et al. 2008)

The latest data in 2007 revealing the distribution of doctors across the country is shown in Table 2.4. By population per doctor ratio, one doctor is responsible for 2,778 people over the whole country in 2007. It indicated that doctors in Bangkok had the lowest workload, meanwhile doctors in the north-east had the highest workload and the gap is 6.2 times. However, this lowest workload of doctors in Bangkok might be overestimated. This is due to the fact that the most advanced health facilities which are the final referred hospital in the referral system are located in Bangkok. As a result, doctors and other health personnel in Bangkok are likely to shoulder such referred patients residing outside Bangkok. Across regions, mal-distribution gap is narrower, i.e. twice in difference between the highest and lowest ratio, the north-east and central

region. According to the health infrastructure, focusing on the three main agencies, less than 10 percent of MoPH doctors work in Bangkok meanwhile the central and north-eastern regions have more than half of MoPH doctors. In contrast, it was found that half of doctors in other ministries as well as in the private sector work in Bangkok.

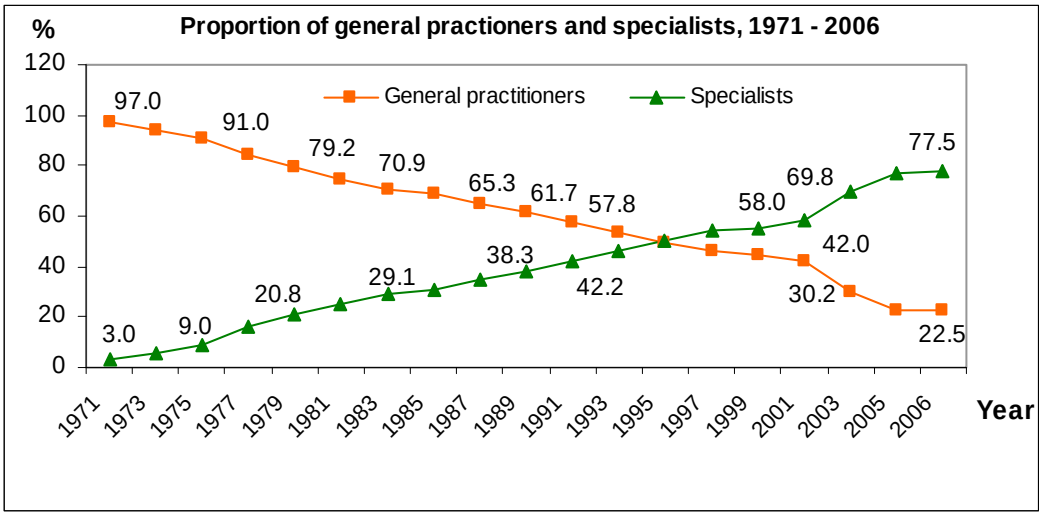
Table 2.4 Geographical distribution of medical doctors by agencies in 2007

Agencies	Total (%)	Bangkok	Region			
			Central	North	North-east	South
Population per doctor ratio	2,778	850	2,683	3,279	5,308	3,354
MoPH	11,415 (50.4)	720 *(6.3)*	3,473 *(30.4)*	2,343 *(20.5)*	3,150 *(27.6)*	1,729 *(15.1)*
Other ministries	5,583 (24.6)	2,806 *(50.3)*	781 *(14.0)*	839 *(15.0)*	626 *(11.2)*	531 *(9.5)*
State enterprises	31 (0.1)	19 *(61.3)*	-	12 *(38.7)*	-	-
Autonomous public organizations	153 (0.7)	24 *(15.7)*	128 *(83.7)*	-	1 *(0.7)*	-
Local administrations	735 (3.2)	690 *(93.9)*	21 *(2.9)*	13 *(1.8)*	8 *(1.1)*	3 *(0.4)*
Private sectors	4,734 (20.9)	2,452 *(51.8)*	1,314 *(27.8)*	416 *(8.8)*	243 *(5.1)*	309 *(6.5)*
Total	22,651	6,711	5,717	3,623	4,028	2,572

Source: Bureau of Health Policy and Strategy (2007)

Figure 2.2 illustrates the ratio between the number of specialists and general practitioners. Thirty years ago, the majority of doctors were general practitioners rather than specialists. The trend of this proportion in 2006 is markedly inversed, with nearly four-fifths of doctors being specialists. This proportion also indicates the current trend in specialized care rather than integrated services. In 2007, the Health Resource Survey revealed that two-fifths of specialists are located in Bangkok and nearly one-quarter works in the central region. Among 79 specialties, the highest proportion is in medicines making up 10.1 percent, followed by pediatrics, obstetrics-gynecology, surgery and orthopedics at 9.3 percent, 8.6 percent, 7.5 percent and 6.7 percent, respectively (Anonymous 2005; Bureau of Health Policy and Strategy 2007; Faramnuayphol, Ekachampaka et al. 2008).

Figure 2.2 Proportion of general practitioners and specialists, 1971 - 2006



Source: The Medical Council of Thailand, in (Anonymous 2005; Faramnuayphol, Ekachampaka et al. 2008)

2.2.3.2 Professional nurses

The main nursing care providers in Thailand include professional nurses and technical nurses. However, technical nurses have received training for higher education and have been promoted to be professional nurses since the end of 2006 (Office of the Permanent Secretary 2006). As a result, this thesis presents details of professional nurses only.

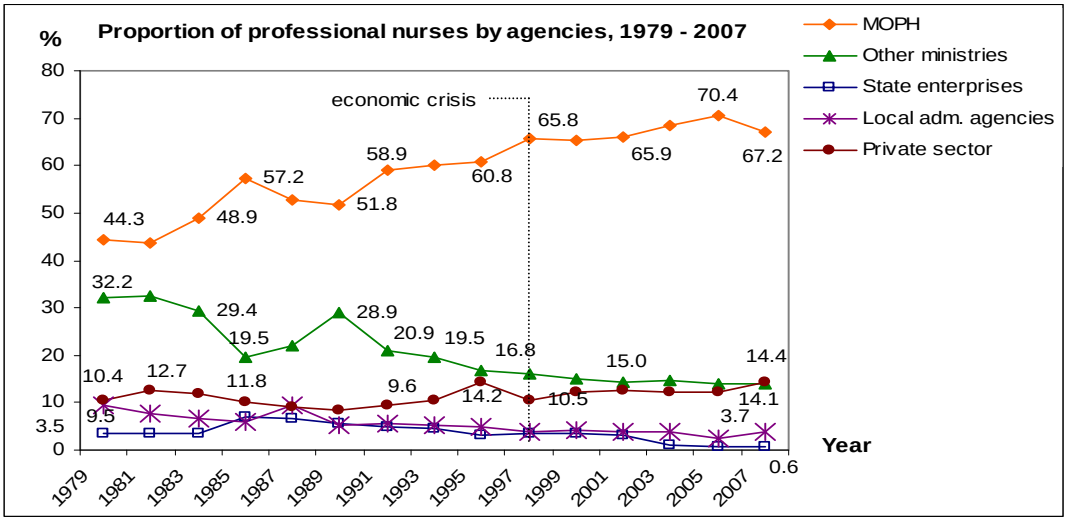
In 2007, Thailand had 76 nursing schools of which 60 schools have graduated nurses. Of these, 16 belong to the Higher Education Commission, Ministry of Education, 29 are MoPH schools, 3 are under the Ministry of Defence, 1 is of the Ministry of Interior, 1 is of the Bangkok Metropolitan Administration and 10 are private schools. The numbers of nursing schools have increased to 80 in 2009 and the current production capacity is 6,000 new graduates per year. As a result of previous insufficiency of nurses, the 6-year national plan to increase production of nurses was launched and 2,320 more graduated nurses per year are to be added on between 2010 and 2016 (Thailand Nursing and Midwifery Council 2009).

Figure 2.3 illustrates the trend in professional nurses distributed in health facilities. Similar to medical doctors, professional nurses provide health care services at health facilities among the 5 groups of agency. The MoPH is the principal agency with an upward trend since the past three decades, proportionately. Whilst professional nurses in other ministries is 12 percent less than the MoPH in 1979. Thirty years later the gap was

broadened because of the relatively declining proportion of the other ministries' and the increasing trend of the MoPH's nurses. This is mainly due to national health policy on expanding the primary care and secondary care services delivery to rural areas as mentioned in section 2.2.1 (Anonymous 2005; Faramnuayphol, Ekachampaka et al. 2008).

In contrast to doctors, the proportion of professional nurses in the private sector has increased slightly during the past three decades, from 10.4 percent to 14.4 percent. It is likely that this is due to the fact that professional nurses are less needed in private hospitals and they might be replaced by other health personnel in some minor duties. However, a similar pattern to doctors in private sector is shown with a peak and trough of the proportion during a few years pre and post the 1997 economic crisis. A Long falling trend in the proportions of professional nurses in hospitals of state enterprises and local administrative agencies follows the trends of health facilities and doctors as described in subsection 2.2.3.1 (Anonymous 2005; Faramnuayphol, Ekachampaka et al. 2008).

Figure 2.3 Proportion of professional nurses by agencies, 1979 - 2005



Source: Report on Health resource survey in Anonymous (2005) and Faramnuayphol et al (2008)

The 2007 geographical distribution of professional nurses is presented with population ratios and numbers and percentages as shown in Table 2.5. By population per professional nurse ratio, the national ratio is 597 people per nurse. The ratio indicates a 4.2 times disparity between the lowest and the highest ratio, i.e. Bangkok and the North. However, the disparity is small among the 4 regions, which is around two times

between the north and the central region. Almost all professional nurses (86.6 percent) are working in public health facilities and two thirds are MoPH health personnel. Approximately 14 percent of the professional nurses deliver nursing care in other ministries and private health facilities. Across the country, nearly one-third of MoPH professional nurses provide their nursing care in the central region meanwhile nearly two-thirds of nurses in other ministries as well as over half of the nurses in private health facilities are working in Bangkok. At present, it is estimated that there is a shortage of professional nurses in rural areas. However, the increase in production of 80 nursing schools may well fill this gap soon.

Table 2.5 Geographical distribution of professional nurses by agencies in 2007

Agencies	Total	Bangkok	Region			
			Central	North	North-east	South
Population per professional nurse ratio	597	240	554	999	638	619
MoPH	70,822 (67.2)	2,762 *(3.9)*	21,772 *(30.7)*	19,191 *(27.1)*	15,094 *(21.3)*	12,003 *(16.9)*
Other ministries	14,913 (14.1)	9,212 *(61.8)*	1,565 *(10.5)*	1,318 *(8.8)*	1,903 *(12.8)*	915 *(6.1)*
State enterprises	70 (0.1)	60 *(85.7)*	-	-	10 *(14.3)*	-
Autonomous public organizations	574 (0.5)	58 *(10.1)*	478 *(83.3)*	14 *(2.4)*	16 *(2.8)*	8 *(1.4)*
Local administrations	3,884 (3.7)	3,253 *(83.8)*	261 *(6.7)*	103 *(2.7)*	148 *(3.8)*	119 *(3.1)*
Private sector	15,135 (14.4)	8,412 *(55.6)*	3,613 *(23.9)*	768 *(5.1)*	1,454 *(9.6)*	888 *(5.9)*
Total	105,398	23,757	27,689	21,394	18,625	13,933

Source: Bureau of Health Policy and Strategy (2007)

2.2.4 Health financing

2.2.4.1 Health insurance system and their payment mechanisms

1) Overview of the health insurance system prior to 2002: the major health care reform

Historical records indicate that the insurance system was first introduced to Thailand in 1929 as a private-own insurance business. Fifty years later, the first private health insurance company started its business in 1978. In the public sector, the policy on out of

pocket payment for drugs and medical services or user charges in public health facilities was initiated in 1945. Nevertheless, the poor were considered for informal user fee exemptions by health workers (Tangcharoensathien, Srithamrongsawat et al. 2002).

Apart from private health insurance which seems to be the first health insurance scheme in Thailand, various health insurance schemes were formed in line with other components of health system developments. Based on the nature and objectives, Supachutikul A in Tangcharoensathien et al (2002), classified the schemes into 4 groups, i.e. Medical Welfare Scheme (MWS) with free medical care; Voluntary Schemes (VS) which includes private health insurance and Health Card Scheme (HCS); Civil Servant Benefit Scheme (CSMBS) is a fringe benefit to compensate the lower public salary; and Compulsory Social Insurance (CSI) is a compulsory scheme which includes the responsibilities of stakeholders, for example, the Social Security Scheme (SSS) which consists of a component of the Social Health Insurance (SHI), the Traffic Accident Insurance (TAI)[14]. Besides, it was also noted that other small scale community financing provided some health benefits or other benefits to its members were available in Thailand[15]. An overview on the MWS and the HCS are presented in this subsection whereas details of the CSMBS and CSI (Social Health Insurance: SHI) can be found in later subsections.

Table 2.6 summarises the chronological events of the four health insurance scheme developments. It was not until 1975 that government policy on the MWS was established with an aim to reduce inequity. At the beginning, free medical care was provided to low-income (the poor) individuals. Later, it was expanded to the elderly, children under 12 years old, veterans, the handicapped, and religious and community leaders. In 1994, the name of the scheme was changed from 'the Medical Welfare Scheme for Low Income Individuals' to 'the Medical Welfare Scheme for Underprevileged Groups', so called 'the Low Income Card: LICS'. During operations and development to achieve the goal, many problems and attempts to get better performance of the Scheme were reported. Targeting the poor is an unfinished agenda that the scheme encountered every year in terms of definition and criteria of poverty,

[14] The TAI covers to all owners of automobile vehicles for the responsibility of traffic accidents via annual compulsory premium payment. It ensures access to medical care of the victims in traffic accidents.
[15] Small scale community financing includes the community saving group in Songkhla province aim for improving quality of life. The members pay small premium routinely. Health welfare scheme is a part of this saving group Phongphit, S. (2002). Chapter 9: Community saving and health welfare scheme. Health insurance systems in Thailand. P. Pramualratana and S. Wibulpolprasert. Bangkok, Desire..

population coverage, and leakage in card issuance. The inequity within the scheme was mentioned as annual disparity of per capita government budget and per capita expenditure between the poor and other underpreviledged groups; and causing an imbalanced resource allocation across provinces. Across insurance schemes and uninsured groups, less outpatient and inpatient utilisation rates and expenditures per capita and poorer health status of the LICS cardholders were reported. However, the LICS evaluation indicated its potential in the cases of high cost inpatient care with DRG reimbursement. This implied to the promising accessibility of the cardholders to high cost care. In summary, the Scheme partially achieved its goals, however, problems existed, i.e. under funding compared to other public schemes, and ineffectiveness in card issuance to the poor whom were the main target (Pannarunothai 2002).

The Health Card Scheme (HCS) is a subsidized voluntary health insurance scheme developed for people in the informal sector of labour market. This was established in 1983 under the circumstances of the WHO policy on 'Health for All by the Year 2000'. The Mother and Child Primary Health care (MCH) Fund was the project initiated for this low-price prepaid health card in seven provinces. A few years later, using a risk sharing concept, it was expanded to be a nationwide health card phase II. It was designed to be a community based revolving fund providing loans for households to build latrines. The debtors returned the collection to health facilities at the end of the year. Beyond the MCH card, there was also a family card for curative care which was limited to a maximum of eight episodes and 2,000 Baht per episode. During phase III (1987-1991), this community financing project was less popular and also faced uncertainty in continuation under the MoPH policy, and was renamed 'the Voluntary Health Insurance Project'. The benefit was reduced to six episodes per card per year. Later on, in phase IV (1993-1998), the project was reformed to be a national public subsidized health card with 500 Baht subsidy per matched household and 100 percent coverage. Previous limitations of using episodes were removed but coverage was restricted to a maximum 5 household members. Health services were directly available at community hospitals. As a result of the economic downturn in the post-period of the 1997 crisis, the Scheme in its phase V was reformed again due to a rise in households' demands but with limitations in government subsidies. The reform included increasing the subsidy to 1,000 Baht but limiting the number of cards sold to 3 million annually; duplicating the validation period for adverse selection; replacing the referral letter with

the cross-boundary card and changing the level of the reimbursement fund. To better serve the poor, the benefit package did not cover hospitalisations in private rooms. Finally, the fee-for service reimbursement for high cost care cases was replaced with the DRG system (Srithamrongsawat 2002).

In assessment, the HCS achieved its goal in coverage to the uninsured group which includes farmers, fishermen, blue-collar workers in small enterprises, public drivers, street venders, etc. It reached 10 percent to 15 percent of population over 18 years old, however, under-coverage in Bangkok and other urban areas was reported. In financing evaluation, the selection bias was based on increasing demand and intention in covering households in which members had chronic diseases. Discrimination in providing health services was noted in the limitation of prescribed drug items. Compared to the CSMBS and the SSS, this Scheme and the WHS received a lower subsidized government budget (Srithamrongsawat 2002).

Table 2.6 Chronological events of the health insurance developments in Thailand

MWS	HCS	CSMBS	SSS
1975: Free medical care for the poor	1983: Commencing the Health Card phase I (the Maternal and Child Health Development Fund)	1980: Issuance of the Royal Decree on CSMBS	1954: First Social Security Act (without implementation)
1981: First issuance of the Low Income Card	1984 – 1986: Expansion of the Health Card Project phase II	1998: Introducing co-payment of the CSMBS beneficiaries; reimbursement limited to medicines in the national essential list; hospital stay limited to private room and board	1974: Issuance of Workmen Compensation Fund
1992: Expansion to the elderly	1987 – 1991: Expansion of the Health Card Project phase III		1990: Implementation of the Social Security Act for enterprises with ≥20 employees
1993: Expansion to other children under 12 years old, handicapped and religious leaders	1993 – 1998: Changing to a national public subsidized voluntary health insurance with equal matching fund (the Health Card Project phase IV)		1993: Law enforcement of 'the Protection for Motor Vehicle Accident Victims Act 1992'
1994: Changing its name from Medical Welfare Scheme for the Low Income to Medical Welfare Scheme for Underprivileged Groups	1994: Expanding of the Health Card to community leaders and health volunteers		1994: Amendment of the Social Security Act for coverage expansion to enterprises with ≥10 employees
1998: financing and management reform of the Scheme, i.e. management decentralization, per capita budget allocation, and reinsurance for high cost care using the DRG and global budget	1999: Increasing in the matching fund but limiting the card selling, adding cross-boundary card, using the DRG for high cost care reimbursement (the Health Card Project phase V)		2000: Amendment of the Social Security Act for coverage expansion to old age pension and child benefits

Source: Adapted from Supachutikul cited in Tangcharoensathien et al (2002); Srithamrongsawat (2002) and Pannarunothai (2002)

2) Post-achieving universal coverage era (2002 to present)

Various health insurance schemes were initiated and developed in the past few decades, however, it seems that many attempts were tried but lots of problems remained. Achieving each scheme's goals in targeting population, population coverage, financing, and equity were difficult and/or unsustainable as well as the system management was also inefficient. These were reflected with the existance of many uninsured people, inequity and vast catastrophic households. The health insurance systems were characterized by fragmentation and duplication. The HCS project was an attempt for universal coverage and social welfare but it had many limitations; and had difficulties in expansion, merging with the MWS and financial management. This concept of universal coverage had been found interesting among some MoPH policy makers, health system researchers and academia since 1993. However, it was not until 2001 that there was a suitable environment and composition for a significant change in the health system.

Some policies on the major health system reform in Thailand had been implemented since 1999 but the substantially new health insurance scheme 'the Universal Coverage', socalled 'the UC Scheme'[16] was the robust outcome. The scheme was implemented to 6 pilot provinces in April 2001 and was fully expanded to the whole country in April 2002 during the leadership of the ex-Prime Minister Thaksin Shinawatra. In addition to the commencement of UC scheme, in October 2002, the MoPH had also officially been reorganized in its role, function and structure. At present, three main health insurance schemes are available in Thailand. Details of the UC Scheme and the two former schemes, i.e. the CSMBS and the SHI are described in the following pages (Pitayarangsarit 2004; Bureau of Health Policy and Strategy 2009). Table 2.7 summarises characteristics including target population, financing and functioning of such schemes.

[16] At the beginning, the Scheme is called 'the 30 Baht Scheme' to promote politically by the Thai Rak Thai Party which agreed to the concept of the universal coverage. The Party committed the UC to the Thais when they won the landslide victory over 2001 general election. The 30 Baht is the out of pocket copayment per episode by means of moral hazard prevention, however, it was abolished in October 2006 Bureau of Health Policy and Strategy (2007). Minutes of the Ministry of Public Health meeting 7/2550. MoPH. Bureau of Health Policy and Strategy..

- **UC Scheme**

Up to 2009, the newest but biggest health insurance scheme operated for eight years. With the spirit to achieve and ensure access to health care for all, Dr Sanguan Nitayarumphong and colleagues always kept in mind the universal coverage concept and put efforts to bring it forward on the agenda of national policy. It was concluded that success through policy implementation requires support from various stakeholders; the generation of evidence to guide policy formulation; strong and functioning health system infrastructure over the country; system design and implementation capacity; and knowledge management as well as political support with the economic context as a catalyst (Tangcharoensathien, Prakongsai et al. 2009).

In addition to the equitable access to quality health care, other objectives of the universal coverage include health system reform to achieve equity, efficiency, and accountability; single standard on the same benefit package; and sustainability of policy, financing and institution. The scheme is funded by general taxes via annual government budgets and was designed to use a close-ended payment mechanism as capitation for upstream budget estimation and downstream payment to health providers. The payment for inpatients care employed the diagnosis related group (DRG) with global budget method since the scheme establishment in 2001. However, payment for high cost care, some special diseases and services uses point system plus point system with ceiling and global budget. The National Health Security Office which is the autonomous public organisation is the administrating body of the Scheme which was recommended by the National Health Security Boards (Pitayarangsarit 2004; Prakongsai 2008; Sornchumni, Kiatthanaphun et al. 2009).

- **CSMBS**

This scheme provides fringe benefits for civil servants and government employees including retired employees and their dependents. Such dependents include parents, spouse and up to 3 children less than the legal age (20 years old). The scheme was launched in 1980 and aims to compensate the lower public salary employees compared to private employees. Since it was designed for government staff, its financial source, therefore, is general taxes via annual government budgets. It has been a fee for service reimbursement system and allows broad medical services for treatment but excludes pre-exposure prevention, and cosmetic surgery. As a result of the 1997-economic crisis,

in 1998 there were many attempts to contain the cost, for example, by limiting reimbursed medicines to the national essential list but these were ineffective measures. Ceiling free reimbursement for hospitalisation by DRG system was introduced to the scheme 1 July 2007. The expenditure of the scheme dramatically increased from an annual growth rate of 12 percent up to 33 percent. Recently in 2008, the total expenditure was 54.9 billion Baht and the per capita expense of the scheme was nearly 5 times higher than the two other schemes. In addition, CSMBS beneficiaries also have a greater utilisation rate than the other two schemes. This is driven by the broader benefit package of medicines which is reflected by the higher out-patient expense than hospitalisation expense and two-thirds of this out-patient expense is expenditure for medicines (Sriratanaban 2002; Tangcharoensathien, Srithamrongsawat et al. 2002; The Comptroller General's Department 2007; Limwattananon, Limwattananon et al. 2009; Soranastaporn 2009).

- **SHI Scheme**

The law enforcement of the Social Security Act took 46 years since its first enactment in 1954. This compulsory insurance is beneficial to the employees of private enterprises which have more than 20 employees in the formal sector. The Social Security Fund shared by tripartite contribution among government, employers and employees with the ratio of 2.75: 5: 5, respectively. However, contributions from employees have long been limited to a maximum of 15,000 Baht monthly wage. Currently, the Social Health Insurance (SHI) is one of seven benefits in the Fund. Medical care is provided under the contract between health facilities and the Social Security Office through the registered beneficiaries to such health facilities annually. The scheme’s payment system is the first initiative of capitation in Thailand. In addition, however, payment for listed high cost care is reimbursed by a reference price and limited to a set number of episodes per year. This high cost care includes chemotherapy, radiation therapy, renal replacement therapy, and bone marrow transplantation. Health care providers tend to be private health facilities rather than public health facilities, particularly in Bangkok and its vicinity (Itivaleekul 2002; Bureau of Health Policy and Strategy 2009; Meekrut 2009; Research and Development Division 2009; Tangcharoensathien, Prakongsai et al. 2009).

Comparing the three schemes, as of 2008, seventy eight percent of the population are UC beneficiaries and have the least expenditure per capita. CSMBS beneficiaries, in contrast, spend the highest expenditure; have the highest utilisation rate of both ambulatory care and hospitalisation. The CSMBS is also claimed to have the least efficiency in cost containment and over-utilisation of the beneficiaries particularly in the appropriateness of medicine use.

Table 2.7 Characteristics of target population, function and financing of major three health insurance schemes, as of 2008

	CSMBS	SHI	UC
Establishment	1980	1954 but first enforcement in 1990	2001
Management body	The Comptroller General's Department, Ministry of Finance	The Social Security Office, Ministry of Labor and Social Welfare	National Health Security Office
Goals/ objectives	fringe benefit	compulsory insurance	universal coverage
Target population	civil servants, government employees, and their dependents (parents, spouse and maximum 3 children)	employees of private enterprises in formal sector	the rest population uninsured from the CSMBS and SSS
Coverage in millions of the Thai population *(%)*	5.0 – 5.6 *(8.1)*	9.29 *(14.0)*	46.95 *(75.7)*
Source of funding	General tax	tripartite contribution among government, employers and employees in ratio of 2.75: 5:5 with ceiling	General tax
Budget/expenditure per capita per year (Baht)	9,782.63 - 10,000	1,900.98 - 2,131	1,631.50 - 2,100
Utilisation rate: OP/IP per person per year	7.5 /0.14	2.61/ 0.053	2.75/ 0.11
Payment mechanism	Fee for service with DRG system for IP commencing since 1 July 2007 (2550 B.E.)	capitation with high cost care reimbursement and additional payment for 25 chronic diseases	exclusive capitation for OP and for IP with DRG system (since 2001) plus point system with ceiling and global budget for special diseases and services*
Healthcare providers	960 public health facilities	main contractors: 153 public + 104 private	hospitals: 836 MoPH + 75 other ministries + 55 private
		network health facilities: 963 public + 1,499 private	health facilities: 13 MoPH + 80 other ministries + 150 private

Table 2.7 Characteristics of target population, function and financing of major three health insurance schemes, as of 2008 (cont.)

	CSMBS	SHI	UC
Service providing	Any health facilities	Registered beneficiaries to contracted health facilities	Beneficiaries reside in the catchment area of health facilities
Benefit package	medical care except pre-exposure prevention	medical care with national essential medicines, basic dental care, kidney treatment and bone marrow transplantation	medical care including health prevention and promotion with national essential medicines, traditional and alternative medicines, basic dental care

***** In 2008 special diseases and services include renal replacement therapy, leukemia, lymphoma, cleft palate and cleft lip, cardiac surgery; and diseases/interventions in some specific areas include epilepsy surgery, haemophilia, cataract surgery, stroke, and diabetes

Source: (Bureau of Health Policy and Strategy 2009; Meekrut 2009; Research and Development Division 2009; Soranastaporn 2009; Sornchumni, Kiatthanaphun et al. 2009)

2.2.4.2 Health expenditures

Health expenditure in Thailand has long been closely monitored in relation to the national economy as stated in the national health account (NHA). Table 2.8 illustrates some indicators in the annual national health account during the past fourteen years (1994-2007). Estimated overall health spending at the current price was 127 billion Baht in 1994 and rose more than two-fold to 315 billion Baht in 2007. The upward trend in health expenditure was highest in 1997, the year of the economic crisis. It was indicated as the percentage of the total health expenditure (THE) to GDP and the percentage of real growth rate of operating health expenditure. However, the trend has dropped since then. It was not until 2002 that the national economy and THE growths recovered to the same level as before the 1997economic crisis. Comparing national health expenditure to national income, i.e. the GDP, the average THE is 3.7 percent of the GDP within the last five years which is slightly over the 2006 average of the WHO Southeast Asian Region countries (3.4 percent) but is lower than the average of lower middle income countries (4.5 percent) and is vastly different to high income countries (11.2 percent). In the aspect of financing agencies, prior to establishment of the UC Scheme, a higher proportion of THE was incurred by private agencies mainly through household out of pocket payments but this has reversed to the public sector, thereafter. The economy also affected the proportion of the THE between expenditure in investment and operating expenditure, that is prior to the 1997-economic crisis, the proportion of investment was more than 10 percent but it has been reduced to less than 10 percent after the crisis. Trend in THE per capita was dramatically upward in both Baht and USD after the crisis; however, the exchange rate between both monetary units has played a significant role. As a result, this current price has limited interpretation.

In addition to the aspect of financing agencies, four financing sources almost equally contribute to the 2007 THE, i.e. the UC Scheme, the central government, the CSMBS & state enterprises as well as households in the proportions of 22 percent, 20 percent, 19 percent and 19 percent, respectively. The remaining 20 percent includes the SSS plus the Workmen Compensation Fund, local governments and others. International financial aid contributed less than 0.1 percent of the 2007 THE. Out-patient and in-patient health services have shared the highest proportion of the THE. The latest proportions in 2007 were 41 percent and 37 percent respectively. The estimated expenditure on medicine was 186 million Baht, 42.8 percent of the THE (Tangcharoensathien, Vasavid et al. 2004; Faramnuayphol, Ekachampaka et al. 2008; Vasavid, Janyapong et al. 2009; World Health Organization 2009).

Table 2.8 Total health expenditure at current year price (THE) by various sources of financing, 1994-2007

Indicator	1994	1995	1997	1999	2001	2002	2005	2006	2007
THE (million Baht)	127,655	147,837	189,143	162,124	170,203	201,679	251,693	290,603	314,796
THE as %GDP	3.5	3.5	4.0	3.5	3.3	3.7	3.5	3.7	3.7
% real growth rate of GDP	na	9	-3	0	3	6	5	6	6
% real growth rate of operating health expenditure	na	11	0	2	1	18	8	14	8
Proportionate THE from public and private financing agencies	45 : 55	53 : 47	54 : 46	55 : 45	56 : 44	63 : 37	64 : 36	68 : 32	73 : 27
Proportionate THE between investment and operating health expenditure	14 : 86	14 : 86	18 : 82	6 : 94	5 : 95	5 : 95	4 : 96	4 : 96	4 : 96
Annual THE per capita (Baht, *USD*)	2,160 *(86)*	2,486 *(100)*	3,110 *(99)*	2,629 *(69)*	2,732 *(61)*	3,211 *(74)*	4,032 *(100)*	4,625 *(122)*	4,994 *(144)*

Source: Adapt from Table 3.1.1 and Figure 3.2.2 in Tangcharoensathien et al (2004), Table 2 and Figure 1 in Vasavid et al (2009)

2.3 Cancers and health services for cancers

This section presents cancer related issues including the health service system for cancer patients in Thailand, i.e. human resources, health facilities and financing.

2.3.1 Incidence and burden of cancers

It was estimated from population-based cancer registration in Thailand that during 1995-1997, the age-standardized incidence rate (ASR)[17] per 100,000 population is 149.2 in males and is 125.0 in females. In males, liver was the first leading site with ASR at 37.6 in 1996; lung and colon & rectum are the second and third with ASR at 25.9 and 10.8, respectively. In females, cervical, breast and liver were the first to third rank and nearly equal in ASR, i.e. 19.5, 17.2 and 16.0, respectively. The geographic variation based on 5 provinces[18] shows that highest cancer ASR in males was in Khon Khaen, a province in the north-east (182.5) with marked ASR of liver cancer (85.0) meanwhile the lowest ASR is in Songkhla in the south (91.4) with first leading site of lung cancer (13.6) as well as oral cavity & pharynx cancer (12.9). Whereas in females, Chiang Mai and Lampang in the North had the highest ASR (148.6 and 146.1) with the first leading site of lung cancer (25.3) as well as cervical cancer (23.6) and the lowest ASR in Songkhla with cervical cancer (16.1) and breast cancer (12.1). At the end of the first decade of the 21st century, Thailand is estimated to have approximately 103,000 new cancer cases per year with the highest number of new cases of liver cancer in males and breast cancer in females. Towards the previous decade, trends in the incidence of cancer were upward with a sharp rise in breast cancer and colorectal cancer cases. Meanwhile, new cases of liver cancer which had long been in the first rank increased slightly. This was due to a falling number of the incidences of liver cancer in the north-east (Martin and Patel 2007; Sriplung 2007). Even though these estimations are based on only 5 provinces which are regional hubs and the capital of Thailand, they might not truly represent the incidence of each region which includes other provinces as well. Only this

[17] Age-standardized incidence rate reported in unit of 'per 100,000 population' is the incidence of population with standard age structure. This age standardization is the risk of cancer adjustment related to age. The world standard age structure was referred in this estimation. ASR is necessary for comparison among different populations Patel, N., N. Martin, et al. (2007). Chapter I: Registry procedure and statistical methods. Cancer in Thailand, Vol. IV, 1998-2000. T. Khuhaprema, P. Srivatanakul, H. Sriplunget al. Bangkok, Bangkok Medical Publisher. **4**.

[18] Five provinces include Chiang Mai and Lampang in the north, Khon Khan in the south, Songkhla in the south and Bangkok, the capital.

report, however, provided the largest and latest multicentre population-based registration for cancers in Thailand.

In Thailand, studies on the 1999 and 2004 burden of diseases indicated that Year of Life Lost (YLL) which is due to premature death, cancer attributed 14-16 percent in males and 17-19 percent in females to overall YLL (4.2-3.95 million in males and 2.6 million in females). In terms of Disability Adjusted Life Year (DALY), cancers contributed 10-12 percent and 11-13 percent to overall DALY which were the second to third rank in both genders. Of these, liver cancer is the 4th cause of disease burden in males in both years and was the 5th, in 1999, and 7th, in 2004 cause in females. In addition, it caused 4-5 percent of in males and 3 percent of DALY loss in females during that period. This DALY loss were mostly due to the YLL of those aged 30-59 and 60 or above (Thai working Group on Burden of Disease and Injuries 2002; International Health Policy Program-Thailand 2007). It could be concluded that from 1999 to 2004, the burden from cancer has not changed. In Thailand, loss from cancer has been burdened by premature morbidity and death in working age population rather than old age population.

2.3.2 Health professionals with specialty related to cancers

Updated information from Medical Council revealed maldistribution in medical doctors with specialties related to cancers[19] across regions in 2007. Table 2.9 shows that the population per specialist ratio is highest in the north-east (22,321) and is lowest in Bangkok (5,317) meanwhile the average of the whole country is 8,692 people for one specialist. Bangkok has a 3 times higher number of specialists than in the north-east.

[19] These specialties include clinical pathology, pathology, radiology, radiotherapy and nuclear medicine, anesthesiology, obstetrics and gynecology, general surgery, cardio-thoracic surgery, urology, oncology, hematology, for instance.

Table 2.9 ASR incidences of males and females in some provinces during 1995-1997 and population per specialist ratio in 2007

	Bangkok	Central	North	North-east	South	Total
Male (ASR)	143.6	na	142.5*, 178.0**	182.5[§]	91.4[#]	149.2
Female (ASR)	125.9	na	148.6*, 146.1**	125.3[§]	81.3[#]	125.0
population per specialist ratio	5,317	12,126	11,846	22,321	13,054	8,692

*Chiang Mai; **Lampang; [§]Khon Khan; [#] Songkhla
Source: adapted from(Martin and Patel 2007) and Medical Council in (Bureau of Health Policy and Strategy 2007)

2.3.3 Health facilities and health services

It was not until 2002 that the health services for cancer patients concomitantly to health care reform for universal coverage were developed comprehensively. Prior to 2002, health facilities for cancer care had independently served patients over the country. Such health facilities are tertiary care or super tertiary care level under many organizations including the private sector. Except for the National Cancer Institute and its regional cancer centres which are specialized health facilities, medical school hospitals, regional hospitals gained financial support from government budgets and their funding agencies for cancer integrated with other care. Almost all of the high technology equipment attained was dependent on annual government budgets for investment. Patients were supported according to their health insurance benefit packages and paid out of pocket for some expensive cytotoxic drugs classified as non-essential drugs. In other words cancer treatment is classified as high cost care.

As a result of the UC scheme established in 2002 and the reform of government budget reallocation for the health sector, financial resources has been pooled in capitation payment mechanism and focused on system operations rather than investment. The ten-year national master plan for three service systems[20] including cancer was developed under the UC scheme. The plan aims to improve the service and bring it into standard; strengthen the capacity of health professionals; and improve access to service of people

[20] Three service systems are cancer centre for excellence or cancer centre; trauma center; and cardiac center. These three diseases were selected as priority according to the study of Thai burden of diseases.

in all regions. Regardless of whatever Ministries the health facilities belong to, public health facilities for cancer care have been classified into three levels as follows.

1) First level (Excellence Cancer Center, ECC): Twelve super-tertiary health facilities which are mostly medical schools and located in Bangkok providing comprehensive services for cancer[21], research and model development have also been indicated.

2) Second level (Advance Cancer Center, ACC): Eight health facilities coordinated as 5 ACCs provide complete services and conducting clinical research have been classified into second level. All health facilities are regional hospitals and regional cancer centres.

3) Third level (General Cancer Center, GCC): Ten health facilities coordinated as 7 GCCs provide only services for cancer patients. All health facilities are regional/general hospitals and regional cancer centres.

Such health facilities have been supported financially from the UC budget in four categories, i.e. medical and laboratory equipment, fringe benefits for health professionals for related cancer care provisions, expenditure for short course training of health professionals and activities for service improvement. In addition to capitation payment and the concept for excellent center development, additional payment through the disease management payment system for some chronic diseases and high cost care for leukemia and lymphoma was introduced in October 2006. Another attempt to increase the access to high cost treatment for cancer care, the UC Scheme has supported 3 medicines for breast cancer and lung cancer since 2008 through the government use of patents by the Ministry of Public Health (Rungkijkarnwattana and Yamprom 2007; Puttasri 2008; Sornchumni, Kiatthanaphun et al. 2009). Maldistribution of the excellent centres was noted. No health facility under the excellent center is available in the catchment area of three National Health Security Regional Offices. Patients have to seek services from centres in Bangkok or other regions which are convenient. In a 2008 evaluation, it was reported that less than half of the health facilities have improved in terms of the service provided and their referral systems. Insufficiencies in equipment and in health professionals were the reasons which underpinned this lack of improvement (Puttasri 2008).

[21] The services include diagnosis and planning treatment, cancer screening, surgery, chemotherapy, radiotherapy, palliative and terminal care, risk factor screening, risk factor screening in community, and community prevention programme.

Beneficiaries under the CSMBS and SHI schemes received chemotherapy through the current essential medicines on the National List of Essential Medicines. Since 2006, the Comptroller General's Department, however, has expanded the benefit package to include 6 high cost non-essential chemotherapeutic medicines for leukemia, gastrointestinal stromal tumor, lymphoma, breast cancer, large intestine cancer and lung cancer (The Comptroller General's Department 2006).

2.4 Conclusion

2.4.1 Lessons learnt from the development of the Thai health system

In conclusion, even though Thailand is a lower middle income country and is dearth in resources, its health system, i.e. policy, infrastructure, manpower and financing, has been strengthened continuously. It has been seen, however, that the health system has developed dependently from the economic situation of the country, particularly over the past 20 years. National health planning and policy making is a part of the National Economics and Social Development Plan which provides guidance for development. The system has been developed on the basis of equity in access to health service accordingly. In addition, the development has focused on the poor. Following the national health plan, health facilities and service system was first invested in, followed by distribution of health professionals. Concomitantly, the financing system to reduce the financial barrier of the poor as well as cost containment with efficient payment mechanism has been developed and implemented. The referral system is a tool for seamless health service between rural and urban areas, the primary care level and tertiary or advance care level. The latest system reform in 2002 brought significant changes to the health system, the introduction of the universal coverage, which ensures more equity in health than before. From seven years ago to now, three main insurance schemes subsidise and ensure that approximately 97 percent of the population has access to health care. However, many issues continue to be a challenge and the system requires further long term and comprehensive monitoring including the sustainability of the financial system, inequity and improving the quality of health service through the goal of this system reform accordingly.

The health service system for cancer care is one of interest in national policy. Cancer, a chronic disease, causes great DALY loss, is in high rank of cause of death, needs long term of care and requires many resources, for example health professionals with

specialty and cost of care. In addition, to almost all patients, the disease usually causes great impact to mental and physical health as well as requires attention from patients' family. Attempts to improve the health service for cancer care and treatment have been recognized. However, death is a certainty and could not be avoided by every ordinary people.

2.4.2 Research gap

With the amount of information and knowledge provided from literatures, it could be concluded that bird-eye view of the national system financing has been closely monitored and health services for some problematic diseases have been taken into consideration. However, there is a room for researches and evaluations in, for example, equity in other aspects, cost containment, improvement of quality of health services in a particular period, i.e. the terminal stage of life. It is perceived that in this critical period of life, as much as resources (cost, high health technology and workload) of health providers and households are pooled to survive or prolong the patients' lives. However, no data provides this picture in the Thai health system and that this will be the focus of the remaining chapters.

CHAPTER THREE

EQUITY IN HEALTH CARE, COST OF AND CARE FOR THE TERMINAL PHASE OF LIFE

This chapter focuses on three areas related to health system development regarding terminally ill cancer patients. First, equity in health care, which is the desired goal of the health system reform, is presented. It starts with its origin and concept, followed by definition and types, particularly from a health perspective and its measurement. Next, a review on the cost of care at the terminal phase of life in several countries is explored in the scope of magnitude, measurements and trends. Finally, it looks at the common health services provided to terminally ill patients in other countries which could be applied to Thai patients.

3.1 Equity, the ultimate goal of health care

The term 'equity' is widely used and is now often applied to health care. Its origin is from philosophy and social justice which is one of the human rights principles. Health is valued as a critical building block, or means to a better and more meaningful life and ill health is a threat to social and economic well-being (Peter and Evans 2001). It has long been a worldwide concern in many international organizations including the UN, the World Bank and the WHO. The equal right to health and opportunity to be healthy are stated in the 1948 UN[22] and the 1946 WHO constitutions and its amendments[23]. In Thailand, the right to health is also stated in its 1997 Constitution and in its latest 2007 Constitution stating that *'A person shall enjoy an equal right to receive public health services…'* That is equity in health is an ultimate goal and a fundamental result within

[22] Preamble, paragraph 5: Whereas the people of the United Nations have in the Charter reaffirmed their faith in fundamental human rights, in the dignity and worth of the human person and in the equal rights of men and women and have determined to promote social progress and better standards of life in larger freedom,

Article 2: Everyone is entitled to all the right and freedoms set forth in this Declaration, without distinction of any kind, such as race, colour, sex, …

Article 25 (1): Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing and medical care and necessary social services, and the right to security in the event of unemployment, sickness, …

[23]Paragraph 3: The enjoyment of the highest attainable standard of health is one of the fundamental right of every human being without distinction of race, religion, political belief, economic or social condition.

and between nations (The United Nations 1948; Braveman and Gruskin 2003; 2005; 2007).

From the 'Health for All' policy commenced in 1977 and oriented in the 1978 Declaration of Alma Ata[24] to the most updated information, there are clear indications of the existence of a widening gap in inequity which is an embedded problem of health care. Many organizations including WHO have been attempting to alleviate such inequity which can be seen in the new generation of research undertaken since the beginning of the twenty first century. The Commission on Social Determinants of Health of the WHO summarised that equity in health is in relation to social determinants like socio-economics, nutrition, education, and environment such as daily living and working conditions. The Commission urged countries to combat inequity and called for 3 measures: improve daily living conditions; tackle the inequitable distribution of power, money and resources; and measure and understand the problem and assess the impact of action (Commission on Social Determinants of Health 2008). This issue of health equity was therefore started on these grounds.

3.1.1 The grounds of equity: philosophy and concept

It was noted that concern about equity and the avoidance of deprivation presumably came from principles in religion. Islam, Catholicism, Christianity, and Buddhism, for instance, indicate this norm and social justice in their teachings. Equity or fairness has been interpreted differently depending on the basis of various views on ideology[25]. It could be defined differently by different people in different settings. Some of these social justice issues emphasize opportunities and outcomes such as welfare, utilities and capability while others emphasize the fairness of processes. However, philosophies which are the grounds of human societies and political affairs as well as the principles of social justice related to health were also mentioned and discussed. Four main ideologies mentioned include utilitarianism, libertarianism, egalitarianism and Rawl's concept. Brief concepts of these ideologies are described below particularly those

[24] See detail in Chapter Two section 2.2.1

[25] Beyond the three main ideologies, Marxist and Desert were mentioned. The Marxist emphasizes on the meeting of need; and Desert emphasizes the reward of merit Wagstaff, A. and E. van Doorslaer (1993). Equity in the finance and delivery of health care: concepts and definitions. Equity in the finance and delivery of health care, an international perspective. E. van Doorslaer, A. Wagstaff and F. Rutten. New York, Oxford University Press**:** 7-19, Williams, A. (1993). Chapter 16: Equity in health care: the role of ideology. Equity in the finance and delivery of health care, an international perspective. E. van Doorslaer, A. Wagstaff and F. Rutten. New York, Oxford University Press**:** 287-98.

related to health (Wagstaff and van Doorslaer 1993; Williams 1993; Peter and Evans 2001; The World Bank 2006; Morris, Devlin et al. 2007).

Utilitarianism is claimed to be the oldest concept and is the background concept of health economics which emphasizes welfare maximization, i.e. maximizing the sum of individual well-being, utilities or welfare. In other words, in health it is the concept of efficiency of resource allocation towards medical success. Two features of utilitarianism were mentioned, i.e. weighted utilitarianism and strict utilitarianism. The former allows application of differential weights to the utilities of different individuals or groups. The latter interprets that society's welfare is the equal-weighted sum of the every member's utilities.

From the perspective of strict utilitarianism, to achieve the greatest distribution of health care refers to the greatest number of individuals as such. It was commented that while strict utilitarianism attends to the main concern of treating everybody equally with social welfare contribution, inequality in outcomes may be worse. Nonetheless, this can be less unequal if more weight of an individual of society is accounted for. Utilitarianism was also critiqued about its inability in dealing with distributive justice, particularly if health losses are weighted by the income lost due to illness or disability and so attaching greater value to the health of the rich than that of the poor.

Libertarianism emphasises individual liberty or natural rights, particularly the rights to life as well as to possessions. For further explanation, the former means an individual is not unjustly killed whereas the latter refers to possessions acquired and transferred without violation of others' rights.

From a health perspective of libertarians, access to health care is part of society's reward system. With their own income and wealth, individuals could get more or better health care. In other words, ones willingness and ability to pay would be the determinant of access. This ideology would be achieved in a private system which is market oriented. It seems that this ideology is the grounds of the current US health systems.

Egalitarianism on the basis of Marxist theories emphasizes the considerations for independent distribution of aggregate population health. Thus, it was claimed to be more suitable for equity judgment than utilitarianism. This concept also supports a

public provided system. However, there are many differences of egalitarianism depending on perceptions of social obligation on individual health or health care.

In contrast to libertarians, a view on access to health care of egalitarian is an individual's right and therefore should not to be influenced by income or wealth. Equal opportunity of access for equal needs is its achievement from a health perspective.

Rawl's concept is the 'maximin' principle based on distributive justice initiated by John Rawls. It is also known as the difference principle. Its concept refers to a 'veil of ignorance' in which everybody ignores his/her position in society. That is, he/she does not know their socioeconomic or health condition, so the individual would adopt a risk-minimising strategy that maximizes the position of the least well-off. This concept emphasizes that resources are distributed in a way that the least well-off group in society gets the maximum gain. Individuals should have the maximal liberty in the same degree of everyone's liberty. Intentionally engaged inequalities are unjust if it disadvantages the least wealthy group.

3.1.2 Definition and achievement of equity in health

It should be noted that at the beginning there was no uniquely correct route to define equity (Morris, Devlin et al. 2007). However, equity is generally defined as '*social justice'*; *'fairly consistent'*; *'justice according to natural law or right specially freedom from bias or favoritism'*; and '*the state, ideal, or quality of being just, impartial, and fair'*

Equity in health can be defined as *'equity refers to differences in health which are considered unfair and unjust'*; *'the absence of socially unjust or unfair health disparities'* which could not be directly measured. As a consequence, the operational and measured definition was defined as *'the absence of systematic disparities in health between social groups who have different levels of underlying social advantage/disadvantage'*; and '*striving to eliminate disparities in health between more and less-advantaged social group'*

Health equity is a multidimensional concern and has been discussed in relation to two main aspects of health context, i.e. health and health care. Health or good health which relates to achievement and capability is actually indicated as health needs and health outcomes (or health status or health conditions). Meanwhile, health needs or the need

for health care is the capacity to benefit from it. Such health outcomes are focused on life expectancy, mortality, morbidity, and health risk, for instance. In terms of health care or treatment or the facilities that society offers to achieve health, financing and delivery are focused on. Regarding financing, equity mostly refers to the meaning of the ability to pay, avoidance of absolute deprivation, budget allocation, financing subsidies from public resources, and out of pocket payments. The delivery usually refers to resource allocation, access or receipt/utilisation of health care services.

Many factors beyond health care could affect health achievement such as genetic propensities, individual incomes, food habits and life style as well as epidemiological environment and work conditions. Some are unavoidable but others could be. Whitehead (2000) clearly distinguishes these into seven categories:

1) natural, biological variation;

2) health-damaging behaviour if freely chosen, such as participation in certain sports and pastimes;

3) the transient health advantage of one group over another when that group is first to adopt a health-promoting behaviour (as long as other groups have the means to catch up fairly soon);

4) health-damaging behaviour where the degree of choice of lifestyles is severely restricted;

5) exposure to unhealthy, stressful living and working conditions;

6) inadequate access to essential health and other public services;

7) natural selection or health-related social mobility involving the tendency for sick people to move down the social scale.

The author states that health differences due to factors in categories 1, 2 and 3 would not normally be indicated as inequities in health meanwhile in categories 4, 5 and 6 which could be avoidable are unjust. Factors in category 7 have two features of consideration, that is, the original ill health may have been unavoidable, but being poor of sick people is preventable and unjust (Whitehead 2000).

Pursuing equity in health and health care does not mean elimination of all health differences. In equity in health, the policy for equity should aim to reduce or eliminate such avoidable and unfair factors and their result. This policy should also aim to provide a fair opportunity for everybody to achieve their full health potential. To achieve equity in health care, it was suggested that the ultimate goal is to closely match service to the level of health needs. As a consequence, however, this may result in disparity of access to and utilisation of services between groups, particularly in favouring the disadvantaged groups which usually have greater need (Mooney 1987; Gwatkin 2000; Whitehead 2000; Bambas and Casas 2001; Sen 2002; Gruskin and Braveman 2003; Whitehead and Dahlgren 2007; O'Donnell, van Doorslaer et al. 2008a).

3.1.2.1 Equity (or inequity) versus equality (or inequality) in health

Sometimes, equity and equality have been used interchangeably. However, it was clearly explained in various literatures that both are not synonymous. Meanwhile equity means fairness and it is a multidimensional concept with broader notions, equality means the state of being equal. Equality was criticized in that it is an ideal and does not have much cutting power and it needs to be specified on what is to be equalized. The term *'inequity'* or *'inequality'* is usually interpreted and presented rather than directly indicated as *'equity'* or *'equality'*.

The violation of health equity can not be judged by considering only inequality in health. In other words, health inequalities are not necessarily inequitable. Achieving the concept of equity in the success of health outcomes may conflict with the principle of equal access. That is, in order to judge inequity and inequality, it requires consideration on such principles mentioned earlier in section 3.1.1 and the context of scope or focus of the concern. Apparently, it is often the case that the country health system needs to mix concepts of equity and equality. However, most views on equity are referred to the egalitarianism because of the fact that health is a basic human need and unlike other goods where a competitive market could be applied.

Despite the fact that inequality in health cannot provide adequate information for health equity assessment, it is an important part to understanding health equity. It is considered to be a case of inequality if two individuals are exactly similar in having health predispositions, including a shared proneness of illness, but the very rich gets cured by some expensive medical treatment whereas the poor suffers from illness and could not

get the treatment due to unaffordability. This is also prone to be a violation of health equity since the rich have privileged treatment. To distinguish inequity and inequality, another simple case which identifies a minimum or basic level of health achievement can be looked at. Equity is marked if all regions of a country achieve life expectancy at birth of at least 70 years but it is inequality if some regions have life expectancy values above 70 years.

To summarise, the issue of equity and equality in accordance with equity from a health perspective described in subsection 3.1.2, three areas which are usually discussed; finance of health care (ability to pay, subsidies received through the use of services, and payment people make for health care); health outcomes (mortality rate, life expectancy, illness status, number of days ill, for instance); and health care (access and utilisation). The first issue of equity is determined to the extent that health care is financed according to ability to pay. The last two issues are usually measured in terms of equitable distribution.

In view of health economics, this distribution focuses on equality in five features including equal health, equal expenditure for equal need, equal use for equal need, equal access for equal need, and equal quality of care for all. Equal health is measured in terms of quality adjusted life year (QALY) and disability adjusted life year (DALY), mortality and morbidity, for instance. Equal expenditure emphasises equal expenditure for equal need. Regardless of preferences for health and health care and attitudes to risk behaviour, it aims for individuals to receive the same share of health spending. Similarly, equal use for equal need does not take such preferences and attitudes into consideration. Equal access is implicated to opportunities to health care access. Two individuals who need the same treatment would be seen as having equal access if their costs for access to health care incurred are valued equally. Hence measuring access is difficult, empirical studies on equity prefer equal use for equal need. Finally, 'equal quality of care for all' means that everybody has an equal opportunity of being selected for attention through a fair process based on need rather than social influence' (Pannarunothai and Rehnberg 1998; Pannarunothai 2000; Whitehead 2000; Peter and Evans 2001; Sen 2002; Braveman and Gruskin 2003; Morris, Devlin et al. 2007; Whitehead and Dahlgren 2007).

In sum, the choice of approaches to equity is a normative judgement. That is, as mentioned earlier the best definition depends on the value system of the society for which decision is being made.

3.1.2.2 Horizontal versus vertical equity

Two types of equity are categorised; horizontal and vertical. Horizontal equity refers to the equal treatment of the equals and vertical equity is the unequal treatment of unequals. Both dimensions of equity must be evaluated against factors affecting a feature of health or health care, which mostly include wealth status, gender, ethnicity, geography, education, and social class. Identifying these two types of equity is again, dependent on the concept and objective of equity in mind. In the assessment of health care financing, horizontal equity concentrates on people who have the same ability to pay the same amount. In contrast, vertical equity would be indicated if payment for health care varied with ability to pay. This equity which is normally employed in the health care system is determined in terms of progressivity. This could be interpreted as progressive, regressive and proportional of the payment and income level. The health finance system is considered to be progressive when the proportional payment rises as income rises; to be regressive when proportional payment falls as income rises; and to be proportional when the ratio of payment is not varied by income.

Within the assessment of health outcome and health care which aims for equity in distribution by means of equal distribution, horizontal equity is just in respect to one of the non-need variables. These variables which should not have any influence on health outcomes and health care include factors mentioned in the previous paragraph. With respect to ethnicity, for example, horizontal equity should be addressed if there is no difference in health care utilisation among ethnic groups. However, if one group, i.e. Caucasians have more use than others, that is pro-caucasian horizontal inequity. In contrast, vertical equity should be regarded if different groups have different health care utilisation with explicitly sensible requirements. That is in case of vertical equity, the Caucasian would be treated relatively favourably if they had a worse health status. However, it was indicated that vertical equity is more difficult in terms of measurement and interpretation. Measuring methods for both types of equity and inequality are discussed in the following subsection (Culyer 1993; Morris, Devlin et al. 2007).

3.1.3 Methods used in measurement of equity in health

In evaluation, equity and equality are comparative principles. Thus, both are measured relative to other people or other groups, at least two of interest, e.g. the poor-the rich, men-women, ethnic minority-majority as well as compared to the average value. It was also suggested that in addition to this measuring across groups, policy makers should evaluate the absolute value changed of each group which may be basically unequal at the beginning. As a result, more information on the gap widened or narrowed is provided including which group gained more advantage from the policy intervention on equity.

Hence health is a product of the complexity of social condition and biological valuation stated in subsection 3.1.2, and ignoring either aspect will hinder the assessment of health equity. It was suggested, therefore, that this combination of both factors in assessing health equity is necessary. According to the three areas of equity in health of interest mentioned earlier, i.e. health outcomes, health care and finance of health care, two sets of data were required, i.e. grouped or individual health status, health use, health expenditure against their socioeconomic status (or living standards or wealth status)[26], demography and geography, and so forth. Mostly, this data could be retrieved from health surveys related or linked to socioeconomic surveys. Measuring for equity was also discussed and that it should assess both self-assessment health status and externally observed medical findings. This is due to that some studies found different gradients of health status through socio-economic level between both data sources. Moreover, two approaches that is health differences between population groups (intergroup disparities) and health distribution across individuals (interindividual variations) were recommended for measuring inequality in health.

The methods employed to look at intergroup differentials include simple measures and measures based on the entire health distribution. In simple measures, for instance, health outcomes, rate ratios and rate differences are used. Both give a valuable interpretation on the gap between two groups like the poor and the rich. Nevertheless, these two methods exclude other groups in between the poorest and the wealthiest. In addition, it requires a reference group defined for interpretation of the equality or inequality

[26] Socioeconomic status or living standards or wealth index includes direct approaches (e.g. income, expenditure, consumption) and proxy measure (e.g. asset index).

meaning. On the other hand, measures based on the entire health distribution include *slope index of inequality*, *relative index of inequality* and *concentration index*. Such methods account for everyone's level of health and the social determinant. In brief, the *slope index of inequality* is based on histograms depicting groups ranked by socioeconomic status. Its height represents health status whereas the width indicates population size. The curve is the absolute difference in health status between successive groups in the social hierarchy which accounted for all health status of all groups. The larger the absolute value of the slope, the greater the inequality. Whereas the *relative index of inequality* is the ratio of the health status of the poorest and the wealthiest. These measures fix the limitation in the simple measures. Detail of the concentration index is explained later in this subsection.

Other measures for inter-individual health distribution are referred to as the *Atkinson index* and *Gini coefficient*. These measures could assess the inequality in longevity. The Atkinson index takes into account the difference of arithmetic mean, geometric mean and harmonic mean of health outcome (e.g. lifespan). The Gini coefficient will be presented in the subsection of concentration index. Hence these inter-individual measures leave the issues of defining population group (in other words, socioeconomic group), more reliable to international and inter-temporal comparison. Furthermore, these measures could be developed to provide the indirect estimation of the contribution of the social group.

Empirical assessment with bivariate relationship between health and one social determinant is a popular approach for determining inequity in said three areas of health. Socioeconomic status, followed by age group and gender, is the determinant mostly monitored for equity in health. Methods employed in this assessment include concentration curve and concentration index. However, another approach which takes into account several variables at one time is multivariate analysis. These measures are described further in the following paragraphs.

3.1.3.1 Concentration curve and concentration index

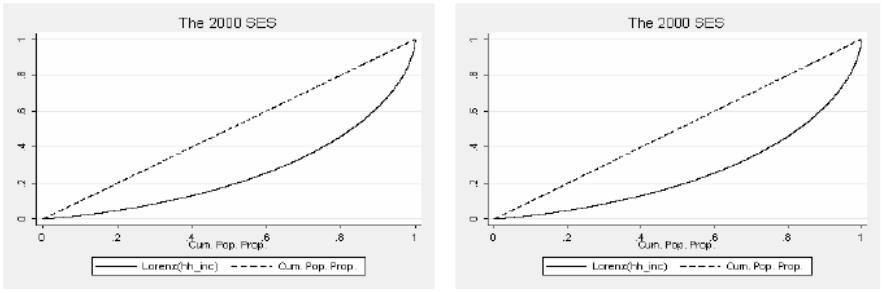
Instead of assessing the health inequality by a descriptive mean across quintiles of one type of living standards, the concentration curve is adapted to display health variations across the full distribution of living standards. This concentration curve and index is originally used for measuring the inequality in income and payment of population. It

gives the graphical presentation of such data distribution. The curve could be used to assess not only inequality in health financing but also in other health variables, for example, child mortality, child immunization, adult health status and health care utilisation. It can also be used to make comparisons of inequality across time and countries. This concentration curve plots between the cumulative percentage of the health variable of interest (y-axis) and the cumulative percentage of the population, ranked by living standards in a gradient of the poorest to the wealthiest (x-axis). It is appropriate that such health variables should be the related socioeconomics and are measured in ratio scale with nonnegative value. Figure 3.1, for example, is a graphical presentation of a concentration curve done by Prakongsai (2008). The 45-degree line running from the zero origin to the top right corner is the line of equality[27]. It means that without taking into account living standards, everyone has exactly the same value of health variable. In fact, there is no perfect equality or 45-degree line and as a consequence, it has another line known as the concentration curve. In the case that this concentration line is above the line of equality, such factor takes a higher value among the poor. It is regressive in terms of health financing or it is pro-poor in terms of the other two areas of health, i.e. health status and health care. In contrast, the line below the line of equality, the variable takes a lower value among the poor, or is progressive, or pro-rich, in the meaning of health financing and of the other two areas of health, respectively. However, these scattered plots of mean have a limitation in comparison to the difference of one line against another line because the method could not account for the standard error of those means. For this comparison, i.e. dominance, many approaches for calculating the difference were suggested. However, this is out of the scope of this thesis.

[27]Specifically, it calls *Lorenz curve for income* in measurement of income inequality. The line is plotted between the cumulative proportion of the population, ranked by the gradient of income from lowest to highest, against the cumulative proportion of income.

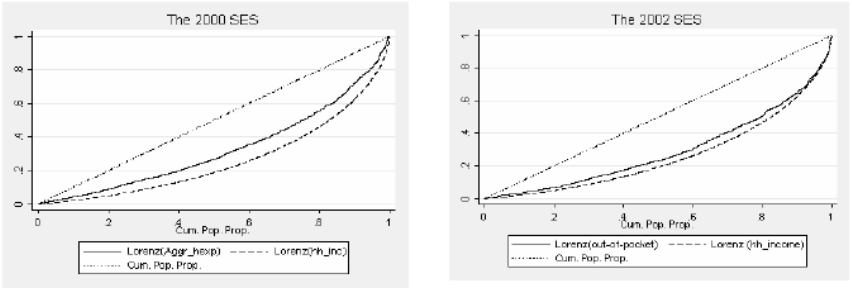
Figure 3.1 Graphs depicting concentration curves in line with Gini coefficient. Kakwani index and concentration index

Figure 7.1: Lorenz curve and the Gini coefficient of household income in 2000 and 2002



Gini coefficient = 0.4980 Gini coefficient = 0.4892

Figure 7.4: Lorenz curve and out-of-pocket payment concentration curve, including the concentration index and Kakwani index in 2000 and 2002



Concentration index = 0.3478
Kakwani index = -0.1502

Concentration index = 0.4137
Kakwani index = -0.0755

Source: Figure 7.1, page 194; and Figure 7.4, page 198 in (Prakongsai 2008)

To add a more meaningful analysis to the visual value of the concentration curve, the concentration index[28] is concomitantly calculated for the magnitude of inequality against the line of equality. It takes into account the statistical method related to the area under the curve, variance and covariance between and within data groups of the compared lines. The index is twice the area under the curve between the line of interest and the equality line and this value is in between -1 and +1. The -1 means that the health variable measured only favours the poorest meanwhile +1 means favouring only the richest group. If the concentration index equals zero, it indicates either equality or the curve crosses the line and there is some area above and below, the line is counterbalanced.

[28] Continuing from analysis of income of the population (in footnote 27), the twice of areas under the curve between this Lorenz curve and the equality line is called *Gini coefficient* for income.

The concentration index could be further calculated by means of the horizontal equity index[29]. This index is the equality comparison between the curves representing different time periods, countries, and geographical areas, health care against health need, for instance, in the same or different health variables. The value of this index is in between -2 and +2. In the case of health care provided against health need (or uses), -2 means all health care is provided to the poorest individual, and all the need is concentrated to the richest, +2 means vise versa.

3.1.3.2 Multivariate analysis

The approaches mentioned earlier measure only a bivariate relationship between health variables and the living standards which might not account for other health-related and health equity related variables stated in section 3.1.2. In addition, the relationship among those variables, in particular their causality is often of interest among researchers and policy makers. Evidence based explanation on health related variables and health problems or health outcomes could lead to better policy recommendations and decisions on policy. Under this circumstance, a multivariate analysis on quantitative data as in a health survey could serve this objective. Multivariate analysis provides better understanding to the extent which health-related variables affect inequality. Controlling other variables in multivariate analysis, the result will provide the effect of the remaining variable on the dependent health variable of interest. In other words, this analysis type not only provides the broader view of health variables relationship but also the magnitude of inequality and the direction of such relationship at one time. Nonetheless, this complicated analysis is more advanced in statistical or econometric techniques and requires more data, in terms of the number of variables, than univariate analysis for a bivariate relationship. This analysis series basically derives from a linear regression model and an ordinary least square equation. Further, it could include various families of both linear and non-linear regression models specifically depending on the characteristics and types of health variables of interest. Those models include, for instance, logistic regression for a binary dependent variable which gives the probability of the two distinct choices like dead or alive; the negative binomial which is suitable for count data like numbers of out patient visits; and the generalized linear model which is

[29] In addition to the Gini coefficient for income, in the case of comparing the inequality of payment against income (e.g. tax payment, household health expense), the difference between the twice of both areas under these two curves refers to *Kakwani's progressivity* index.

appropriate for continuous data like health expenditure (Anand, Diderichsen et al. 2001; Peter and Evans 2001; Sen 2001; Morris, Devlin et al. 2007; Prakongsai 2008; O'Donnell, van Doorslaer et al. 2008a; O'Donnell, van Doorslaer et al. 2008b; O'Donnell, van Doorslaer et al. 2008c; O'Donnell, van Doorslaer et al. 2008e; O'Donnell, van Doorslaer et al. 2008f). Table 3.1, O'Donnell et al (2008b) summarizes data requiring for health equity analysis in various types of analysis mentioned above.

Table 3.1 Data required for health equity analysis

	Health variables	Utilisation variables	Living standards measure (ordinal)	Living standards measure (cardinal)	Unit subsidies	User payments	Background variables
Health inequality	✓		✓				
Equity in utilisation		✓	✓				
Multivariate analysis	✓ or	✓		✓			✓
Benefit incidence analysis		✓	✓		✓		(✓)
Health financing							
▪ progressivity				✓		✓	
▪ catastrophic payments				✓		✓	
▪ poverty impact				✓		✓	

Source: Table 2.2 page 16 in O'Donnell et al (2008b)

3.1.4 Monitoring equity in health and health care in Thailand

Equity in health and health care has long been the concern of many public organisations, academia and civil societies in Thailand. As mentioned in Chapter Two, section 2.1 that equity in health and individual right in access to health care is an ultimate goal stated in the two latest Constitution of the country. It is also part of the mission of the health systems indicated in the national health plan (Chapter Two, section 2.2.1). Fairness and goodness is the target of the health system performance. The fairness or equity of the system has been monitored for the past few decades, particularly when introducing new health financing insurance schemes (Chapter Two,

subsection 2.2.4). In addition to empirical studies on disparity (or equity) of the health outcomes (mortality rate) indicated in Chapter One, section 1.2.2 and of health facilities, health manpower and health financing in Chapter Two, section 2.2.2, 2.2.3 and 2.2.4, respectively, there are some recent studies in the country aimed specifically at monitoring the equity in health and health care.

In those studies, the equity in the Thai health system was defined differently depending on the health system mentioned. However, such studies concur to the current constitution and the goal of the UC scheme, two health systems were emphasized, that is health financing and health services. In health financing, it aims for vertical equity or progressive inequality in tax payment and public subsidies as well as out of pocket payment. In other words, equity desired in health financing is inequality proportionate to ability to pay. On the contrary, the goal for health outcomes and opportunity in access to health care utilisation aiming for horizontal equity. Regardless of the personal characteristics, the individual would have similar health and opportunity to access health care equal to others who have the same need.

Continuing from Chapter Two, studies in inequity concentrate on financing and use of health services. After the significant health financing and health systems reform in 2002, most inequity studies were targeted to closely monitor the impact of the newest scheme, UC, itself and compare it against the two older schemes, i.e. CSMBS and SSS. Using descriptive analysis in an empirical cross-country study in inequality of the needs for, use of and spending on health services, the Thai 1986 and 1991 household surveys[30] show an upward trend by consumption quintile in health care use of the self-reported ill people. The health expenditure proportionate to consumption expenditure was considered regressive. Two other studies indicate the equity in utilisation of health care with similar methods, i.e. concentration index, and databases but for different periods (1986 and 1991 in Pannarunothai et al (1998) versus 2001 and 2003 in Prakongsai (2008)). In addition to the concentration curve, the latter study also employed benefit incidence analysis. Even though both studies used the same surveys, they could not be totally comparable because of the different manipulation of the health facilities. Compared to the former period of each study, both studies indicated less inequality in health care use against income level. It was reported that the UC policy implementation

[30] Those surveys include the nation-wide health and welfare survey (HWS) and the nation-wide socioeconomic survey

had improved insurance coverage and inequality in health care use of the poor in both directions, i.e. more regressive of pro-poor and less progressive of pro-rich. Compared to income, the direct tax payment was more progressive, the indirect tax payment was less regressive and out of pocket payment was significantly less regressive. The contribution to social health insurance was less progressive and the payment for private health insurance premium was more regressive. The benefit incidence analysis shows an increase in the pro-poor net public health subsidies across income and geographical area. There was also another small scale study in 3 low-income provinces in 3 regions to monitor the impact of the UC policy on inequality and disparity in the early period after the UC implementation in 2002. The analysis with the probit model shows that the probability of seeking care has a positive relationship with income and the uninsured person less likely to seek care than others with insurance. Recently, an analysis on longitudinal data during 1996 to 2006 with OLS regression shows that the UC implementation increased use of ambulatory care both in numbers of patients and numbers of visits but did not have a significant impact on hospitalisation. The trend was negatively related to the geographical socio-economic status and hospital size. However, the increasing trend gradually reduced in a few years after the UC. The study also reported more of beneficiaries of insurance schemes prior to the UC access to the health service than uninsured group. This led to the suspicion in inequality in the service provided. On the impact of the UC on drug utilisation, a study reported that after two years of the policy implementation, the UC beneficiaries had less chance of receiving new drugs or expensive drugs than the CSMBS beneficiaries. In addition, the UC beneficiaries had received a fewer amount of new drugs or expensive drugs per year than the CSMBS beneficiaries (Pannarunothai and Rehnberg 1998; Makinen, Waters et al. 2000; Pannarunothai 2000; Limwattanon, Limwattananon et al. 2004; Pannarunothai, Patmasiriwat et al. 2004; Suraratdecha, Saithanu et al. 2005; Panpiemras, Sampuntharak et al. 2007; Prakongsai 2008).

3.2 Utilisation and Cost of care at the terminal stage of life

The costs of health care in the last period of life as well as the cost of care for the aging are a concern and often reported on in developed countries. Perhaps, such costs play some role to the growth of overall health budget or health expenditure. Cost of care for dying patients might be driven by the aggressive treatments for patients in crisis or treatments for prolonging life. Treatment cost with new technologies are always more

expensive than conventional ones. As well as cost of treatments themselves, the growing ageing population and the majority age of dying people might enlarge the magnitude of the expenditures particularly in an unhealthy aging population. As a result, the studies towards such topics related to future health expenditure projection including last period of life were conducted during the 1980s through 2000s where the 'baby boom generation' were coming into retirement age within the next decade.

3.2.1 Magnitude of the medical care expenditure; patterns and determinants affected to utilisation and expenditures prior to death

This subsection presents studies related to expenditure (or cost) of care at the terminal stage of life. The topics include the magnitude of the cost incurred to the health systems; pattern of health care utilisation and cost component; characteristics of the decedents; and determinants of the utilisation and cost at the terminal stage of life. Since most studies examined many dimensions and the relations of utilisations and expenditures to factors of interest at one period of time, it is difficult to distinguish and present those issues without a reiteration of their study design. In addition, it seems that the studies in the United States of America are the pioneer studies on these issues which mostly provide an analysis of Medicare data. Medicare is a public insurance scheme which mostly provides health care costs for the elderly, so there were concerns about its budget for such care for beneficiaries. Studies based in Canada and the EU including the UK, the Netherlands, Switzerland, Sweden and Germany were also obtained. In order to understand the background knowledge of the cost last period of life which is related to the context of population and health service systems, this subsection presents, firstly, studies in the US followed by other OECD countries. However, such studies in other OECD countries were mostly intended to adapt the US findings and recommendations to the non-US health systems as well as to improve the methodology used in cost estimation and prediction, so there were no or few country-specific studies from other countries present that were similar in manner to that of the US.

3.2.1.1 The United States of America

Expenditure for decedents prior to death of Medicare[31] was intensively assessed particularly during the 1980s to 1990s. Annually, elderly decedents accounted for 5 to 6 percent of Medicare beneficiaries. Expenditures for last month of life rose from $5,400 in 1988 to $7,400 in 1995 (in 1995 dollars). However, the last year of life spending was reported as virtually stable during 1976-1999, range from 26 to 30.8 percent of the total Medicare outlays. The average last year per capita (in current value) of decedent increased from $3,488 in 1976 to $26,300 in 1997, and dropped to $24,856 in 1999 and $22,107 in 2006 but it was $37,581 (in 1996 dollars) during the period of 1992-1996. In contrast, spending per survivor was from $492 to $4,400 and dropped to $3,669 and increased to $5,694 in the same years. In terms of expenditure ratio, Medicare spending for decedents ranged from 4.3 in 1979 to 6-6.3 times in 1992-1997 on the survivor. In addition, on non-Medicare spending and of out of pocket payment this ratio was 3.7 and 3.2 times during the period of 1992-1995, respectively. By health services, expenditure for institutions for continuous stay had the highest expense ratio, 13.2 times, whereas acute care costs in hospital was 7.6 times and ambulatory care was 3 to 3.4 times (Calfo, Smith et al.; Riley and Lubitz 1989; Lubitz and Riley 1993; Garber, MaCurdy et al. 1998; Hogan, Lunney et al. 2001; Hoover, Crytal et al. 2002; Lunney, Lynn et al. 2002; The Henry J. Kaiser Family Foundation 2007).

Inference from mentioned studies to national figures should be done cautiously. This is because Medicare includes mainly elderly aged 65 and above and does not incur all spending of the beneficiaries. As a consequence, these costs of medical care in the US comprises of various components[32], such studies represents national data reported in the last year of life cost mostly focused on the Medicare which limited its benefit package and beneficiaries to mostly those aged over 65 years. One of its survey data revealed that while Medicare accounted for 61-63 percent of total expenditures for decedents, Medicaid and other payers accounted for 10-13.4 percent and 5.6-12 percent, respectively. Out of pocket payments shared 13.9-18 percent of decedents expenditure

[31] Medicare is a federal health insurance programme covers both acute and post-acute care of Part A and Part B but excluding non-skilled nursing home and prescription drug, for instance. Beneficiaries include American ages 65 years or over including person age less than 65 years with certain disabilities and person at any age with end stage renal failure.

[32] In the US health system, the medical care expenditure usually comprised of five main components, i.e. inpatient hospital services, physician services, nursing home services and home health care services and others. Others include drug and prescriptions, medical supplies, and rarely used miscellaneous services such as speech therapy and counselling.

in which the major payment was for nursing home care. That is, the oldest individuals paid the highest proportion of out of pocket payments. It was argued that decedents of Medicare aged 65 and above accounted for two thirds of all deaths in the United States which was less than one percent of the population. On the other hand, Medicare decedents accounted for 21-25 percent of its total expenditures and expenditures for all decedents were estimated to account for only 10-12 percent of the total health care expenditure. However, the 2006 spending of Medicare accounted for 20 percent of the national total health expenditure (Scitovsky 1984; Emanuel and Emanuel 1994; Hogan, Lunney et al. 2001; Emanuel, Ash et al. 2002; Hoover, Crytal et al. 2002; Riley 2007; The Henry J. Kaiser Family Foundation 2007). These figures were indirect estimations and there was likely an alteration in estimation of decedents' expenditure. To some extent, estimations from the previous decade might not precisely predict estimations for the present decade.

Characteristics of people, patterns of health care utilisation and costs of care when death approached were reported on a time trend and cross-sectional basis. Not all of decedents were hospitalized in their last year of lives but an upward trend was found in seeking care as well as the number of days in using health services. For example, during 1989-1995, decedents who died without using any Medicare services fell from 40 to 25 percent. A cross-sectional study on Medicare beneficiaries in two urban states of the United States died in 1996 showed that 77 and 55 percent of decedents were admitted for acute care.

Of deaths during 1996-1999, less than 1 percent of Medicare beneficiaries had no expenditure in their final year before death while 4.7 percent and 6.5 percent had zero expenditure in their second and third year before death. According to a population-based study on hospital care for children and young adults in Washington State, 35 percent of old children and young adults with complex chronic conditions were hospitalised during the last year of life and two-thirds were infants. During the second month to the last month of life, hospitalisation rates doubled during the first half of the last year of life. Additionally, hospitalisation increased to four times higher in the last month of life. However, it was noted that patients who died from cancer had last-month hospitalisation at 2.4 times greater than the first half of the last year of life. The median length of stay of such cases was 18 days and the 75th percentile was 52 days (Garber,

MaCurdy et al. 1998; Emanuel, Ash et al. 2002; Feudtner, DiGiuseppe et al. 2003; Shugarman, Campbell et al. 2004).

In accordance with health care utilisation, the cost was typically exponentially increasing during the seventh month to the last 30 days prior to death. Figure 3.2 depicts the trend of utilisation probability and expenditure over the ***proximity to death***. On average, the cost of last six months, last three months and last month of life accounted for 70-71, 51 and 30 percent, respectively, proportionate to the cost for the last entire year. Nearly the same proportion was found in Medicare expenditure but was different for out of pocket, that is 67, 43 and 19 percent, respectively. Among different ***types of services***, expenditure for acute care in hospital within the last six months of life accounted for 80 percent of such expenditure for the last year while the portion for acute care for the last three months and last month was 66 and 51 percent, respectively. Almost the same portion was found for hospice care but differences were found in ambulatory care of which its portion was 54-69, 31-48 and 16-25 percent in respect to such period of life. In comparison, for expenditure across types of service in the last year, acute care services were higher than the physician services as indicated by the reimbursement ratio of Medicare, i.e. 5 versus 2.8. 1988 data, (Scitovsky 1994) indicated the percentage distribution of Medicare payment for the last year of life for beneficiaries aged 65 and over by type of service, i.e. acute care, physician visit, skilled nursing, home health and all others was 69.8 to 71.7, 19.0 to 20.8, 1.2 to 3.2, 2.1 to 2.9 and 3.3 to 6.8, respectively. This was markedly different to the survivor's payment pattern over similar types of service, i.e. 52.5 to 56.3, 29.2 to 34.8, 0.4 to 3.3, 1.5 to 4.5 and 6.6 to 10.2, respectively. Another study on last-year-of-life utilisation and expenditure of Medicare decedents dying from lung cancer between 1996 and 1999, a multivariate regression technique revealed that women were more likely to use inpatient care than men but there was no difference in expenditure by gender. However, while gender was not associated with utilisation of outpatient services as well as physician services, expenditure did. Expenditures for both services for women were $216 and $500 less than men, respectively. The older aged and women had a greater likelihood in using skilled nursing home care than the younger aged and men. Expenditure for women was $722 higher than men. Similar results of gender were observed in home health services and hospice services. It was found that women were more likely to use the services and had higher expenditure than men, i.e. $900 and $830, respectively

(Riley and Lubitz 1989; Scitovsky 1994; Hogan, Lunney et al. 2001; Hoover, Crytal et al. 2002; Shugarman, Campbell et al. 2004).

Figure 3.2 Pattern of expenditure during the last period of life

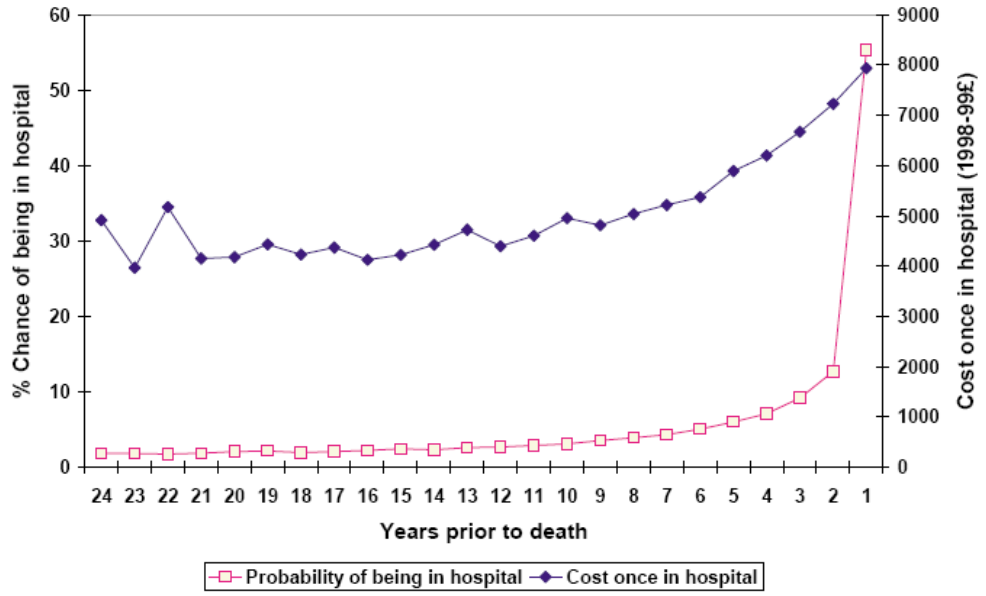


Fig. 1. Probability of being hospitalised and costs once in hospital, by year from death: random-effects panel data model.

Source: Figure 1 in (Seshamani and Gray 2004b)

As indicated in a study on top ranking academic medical centres in the United States by Wennberg et al (2004), high variations were found in services provided for Medicare beneficiaries with certain chronic conditions who died during 1999-2000. This variation in services during the final period before death included, for example, staying in an ***intensive care*** unit. This specific care was always expected because of its crucial role in health care use and high cost of care of decedents during when death was being approached. However, Barnato et al (2004) could partly indicate a relationship between intensive care and the patients at terminal stage in their nationwide study of Medicare decedents dying between 1985 and 1999. It was found that in absolute terms, the decedents were more likely to receive intensive care. During such period, decedents who received any intensive procedure increased from 20.9 to 31.0 percent, while survivors use increased from 5.8 to 8.5 percent. However, other indicators including

per-capita use of intensive services, per-capita expenditures, hospital and intensive care unit admission rate and the likelihood of undergoing an intensive procedure did not increase more than the changes of survivors. Further, alteration in the intensive care use was monitored by diseases. In nearly a similar period between 1988 and 1995, the researchers reported that overall, the trend in numbers of days in intensive care use was likely not to change. Meanwhile, Medicare decedents with acute myocardial infarction had the highest numbers of days in this unit which was similar to decedents with haemorrhagic stroke; decedents with lung cancer spent the least numbers of days in such unit. (Garber, MaCurdy et al. 1998; Barnato, McClellan et al. 2004; Wennberg, Fisher et al. 2004)

The cost decreased as the ***age*** of decedents increased, and this was opposite to the cost of survivors which increased with age. Some other studies reported a similar fashion where medical expenditure, which included not only expenditure for hospital services but also physician services, nursing home, for instances, reduced after age above 80. For example, the very elderly group's expenditure was 80 percent of the expenditure of the younger groups. As shown in (Lubitz, Beebe et al. 1995), Medicare expenditures for the last two year of decedents who died at 70, was $22,590 but for those aged 101 or above was $8,296 (in 1990 dollars). This was due to the marked reduction in hospital and physician services with aggressive care whereas the nursing home services as well as home health care significantly increased. Gender is always a factor of interest as well. By ***gender***, men were less likely to access health care services than women. One study examined Medicare data during 1982-1986 which indicated 10.1 and 6.2 percent of no billed services of women and men, respectively, within the 90 days of death. Moreover, a multivariate regression analysis of the Medicare data of Beneficiaries who died during 1996-1999 shows that expenditure for women was higher than men during the three years before death. Further analysis, however, revealed that across age groups, the expenditure for women to men ratios in the second and third year before death were higher than 1. Meanwhile, these ratios in the last year of life were lowest and were less than 1 in the group aged 90 and above. (Calfo, Smith et al.; Scitovsky 1984; Scitovsky 1988; Riley and Lubitz 1989; Gaumer and Stavins 1992; Scitovsky 1994; Lubitz, Beebe et al. 1995; Levinsky, Yu et al. 2001; Hoover, Crytal et al. 2002; Shugarman, Campbell et al. 2004).

Expenditure also altered with the ***functional status*** of the decedents before death which was assessed by the decedents' next of kin. In general, there was no significant difference found in average expenditure of decedents with different functional status prior to death. Nevertheless, compared with decedents aged between 65 and 79 with total impairment, the group aged 80 and over with the same functional status had higher expenses. In contrast, the younger group with unimpairment or partial impairment had higher average medical expenses than the older age group. By types of service, expenditure during the last year of life of the unimpaired decedents was mostly for hospital services whereas the same expense of the totally impaired decedents was dominantly for nursing home and home health care, particularly for decedents aged 80 and over. That is, holding age constant, expenditure for hospital and physician services sharply reduced in line with declining functional status. Further analysis in hospital services shows that partially impaired decedents were the highest admitted with highest numbers of admission, with greatest average length of stay but had a lower mean charge per day than unimpaired group. Similarly, the partially impaired group had greatest numbers of physician visits but paid less per visit than the unimpaired group (Calfo, Smith et al.; Scitovsky 1988).

Cause of death was usually reported concomitantly with age and gender in analysis of cost for and utilisation of decedents. Descriptive data shows that typically in Medicare, diseases reported including heart disease, cancer, stroke, chronic obstructive pulmonary disease (COPD), pneumonia/influenza and dementia. Expenditure by those causes had different patterns within the period before death. For example, it was indicated that, among others, malignant neoplasms or cancers, decedents had the highest Medicare reimbursement ratio during the last two years. Meanwhile, nephritis and COPD decedents were the most expensive because of their consistently high reimbursement within the 6-year period before death. This finding was supported by the following figures. Among three leading causes of death in 1979, cancer showed the highest reimbursement ratio of acute care as well as physician services in the last year, i.e. 7.7 and 4.3 while the ratios of stroke and heart diseases were 4.3 and 2.1, and 3.8 and 2.2, respectively. Another study found high costs during the last year of life care of male Medicare beneficiaries dying from cancer aged 65 to 74. In last year before death in 1988, Medicare beneficiaries who died from nephritis had an average per capita of $8,362 and $8,021 from malignant neoplasm. Oppositely, per capita of beneficiaries

who died from heart diseases costs amounted to $4,018, from acute myocardial infarction, which was due in part of many sudden deaths, $3,170 and from accidents, $4,508. In 1996, the mean last year of life expenditure per decedent in two urban states was approximately $35,000-$36,000 for dying from COPD, $34,500-$35,000 for cancer, $28,000-$30,000 for pneumonia/flu, and $23,600-$24,800 for heart disease and stroke (Riley and Lubitz 1989; Scitovsky 1994; Hogan, Lunney et al. 2001; Emanuel, Ash et al. 2002)

Considering proximity to death, types of services and specific diseases, over the three months before death between 1988 and 1995, trends of hospital expenditure were reported as sharply increasing. In monetary terms, this expenditure for the final month of decedents with AMI rose by nearly 50 percent in real terms to $10,000 per capita while expenditure for the final two years before death was heavily weighted to the use of outpatient services, i.e. $235 in 1988 to $707 in 1995. Similar findings were found in decedents with haemorrhagic stroke but a different pattern was found in lung cancer. Expenditures of these cancer decedents rose up sharply for nonacute hospital care and inpatient and outpatient hospice (Garber, MaCurdy et al. 1998).

Comorbidity levels or number of chronic conditions of the decedents was also mentioned in the studies, in particular, those using multivariate regression analysis. Because it was kept as a control for burden of diseases in the model, none of such studies discussed its influence to utilisation and expenditure prior to death. It descriptively presented that the mean comorbidities by age groups were similar in the range of 3.0 to 3.6. However, a study of two states in the US shows that Medicare expenditure increased with increasing levels of comorbidity. Within each of those levels, expenditure decreased with increasing age (Levinsky, Yu et al. 2001; Shugarman, Campbell et al. 2004; Wennberg, Fisher et al. 2004).

Last year of life costs were also high in beneficiaries who were in a ***minority group*** or who lived in ***socioeconomic status of residential area*** or area of high poverty rates. In multivariate regression analysis of Medicare beneficiaries who died between 1996 and 1999, the result shows that expenditures for blacks were lower than those for whites in the last second and third year before death, but there was no statistical difference in the last year of life. Owing to the unavailability of household or decedent socioeconomic data, all studies were aimed at the socioeconomic status of decedents' residential area.

Decedents residing in the wealthiest area had 16 percent and 7 percent higher expenditure in the third and second year, respectively, than those in the poorest areas. However, an inverse pattern of expenditure was revealed in the last year before death, that is, decedents in the wealthiest area had 5 percent less expenditure than those from the poor areas. On the supply side, location of hospitals and ***hospital capacity***, for instance, the number of beds which had an influence to physicians decision on patient admission could determine the utilisation of health services and physician to patient ratio (Hogan, Lunney et al. 2001; Shugarman, Campbell et al. 2004; Wennberg, Fisher et al. 2004).

Place of death was often mentioned in cost analysis among decedents. In the analysis of 15-year records of Medicare beneficiaries who died during 1985-1999, death in hospital shows a declining trend from 44.4 to 39.3 percent. This is similar to a national study in 1980-1998 mentioned in the Chapter One (subsection 1.3.3) as well as a study of Medicare beneficiaries who died between 1989 and 1995. The latter study found that the percentage of hospital deaths fell dramatically from 42 to less than 35 percent during such period. However, place of death was also determined by causes of death and types of services before death. Disease-specific trends in place of death revealed that in acute myocardial infarction and haemorrhagic stroke, 70 percent of patients died in an acute care hospital. While the trend of both diseases decreased very slightly over such time, the trend of decedents with lung cancer dramatically reduced from 52 percent to 36 percent. A cross-sectional study on the 1996 decedents of Medicare beneficiaries in two urban states shows variation in the last year of life where costs were different according to use of hospice care and place of death. This hospice care was concentrated on patients with terminal stage cancer. That is, more than 35 percent of cancer decedents accessed hospice care or 60 percent of hospice users were cancer decedents. This kind of care also determined death at home and death outside hospital; for example, 43 percent of decedents who did not use hospice care died in hospital, but 5-11 percent of hospice users died in hospital. Surprisingly, it was concluded that hospice and home health care did not significantly reduce expenditure on other types of services during 1988-1995. Additionally, in 1996, using hospice care did not reduce cost of care during the last year before death except for cancer decedents where 13-20 percent of expenditure during such period was saved. The findings of another study on Medicare data between 1993 and 1998 partially supported the former study. Forty six percent of

terminal illness cases which were mostly cancer patients still had a high average of Medicare expenditure, with 52 percent exceeding $25,000 in last year of life reimbursement. (Garber, MaCurdy et al. 1998; Emanuel, Ash et al. 2002; Lunney, Lynn et al. 2002; Barnato, McClellan et al. 2004; Flory, Young-Xu et al. 2004).

3.2.1.2 Canada

A study in a province of Canada reported that during one decade (1991-2001), the spending on decedents was 20-22 percent of the expenditure for the population aged 65 and above. This narrow range of proportion is due to the crude death being unchanged and expenditure in monetary terms for the final year of decedents' life was stable but the cost for survivors dropped between 5 and 30 percent. Expenditure included publicly funded hospitals, physicians' services, prescription drugs and home and facility based continuing care. In contrast to the US, the absolute term of inflation-adjusted costs increased with age, i.e. from C$25,000-C$30,000 to over C$40,000 per capita for all services. This cost increase was due to the dramatic rise of cost for continuing care from C$5,000 for decedents aged 66-70 to over C$25,000 for those aged 93 and above. On the other hand, the expenditure for the other three services fell 40-70 percent with declining age. The greatest, 23 percent, change of decedent/survivor ratio over 1991 and 2001 was the expenditure for all services of population aged 81-90. In 1984-1985 data of another province supported the positive association of health care cost and age. It was estimated that the per capita expenditure for hospitalisations including nursing homes and ambulatory visits to physician in four years before death was C$35,300 for decedents aged 45 and over. Further, those aged 45 to 64 spent C$23,600 while decedents aged 85 and over would have expenditure of C$49,400 per annum during the final 4 years before death. However, this estimation was calculated from data on utilisation by the very elderly which was very likely overestimated since the researchers found that this age group was more likely to be admitted in small rural hospitals where the cost might be cheaper than their estimation. In decedents' utilisation, average length of hospitalisation per year was greater than the survivors, particularly in the last year of life (41.4 versus 1.8 days). This marked disparity between survivors and decedents was found in the youngest group (45 to 64 years). There is no relation between age and utilisation in females and in very elderly males in the last year before death, nonetheless younger male decedents spent less admitted days than females. In contrast, a strong relation between age and utilisation was found in nursing homes but a negative relation

between both factors was found in ambulatory visits to physicians. Trends of days spent in nursing homes and numbers of ambulatory visits is upwards through the year proximity to death (Roos, Montgomery et al. 1987; Payne, Laporte et al. 2009).

3.2.1.3 The United Kingdom

In the UK, some significant studies on the utilisations and expenditures on the last period of life were found. In 2002, it was noted that one percent of the population was decedents and accounted for 28.9 percent of hospital expenditures. More than half of these costs were spent on the oldest age group which was the biggest group (Seshamani and Gray 2004c).

A descriptive study on NHS admissions of all decedents aged 45 years and above during 15-years prior to 1991 in the Oxford Record Linkage Study indicated some findings. About a quarter of all decedents at each age spent little or no hospitalisation expenditure whereas minority decedents were very heavy users. Numbers of days in hospital before death increased with increasing age and were different by gender. Over such period, however, it was not accumulated uniformly. Another longest panel data using a similar dataset by tracking the general and psychiatric hospital data of population in Oxfordshire aged 65 and above since 1970 until 1999 shows that 26.8 percent of decedents did not have any hospitalisations before death. The proportion of place of death was similar to the national statistics, i.e. 53 percent, 16 percent and 30 percent of decedents died in hospitals, nursing homes and private addresses, respectively. With the two part model, it was estimated that decedents which were one percent of the population shared 28.9 percent of hospital expenditures in the year 2002. Compared to the younger age groups, the oldest age group had marked costs of dying. In particular, the 5 percent of decedents aged 65 and above who were in the last year of life accounted for half of the hospital expenditures of all patients in the age group. Similar findings to the US were found in the trend of probability of being in hospital and the expenditure for hospitalisation. That is the exponential increase near the last period of life, as shown in Figure 3.2. in expenditure was partly due to a significant increase of the probability of hospitalisaiton. Such probability was expected to increase as time close to death increased, in particular from quarter 2 to the last quarter of life which was three fold increasing. In addition, within 15 years of death, nearly half of decedents aged 65 and above had never had hospitalisation except in their last year of

life. Age had a significant effect on expenditure in the last year of life in a parabolic upward trend between ages 65 and 80 before declining to age 95. However, the proximity to death also revealed its significant interaction with age on their effect to expenditure as shown by the ten year expenditure figures prior to death. That is hospital expenditures increased in the oldest women due to increases in the probability of being hospitalised (Himsworth and Goldacre 1999; Seshamani and Gray 2004a; Seshamani and Gray 2004b; Seshamani and Gray 2004c).

Socioeconomics was another factor studied in the UK. In two different ***social classes*** (middle class and working class), the 1987 sample of deaths in 10 areas shows a higher proportion of middle class death in the older age group while a higher proportion in the younger age group was found in the working class, i.e. 60 percent versus 50 percent at aged 75 years and 25 percent versus 17 percent of aged under 65. No significant differences were found in mortality according to marital status and proportion of contact with general practitioners in both classes. Similar proportions of both classes were also found in admission to residential homes, to hospitals and hospices and receiving nursing care at home during the last year of life. However, a higher proportion of middle class decedents died at their home or nursing home than the working class, in particular decedents aged 85 and above. The British Household Panel Study in 1991-2003 shows that over 90 percent of decedents aged above 16 years had seen their general practitioner in their final year of life. Numbers of utilisation across age groups were also parabolic, i.e. the highest proportion, a quarter of frequent users was found in decedents aged under 65 and then dropped to 24 percent of the 65-74 year age group and 19 percent of aged over 75. Moreover, this study found that ***health status and functional ability*** of decedents were important determinants of the utilisation of general practice and hospital services. Decedents who felt insecure financially were less likely to pay for health and social services but were more likely to be frequent attendants in general practice. Decedents aged 75 years or decedents who had limited activities were more likely to pay for services (Cartwright 1992; Hanratty, Jacoby et al. 2008).

3.2.1.4 The Netherlands

Expenditures for the last year of life of the Dutch dying nationwide during 1992-1994 were approximately 16 times of the survivors (29,676 versus 1,801 guilders). Within six years before death, the expenditure for decedents was more than three times of the

population. Further, this ratio in elderly group was 4.7 and markedly higher in the non-elderly group, i.e. 27.3. One percent of sickness fund decedents accounted for 7.8 percent of all expenditure. Decedents aged 65 and older shared 15 percent of expenditure for this age group while the younger decedents shared 4 percent only. By ***gender and age***, the average last year of life expenditure for both men and women in the youngest age group were 10-20 times higher than for the average population. Similar to some studies, this expenditure ratio decreased when age increased. There was a marked difference in expenditure ratio between men and women in younger group aged less than 40 years which was likely to be explained by accident related deaths. Later in 1998-1999 national samples of all ages excluding newborn, the expenditure of decedent to population ratio were 13.5 times (14,906 versus 1,192 Euros). It was estimated that per capita expenditures per life time was 94,233 Euros. By services, the proportions of decedents' expenditure attributed to hospitalisation and medical specialists, nursing homes, pharmaceutical cares, home cares and general practitioners were 54, 19, 7, 7 and 1 percent, respectively. Of all decedents, 28 percent dying from cancers accounted for 35.3 percent whereas 8.8 percent dying from stroke accounted for 8.2 percent and 9.6 percent dying from myocardial infarction accounted for 5.2 percent of total estimated expenditure of 2.1 billion Euros. Including expenditure for cure and care, this study found that expenditure increased when age increased. Meanwhile expenditure for cure in decedents sharply dropped as age increased, increasing in expenditure for cure in survivors was found as age increased. In addition, expenditure for care of both groups increased with age but such expenditures for decedents were more expensive in monetary terms. By gender, expenditure for younger decedents, both men and women were 30 times higher than survivors. The ratios dropped to less than 5 times at age 70 and over. The ratio for women was higher than for men aged 45-65 but was less than men in ages over 75 years. This pattern was also present in mainly death from cancer, diabetes and diseases of the urinary tract. It was also found in the 1997 data that the last month expenditure accounted for 36 percent of expenditure of the last year of life. Meanwhile, cure costs for last year of decedents shared 10 percent of total cure costs, care costs shared 5 percent of total care costs (van Vliet and Lamers 1998; Stooker, van Acht et al. 2001; Polder, Barendregt et al. 2006).

3.2.1.5 Other European countries

Apart from studies aimed to discuss methodology (details in subsection 3.2.2), one in Switzerland, one in Germany and two studies in Sweden were found.

Payments for last year of life in Switzerland attributed 18-22 percent of the total health care expenditure for the retired group. The average per capita expenditure ratio of decedent to survivor was 5.6 to 1. Owing to this payment being part of the total health expenditure, it accounted for only insurance companies but excluded public financing, so the ratio was lower than the US data which is based on public expenditure. For decedents aged 65 and over dying in the period of 1987-1992, a significant decrease in expenditure was found as age increased as well as women had higher expenditure than men. For example, a 65-year woman had an estimated expenditure of 1,850 Swiss francs while a 85-year woman would have 1,450 Swiss francs. Due to the small number of young decedents, this study could not reveal certain positive relation between expenditure and younger ages (Felder, Meier et al. 2000).

In Germany, the 1997 data of AOK, the largest public health insurer, revealed that 1.1-1.4 percent dying beneficiaries accounted for 10-12 percent of total annual hospital costs. In addition to age group and gender, hospital expenditure was different by region, i.e. the youngest group (20-49 years) in Western Germany had higher expenditure compared to the older group (55-59 years) which accounted for the highest expenditure in the East. It was found that expenditure of decedents was 4-5 times higher than survivors in the youngest female group which was 3 times different from men. The gap narrowed as age increased. By diseases, cancer was the first cause of death in males aged 60-64 years and the cause proportion declined after this age group. In females, over one third of those aged 55-59 years died from cancer. Approximately, cancer cost 23,700 DM for females and 23,500 DM for males in the last year of hospitalisation, whereas expenditure for other diseases was 14,000-16,000 DM. Compared to survivors, estimated expenditure for decedents dying from cancer and cardiovascular diseases was 6,178 DM and 5,755 DM, respectively. Similar to previous studies, comorbidity could not show any effect to expenditure of decedents in the multivariate regression except in decedents with 4 comorbidities. Types of health facilities also plays a role in expenditure, for example, hospitals with more departments or university hospitals had higher expenditure than hospitals with only one department. The regression also

confirmed descriptive results of the relation of age and expenditure, i.e. for suffering from the same disease, elderly cost less than younger decedents. It was concluded that findings on determinants of the last year of life expenditure in German data was similar to the US but was different in the level of per capita expense of which the US was higher and its declining pattern was lower (Brockmann 2002).

The 1992-1997 Swedish data also revealed that less than 1 percent of the dying population accounted for 11 percent of total annual expenditure for acute care. This decedent per capita was 14 times higher than the rest of population. Meanwhile the last year of life expenditure accounted for 11.3 percent of the entire life longevity, life before 6 years prior to death accounted 63.5 percent of acute care expenditure. Men had a higher proportion of expenditure for the last year of life than women. The study also found that 88 percent of length of stay was accounted for by patients with five or less years of life (Batljan and Lagergren 2004). Recently, Jakobsson et al (2007) examined an explorative survey of a Swedish county in 2003 to reveal the utilisation of health care services during the last three months of life. In their decedent samples, 79 percent used hospital care, 60 percent used primary care and 72 percent used community care. In addition, approximately 71 percent used 2-3 health care facilities during such period of life. On average, decedents had 1.23 admissions in which it correlated to age, residence and mental disorders. It was also found that the probability of using hospital-based care varied upon type of resident (for inpatient care); type of living arrangement (for outpatient care) and presence of mental disorders (mostly dementia). Age was found to have a negative correlation to hospital based care but a positive correlation to general practitioner services and care at residential care facilities. Probability of using care in private homes was mainly seen in decedents with cancers and with musculoskeletal diseases.

Table 3.2 summarises all major findings in ulitisation and expenditures in sourced literature.

Table 3.2 Summary of findings about the utilisation and expenditure during the last period of life (particular last year)

	USA (1) and Canada (2)	**UK**	**Netherlands**	**Switzerland (1), Germany (2), and Sweden (3)**
Data study period	▪ 1976-1999; 1985-1999; 1988-1995; 1996-1999 (1) ▪ 1984-1985; 1991-2001 (2)	2002, 1976-1991; 1970-1999; 1991-2003	1992-1994, 1997, 1999	▪ 1987-1992 (1); ▪ 1997 (2) ▪ 1992-1997; 2003 (3)
Decedent population	▪ 5-6 of Medicare beneficiaries (1)	▪ 1% of population	▪ 10.2 enrollees per 1,000 (2.5 in younger; 56 in 65+)	na
Access to care	▪ 55-77% had admission (1) ▪ <1% no expenditures on hospitalisation (1)	▪ 26.8% non-hospitalisation ▪ 90% of decedents met GP during the last year	na	▪ In last 3 mths, 79% access to hospital care; 60% access to primary care; 72% access to community care (3)
Magnitude of expenditures (%decedents to %total health expenditures: THE)	▪ 26-30.8% of Medicare (1) ▪ 10-12% of THE (1) ▪ 20-22% of THE for age 65+ (2) ▪ Hospitalisation: 41.4 days of decedent versus 1.8 days of survivor (2)	▪ 1% of population accounted for 28.9% ▪ 16% shared 64.6% costs in 85+ ▪ 5% share 50% of hospital expenditure of age 65+	▪ 0.89-1% accounted for 7.8-11.1% ▪ 15% shared costs for 65+; 4% shared for younger ▪ 36% of last year incurred to the last month	▪ 18-22% of the THE in retired person group (1) ▪ 1.1-1.4% accounted for 10-12% of hospital cost (1) ▪ 1.1-1.4% of AOK beneficiaries accounted for 10-12% of annual hospital costs (2) ▪ <1% accounted for 11% of acute care costs (3)

Table 3.2 Summary of findings about the utilisation and expenditure during the last period of life (particular last year), (cont.)

	USA (1) and Canada (2)	**UK**	**Netherlands**	**Switzerland (1), Germany (2), and Sweden (3)**
Expenditures of decedent to survivor ratio	▪ 4.3-6.3 times of Medicare (1)	na	▪ 13.5-16 times for all ages; ▪ 4.7 times in elderly; ▪ 27.3 times for nonelderly ▪ 3 times for all ages in year 6 before death	▪ 5.6 times for all ages (1) ▪ 4-5 times in youngest women and 3 times in men (2) ▪ 14 times for all ages
% source of payment	▪ Medicare: 61-63; Medicaid: 10-13.4; others: 5.6-12; OOP: 13.9-18 (1)	na	na	na
%expenditures by types of health service	▪ acute care: 69.8-71.7; physician visit: 19.0-20.8; skilled nursing: 1.2-3.2; home health: 2.1-2.9; others: 3.3-6.8 (1)	na	▪ hospital: 54; nursing home: 19; pharmacy: 7; home care: 7; GP: 1	na
Factors of interest likely affected to utilisations and expenditures				
Age and gender	▪ Positive relation to age 65+, and negative relation to age 80+ (1) ▪ very elderly expenditure was 80% of the younger (1) ▪ expenditures for women > men (1)	▪ positive relation of expenditures to age 65+, and negative relation to age 95 ▪ positive relation of utilisations to age <65, and negative relation to age 65+	▪ Ratio of decedents' expenditure to population: 20 for aged 60-69; 10 for aged 80+ ▪ Expenditure for cure decreased with age increased ▪ Expenditure for care increased with age increased	▪ negative relation to age 65+ (1) ▪ expenditures for women > men (2) ▪ expenditures for men > women (3)

Table 3.2 Summary of findings about the utilisation and expenditure during the last period of life (particular last year), (cont.)

	USA (1) and Canada (2)	**UK**	**Netherlands**	**Switzerland (1), Germany (2), and Sweden (3)**
Age and gender (cont.)	▪ positive relation to age 66+ because of continuing care (2) ▪ positive relation between age and use of nursing home (2) ▪ negative relation between age and use of ambulatory care (2)			▪ negative relation between hospital utilisation and age but positive relation between GP, residential care and age (3)
Proximity to death	▪ last 6 mths acute care: 70-71%; last 3 mths: 51%; last mth: 30% (1) ▪ upward trend in use of nursing home and ambulatory care and proximity to death (2)	na	na	na
Socioeconomics	▪ wealthiest area had 7-16% higher expenditures than poorest area (1)	▪ 60% of middle class and 50% of working class died at age 75 ▪ Bad off financial group: less likely to pay for health and social services but more likely to use GP	na	na

Table 3.2 Summary of findings about the utilisation and expenditure during the last period of life (particular last year), (cont.)

	USA (1) and Canada (2)	**UK**	**Netherlands**	**Switzerland (1), Germany (2), and Sweden (3)**
Cause of death (proportion of decedents accounted for proportion of expenditures for all patients)	▪ reimbursement ratio, cancer: 4.3-7.7; stroke: 2.1-4.3; heart diseases: 2.2-3.8 (1)		% cause shared % expense ▪ cancer: 28% shared 35.3% ▪ stroke: 9% shared 8% ▪ MI: 9.6% shared 5.2%	▪ cancer paid highest costs (2) ▪ probability of using private care was higher in cancer and musculoskeletal diseases (3)
Place of death	▪ hospice care for cancer reduced 13-20% of expenditure (1)	na	na	na
Comorbidity	▪ Means 3.0-3.6 diseases (1)	na	na	▪ no effect to expenditures except decedents with 4 diseases (2)
Coverage of sources of expenditures in most studies	▪ Medicare cover 44 millions of elderly and disable American in 2006(1)	na	The Dutch Sickness fund cover 62-64.1% population	na

3.2.2 Methods discussed for expenditure estimation and the significant effect of proximity to death

In estimating the expenditure for the last period of life, some issues found in discussion were mainly concerns including the determination of the yearly cost for the decedents, specifically the last year of life. Nevertheless both methods, i.e. calendar-year and life-year were similarly calculated from retrospective retrieval of data from date of death, gave different expenditure. This is due to the different proportions of expenditure contributed to the year of death and before in different ways. Although the calculation was based on the completed data of decedents who died on December 31, and its correction factor, the calendar-year which is the conventional method was indicated as an overestimation. Concern was raised on the highest expenditure in the last month of life which seems to be an imbalanced average simultaneously in case of decedents who died during the calendar year. It was indicated that this method adding a 30 percent overestimation of last year life expenditure on life-year method (Stooker, van Acht et al. 2001).

Many methods in estimation and projection of health expenditure were published as well as discussed on which factors should be taken into consideration. Normally, determinants in the simple model accounted for the population size, mortality, and age-gender distribution in accordance with the assumption that health needs are constant across age-gender groups. However, van Vliet et al (1998) indicated that mortality was not recommended as a risk adjuster in improving the estimation of capitation payments. This was ascertained with their models including mortality based on 1992-1994 decedents in the Dutch sickness fund data and revealed the disparity between predicted costs and higher actual costs.

Limitations on the simple estimation of health care expenditure are that they could not accommodate the delayed disability and prolonged life, probably influenced by technological change and other social factors. Health care expenditure can affect longevity of life and those expenditures intrinsically related to proximity to death. Moreover, proximity to death can be correlated with other unobservable factors which correlate with health service utilisation. Some studies, therefore, hypothesized on health care expenditure during the last period of life as a function of time to death and/or as a function of age (Zweifel, Felder et al. 1999; Felder, Meier et al. 2000; Stearns and

Norton 2004; Seshamani and Gray 2004a; Seshamani and Gray 2004c; Werblow, Felder et al. 2007). Concomitantly, the appropriate models testing this hypothesis were evaluated and discussed as well as the different effects on different health care expenditure. The two-part model was claimed to be superior to the Heckit (or Heckman) model with inverse Mill's ratio. Details of the two part model presents in Chapter Four, subsection 4.3.2.1 (4).

It was found that time to death correlated with both age and in-hospital expenditure. For the reason that proximity to death showed it had a stronger effect than age in all tests, model predicted health expenditure accounting for proximity to death was suggested to accommodate the overestimation from age. With the assumption that there is no change in relationship between age, proximity to death and health expenditure, Stearns et al (2004) proved that model with proximity to death during 1998-2020 estimated 9-15 percent less per capita health expenditure for Medicare beneficiaries aged 66-70 than the simple model which accounted for age only. In addition, the variation of such estimation depends on the increase in the longevity rate. Seshamani et al (2004c) also reported similar findings of the effect of proximity to death in the UK data for the projection through the entire age groups at death during 2002-2026. Keeping other factors constant, lower mortality rates and rising life expectancy could lower the average actual per capita hospital expenditure. These factors in expenditure estimation were also confirmed by a Swedish study projected in the period of 2000-2030. Compared to the simple estimation, the projection with such factors reduced the upward trend of expenditure from 18 percent to 11 percent (Batljan and Lagergren 2004). These findings were partly in accordance with the epidemiological theory that through increases in life expectancy, morbidity is slightly delayed. As a result, a healthier person would cost less to the health systems in the future. However, both models accounted for demographic change to the hospital expenditure but were limited to the effects of change in technology and other health or social care expenditure. Recently, Werblow et al (2007) tested all components of health care services in the 1999 Swiss claimed data compared between survivors and decedents. The findings confirmed that age had a very small effect, i.e. zero or a decreasing effect beyond aged 80, to the health care expenditure except for long term care, nonetheless, the weak effect of age was found in long term nursing home care. In contrast to age effect, time to death contributed a significant explanation to the health care expenditure.

3.2.3 Policy implication of the last period of life expenditure

Two issues of the usefulness of studies in the last period of life were discussed in literature including projections of future health expenditure as well as capitation estimation; and savings from health expenditure spent for decedents. The former facet was initiated from concerns on the changing of factors which would have mainly affected growth rate of future health expenditure. Those factors which potentially increase the expenditure include change on population demographic structure and aging population; longevity of life expectancy; and change on the pattern of illness from communicable diseases to chronic illness mentioned earlier in this section. The latter concern was based on the current growth of health care expenditure with the idea of saving health care costs. Such costs, in particular the costs for in-hospital care, were questionnable in spending for prolonging the last period of life in terminally ill patients using high and expensive technology. Therefore, further policy on health care for terminally ill patients without treatment intended for cure was developed and it was focused on outside hospital care, for example, hospice care and advance directive. Details of health care for terminally ill patients are presented in the following section (Emanuel and Emanuel 1994; van Vliet and Lamers 1998; Stooker, van Acht et al. 2001; Stearns and Norton 2002; Stearns and Norton 2004; Seshamani and Gray 2004c).

3.3 Health services for the terminally ill patients

As previously mentioned, cost of care at the end of life was reported as high cost of care without any cost-effectiveness by conventional measurement of a healthy life year. When death approached, all curative treatments, chemotherapy for example, could be used at this illness stage to prolong short period of life and patients finally ended with death. As a result, it has less value compared with chemotherapy at the first or second stage of cancer. On the other hand, patients might suffer much more from such treatments due to physical weakness at the terminal stage of life. In economic and policy views, there were suggestions and attempts to reduce such costs with alternative health care services including substituting high technology medical curative treatment with other treatments for medical and social care. In humanity and patient right views, patients should suffer less from any aggressive treatments. Palliative care and hospice care; and advanced directive (or living will) stated refusing life-sustaining interventions are those alternative interventions. Dying from cancer with no cardiopulmonary

resuscitation was raised as a pragmatic case for reducing useless costs. It was also suggested that home hospice care was cheap and could help save from 31 to 64 percent of medical care costs, compared to traditional care for terminally ill (Emanuel and Emanuel 1994). Even though this topic is a very large area with huge publications, this section focuses and briefly describes overview of cares for terminally ill patients. Advanced directive (or living will) is beyond the scope of the thesis.

3.3.1 Health care for terminally ill patients: similarity and difference of cares

A few terms of health care for terminally ill patients were often found in literature including palliative care, end of life care and hospice care. Sometimes, those cares are used interchangeably due to no differentiation in time horizon. Apart from the three terms mentioned, following subsection, terminal care as well as supportive care is also presented briefly.

3.3.1.1 Palliative care

Even though there are original patients and the majority of patients receiving such care including terminal stage cancers, care has been enhanced to patients with advanced HIV/AIDS, advanced organ failure as well as the elderly.

Saunders's chronological record on the evolution of palliative care indicated that palliative care was developed from her experience on oral and regular regimen of morphine. She provided clinical care and conducted research in patients with advanced malignant diseases at St. Joseph's hospice during 1950s (Saunders 2001).

Nowadays, ***palliative care*** is:

'An approach that improves the quality of life of patients and their families facing the problem associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial and spiritual.'

The WHO defined this term in 2002 indicating a shift in the traditional concept of care to the new one. Figure 3.3 depicts both concepts of palliative care. The new concept includes not only physical, emotional, social and spiritual supports for patients themselves but also bereavement counselling for patient families extended into the

period after patients death. That is, patients and families needs could be recognized, planned for and responded to.

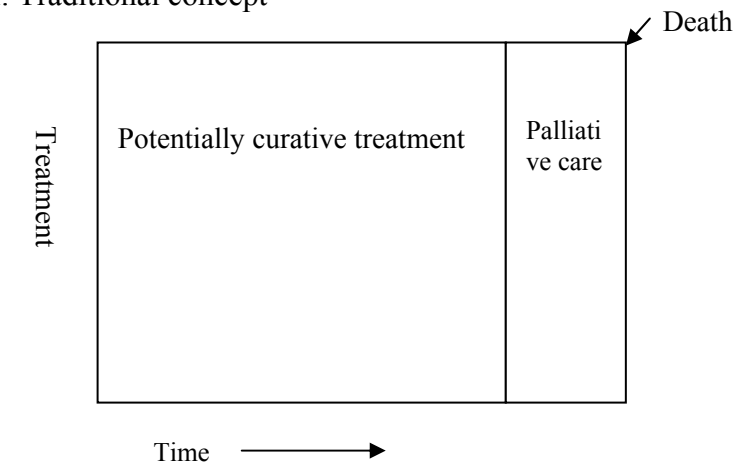
Actually, palliative care aims to help patients live a good quality life as actively as possible until death. It was originally developed for patients with cancer due to its clear and predictable terminal course of illness. The traditional concept distinguishes palliative care from curative treatment over time when effective treatments are beneficial. In the new concept which was developed beyond cancer, palliative care could start in line with continuing curative treatment, from the time of diagnosis. Meanwhile, the intensiveness of palliative care increases naturally, the curative treatment which may help to alter the progress of diseases is reduced until death. This integral care should be done in any health care setting or even patients' home (Finlay 2001; Davies and Higginson 2004; Davies and Higginson 2004).

The WHO suggested that palliative care (World Health Organization 2009) comprises of:

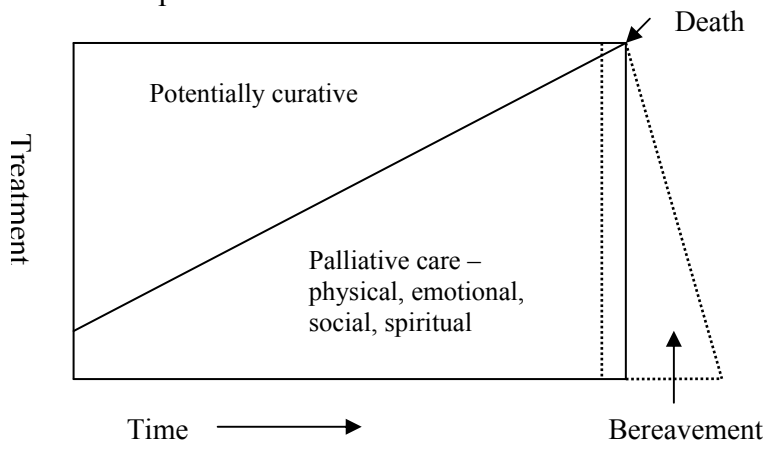
- providing relief from pain and other distress symptoms;
- affirming life and regards dying as a normal process;
- intention neither to hasten nor to postpone death;
- integrating the psychological and spiritual aspects of patient care;
- offering a support system to help patients live as actively as possible until death;
- offering a support system to help the family cope during the patients illness and in their own bereavement;
- using a team approach to address the needs of patients and their families, including bereavement counseling, if indicated;
- enhancing quality of life, and positive influencing the course of illness;
- early applying in the course of illness, in conjunction with other therapies that are intended to prolong life, such as chemotherapy or radiation therapy, and including those investigations needed to better understand and manage distressing clinical complications.

Figure 3.3 Diagrams depict palliative care in traditional concept (A) and new concept (B)

A: Traditional concept



B: New concept



Source: Figure 5 and 6 in (Davies and Higginson 2004) which adapted from Lynn and Adamson. Living well at the end of life: adapting health care to serious chronic illness in old age. Arlington, VA, RAND Health 2003.

The Health Committee (2004) recommended that two types of palliative care providers should be distinguished. General palliative care providers are the usual professionals for the patients and family who provided most of the palliative care. The team includes GPs, district nurses, hospital doctors, ward nurses, allied health professional and staff in care homes. Specialist palliative care is provided by specifically trained multidisciplinary teams including specialists in palliative medicine, nursing, social work and psychological care. This team is expected to provide advice on symptom control and pain relief and to give emotional, psychological and spiritual support to patients and their families, friends and carers, both during the patient illness and into bereavement.

3.3.1.2 End of life care

End of life is the term most found in literature without a clear definition stated. However, it was mentioned in Seymour et al (2005) and Department of Health (2008) that end of life originated from North America and is used in the UK and Australia. In North America, it has been used in the context of the care for elderly, that is:

'End of life care for seniors requires an active, compassionate approach that treats, comforts and supports older individuals who are living with, or dying from, progressive or chronic life threatening conditions. Such care is sensitive to personal, cultural and spiritual values, beliefs and practices and encompasses support for families and friends up to and including the period of bereavement.'

However, in the UK, the term is a programme supported by the NHS. The term was implicitly stated in the Programme's document (Department of Health 2008) as follows:

'End of life is the support given to a person with advanced, progressive, incurable illness to live as well as possible until they die. It includes services that enable the supportive and end of life care needs of both patient and family to be identified and met throughout the last phase of life and into bereavement. It includes management of pain and other symptoms and provision of psychological, social, spiritual and practical support.'

In addition, it was also stated that patients approaching end of life should expect that their care will be:

- pre-planned wherever possible and based on need (not diagnosis, age, sexual orientation, geography or other factors);
- well coordinated and delivered in accordance with best practice to minimize physical, psychological or spiritual suffering;
- equitable and delivered in a dignified and respectful way;
- ethical with regard to preference and personal beliefs.

Similar implications found in Thailand, however, show that end of life care is usually implicitly focused on the care during the time close to death. There is no definite

terminology but it could be holistic palliative care within weeks, days or hours before dying (Nimmannitya 2007; Puengrasamee 2007).

3.3.1.3 Hospice care

Hospice care was previously provided by nursing nuns in hospice. Later, it was a purpose-built model with an emphasis on offering palliative care to dying patients and supportive care to their families in bereavement. The term 'hospice' has similar roots to hospitality and host. In 1967, this specialised care for dying patients was first introduced by Dame Cicely Saunders, physician who established the modern hospice, St. Christopher's Hospice in a residential suburb of London. Home care which was incorporated into the plan and started two years later (Oxford University 2000; Saunders 2001; The National Hospice and Palliative Care Organization 2009).

This concept of holistic hospice care was introduced into the US during Sauders's visit to Yale University in 1963. It was expanded in the US since the 1970s to replace conventional curative care. In the US, hospice care was added to the Medicare benefit part A in 1982. Eligible patients recruited must have a prognosis of death of six months or less. The care could be delivered to both home and facility-based settings including hospice centres, hospitals, nursing homes, and other long term care facilities. (Scitovsky 1994; Swanson and Cooper 2005; The National Hospice and Palliative Care Organization 2009).

Normally, the patient's primary caregiver is a family member who sometimes makes decisions for the terminally ill patient. The US on-call 24 hour staff makes visits routinely to assess and to provide additional care and services to the patients and family members. Hospice teams develop a tailor-made care plan for individual patient needs. The team comprises of the patient's GP; hospice physician; nurses; home help aides; social workers; clergy or other counselors; trained volunteers; and speech, physical, occupational therapists, if needed (The National Hospice and Palliative Care Organization 2009).

3.3.1.4 Terminal care

Terminal care is limited as part of palliative care and usually refers to the management of the last few days or weeks or months of life starting from when the patient is in the downward progress (Seymour, Witherspoon et al. 2005).

3.3.1.5 Supportive care

Supportive care had been introduced in the context of curative cancer care. It was stated as a term covering services which help people with cancer and their families in coping with cancer and its treatment. In addition, it is an important part of care for patients which the Nation Council for Hospice and Specialist Palliative Care Services, UK (The Health Committee 2004; Seymour, Witherspoon et al. 2005) states as:

'That which helps the patient and their family to cope with cancer [and other diseases] and treatment of it—from pre-diagnosis, through the process of diagnosis and treatment, to cure, continuing illness or death and into bereavement. It helps the patient to maximize the benefits of treatment and to live as well as possible with the effect of the disease. It is given equal priority alongside diagnosis and treatment.'

The National Institute for Clinical Excellence (NICE) suggested that in delivering care, it is the responsibility of all health and social care professionals. The care ranges from self-help to user involvement, spiritual and social support.

3.3.2 Problems with care for terminal illness

3.3.2.1 Equitable access

Equitable access to high quality palliative care is a goal in the UK government health policy on improving patient choice. It was set as a purpose of the end of life care strategy mentioned earlier. Equality was evaluated in various categories, i.e. age, gender, religion and belief, sexual orientation, gender identity, race, disability, homelessness, refugee and detention in prison. Literature review by the programme's equality impact assessment, for example, indicated potential inequality in end of life care in respect to age. Patients with cancer got better access to the care than patients with other long-term conditions. The hospice and palliative care were not specifically addressing issues of cultural and religious differences and ethnicity. Few members from the Black and Minority Ethnic Community used home and hospice care. No documents concerning gender inequality as well as equality related to religion and belief were found. However, it is difficult to identify inequality due to different levels of individual belief and practices (Department of Health 2008).

Regulation for the financing regime and benefit package also determined utilisation of end of life care. For example, even though the hospice programme widely covers

patients with other terminal illnesses, the majority of the hospice users are terminally ill cancer patients in the US, limited with the enrolling condition that eligible enrollees should have a prognosis of 6 months or less. Patients with other terminal illnesses including dementia and heart diseases had difficulty with definite prognosis and mostly were nursing home users and were probably excluded from hospice services. In addition, some conditions also resulted in the unavailablity of hospice care to patients dying at nursing homes. Consistent findings in determinants of hospice use included gender and types of cancer. That is, women and lung cancer were more likely to use hospice care. Residing in rural areas and Medicare fee-for-service insurance reduced use hospice as well as shortening length of stay. Other patient characteristics which determined different rate of enrollment included being 75 years or older; living in areas with income in the top two quartiles; having metastatic cancer at diagnosis; and patients with different year prognosis. On the other hand, providers' characteristics determining such rates included physician specialty and having oncologist visits. It was also indicated that rate of hospice enrollment was substantially different by health centres which patients received outpatient care (Byock 2001; McCarthy, Burns et al. 2003; Keating, Herrinton et al. 2006).

3.3.2.2 Disparity of services

Disparity of services provided and patients receiving hospice care was reported. In examining the hospice services in the US, a national survey between 1992 and 2000 revealed time trends of patients receiving hospice services across 12 core and non-core services. Focusing on five key categories of palliative care including nursing care, physician care, medication management, psychosocial care and caregiver support, 22 percent of hospice patients received and 14 percent of hospices provided these five key services in 2000. However, some services received substantially increased over the study period. The greatest percentage changes and probability of receiving were in patients receiving medication management, spiritual care, durable medical equipment and supplies, and social services. The difference was also found according to geographical variation. Patients had a higher probability of receiving skilled nursing services and continuous home care in urbanized hospices than in rural ones. In addition, patients of the hospice in the Northeast received fewer types of services than patients of hospices in other regions. The researchers discussed that the services delivered and what

patients received partly depended on the policy of the financing systems, for example, the condition of the reimbursement for each service (Carlson, Morrison et al. 2007).

3.3.2.3 Quality of care

Quality of care at the end of life is another domain often discussed and an issue of concern. It was recognised as a global problem for public health and health systems. This is because each death would affect more people who were grieving, e.g. decedent's relatives and friends. As part of the health system, however, there is no definite indicator to measure performance and quality of this end of life care. This measurement should take into consideration the views of stakeholders. Conceptual domains for such measurement were different upon perspectives including, of experts and of patients. Patient perspective rather focused on outcomes than the process of care as well as it was simpler, more straightforward and more specific (Singer, Martin et al. 1999; Singer and Bowman 2002).

3.4 Conclusion

This chapter reviewed three topics related to health systems including health services, and health financing in particular to terminal illness and mortality in Thailand which was the area of interest indicated in Chapter One and Chapter Two.

First, equity or fairness in health is mainly defined on the basis of the philosophy of social justice and political views. There are four ideologies related to health including utilitarianism, libertarianism, egalitarianism and Rawl's concept. Health systems of individual countries are predominantly based on one ground of these ideologies but are also mixed with other concepts in its minor components and the target of equity achievement, for example, the US health systems is the libertarianism but some of the European country health systems are based on the egalitarianism. Two areas of equity were often discussed, i.e. equity in health and equity in health care. Health implied to health outcomes (health status, health condition and life expectancy, for instances.) and health care means health services, treatments, access to care and health financing. Pursuing equity in health and health care does not mean the elimination of all health differences but some avoidable or unfair factors should be reduced or eliminated, instead. Equity and equality are not similar but usually they are used interchangeably. Meanwhile equity means fairness, equality means the state of being equal. Health

inequalities are not necessarily inequitable. To judge inequity and inequality, it requires consideration with the concept of equity and the context of the scope or focus of the concern. For example, public health services are usually set to provide equal access for all citizens of the country but public financing is aimed more at subsidising the poor than the rich. Such samples are linked to other two terms of equity, i.e. horizontal and vertical equity. The former refers to the equal treatment for the equals and the latter is the unequal treatment of unequals. Both types are examined on factors of interest. That is, factors such as the socioeconomic status of all citizens. Measuring equity which is a comparison in principle employs a range of simple measures, e.g. rate ratio, to concentration curve, concentration index, and multivariate analysis.

In Thailand, equity in the health system is highlighted as a goal of the Constitution of Thailand, as a mission stated in the national health plan and as an indicator of health system performance. As a result of Thai health systems being mainly provided by the public sector, it seems to be based on the ground of egalitarianism. Equity has long been evaluated since a few decades ago, in particular to the newest health insurance scheme--the Universal Coverage--in which equity is an achievement (see Chapter Two, subsection 2.2.4.1). Meanwhile, health financing as well as use of or access to health services are the two focuses of equity in health system, currently mortality and life expectancy are also the crucial issues of equity in health monitoring (see Chapter One, section 1.2.2).

A second area of interest was health expenditure of terminally ill patients. For the reasons that the elderly represent the greatest group of the dying every year, demographic change in the ageing population increases in chronic illnesses and in the growth rate of monetary terms of health expenditure and health expenditure for a specific period of life were intensively revealed in various industrialized countries during past three decades. It was reported that one to five percent of this population group, decedents, accounted for ten to thirty percent of annual national health expenditure or insurance's annual expenditure. Expenditure for the last period of a decedent's life was 3-16 times higher than expenditure for the equal period of survivors. Financial sources accounted for different proportions of health expenditure towards death, in particular to the elderly. This is due to the benefit package and financial support of the insurance scheme. For instance, in the US, the elderly paid greater out of pocket payments than the younger group because most of the oldest group stayed in

nursing homes which are mostly not included in the Medicare benefit package. By type of services, expenditure for acute care or in-hospital services accounted for the highest proportion, compared to other health services. Many factors including age, gender, proximity to death, socioeconomics, types of services, causes of death, comorbidities, and places of death related to or determined the expenditure and utilisations of health services. Age, gender and proximity to death are factors most examined. It was found that expenditure and age had a positive relation until the age of 80 and this relationship became negative over 80. Women had greater expenditure than men. The nearer to death, the higher the expenditures were. In addition, these three factors did not only affect health expenditure during the last period of life but were also the determinants in health expenditure projections. By cause of death, expenditure had different surging patterns. Meanwhile, cancer was the cause of death reported to have the highest expenditure during the period close to death, nephritis and COPD had consistent high costs during the longer period before death.

Finally, there is interest in health services provided to terminally ill patients which accounted for expenditure during the last period of life. Nowadays, specific care for terminally ill patients who were diagnosed with very least chance for curative treatment, receive palliative care. Palliative care and end of life care are similar. Meanwhile, the term palliative care is more generous to the terminal phase of all diseases and all ages, end of life is previously used in the context of older people dying. The new concept of palliative care defined by WHO in 2002 or the concept of end of life care pay attention to not only the pain and physical symptoms of patients, but also psychological, social and spiritual aspects of patients including bereavement of families before and after patient death. Hospice care is a likely model for caring for people with the new concept of palliative care. This care could be provided at home, health facilities and hospice facilities with palliative care teams. For the reason that people should have dignity until dying and that one death could affect the people who are alive and high costs of in-hospital expenditures, many industrialized countries raised the importance of services for terminally ill patients. The services have been stated in their policy for health services and in insurance benefit packages as well as monitoring the performance and problems found. Equity of access to these services, quality of care and variety of care provided and services received are the issues of concern.

3.5 Research gap

Even though there is a lot of literature exploring expenditure during the last period of life, most of them evaluate data from the same databases or surveys. As a result, the knowledge and interpretation are limited to similar sources of financing and its benefit package, and more specifically to the elderly group. Learning about expenditure for this specific period of life is also useful to project national health expenditure. In addition, there is no study in health expenditure for the last period of life while palliative care or end of life care in Thailand has been initiated in last decade and is in the infancy provocation since a few years ago. Concomitant consideration to the goal of Thai health systems, equity in health has long been monitored and remains the main concern of health systems. That is equity in health expenditure during the last period of life might play some role in the health financing and health services for terminally ill patients in Thailand. As a consequence of a knowledge gap and research questions related to mortality mentioned in Chapter One (section 1.5) and the health systems of Thailand in Chapter Two, some specific research questions had been drawn:

1) Is there any inequity among Thai people in health care during the end of life period?
2) What are the factors influencing that inequity?
3) How do terminally ill cancer patients and their families cope with financing and their preferences for healthcare during that period?
4) What new policy directions need to be developed or changes made in the current policy and practices in Thailand?

CHAPTER FOUR

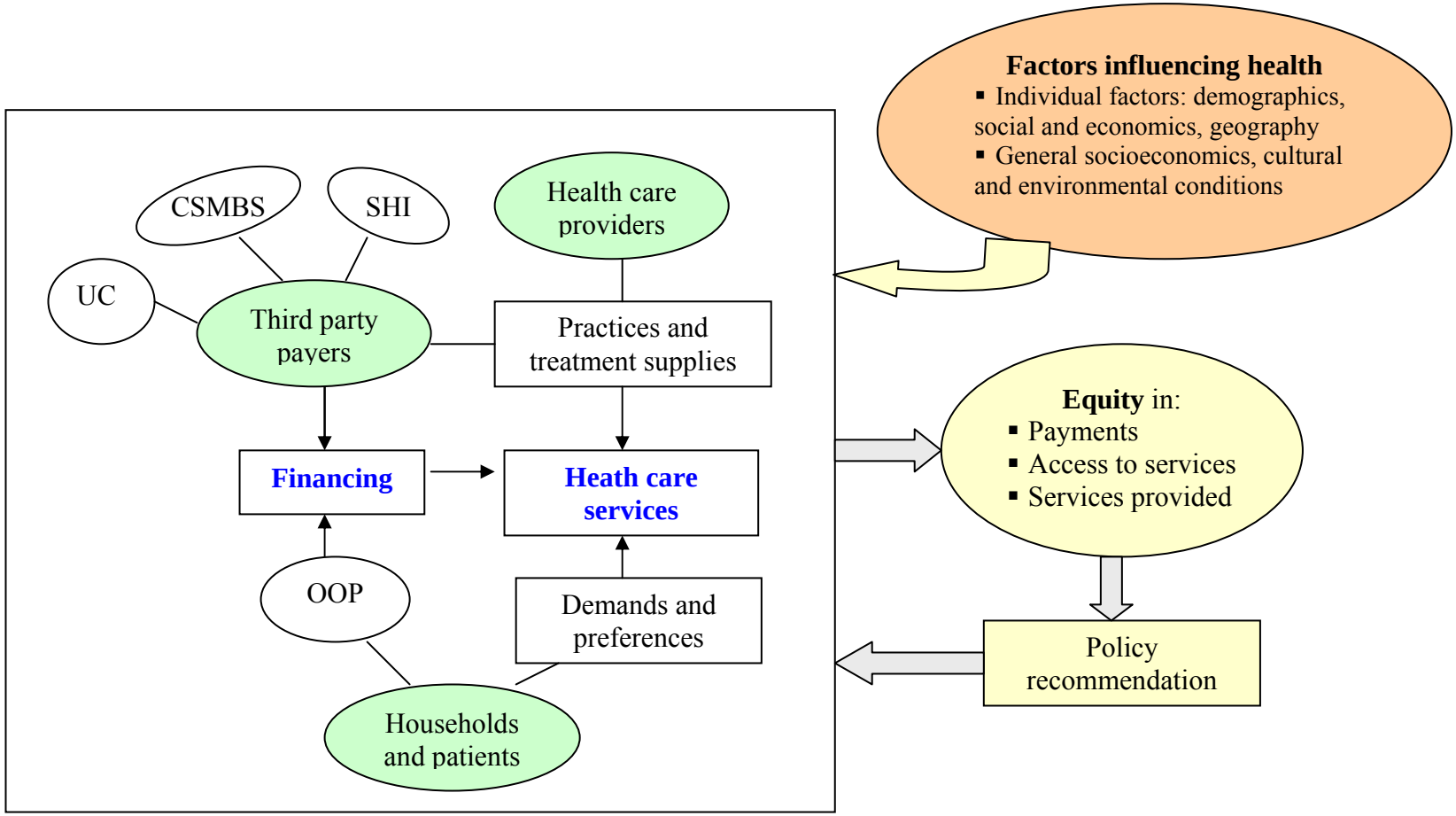
OBJECTIVES AND METHODOLOGY

To detail the research questions mentioned in section 3.5 of Chapter Three, this chapter presents the conceptual framework, objectives, and the methodology for the whole thesis, respectively. The following section includes the conceptual framework and the main and specific objectives of the thesis. Later in this chapter, data availability and research design are presented, including an overview of methods used in this thesis. Defining terms are presented in Appendix 1

4.1 Conceptual framework

Based on the literature review (Chapter One, Two and Three), Figure 4.1 shows the conceptual framework of the thesis. There are three key stakeholders in health care systems which include third party payers or health funding agencies, households and patients, and health service providers. They determine health financing through health expenditure as well as health services through supplies and demands for services. Focusing on third party payers, in Thailand this means that for the three main health insurance schemes, health expenditure is paid by government revenues and tripartite contributions (see Chapter Two, Table 2.7). Out of the insurance payments, households also pay for the extra medical care costs and other indirect costs. These payments have direct effects on health care services. On the other hand, two key stakeholders include health care providers, who supply services, and the households and patients who create demand for the services, also play roles in the health care system for terminally ill patients. However, many factors could have effects on such health care system through their influence on supply and demand. In order to reveal the factors influencing health care, the conceptual framework provides two suggestions, i.e. the 7 categories of avoidable and unavoidable factors that are likely to affect health and equity suggested by Whitehead (2000) (see Chapter Three, section 3.1.2) and factors influencing health suggested by Dahlgren and Whitehead (1991) cited in (Pelaseyed and Jakubowski 2007). Those factors were classified into 2 groups, that is, individual factors and general conditions. Equity or disparity including payments, access to the care and services provided could be monitored towards this context. As a result, findings from reviewing literature and data analysis in the thesis recommend improvements on health care services for terminally ill patients.

Figure 4.1 Conceptual framework of health financing and health care services for terminally ill patients



4.2 Objectives

To accommodate study time and feasibility, the objectives were adjusted and rearranged, in order of studies presented, from those first indicated in Chapter One, section 1.6.2. As a consequence, the research aims:

4.2.1 To estimate costs of treatment prior to death for the health system (3 main insurance schemes, UC, SHI, CSMBS during 2006 Thai fiscal year[33]). In particular, to investigate disparity in the cost among the three schemes[34];

4.2.2 To estimate household health expenditure (direct medical cost, indirect medical cost and indirect non-medical cost) of the last three months for outpatient care and the last six months for inpatient care prior to death of Thai decedents during the 2006 Thai fiscal year. In particular, to investigate:

- expenditure not covered by health insurance schemes; UC, SHI, CSMBS, private and uninsured decedents;
- expenditure and health seeking behaviour prior to death categorized by household incomes quintiles;

4.2.3 To elaborate the inequity in such estimated expenditure and in views of terminally ill patients, their relatives and health professionals including the multitude of factors which are revealed important when people are dying;

4.2.4 To explore current practice on the disclosure of diagnosis, preference for quality of life and care, place of dying[35] among health professionals, terminally ill patients and the patients' relatives;

4.2.5 To describe the service and care pathways for terminally ill patients at several types of health facilities; and

4.2.6 To recommend, accompanied with cost and consequences from quantitative study; and views of health professionals, terminally ill patients and the patient relatives[36], policy options for improving the healthcare services for terminally ill patients.

[33] 2006 Thai fiscal year started from 1st October 2005 to 30th September 2006.
[34] Comparison of admission episode and costs of decedents to the general population was dropped
[35] Perception on advance directives was dropped due to too much study area under this thesis
[36] Policy makers' perspectives was dropped due to too much study area under this thesis

4.3 Methodology

To meet the objectives and conceptual framework, mixed methods and three data sources could be employed.

4.3.1 Overview on data availability and research design

The thesis was based on cross-sectional analysis of data from one year of health care in Thailand as well as on the qualitative data of patients and health care providers in a representative province. Table 4.1 summarises all feasible datasets and their details which was able to match the objectives. Two sources provided secondary data in this circumstance which include the secondary claims data submitted from the health providers or health facilities to the health insurance offices and a survey on household health expenditures for decedents in 2005-2006 conducted by the National Statistical Office. The claims dataset was mapped to the death certification data (details of mapping presents in Chapter Five, subsection 5.2.2). A qualitative approach with health professionals and patients and their relatives could support and fulfill the part where the secondary data was limited in explanation. Main outcomes of interest including retrospective health expenditures and service utilisation were available in both datasets, however, they were provided in different intervals during the same period. Length of hospitalisation was available in only the claimed dataset. Data for the general population could not be matched to data of decedents. Most of the individual factors of decedents could be retrieved except for socioeconomics and geography of residential area of decedents in the claimed dataset. In addition, some data was categorized differently, for example, death at home could not be identified as place of death in claimed data but it was reported in the household survey. For the reason that the research aims to provide an overview from a national outlook and aims to recommend improvements in health care services, cancer was selected to be a tracer disease of data analysis and such recommendations. Individual decedent is the unit of analysis in this thesis.

Table 4.1 Summary of objectives in accordance with data availability

Objectives	Required information	Health insurances		Household survey		Qualitative study
		Availability	Remarks	Availability	Remarks	
Costs and expenditures for treatments among 3 schemes (O 4.2.1 and 4.2.2)	Expense for ambulatory care	×		✓	Lump in 3 months prior to death	±
	Expense for acute care	✓	Admissions in one year prior to death	✓	Lump in 6 months prior to death	±
	Length of stay	✓	Admissions within one year prior to death	×		±
Admission episodes and health seeking behaviour with general population (O 4.2.1 and 4.2.2)	Numbers of visit	×		✓	Within 3 months prior to death	±
	Numbers of hospitalisation	✓	Admissions within one year prior to death	✓	Within 6 months prior to death	±
Multitude of factors (O 4.2.3)	Demographics	✓	Age and gender		Age, gender, household relationship	✓
	Socio-economics background	×		✓	Marital status, education, occupation and income	✓
	Geography of residence	×		✓	Region, municipality	✓

Table 4.1 Summary of objectives in accordance with data availability (cont.)

Objectives	Required information	Health insurances		Household survey		Qualitative study
		Availability	Remarks	Availability	Remarks	
Multitude factors (O 4.2.3) cont.	Places of death	✓	Public health facilities, private health facilities and elsewhere	✓	Public health facilities, private health facilities, home, elsewhere	✓
	Causes of death	✓	Cause of death in ICD-10 coding	✓	98 diseases and 6 groups of disease	✓
	Health insurance schemes	✓	UC with various codes and CSMBS	✓	UC with/without 30 Baht co-payment, CSMBS, SHI, private insurance, insurance by employer and uninsured	✓
Disclosure of diagnosis (O 4.2.4)		×		×		✓
Patients' preference (O 4.2.4)		×		×		✓
Service pathway (O 4.2.5)		×		×		✓

4.3.2 Methods

As mentioned earlier, this thesis employed mixed methods for four studies, that is, a quantitative approach for the two secondary datasets and qualitative approaches—in-depth interview with health professionals and patients and their relatives. Details of methods of each dataset are presented in Chapter Five, section 5.2 and Chapter Six, section 6.2.

Ethical considerations: The ethical concerns on this research proposal were approved by the Institute of Health Ethics Committee, University of East Anglia, in August 2006.

4.3.2.1 Quantitative method

Analysis of two studies, health insurance expenditure and household expenditure follow the quantitative discipline by statistical methods. Stata10 and SPSS15 were used for data analysis.

(1) Exploratory test

For practicality in data analysis, exploratory tests or preliminary tests were performed to learn the characteristics of both independent and dependent variables. This provided better data manipulation, for example in their correlation, and an appropriate advanced statistical method of analysis. Following the suggestion of econometric analysis, in general, both independent and dependent variables of interest were first explored by univariate methods, i.e. Analysis of variance (one-way ANOVA) for parametric data and Kruskal Wallis test for non-parametric data or interval data with non-normal distribution, test of collinearity of independent variables when appropriate. This analysis guided some simple meaning, the relationship between individual independent variable and dependent variable, and their descriptive statistics for instance, arithmetic mean and standard deviation, variance, minimum and maximum values, percentage of missing data, median, 10^{th} percentile, 90^{th} percentile, range of the value, skewness, and kurtosis (Kennedy 1998; Dougherty 2002; Gujarati 2003; Acock 2006; Buam 2006).

(2) Selection of independent variables

The selection was based on the availability of secondary data; literature review of relevant research; exploratory tests of its significance by univariate analysis; and the research questions and objectives of this research. As much as possible and availablity,

all factors of interest of both secondary datasets were selected and manipulated identically. In case of categorical variables, the most common or interested category would be selected as the reference category.

(3) Handling missing data

The missing value in the regression model would be handled by listwise (or casewise) deletion in the two studies. That is, if there was any missing data even in one variable, an observation with this missing data would be dropped from the analysis. The number of observations in each stepwise regression analysis would not alter and have any effect on the parameters estimated in every analysis. However, lots of samples would be lost by this sort of deletion even with only one missing piece of data from one variable, and so will probably reduce the power of the analysis. However, this would not be the case for the studies because there was little missing data in exploratory analysis. The number and percentage of missing data would be reported in particular chapters, that is, Chapter Five and Chapter Six. Another manipulation because of missing values was data imputation which this thesis did not employ. The missing value was be replaced by imputed value resulting from the predicted value of other values in such variable. It is argued that this method works well if the non-missing data of the sample is representative of the entire population of that variable (Dupont 2002). In correlation test, the pairwise method was used. It dropped an observation when there was a missing value of only two variables in the analysis (Dupont 2002; Acock 2006).

(4) Multivariate analysis and model selection

a) Hypothesis testing for coefficients and confidence interval

Prior to elaborating on the several models being tested in this research, it is an important to consider the hypothesis test for coefficient parameters of interested independent variables. The simple regression equation for relation between dependent variable and independent variable is

$$Y = \beta x + \varepsilon \, .$$

Where y is a dependent variable; x is independent variable; β is coefficient from i to k number; and ε = residual. The confidence interval in this research would be set at 95 percent or p value less than 0.05.

Once there are more than two independent variables of interest, hypothesis testing would be as follows (Dougherty 2002; Gujarati 2003):

- testing the overall significance of the estimated model; and
- testing individual regression coefficients.

Based on different estimation methods as ordinary least square for standard linear regression and maximum likelihood algorithms for generalized linear model family, different statistics are used for both groups of modeling. A general hypothesis testing of each group is explained briefly.

b) Model selection, model specification test and goodness of fit test

Many models were employed in multivariate analysis depending on the type of dependent variables. Ordinary Least Square (OLS) is the most familiar regression approach for continuous data including health expenditure (Details of OLS, see Appendix 2, A2.1 and A2.3). Some studies, for example, Brockmann (2002) employed the OLS to test determinants and to estimate the 1997 German hospital expenditure. However, health care data generally presented a skewed distribution due to a high proportion of no use of or no costs for health care services (zero count) and a small proportion of heavy use or very high costs of care. Therefore, the data usually could not meet the assumptions of the OLS, in particular the homoscedasticity of the residual. To accommodate such assumptions, log transformation of the expenditure is used in order to normalise its distribution. After log transformation, the popular OLS is employed. In the interpretation of the results, however, such retransformation of log scale is complicated and misleading. This is due to the fact that the expected value of the logarithmic term of dependent variable, is not equivalent to the logarithmic term of the expected value of dependent variable, $E(\ln(y)/x) \neq \ln(E(y/x))$. In other words, the geometric means calculated within the logarithmic term are not equal to arithmetic means of the raw scale. In this particular case, Duan (1983) suggested smearing factor, so-called Duan adjustment in retransformation (Duan 1983; Roos, Montgomery et al. 1987; Shugarman, Campbell et al. 2004; Wennberg, Fisher et al. 2004; Koroukian, Beaird et al. 2006-2007). This smearing factor is estimated as mean of exponential residual from the regression of log transformation data. It is typically between 1.5 and 4.0.

Based on updated literature review, however, retransformation with smearing factor for the data with heteroscedasticity of the OLS residual performs the bias in cost estimation (Seshamani and Gray 2004a). Alternative approaches to multivariate OLS with or without log transformation of the continuous dependent variable were recommended. That included generalized linear model (GLM) with gamma distribution and log link or other appropriate distributions and link functions (see details in Appendix 2, A2.4.1). In addition, it could be employed either as a one part model or in the second part of the two-part model (or hurdle model) depending on the purpose of the analysis. Various analysis objectives include, for example, improving understanding of the health systems, exploring the net effect of covariates on costs, and estimating a person's future utilisation. Diehr et al (1999) and Buntin et al (2004), suggested further that if the aim is to understand the health systems, the two-part model seems best because the model allows the distinguishing of factors which affected decision making on use (probability of use--in other words), and factors affecting numbers of uses or costs. In contrast, in case that there is no interest in the probability of use but understanding the effect of individual covariates, one part model is more useful because it generates a single regression coefficient for each variable and thus can be interpreted easily. Additionally, the one part model is recommended for predicting future costs. The Two-part model is presented below, in topic c). Regardless whether the one-part model or two-part model is selected, some regression models and specific testing should be performed for selecting the most suitable and the best fitted regressions to the data (Duan 1983; Gaumer and Stavins 1992; Manning 1998; Diehr, Yanez et al. 1999; Cooper 2000; Manning and Mullahy 2001; Clarke, Gray et al. 2003; Buntin and Zaslavsky 2004; Seshamani 2004d; Dodd, Bassi et al. 2006; Greene 2008; Jones 2008).

In addition to the diagnostic tests for each model mentioned in Appendix 2, section A2.3 to A2.4, Dodd et al (2006) suggested two other tests which calculated the natural scale and could be employed for comparison across non-nested models, these are OLS, Log OLS, GLM and median models. These two tests for the best fitting model include the root mean square error (RMSE) and the mean absolute error (MAE). Meanwhile the model revealing the lowest RMSE is the best for predicting mean costs, the lowest MAE determining the best predicted median costs. The authors also employed a residual diagnostic with scatter plot of residual against fitted values for comparison of random scattering of the residual could identify the good fit (Dodd, Bassi et al. 2006).

Similarly, scatter plot and standardized normal probability plot also might help identifying the good fit of the GLM (Hardin and Hilbe 2007).

In multivariate analysis of count data, numbers of utilisations, rate data and length of hospitalisation, it was suggested to employ a Poisson model and negative binomial model. Like distribution of expenditure, both models which are members of the exponential family of GLM are appropriate for non-normal distribution of count data. Details of both models and concerns on overdispersion of the Poisson model are indicated in Appendix 2, section A2.4.2. Further, there are zero-truncated models of both Poisson and negative binomial which exclude zeros and account for the positive value. In contrast to the zero-truncated model, the zero-inflated model accounts for the excess zeros. The model takes into consideration the probability of always-zero plus the probability of being zero in the binary probability of the non-zero value (Hardin and Hilbe 2007; Cameron and Trivedi 2009).

In addition, this study employed the robustness of standard error. This provides standard errors that are valid even if model errors are heteroscedastic (Cameron and Trivedi 2009).

c) Two-part model and hurdle model

As mentioned, limitations of health data usually overruled the assumption of the OLS in topic b) model selection, the two-part model or hurdle model is a model suggested to deal with the problems, especially the heteroscedasticity and misspecification of the general Poisson or negative binomial models. The two-part model in principle generates separate probability function and positive outcome. The first part is to model the participation decision, in this study, that is the probability of having any use of health services or having any expense by logit or probit model. The logit is widely used. The second part will focus on estimations of the positive value of the count data or continuous data. Such data includes numbers of heath service utilisation and amount of expenditure. An economic modeling method for the second part depends on appropriate methods suitable for such data, for example, count data like number of utilisation, the zero-truncated Poisson model or zero-truncated negative binomial model are specified; for expenditure or cost as continuous data, the generalized linear model with gamma distribution and log link or log transformed OLS regression with smearing factor are recommended. However, the latter regression has limitations when there is

heteroscedasticity in the residuals as already mentioned in Appendix 2, A2.3. The expected level of individual estimation will be the multiplying of both parts (Diehr, Yanez et al. 1999; Cooper 2000; Greene 2008; Jones 2008; Cameron and Trivedi 2009). Details of logistic regression and other generalized linear model family were mentioned previously in Appendix 2, A2.5 and A2.4, respectively. The following is the equation for overall estimation from the two-part model:

$$E(y|\, x) = \Pr(y_i>0|x_i^j) \text{ x } \exp(\beta^j x_i^j)$$

Following studies revealed application of the two part model to health care utilisation and expenditure. Clarke et al (2003) employed the two part model to analyse health care costs for diabetes patients with some major complications who participated in the UK Prospective Diabetes Study conducted in 1996-1997. The first part, logistic regression was employed to model the likelihood of incurring hospital costs and the GLM with gamma family and a log link function was used in the second part to model the positive hospital cost. Estimations on the expected hospital cost are the multiplication of such probability and conditional cost being incurred. In analysis of the effect of age and proximity to death on hospital expenditures in the 1970-1999 Oxford Record Linkage Study, Seshamani (2004d) also employed the two-part model. The study used the probit model to determine the effect of the covariates on the yearly likelihood of entering hospital with robust standard error to correct for heteroscedasticity. To examine the effect of the covariate on hospital expenditure, OLS regression in the second part was employed for the natural log of such expenditure with robust standard error. Given the selected condition, the prediction of the expected average expenditure, by multiplying the results of the two parts, more clearly illustrated the effect than the Heckman model. In the same series debating the influence of proximity to death on health care expenditure, Werblow et al (2007) applied the two-part model to the 1999 claimed data of the Swiss sickness fund. Employing the probit to the first part and OLS for the second part, the researchers revealed the effects of some covariates and estimated health care expenditures compared between decedents and survivors.

An example of application on the two-part model for count data is revealed by Chang et al (2003). The researchers modeled the utilisation of the pharmacy in the 1992-1993 Vietnam Living Standards Survey. For the reason that more than 70 percent of observations are zero data which may violate the restriction of equidispersion of mean

and variance, and the 'excess zeros' problem, the two-part model was selected. It revealed the covariate effect on the choice problem in the first part and the level of consumption in the second part. The zero-inflated Poisson model was also employed and yielded similar results.

In summary, the two quantitative studies of the research employed the models, testing with some statistics recommended (details in Appendix 2). Table 4.2 summarizes the hypothesis test and goodness of fit within each estimation method.

Table 4.2 Summary of hypotheses tests and tests for modeling outcome variables

Statistic technique	OLS	ML	ML		
Data type	continuous		Count		Binary
Outcome variables	Hospital charge, household expenditure		Number of visit, number of admission		Probability of participation decision
Model	Multiple linear regression	GLM: gamma log; Poisson log	GLM: Poisson (ZTP)	GLM: NB (ZTNB)	Logistic regression
Hypotheses test					
• *Test for all joint coefficients within particular model (nested model)*	F	LR: deviance	LR: deviance		LR
• *Test for individual coefficient*	t	t (z), Wald test	t (z), Wald test		t, Wald test
Goodness of fit test	R^2	LR			
Test for family	na	Modified Park test	Modified Park test	na	Na
Test for link function	na	Pearson correlation; Pregibon link test; Modified Hosmer and Lemeshow; AIC and BIC	Pearson correlation; Pregibon link test; Modified Hosmer and Lemeshow; AIC and BIC	AIC, BIC	Na
Residual analysis	Residual plot versus fitted value				
Overdispersion	na	na	Deviance/df, α		Na

OLS = ordinary least square; ML = maximum likelihood; LOS = Length of stay; F = F statistic; t = t statistic; LR = log likelihood ratio; GLM = Generalized linear model; NB = negative binomial; ZTP = Zero-truncated Poisson; ZTNB = Zero-truncated negative binomial; AIC = Akaike information criterion; BIC = Bayesian information criterion; z = coefficient divided by standard error

d) Model validation

The multivariate regressions were validated with a fifty percent random sample of the data. That is, the models were tested, and then estimated with the second half of such random samples (Buntin and Zaslavsky 2004).

4.3.2.2 Qualitative method

This section presents the last two pieces of the entire research which is a primary qualitative study. However, in qualitative discipline, this subsection presents the study approach and research design in general. Like the two quantitative studies, details of the method are explained in Chapter Seven, section 7.2 and Chapter Eight, section 8.2.

(1) Research questions

- How do health professionals, terminally ill cancer patients, and their relatives decide on medical and non-medical intervention at the end of patients' life?

- How do terminally ill cancer patients and their families cope with their expenditure for patient care?

- What are the preferences on quality of care, place for dying among such groups?

(2) Study approach

In qualitative studies, many kinds of research are proposed, i.e. grounded theory research, phenomenological research, focus group research, ethnography and case study. Each approach is suitable on the grounds of philosophy, theory and purposes of a research. The grounded theory method aims to construct a new theoretical concept. Nowadays, it is popular in the research in nursing studies and social health. Ethnographies are usually employed in anthropology studies. Phenomenological research emphasises lived experience and its meaning to such experienced people. Focus group research is focused on the discussion of a selected group on a topic of interest. However, a good focus group requires experienced facilitators and it is sometimes difficult to invite and to make an appointment among the group, in particular in groups with busy activities or shift working like physicians. Use of case study, one of qualitative study approaches seems to be the most appropriate approach for the research

questions and purposes of this research. It provides better understanding in particular people, problems or situations in depth. Among three types of this study including descriptive, exploratory and explanatory, the explanatory study focused not only on disclosing or revealing the phenomenon but also on gaining new explanations or to revise existing explanations. It is very useful as an explanation supporting findings from quantitative study (Hudelson 1996; Podhisita 2006).

(3) Research design

The research is aimed at patients with, and health professionals providing care for, terminal stage cancer. Cancer was selected as a tracer disease due to its trajectory of patients' functional status representing terminal illness which has a certain period at the end stage of life. Due to its more precise prognosis, patients, their relatives and health professionals have some time (approximately 6 months) for good planning in terms of providing health care services and considering preferences of patients. One out of all 75 provinces[37] was targeted because it represents the majority pattern, excluding the specific pattern of metropolitan of health service system in Thailand. The North Eastern region was chosen because it covers a large area and has the largest population in Thailand. As a result, the social and cultural issues of such population which might afftect the health seeking behaviour would be explored and explained over the findings from the quantitative studies. Further, Ubonratchthani, the biggest province in the lower north-east with a population of 1.77 million was selected as a research site. According to its role as a regional hub for three neighbouring provinces, there are several levels of health services including from primary to tertiary and specialised care and types of health facilities both public and private distributed in 25 districts. To have a variety of participants and health services, the study was designed to cover target groups at three settings with different levels of health services. The 900-bed regional hospital, the MoPH regional cancer centre and a 30-bed district hospital, KhuangNai hospital--38-kilometres far from provincial centre, were purposively selected. Such regional hospital provides tertiary care for all diseases including medical services for cancer patients as well as it serves as the main referral recipient for other hospitals with less advanced medical care in the region. The cancer centre specifically provides care for cancer patients referred from provincial/regional hospitals located in 9 provinces of lower

[37] Bangkok was excluded due to it is the capital with special characteristic.

north-eastern region. Both health facilities, in collaboration, are advance caner centre (see details in Chapter Two, section 2.3.3). Even though the KhuangNai hospital, a community hospital, located next to city center than other community hospitals, it was selected due to staff availability and accommodation for the researcher during the data collection.

(4) Data collection

It was important to take into account the difficulties in researching this topic. Firstly the topic of research itself might add to the feeling of grief in terminally ill cancer patients, and their relatives, who know about the coming death during this terminal stage of the patients. Patients also sometimes have weakness physically and so have difficulty travelling. Finding several patients who meet the criteria at the same time could not be achieved in the research setting. In-depth interview seems to be the most appropriate approach at the convenience of all informants. It could also maintain the interviewee's privacy. To be concise with the main information gathered from individuals, a face-to-face informal interview was set up with semi-structured topics and open-ended questions. All interviews were digitally recorded. Observations and field notes were the supportive tools in this circumstance.

All participants, particularly patients and relatives, were verbally invited to participate through verbal or/and leaflet information about the study, however, interviewing was not done unless the participant agreed (verbal consent).

Issues of evidence, trustworthiness and validity: The researcher and her assistant used herself as a research tool, that is, the interviewers conducting the fieldwork for approximately six months to be familiar with informants and their community (health facilities). It was also to ensure a strong relationship, trustworthiness and rapport among the researched and the researcher. The researcher dealt fairly with all informants and every detail given, followed by the good practice of interviewing and the prevention of common interview problems. A field note was written and was used to support data collection and to ensure decision making for data analysis and interpretation. In addition, this research used a triangulation technique. Three data sources, i.e. patients and their relatives were interviewed and patients' medical records confirmed the same issues, particularly patients' illness. Both similar and different perspectives can be gained from this technique. Furthermore, there might be more than one interview with

an interviewee until the information provided was exhausted and no additional topics or information were raised. Therefore, the informants' narrative will be more valid than from just one interview.

(5) Data analysis

It was indicatied that the raw data from qualitative study could be analysed with many techniques depending on the ontological perspective and epistemological approach. Qualitative research typically allows the flexibility in data anlysis method in relation to the study approach and one study might employ more than one method of data analysis. However, there were generally common features indicated on data analysis, i.e. data reduction; data display; and conclusion drawing and verification. Either, analysis was cross-sectional and categorical indexing; non-crossectional data organizations; and using diagrams and charts. Analyses were named in literature including discourse analysis, thematic analysis, conversation analysis, interpretative phenomenological analysis, content anlysis, narrative anlysis and grounded theory. Due to its flexibility but probable provision of a rich and detailed data, it was suggested that thematic analysis is a fundamental method that researchers in qualitative approach should learn (Miles and Hubeman 1994; Mason 2002; Braun and Clarke 2006).

It was commented that analysis of the qualitative raw data takes a great part of study time, so do this thesis as following described. First, all digitally recorded in-depth interviews were transcribed verbatim by the research assistant. All transcribed text of all interviews including descriptive indication on emotional reflection during the conversations were checked and confirmed in its accuracy by the researcher and her field note. In particular to the patients' illness history, each patient's medical record was another source of comfirmation.

Next, the transcribed data was reduced and analysed in an interpretive manner, looking at what people meant by what they said. Using manual cut-and-paste technique, cross-sectional and categorical indexing was done to establish the themes. This thematic analysis was in line with semi-structured topics and the opened-end quentions setting up for in-depth interview. The themes emerging including new found themes were analysed to see if there were any relationship to others and to the original research questions. Findings from the case studies are presented in multiple units within the themes (Mason 2002; Creswell 2007).

Cases for which their narrative was quoted in the study findings were presented in anonymous coding. Due to the focuses of the two qualitative studies on issues and their contents in detail rather than frequency and proportion of similar vesus contrasted events, the data were displayed in both the majority and the minority in causality and in relation to interested themes.

4.4 Conclusion

To achieve the objectives to assess equity in the access to health care in terms of utilisation and expenditure during the last period of life and to explain any existing equity or inequity, this thesis employed mixed methods, using quantitative and qualitative approaches. The quantitative method of multivariate regressions, i.e. the one-part and two-part models for understanding factors affecting health care utilisation and expenditure, and the qualitative method --case study-- gives further explanation of these factors in the case of people with cancer. Preferences and coping mechanisms of cancer patients in the terminal stage as well as information from health professionals further facilitate findings from the quantitative approach. Further details on particular methods present in each study, Chapter Five, Six, Seven and Eight.

CHAPTER FIVE

HEALTH INSURANCES' EXPENDITURE FOR PATIENTS PRIOR TO DEATH BETWEEN 2005-2006

5.1 Introduction

Among industrialised countries, literature reviewed in Chapter Three revealed concerns about expenditure during the last period of life in which less than one percent of the population accounted for 10 percent to nearly 30 percent of total health expenditure. This sharing seems to be greater in health insurance expenditure in particular for the elderly. For example, 5 percent of decedents accounted for 30 percent of total expenditures for the US Medicare beneficiaries. However, this high and wide range of the proportion of expenditure depended on the types of care that the expenditure covered (section 3.2.1). This leads to various questions, including the magnitude of and per capita expenditure in Thailand. On the other hand, equity in health is a goal of the Thai health system, but, before the proposed development of the universal coverage scheme, there had not been any information about equity in health during this last period of life (section 3.1.4). This part of the thesis aims to explore disparity (or inequality) in treatment expenditure paid by the three health insurance schemes; to estimate such expenditure; and to explore multitude of factors which are considered important when people are dying. This chapter presents expenditure during the last year of life claimed by hospitals from two health insurance schemes, UC and CSMBS. The Social Health Insurance (SHI) data which was also proposed in the proposal was dropped from the study due to its incomparability in data collection to the other two databases during the study period. In addition, this chapter reveals the factors influencing those disparities.

This study on secondary cross-sectional data analysis was hypothesized that claimed expenditure during last year of life are affected by individual demographics and other determinants. The unit of analysis is based on individual decedents.

5.2 Methods

This section presents details of the analytical method, data sources, data retrieval and manipulation for secondary data analysis, including, for instance, categorization of cause of death. Assumptions used in this study and all variables determined in data analysis and analytical method are also described.

5.2.1 Analytical methods

The data in this study was normally explored with univariate tests (see Chapter Four, subsection 4.3.3.1 (1)) and with multivariate analysis, respectively. As a result, this dataset contains only the positive admissions of the decedents, numbers of admissions were tested with zero-truncated Poisson and negative binomial and expenditures were tested with Generalized Linear Model of 3 families and 2 link functions, when appropriate, as indicated in Chapter Four, subsection 4.3.3.1 (4).

5.2.2 Data sources

The study got a new mapped dataset from two institutes, the Bureau of Health Policy and Strategy (BPS), Ministry of Public Health and the Central Office for Health Information[38]. The former institute provided the certified death records of decedents who died between 1st October 2005 and 30th September 2006[39]. This individual data includes Citizen Identification number (CID), code of registered residential address, cause of death in WHO-ICD-10[40], code of dying place (in terms of hospital code) and hospital codes and hospital names, and date of death (separated in date, month and year). To accommodate the WHO ICD-10 rule and guideline, cause of death in this dataset was routinely verified by health staff of the institute. At the latter institute, this dataset was further mapped to all admissions whether or not there was a claim for the expenditure. Admissions within one year of individual decedent were retrieved backward from the date of death.

[38] This clearance office is responsible for clearing payment data for 2 main health insurance schemes in Thailand, i.e. UC and CSMBS. Another main scheme, Social Health Insurance (SHI) has its own management by the Social Security Office.
[39] 2006 Thai fiscal year
[40] ICD is International Classification of Diseases and Health Problems. The latest one is ICD-10, 10th revision, 2007 version. It is handled by the World Health Organization since 1948 and used for many purposes in health epidemiology, mortality and morbidity statistics including death certificates and health records. The codes are four-character subcategories within 22 chapters.

In the mapping process, CID and date of death were the key mapping code in the process of validation done by the Central Office for Health Information. In the case of decedent without a date of death but still had month and year of death, it was set to day 15 of that month and year of death. The claimed data including admission episode, age at admission, date of birth, gender, date of admission, date of discharge, age at date of admission, health insurance scheme, primary diagnosis and 12 secondary diagnoses, hospital charges were additionally gained in accordance with new generated study identification numbers while the CIDs were dropped. Hospital charges in this new dataset included total claimable and total un-claimable expenses as well as in disaggregated expenditure in 16 components, e.g. laboratory service, x-ray, medical devices and medicines. However, only claimable expenses were accounted for in this study. It should be noted that this claimed amount might not be the absolute payment from the health insurers. Finally, observations for admissions per decedent were collapsed into one observation per decedent linked by the unique study identification numbers. This new dataset which accounted for the last year of life includes claimed charges, total numbers of admissions, age at death, gender, causes of death, numbers of comorbidity in the last admission, length of hospitalisation, places of death and health insurance schemes.

Ethical consideration: In addition to the ethical approval by the University, this study strictly conformed to the confidentiality act under the National Registration Record Act B.E.2534 (1991). Even though the first dataset of death certificate records contained citizen ID and personal information, the study could obtain only the citizen id and some information mentioned earlier. Thereafter, in the mapping process, the CID of this part of the thesis, was replaced with new generated study ID which could not be related to other parts of the thesis, the survey in Chapter Six and qualitative study in Chapter Seven.

5.2.3 Variables in multivariate analysis

Variables in this study were selected in accordance with the limitations of the secondary data provided and information indicated in reviewed literature from other countries. Details of variables and data manipulation are described below.

5.2.3.1 Independent variables

(1) Gender: Female is reference category. It was hypothesised that females would have a higher expenditure than male.

(2) Age at death: Age at death was calculated from date of birth and date of death. In case of loss of exact date of birth or date of death or both dates, age at death was replaced by age recorded in the last admission of individuals. The primary data analysis naturally shows a greater number of deaths at older ages with the arithmetic mean age of 63.2, and a standard deviation of 18.7 years. As a result, even though continuous data was available, this study categorized age into eleven levels with 5-year and 10-year intervals shown in Table 5.1. Under five-year group was the reference point and would have higher expenditure than the old age group because children are expected to have longer life expectancy than the elderly. Therefore, spending on resources for the terminal stage of life might prolong life and be more expensive.

(3) Health insurance schemes: Two health insurance schemes including the CSMBS and the UC were separated into three categories. This is due to two types of the UC in the data period, that is, the group with 30 Baht copayment exemption (UCE) and the group with 30 Baht copayment of user fees (UCP). CSMBS was selected as a reference point. Owing to differences in payment systems and benefit packages between the CSMBS scheme and UC scheme, it was expected that CSMBS paid greater expenditure than the UC.

(4) Causes of death: Causes of death in the BPS's dataset were recorded in ICD-10 codes. These codes were reclassified into three principal groups including 1) communicable, maternal, perinatal and nutritional conditions; 2) non-communicable diseases; 3) injuries, poisoning, certain other consequences of external causes, and external causes of morbidity and mortality; and 4) a group of ill-defined causes. This categorisation was done through the categories in the Thai study of Burden of Diseases accordingly (see Appendix 3, Table A3.1) (International Health Policy Program-Thailand 2007; World Health Organization 2008). Senility, the fifth group and cancer and tumour, the sixth group, were additionally selected from the ill-defined group and non-communicable diseases, respectively. Even though senility is rather a mode of death than cause, it is related to old age which is always the biggest group of decedents. Furthermore, it might have differences in claimed expenditure from other ill-defined

causes. Cancer and tumours are the leading causes of death in the country as stated in Chapter One, section 1.3.2 as well as being the causes of death of interest and the tracer case on the two qualitative studies of this thesis. Its claimed expenditure might have a high cost care which was different from other chronic diseases in patterns of expenditures across proximity to death; in particular the last year of life (see Chapter Three, subsection 3.2.1). Among six groups, ill-defined cause of death was selected as reference category. Due to differences in illness patterns of diseases along the illness period, cancer decedents was estimated to have greater expenditure for the last year of life than other causes of death (see Chapter Three, subsection 3.2.1.1, cause of death).

Note: Communicable diseases include maternal, perinatal and nutrition conditions
Injuries include poisoning, certain other consequences of external causes and external causes of morbidity and mortality

(5) Places of death: Places where decedents died were recorded in their death certificates. In this study, the secondary data indicates these as 1) public health facilities; 2) private health facilities; and 3) elsewhere. Homes were included in the 'elsewhere' category and could not be differentiated within this group which also accounted for death during transportation, sudden death in accidental areas, and homicide as well as suicide. Elsewhere was indicated as a reference category and was estimated to reveal the cheapest expenditure because of including dying at home in this group which might reduce claimed expenditure for acute care in hospitals.

(6) Numbers of admission: This variable aggregated all admissions at any in-patient units of health facilities in the final year of life. It was summed in numbers of admission per decedents per year. As a result of skewness in this count data in preliminary analysis, it was categorised into five groups indicated in Table 5.1. The first level was selected as reference category. It was predicted that the more admissions there are, the higher the expenditure (see Chapter Three, subsection 3.2.1.1).

(7) Numbers of comorbidity in last admission: Comorbidities were identified with the ICD codes of secondary diagnoses which were limited to a maximum of twelve illnesses. Only comorbidities in the last admission were accounted for in the analysis. The preliminary analysis shows that claimed expenditure in last admission accounted for 50-60 percent of expenditure in a year. Thus, it was hypothesised that most serious fatal and chronic diseases which were the significant burdens of expenditure should be

included in this last admission. However, the Charlson comorbidity index was also employed in this study to adjust risk of the severe burden of comorbidity[41] (Charlson, Pompei et al. 1987). In contrast to the numbers of last admission, the index took into account of all comorbidities records in all admissions with in the final year of an individual. Comparing both candidate comorbidity variables in regression model in terms of the accountability to determine claimed expenditures, numbers of comorbidity in last admission is superior. As a consequence, it was selected into the multivariate analysis. Further, due to its skewness, this variable was categorised into 6 groups indicated in Table 5.1 and no comorbidity (first level) was selected as a reference category. It was also predicted that expenditures increase with comorbidities increase (see Chapter Three, subsection 3.2.1.1).

5.2.3.2 Response variables

Claimed expenditure or hospital charges: As mentioned earlier in subsection 5.2.2 this study accounted for only the total claimable hospital charges. This expenditure in all admissions of individuals was collapsed into one record per person per final year of life. Due to its highly skewed nature with a long right tail, with figures ranging from 10 Baht to 6,741,127 Baht, the expenditure was also taken into log-scale in testing for the best fit model.

[41] The index reflects the cumulative increased likelihood of one-year mortality of 19 predefined comorbidities which were assigned weight of 1-6. The higher the score is, the more severe the burden of comorbidity.

Table 5.1 Variables in multivariate data analysis

Variable name	Source of data	Details of categorisation and reference category
Independent variables		
Male	Death certificates and claimed data	Binary data as: male and female (reference)
Age at death	Death certificates and Claimed data	Eleven categorical data as: under 5 years; 5 to <10 years; 10 to < 20 years; 20 to <30 years; 30 to <40 years; 40 to <50 years; 50 to <60 years; 60 to <70 years; 70 to <75 years; 75 to <80 years; and 80 years and above Reference category: under 5 years
Health insurance scheme	Claimed data	Three categorical data as: CSMBS; UC with 30 Baht user fee exemption: and UC with 30 Baht payment Reference category: CSMBS
Cause of death	Death certificates	Six categorical data as: ill-defined causes; communicable diseases; non-communicable diseases; injuries; senility; and cancer Reference category: ill-defined causes
Place of death	Death certificates	Three categorical data as: elsewhere; public hospitals; and private hospitals Reference category: elsewhere

Table 5.1 Variables in multivariate data analysis (cont.)

Variable name	Source of data	Details of categorisation and reference category
Numbers of comorbidity in last admisison	Claimed data	Six categorical data as: no comorbidity: 1 comorbidity: 2 comorbidities; 3 comorbidities; 4 comorbidities; and 5 comorbidities and above Reference category: no comorbidity
Response variables		
Number of hospitalisations	Claimed data	Count data Minimum = 1, maximum = 50
Claimed expenditure	Claimed data	Continuous data (Baht) minimum = 10, maximum = 6,741,127

5.2.3 Handling missing data

Missing data was manipulated using methods described in subsection 4.3.2.1 (3). In addition, due to some errors in values, such records of individuals were dropped from the analysis. These include records with other health insurance schemes, length of stay greater than 365 days (or one year), zero claimed expenditure and age less than zero. The study did not employ data missing imputation because after dropping records with missing data, there was sufficient data, in fact, more than 200,000 records, for analysis.

5.3 Results

Findings in this study include two main topics, that is, general findings with descriptive statistics and the results from multivariate analysis. The presentation was mainly focused on the health insurance schemes as indicated in the conceptual framework and objectives of the thesis (see Chapter Four, section 4.1 and 4.2). The analysis aims to reveal the examination of the four base models for the 'best fit' model selection in prediction for claimed expenditure as well as to reveal the determinants of the expenditure.

5.3.1 General findings

In the 2006 fiscal year, 392,750 decedents were recorded in death certificates dataset. Of these, 298,587 decedents (76 percent) had records of claimed data with at least one hospitalisation. After excluding decedents with unclear health insurance status mixed in the data which might have led to data duplication, there were 203,413 UC and CSMBS beneficiaries (51.8 percent) and the net numbers of decedents in analysis were 202,858 (51.6 percent of total decedents or 67.9 percent of hospitalised decedents). The exclusion of missing data included 185 in length of stay errors, 1 in age error and 369 of zero claimed expenditure. Of these, 35,396 decedents (17.4 percent) were CSMBS beneficiaries, 118,548 decedents (58.4 percent) were UCE and 48,914 decedents (24.1 percent) were UCP. The claimed expenditure for a total of 202,858 decedents was 13,004,516,940.39 Baht which 32.7 percent (4.2 billion Baht) was expenditure for CSMBS beneficiaries, 46 percent (6.0 billion Baht) for UCE beneficiaries and 21.4 percent (2.8 billion Baht) for UCP beneficiaries. Expenditure per decedent ranged from 10 Baht to 6,741,127 Baht and the top decile decedents (20,285) accounted for 52.4 percent of total expenditure (6.8 billion Baht). In addition to the claimed expenditure for

the last year of life, expenditure in last admission accounted for two thirds of the last year (63.8-66.1 percent by health insurance groups). On average, decedents died within 35.7 days after last admissions.

Table 5.2 presents characteristics of all decedents and claimed expenditure in three types of insurance and Figure 5.1 shows trends of mean expenditure across groups in 4 variables. As a result that the UCE beneficiaries were the majority of decedents in this dataset, the group's descriptive characteristics also dominated characteristics of all decedents. Next, findings are then mostly presented for overall decedents in comparison to the rest of health insurance groups, CSMBS and UCP.

Meanwhile, nearly sixty percent was the UCE beneficiaries but spent the lowest expenditure per capita (50,439 Baht), only 17.4 percent of decedents was CSMBS beneficiaries which spent 2.2 times of expenditure over the UCE. More men died than women in all insurance groups, in particular in UCP beneficiaries which was the working age adults. In addition to gender, the UCP beneficiaries died at working age, on average 45.8 years, but CSMBS beneficiaries died at older ages, 71.3 years and UCE beneficiaries died at 67.9 years. On average, children under five years old had the highest expenditure for the last year of life and the expenditure had a downward trend to the lowest values at 30-40 years old, then the trend was slightly upward to the peak at 70-75 years. Thereafter the trend was slightly declining. This trend represented the UCE decedents' expenditure which is the largest group. Expenditure trends across the other two health insurances were different in some age groups, for example, the CSMBS had a paradox curve in ages under 5 years to 20-30 years whereas the under 5-year UCP beneficiaries had lower expenditure than the older children. In addition, among older age groups, the UCP beneficiaries aged 75-80 years had the highest expenditure, on average 64,312 Baht. Nearly one third of the causes of death were ill-defined causes including senility which is a mode of death in this group. Over a quarter of decedents (27.7 percent) died from non-communicable diseases excluding cancer followed by communicable diseases and cancer, respectively. These rankings and proportions had trivial differences across the three health insurance groups. It was found that 27.7 percent of decedents dying from non-communicable diseases accounted for 28.2 percent of total claimed expenditure whereas 18.1 percent of decedents dying from communicable diseases accounted for 24.2 percent of total claimed expenditure and 17.2 percent of decedents dying from cancer accounted for 21.6 percent of total claimed

expenditure. In terms of per capita expenditure, communicable diseases and cancer were the first and the second causes of death with the highest expenditure in CSMBS and UCE groups. In contrast to both health insurance groups, cancer is the most expensive cause of death whereas communicable diseases and non-communicable diseases were the second highest with nearly equal per capita expenditure (55,398 Baht and 56,187 Baht) in the UCP beneficiaries. This claimed expenditure was 1.02-1.34 times over the mean.

Nearly 52 percent of decedents died outside hospitals and they had cheapest expenditure, that is, 0.4 times that of dying at private hospitals which was the most expensive. Even though the proportions of the causes of death were slightly different across the three groups of health insurance, the CSMBS group revealed differences from the other two groups, in patterns of place of death as well as expenditure. With nearly two thirds of its beneficiaries, public hospitals were the major place of death whereas half of the UCP beneficiaries died in public hospitals. Interestingly, per capita expenditure for the CSMBS beneficiaries dying at public hospitals was distinguishably more than double of expenditure for both UC groups (2.1-2.4 times) and it was greater than expenditure from dying at private hospitals where was expected to be the highest cost of death. Only 2.1-3.8 percent of decedents died in private hospitals. Apart from the main cause of death, decedents usually died with some other illnesses. Approximately 16 percent decedents had no other illness and on average, decedents had 1-3 comorbidities in the last admissions. However, focusing on decedents with more comorbidity, the CSMBS beneficiaries with 5 illnesses and over had a greater proportion than the both UC groups (20.6 percent versus 15.4-15.9 percent). In terms of Charlson's comorbidity index which emphasises 19 diseases or conditions leading to high risk in mortality, 34-44 percent of decedents died without high risk to death except their main leading cause of death. The UCP and the CSMBS beneficiaries had a higher score than the UCE group. This is due to the higher proportion of the category of Charlson's score of 3 and above (see Appendix 3, A3.4). Over one-third of the decedents had one admission during their last year of life (36.7-37.5 percent), and the three groups of insurances revealed similar patterns in numbers of admissions. Expenditure by numbers of admissions revealed no difference across the three health insurance groups except the deepest slope of the CSMBS group.

Table 5.2 Descriptive statistics of decedents and claimed expenditures by variables

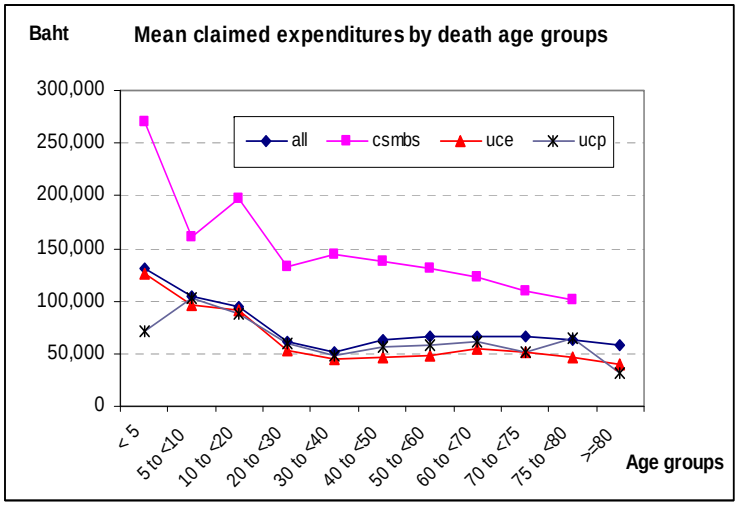
Variables	Percentage of decedents and mean claimed expenditures							
	All		CSMBS		UCE		UCP	
Numbers of decedents (n)	202,858		35,396		118,548		48,914	
	% n	Baht	*% n*	Baht	*% n*	Baht	*% n*	Baht
All	*100.0*	64,106	*17.4*	119,994	*58.4*	50,439	*24.1*	56,789
Gender								
Male	*54.7*	64,025	*55.5*	119,288	*52.1*	51,613	*60.6*	53,215
Female	*45.3*	64,205	*44.5*	120,877	*47.9*	49,164	*39.4*	62,280
***Death age** (yrs.)*								
Mean ± S.D.	63.2 ± 18.7		71.3± 14.6		67.9 ± 17.7		45.8 ± 11.7	
< 5	*1.2*	130,189	*0.5*	195,607	*1.8*	125,479	*0.1*	71,212
5 to <10	*0.4*	104,849	*0.1*	270,184	*0.7*	96,734	*0.0*	103,325
10 to <20	*1.3*	94,157	*0.5*	160,427	*1.3*	90,680	*1.9*	88,439
20 to <30	*2.6*	61,085	*0.3*	197,220	*1.0*	53,331	*8.3*	60,236
30 to <40	*6.6*	51,251	*1.4*	132,398	*2.5*	45,489	*20.0*	48,849
40 to <50	*10.5*	62,296	*5.7*	144,260	*4.6*	46,427	*28.1*	56,508
50 to <60	*14.4*	65,798	*10.7*	138,180	*7.0*	47,629	*35.0*	58,673
60 to <70	*20.0*	66,903	*18.2*	131,601	*26.6*	54,188	*5.4*	60,556
70 to <75	*13.2*	66,604	*16.0*	123,140	*17.7*	51,464	*0.3*	52,122
75 to <80	*12.5*	62,368	*18.1*	109,670	*15.9*	46,306	*0.3*	64,312
>=80	*17.3*	57,587	*28.6*	101,725	*20.9*	39,828	*0.5*	31,936
Causes of death								
Ill-defined	*21.3*	50,918	*20.1*	93,729	*24.3*	41,190	*15.2*	47,561
Communicable ds.	*18.1*	85,620	*18.2*	166,350	*15.1*	77,396	*25.2*	55,398
Non-communicable ds.	*27.7*	65,350	*27.3*	112,431	*27.2*	55,308	*29.1*	56,187

Table 5.2 Descriptive statistics of decedents and claimed expenditures by variables (cont.)

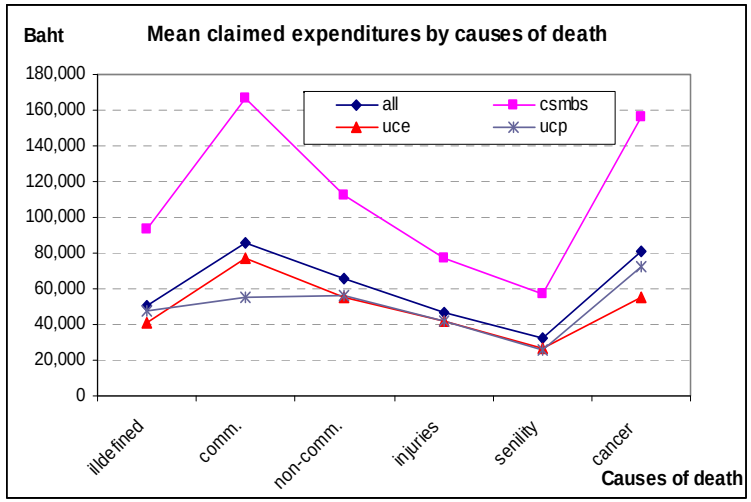
Variables	Percentage of decedents and mean claimed expenditures							
	All		CSMBS		UCE		UCP	
Injuries	*4.9*	46,687	*3.7*	77,395	*3.6*	42,103	*8.7*	41,740
Senility	*10.8*	32,381	*10.8*	57,344	*15.2*	27,130	*0.2*	26,101
Cancer	*17.2*	80,780	*19.9*	156,585	*14.6*	55,229	*21.6*	72,094
Places of death								
Elsewhere	*51.6*	43,699	*37.4*	79,264	*58.8*	35,970	*44.7*	46,819
Public hospitals	*45.8*	84,481	*60.2*	145,840	*39.1*	68,637	*51.5*	61,725
Private hospitals	*2.6*	110,973	*2.4*	105,667	*2.1*	116,083	*3.8*	106,561
Comorbidity								
Mean ± S.D.	2.5 ± 2.2		2.9 ± 2.3		2.5 ± 2.2		2.5 ± 2.2	
None	*15.9*	36,382	*13.9*	72,383	*16.7*	27,990	*15.4*	34,820
1	*22.6*	42,240	*18.5*	81,071	*23.5*	33,886	*23.6*	40,390
2	*20.0*	52,169	*18.8*	93,520	*20.0*	42,421	*20.7*	47,879
3	*15.6*	68,319	*18.8*	127,718	*14.9*	50,936	*14.9*	56,213
4	*9.5*	73,852	*9.5*	121,743	*9.5*	61,830	*9.5*	68,535
>=5	*16.4*	126,054	*20.6*	203,649	*15.4*	102,924	*15.9*	107,702
Numbers of admission								
Mean ± S.D.	2.8 ± 2.5		2.8 ±2.5		2.7 ± 2.4		2.9 ± 2.6	
1	*37.2*	35,564	*36.7*	65,588	*37.5*	28,683	*36.7*	30,880
2	*24.8*	53,306	*23.9*	98,257	*25.2*	43,573	*24.6*	45,911
3	*13.8*	70,846	*14.3*	128,671	*13.8*	56,324	*13.2*	62,431
4	*8.5*	86,781	*8.8*	156,544	*8.5*	69,821	*8.4*	75,610
>=5	*15.7*	130,487	*16.4*	246,571	*15.0*	100,074	*17.1*	114,588

Figure 5.1 Patterns of claimed expenditures across 5 variables

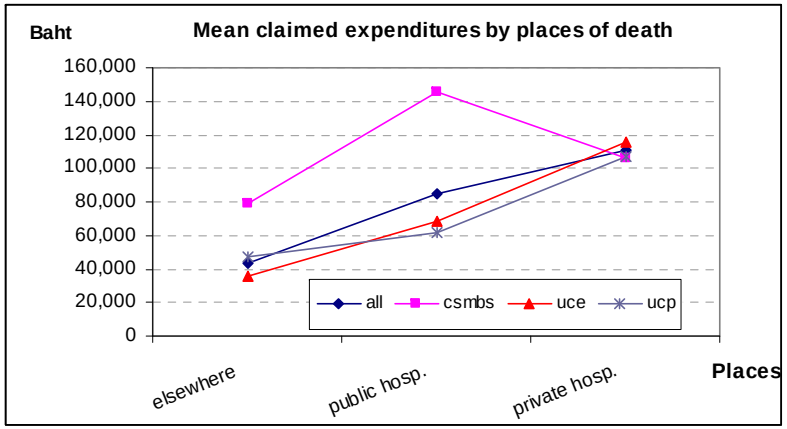
A: Death age groups



B: Causes of death



C: Places of death



D: Numbers of comorbidities in last admission

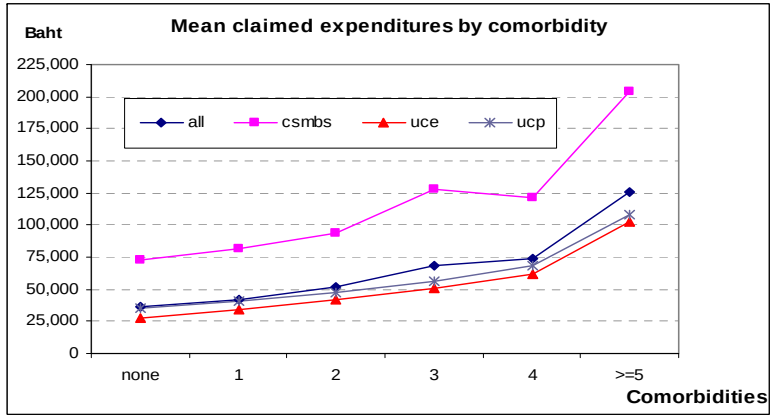
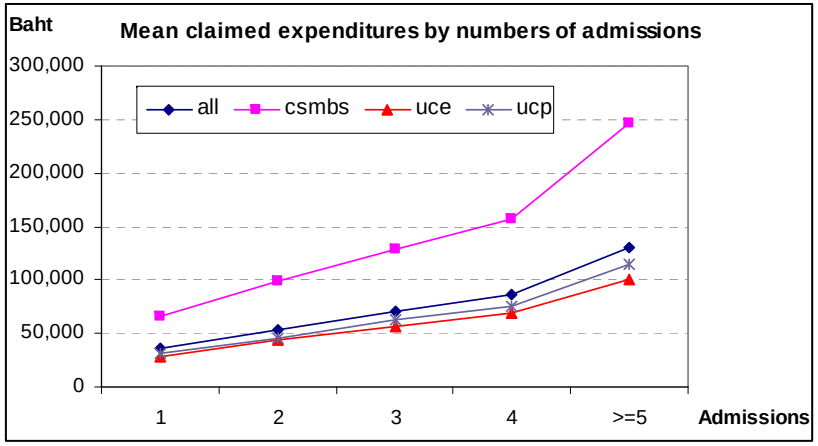


Figure 5.1 Patterns of claimed expenditures across 5 variables (cont.)

E: Numbers of admissions



Focusing on the pattern of places for dying and causes of death, Figure 5.2 shows the proportions of decedents with different causes dying at different places. Overall, half of decedents died elsewhere including homes and another half died in hospitals. Nearly four-fifths of decedents (77.7 percent) dying from communicable diseases as well as over two-thirds of decedents dying from injuries died in public hospitals. In contrast, almost all of the decedents dying from senility died outside hospital, for which location was expected to be decedents' homes. Groups of cancer and other chronic non-communicable diseases died in public hospitals and elsewhere which was also expected to be decedents' homes. Further, in dying from cancer, Figure 5.3 shows places of death across health insurance groups. Nearly two-thirds of CSMBS beneficiaries died in hospitals, mostly in public hospitals and the remaining third died at home. In contrast, both UC groups revealed a similar pattern of dying places, that is, two-thirds of the decedents died at home.

Figure 5.2 Percentage of decedents categorised by place of death and causes of death

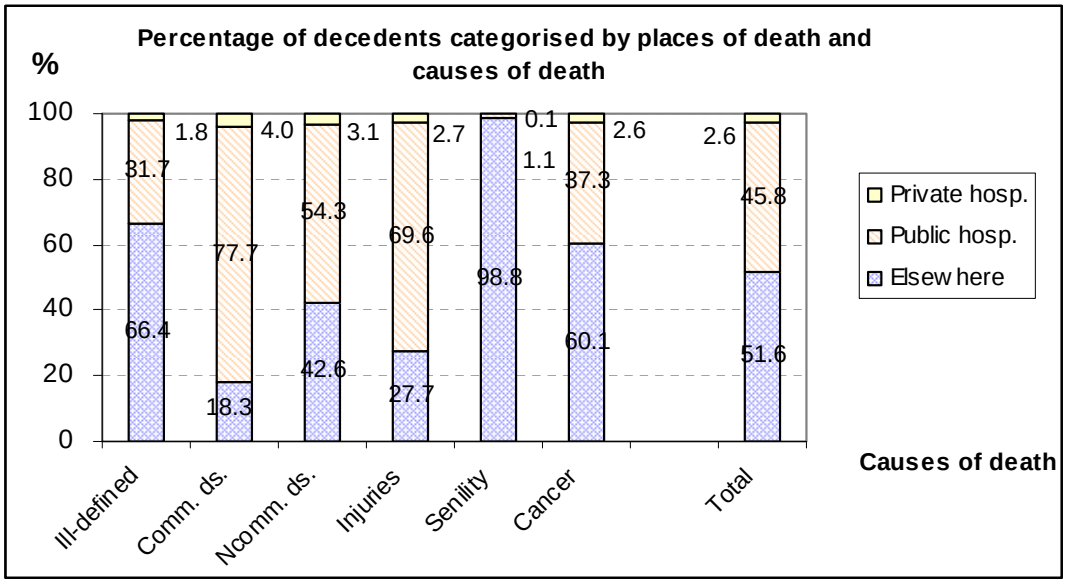
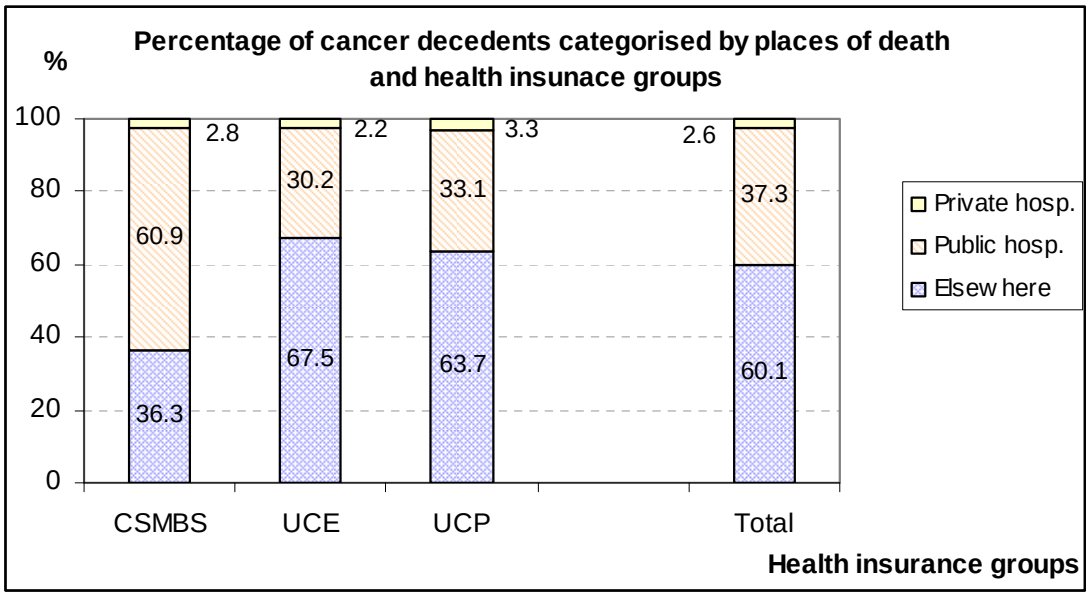


Figure 5.3 Percentage of cancer decedents categorised by places of death and health insurance groups



5.3.2 Multivariate analysis and the model selection

5.3.2.1 Hospitalisations

The base models were selected through model selection methods in Chapter Four, subsection 4.3.2.1 (4) b) accordingly. It was only the zero-truncated Poisson model and zero-truncated negative binomial were tested. The test for the significance of α interpreted that the zero-truncated Poisson had overdispersion. As a result, the zero-truncated negative binomial is more appropriate (details of the statistical tests of both models indicated in Appendix 3, Table A3.5).

5.3.2.2 Claimed expenditure

The distribution of the claimed expenditure was shown in Appendix 3, Figure A3.1. Its distribution revealed greatly non-normal distribution with 7.5 of skewness and 142.7 of kurtosis. In contrast, it was in the range of normal distribution in logarithmic term (-0.05 skewness and 3.0 kurtosis). The candidate models included the OLS, the OLS of logarithmic term of claimed expenditure with Duan's smearing factor, the GLM with gamma distribution and log link, and the GLM with Poisson distribution and log link. The R^2 from the OLS model indicated that this set of variables could explain 12.2

percent of the linear relationship of the covariates over the claimed expenditure. Details of coefficients of all variables, and their significance as well as all test results including specification test for GLM, both families and link functions, and plots were shown in Appendix 3 (Table A3.6 and Figure A3.2-A3.3). Table 5.3 summarises the test results (Root Mean Square Error: RMSE and Mean Absolute Error: MAE) and Table 5.4 summarises predicted descriptive statistics of the four models compared to the observed ones. The F statistic revealed that the OLS and the OLS of log transformed data were superior to the model with constant only. In GLM, the specification test for family (in both gamma and Poission model) shows that none of the four families including gamma, Poisson, Gaussian and inverse Gaussian fitted the data. However, the χ^2 value of the gamma was the lowest value which indicated that the gamma was likely better than other families. For the log link test, two out of the three tests in the gamma present insignificance meaning of the appropriate of the log link function. In addition, scatter plots between fitted value versus residual of the GLM gamma-log and the OLS of log transformed data show better fit than the other two models. Comparing the two GLMs, scatter probability plot of predicted value against residual and standardized normal probability plot of the gamma-log show better distribution and closeness to the normal line, respectively. In summary, it seems that GLM gamma-log based models could provide a better fit than others.

Further, according to Dodd et al (2006) suggestion indicated in Chapter Four, subsection 4.3.2.1 (4) b), it was the GLM Poisson-log which gave the lowest RMSE for the best mean predicted, following with the GLM gamma-log, logarithmic term of OLS and OLS, respectively. The GLM with Poisson-log gave the lowest MAE meaning the best prediction for the median. Focusing on the mean prediction which was the expected value of interest, shown in Table 5.4, the GLM Poisson-log estimated the mean which closest to the observed one whereas the OLS estimated negative value of the minimum expenditure, -13828 Baht, which is impossible. The GLM with gamma-log and the logarithmic term of the OLS with Duan's smearing factor estimated the greatest mean beyond the observed one. Even though the GLM with Poisson and log link gives best estimated mean, the results of misspecification tests mentioned above indicated the GLM with gamma and log link was superior. As a consequence, this study employed the GLM with gamma and log link for the reason that the overdispersion of the Poisson model could not be overcome.

Table 5.3 Diagnostic test results of root mean square error (RMSE) and mean absolute error (MAE)

Candidates model	RMSE	MAE
Observed	na	na
OLS	117028.8	57960.8
Ln OLS with Duan's smearing	116896.5	57737.3
Gamma-log	116602.9	57176.7
Poisson-log	116456.4	57063.6

Table 5.4 Summary statistics predicted from the observed data and four candidate models

Candidates	Mean	SE	Lower bound	Upper bound	SD	Min	Max	Median	75Ptile	90Ptile
Observed	64107	276.8	63564	64649	124658.0	10	6741127	25437	64289	152976
OLS	64298	136.8	64029	64566	43556.0	-13828	280547	53030	93416	124419
Ln OLS with Duan's smearing	66046	158.7	65735	66357	50513.6	12359	528907	49636	80586	128262
Gamma-log	66415	212.9	65998	66833	67785.5	8829	908281	43910	81387	140819
Poisson-log	64202	144.9	63918	64486	46114.3	15215	674416	49497	76116	117416

5.3.3 The model and factors determined hospitalisation and the claimed expenditure

5.3.3.1 Hospitalisations

All variables including age at death, gender, causes of death, places of death, health insurances and comorbidities in last hospitalisation before death played a significant role in determining hospitalisations during the last year of life. Table 5.5 shows the incidence ratio of the coefficient of variables. For instance, it revealed that decedents aged 10 to 20 years were significantly admitted 85 percent of decedents aged less than 5 years in the last year of life when keeping other variables constant. The hospitalisations decreased as age increased, particlurly marked decreasing in the age of 80 and above. Both UCE and UCP beneficiaries had less hospitalisation than the CSMBS. Decedents dying from cancer had a 51 percent hospitalisation significantly greater than dying from ill-defined causes. Interestingly, hospitalisations had significant positive correlation with number of comorbidities.

Table 5.5 Individual variables in zero-truncated negative binomial for hospitalisations

Variables	IRR	Std. Err.
Age 5-10	0.9628	0.0711
Age 10-20	0.8583**	0.0486
Age 20-30	0.9263	0.0413
Age 30-40	0.8512**	0.0337
Age 40-50	0.8652**	0.0328
Age 50-60	0.8806**	0.0330
Age 60-70	0.8224**	0.0296
Age 70-75	0.7757**	0.0285
Age 75-80	0.7070**	0.0263
Age >= 80	0.5593**	0.0208
Male	0.9121**	0.0079
UCE	0.9687**	0.0116
UCP	0.8842**	0.0146
Communicable ds.	0.9850	0.0146
Non-communicable ds.	1.0976**	0.0143
Injuries	0.3464**	0.0124
Senility	0.8376**	0.0168
Cancer	1.5057**	0.0201
Public hospitals	0.9842	0.0099
Private hospitals	0.9483**	0.0118
1 comorbidity	1.12409**	0.0170
2 comorbidities	1.2079**	0.0185
3 comorbidities	1.2869**	0.0205
4 comorbidities	1.3031**	0.0235
>=5 comorbidities	1.3337**	0.0208

IRR = Incident Rate Ratio; * $p < 0.05$; ** $p < 0.01$

5.3.3.2 Claimed expenditure

Table 5.6 shows all variables determining the claimed expenditure in the last year of life. All variables but gender had a significant role in determining the claimed expenditures. In addition, almost all of the categorical variables were significantly different over their reference category. For instance, it revealed that when keeping other variables constant, claimed expenditure of decedents dying at age over 5 years were 40-70 percent of the claimed expenditure of the under 5-year group. Decedents dying at 80 and above as well as decedents dying aged between 30 and 40 spent the least claimed expenditure. It is likely that the claimed expenditure decreased as age increased. Claimed expenditure of both UC groups was approximately half of the CSMBS beneficiaries. By causes of death, decedents dying from cancer were likely to have 55 percent greater claimed expenditure than decedents dying from ill-defined causes. Dying at public hospitals spent 37 percent more than those dying somewhere else. The expenditure doubled when there were 4 comorbidities and the expenditure was over double with 5 comorbidities and above, compared to decedents without comorbidity in last admission.

Table 5.6 Individual variables in GLM with Gamma distribution and log link for claimed expenditure

Variables	Exp(b)	Std. Err.
Age 5-10	0.6945**	0.0598
Age 10-20	0.6595**	0.0495
Age 20-30	0.5115**	0.0350
Age 30-40	0.4060**	0.0238
Age 40-50	0.4474**	0.0254
Age 50-60	0.4621**	0.0258
Age 60-70	0.4777**	0.0260
Age 70-75	0.4732**	0.0261
Age 75-80	0.4446**	0.0246
Age >= 80	0.3998**	0.0221
Male	1.0183	0.0109
UCE	0.4639**	0.0064
UCP	0.4984**	0.0100
Communicable ds.	1.2057**	0.0214
Non-communicable ds.	1.1351**	0.0178
Injuries	0.7639**	0.0246
Senility	0.8617**	0.0209
Cancer	1.5532**	0.0262
Public hospitals	1.3731**	0.0165
Private hospitals	0.9111**	0.0130
1 comorbidity	1.1686**	0.0217
2 comorbidities	1.3992**	0.0271
3 comorbidities	1.6791**	0.0319
4 comorbidities	1.9145**	0.0424
>=5 comorbidities	2.9874**	0.0562

* p< 0.05; ** p < 0.01

5.4 Summary of research findings and study limitaiton

5.4.1 Summary of research findings

The study revealed numbers of hospitalisation and the claimed expenditure which incurred the health insurances for last year of life of the Thai people who sought acute care during 2006 Thai fiscal year (October 2005-September 2006). Data used in this study was retrieved from death certificates data mapped to costs that hospitals charged to two health insurance offices comprising of some demographic and other factors of decedents (demand side) and health insurances which are the third party payers driving hospital services (supply side) towards their financial systems and benefit packages. Three main findings from this study included the pattern and characteristics of decedents who sought acute care during their last year of life; numbers of hospitalisation and claimed expenditures; and the factors which determined such claimed expenditure.

During the last year of life, 76 percent of all 392,750 decedents accessed acute care in hospitals with at least one admission. However, this study could analyse 68 percent of hospitalised decedents who accessed the hospital acute care. Total claimed expenditure was approximately 13,004 million Baht in which approximately 18 percent of decedents were CSMBS beneficiaries accounting for one third of this expenditure. Fifty-eight percent was the UCE accounted for 46 percent of and 24 percent was the UCP accounted for 22 percent of the expenditure. The top decile decedents spent over half of the total expenditure. More than half of the decedents had 1-2 admissions during their last year of life with the average of 2.8 admissions. The claimed expenditure for last admission was two thirds of the expenditure for the last year.

On average, decedents died aged 63.2 years with the CSMBS beneficiaries dying at an older age, 71.3 years, and the UCP at working age, 45.8 years. Non-communicable diseases excluding cancer were the top ranking causes of death, followed by communicable diseases as well as cancer. Half of all decedents died outside hospitals including homes. Most in-hospital death was at public hospitals. Almost all deaths from senility and nearly two thirds of decedents dying from cancer died elsewhere which was expected to be homes. In contrast to the UC beneficiaries, a minority of CSMBS beneficiaries died outside hospitals. On average, a decedent who sought acute care had 2.8 hospitalisations in last year. Per capita expenditure was 64,106 Baht in which

CSMBS expenditure was double that of the UC. Trends for claimed expenditure across age groups revealed the highest expenditure in decedents aged under 5 years and declined to the lowest expenditure at aged 30-40 years and rose to the stagnant line from age 50. The claimed expenditure increases with numbers of comorbidity as well as numbers of admission increased. Claimed expenditure of CSMBS beneficiaries revealed different patterns from the UC across age groups and in particular in places of death.

All six variable groups played significant role in determining hospitalisations during the last year of life in zero-truncated negative binomial model. Hospitalisations had a negative relation to age at death but had a positive relation to number of comorbidities in the last hospitalisation. Compared with five other causes of death, decedents dying from cancer had highest hospitalisations. The UC beneficiaries had less hospitalisation than the CSMBS.

The Generalised Linear Model (GLM) with gamma distribution and log link which was the best fitted model revealed the significances of factors determined the claimed expenditure when keeping other factors constant. Such factors included age group, causes of death, places of death, health insurance schemes, and number of comorbidities in the last hospitalisation. The expenditure had a positive and negative relation to age at death but had a positive relation to numbers of comorbidities. Dying from cancer and communicable diseases had 55.3 percent and 20.6 percent higher than expenditure of dying from ill-defined causes. Dying at public hospitals had a 31.3 percent higher expenditure than dying outside hospitals. The UC beneficiaries incurred half expenditure of the CSMBS beneficiaries.

5.4.2 Data and methodological limitations of the study

This one year cross-sectional study revealed characteristics, pattern of utilisations and expenditure only of those decedents who accessed acute care in hospitals within a year before death. It excludes non-user decedents because of the data availability. In addition, the study could not reveal and discuss with concrete information and comparisons between decedents and the rest of the population or survivors. Hence this study aims to explore disparities in and to estimate treatment expenditure paid by health insurance schemes as well as to explore the factors considering important when people are dying, as this topic needs another set of research questions and study design. In addition, this study also could not lead to any conclusion on the prevalence of service

utilisation and accessibility and mortality rate by health insurance schemes. This is due to the fact that there is no data of other main health insurance schemes, i.e. the SHI as well as there is no information on the decedents without any access to health service in their final year. The SHI data was dropped because of differences in data collection and a limitation on accessibility to the database.

As a result, the OLS model shows a low linear relationship between the covariates and the dependent variable, $R^2 = 0.122$ including unclear results from specification tests for the GLM with both families of distribution and link function. It indicated some technical problems including the feasibility of lacking important variables. Other factors likely to improve the goodness of fit and explanation by multivariate regression were from both demand side and supply side. These interested variables include geographical variation and socio-economic data discussed in previous studies, for example, residential area of the decedents before death including region, urban-rural area; decedent living standards; proximity to death; levels of cares or types of service provided the acute care, i.e. secondary or tertiary or advanced tertiary care which related to places of death; and intensive care use (Zweifel, Felder et al. 1999; Felder, Meier et al. 2000; Barnato, McClellan et al. 2004; Wennberg, Fisher et al. 2004; Seshamani and Gray 2004a; Seshamani and Gray 2004b; Faramnuayphol and Vapattanawong; Faramnuayphol and Vapattanawong).

Length of hospitalisation in preliminary analysis shows very strong relation to the claimed expenditure by providing great attribution in the OLS model (approximately, $R^2 = 0.5$). However, it was dropped from the model due to the fact that length of hospitalisation is a core factor in payment calculation in health payment system using diagnostic related groups (DRG) and adjusted related weight (adjusted RW). Further examinations, therefore, are required to ensure whether or not length of hospitalisation has endogeneity to other independent variables; or is it autocorrelated with the claimed expenditure, the dependent variable; or is it the instrument variable to the claimed expenditure. As a consequence, other based models including linear instrumental-variable regression might be more appropriate (Cameron and Trivedi 2009). Even though length of stay was not included in the multivariate analysis, its descriptive statistics were presented in Appendix 3, Table A3.7.

It should be kept in mind that cause of death is not always the leading cause of hospitalisation and cause of overall expense in the last year of life. Decedents may have one disease but suddenly die from another disease. For example, a patient was admitted for diabetes previously but their last admission was due to a road accident. However, the study revealed that expenditure for last admission accounted for two-thirds of expenditure for the final year. That is, the last admission which should be most related to causes of death shared most of the expenditure through the last year. In addition, it already took into account the comorbidities in last admission which borne expenditure were included in the modeling. However, other illnesses or diseases which might also incur expenditure prior to the last admission were excluded. In this study, Charlson comorbidity index was also applied. This index took into account the risk to death of all illnesses recorded in 12 secondary diagnoses in all admissions in final year. Nonetheless, in preliminary test, it attributed to the model less than the numbers of comorbidities in last admission. This finding should be further explored, particularly the relation between widely used comorbidity index and the factors determining the payment mechanism of the third party.

5.5 Discussion

The study gave an overview of expenditure and factors related of decedents who sought acute care at the national level in 2006. Even though it is out of the scope of this study, the numbers of hospitalisations were also revealed, however, the discussion focused on the expenditure.

The aim could be achieved in that it revealed the inequality of payment for acute care by health insurance schemes. That is the CSMBS paid more than double expenditures of the UC for the last year of their beneficiary life when keeping other factors constant. In addition, other factors determining the last year of life expenditures included death age, causes of death, places of death and numbers of comorbidity in last admission. It shows the negative relation from age under 5 to age 30-40, a slightly positive relation to age 60 and it was stagnant during age 50-75, with a negative relation to age 75 and above. Focusing on the old age group, this trend was different from findings in the OECD countries in which the expenditure had a positive relation to age 65 until 80 or 95, and

negative relation after that age. This might relate to life expectancy of each country[42] whose population lives longer than average life expectancy indicated in this study. Such older age group in developed countires might have less expenditure for in-hospital services but greater expenditure for other institutional services, for example, hospice care and nursing home. This is due to the fact that health service models vary from country to country. In addition, expenditures for the decedents aged 60 and above were only half of expenditure for the youngest age group (under 5 years). By gender, average expenditure for both genders was very similar in monetary terms, descriptive mean approximately 64,000 Baht, and the rate ratio from the model (4 percent higher in male). The expenditure across this factor was different in each country which might relate to other factors in the studies of each country (see Chapter Three, Table 3.2).

Causes of death, another determinant of expenditure for the last year of life, was often evaluated. Owing to differences in disease categorization, only cancer was the group most studies explored. Spending for cancer was 1.3 times of the average but the reimbursement ratio of cancer in the US was in range of 4.3-7.7 for all decedents (Scitovsky 1994). Even though the ratio of spending on Thai cancer decedent was very low, compared to the US, but this study was limited to account for other patients like the US study did. In addition, this study found that 17.2 percent of cancer decedents accounted for 21.6 percent of expenditure meanwhile a study in the Netherlands found 28 percent accounted for 35.3 percent which was quite similar (see Chapter Three, Table 3.2) (Polder, Barendregt et al. 2006).

In addition to its objective, this study could not exactly indicate the magnitude of expenditure for the last year of life to the total health expenditure because of the time horizon of last year of life is not the fiscal year and the coverage of the decedents and their expenditure mentioned earlier. However, it might implicitly reveal that the total expenditure for acute care in last year of life in this study was 13,004 million Baht and the total health expenditure was 290,603 million Baht in 2006 (see Chapter Two, Table 2.8)(Vasavid, Janyapong et al. 2009). That is, it might approximately be 4.5 percent of total health expenditure accounted for by decedents. This might be overestimated because the differences in defined year of the two figures; and underestimated because a lack of SHI decedent data and lack of expenditure for ambulatory care and household

[42] Life expectancy of Thai population in both genders was 72 years and of the UK was 79 years in 2006 World Health Organization (2008). World health statistics 2008. Geneva, World Health Organization.

expenditure. Another indicator, the per capita could not be directly compared due to this study could not obtained from the other part of expenditure from the SHI scheme.

Apart from the inequality in expenditure across health insurance schemes, further disparity was found in places of death related to cause of death. In cancer decedents, it is clearly noticeable that while the CSMBS beneficiaries were likely to die in public hospitals, the UC beneficiaries died outside hospitals which were expected to be decedents' homes. Further study on the background of these different groups might help in understanding their practices and in better guiding health services.

Ill-defined causes of death remain the problem included in this study. It did not only indicate the poor quality of the data in mortality report, but it also affected the study on expenditure and others. Approximately, thirty percent of ill-defined cause of death including senility in this study weakened the validity and differentiated power expenditure by causes of death in some way. As a result, improving the defining causes of death was urgently needed. Study on specific causes of death, for instance, stroke, cardiovascular diseases could be conducted to reveal a specific pattern of expenditure and factors related and this might lead to better health service for this specific group. The causes of death classified with the trajectories of physical function indicated in Chapter One, section 1.4 might also provide clearer distinguished expenditure between groups (Lunney, Lynn et al. 2002; Murray, Kendall et al. 2005).

5.6 Conclusion

Three issues this study could provide information on include: the hospitalisations and the per capita expenditure for last year of life for acute care in hospitals; the inequality in expenditures for different health insurance schemes and other factors influencing expenditures; and estimated per capita expenditure for individuals with specific characteristics.

In 2006, the average per capita expenditure was 64,106 Baht in the last year of life with 2.8 hospitalisations. It was estimated the CSMBS beneficiaries likely had an expenditure of 1.5 times greater than of the UC beneficiaries. Cancer patients had greatest hospitalisation compared to other diseases including other chronic diseases. Dying from cancer and communicable diseases caused the highest expenditure. It was also found that the CSMBS beneficiaries who died from cancer were likely to die in public hospitals, in contrast to the UC beneficiaries who were more likely to die outside hospitals.

CHAPTER SIX

HOUSEHOLDS' HEALTH EXPENDITURE FOR PATIENTS PRIOR TO DEATH BETWEEN 2005-2006

6.1 Introduction

The Universal Coverage health insurance scheme launched in 2002 aims to eliminate the financial barrier in accessing health care and to reduce the incidence of catastrophic illness among the Thai population, in particular the poor. In 2008, 97.8 percent of Thai citizens were enrolled in one of the 3 main health insurance schemes, i.e. UC, CSMBS and SHI (see Chapter Two, Table 2.7). However, the benefit package of each scheme is different and still has limitations such as not being able to provide free financing for all individual requirements of all members. That is additional 'out of pocket' payments for health services; both for health facilities and for complementary medicine remain.

Spending on health care through the full extent of life including last period of life has been widely reported (Seshamani and Gray A. 2002; Shactman, Altman et al. 2003; Seshamani and Gray 2004b). It was found that for care during the last period of life, spending on massive resources of health care providers was taking place, incurring expenditure by health insurers, and requiring intensive inputs from households' members and households' incomes and assets (see Chapter One, subsection 1.4 and Chapter Two, subsection 3.2.1).

Although literature and findings in Chapter Five illustrate the high expenditure on healthcare in this critical period of life, it is also believed that households still share a part of overall expenditure. Apart from the health care providers and insurers, such payment is likely to be an added burden to households, but no research on household expenditure during this specific period of life has been reported in Thailand thus far. To be consistent with Chapter Five, this chapter, therefore, mainly aims to investigate disparity (or inequality) in household expenditure during the last period of life among health insurance beneficiaries of UC, CSMBS, SHI including private health insurance and uninsured decedents. Further, the study specifically aims to:

- estimate the utlisation and household health expenditure (direct medical cost[43]) for the last 3 months for ambulatory care and for the last 6 months for acute care prior to death;
- estimate the proportion of such expenditure to household income; and
- investigate the health care seeking behaviour prior to death categorised by household income quintile

Similar to Chapter Five, this chapter also reveals the factors influencing such disparity. Through the literature review in Chapter Three, subsection 3.1.2 and 3.2.1 accordingly, it was hypothesised that household expenditure in 2005-2006 was affected by individual demographic and geographic determinants including those that are health related, particularly in individual socioeconomics and health insurances. The unit of analysis was individual decedents.

This chapter presents the cross-sectional secondary analysis of two linked datasets, methods, results, discussion and conclusion. Results are presented in two main sections of general findings which include population mortality and patterns of health seeking; and findings from multivariate regression which included factors affecting health care utilisation and expenditure.

6.2 Methods

Like the methods in Chapter Five, section 5.2, this section presents analytical methods, details of data sources including data retrieving and manipulation requirements in secondary analysis. All variables included in the multivariate analysis are also described.

6.2.1 Overview of the study design and source of secondary data

As described in Chapter Four, subsection 4.3.1, this part of the research uses the secondary data of the Survey on Healthcare Utilisations of and Household Health Expenditure for Decedents prior to Death between 2005 and 2006 (SHUE) which was linked to the 7th Survey of Population Change (SPC). The SPC was the backbone survey of the SHUE which used twelve variables and population weighting factors of the SPC.

[43] includes expenditures for medical care from health facilities' services and complimentary medicines. The indirect medical costs and indirect non-medical costs were excluded due to incomplete data.

Once death was indicated in the household of the SPC, household proxies were further surveyed with the SHUE questionnaire. Hence, subsection 6.2.3 presents details of the SPC sample design and sample size, population estimation, and survey data. Following this, details in subsection 6.2.4 are given of the SHUE coverage and identification of cause of death as well as variables of interest in subsection 6.2.5.

Ethical consideration: Although the second dataset, the SHUE, had registered households and members records, the NSO abides by the Thai Statistics Act B.E.2550 (2007)[44]. The data provided was limited to only the scope of the study. The researcher has not been able to map any variables of individual personal records beyond either these surveys or the first two datasets in Chapter Five of this thesis. The first names, family names, CID numbers, and addresses of the respondents were dropped and new study identification numbers (study IDs) were generated. In addition, all completed questionnaires were kept at the NSO and the researcher was restricted to the accessibility of these hard copies.

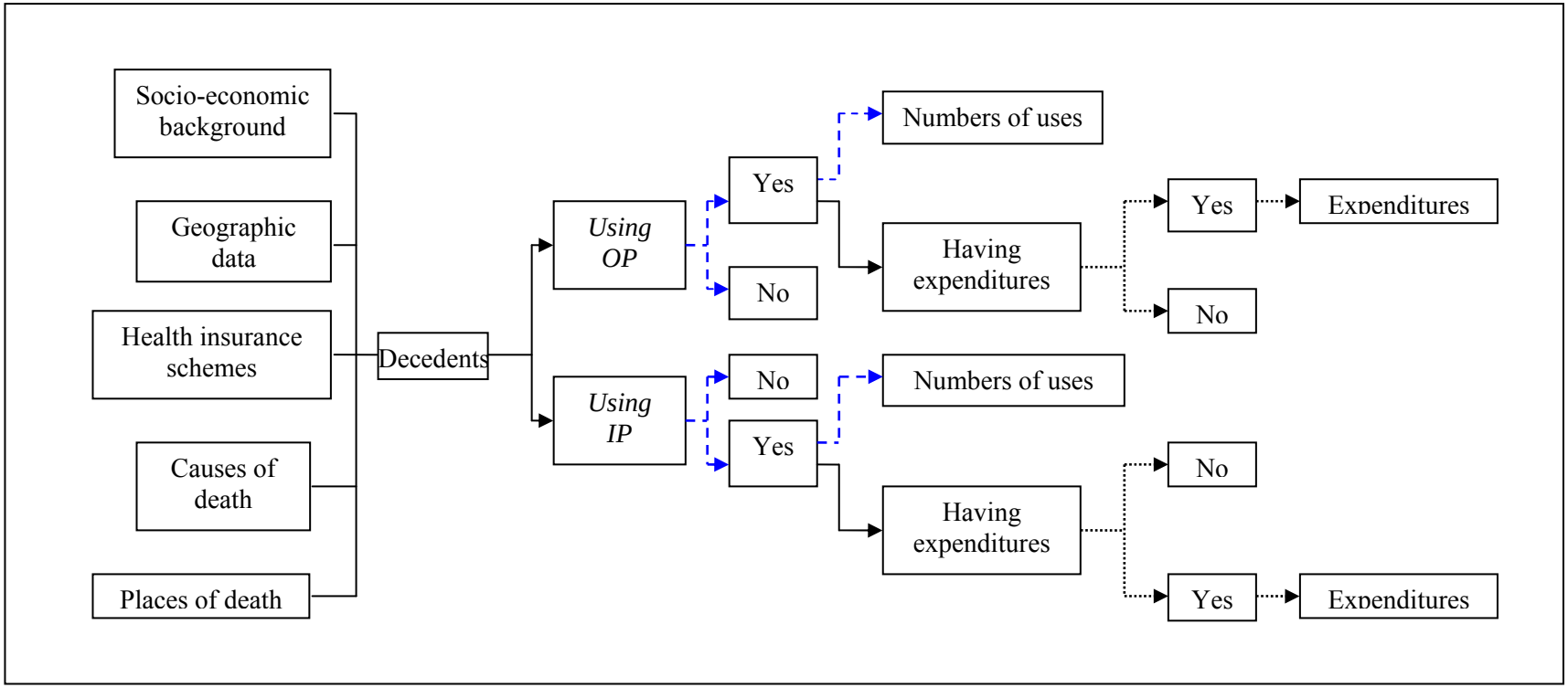
6.2.2 Analytical methods

Like Chapter Five, the analytical steps and methods employed in this chapter follow the method in Chapter Four, subsection 4.3.2.1. As a consequence that this study of the thesis had obtained the data from the SHUE which could provide information of decedents that did or did not have access to health services, the two-part model was employed in the multivariate regression and the step of analysis could be depicted as in the diagram in Figure 6.1 (see details of the two-part model in Chapter Four, subsection 4.3.2.1 (4) c)). This model could distinguish the propensity and intensity of utilisations and expenditure and therefore, it provides a better understanding of factors determining accesses to and expenditure for health services of individual decedents with different characteristics. In Figure 6.1, the dashed line represents the analysis pathway of utilisations whereas the dotted line presents the route of expenditure which the two-part model for count data and for continuous data were employed, respectively. In addition, this study analyses the ambulatory care and acute care independently with the similar set of independent variables. This is due to differences in the time horizon designed for

[44] Section 15 Personal information obtained under this act shall be strictly considered confidential… (2) Such disclosure is for the use of agencies in the preparation, analysis or research of statistics provided that such disclosure does not cause damage to the information owner and does not identify or disclose the data owner.

the survey as well as differences in types of healthcare services that decedents used prior to death, indicated in the literature (see Chapter Three, subsection 3.2.1.1). It should also be noted that expenditure in this chapter refers to out of pocket payment for direct medical cost including medicines, medical supplies, for instance.

Figure 6.1 Determinants and pathways of analysis of health care utilisations and expenditures of decedents



6.2.3 The Seventh Survey of Population Change (SPC)

This survey was designed as a fully-structured questionnaire which was repeated five times at 3 month intervals with the first round providing an enumeration. The survey was conducted from July 2005 to August 2006 by the nationwide staff of the Provincial Statistical Office. The objectives of the survey were to estimate population indicators including birth rate, mortality rate, fertility rate, and population growth rate; and to provide current information for population projection including demographic characteristics, data on change in demographic characteristics in the mid-decade (inter-census) period, as well as other socio-economic data.

6.2.3.1 Survey design, sample size and population estimation

It was a stratified two-stage sampling in which Bangkok and 4 regions (Central, North, North-East, and South), which included all 76 provinces were the strata. Blocks in municipal areas and villages in non-municipal areas were the primary sampling units, and private households and special households were the secondary sampling unit. Further details of the survey design and samplings are presented in Appendix 4, A4.1.

Finally, 82,000 out of 354,678 households in 2,050 sample blocks/villages were included in the survey. All special households were also assigned to be samples. All household members were interviewed, however, in impractical cases; the heads of the households were allowed to respond as proxies.

In inferences from individual samples to population, the weighting factor was applied (see details of its estimation in Appendix 4, A4.1). As a result of inferences, the estimated populations presented in each table might not be exactly the same because of the rounding up of the estimation into integer.

6.2.3.2 Survey data of the SPC

All questions and proposed answer choices are shown in a translated questionnaire indicated in Appendix 4, A4.2. Data employed in this study include information in households' geographic data, Part 1 and Part 4. Details were mentioned simultaneously with data in the SHUE under the topic of variables in multivariate analysis, subsection 6.2.5.

6.2.4 The Survey on Healthcare Utilisations of and Household Expenditures for Decedents prior to Death in 2005-2006 (SHUE)

In every visit by the SPC data collectors to each household, once it was established that there were decedent(s) during the three-month period prior to each visit, the data collectors interviewed the decedent care giver(s) prior to death using an additional SHUE questionnaire for every decedents. This questionnaire mainly focused on utilisations of healthcare and household expenditure for the decedents before death. It retrieved information for ambulatory care (OP visit) during the last three months and for acute care (hospitalisation) during the last six months before death.

6.2.4.1 Survey data of the SHUE

All questions and proposed answer choices are shown in a translated questionnaire indicated in Appendix 4, A4.3. This survey data was the main information employed in the analysis. Details of the data were mentioned simultaneously with data from the SPC under the topic of variables in multivariate analysis, subsection 6.2.5.

6.2.4.2 Identifying causes of death

Causes of death of decendents were conveyed by the patient's care giver or a household member and, if possible, the death certificate was shown to confirm the death to the data collectors[45]. The certificate included causes which had been indicated previously by the heads of villages or district officers, who officially provide the certificate for death at home, or causes which had been diagnosed by health personnel at a health facility. In addition to the death cases identified by non-health personnel, deaths at home or deaths with unknown causes were verified with Mahidol Verbal Autopsy System[46] by data collectors. In the case that cause of death was identified differently, cause from verbal autopsy was indicated as cause of death of the decedents. Finally, all reported causes of death were categorized into 98 diseases in SPC as well as 6 major groups in the SHUE.

[45] There were two objectives of clarification on death certification in the SPC, i.e. 1) to evaluate the death certification system and completeness of mortality data of Thailand; and 2) to confirm cause of death from interviewing

[46] Mahidol Verbal Autopsy System was developed by Institute for Population and Social Research, Mahidol University, Thailand. It was developed as a software on PDA as well as an algorithm manual and aims for cause of death investigation by non-medical personnel.

6.2.5 Variables in multivariate analysis

While there was a lot of information in the questionnaires, this study took a selected set of data from the surveys to meet the aims of the study described in this thesis (see questionnaires in Appendix 4, A4.2 and A4.3). Table 6.1 summarises independent and dependent variables provided in the two surveys and new generated ones which were selected into the multivariate analysis in accordance with previous reviewed literature (Chapter One, section 1.3.2 and 1.4 and Chapter Three, subsection 3.2.1.1). Details of data manipulation are described as follows.

6.2.5.1 Independent variables

Independent variables include geographic data (region and municipality), demography (gender, and age at death), socioeconomics (income quintile and occupation), household relationships (being head of household), causes of death, places of death, health insurances and use of complementary medicine (in modelling utilisation of and expenditure for ambulatory care). Categorization of some independent variables provided by multiple choice questionnaires was revised to be consistent with the variables in Chapter Five, subsection 5.2.3. This revision also reduced the impact of differences in numbers of groups and samples in statistical analysis. The reference category of some variables was selected using the same reasons indicated in Chapter Five.

(1) Region: In SPC Part 1, addresses of households were indicated. Of these, five regions of Thailand were classified as Bangkok Metropolitan (the capital), Central, North, North-east and South. Bangkok was indicated to be the reference category. For the reason that Bangkok had the best distribution of health facilities in particular advanced tertiary care, it was hypothesised that decedents living in Bangkok had the highest access to and expenditure for healthcare services.

(2) Municipality: Urban and rural areas were separated by local governments as municipal and non-municipal areas from household addresses in SPC. All residences in Bangkok were indicated as a municipal area. To be consistent to region, urban areas were selected as a reference. Due to more convenience in travelling, it was expected that decedents living in urban areas had greater accesses to and expenditure for health services.

(3) Gender: This was coded as male and female in SPC Part 1. Female, a reference category, was expected to have greater access and expenditure.

(4) Age at death: Age in years was calculated from the date of birth and date of death provided in the SPC Part 1 and Part 3. In the case of data loss of either date, age in the fifth round was employed. To be consistent to categorisation and its reason stated in Chapter Five, subsection 5.2.3.1 (2), eleven groups of age were defined. The under five year old group was the reference category.

(5) Being head of the household: The SPC Part 1 provided 10 categories of household members' relationship to the head of the household, however, only binary variable on whether or not the decedent was the head of household was employed in the multivariate analysis. This was in accordance with the discussion on the importance of the death of the head of the household to the households' income and composition (see details in Chapter One, section 1.4). Being the head of the household might result in higher access to and higher expenditure for health services.

(6) Education: Individual household members aged 6 years and above had the records of highest education in SPC Part 1. The 99 codes according to the standard code of education in the National Statistical Office were recategorised into three levels. Those included no education, primary level (1 to 6 years) and higher than primary level. To include children below 6 years old in the multivariate regression, their missing records of education was imputed to be no education. No education was selected to be a reference category and it was hypothesized that education had a positive relation with access to and expenditure for health services.

(7) Occupation: Individual household members aged 15 years and above were asked about their occupations and income. From four digit codes in records of main occupation in SPC Part 1, three-level category of new occupation was generated. It comprises of economically inactive; professionals which also included senior officials, technical or administrative workers and armed forces; and other occupations. To include children below 15 years old in the regression, their occupation was imputed to be economically inactive. In addition, this group was set to be a reference category. The group of professionals was expected to have highest access to and expenditure for health services.

(8) Income quintile: From SPC Part 1 information on every household member average income both monthly and income received in-kind, the individuals income could be estimated through the methods described in Appendix 4, A4.4 accordingly. Individuals were equally categorised into 5 levels of incomes (quintile). The fifth quintile is the well-off group while the first quintile is the group of poorest households of this dataset and it was indicated as the referent category. So, it was hypothesised that access to and expenditure for health services increased as income increased.

Note: Actually, this study had two living standard measures which included the incomes and incomes received in-kind in SPC Part 1, and household assets in the SPC Part 4. However, income and consumption were reported in its difficulty in developing countries because of less formal employment, reluctance to disclose information of income and quality of that information (O'Donnell, van Doorslaer et al. 2008d). As a result, this study also constructed the living standards by household asset index and found a significant positive correlation to income (see details in Appendix 4, A4.4). The measurement for living standards by income was selected to represent a socioeconomic factor due to less missing data than asset index in this data set (0.1 percent versus 4.1 percent).

(9) Causes of death: Due to the fact that qualified causes of death requires well-trained personnel on ICD codes and causes of death identification, this study recategorised the ninety eight causes of death (SPC Part 3) into six causes. Similar to causes of death in Chapter Five, these causes were the categories through the Thai study of Burden of Diseases accordingly. A fewer groups of causes might lead to less errors in identifying the causes because of the broader scope of each cause. The six causes included communicable diseases; non-communicable diseases; injuries; senility; cancer; and ill-defined causes. Ill-defined cause was a reference category and was expected to have least access to and expenditure for health services.

Note: Communicable diseases also included maternal, perinatal and nutritional conditions. Injuries also included poisoning, certain other consequences of external causes, and external causes of morbidity and mortality.

(10) Places of death: Eight places of death indicated in answer choices in SPC Part 3 were re-categorized into 4 groups as public health facilities, private health facilities, home and others. Home was an additional group to places of death from that in Chapter

Five. It was selected to be the reference and was expected to be the place that results in least access and expenditure.

(11) Health insurance schemes: Seven health insurances were provided as answer choices in two questions, main and second health insurance schemes of decedents in the SHUE Part 1. The study included only the main insurance schemes because of rare response to the second health insurance scheme. The seven choices were recategorised into five groups used in the analysis, that is, uninsured group, CSMBS, UCE, UCP, and SPrEm (SHI, Private Health Insurance and Insurance provided by Employers). Following to Chapter Five, the CSMBS, a reference category, was expected to have highest access to and expenditure for health services.

(12) Using complementary medicine: In ambulatory care, the SHUE provided records of using non-institutional health facilities including pharmacy, self medication, herbal medicines and alternative medicines. As of the survey period, complementary medicine had not been included in the benefit packages of all health insurance schemes including the newest health insurance, UC. However, after having health insurance allowing for health services from institutional health facilities which were mostly free of charge or 30 Baht user fee, use of complementary medicines might fall. As a consequence, this binary variable hypothesized that using complementary medicine results in greater access to and expenditure for ambulatory care as a whole.

6.2.6.2 Omitted independent variables

A socio-economic factor commonly found in some studies, i.e. marital status was not included in multivariate analysis. This is due to no significant findings according to marital status in a study by Cartwright (1992). In addition, as a result that this study aims to reveal the effect in all different age groups, records of marital status which was hurdling at age 13 years and above were ignored. This could automatically keep additional 3.9 percent of samples in the multivariate analysis.

6.2.6.3 Response variables

Regarding the analysis pathways indicated in Figure 6.1, using health services consists of ambulatory care and hospitalisation, with different periods of recall for different care. In each care, it was set as two hurdles, that is, the first hurdle was using care and

amount of care and the second hurdle was having expenditure and value of expenditure among the respondents that reported using care. As a result, this study focuses on:

(1) Using or seeking ambulatory care: All decedent care givers were asked to respond to this 'yes-no' binary choice. It was provided in the SHUE questionnaire.

(2) Numbers of visits: This count data were specified to the respondents indicated 'yes' in using ambulatory care in (1). It was limited to 98 visits within the period of 3 months before death. In addition, all visits of all types of health facilities were summed into a variable.

(3) Having expenditure for ambulatory care: In decedents who reported using ambulatory care, respondents were asked about the total household direct medical expenditure for ambulatory care within the last three months of decedents' lives. Of these, no payment or zero Baht was included. In analysis, as a result that there were nearly one-third of users for ambulatory care having zero payment, a binary variable of having expenditure was generated for the two-part model accordingly.

(4) Expenditure for ambulatory care: Similar to numbers of visits, all expenditure through all types of health facilities was summed into a total expenditure per decedent during the last three months of life. This continuous data were limited to 99,998 Baht through the SHUE questionnaire design.

(5) Using or seeking acute care: Similar to using ambulatory care, all decedent care givers were asked with a binary choice of using acute care as part I of the hurdle model.

(6) Numbers of hospitalisations: Like numbers of visits, this count data were intensified to acute care users only.

(7) Having expenditure for hospitalisation: Like having expenditure for ambulatory care, this binary choice variable was generated to be a hurdle for having out of pocket expenditure for hospitalisation at all types of health facilities.

(8) Expenditure for hospitalisations: This new continuous variable was generated by summing up all expenditure incurred by households for all types of health facilities providing acute care.

6.2.6.4 Handling missing data in multivariate analysis

Missing data was manipulated using the method described in subsection 4.3.2.1 (3) in Chapter 4. The SPC lost some of the household members' income data, 0.1 percent of income quintile was not available. As a result, the multivariate analysis included 2,170 samples which represent 382,901 decedents. In other word, the analysis had 0.2 percent of missing data.

Table 6.1 Variables in multivariate data analysis

Variable name	Source of data	Details of categorisation and reference category
Independent variables		
Region	SPC Part 1	Five categorical data as: Bangkok; central; north; northeast; and south Reference category: Bangkok
Urban (Municipality)	SPC Part 1	Binary data as: urban area (municipal area) and rural area (non-municipal area, reference)
Male (Gender)	SPC Part 1	Binary data as: male and female (reference)
Age at death	SPC Part 1 and Part 3	Eleven categorical data as: under 5 years; 5 to <10 years; 10 to <20 years; 20 to <30 years; 30 to <40 years; 40 to <50 years; 50 to <60 years; 60 to <70 years; 70 to <75 years; 75 to <80 years; 80 years and above Reference category: under 5 years
Head of household	SPC Part 1	Binary data as: being head of household and none (reference)
Education	SPC Part 1	Three categorical data as: no education; primary level; and higher level Reference category: no education
Occupation	SPC Part 1	Three categorical data as: economically inactive; professionals; and others Reference category: economically inactive
Income quintile	SPC Part 1	Five categorical data as: Q1; Q2; Q3; Q4; Q5 Reference category: Q1
Causes of death	SPC Part 3	Six categorical data as: ill-defined causes; communicable diseases; non-communicable diseases; injuries; senility; and cancer Reference category: ill-defined causes

Table 6.1 Variables in multivariate data analysis (cont.)

Variable name	Source of data	Details of categorisation and reference category
Places of death	SPC Part 3	Categorical data as: home; public health facilities; private health facilities; and others Reference category: home
Health insurance schemes	SHUE Part 1	Five categorical data as: uninsured; CSMBS; SPrEm; UCE; and UCP Reference category: CSMBS
Response variables		
Using ambulatory care	SHUE Part 1	Binary data as: yes and no (reference)
Numbers of visits	New generated variable from data in SHUE Part 1	Count data with defined range from 1 to 98 visits minimum = 1; maximum = 98
Having expenditure for ambulatory care	New generated variable from data in SHUE Part 1	Binary data as: yes and no (reference)
Expenditure for ambulatory care	SHUE Part 1	Continuous data with defined range from 1 to 99,998 Baht minimum = 5; maximum = 99,998
Using acute care	SHUE Part 2	Binary data as: yes and no (reference)
Numbers of hospitalisations	New generated variable from data in SHUE Part 2	Count data with defined range from 1 to 98 hospitalisations minimum = 1; maximum = 48
Having expenditure for hospitalisations	New generated variable from data in SHUE Part 2	Binary data as: yes and no (reference)
Expenditure for hospitalisations	New generated variable from data in SHUE Part 2	Continuous data with defined range from 1 to 999,998 Baht minimum = 20; maximum = 999,998

6.3 Results

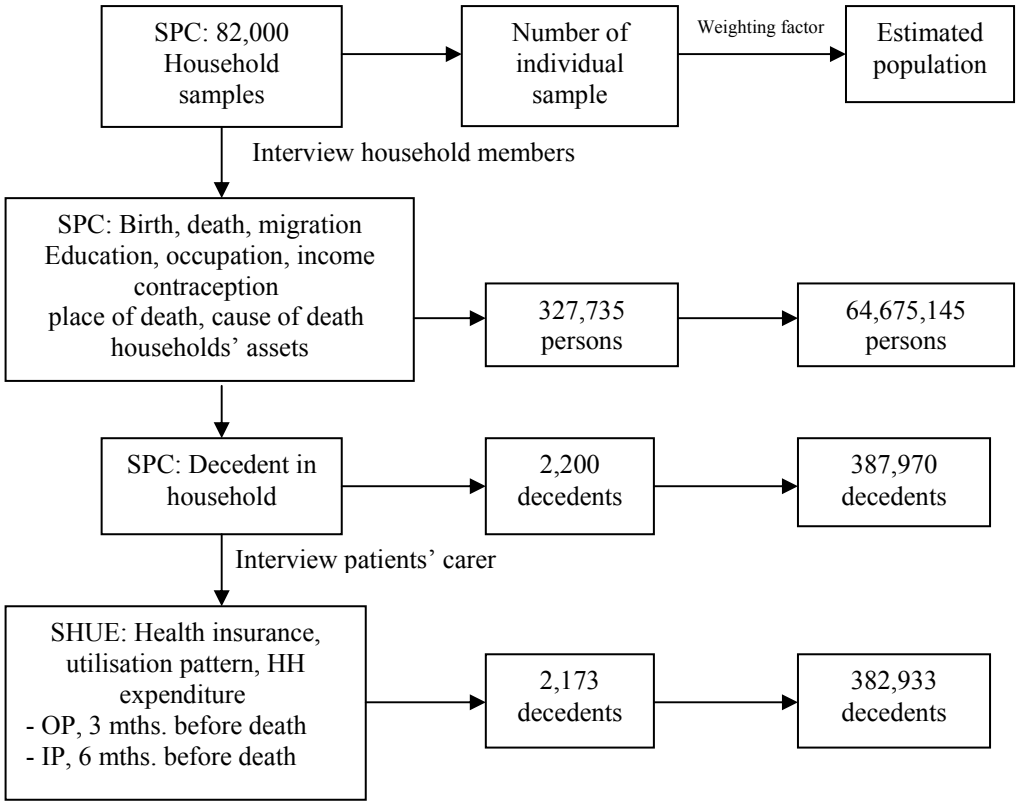
Six main findings from this study are presented in this section. As a result that this study reveals findings from data in two linked surveys, samples and population inferred are firstly presented prior to the main findings. Thereafter, the first section presents the general findings of mortality and descriptive statistics focusing on the disparities from income and health insurance schemes including the proportion of expenditure to household income and health seeking behaviour; the second section reveals the results from multivariate analysis; the last section presents the implication of the models to reveal the inequality in cancer patients.

Based on the fifth round of SPC, Figure 6.2 describes the flow of data collection, numbers of samples collected and the estimated number of population in both surveys. It was estimated that in 2005-2006 the Thai population was 64,675,145 (327,735 samples) and the numbers of decedents was 387,970 (from 2,200 samples). That is, the mortality rate was 6.0 per 1,000 habitants. The response rate of the SHUE was 98.7 percent of the death population, i.e. the study collected data on 2,173 (total N = 382,933) decedents on health care utilisations and household expenditure.

6.3.1 General findings

As mentioned earlier, in subsection 6.2.5.1, twelve variables of interest were collected in either the SPC or the SHUE which is unable to reveal a comprehensive crossover of all variables, descriptive statistics by income quintile and health insurance schemes are focused on. Due to the designs of the two surveys, some variables could be described as estimated population ratios but some of them could not. However, these population ratios were also revealed by income quintile specifically to variables of interest which included age specific to gender, to regions, to education and to occupation. These variables are often studied in mortality and inequity in previous literature (Commission on Social Determinants of Health 2008). In such cases of health insurance schemes, descriptive statistics in estimated population across such variables are presented instead of the population ratios.

Figure 6.2 Diagram of collected samples and estimated population of both surveys



Note: Sample and estimated population is based on the 5th round of the SPC.
Source: summary from SPC' s and SHUE' s survey designs

6.3.1.1 Lifespan and mortality rate

The youngest decedent was an infant aged less than 1 year and the oldest died at 115 years. Average lifespan was 62.7 years and women lived 10 years longer than men (68.5 versus 58.0 years). By income quintile, the poorest decedents in the 1st and 2nd quintile had the longest lives, approximately 67 years, whereas decedents in the 3rd quintile had a lifespan of 56.2; in the 4th quintile 57.6; and the richest in the 5th quintile 60.7 years. Decedents in CSMBS scheme were the oldest with an average age of 70 and decedents in the SPrEm scheme were the youngest dying at 37.4 years. Meanwhile, on average, UCE died aged 68.5, the UCP died at age 20 years younger. Uninsured decedents died at 65.5 years (see details in Appendix 4, A4.5 Table A4.4).

The crude mortality rate was 6.0 per 1,000 population. Table 6.2 shows the age specific mortality rate. No gradient of mortality rate from high to low in the poorest quintile (Q1) to the richest quintile (Q5) in all age groups. However, when comparing between

the poorest and the richest quintile, a disparity in age specific mortality rate, higher in the poorest and less in the richest group, was found in age groups below 50 years and in between 60 and 80 years.

Table 6.2 Age specific mortality rates in overall population (per 100 population)

Age group (yrs.)	Q1	Q2	Q3	Q4	Q5
<5	0.3	0.04	0.5	0.2	0.1
5 to <10	0.01	0.02	0.1	0.1	-
10 to <20	0.1	0.02	0.1	0.1	0.1
20 to <30	0.3	0.3	0.1	0.1	0.1
30 to <40	0.3	0.2	0.4	0.2	0.03
40 to <50	0.6	0.3	0.4	0.2	0.3
50 to <60	0.5	0.8	0.6	0.7	0.6
60 to <70	1.5	1.4	2.0	1.5	1.0
70 to <75	3.4	4.1	3.4	2.4	2.2
75 to <80	4.7	5.1	6.0	2.6	3.2
>=80	8.3	12.6	7.5	8.2	8.6
Total	0.9	0.7	0.6	0.4	0.3

Age specific mortality rates across quintile and some demographic, geographic and socioeconomic variables including gender, region, education, occupation were shown in Appendix A4.5, Table A4.5 to A4.8. No gradient of higher rate to lower rate across income quintile of individual age group from the poor (Q1) to the rich (Q5) was found. However, the total rates indicated that the poorer population had higher mortality rate across almost all levels of variables except population with professional occupation.

6.3.1.2 Using care and paying out of pocket

In general, 58.6 percent of decedents accessed ambulatory care services during the last three months and 57.0 percent accessed acute care during the last six months of life. In addition, 39.1 percent of decedents sought both types of care. Of these users, 65.6 percent paid for ambulatory care and 42.2 percent paid for acute care. In total, the expenditure of 760 decedents seeking ambulatory care and paid out of pocket within the last three months was 4,691,515 Baht and of 526 decedents seeking acute care and paid within the last six months was 24,964,256 Baht.

Table A4.9 shows the percentage of decedents using care and the percentage of users paying out of pocket categorized by variables (Appendix A4.5). It was found that more than half of the UCP decedents accessed ambulatory care as well as acute care and almost all of the users (97.4 and 95 percent, respectively) paid out of pocket. This is due to the 30 Baht user fee of the UC scheme. Compared to other health insurance, uninsured decedents sought both types of care in the lowest percentage but more than four fifths of the users made payments. In contrast, two-thirds of the CSMBS decedents sought both types of care but only one-third of users paid out of pocket. Alternatively, nearly two-thirds of the SPrEm decedents accessed ambulatory care and four fifths of the users had payments whereas one forth decedents accessed acute care and more than two third had payments. Compared to other causes of death, decedents dying from injuries had the lowest percentage of access to ambulatory care (13.1 percent) but had the highest percentage of users paying for care (76.8 percent).

6.3.1.3 Decedents and access to care across income quintile and across health insurance schemes

Among decedents, the percentage of decedents distributed across income quintile and various variables, and across health insurance schemes and various variables are shown in Table A4.10 and Table A4.11 (Appendix A4.5). Such Tables also present the percentage of access to ambulatory care and acute care. Across quintiles, decedents aged 80 and above was the biggest group dying in the two poorest quintiles whereas the age between 50 and 60 of the two well-off groups was the group that had more deaths. In the 1st and 2nd quintile, decedents in the north-east and the north were the majority of decedents, but decedents in the north-east and Bangkok were the majority of the 5th quintile. In all but the 5th quintile, more than two-thirds of decedents resided in rural areas. More than half of decedents in all but the 1st quintile were not head of households. The biggest proportion of decedents in all quintiles was educated up to primary level and economically inactive. Nearly half to two-thirds of decedents in all except the well-off quintile died at home. In addition, the higher the quintile, the greater the proportion was of those dying in hospitals. In all except the 5th quintile, decedents being UCE beneficiary were the majority but CSMBS beneficiaries were the majority in the 5th quintile. Decedents in all quintiles had similar proportions in causes of death except the 1st and 2nd quintiles which had a higher proportion than other quintiles in dying from senility. In the percentage of access to ambulatory care, there was no clear

pattern of most of the variables across quintile. However, females had higher access than male decedents and more than four fifth of decedents dying from cancer in all quintiles accessed ambulatory care before dying. In addition, this access was the highest proportion, compared to other causes of death. Similarly, no pattern was found in access to acute care by most of the variables. It seems that decedents living in urban areas had higher access to the care than decedents living in rural areas except decedents in the 4th quintile and decedents who were head of household and had higher access than other members. Decedents actively working before death also accessed care more than decedents who were economically inactive. Decedents dying elsewhere were less likely to access care than those dying in hospitals and dying at home in all quintiles. Compared to other health insurance schemes, CSMBS beneficiaries in almost all quintiles had higher access to care. In uninsured groups, the well-off decedents accessed care more significantly than other quintiles. Decedents in all quintiles dying from communicable diseases and cancer accessed acute care at a greater number than decedents dying from other causes of death.

Focusing on health insurance schemes independently, Table A4.11 in Appendix A4.5 shows the distribution of decedents. Nearly one-third of uninsured decedents were aged 80 and above; a quarter resided in Bangkok but more than half were in rural areas; nearly two-thirds were members of the households and nearly half were educated up to primary level. Approximately, four-fifths of decedents were economically inactive and nearly half were the poorest and 70 percent died at home with nearly one-third dying from senility. Nearly four-fifths of decedents did not use complementary medicines. The majority of the CSMBS decedents were similar to the uninsured group in age, gender, residing in rural areas, education, occupation, and using complementary medicine. However, nearly one-third of CSMBS decedents resided in the north-east and more than half were head of households. One-third of decedents were the poorest and another third was the well-off. Half of the beneficiaries died in public hospitals and nearly half died at home. More than one-third of the CSMBS decedents died from non-communicable diseases. The SPrEm had differences in the majority of decedents by some variables, compared to the former groups. That is, nearly two-fifths of decedents aged 30 to 40 years. More than half resided in northern and central regions. Nearly four-fifths were household members and had the highest education being higher than primary level. Nearly half of the decedents were in the third quintile and more than one-third of

SPrEm decedents accessed complementary medicines. Even though UCE and UCP decedents were beneficiaries of the UC scheme, both groups had differences in distribution by variables. The majority of the UCE decedents were aged 80 and above while the UCP were aged from 50 to 60 years. The UCE decedents were economically inactive but the UCP decedents had other occupations. More than one-third of the UCE decedents were the poorest meanwhile the UCP decedents were in 2nd and 3rd quintiles. Nearly two-thirds of the UCE beneficiaries died at home but those from UCP died at home equally to dying in public hospitals. While the UCE decedents died from senility, the UCP ones died from non-communicable diseases.

In access to ambulatory care, the CSMBS and SPrEm decedents accessed care the greatest amount, i.e. 66.7 percent and 62.4 percent, respectively. Even though access to care by various variables were categorised, the CSMBS decedents still revealed greatest access in most of the variables. In addition, 67.7 percent of CSMBS decedents accessed acute care but 58.3 percent of the UCP and 56.5 percent of the UCE decedents were the second and third group which accessed care greatly. Across individual categories of variables, there was no clear pattern of access to care among health insurance schemes.

6.3.1.4 Numbers of visits for ambulatory care and hospitalisations for acute care across income quintiles and across health insurance schemes

On average, of all decedents, access to ambulatory care was 4.8 visits during the last three moths of life and access to acute care was 1.7 hospitalisations. Table A4.12 revealed average visits and hospitalisation compared among income quintile by various variables (Appendix A4.5). In ambulatory care, it was found that no pattern in numbers of visits across most of the variables. However, decedents dying from cancer in every quintile but the 3rd quintile were likely to have a greater number of visits than decedents dying from other causes of death. It was also revealed that decedents in every quintile treated with complementary medicines had a greater number of visits than those with no treatments. Similarly to visits to ambulatory care, no pattern of hospitalisation among decedents in the different quintiles by various variables was seen. However, decedents dying from cancer had a higher number of hospitalisations than decedents dying from other causes in every quintile. Table A4.13 also shows no pattern observed of visits and of hospitalisations across health insurance schemes (Appendix A4.5).

6.3.1.5 Expenditure for ambulatory care and acute care across income quintiles and across health insurance schemes

On average among users, households paid 3,763 Baht for ambulatory care within the three months before death and 15,767 Baht for acute care within the six months before death. Table A4.14 revealed household expenditure for both types of care by quintile and other variables (Appendix A4.5). No gradient between low to high expenditure from the poorest quintile to the richest quintile in all variables was found. However, the richest quintile paid 3 times more than the poorest quintile. Similar to ambulatory care, there was no gradient and pattern of expenditures paid for acute care across quintiles but on average, the richest quintile paid 6.3 times more than the poorest quintile.

Compared among health insurance schemes, Table A4.15 shows the average expenditure by variables. It was clear that the uninsured decedents paid the greatest expenditure for ambulatory care (26,776 Baht), followed by the SPrEm decedents (6,530 Baht) and UCP decedents (4,988 Baht), respectively. There was no gradient and pattern of high to low expenditure across health insurance schemes and variables. However, female decedents as well as decedents educated higher than primary level were likely to have a greater expenditure than men and decedents educated at a lower level. Compared to other places of death, decedents dying in private hospitals had greatest out of pocket expenditure for beneficiaries of every health insurance scheme.

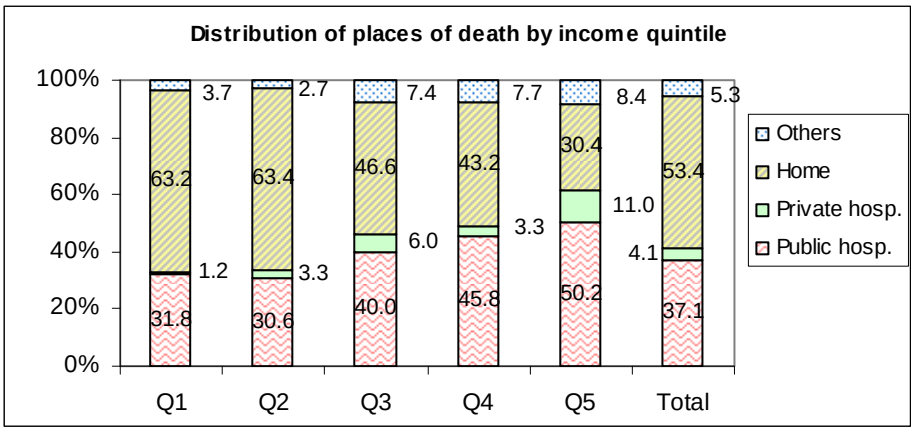
6.3.2 Pattern of places of death

Focusing on the pattern of places of death across income quintile, health insurance schemes and causes of death, Figure 6.3 shows such distributions of decedents. In total, half of all decedents died at home (53 percent), followed by approximately one-third in public hospitals (37 percent). The cause of death might have an influence to the places of death due to its relation to comorbidity prior to death. It is clear that death at public hospitals increased as the wealth by income quintile increased. In contrast, death at home decreased as the wealth increased (panel A). Approximately two-thirds of uninsured decedents as well as of UCE beneficiaries died at home whereas half of the CSMBS decedents died in public hospitals (panel B). By causes of death in panel C, the majority of decedents dying from ill-defined causes, senility and cancer died at home (75.7, 88.2 and 62.3 percent, respectively). On the other hand, nearly two-thirds of decedents dying from communicable diseases died in public hospitals (panel C).

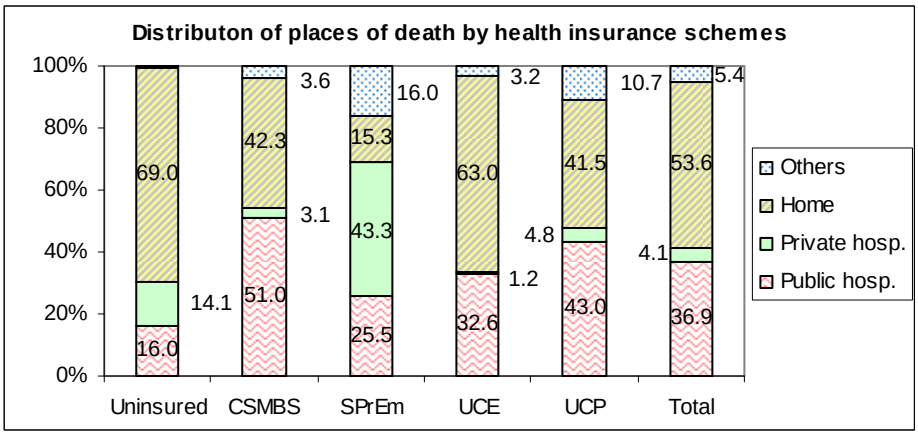
Focusing on decedents dying from cancer, in addition, it was found that most of decedents residing in Bangkok (94.1 percent) died in either public or private hospitals, that is, only 5.9 percent died at home. In contrast, 79.1 percent of decedents resided in the north-east died at home whereas 20.9 percent died in hospital.

Figure 6.3 Distribution of places of death categorised by three variables

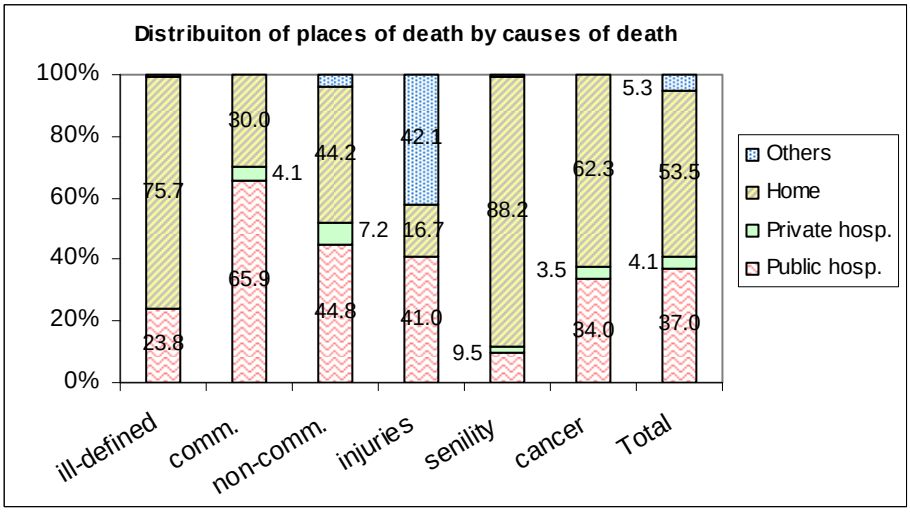
A: Income quintile



B: Health insurance schemes



C: Causes of death



6.3.3 Pattern of health care use

Figure 6.4 illustrates the utilisation pattern of access to ambulatory care and acute care by income quintile and health insurances. In seeking ambulatory care (panel A), generally community hospitals and general/regional hospitals were the major health facilities of decedents in all quintiles but the well-off quintile. Decedents in the richest quintile sought one-fifth of care at university hospitals while decedents in other quintile sought this care at these types of health facilities at less than 10 percent. In contrast, decedents in the richest quintile used complementary medicine at less than 15 percent while decedents in other quintile used 15 to 24 percent proportionate to all types of health facilities. This pattern was similar to the utilisation of private clinics in which there was a gradient of high to low utilisation proportion from the poorest to the well-off quintile. In acute care, panel B shows a gradient of seeking care at different type of health facilities from the poorest to the well-off quintile. Access to community hospitals and general/regional hospitals was higher in the poorest quintile and declined in the better-off quintile (from 87.6 percent in the 1st quintile to 67 percent in the 5th quintile), particularly in the community hospitals (from 36.6 percent in the 1st quintile to 14.5 percent in the 5th quintile). In contrast, access to university hospitals and private hospitals increased as the level of quintile increased, that is, from 6.6 percent and 5.8 percent in the 1st quintile to 20.5 percent and 22.5 percent in the 5th quintile, respectively.

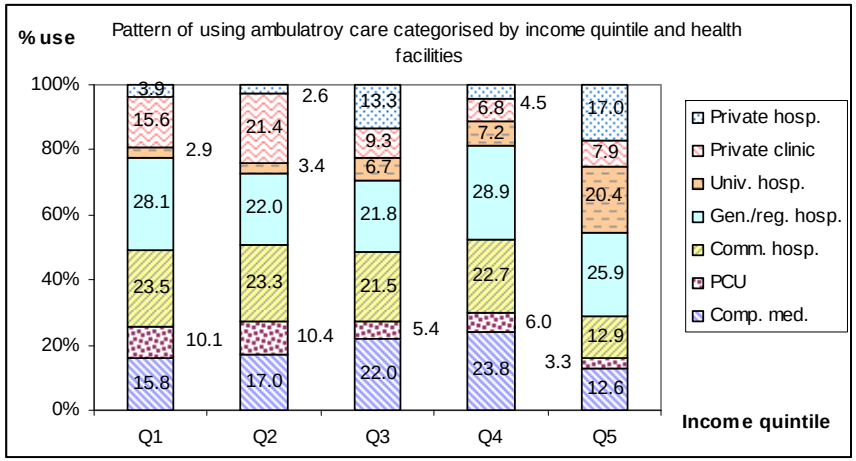
By health insurance schemes, Figure 6.4, panel C shows the proportion of using ambulatory care at every health facility. Uninsured decedents accessed care at private hospitals at more than one-third of all types of health facilities and using complementary medicines was the second most popular. SPrEm decedents accessed care at private hospitals equally as to complementary medicines, that is, two-thirds of all access. With similar proportions, both UCE and UCP decedents accessed care at PCU, community hospitals, general and regional hospitals. In contrast, more than one third of CSMBS decedents accessed general and regional hospitals (38.2 percent). Meanwhile, university hospitals accounted for the second most popular health facility (16.2 percent) while the PCU as well as community hospitals ranked third (10.2 percent). In acute care, private hospitals were the most favourite health facility of the uninsured as well as SPrEm decedents, that is, 45.8 percent and 41.1 percent, respectively. CSMBS decedents accessed care at general and regional hospitals at more than half of the access

to other types of health facilities while the UCE and UCP used general and regional hospitals (49.3 percent and 43.2 percent, respectively) and community hospitals (37 percent and 37.6 percent, respectively).

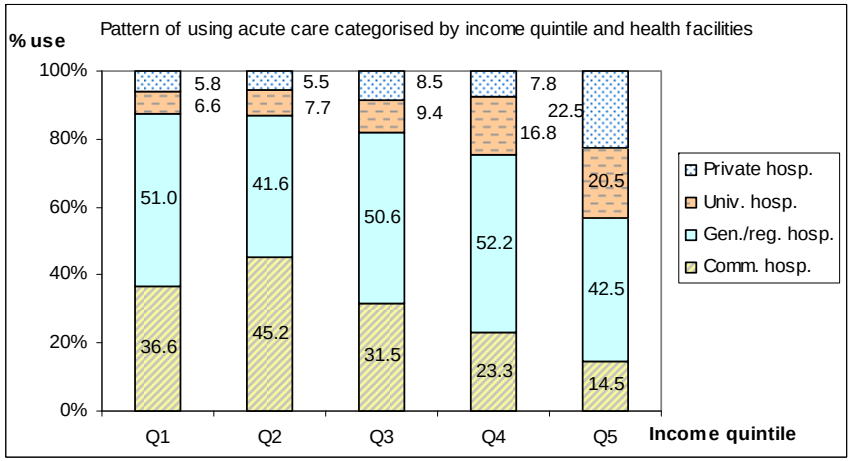
Looking at geography and causes of death, the supply side and demand side factors in health services might influence the pattern of health seeking behaviour. Both factors were out of scope of this chapter's objectives. However, the distribution pattern of both factors was depicted in Appendix A4.5, Figure A4.1.

Figure 6.4 Pattern of health care use at health facilities among different income quintiles and health insurance schemes

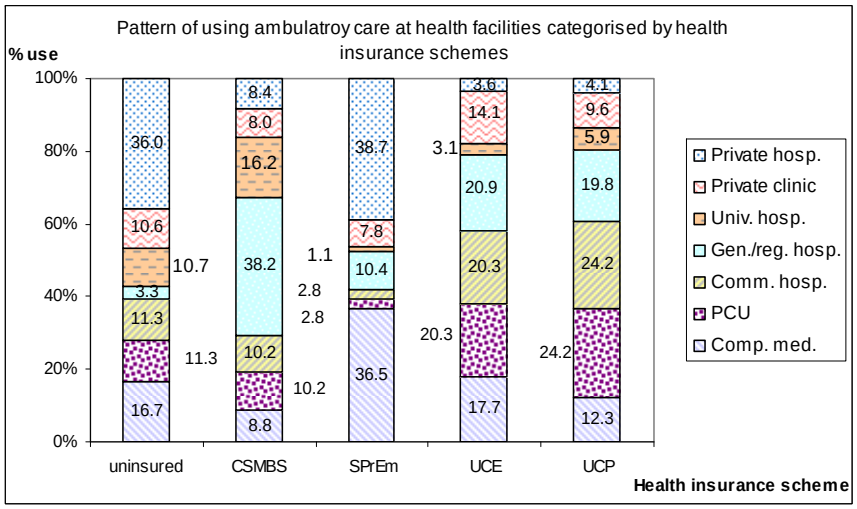
A: Using ambulatory care categorised by income quintile



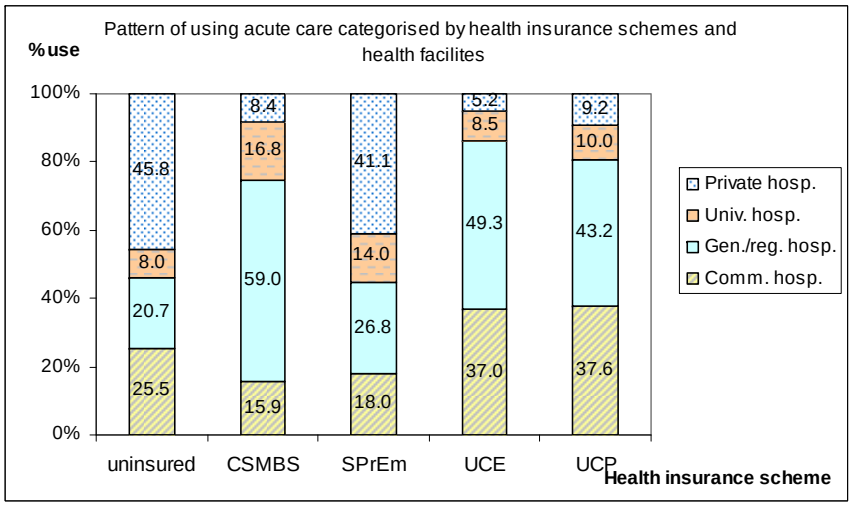
B: Using Acute care categorised by income quintile



C: Using ambulatory care categorised by health insurance schemes



D: Using acute care categorised by health insurance schemes



6.3.4 Multivariate analysis and the model selection

It was shown in previous literature that there are many factors affecting health care use at end of life. This subsection, therefore, examines the impact and magnitude of some selected variables of the surveys on health service utilisation and household expenditure according to the analytical methods in Chapter Four, subsection 4.3.2.1 (4), and subsection 6.2.2. Ten to eleven categorical variables included in the analysis are detailed in subsection 6.2.5.1, that is age at death, gender, region, municipality, head of household status, education, occupation, income quintile, cause of death, place of death, health insurance scheme and use of complementary medicine (specifying to ambulatory care). Such analysis with the two-part model was specified to utilisation of and expenditure for ambulatory care within the last three months and acute care within the last half year prior to death.

Utilisation of and expenditure for both types of care had non-normal distributions. The histograms of these utilisations and expenditure including the values of skewness and kurtosis are illustrated in Figure A4.2 and A4.3 (Appendix A4.6). The two-part model for utilisations employed the first part with logistic regression and the second part with the best fitted model, compared between zero-truncated Poisson model and zero-truncated negative binomial model. The model for expenditure employed the first part with logistic regression and the second part with the best fitted model, compared between four based models. Such candidates included the OLS, the OLS of logarithmic term of expenditure with Duan's smearing factor, the GLM with gamma distribution and log link, and the GLM with Poisson distribution and log link. The R^2 from the OLS indicated that this set of variables could explain 35.9 and 28.7 percent of the linear relationship of the covariates over the expenditure for ambulatory care and acute care, respectively. Details of coefficients of all variables in all models and their significance as well as test results including overdispersion for Poisson in modelling utilisation, specification test for GLM, i.e. both families and link functions, and plots were shown in Appendix 4, A4.6 (Table A4.17 to Table A4.20 and Figure A4.4 to A4.5).

In model selection for the utilisations between the zero-truncated Poisson and the zero-truncated negative binomial, overdispersion indicated by the α value is the test employed. Such value in Table A4.17 indicates overdispersion of the zero-truncated Poisson model for ambulatory care utilisation but Table A4.18 revealed no

overdispersion of the model for utilisation of acute care. As a result, the zero-truncated negative binomial is more appropriate for utilisation of ambulatory care and the zero-truncated Poisson model for utilisation of acute care.

According to suggestions by Dodd et al (2006) described in Chapter Four, subsection 4.3.2.1 (4) b), Table 6.3 and 6.4 summarises the test results (Root Mean Square Error: RMSE and Mean Absolute Error: MAE) and predicts the mean of the four candidates in modeling the expenditure for both types of care, compared to the observed ones. The lowest RMSE and the predicted means in both Tables indicated that the OLS was the best fitted model. However, the OLS might not be the appropriate model for expenditure due to the distribution profile, skewness and kurtosis of the data (shown in Appendix A4.6, Figure A4.2 and A4.3) could not meet the OLS assumption on the homoscedasticity of the variance. As a result, compared among the other three candidates in modeling the expenditures for both cares, the modified Park test in both GLM gamma-log and Poisson-log revealed that both families were suitable. Even though the predicted mean is approximately 50 percent over the observed mean, such model is the best fitted to this particular dataset in predicting expenditure for both types of care due to the lowest RMSE and MAE. In addition, the modified Park test in both GLM gamma-log and Poisson-log revealed that both families were suitable. The insignificance of Pregibon test for link function in modeling the expenditure for ambulatory care indicated; insignificance of Peason correlation test in GLM gamma-log and of Modified Hosmer and Lemeshow in modeling the expenditure for acute care, indicated that the log link could be employed (details in Appendix A4.6, Table A4.20 and Table A4.21). In addition, Table 6.3 and Table 6.4 indicated that the GLM Poisson family with log link provided the lowest RMSE and MAE. Even though the predicted mean is approximately 50 percent over the observed mean of both expenditures, such model is the best fitted to this particular dataset in predicting expenditures for both types of care over the other three models.

Table 6.3 Diagnostic test results of the root mean square error (RMSE) and mean absolute error (MAE); and predicted means for ambulatory care

Candidate model	RMSE	MAE	mean	S.E.	lower bound	upper bound
observed			7187.5	1180.8	4828.6	9546.4
OLS	15826.8	9457.1	7602.8	998.9	5607.3	9598.4
LnOLS with Duan's smearing factor	58837.8	19733.0	21593.3	4736.6	12130.9	31055.7
GLM gamma-log	100103.3	13035.0	14971.5	3597.1	7785.4	22157.6
GLM Poisson-log	28793.5	28793.5	10704.2	2410.0	5889.8	15518.7

Table 6.4 Diagnostic test results of the root mean square error (RMSE) and mean absolute error (MAE); and predicted means for acute care

Candidate model	RMSE	MAE	mean	S.E.	lower bound	upper bound
observed			39526.0	7228.4	25149.0	53902.9
OLS	132465.8	77890.5	57868.3	7258.1	43432.1	72304.5
LnOLS with Duan's smearing factor	833226.1	300077.0	313064.8	56533.1	200622.7	425506.8
GLM gamma-log	1250699.9	307199.8	312793.7	85572.1	142594.2	482993.1
GLM Poisson-log	187284.3	58094.85	60841.9	12338.3	36301.5	85382.3

6.3.5 The model and factors determining utilisation and expenditure

This subsection specifies the factors determining utilisation of and expenditure for ambulatory care and acute care with the selected model indicated in the previous section. In addition to the odds ratio and rate ratio of all variables which were adjusted in such selected model, the unadjusted odds ratio and incident rate ratio of each variable were presented. For both types of care, the two-part model comprises of the first part which determines the probability of access to care or having expenditure and the part II which determines the positive value of access or the expenditure.

6.3.5.1 Utilisation of ambulatory care

Variables which played a significant role in determining the probability in utilisation of ambulatory care included age, cause of death, place of death and health insurance

scheme whereas determining numbers of visits included, region, education, income quintile, cause of death, place of death, health insurance scheme and use of complementary medicine (Table A4.17 in Appendix A4.6). In the model for ambulatory care, Table 6.5 reveals odds ratio and the rate ratio of individual categorical level of a variable compared to its reference category when keeping other variables constant as well as unadjusting. Significantly when keeping other variables constant, decedents in all but the age group of 10 to <20 years had greater probability to use services for ambulatory care than decedents aged less than 5 years. Those aged between 20 to <30 years had the greatest probability. Uninsured decedents also had a two-third less probability than the CSMBS group in accessing such care. Decedents dying from communicable diseases, non-communicable diseases, senility and cancer had a higher probability to access services for ambulatory care than decedents dying from ill-defined causes. Decedents dying elsewhere had 87 percent less probability to access health services for ambulatory care than dying at home.

In determining the number of visits when keeping other variables constant, decedents living in the southern region accounted for nearly 50 percent less visits than those living in Bangkok. Higher educated decedents made three times more visits than uneducated decedents but the richest decedents in the fifth quintile represented nearly 50 percent less visits than the poorest decedents. SPrEm and UCP decedents had twice to thrice the number of visits of CSMBS decedents. Those dying from non-communicable diseases or cancer accounted for approximately 3 times more visits than those dying from ill-defined causes of death. Dying in public hospitals caused less ambulatory visits than those dying at home. Decedents using complementary medicine had a greater number of visits than no use.

Table 6.5 The two-part model for the utilisation of ambulatory care

Variable	Part I: Logistic regression				Part II: Zero-truncated negative binomial			
	Adjusted model		*Unadjustd model*		Adjusted model		Unadjusted model	
	Odds Ratio	Std. Err.	*Odds Ratio*	*Std. Err.*	IRR	Std. Err.	*IRR*	*Std. Err.*
Region, central	1.1293	0.5951	*0.6519*	*0.2524*	0.9229	0.2137	*0.8655*	*0.3180*
Region, north	1.5807	0.6995	*1.2786*	*0.4002*	1.0660	0.2210	*3.0021*	*1.7109*
Region, north-east	1.3039	0.5900	*0.9561*	*0.3166*	0.9135	0.2315	*0.8126*	*0.2494*
Region, south	1.4882	0.6129	*1.1127*	*0.5053*	0.5755*	0.1397	*1.4558*	*0.8273*
Urban	1.2584	0.2590	*1.0763*	*0.1865*	0.9842	0.1175	*0.5204*	*0.2771*
Age 5 to <10	81.9315**	115.4153	*1.5595*	*2.2600*	0.5307	0.2541	*0.7109*	*0.2875*
Age 10 to <20	4.9758	6.9749	*0.5759*	*0.6013*	1.0256	0.4719	*2.3959*	*1.2930*
Age 20 to <30	315.3343**	477.0804	*20.1062***	*19.8005*	0.7261	0.3272	*11.2184***	*6.7658*
Age 30 to <40	25.1074*	33.3640	*23.1728***	*23.9623*	0.5291	0.2189	*17.8832***	*10.9019*
Age 40 to <50	22.7970*	31.5394	*14.5269***	*12.5342*	0.5493	0.1930	*2.1599*	*1.1470*
Age 50 to <60	10.5186*	12.5139	*10.9924***	*9.5016*	0.5841	0.2251	*3.4484**	*2.0274*
Age 60 to <70	22.5107*	27.2747	*22.2828***	*19.7451*	0.9280	0.2576	*2.0411*	*0.9910*
Age 70 to <75	17.4583**	18.9500	*16.9728***	*12.5416*	1.0954	0.3173	*2.5055*	*1.3186*
Age 75 to <80	17.6623**	19.4905	*17.3427***	*13.6376*	0.8886	0.3190	*1.3986*	*0.6609*
Age >=80	18.5555**	18.8088	*14.4826***	*10.9269*	1.1529	0.3612	*1.5071*	*0.6567*
Male	0.8791	0.1373	*0.6259**	*0.1493*	0.9009	0.1217	*0.6294*	*0.4054*
Head of household	1.0703	0.2891	*1.1692*	*0.2577*	0.8396	0.1473	*0.3081***	*0.1267*
Education, primary	1.2520	0.4453	*1.5387*	*0.5386*	1.0713	0.1573	*1.6766**	*0.3621*
Education, higher	0.4451	0.2370	*1.0247*	*0.5682*	3.0389**	0.9305	*11.7556***	*6.0447*

Table 6.5 The two-part model for the utilisation of ambulatory care (cont.)

Variable	Part I: Logistic regression				Part II: Zero-truncated negative binomial			
	Adjusted model		*Unadjustd model*		Adjusted model		*Unadjusted model*	
	Odds Ratio	Std. Err.	*Odds Ratio*	*Std. Err.*	IRR	Std. Err.	*IRR*	*Std. Err.*
Occupation, professionals	0.5714	0.4054	*0.3319**	*0.1690*	1.2394	0.4491	*0.4916*	*0.3139*
Occupation, others	1.3053	0.5501	*1.3861*	*0.4681*	1.0828	0.1672	*0.7036*	*0.3839*
Income, Q2	1.2439	0.4551	*1.0430*	*0.2998*	1.0031	0.1615	*1.8436*	*0.8490*
Income, Q3	1.1928	0.3186	*1.0090*	*0.4015*	0.9120	0.1744	*4.0320*	*2.8762*
Income, Q4	0.8694	0.2715	*1.0226*	*0.4111*	0.8103	0.1811	*1.8170*	*0.8871*
Income, Q5	2.1674	0.8757	*1.0409*	*0.2807*	0.4607**	0.0824	*0.6654*	*0.2149*
Communicable ds.	14.5721**	9.4453	*6.5074***	*4.0656*	1.9172	0.8130	*1.7292*	*0.7095*
Non-communicable ds.	6.7252**	3.7080	*5.14756***	*2.3650*	2.8281*	1.1370	*7.0085***	*5.0110*
Injuries	0.3776	0.2850	*0.3284*	*0.2439*	5.3033	5.2382	*13.4915***	*10.2975*
Senility	5.0116*	3.7113	*4.4367***	*2.3439*	1.1481	0.4757	*1.2211*	*0.4767*
Cancer	13.0257**	8.2656	*14.9803***	*7.685272*	3.4032**	1.2226	*6.4350***	*3.0365*
Place of death, public hosp.	0.6984	0.1538	*0.6206**	*0.1385*	0.6562*	0.1252	*0.5390**	*0.1445*
Place of death, private hosp.	1.0769	0.7431	*1.2729*	*1.2570*	1.7012	0.6040	*9.8664***	*4.3772*
Place of death, others	0.1292*	0.1054	*0.0547***	*0.0278*	1.2267	1.2120	*0.3962*	*0.3201*
Uninsured	0.3357*	0.1525	*0.4383**	*0.1768*	1.8244	0.6707	*3.1919***	*1.1586*
SPrEm	3.0608	2.1599	*0.8614*	*0.6296*	3.0419*	1.6500	*29.0150***	*9.1944*
UCE	0.6831	0.2165	*0.9606*	*0.3153*	1.1600	0.1756	*2.0430***	*0.5072*
UCP	0.7573	0.3172	*0.5780*	*0.1633*	2.0521**	0.4598	*3.6845***	*1.5182*
Complementary medicine					1.7915**	0.2476	*4.1748***	*2.2733*

6.3.5.2 Utilisation of acute care

Table 6.6 reveals all variables included in the two-part model for utilisation of acute care, both adjusted and unadjusted model. Keeping other factors constant, meanwhile age, occupation, cause of death, place of death and health insurance scheme were the factors determining the probability of hospitalisations, age and cause of death significantly determined the number of hospitalisations (Table A4.18, Appendix A4.6). For individual level of category compared to the reference category, for example, decedents aged 20 to <30, 30 to <40, 70 to < 75, 75 to <80 and 80 and over had a greater chance to be hospitalised than children aged less than 5 years. SPrEm beneficiaries had 95 percent less probability of hospitalisation than CSMBS beneficiaries during the last half year of life. Decedents dying from communicable diseases, non-communicable diseases, senility, and cancer had a greater probability to be hospitalised of 10 to 43 times more than dying from ill-defined causes. Meanwhile dying at public or private hospitals had 3 to 3.7 times greater probability of hospitalisation, dying elsewhere had 90 percent less probability than dying at home.

In determining the number of hospitalisations, decedents aged 5 to <10 years had a much smaller number of hospitalisations than ones who were aged less than 5 years while decedents dying from injuries had nearly one-fifth less number of hospitalisations than decedents dying from ill-defined causes.

Table 6.6 The two-part model for utilisation of acute care

Variable	Part I: Logistic regression				Part II: Zero-truncated Poisson model			
	Adjusted model		*Unadjusted model*		Adjusted model		*Unadjusted model*	
	Odds Ratio	Std. Err.	*Odds Ratio*	*Std. Err.*	IRR	Std. Err.	*IRR*	*Std. Err.*
Region, central	0.8422	0.3503	*0.7317*	*0.1701*	1.8480*	0.5418	*1.5378*	*0.3690*
Region, north	1.0506	0.4826	*0.8687*	*0.2947*	1.2916	0.3042	*1.3501*	*0.3920*
Region, north-east	0.8190	0.3442	*0.6933*	*0.2470*	1.6810*	0.4228	*1.3983*	*0.3077*
Region, south	0.8623	0.4071	*0.8298*	*0.3805*	0.8302	0.2985	*0.9507*	*0.2288*
Urban	1.1725	0.3364	*1.1813*	*0.2679*	0.9651	0.2301	*0.9726*	*0.1861*
Age 5 to <10	9.3640	11.2594	*0.2215*	*0.3661*	4.7600E-09**	6.0100E-09	*9.2900E-09***	*9.4000E-09*
Age 10 to <20	0.9611	1.3084	*0.1588*	*0.1828*	1.0617	0.8626	*1.0152*	*0.4735*
Age 20 to <30	38.7175**	52.7206	*4.8011*	*5.5105*	1.1743	0.4981	*1.8016*	*1.0834*
Age 30 to <40	13.5036*	17.0202	*2.8739*	*3.0331*	0.8288	0.4331	*0.8455*	*0.4282*
Age 40 to <50	7.3326	8.2854	*5.1988*	*5.1933*	0.4923	0.3712	*0.5041*	*0.2612*
Age 50 to <60	6.6771	7.1468	*6.5675*	*6.5887*	1.1545	0.5989	*0.8888*	*0.3571*
Age 60 to <70	7.0298	8.4718	*4.5810*	*4.6223*	0.8469	0.3748	*0.8131*	*0.3484*
Age 70 to <75	19.2577*	22.3295	*7.0453**	*6.9763*	0.7491	0.3679	*0.7108*	*0.2869*
Age 75 to <80	19.8869**	22.2739	*6.8887**	*6.5321*	0.5632	0.2621	*0.5071*	*0.1870*
Age >=80	11.8942*	13.1683	*2.4098*	*2.2370*	0.6234	0.2702	*0.5621*	*0.2189*
Male	1.2950	0.3631	*1.3431*	*0.3291*	1.1542	0.1817	*1.36E+00*	*0.2428*
Head of household	1.1905	0.2651	*2.0134***	*0.3908*	1.0293	0.1693	*0.9947*	*0.2028*
Education, primary	1.0048	0.2065	*1.9297**	*0.5538*	0.8623	0.2454	*0.9473*	*0.2019*
Education, higher	0.6581	0.3759	*1.1567*	*0.6605*	1.6536*	0.3723	*1.7017*	*0.5648*

Table 6.6 The two-part model for utilisation of acute care (cont.)

Variable	Part I: Logistic regression				Part II: Zero-truncated Poisson model			
	Adjusted model		*Unadjusted model*		Adjusted model		*Unadjusted model*	
	Odds Ratio	Std. Err.	*Odds Ratio*	*Std. Err.*	IRR	Std. Err.	*IRR*	*Std. Err.*
Occupation, professionals	2.6085	1.4819	*1.9387*	*1.1342*	0.3750**	0.1414	*0.7451*	*0.1558*
Occupational, others	2.9831**	1.0620	*2.5310***	*0.8782*	0.7901	0.1422	*0.8962*	*0.1664*
Income, Q2	0.5583*	0.1563	*0.6591*	*0.1978*	1.0195	0.1436	*1.3009*	*0.2898*
Income, Q3	0.7011	0.2570	*0.7576*	*0.3001*	0.9797	0.1834	*0.8912*	*0.1087*
Income, Q4	0.5533	0.2395	*1.0863*	*0.4687*	0.8501	0.2017	*0.9319*	*0.2042*
Income, Q5	0.3216**	0.1248	*0.4289**	*0.1403*	0.6555	0.2491	*0.7664*	*0.2031*
Communicable ds.	31.9585**	23.9480	*28.0114***	*17.8807*	0.7372	0.2545	*1.0461*	*0.2397*
Non-communicable ds.	19.2425**	15.2476	*20.1191***	*13.3828*	0.7963	0.2857	*0.9716*	*0.2075*
Injuries	4.5240	3.7030	*2.5612*	*1.4439*	0.1668**	0.0600	*0.3768***	*0.1233*
Senility	9.8317**	6.5781	*7.5368***	*4.2314*	0.6954	0.2669	*0.7735*	*0.1983*
Cancer	42.9494**	34.2598	*45.7344***	*28.3729*	1.0979	0.4345	*1.5037*	*0.3509*
Place of death, public hosp.	3.0349**	1.0642	*2.2384***	*0.6443*	0.9635	0.1186	*0.8343*	*0.1487*
Place of death, private hosp.	3.7585*	2.2600	*0.8855*	*0.7628*	1.0380	0.4763	*0.8158*	*0.1971*
Place of death, others	0.0938**	0.0671	*0.0423***	*0.0226*	1.8443	0.8453	*0.9813*	*0.3442*
Uninsured	0.4467	0.2466	*0.4329*	*0.2228*	0.8855	0.2333	*1.0551*	*0.3812*
SPrEm	0.0537*	0.0606	*0.0847***	*0.0528*	0.3788	0.1904	*0.5419**	*0.1486*
UCE	0.6400	0.2814	*0.7315*	*0.2368*	0.7232	0.1527	*0.8275*	*0.1383*
UCP	1.0278	0.4658	*0.9323*	*0.2984*	0.9148	0.2532	*1.2064*	*0.3235*

6.3.5.3 Expenditure for ambulatory care

Table A4.19 and A4.20 show the logistic regression for the probability of having expenditure and the GLM (Poisson-log) for the values of expenditure for ambulatory care, respectively. It was indicated that after adjusting age, being head of household, occupation, cause of death, place of death and health insurance scheme determined the probability of having such expenditure while region, urban area, age, male, being head of household, occupation, cause of death, place of death, health insurance scheme as well as using complementary medicine determined the values of expenditure. Table 6.7 reveals the odds ratio and rate ratio of each factor in both parts of the model when keeping other factors constant as well as unadjusting.

For instance, when keeping other factors constant, decedents accessing ambulatory care aged 20 to <30, 30 to <40 and 40 to <50 had 99 to 92 percent less probability of having expenditure than children dying aged less than 5 years. Heads of household had 65 percent less likelihood of having expenditure than other members of the household. The uninsured as well as UCP decedents had approximately 300 to 500 times greater likelihood of having expenditure than CSMBS decedents. In determining the values of expenditure, decedents living in the central region had only one quarter of the expenditure of decedents living in Bangkok; decedents living in other regions had approximately one third or two fifths of the expenditure of decedents living in Bangkok. Heads of household paid 57 percent more than other household members. Decedents dying at private hospital had 4 times the expenditure of those dying at home.

Table 6.7 The two-part model of the expenditure for ambulatory care

Variable	Part I: Logistic regression				Part II: GLM (Poissopn-Log)			
	Adjusted model		*Unadjusted model*		Adjusted model		*Unadjusted model*	
	Odds Ratio	Std. Err.	*Odds Ratio*	*Std. Err.*	IRR	Std. Err.	*IRR*	*Std. Err.*
Region, central	2.0114	2.4303	*0.8234*	*0.5108*	0.2630*	0.1375	*0.1032***	*0.0305*
Region, north	1.1872	1.2914	*0.4487**	*0.1747*	0.3956*	0.1717	*0.3599**	*0.1617*
Region, north-east	2.7743	3.0755	*0.7492*	*0.3301*	0.3063*	0.1434	*0.2045**	*0.1303*
Region, south	2.4300	2.7482	*0.7834*	*0.4885*	0.3085**	0.1128	*0.1284***	*0.0571*
Urban	1.2095	0.3983	*1.1692*	*0.2310*	0.4394**	0.1338	*1.5066*	*0.5817*
Age 5 to <10	0.2466	0.3007	*0.6028*	*0.8757*	1.7010	1.7891	*1.5596*	*0.5325*
Age 10 to <20	(dropped)		*(dropped)*		1.9566	1.3834	*12.1547***	*10.0256*
Age 20 to <30	0.0129**	0.0205	*2.2965*	*2.3338*	6.2194	6.2509	*8.8962***	*6.0707*
Age 30 to <40	0.0400**	0.0483	*3.2513*	*3.9856*	0.5201	0.4482	*2.3680*	*1.0394*
Age 40 to <50	0.0824*	0.0860	*1.1257*	*1.0046*	0.3118	0.2346	*1.5122*	*0.8134*
Age 50 to <60	0.1904	0.3132	*5.7791**	*4.8967*	1.0408	0.7827	*2.9027*	*1.8022*
Age 60 to <70	0.2084	0.2284	*0.5658*	*0.4770*	0.8950	0.6331	*3.5790**	*2.0461*
Age 70 to <75	0.3471	0.4001	*1.2661*	*0.9338*	0.3462	0.2576	*1.1798*	*0.5049*
Age 75 to <80	0.5319	0.6680	*1.2600*	*1.0406*	0.4834	0.3634	*0.8666*	*0.4041*
Age >=80	0.4326	0.4838	*1.1488*	*0.7809*	0.8466	0.5870	*1.8994*	*0.8993*
Male	0.8006	0.3315	*1.0049*	*0.2613*	1.8792**	0.3692	*1.8368*	*0.6062*
Head of household	0.3515**	0.1411	*0.5118**	*0.1705*	1.5693*	0.2873	*0.9767*	*0.3615*
Education, primary	0.9943	0.4298	*1.3435*	*0.5226*	1.3311	0.3642	*2.1861*	*0.9883*
Education, higher	0.8884	0.5434	*1.3803*	*0.9944*	1.7789	0.7231	*7.3016***	*3.5113*

Table 6.7 The two-part model of the expenditure for ambulatory care (cont.)

Variable	Part I: Logistic regression				Part II: GLM (Poissopn-Log)			
	Adjusted model		*Unadjusted model*		Adjusted model		*Unadjusted model*	
	Odds Ratio	Std. Err.	*Odds Ratio*	*Std. Err.*	IRR	Std. Err.	*IRR*	*Std. Err.*
Occupation, professionals	26.8158**	27.7575	*2.6724*	*2.4060*	0.5143	0.2076	*2.0298*	*1.1696*
Occupational, others	1.3049	0.6427	*1.6238*	*0.5768*	2.0850	0.9048	*0.8857*	*0.5365*
Income, Q2	1.3029	0.7520	*2.1191*	*1.0420*	1.0995	0.4697	*0.8362*	*0.6395*
Income, Q3	0.5164	0.2004	*1.6988*	*0.7073*	2.0138	0.9690	*0.9237*	*0.3123*
Income, Q4	0.6814	0.4156	*1.7001*	*0.7379*	1.1953	0.5200	*0.3960*	*0.2165*
Income, Q5	0.8028	0.5816	*1.0585*	*0.4313*	1.2410	0.4455	*2.5816*	*1.3559*
Communicable ds.	1.7016	2.6629	*0.6062*	*0.5449*	0.2533	0.2457	*0.3129*	*0.2917*
Non-communicable ds.	1.6308	1.9698	*0.9324*	*0.6858*	0.5181	0.5054	*0.6466*	*0.5715*
Injuries	10.3519	16.3078	*2.7532*	*3.3116*	0.1169	0.1340	*0.1959*	*0.1851*
Senility	2.0837	2.6542	*1.3177*	*0.7516*	0.0901	0.1022	*0.1374**	*0.1240*
Cancer	5.0931	7.6936	*2.4435*	*1.8313*	0.2539	0.2675	*0.8516*	*0.8155*
Place of death, public hosp.	0.2957**	0.1258	*0.6300*	*0.2778*	0.2054**	0.0736	*0.2943***	*0.1138*
Place of death, private hosp.	3.9772	3.8896	*6.7311**	*6.3285*	4.1224**	1.2794	*2.5950*	*1.2894*
Place of death, others	0.3828	0.5014	*0.4081*	*0.3450*	0.1965	0.2655	*0.2635*	*0.3031*
Uninsured	317.4963**	451.5934	*27.9108***	*21.8341*	2.2292*	0.7724	*4.6829***	*2.2250*
SPrEm	7.6145	9.2803	*16.8194***	*17.5586*	0.1887*	0.1300	*1.0924*	*0.3960*
UCE	0.8938	0.4089	*2.1919**	*0.7296*	0.5376*	0.1662	*0.3926**	*0.1757*
UCP	485.4059**	491.1424	*94.1623***	*90.8702*	0.2953*	0.1577	*0.8074*	*0.4393*
Complementary med.	126.4473**	173.2768	*48.2729***	*49.7839*	0.5664*	0.1376	*0.3903**	*0.1635*

6.3.5.4 Expenditure for acute care

The two-part model for expenditure for acute care is shown in Table A4.21 and A4.22 in Appendix A4.6. Significantly, factors influencing the likelihood of having the expenditure included region, age, education, income quintile, occupation, cause of death, place of death and health insurance scheme. In addition, the factors adjusting in the model that significantly influenced the values of expenditure included region, age, male, cause of death, place of death and health insurance scheme. Table 6.8 illustrates the odds ratio of the part I and rate ratio in the part II of the two-part models, both adjusted and unadjusted. For instance, it was found that decedents living in central or north-eastern regions had four-fifths the likelihood of having expenditure for acute care compared to living in Bangkok. Decedents in the richest quintile had nearly 3 times greater likelihood of having expenditure than the poorest quintile. Part I of the model shows disparity in likelihood of having expenditure across different causes of death, compared to the ill-defined causes while dying from injuries had the greatest probability of having expenditure. In predicting values of expenditure for acute care, decedents in all regions had 16-34 percent the expenditure of decedents living in Bangkok. Expenditure for males was twice the expenditure of female decedents and the expenditure of the uninsured group was 5 times higher than that of CSMBS decedents.

Table 6.8 The two-part model of expenditure for acute care

Variable	Part I: Logistic regression				Part II: GLM (Poisson-Log)			
	Adjusted model		*Unadjusted model*		Adjusted model		*Unadjusted model*	
	Odds Ratio	Std. Err.	*Odds Ratio*	*Std. Err.*	IRR	Std. Err.	*IRR*	*Std. Err.*
Region, central	0.1900**	0.1098	*0.2603***	*0.1233*	0.3456*	0.1597	*0.4436*	*0.3434*
Region, north	0.4073	0.2445	*0.2117***	*0.0840*	0.2745**	0.1343	*0.1398***	*0.0583*
Region, north-east	0.2044*	0.1428	*0.1192***	*0.0493*	0.1888**	0.0950	*0.0749***	*0.0515*
Region, south	0.5311	0.4611	*0.0730***	*0.0464*	0.1571**	0.0878	*0.1227***	*0.0518*
Urban	0.8880	0.3380	*1.9776***	*0.4198*	0.5763	0.2376	*2.0567*	*1.3452*
Age 5 to <10	(dropped)		*(dropped)*		(dropped)		*(dropped)*	
Age 10 to <20	(dropped)		*(dropped)*		16.4851*	18.8293	*17.7359***	*15.0350*
Age 20 to <30	1.6388	1.9623	*18.7982**	*21.9914*	64.9716**	63.2344	*4.1643***	*1.9151*
Age 30 to <40	0.2342	0.2831	*4.0381*	*3.8226*	7.3079	8.2365	*0.7842*	*0.6128*
Age 40 to <50	0.2130	0.2903	*7.01201**	*6.8552*	1.9493	1.9980	*0.2460**	*0.1391*
Age 50 to <60	3.2401	3.7654	*6.2753*	*6.2802*	36.1703**	25.9378	*4.2968**	*2.6468*
Age 60 to <70	0.7411	0.7107	*1.9007*	*1.6561*	15.9367**	13.5973	*4.0686*	*2.9501*
Age 70 to <75	7.4745	7.6651	*1.7096*	*1.4739*	7.4428**	5.2979	*3.3216**	*1.6760*
Age 75 to <80	3.5940	3.9169	*1.2902*	*1.0876*	38.7833**	31.8770	*27.0277***	*20.5299*
Age >=80	4.2343	4.1933	*2.0666*	*1.6281*	12.6495**	10.1785	*8.4372***	*5.1924*
Male	0.8384	0.4036	*1.0641*	*0.3043*	2.1586**	0.6124	*2.6278**	*1.0950*
Head of household	1.2153	0.4716	*0.8053*	*0.2240*	0.8700	0.2296	*1.3932*	*0.7959*
Education, primary	0.6517	0.2464	*1.0201*	*0.3353*	1.2406	0.3617	*0.7911*	*0.4520*
Education, higher	2.7691	2.1313	*3.8570**	*2.5799*	1.9283	0.7753	*1.1750*	*0.6836*

Table 6.8 The two-part model of expenditure for acute care (cont.)

Variable	Part I: Logistic regression				Part II: GLM (Poisson-Log)			
	Adjusted model		*Unadjusted model*		Adjusted model		Unadjusted model	
	Odds Ratio	Std. Err.	*Odds Ratio*	*Std. Err.*	IRR	Std. Err.	*IRR*	*Std. Err.*
Occupation, professionals	5.5934	4.9986	*10.8693***	*8.0619*	0.5166	0.2863	*0.3114*	*0.2070*
Occupation, others	0.4686	0.2630	*1.7308*	*0.7548*	0.3830	0.1879	*0.0931***	*0.0512*
Income, Q2	1.0539	0.5692	*2.8416**	*1.1622*	0.5533	0.2824	*0.3197*	*0.1612*
Income, Q3	2.9611	1.8057	*2.9637**	*1.5851*	0.8225	0.4139	*1.4425*	*1.1610*
Income, Q4	3.1616	1.9273	*2.7408*	*1.6602*	0.7583	0.4236	*0.7080*	*0.5171*
Income, Q5	3.7797*	2.1069	*4.5392***	*2.3594*	1.1790	0.5443	*3.1422**	*1.5861*
Communicable ds.	218.6065**	326.9798	*2.6054*	*3.1329*	8.1225	9.1728	*4009.999***	*2191.8310*
Non-communicable ds.	189.5587**	236.0907	*3.4190*	*3.9944*	3.6923	3.8096	*789.4102***	*358.1875*
Injuries	1203.995**	2306.0800	*18.0214**	*20.8545*	2.9863	4.8813	*1018.897***	*472.1334*
Senility	336.6392**	422.2768	*1.5973*	*1.8053*	1.9156	1.9123	*698.1312***	*281.0954*
Cancer	1072.132**	1387.2520	*3.8699*	*4.3801*	2.0775	2.5539	*1134.656***	*348.5888*
Place of death, public hosp.	2.2503*	0.7762	*1.9504**	*0.6095*	1.0630	0.3370	*1.6350*	*1.1142*
Place of death, private hosp.	11.6738*	12.5103	*16.8359***	*12.7653*	1.8474	0.7631	*3.7888**	*2.4149*
Place of death, others	1.2491	1.1010	*0.7552*	*0.9346*	0.1730*	0.1459	*0.1055***	*0.0477*
Uninsured	45.6689**	42.6860	*7.7380**	*6.4296*	4.9680**	2.2266	*3.6382**	*2.2253*
SPrEm	2.1538	3.2045	*3.3334*	*2.3182*	0.3899	0.5664	*1.2496*	*0.8108*
UCE	0.6689	0.1969	*0.4740**	*0.1550*	2.3905	1.2149	*1.9203*	*1.3444*
UCP	6478.04**	6380.6870	*414.3686***	*243.0202*	0.2321	0.1873	*0.1535***	*0.0872*

6.3.6 Reasons underpinned for no use of acute care within the last six months of lives

Of all decedents, it was reported that 43 percent (N = 164,664) did not have any hospitalisation within the last six months prior to death. Of these non-seekers, the reason provided included sudden death (61.1 percent); decedents refused to be hospitalised (15.2 percent); decedents desired to die at home (14.2 percent); inconvenience in travelling (2.9 percent); inability to pay (0.4 percent); and other reasons which unable to identify (6.2 percent).

6.4 Summary on research findings and study limitation

6.4.1 Summary of research findings

For the 2006 Thai fiscal year, the mortality rate reported in this study was 6.0 per 1,000 population while the official mortality rate was 6.76, indicated in the Report on the 2005-2006 Survey of Population Change which is a similar survey. It was found in this study that decedents died aged 62.7 in which males died at 58.0 and 68.5 for females, while male life expectancy was reported as 69.9 and 77.6 for females. This difference is due to the official calculation based on the de jure mid year population while this study calculation is based on the estimated population in the fifth round of the survey. In addition, numbers of decedents were adjusted with population factors and the factors resulted from the Post Enumeration Survey by the National Statistical Office (Economic and Social Statistics Bureau 2007). Focusing on the wealth status (income quintile) which was different from the report on such survey, the age specific mortality rate do not show any disparity pattern across income quintile by selected factors indicated as the social determinants of health, for example, geography (region), and socioeconomic status (education and occupation) (Commission on Social Determinants of Health 2008). However, these age specific mortalities revealed the disparity between the poorest and the richest group in some regions, primary education, for instance. When comparing life span across health insurance schemes, decedents in CSMBS schemes were the oldest and SPrEm decedents were the youngest. This is due to each health insurance criteria for beneficiaries and benefit packages.

Prior to death, nearly 60 percent of decedents sought either ambulatory care or acute care in the last quarter and the last half year of life, respectively, and nearly two-fifths sought both forms of care. Of these, nearly two-thirds and two-fifths paid out of pocket

for ambulatory care and acute care, respectively. On average, the access rate was 4.3 visits per decedents within the last three months for ambulatory care and the household expenditure was 3,763 Baht per user. The access rate to acute care was 1.7 hospitalisations per decedent within the last six months and households paid 15,767 Baht per user.

Place of death shows relation to wealth status, health insurance scheme and cause of death. It was found that death at public hospitals increased and death at home decreased as wealth increased. CSMBS beneficiaries were more likely to die in public hospitals than beneficiaries of other schemes but uninsured group and the UCE likely died at home. Nearly two-thirds of decedents dying from communicable diseases died in public hospitals and in contrast, a similar proportion of decedents dying from cancer died at home. In seeking ambulatory care, community hospitals and general/regional hospitals were the major health facility that all except the richest group accessed. Such decedents sought care at general/regional hospitals and university hospitals. Access to private clinics and complementary medicine decreased as income quintile increased. Of seeking acute care, the use of community hospitals and general/regional hospitals decreased as income quintile increased which is contradictory to the use of university hospitals. It is also clear that access to both types of cares at available health facilities was according to the health insurance scheme. However, while the CSMBS decedents were likely to access general/regional hospitals and university hospitals, both UCs accessed to PCU, community hospitals as well as general/regional hospitals for ambulatory care, which was equally distributed, and general/regional hospitals and community hospitals for acute care.

In the two-part model, the based model was employed in multivariate regression in this study for both utilisations of and expenditure for ambulatory care and acute care. It provided the probability of using care or having expenditure in Part I and the positive values of the use and expenditure in Part II. Specifically to Part I and Part II, respectively, the best fitted model for utilisation of ambulatory care comprises of the logistic regression and the zero-truncated negative binomial model while the model for utilisation of acute care was the logistic regression and the zero-truncated Poisson model. In addition, the model for expenditure for both types of care was the logistic regression and the Poisson model.

A summary of the variables and the significant role of some variables for utilisations and expenditures of both types of care are shown in Table 6.9. It is clear that the four main predictors which played significant roles in seeking behaviour and payment for both types of care includes age, cause of death, place of death and health insurance scheme whereas the wealth status of the decedents which was one of two factors of interest stated in the objectives played a lesser role. Further, cause of death revealed its strong effect in determining all behaviour and payments but places of death and health insurance scheme had significant roles in all except in determining the number of hospitalisations. Age also affected all but the determining number of ambulatory visits and occupation was likely to determine the likelihood in seeking care and having expenditure. Region, a geographical factor, also determined the value of household payment for both types of care.

Table 6.9 Predictors of seeking health care and out of pocket payment for ambulatory care and acute care

Factor	Predictor	Ambulatory care				Acute care			
		Seeking care	Visit value	Having payment	Payment value	Seeking care	Visit value	Having payment	Payment value
Geography:	*Region*		**		**			*	*
	Bangkok (ref.)								
	Central	(+)	(-)	(+)	(-)*	(-)	(+)*	(-)**	(-)*
	North	(+)	(+)	(+)	(-)*	(+)	(+)	(-)	(-)**
	North-east	(+)	(-)	(+)	(-)*	(-)	(+)*	(-)*	(-)**
	South	(+)	(-)*	(+)	(-)**	(-)	(-)	(-)	(-)**
	Municipality				**				
	Rural (ref.)								
	Urban	(+)	(-)	(+)	(-)**	(+)	(-)	(-)	(-)
Demography:	*Age at death (yrs.)*	**		**	**	**	**	*	**
	<5 (ref.)								
	5 to <10	(+)**	(-)	(-)	(+)	(+)	(-)**	*(dropped)*	*(dropped)*
	10 to <20	(+)	(+)	*(dropped)*	(+)	(-)	(+)	*(dropped)*	(+)*
	20 to <30	(+)**	(-)	(-)**	(+)	(+)**	(+)	(+)	(+)**
	30 to <40	(+)*	(-)	(-)**	(-)	(+)*	(-)	(-)	(+)
	40 to <50	(+)*	(-)	(-)*	(-)	(+)	(-)	(-)	(+)
	50 to <60	(+)*	(-)	(-)	(+)	(+)	(+)	(+)	(+)**
	60 to <70	(+)*	(-)	(-)	(-)	(+)	(-)	(-)	(+)**
	70 to <75	(+)**	(+)	(-)	(-)	(+)**	(-)	(+)	(+)**
	75 to <80	(+)**	(-)	(-)	(-)	(+)**	(-)	(+)	(+)**
	>=80	(+)**	(+)	(-)	(-)	(+)*	(-)	(+)	(+)**

Table 6.9 Predictors of seeking health care and out of pocket payment for ambulatory care and acute care (cont.)

Factor	Predictor	Ambulatory care				Acute care			
		Seeking care	Visit value	Having payment	Payment value	Seeking care	Visit value	Having payment	Payment value
	Gender				**				**
	Female (ref.)								
	Male	(-)	(-)	(-)	(+)**	(+)	(+)	(-)	(+)**
Socioeconomics:	*Head of household*			**	*				
	No (ref.)								
	Yes	(+)	(-)	(-)**	(+)*	(+)	(+)	(+)	(-)
	Education		**					**	
	Uneducated (ref.)								
	Primary level	(+)	(+)	(-)	(+)	(+)	(-)	(-)	(+)
	Higher	(-)	(+)**	(-)	(+)	(-)	(+)*	(+)	(+)
	Occupation			**	**	**		*	
	Economically inactive (ref.)								
	Professionals	(-)	(+)	(+)**	(-)	(+)	(-)**	(+)	(-)
	Others	(+)	(+)	(+)	(+)	(+)**	(-)	(-)	(-)
	Income quintile		**					*	
	1st (ref.)								
	2nd	(+)	(+)	(+)	(+)	(-)*	(+)	(+)	(-)
	3rd	(+)	(-)	(-)	(+)	(-)	(-)	(+)	(-)
	4th	(-)	(-)	(-)	(+)	(-)	(-)	(+)	(-)
	5th	(+)	(-)**	(-)	(+)	(-)**	(-)	(+)*	(+)

Table 6.9 Predictors of seeking health care and out of pocket payment for ambulatory care and acute care (cont.)

Factor	Predictor	Ambulatory care				Acute care			
		Seeking care	Visit value	Having payment	Payment value	Seeking care	Visit value	Having payment	Payment value
Others:	Causes of death	**	**	*	**	**	**	**	**
	Ill-defined (ref.)								
	Communicable ds.	(+)**	(+)	(+)	(-)	(+)**	(-)	(+)**	(+)
	Non-communicable ds.	(+)**	(+)*	(+)	(-)	(+)**	(-)	(+)**	(+)
	Injuries	(-)	(+)	(+)	(-)	(+)	(-)**	(+)**	(+)
	Senility	(+)*	(+)	(+)	(-)*	(+)**	(-)	(+)**	(+)
	Cancer	(+)**	(+)**	(+)	(-)	(+)**	(+)	(+)**	(+)
	Places of death	**	*	**	**	**		*	**
	Home (ref.)								
	Public hosp.	(-)	(-)*	(-)**	(-)**	(+)**	(-)	(+)*	(+)
	Private hosp.	(+)	(+)	(+)	(+)**	(+)*	(+)	(+)*	(+)
	Others	(-)*	(+)	(-)	(-)	(-)**	(+)		(-)*
	Health insurances	*	**	**	**	*		**	**
	CSMBS (ref.)								
	Uninsured	(-)*	(+)	(+)**	(+)*	(-)	(-)	(+)**	(+)**
	SPrEm	(+)	(+)*	(+)	(-)*	(-)*	(-)	(+)	(-)
	UCE	(-)	(+)	(-)	(-)*	(-)	(-)	(-)	(+)
	UCP	(-)	(+)**	(+)**	(-)*	(+)	(-)	(+)**	(-)
	Complementary med.		**						
	no (ref.)								
	yes		(+)**	(+)**	(-)*				

Source: Table A4.17 to Table A4.22, Note: * $p < 0.05$; ** $p < 0.01$;
Ref. = reference; (+) and (-) = direction of the coefficient of such independent variable relative to the its reference and dependent variable

6.4.2 Data and methodological limitations of the study

This study was limited from having a better analysis due to the issues including, first, the difference in duration of data, that is, within 3 months of ambulatory care and within 6 months acute care. This mismatched duration made the analysis difficult in summing up the household expenditure of both types of care. As a result, the study had to reveal utilisation and expenditure for both types of services separately. Furthermore, for expenditure, in order to generalise such different periods into a year commonly used in health measures and financial terms, it required weighted factors for proportionate extrapolation. However, there was no factor available in the Thai setting, neither utilisation nor costs for ambulatory care nor acute care. Although Lubitz et al (1993) reported that the cost for hospitalisation during the last six months, last three months and last months of life accounted for 70-71, 51 and 30 percent of the cost for the whole last year of life in the US and Seshamani et al (2004a) predicted a significant increase in the rate of expenditure in the UK, as time gets closer to death, the model used in this study has not employed this fraction. This is for the reason that the different health systems in each country are likely to have different financing system and benefit packages which implicated different health care cost proportion.

A suggestion for further research using this survey method could include reducing the duration of acute care to 3 months to be equal to the term of ambulatory care. In fact, the severity of illness prior to death may be in greater need of hospitalisation than other periods in life. Some studies support this assumption, for example, Seshamani et al (2004a) indicated that the probability of being hospitalised from the 2nd quarter to the last quarter of life had a three fold increase (more details in Chapter Three, section 3.2.1) (Feudtner, DiGiuseppe et al. 2003; Seshamani and Gray 2004a). This might also lead to a reduction in the recall bias of the interviewees and therefore an increase in the accuracy of the responses.

Next, household expenditure on non-medical care cost might represent a great burden of cost incurred to households as well, particularly the travelling costs for households in remote rural areas. Although this travelling cost was included in the SHUE questionnaire, it was only for the last visit and last hospitalisation. A question about the average travelling expenditure households paid per visit or hospitalisation may be more useful. It would then not underestimate travel costs in the instance where the last visit or

hospitalisation was different from the usual health facility or free charge by the referral system. In contrast, the severity of illness in the last visit or hospitalisation might be greater than the visits or prior hospitalisations which the decedents required more comfortable and intensive care but expensive vehicles. That is, as a consequence, this last travel cost might be overestimated in representing the average cost of travelling during the last period of life. In addition, the question on reasons that underpinned no utilisation should not only be asked for non-hospitalised decedents but also the decedents who were non-users for ambulatory care services. This might fulfil the evidence for the non-seeking care decedents and monitoring the health system performance during the last period of life.

Two important items of information are lacking from the surveys, i.e. the religious group and ethnicity of the decedents. Even though 94 percent of Thais are Buddhist, the rest of the country is Muslim and Christian (Ekachampaka, Taverat et al. 2008). Religion might have an influence on the concept of death, beliefs and decisions on dying. Ethnicity might also have role in accessibility to health care, especially the ethnic minorities or permanent residents without citizen ID. Those minority groups had not been enrolled in any three health insurance schemes due to lack of citizen ID. The implicaiton of these factors on health seeking behaviour was found in a study in Medicare beneficiaries dying between 1996 and 1999, where difference in expenditure between blacks and white was indicated (Shugarman, Campbell et al. 2004). An additional minor point was the information about health insurance schemes of all respondents in the main SPC questionnaire might shed more light, for example, on decedent to population ratio of each health insurance scheme.

The analysis of health care utilisation and health expenditure employed the hurdle model or two-part model, in which the first stage or first part estimated the probability of using care and having expenditure by logistic regression. With regard to the modelling for probability, other models should be tested as well, for example, the probit model, clog-log model and log-log model for binary choice (Hardin and Hilbe 2007). The second part of the model for expenditure employed OLS, OLS on log expenditure with Duan's smearing factor, and the two generalized linear models family including gamma-log and Poisson-log. Poisson and log link was the best model for expenditure for both types of care. However, two tests of goodness of fit for the log link were significant, that is, this link might not fit the data. This might be partly due to high

variations in data and in this circumstance more data may be required. Owing to unavailability of some commands in Stata, analysis on the survey using weighted factor had limitations, in particular, post-estimation tests. The predicted means of expenditure by the two GLM models were higher than the observed mean, in particular, the gamma-log model. Thus, in addition to the based model, other one-part models might be more appropriate than this two-part model for both utilisation and expenditure. This one part for numbers of utilisation includes zero-inflated Poisson or zero-inflated negative binomial which takes the zero count into account of the regression (Hardin and Hilbe 2007). There might be another model which is more appropriate to health care utlisation and expenditure. Similar to the issue discussed about the effect of length of hospitalisation on as an endogenous regressor in Chapter Five, subsection 5.4.2, modelling in this study might have such effect of three socioeconomic factors plus health insurance scheme. As a result, ensuring of neither collinearility nor association with the linear instrumental-variable regression which accounts for the endogenous regressors should be employed (Cameron and Trivedi 2009). Taking these education, occupation and wealth status plus health insurance scheme might lead to over-adjusted position of the socio-economic factor in the model. Further details discussing the association of such socioeconomic factors and the effect on health care utilisation and household expenditure are described in following section.

6.5 Discussion

This study was a survey from the household perspective whereas all the studies found in the literature reviewed in this thesis were studies on expenditure incurred by health insurers. Thus, to some extent, expenditure of both sides might be different in pattern of use and factors determining expenses. The analysis of the household survey in this chapter meets most of its aims as a means of: estimating utlisation and household expenditure for decedents prior to death; revealing the health seeking behaviour of such decedents; and revealing the multiple factors affected to those seeking and expenditure which probably leads to inequity of household payment. One objective that the analysis was unable to address is the proportion of health expenditure to household expenditure, due to disaggregation of questions on the types of service use and expenditure as previously mentioned in subsection 6.4.2.

Compared to the general population, the proportion of decedents by health insurance schemes in 2005-2006 was different in all schemes except the UC. That is, the enrollees in 2008 (indicated in Chapter Two, subsection 2.2.4.1) and decedents were 75.7 versus 79.1 percent in the UC group; 8.1 versus 13.7 percent in CSMBS beneficiaries; 14.0 versus 3.0 percent in SPrEm; and 2.2 versus 4.1 percent of uninsured group. It was for the reason that, for example, death actually occurs at older ages rather than childhood and younger ages. This old age is more likely distributed in UC and CSMBS schemes than the SPrEm which its target population includes working ages with a small mortality rate.

Even though the seeking behaviour of the general population was reported in yearly durations and excluded decedents, comparison between both groups might provide some useful information. The general population revealed in 2003 Health and Welfare Survey[47], the latest survey close to the survey period of this study, was reported that on average, the hospitalisation rate was 0.08 per person per year whereas the rate of the decedents in last six months of life was 1.7 hospitalisations per person (Vasavid, Tisayaticom et al. 2004). It should be noted that decedents were the population with high access. The utilisation of a decedent might share the health care resources more than double the general population. As a result, the report of illness, morbidity lacking of this decedent group might be underestimated. By health insurance schemes, it was reported in a different fashion in the HWS study and this study where the CSMBS beneficiaries were the group of highest hospitalisations in general population but the UCP decedents were the group with greatest hospitalisations, i.e. 0.10 versus 2.1. This might reflect the different patterns of health care use during the other periods and the terminally ill stage across different health insurance schemes.

Even though first choice of health facilities between the UC and the CSMBS beneficiaries are different, no difference was found in ambulatory care seeking behaviour in both UC beneficiaries and CSMBS beneficiaries between the general population and the terminally ill group. That is, the UC group sought more service at PCUs and community hospitals and the CSMBS group sought more service at community hospitals and general/provincial hospitals. In seeking acute care, the

[47] The Health and Welfare Survey is the regular survey on health conducted by the National Statistical Office. It explores illness episodes, health service utilisation and compliance rate of health insurances. Such illnesses are the episode in a month for ambulatory care and 12 months for acute care prior to interviewing date. The samples are the existing household members.

majority of hospitals which the general population and decedents accessed were not similar in the two groups. That is, in the general population, the group with CSMBS insurance sought general/regional hospitals (32.3 percent) as well as community hospitals (28.2 percent), and those covered by the UC accessed community hospitals (54.4 percent) and general/regional hospitals (27.0 percent). In contrast, CSMBS decedents accessed general/regional hospital substantially (59.0 percent) and those from UC sought care at general/regional hospital (49.3 percent in UCE and 43.2 percent in UCP) and community hospitals (37.0 percent in UCE and 37.6 percent in UCP), respectively (Vasavid, Tisayaticom et al. 2004). It seems that the terminally ill population might seek more advanced care than the general population and patterns of using health facilities for acute care were also changed. However, these comparisons provide only a rough idea and interpretation should be done cautiously because of differences in time frame of both surveys and the survey design. Further research is needed for confirmation.

By wealth status, Prakongsai (2008) reported that people in the poorer quintiles were more likely to seek ambulatory care at primary care health facilities than the better-off quintiles. In contrast, this study could not reveal different seeking patterns between the poor and the rich. It seems that community hospitals and general/regional hospitals were the popular health facilities for ambulatory care among decedents regardless of wealth status. In seeking acute care, the 2003 survey revealed that the poorest quintile had the lowest rate of hospitalisations while the richest had the highest rate (0.105 versus 0. 598 hospitalisations per capita per year). In contrast, the poorer decedents in the 1st and 2nd quintile had the highest rate of hospitalisations (1.8 and 1.9 versus 1.3 hospitalisations per six months). Further, utilisation of community hospitals decreased as income quintiles increased in the general population which is similar to the decedent group. In addition to the decedent group, utlisation at university hospitals and private hospitals had a positive relation to the wealth status.

Compared to other countries, Thai decedents are likely to have less access to formal health care than decedents in developed countries, i.e. 58.6 percent and 57 percent for ambulatory care within three months and acute care within six months, respectively while access to acute care in the US was 55-77 percent; 90 percent in access to GP and 73.2 percent in access to acute care during the last year of life in the UK; and 79 percent in access to acute care and 60 percent to ambulatory care during the last three months in

Sweden (details show in Chapter Three, Table 3.2) (Emanuel, Ash et al. 2002; Seshamani and Gray 2004a; Jakobsson, Bergh et al. 2007).

The findings of this study show there was disparity and inequality in utilisation and expenditure among decedents due to the effect of many factors revealed in the multivariate analysis. The main determinants of health care service utilisation and household expenditure include age at death, cause of death, place of death and health insurance scheme. In contrast, municipality, gender, being head of household, education and wealth status (income quintile) play a small role in utilisation and expenditure for both types of care. Geography (region) was likely to have no significant role in probability of payment but have a significant role in monetary terms of expenditure for both types of care. The differences revealed that when keeing other factors constant, decedents who sought care in the four regions had significantly less out of pocket payments than decedents living in Bangkok, implicating in inequality of payment across the geography. Cause of death revealed its different effects in all steps of determining utilisation and expenditure; however, it is difficult to conclude the inequality or the inequity. This is due to the fact that patients with different diseases may need different types of health care and services which is indicated as vertical equity, and it is difficult to measure such health needs (see Chapter Three, subsection 3.1.2.2). Compared to home death, dying at public hospitals was expected to have less chance and number of utilisation of, and less chance to incur and less amount of household expenditure for ambulatory care, but such place determined greater household expenditure for acute care. In other words, dying at home would lead decedents to have more utilisation of and expenditure for ambulatory care but would lead to less utilisation of and expenditure for acute care than dying in public hospitals.

Focusing on wealth status, a main factor of interest, when holding other factors constant, it only had an effect on the amount of utilisation of ambulatory care and on payment for acute care.(Table 6.9). The richest decedents had significantly fewer visits for ambulatory care and a significantly less likelihood of hospitalisation than the poorest. Both adjusted and unadjusted models revealed a likely similar significant role of the wealth status for utilisation and household payment except the amount of payment for acute care (Table 6.8). After adjusting, the odds ratio and its standard error did not show great change. Considering with other socioeconomic factors (education and occupation) between adjusted and unadjusted models, these two factors also

revealed likely similar significant effect and small changes in odds ratio, rate ratio and standard error across each category (Table 6.5 to Table 6.8). Such change might support that there was no collinearity among the socioeconomic factors in the model but rather the association of such independent categorical variables.

However, data quality of the wealth status which might influence the minimal effect to dependent variables should be taken into account. In this study, wealth status (or living standards) of individuals represented by household income quintile might have less accuracy than other methods. As indicated in Appendix 4, section A4.4, income quintile and quintile of household assests shows weak correlation possible leading to inaccuracy, that is, the quintile was scattering in distribution and less than half of population was classified in similar quintile. This might be in line with comment of O'Donnell et al (2008b) that generally, household income as well as consumption or expenditure itself has limitation leading to inaccuracy. This is due to reluctance of the survey respondents in disclosure of information. In developing countries including Thailand, the common employment is in the informal sector for which income is a multisource and continually changes, as a consequence collecting income is more difficult than comsumption (O'Donnell, van Doorslaer et al. 2008d).

In contrast to the socio-economic factors, health insurance scheme, another main factor of interest, clearly shows their significant effect in all steps determining the utilisation and expenditure of decedents. With regard to collinearity among socio-economic factors and health insurance schemes and overadjusting of the model, Table 6.5 to Table 6.8 show small change of odds ratio, rate ratio and standard error between adjusted and unadjusted models for use of both types of care. Dramatic change was observed in the likelihood of payment for both types. Even though health insurance schemes unavoidably relate to the socioeconomic status of their beneficiaries, the distribution of decedents in this study by health insurance schemes across education, occupation and wealth status shows unexpected relation as usual. That is, for example, the majority of CSMBS decedents had primary education and was economically inactive but was categorized in the 1st quintile as the same as the 5th quintile rather than the 2nd quintile (Appendix 4, Table A4.11) rather than higher education, having professional work and de facto being the well-off. As a result, such concerned problems might not be the case of the modelling in this study. In other words, those three socioeconomic factors including health insurance scheme were associated. This might be for the reason that the

study focusing on a special group of the whole population, the decedents which their wealth status represents the status of selected households rather than individual status of decedents (See details of method using for determining and categorising wealth status in Appendix 4, A4.4). The majority of the decedents was in old age, more than 60 years (subsection 6.3.1.1), hence, it was expected that they were not well-educated when they were young, at least 30 years ago. Even though they were CSMBS beneficiaries, they were economically inactive due to retiring before death. General CSMBS beneficiaries include people with the direction of higher education and being professional, compared to the UC. Specific to the propensity of having expenditure, it could additionally be explained by the fact that the health insurance schemes focus on different target population and provide different benefit packages (see Table 2.7). For example, compared to other schemes, the UCP shows greater probability of paying compared to the CSMBS because it was a compulsory of 30 Baht copayment of user fee as well as the uninsured decedents who were required all payment.

Regardless of proving quality of the data, it should be concluded that there was nonsignificant inequality in access to ambulatory care between the rich and the poor when holding other factors constant (Table 6.5). However, significant inequity of access to acute care was found and the poor had greater access than the rich (Table 6.6). On payment, there was no significant inequality in the chance and value of expenditure incurred for ambulatory care except the chance of paying for acute care between the rich and the poor. That is, the rich had significantly greater chance of paying than the poor (Table 6.7 and Table 6.8).

Further indicating the progressiveness or regressiveness could be revealed by multiplying the predicted likelihood and the predicted value of utilisations and expenditure. However, this is out of the scope of this study.

After holding other factors constant and compared to ill-defined causes, decedents dying from cancer would have the greatest chance in access to and number of utilisation of both types of care. However, such cancer decedents would have greater chance in paying and amount of expenditure for ambulatory care than dying from ill-defined causes and other non-communicable diseases but higher chance of paying but less value of payment than decedents dying from other non-communicalbe diseases.

6.6 Conclusion

Access to ambulatory care and acute care during the last period of life was likely to be different from regular access by the general population including the utilisation pattern of health facilities. Decedents had greater access to both types of care and the utilisation during this period which shifted to health facilities with more advanced care. Vast differences were also found in utilisations of and household expenditure for ambulatory care within the last quarter of life as well as acute care within the last two quarters of decedents' lives between 2005 and 2006. With multivariate regressions, it was confirmed that four factors including age at death, cause of death, place of death and health insurer had a significant effect on such utilisation and expenditure incurred to the decedents' households. However, it could indicate the majority of horizontal equity in access and ability to pay or wealth status whereas the difference in health insurers benefit packages determined disparity in access to both types of care and expenditure incurred to households even in the last period of life.

CHAPTER SEVEN

THE LAST PERIOD OF LIFE: TERMINALLY ILL CANCER PATIENTS AND THEIR CARE GIVERS PRACTICES AND PERSPECTIVES

7.1 Introduction

Unlike other diseases, cancer is a chronic disease that has a clear terminal stage. Up until now, patients with this chronic disease were likely to die within a certain period which depends on the disease staging after the first definite diagnosis. This period is shorter in the terminal stage, and has been estimated at less than three to six months (Thomas, Morris et al. 2004; National Cancer Institute 2006). The patients and their family might perceive disclosure of the diagnosis and prognosis, particularly in terminal illness, as bad news and thought that they were going to die. As a result, studying for example, their conceptualisation and experience of illness, their social culture, the level of economic development of the country, is needed to support the understanding of their preference, context and difficulties. These might lead to improvements in the services for health care for the terminal stage cancer patients and to have a good quality of life. For example, Murray et al (2003) indicated differences in needs and received health care between the 20 incurable cancer Scottish patients and 24 Kenyan patients, the background underpinning these differences included the health service system and available resources, disease patterns, religious beliefs and poverty level (Murray, Grant et al. 2003).

Regarding the place of death which might be a factor determining the health services for the advanced stage cancer patients, Tang et al (2005) found that in a national survey taken during February 2003 to May 2004, 61 percent of terminally ill cancer patients and 56.9 percent of their family caregivers from a total of 617 dyads in Taiwan preferred death at home (Tang, Liu et al. 2005). Meanwhile, Thomas et al (2004) found in qualitative conversation style interviews with 41 cancer patients and 18 care givers that no patient expressed a wish to die in hospital. Preferences were overwhelmingly in favour of either a home or hospice death. The study identified 13 factors as shaping the place of death preference (Thomas, Morris et al. 2004). In 2001-2002, Sepulveda et al (2003) found that preliminarily, the main needs of terminally ill HIV/AIDS and cancer

patients in 5 African countries seemed to be the relief of pain, accessible and affordable drugs and financial support. Poverty and sickness combined to put families in a critical financial situation. Other needs included the relief of symptoms other than pain and alleviation of social, emotional and spiritual problems (Sepulveda, Habiyambere et al. 2003).

Thus, this chapter focuses on the terminally ill cancer patients and care givers views. It was designed to seek an overview on their perspectives and preferences by employing the qualitative approach. The objectives of this study included:

- To explore the current practice on the disclosure of diagnosis, preference for quality of life and care, place of dying in terminally ill patients and the patients relatives; and
- To explore the multitude of factors considered important when people are dying.

7.2 Methods

Following the details given in Chapter Four, subsection 4.3.2.2, this study employed a qualitative approach, that is, the case study method in exploring and revealing some explanations supporting the findings from Chapter Five and Chapter Six. Terminal cancer was the disease of interest, as justified in the same section of Chapter Four.

Ethical consideration: In addition to the ethics approval from the university, this part of the research was approved by the ethics committee of Sappasithiprasong Regional Hospital in 2007 and accepted by referring of other health institutes in Ubonratchathani province.

The study encompassed end of life, dying and death. Thus, there might be unavoidable grief and bereavement of patients and their relatives during interviewing. Considering the sensitivity of the topic, the researcher aimed to avoid emotional disturbance and the interviews were conducted in a conversational style. The participants were given verbal information in illiterate cases or leaflet information (Appendix 5, A5.1) and details of the purposes of the study. There was no pressure on them to take part in the study. Verbal consent or/and informed consent (Appendix 5, A5.2) was gained and only competent adults were interviewed. Their permission to have their interviews tape recorded was requested and the cassettes will be kept confidentially for 5 years

according to the circumstances of the project[48] and would be destroyed following that. They were guaranteed anonymity but were told that their information may be quoted without their names and family names in research findings. By observation or talking, whenever the interviewees begin to express their sorrow, e.g. crying, the interviewing was paused immediately. The researcher might change the conversation to other relaxing topics and continued the interview whenever the interviewee was willing. When the interviewee continued to be distressed, the attending physician or nurse was informed. According to their opinion, psychologists or counsellors may be requested to alleviate the interviewees' distress. The participants could withdraw his/her participation independently for whatever reason and whenever they wished.

7.2.1 Research design and setting

Research was carried out as in-depth interviewing conducted during March to August 2007 in Ubonrachathani province as indicated in Chapter Four, subsection 4.3.2.2 (3). The researcher stayed for one to two months at each of three hospitals, i.e. Ubonratchthani Regional Hospital, Ubonratchathani Cancer Center, and KhuangNai. Figure 7.1 and 7.2 display the map of Thailand; the location of Bangkok and Ubonratchthani; and all 25 districts in the province and the three hospitals. Due to the distinctive referral system specific to health services for cancer patients, the patients who had definite diagnoses of cancer could have a short cut referral process, that is, patients could walk into the regional hospital or the cancer centre with one referral memo for an extensive period.

[48] The University's Guidelines on Good Practice in Research requirement

Figure 7.1 Map of Thailand, location of Bangkok, Ubonratchthani and other provinces in the regional referral systems of the regional hospital and the cancer centre

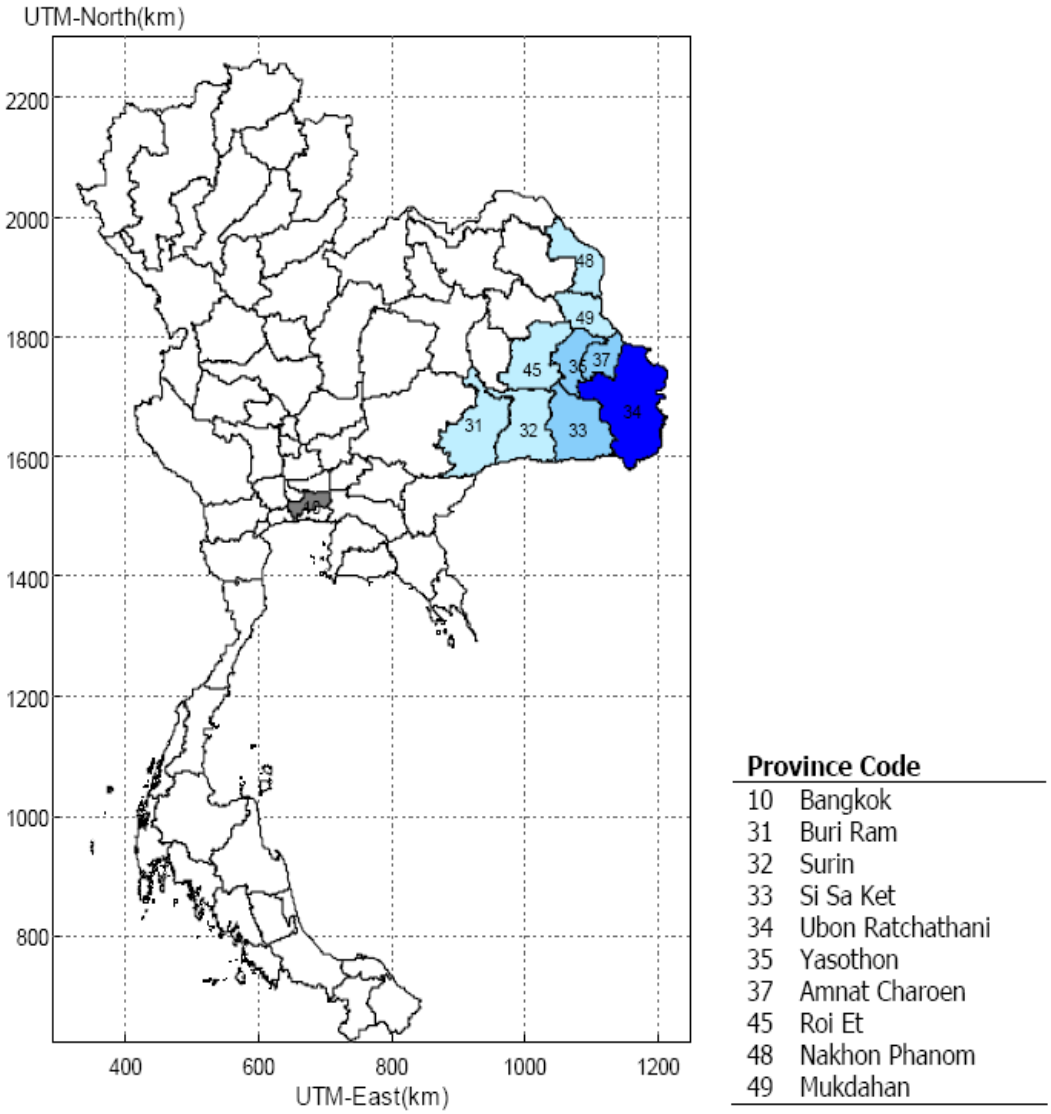
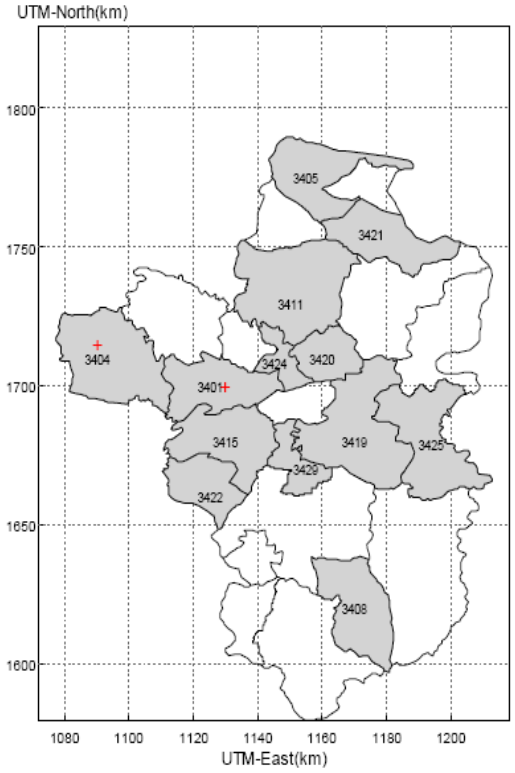


Figure 7.2 All 25 districts in Ubonratchthani including the districts the patient resided in (highlighted in grey) and the two districts where the three hospitals are located (the red-cross symbol)



District Code	
3401	MuangUbonRatchathani
3404	KhuangNai
3405	Khemarat
3408	NaChaluai
3411	TrakanPhutphon
3415	WarinChamrap
3419	PhibunMangsahan
3420	TanSum
3421	PhoSai
3422	Samrong
3424	DonMotDaeng
3425	Sirinthorn
3429	NaYia

The study employed purposive sampling by starting with identifying the potential participants in accordance with the eligible criteria by physicians or nurses, followed by inviting the patients and their care givers to participate, asking for telephone numbers and making an appointment for conducting interviews at their most convenient time and place, all during the day and mostly at their home. In the case of those who were hospitalized, in which case most patients were either in severe conditions or unwilling to participate, interviewing their care givers was conducted in a private area in the hospital. In order to facilitate the convenience in travelling of the researcher and research assistant, all participants resided in Ubonratchathani. Details of identifying participants and their eligible criteria are described in the following section, 7.2.2.

In addition to the patients and their caregiver perceptions on their illness, patients' history of illness was confirmed by the patients' medical record. This provides triangulation of the data collected in this study. Some participants might give more than

one interview depending on the completeness of their first interview. Later, they received a telephone call following up on their illness and mental health approximately within a week up to a month from the researcher. To be consistent across the researcher and research assistant, and individual to individual participant, the in-depth interview was constructed through the guided questions as described in Appendix 5, A5.3.

7.2.2 Identifying participants

Physicians and nurses who attend to the terminal stage cancer patients at surgical clinic/wards, obstetrics and gynaecology clinic/wards, pain clinics and general practice clinics were communicated with and asked to identify the cases. Then, the patients or their relatives (if any) were firstly approached by probing for the patients' primary perception on their illnesses and diagnoses. Patients without the awareness of their diagnosis of cancer were dropped. All participants addressed were invited to be informants with verbal and leaflet information about the study (see details in Appendix 5, A5.1), however interviews were not conducted unless the participants agreed by verbal consent and/or completing the consent form (Appendix5, A5.2).

7.2.2.1 Cancer Patients

Patients were recruited if they met the eligible criteria including patients who: 1) are age 20 or above[49]; 2) have a disease at a terminal stage which continues to progress with distant metastases and is unresponsive to current curative cancer treatment or is given palliative treatment or has a prognosis of less than three months; 3) know their diagnosis of cancer[50]; 4) the physician consents for her/him to participate; 5) who are cognitively competent; 6) who have no psychological problem e.g. depression, psychiatric disorders (since (s)he cannot reflect on her/his real thoughts with the narrative); and 7) willing to participate in the study.

7.2.2.2 Patients primary caregiver or decedents relatives

Patients caregivers were included with criteria as those who: 1) are most involved in the patient care and health care decision making; 2) know that the patient is in the

[49] Legal age at adult according to the Constitution of Thailand
[50] It was different from the proposal due to almost all of the patients in the fieldwork who met other criteria did not know their disease staging.

terminally ill stage of cancer; 3) are cognitively competent; and 4) willing to participate in the study.

7.2.3 Data analysis

The analysis was done using the method in Chapter Four, subsection 4.3.2.2 (5) accordingly. Due to the dialect specific to the Thais in the north-eastern region, the interviews were conducted in the official Thai and north-eastern dialect translated by the research assistant who is a local north-eastern Thai. The research assistant was a translator for the researcher and the patients as well as transcribing the conversation in the local dialect to official Thai.

7.3 Findings

This section revealed the findings from patients and caregivers experiences and views on cancer, making decisions regarding treatment, complementary medicines and supplement foods, preference for the place of care and place for dying, household expenditure, and perception on health insurance scheme and health services. On average, an interview took at least 2 hours per participant. Information was gathered from twelve patients and their caregivers while eight caregivers were interviewed alone, representing the patients.

7.3.1 Characteristics of selected patients and their caregivers

Forty-six cases were identified during the six months of standing by at three hospitals and twenty six were not recruited or dropped out. Reasons of such excluded cases include two patients dying prior to communication; eight residing in other provinces; eight unwilling to participate either since the beginning or during the second and third approach; three with unknown diagnosis; two unable to communicate or to follow up; and three unclear staging of cancer.

Twenty terminal stage cancer cases participating in this study completed the interview. Mainly, patients as well as care givers were the key informants. However, seven patients were not in a good mood or condition for interviewing and their care giver did not agree, as well. Table 7.1 summarises the main characteristics of the patients and their care givers. Thirteen female and seven male patients participated in this study, ages ranging from thirty-six to sixty-three years with an average of fifty-two. Of these,

eight were diagnosed with cancer of the liver or bile duct; four with cervical cancer; two with ovarian cancer as well as colon; and one each of stomach, lung, nasal cavity and rectum cancer. All of the patients were educated at primary level except a patient who was a teacher graduated with bachelor degree. Half were farmers and a quarter was owners of small businesses, two were workers and one of each was a housewife, teacher, police and employee. All were Buddhists; fourteen were married and all but one lived with their spouse; and the others were single or divorced. Two were CSMBS beneficiaries, of which one was transferred from UC to CSMBS beneficiary; one was the SHI beneficiary; and the others were UC beneficiaries.

Normally, there was more than one care giver taking care of a patient, particularly in older patients who were mothers. Next of kin and spouses were the primary care givers of patients with support from their families, of which three fourths were nucleus families. Ten of the care givers were the patient's spouse; seven were daughters and one daughter in law, one elder sister and one sister-in-law. There were fourteen females and six males and aside from their spouses, all had higher education than the patients. Five were government employees or state enterprise employees, five farmers, five owners of small business, three workers, one teacher and one housewife.

Table 7.1 Main characteristics of cancer patients and their care givers

Study no.	Family type	Patient					Care giver		Key informants
		Gender	Age	Health insurance scheme	Type of cancer	Residential area	Gender	Relationship to patient	
1	E	M	45	UC	colon	urban	F	spouse	CG
2	N	F	53	UC	adv. hepatoma	remote rural	M	spouse	P & CG
3	N	F	36	UC	cervix	remote rural	M	spouse	P & CG
4	N	F	48	UC	liver	urban	M	spouse	CG
5	E	M	39	SHI	cholangiocarcinoma to brain	remote rural	F	sister	P & CG
6	N	M	56	UC	hepatoma	urban	F	spouse & daughter	P & CG
7	E	F	55	UC	adv. hepatoma	rural	F	daughter	P & CG
8	E	F	62	UC	ovary	sub-urban	F	sister in law	P & CG
9	N	F	63	UC	colon to liver	remote rural	F	daughter	P & CG
10	N	F	56	CSMBS*	ovary	urban	F	daughter	P & CG
11	N	M	63	UC	nasal cavity	urban	F	spouse	CG
12	N	M	59	CSMBS	hepatoma	rural	F	daughter	CG
13	N	F	54	UC	cholangiocarcinoma	remote rural	F	daughter	P & CG
14	N	F	55	UC	cervix	rural	M	spouse	P & CG
15	E	F	48	UC	lung	rural	F	daughter in law	P & CG
16	N	F	40	UC	stomach	remote rural	M	spouse	P & CG
17	N	M	53	UC	rectum	sub-urban	F	spouse	CG
18	E	F	55	UC	cervix	urban	F	spouse	P & CG
19	N	F	36	UC	cervix	rural	M	spouse	CG
20	N	M	59	CSMBS	liver	sub-urban	F	spouse	CG

Note: E = expanded family; N = nucleus family; P = patient; CG = primary care giver;
CSMBS* = transferred from UC

7.3.2 Telling the truth and the meaning of cancer

Three approaches used in telling the diagnosis included physician to patient; physician to patient together with patient's relatives; and physician to patient's relatives, and later physician to patient or relative to patient. It seems that the last style was often used. However, most of the patients with cancer knew their diagnosis directly from their doctors. Patients sometimes proactively asked the physician rather than passively listening. This is due to their suspicion that they might have cancer. Some patients who did not know their diagnosis from the doctors but relatives knew due to the relatives' fear of patients' emotions which might lead to the deterioration of their illness. However, in fact, patients had always suspected their sickness themselves and they were likely aware of the cancer due to the disease progress as well as their awareness when they were referred from community hospital or regional/provincial hospital to the Regional Cancer Center. As a result, even though the patients received a shock at the first moment of knowing the diagnosis, they could gradually accept it. It was appropriate in telling the patients truthfully by doctors themselves.

> *"In the first month (after knowing the diagnosis), I don't wanna go anywhere…it was likely get stuck and obsessively think…like…I have cancer…I get it, the popular disease which the rich doesn't want to...so how am I…so, I don't wanna do anything…I don't wanna go anywhere…I don't feel enjoyable…During the first month I think what I should do…how long I'll survive. I ask myself…if 1 year or 2 years, what I'm gonna do…if I'm strong…what I wanna do."*
>
> (Case no.5: patient)

In the patients view, cancer can not be cured and means death whereas tumour is curable and does not lead to death. This thought was mostly perceived from their experiences with neighbours or relatives with cancer who finally died in a certain period and some had pain but the others did not. It was likely that they did not fear death, but the pain and suffering from cancer.

> *"I don't know…I asked doctor whether cancer has a mouth, like frogs…like ducks. The doctor told it doesn't like that but it will eat our blood. It doesn't have a mouth, otherwise cattle will eat us so.…I asked the doctor what cancer look like…catch for me and then chop it…chop like mince."*

(Case no.8: patient)

"I routinely go to the hospital for drainage of ascitic fluid. It's now not less than 50 times, 8-9 litre of each. I feel no pain. My doctor tells me every time to be restrained and I do (laughing). I told her that I didn't fear for dying but I'm afraid of suffering…I'm really scare of such suffering."

(Case no.10: patient)

"The doctor said that I should accept it, don't be afraid of because doctor could also die. I told her I'm alright but I came to see you because I have pain. I wanna be treated to be free from pain…"

(Case no.8: patient)

In contrast to the patients, the care givers learned about cancer and steps for treatment from doctors and open source information, e.g. TV programmes and hospital information leaflets. Patients' relatives played an important role in providing moral support to patients and knowledge transferring from doctors to patients. Patients and care givers expressed their vulnerability on knowing the prognosis, particularly in the terminal stage of the disease.

"I wanna know so that I could control my mind…I think my dad (the patient) also wanna know…In fact, my dad always follow the doctor's suggestion (he perceives only that he has liver mass). But in the second visit, the doctor said that whatever you (the patient) want to eat, you could eat. So, my dad was worried about this suggestion which seems that he gonna die. After that, he got worse."

(Case no.6: secondary care giver)

"…I don't know how bad terminal stage is… I dare not to ask the doctor that how long my mom would be alive…coz…if I know that my mom is in the terminal stage of the disease, I couldn't restrain myself…" (crying)

…I wanna ask the doctor how the terminal stage would be (but she did not do). Others in terminal stage were live long…"

(Case no.9: primary care giver)

"CG: sometimes it isn't just the patient but relatives that asked which stage and suggested we should ask the doctor. But I don't…I think we're

O.K….We'd better don't know. It's no need to ask which stage, how long will he alive.

P: Yeah, I think so. If asked…then we know…it'll…my feeling gets worse, I'll get worse, so unknown (prognosis) is better"

(Case no.5: patient and primary care giver)

7.3.3 Decision making on treatments

Thereafter visiting some health facilities and perceiving their disease as cancer, all patients were obedient and followed their doctors' suggestions. They decided to get such suggested treatment by themselves and informed their primary care givers later, in the case that the patients are parents and primary care givers are offspring. In contrast, if the primary care givers were spouses, consultation between patients and care givers usually took place. However, regardless of the decision made by the patient, it was supported by their care givers. For example, Miss P, a single woman, actually living alone but thereafter getting sick with cancer, moved to stay with her younger brother and sister in law. She immediately decided to follow the doctor's suggestion on chemotherapy when the doctor explained the progress of her disease.

"Yesterday, the doctor told me that the cancer spreads…could not remove but could 'khao ya' (intravenous chemotherapy) to suppress it. I said O.K. (for khao ya), so that it might be alleviated…I don't know where it spreads to."

(Case no.8: patient)

After realizing they had cancer, half of the cases had ideas to seek treatment at hospitals in other provinces, for example, advanced health facilities in Bangkok. However, they changed their minds due to suggestions by their neighbours who had experience that the services from hospitals in Ubonratchthani (Ubon) were similar to the advanced hospitals in other provinces. Seeking treatment in KhonKhan[51] or Bangkok would require much more money for travelling, lodging for the care giver and treatment of which the UC scheme will not pay for except for official referrals. In addition, there was no difference of view or conflict between the patients and care givers. This was due to the fact that the

[51] There is a KhonKhan University with Faculty of Medicine and the University hospital, the only one University hospital in the north-eastern part of Thailand. KhonKhan is located in the upper north-east.

care givers did not want to see the patients suffer from cancer and their utmost desire was to satisfy their loved ones.

> *"…We don't go to KhonKhan or Bangkok because we don't have money. Even we have, we won't go because we have seen from a patient who went to KhonKhan for treatment and they think that here is better. Another rich patient who went to Bangkok said that it's similar to Ubon…similar medicines, similar radiation. So, why do we want to go to and I think it's true…"*
>
> (Case no.17: primary care giver)

> *"Yes…we had an idea of going to KhonKhan. My neighbour was recovered with the treatment there because previously, there was no cancer centre here. Anyway, he suggested that now it's the same, it's no need to go there…wherever is similar. We won't go to Bangkok coz…we don't have enough money for travelling…"*
>
> (Case no.16: patient and primary care giver)

7.3.4 Complementary medicines and food supplement

Almost all patients had experience in seeking complementary medicine or food supplements in addition to the Western treatments from hospitals. This was due to the attempt to fight cancer, to be healthy as well as to prolong their lives. Some expenditure for these additional treatments was incurred by the patients' family and some might not have been as they were a gift from their relatives or neighbours.

When the relatives or neighbours were informed of the patients' illness, suggestions on complementary medicines and/or food supplement were introduced to the patients by word of mouth. In addition, the food supplements could be directly sold by the sale representatives from the direct sale products. These complementary medicines could range from holy water from temples to fresh herbal medicines and herbal decoction. One patient even reported that she took liquid plant fertilizer. It was usually a case of either medicines or supplements, but the patients sometimes used them together.

> *"..The doctor told that my cancer could not be removed… I could be alive just one more week…he told my daughter. Later on, I stayed at home and I didn't know what to do…so I test drinking the EM…a plant fertilizer. I*

thought whatever will happen, it will happen…if it causes death…let it happen. If cancer is not killed, then it is myself that be killed (laughing)"

(Case no.10: patient)

In contrast, two patients adhered strictly to their doctor advice and Western medicines including vitamins and minerals prescribed.

"…A salesman came to me at my house with a big file contains photos of a doctor, his clients who had cancer had paralysis…they eat this and that…and recover. My relatives also routinely bring me herbal medicines. I received but have never taken them…coz the doctor forbid eating them. It may counteract with the prescribed medicines."

(Case no.3: patient)

Even if patients did not take complementary medicines, supplementary foods were very popular among patients. With the strong willpower to fight cancer and to survive longer, all patients had experiences of taking supplementary foods, even expensive ones, bird's nest in syrup or expensive fruit juice, for instance. It was in order to supplement or to replace the main foods patients could not consume. Ms R (case no. 15) who worked in Sweden before and during her first diagnosis of and treatment for lung cancer. Finally, she decided to travel back and to die in her hometown. She talked about the supplementary foods that:

"I eat everything saying 'it's good'…I paid 1,800 Baht per bottle even it was fruit juice but claimed to eliminate toxic substances. I wanna recover…wanna go back home to stay with my son. Whatever it is, I could eat…just do not trouble me with allergy (nausea and vomiting)…"

(Case no.15: patient)

7.3.5 Household expenditure

Patients and their care givers detailed their expenditure in accordance with four main categories the researcher introduced and it was estimated that the household incurred from 50,000 up to 100,000 Baht since the first definite diagnosis. First, the additional payment for treatment included the investigation from private hospitals/clinics which provided quicker results than public hospitals; and some medical supplies and devices, for example, wound dressing set and rubber gloves, oxygen and refilled oxygen tank.

Second, travelling cost of both patients and care givers were estimated to account for a high proportion of household expenditure. This ranged from 40 Baht round-trip per person by bus to 1,200 Baht round-trip or per day by private van rental required in handicapped patients. This range included the estimated gasoline cost of household personal car. This household travelling cost was higher with an increasing of number of hospital visits, in particular in times close to death. It was highlighted by the patients and their care givers that this travelling cost markedly increased during the period of undergoing treatment courses of chemotherapy, radiation and pain control.

Greater household expenditure was related to payments incurred from alternative medicines and food supplements. As mentioned in the previous subsection, almost all had experience on either or both types of care. It was reported from to cost 200 Baht per time to 6,000 Baht per month. Last, the care givers also incurred expenditure for food and lodging when visiting hospital with the patients and staying nearby if the patients were hospitalised.

Indirectly, there must be reductions in household income due to the patients themselves and the care givers whom the advanced cancer patients depend on. It was learned from such advanced cases that there must be a care giver who spent most of the time taking care of the patient. The care givers resigned from their permanent job and most of them migrated back from remote provinces. In addition, in the case that the patient was a head of household and breadwinner while his spouse was a housewife, household assets were gradually sold out. It seems that borrowing from the village fund and relatives was the source of income as well.

> *"…At the time, I have worked nearby Bangkok. Our neighbour here rings me and tells that my mom is referred to Sappasit hospital. So, I quit my job immediately, come back home and haven't got any job since then…"*
>
> (Case no.13: primary care giver)

> *"…My children living in Bangkok come back because mom (the patient) gets sick. Previously, we (the patient and primary care giver) live with my grandchild and my two children who are still studying here. Nowadays, mom can't walk, my children must quit from their jobs because they couldn't have long holiday…"*
>
> (Case no.14: primary care giver)

"…We don't have saving. I haven't done any job but my husband did…a year now that he couldn't work…so whatever we have, I sell them out.

…borrow from village fund--60,000 Baht now and also from my relatives.…..Currently I did borrow again…borrowing and selling our assets…my golden necklace…our cattle. I don't know how I can return them…but it's just until my three children graduated, well…let see…"

(Case no.17: primary care giver)

Table 7.2 Patients' residential area and their expenditure estimated since diagnosis of cancer including terminal stage

Study no.	Health insurance scheme	Type of cancer	Residential area	Estimated distance from home to hospital (km)	Expenditure since diagnosis (Baht)				
					Extra medical care	Travelling (per round trip)	Complementary med. & food supplement	Travelling of care giver (per round trip)	Estimated total
1	UC	colon	Urban	15	5,708	400*, 20**	1,200	20	50,000
2	UC	adv. hepatoma	Remote rural	50		600*	2,600		
3	UC	cervix	Remote rural	103			90 /day	200	100,000
4	UC	liver	Urban	10			3,000		
5	SHI	cholangio-carcinoma to brain	Rural	102	300		no use		
6	UC	hepatoma	Urban	4	6,000		5,400		10,000
7	UC	adv. hepatoma	Rural	42	2,050		Free		
8	UC	ovary	Sub-urban	40		400*, 120**	no use	120	
9	UC	colon to liver	Remote rural	105		170**	1,090	170	
10	CSMBS*	ovary	Urban	3		10**	47,500		
11	UC	nasal cavity	Urban	5	5,000				
12	CSMBS	hepatoma	Rural	108					

Table 7.2 Patients' residential area and their expenditure estimated since diagnosis of cancer including terminal stage (cont.)

Study no.	Health insurance scheme	Type of cancer	Residential area	Estimated distance from home to hospital (km)	Expenditure since diagnosis (Baht)				
					Extra medical care	Travelling (per round trip)	Complementary med. & food supplement	Travelling of care giver (per round trip)	Estimated total
13	UC	cholangiocarcinoma	Remote rural	120		1,200*		340	
14	UC	cervix	Rural	45		500*	90 Baht/ day		100,000
15	UC	lung	Rural	48	6,500		4,100		
16	UC	stomach	Remote rural	100		1,000*	12,800	120	
17	UC	rectum	Sub-urban	35		300*	Free (2,000)		100,000
18	UC	cervix	Urban	7			10,000		20,000 / month
19	UC	cervix	Rural	55		500*	200	80	70,000
20	CSMBS	liver	Sub-urban	2	3,000		12,300		

7.3.6 The place of care and the place of dying

Both patients and care givers did not have any plan for the place of care and the place for dying, however, they had different expectations. There were debates between the choices of hospitals versus home. The care givers preferred hospitals to home because of their concerns over the patients' symptoms and suffering in which they might not be able to help the patients and feel guilty, whereas doctors and nurses could help. However, patients favoured home over hospitals. It was due to the comfortable feeling and being familiar with the private area and personal belongings; and warm feeling of being among family members, relatives and close friends. Despite having a few private rooms, there is no comfortable private area in public hospitals for patients' relatives and close friends similar to patients' homes. In addition, it was inconvenient for travelling by the visitors to the hospitals. A few patients passed their decisions on to their next of kin and doctors.

> *"Interviewer: It was that you're concerning over patient's suffering?*
> *CG: Yes…coz…I'd seen and I couldn't help…I feel terrible…Due to pain, he's groaning and 's struggling…sweating through the whole body on the bed…like showering…I couldn't tolerate. So, if anywhere could help him free from pain, I would select that place. In contrast, if there is no pain, I choose home."*
>
> (Case no.17: primary care giver)

There might be a different view from primary care givers of urban patients that they preferred the patient to die in hospital because it was most convenient for the patient and family.

In the Northeast, it was also a myth that souls of people dying at home would be able to visit to their home and village after death. In contrast, souls of those dying outside could not return home. In addition, the transportation costs of bodies are much more expensive than of live patients. There might be additional costs involved such as for the mortuary, cleaning, etc. As a result, at the end of life given a few hours or a few days before death, most patients were likely to be taken back home, particularly in the rural areas.

7.3.7 Perception on health insurance schemes and health services for cancer patients

It was stated that the route of seeking health service of cancer patients usually started at private clinics and community hospitals like other common diseases. After finding signs and symptoms, and primary investigation of any cancer during the few visits, the patients were then referred to the regional hospital and cancer centre. Almost all cases of the UC, CSMBS and SHI had good perception on the process and standard benefit of the scheme in particular to cancer. One case seems to have less understanding and was underprivileged compared to the others due to the different subtype of the UC scheme (alien). The UC beneficiaries knew that the letter for referring to the regional hospital or cancer centre was valid for a certain period since cancer is a chronic disease and requires more visits to receive specialized care at such hospital and centre. If there was an emergency or uncomplicated condition of their illness, they should go to the community hospital where they registered at the secondary care unit. However, there were some cases who mentioned difficulty in and higher expenditure for routine travelling for pain control medicines. The care givers had to come to the pain clinic to get the medicines. In addition, the patients also had to come to the clinic frequently to get the medicines. For example, Mr. P had post-operation rectal cancer chemotherapy and radiation, four years later, his pain was increasing and as a result, he was referred to the pain clinic for pain control and supportive care. Mrs. P, the spouse and the care giver of Mr. P, said that the patient had been treated for pain control for a year and now Mr. P could not walk. Their house was approximately 30 km. away from the hospital.

> *"During the past year, I did weekly visit to the clinic to get drugs, but recently, I come three times a week because it (the pain killer) isn't enough….*
>
> *…I do have to hire a van because my husband (the patient) couldn't walk. If I don't take my husband to the hospital, I'll get drugs for one day only. I also could not leave him alone at home for long time. They (health staff) told that for an admission at least 6 hours, we can get one-week drugs. Previously, the doctor prescribed for two weeks but the pharmacy could not give us, due to the drugs are very expensive.…*
>
> *…The drug (morphine tablet) is 54 Baht per tablet; he takes 14 tablets per day. So, now 700 Baht per prescription is not enough for one day.…We know that he couldn't recover and he'll deteriorate but just doesn't*

suffer…just that…you know…it suffers… if we could not get the drug.…Whatever will be…but rather no suffering…if he passed away…just let him go without suffering because when he feels pain, I wanna die, too."

(Case no.17: primary care giver)

"I heard from another case coming from Yasothorn (another province) talking about the expenditure. The relative took a patient who is unable to walk and so s/he requires a rental private van. The rental rate is 1,000 Baht per day and if the patient is admitted, so it's two days…means 2,000 Baht and coming once a week…how much the expenditure is. Moreover, it must have the food expense for the care giver.

… Since policy change by the new director, the patient has to be admitted. Previously, I took care of my mom (the patient) at home and I just bring a booklet recorded the detail of drugs taken and pain score. It's quite convenient but now my mom has to come and she complains because she feels pain when moving for travelling to the hospital.…"

(Case no.18: primary care giver)

Focusing on the sixteen UC beneficiaries, all of them expressed their satisfaction on this latest health insurance scheme. It helped in seeking care, gave a chance to survive and to prolong life.

"Interviewer: The 30 Baht (the UC scheme) is good?

A: Good, good, I acquiesce that the 30 Baht is good. If forgetting this health card, we have to pay more than 200 Baht even at the T hospital (a community hospital). Paying 30 Baht is simply. If there was no 30 Baht, we'll pay a lot. Probably, the patient wouldn't survive until now. If we don't have money and it isn't necessary, we won't go (to the hospital)."

(Case no.14: primary care giver)

"If there was no the gold card (the UC scheme), we would not be able to get the treatment like this because just travelling to the hospital costs a lot…we now have nothing left to sell (to earn the money). If we have to pay…only the drug… it costs nearly 10,000 Baht…we wouldn't have money for. If there is no card (no the UC scheme), we would let him die since the operation coz we don't have income and my children are still school-age.…We wouldn't

pay for the operation, would we? The operation cost is not cheap, and the drug cost taken after the operation, too. I'd seen the drug cost… it was 9,800 Baht per month. Now the drug cost…just for a week…they give us 2 bottles of red syrup (Morphine syrup) which is 500 Baht each and 140 tablets and other drugs. It isn't cheap. If there was no the card (the UC scheme), I wouldn't have an ability to pay for the treatment and he would not survive til now… only his name would be left (laughing)"

(Case no.17: primary care giver)

The cases (patients and family members) seem to be satisfied with the services from the place they were receiving the treatment. However, in comparison among hospitals, that is community hospital, regional hospital and the cancer centre, according to those with experience in all three types of hospitals for current illness, they preferred the cancer centre. This is due to the more service minded and better attention from staff, less crowded, fewer queues and quiet. In addition, there were only cancer patients who could empathise with each other. Patients and care givers had more time to consult and to clarify the way they could receive care for the patients at the centre. Nonetheless, they realised that the regional hospital was most crowded with huge numbers of patients with variety of illnesses and diseases. The health personnel then have limited time to pay attention to the patients.

Focusing on the pain control, there was limited medicine items for pain control in the community hospital. A care giver revealed her concerns on drug use and its benefits. Even though the hospital would have similar items of pain control substances as the centre had, she still had doubt in the expertise on such medicines because the hospital emphasized on general diseases.

"Interviewer: Supposed that the K hospital (a community hospital) has all drug item for pain control, is it good?
CG: It might be good. It's nearer (the community hospital) but I'm not sure in their care and advice while I'm confident in the cancer centre even it's farther….it's good if the hospital could practice like the centre do. However, if the hospital just give the drugs (without advice and therapeutic monitoring), it's useless because each tablet is valuable…"

(Case no.17: primary care giver)

7.4 Summary of research findings and study limitations

7.4.1 Summary of research findings

Data was gathered from twenty cases of patients in advanced stages of cancer and/or their primary care givers. Of these, sixteen were UC beneficiaries, three CSMBS and one SHI. Nearly half the cases had liver cancer, including cholangiocarcinoma. Three styles of telling the truth or breaking bad news were identified. Used most often was the doctor telling patients relatives and later either the doctor telling patients or relatives telling patients. It was the fear of relatives that resulted in some patients not perceiving the cancer at the time of definite diagnosis. The patient experiences reflected that cancer means being incurable. Knowing that they were going to die from cancer did not cause fear but suffering from cancer pain did. Two types of decision making on receiving treatments were found, that is consultation with spouse and deciding by oneself in the case that the patient was the mother or father. All cases followed the physicians' recommendation and all cases adhered to hospitals in the province. This is due to the fact that crossing to health facilities out of the referral system required more financial resources for out of pocket and the inconveniences in travelling and the care givers lodging.

Almost all of the cases had experience in seeking complementary medicines and/or food supplements while they followed the treatment at hospitals. This was the fight against cancer, keeping healthy as well as prolongation of life. In addition to the extra unclaimed medical care cost, travelling expense, and expense for care givers board and lodging, such seeking behaviour was a major cause of household expenditure. In order to take care of the patient, it was likely that an offspring had to quit from the current job in remote provinces. Therefore, this resulted in decreasing household income, particularly in the nucleus families.

The patients and care givers had different expectations on the place for care and the place for dying. While patients preferred home, the care givers preferred the hospital. Home gives a comfortable feeling and environment, familiar private area and personal belongings. In contrast, hospitals were superior in ensuring the treatment to alleviate patients suffering by health professionals. However, the place of dying should be home due to the cultural belief in this north-eastern area as well as saving travelling expenditure from transporting the dead back home.

All cases, especially the UC beneficiaries, were satisfied with the health insurance and its benefits. It provided the opportunity to access the high cost care including medicines for pain control. However, some households had difficulty in earning for travelling expenditure and the extra unclaimed medical cost. It seems that the limitation on claimed expenditure of 700 Baht per visit increased the frequency of patients and care givers visits to get medicines for pain relief out of the schedule for routine following up. Inevitably, their travelling cost was also massively increased and there was also the effect of travelling on patients' physical health. The cancer centre seems to be the preferred hospital for cancer care due to its specialty in services related to the disease, less crowding and providing more information and knowledge in caring for the patients accordingly.

7.4.2 Data and methodological limitations of the study

Due to the study tracking the cancer cases from hospitals, it was not possible to provide different views from cases without access to the institutional care. All cases were likely to have positive attitude to the health services. The study also lacked of the views of cases accessing private health facilities which were difficult to find due to their policy on patient privacy. Reaching such cases might require the comprehensive data in family folders and home-based care records at primary care units and health centres. Views of patients and their relatives residing in other provinces, for example, Srisakate and Nakornpanom under similar referral systems of the regional hospital and the cancer centre, respectively, might create better understanding of the services as well as the difficulties the patients and families confronted, for example, access to the care. In addition, an interesting inclusion criterion for patients and relatives should be the socioeconomics of the patients' families or households. Child to adolescent cancer patients and their parents was a group of patients which might provide different views on such issues, and would be of interest of this study. Household expenditure during the terminal stage was the most difficult part of the interview and much time was spent on this during the interviews. This resulted in the incomplete data in Table 7.2. Most of the patients and relatives could not give the exact amount and value of their spending and thus strategies and interviewer skill to detail the expenditure was required.

Talking about death with relatives and cancer patients who are close to death and dying during the period of recently perceiving the bad news were the difficulties the

researchers confronted with. It is quite difficult to get the fact and deep information from interviewing with such vulnerable relatives and patients as well as to limit and to protect them from some issues related to their sensitive points. That is, balancing between achieving the study objective and maintaining the ethical conduct was an issue. In addition, due to the vulnerable emotion and the sadness of the patients and relatives, continuation of many interviews could affect to the mood of the interviewers. As a result, the interviewers could have some mechanisms to protect their mental health from such sympathy to the cases.

7.5 Discussion

The process of telling the truth about the diagnosis and prognosis, particularly in the style comprising of two steps of physicians to relatives and then physicians to patients or relatives to patients was found to be different from the way in which it was mentioned in literature or textbooks. This implies that stressing the importance of the relatives' involvement is likely not to be less important than the patients. Even though the perception of the cancer patients in this study referred to death, it did not bring the patients feelings down much. Perceiving that the disease was in terminal stage might worsen patients feeling and willpower to fight against the disease. As a result, it seemed that most of the patients in this study did not know the prognosis from the physicians. The patients themselves realised the remaining time of life from the deterioration of their physical condition. Mystakidou et al (2004) reviewed that this disclosure style of giving the priority to relatives and undisclosed diagnosis on terminal stage of cancer was also probably accepted in other countries where there is no Anglo-Saxon background. This strong paternalistic approach was indicated in Japan, Turkey, Kuwait, Saudi Arabia, Greece, Italy and Spain (Mystakidou, Parpa et al. 2004). That is cultural issues as well as national legislation partially takes part in the approach of telling the truth. Compared to Japanese patients, the Thai patients might be able to make more decisions on treatment while the Japanese patients' family makes decisions. However, telling the truth could not be justified as right or wrong due to the fact that telling the truth or breaking bad news regarding diagnosis and prognosis of cancer has pros and cons to the patients and the ethical dilemma remains (Kazdaglis, Arnaoutoglou et al. 2010). In addition to the patients' knowledge of their illness and prognosis, their perception on cancer seems likely to mean that they thought death was less serious than

pain and suffering from the disease. This might be a strong message about the health services provided to patients in the terminal phase of life.

Two decades ago, a survey in Thailand revealed that 71 percent of the elderly ages 60 years and above in Bangkok wished to die among their beloved, close relatives and only 39 percent expected to die in hospitals. However, if they had chronic diseases, more than half wished to die at home with health care services provided by health professionals. In addition, the study indicated that differences in preferred place of death were determined by attitude, gender, ethnicity, religion, income, education level and age group (Silapasuwan and Tongvichien 1990).

Improving health care services provided to patients at the terminal stage was the issue in line with place of care towards place of death at the end of life. Such place of care also was determined with several factors as well as being in the complexity of decision making. For example, different views between the patients and care givers on preference of the place of death were often reported.

Preference on place of death for the patients in this study was similar to a survey in Taiwan during 2003-2004 and in the UK during 2000-2002. In Taiwan, home was the most preferable place of death for both patients and their care givers. However, a higher proportion of the family care givers indicated a preference for hospital death for patients. Multiple reasons were provided including cultural concerns, quality of life, availability and ability of family caregivers, quality of health care, worries of being a burden to others, and concerns over the difficulty in managing the body if the patients died at home. This is due to the fact that the Taiwanese normally live in apartments (Tang, Liu et al. 2005). Even though the setting and culture were different, it was reported that nearly one-third of patients preferred to die at home as well as another one-third preferred hospice. No patients wished to die in hospitals. However, some patients wishing to die at home but actually died at hospice or hospitals. Factors which had an influence on place of death were categorised into four domains including the informal care resource, management of the body, experience of services and existential perspectives. It was also reviewed that clinical factors of the patients were associated with the ability in dying at home (Thomas, Morris et al. 2004; Cohen, Bilsen et al. 2006). Thus far, preferences for place of care and place of death in all, including this study were similar in home death. However, the factors shaping the actual place of

death depended on the patients' physical conditions and limitations, availability of the care givers as well as health care providers' facilities. Local culture, in particular in Thailand, also played some role in place of death rather than the place for terminal care. That is, patients in last hours or last minutes to death were likely to be moved to die at home.

Even though the household expenditure during the last period of life in this study could not reveal the exact total payment or average payment, it indicated the categories of household payment for caring for the terminally ill patients. Such payments included extramedical care and medical supply which the insurance benefit scheme did not include, for example, mobile oxygen, diaper; travelling cost for the patients which could range from 10 Baht for public transport to 1,200 Baht per day of a rental private van; complementary medicine and food supplements ranging from no payment to 47,500 Baht a year; and travelling cost of a care giver. However, this expenditure excluded food and lodging during patients' hospitalisation as well as the care givers income loss. The more visits the patient or the care giver made to the physicians, the expenditure for travelling cost increased. In addition, the care givers of the two patients detailed their coping mechanism to gain money for such payment by their personal assets sales, due to changing from the breadwinner to the full-time informal care giver.

Complementary medicine and food supplements were popular among patients with chronic diseases including cancer and at the end of life. It seems to be another main treatment or care for the patients who were physically weak and wished to regain their healthy status. However, both medicine and food were the important factors of household expenditure as indicated in this study. All patients took either complementary medicine or food supplements or both concomitantly with the conventional therapy from Western medicine. This finding seems to show greater prevalence of using complementary and alternative medicines than in Australia. Correa-Velez et al (2003) found that 32 to 42 percent of the Australian in Brisbane used at least one type of complementary and alternative medicines at the end of life (Correa-Velez, Clavarino et al. 2003). However, findings from these studies were applicable to the patients using both complementary medicines and conventional therapy. This lacks the patients who were denied or were unable to access conventional therapy and might use only complementary medicines.

It might be due to differences in health systems of individual countries and difficulties in data collection on household expenditure, but no literature could be found that described household expenditure at the end of life, particularly none in developing countries was found that was comparable to the data reported in this study.

The participants who were the UC beneficiaries in this study expressed their satisfaction in the UC scheme. Because of this, these cancer patients could access such high cost care without payments and be able to live longer. Prior to the UC, this access was impossible because cancer treatment was unaffordable. That is, it should be highlighted that the UC scheme achieved its goal on access to health care for all, in particular in the under privileged group (see Chapter Two, subsection 2.2.4.1). However, the complaint on limitations on the 700 Baht claim for pain control in palliative care per ambulatory visit which results in an increase in unnecessary additional visits for medication, resulting in increasing in travelling costs, was an issue requiring further exploration. Travelling costs might be another economic burden leading to impoverishment or catastrophic household expenditure instead of direct medical costs which were previously limited to access to health care.

Further discussion in line with the health professionals' current practice, preferences and health service for terminal stage cancer patients in Chapter Eight will be presented in Chapter Nine.

7.6 Conclusion

This chapter has shown the views of patients with terminal stage cancer and their care givers on their attitudes and understanding about cancer; decision making regarding cancer treatments; using complementary medicines and food supplements; household expenditure; place for care and place for dying; and perception on their health insurance scheme and health service for cancer patients. The study employed the in-depth interview approach for individual patients and their primary care givers in Ubonratchthani province. The findings provided better understanding on the perception, coping mechanisms as well as constraints of the patients and their family during the terminal stage of life.

CHAPTER EIGHT

THE LAST PERIOD OF LIFE: CURRENT PRACTICE AND HEALTH SERVICES FOR TERMINALLY ILL CANCER PATIENTS

8.1 Introduction

Regardless of patient demand, the health service is a system that is driven by health care providers as well as third party payers. That is, even though the third party payers or the health insurance payers determine the payment and benefit package for their beneficiaries, the quality and quantity of health service or health care provided to the beneficial patients also depends on the care providers. Consequently, their preferred practices are always of interest in understanding patterns of care.

Health care for terminal illness, the final phase of human life, is possibly another issue which health care providers and patients, including their relatives had different views. These differences might include, beginning with the disclosure of the diagnosis, treatment, and until the patient's final period. Therefore, learning about the views and practices of health care providers might fulfill the comprehensive understanding of the health service provided to the terminal stage patients and the explanation for the factors which significantly determined the health insurance payers in Chapter Five.

There are several studies in Thailand revealing knowledge, attitude, caring behaviour and truth revealed for end of life patients. However, those are surveys of nurses and/or nursing students (Vijitsukon 1975; Pratoomwon 1991; Daodee 1994; Wattanachote 1997; Mahanupab, Leksawat et al. 1998; Pokpalagon 2005). Saruayiam (1998) identified ethical dilemmas in the case of terminally ill patients concerning veracity of general information e.g. patients illness and hospital rules, truth telling regarding diagnosis-treatment-prognosis, prolongation of life, euthanasia and hospice care according to the views of health professionals at two hospitals with advanced tertiary care and the National Cancer Institute in 1998. All are located in Bangkok (Saruayiam 1998). However, due to the social change and advancement in medical technology, this study partially followed such study’s constructive qualitative approach but in a different setting.

Following the patients and care givers views on their preferences in Chapter Seven, this chapter, on the other hand, adds the health care provider's views and practices on patients' preference on the place of care and the place for dying. That is the study aims:

- To explore the current practice on the disclosure of diagnosis, preference for quality of life and care, place of dying in terminally ill patients and the patient relatives
- To describe the service and care pathways for terminally ill patients at several types of health facilities

8.2 Methods

This study employed a qualitative approach as indicated in Chapter Four, subsection 4.3.2.2. It involved exploring and revealing explanations to support the findings from Chapter Five and Chapter Six and in particular, views of health professionals on the terminal stage of cancer.

8.2.1 Research design and setting

Similar to Chapter Seven, subsection 7.2.1, in-depth interviews during the same study period were employed. Also similar was the study site which was located in two hospitals and a cancer centre to gather information on disclosure of diagnosis and health services for terminal stage of cancer. This study focuses on the information from and perspectives of health professionals taking care of cancer patients. To be consistent across the interviewees, the in-depth interview was conducted through the guide questions as described in Appendix 6.

8.2.2 Health professionals

The snowball method was employed for identifying the health professionals. They were recruited if they met the eligible criteria including physicians or nurses who 1) work at palliative care unit or medicine unit or surgical unit or obstetrics and gynaecology unit in the regional hospital or the cancer centre; 2) work at community hospitals; and 3) is willing to participate in the study.

In order to obtain additional information on the service system for medicines provided to terminally ill patients, particularly the pain relief group, the heads of pharmacy unit at the regional hospital and the cancer centre were also interviewed.

8.2.3 Data analysis

The analysis was done using the method described in Chapter Four, subsection 4.3.2.2 (5).

8.3 Findings

This section revealed the findings from health professional experience and views on current practice of disclosure of diagnosis, place of care and place for dying, perception on health insurance scheme and health services. On average, an interview took 30 minutes to one hour per participant. Information was gathered from eighteen health professionals in three hospitals.

8.3.1 Characteristics of health professionals

Ten physicians, six nurses and two pharmacists participated in this study. Of the physicians, two had expertise in general surgery, three in general practice, two in radiation therapy, one in obstetric-gynecology, one in haematology and one in family medicine. Of these nurses, two had expertise in general nursing care, one in oncology, one in anaesthesiology, one in psychology, and one in cancer care. On average, these twelve female and six male health professionals had 16.3 years of experience in their careers and 11.1 years in the health services for cancer patients. Eight were working in the regional hospital, six in the cancer centre and four in the community hospital.

Table 8.1 Characteristics of participating health professionals

No.	Professional	Hospital	Gender	Professional experience (yrs.)	Experience on cancer (yrs.)
1	Physician	RH	F	18	11
2	Physician	CC	M	12	9
3	Physician	CH	F	8	8
4	Physician	CC	F	10	5
5	Physician	CC	M	17	10
6	Physician	RH	M	31	25
7	Physician	RH	M	22	16
8	Physician	CH	M	6	6
9	Physician	CC	F	18	14
10	Physician	RH	F	9	6
11	Nurse	CH	F	23	10
12	Nurse	RH	F	20	20
13	Nurse	CC	F	12	10
14	Nurse	RH	F	24	15
15	Nurse	CH	F	20	13
16	Nurse	CC	F	8	8
17	Pharmacist	RH	F	26	3
18	Pharmacist	CC	M	10	10

Note: RH = regional hospital; CH = community hospital; CC = cancer centre

8.3.2 Disclosures of diagnosis and prognosis

Identifying the diagnosis can be classified into two types, that is, at the primary or secondary care level where the definite diagnosis could not be made and at the advanced or specialised hospitals; and at the early and the late stage of the disease.

Prior to disclosure of the definite diagnosis, physicians at primary care or secondary care level gave the general diagnosis of tumour or mass and referred the patients to the tertiary care, through the referral system accordingly.

"Interviewer: Could you do definite diagnosis here?

P: Even we could do, we won't tell the case. We must refer to the regional hospital..."

KI no.3

At such hospitals, the biopsy, other investigations and staging of cancer was determined for definite diagnosis. In order to treat the patients as soon as possible, and to obtain the patients' adherence to the treatment, the patients were informed about their disease followed by the details of the course of treatment.

"…if the patients understand, it would follow with the good cooperation for following up the treatment. I think that prior to treatment, the diagnosis must be clarified.…"

KI no.9

In patients with late stage cancer, specifically advanced stages (III and IV) including last to the end of life, all physicians had a similar principle in disclosure of the diagnosis or communicating bad news. Due to the reason that the patients' next of kin were the potential care givers throughout the patient's survival period and were often the decision maker for treatment and care management, such next of kin were the first to know the diagnosis including prognosis. They would then better prepare themselves, including their availability as care givers. Nonetheless, identifying the next of kin as well as the patient's decision makers was the first step prior to the disclosure. These next of kin had best knowledge of patient's characteristics, behaviour as well as other illnesses or conditions which might affect the patient's mental health and will power if they perceived the truth as bad news. Concomitantly, physicians also evaluated the patient's condition in accordance with accommodating the patient's rights and decision of their next of kin.

"In our country, it is the relatives who don't want (us to tell the patients). In fact, we must tell the patients. But in Thailand, if we had conflict to the relatives, we would get into trouble, sometimes. Good compliance to the treatment is due to the relatives who are really important."

KI no.5

"I'll firstly invite the patients' relatives. Mostly, I haven't directly talked to the patients. Mostly, I have talked to the relatives who are offspring, wife, or husband of the patients…I tell them the disease, staging of the cancer, and ask them about the readiness of the patient in perceiving the disease. I think that our culture is probably different from the western countries…"

KI no.2

"In fact, telling (the diagnosis) is better. First, the patients will know their disease, second, when perceiving, good practice will follow if they have will power.…If we don't tell them, sometimes the patients will resist.…"

KI no.11

This experience-based evaluation included physical and mental health status of the patients; underlying or other diseases, for instance, chronic heart failure, which might have been a contraindication to breaking bad news; patient's age; residential area; the care givers characteristics; and the patient's health insurance scheme which often implied to their care givers something about education level and their knowledge in health and medical science. This practice on disclosure also prevented themselves from future difficulties and suing after the patient's death.

"I'm personally not undisclosed to the patients if there is no any prohibiting condition to listen bad news. Contradict condition is that the relatives tell that the patient has heart disease, their GP said that the patient's feeling shouldn't be hurt.…"

KI no.4

"Partially, if it is the CSMBS beneficiaries, their children will perceive well, in general. Because usually, their children are teachers, officers who are better educated…but it's just partly…"

"…Sometimes I will evaluate that where are their house, near to or far from the hospital, then I will make 2 to 3 following up appointments to seeing how the illness progresses (including the patient)…"

KI no.1

"…it could evaluate from patients' gesture…"

KI no.5

"…Actually, I evaluate the patients' age—age interval, gender…for old age group, it must take some time…Basically, there is no difference between male and female but age does. Old age need more time for understanding."

KI no.9

Due to the recognition of their illness, some patients might want to know the diagnosis themselves, and as a result, physicians inform them directly. However, some patients know their diagnosis from their next of kin or indirectly by perceiving their disease from being referred to the "*cancer*" centre. In the case that the care givers did not agree to tell the truth, the patients were informed that it was "*tumour*". Otherwise, it might require a few visits for evaluation of patient's mental health and perception to ensure the ability to accept this bad news.

"I tell them "cancer" but in the case that the relatives don't want to tell the patients, I'll say "tumour". And I refer them to the cancer centre because I'm not sure whether you have cancer or not. It must require additional investigation, I tell them…I think that finally, the patient must know because our treatment process will let patients know that they have cancer. But today, they might not need to know that they have cancer. Going to cancer centre…finally they must ask that I do have cancer."

KI no.6

"…that is, I try to tell…you have "tumour". Otherwise, sometimes I tell the patients the expected symptoms…itching, loss appetite, flatulence…"

KI no.1

In contrast to the diagnosis, even though the staging and prognosis were a popular concern of the patients and their care givers, physicians informed the care giver and they sometimes tried to put this issue less priority to the patients. Rather, the supportive treatment, including palliative care and quality of life of the patients were the main focus where information and knowledge were provided.

"Could they live long, this is mostly the relatives ask, the patients themselves never ask "Whether I could live long?" If it is the advance stage, I'll tell the relatives…something like …on average one month or one year."

KI no.6

"Yes, I'll tell the patients intermittently. Even it is the terminal stage, I won't say terminal stage but I'll say you have breast cancer, something like that. To the relatives, I tell them all…"

KI no.2

In addition to disclosure of the diagnosis, nurses and other health professionals played an important role in further explaining the disease stage and treatment plan, particularly in the case that the physicians are busy with other patients. This knowledge also included the preparation for treatment, the health care and hygiene, wound dressing, nutrition and medicines.

"Sometimes, I continue the explanation to the patients and their relatives from the physician, in particular in the cases having doubt…"

KI no.13

"…We'll tell the patients after the physicians told the case. We won't be the first who tell the patients…we'll help in preparation for the case nearly dying and the relatives don't want to bring the dead body back home, it is the cultural belief…."

KI no.16

8.3.3 Route of health care and treatments for cancer patients

The route of health care might be identified into two processes of access to care, that is, for the initial diagnosis of cancer and the recurrence into late stage of cancer. In the first diagnosis, thereafter recognising their illness, the patients visited the hospitals for which they had registered, which were community hospitals for those in the districts as well as provincial/regional hospitals in provincial city areas. The patients residing in Ubonratchathani with suspected diagnosis of cancer were further referred to the regional hospital. While the patients residing in the district areas of three other neighbouring provinces had one in-between step, i.e. referring from community hospital to the provincial hospital.

"…If it is the first stage or first diagnosis here or we suspect, we'll send them (the patients) to other hospitals. We don't provide care for them and we send them to the cancer centre and the regional hospital. We won't see

them for 5-7 years until the end stage which the centre and the regional hospital send them back with recommendation on palliative care.…"

KI no.3

At the regional hospital including the cancer centre, the patients were investigated for definite diagnosis of cancer and for plan of treatment, particularly treatment with surgery and chemotherapy. The patients requiring radiotherapy, for instance, were sent to the cancer centre. Once the diagnosis was definite, further visits and follow up could be by passed to the advanced care level. In the case of early stage cancer, the patients adhered to treatment by following up with the same physician at the hospital or the cancer centre which was the last health facility that provided the treatment until the disease was recurrent into the advanced stage.

When focusing on the chemotherapy, it was indicated that according to the policy on excellent centres, and the disease management programme of the UC scheme (see details in Chapter Two, subsection 2.3.3), the chemotherapy ward and the cancer coordination centre at the regional hospital, as well as the systematic collaboration between the regional hospital and the cancer centre were established in August 2006 and were strengthened. This resource management, in particular the chemotherapy ward, had an advantage over the previous care management which was distributed by ward specialty. It pooled together the cancer patients requiring similar treatment, environment and care, as well as the care providers specialised in nursing care and pharmaceutical care. Such chemotherapy ward also reduced the crowding of patients in general wards. However, there was still a limitation on the Rule of Government Procurement on medicines which was constrained to the purchasing of expensive medicines.

8.3.4 Palliative care and pain control for, prolong life versus prolong death in the advance stage of cancer

When the cancer deteriorated to the advanced stage in patients with prior early stage diagnosis or with the first diagnosis at the advanced stage, patients might be referred back to the primary hospital, particularly the patients residing in the rural areas, for supportive treatment and palliative care. Some patients might be treated at the regional hospital or referred to the cancer centre for further therapy which alleviated the patients suffering, for example radiation for pain control until the end of life.

"…I'll refer (the patients) to the regional hospital for the definite diagnosis, then the regional hospital refers back with the suggestion on supportive treatment at community hospital…"

KI no.3

Prolonging life versus prolonging death was the issue discussed in the interviews. Palliative care is a tool to maintain patients' quality of life and diminishing their suffering and it might prolong life a few months beyond the estimated prognosis. While palliative care for "*prolonging life"* means an increase in survival period and includes chemotherapy, radiation therapy, pain control and supportive care, *"prolonging death"* implies intubations in the patients who were undergoing cardiopulmonary resuscitation (CPR) and were unconsciousness after cardiac arrest. Prolonging death was an issue discussed with the patient's next of kin when the physician had seen the deterioration of the patients. It was suggested to not do CPR and no intubation, however, some cases asked for this practice due to their families' concerns. Following intubation, it would not be allowed to withdraw the tube and, as a consequence, patients who were still conscious and/or their next of kin would have to make in advance a decision.

"As I said…it depends on whether or not such cancer has any evidences. In my opinion, prolong life means increasing in life time. But it doesn't mean intubation in the ICU, it's different…umm…and this means "prolong death" which helps nothing. It doesn't make any usefulness. A patient in this condition…umm…like that…With the nature of that cancer, he/she couldn't alive…it (prolong death) seems useless for everyone."

KI no. 2

"…But we have to talk (with the patients relatives)…that if they want intubation and dripping Dopamine (inotropic agent), I don't agree. It is prolonging death.…"

KI no.1

Focusing on palliative care and pain control, there was the programme/unit in the regional hospital and the cancer center. At the regional hospital, almost all physicians specialized in cancer normally took care of their terminally ill cancer patients until death with supportive care. However, a palliative care programme was commenced a few years ago and integrated in the family medicines unit. The main responsibility of

this unit was the primary care of the primary care units (PCU) within its catchment area. Apart from hospitalisation in the wards according to specialised departments, e.g. gynecology and surgery, patients with late stage cancer could end up at the family medicines ward. Recently, the pain control unit was created and functioned under the anaesthiology department.

Similar to the regional hospital, the cancer centre established a palliative care unit and pain control clinic since 2002. Due to rare cases with long hospitalisation and dying at the centre, nowadays, the specialised palliative care unit has reserved only a few single private rooms for terminal stage patients expecting to end up at the centre. These rooms were also called the hospice unit, providing hospice care. The pain control clinic provided only the medicines for pain relief. Previously, acupuncture was a health service provided by a trained physician but it was stopped because of moving to other hospitals by the physician. There were concerns over the claimed expenditures for the pain control under the UC scheme. It was limited at the highest amount of 700 Baht per visit, whereas the expenditure for a patient with advanced pain was mostly over this ceiling amount. As a result, the patients or the care givers had to frequently visit the hospital for the medicines even when patients were not due for following up. The extra unclaimed expenditure was absorbed by the referred hospital and the increasing travel expenditure of these unnecessary visits incurred by the patient's household.

> *"The duration for following up is a week after the problem of the budget and payment.…Previously, if there is no problem, the uncomplicated or stable case, they get the drugs (for pain control) no longer than a month…Up to date, there is no problem with the restriction of this narcotic drug (morphine) but I don't know the future.…"*
> *"Nowadays, asking about the quality of the service, it would decrease. Patients evaluated that it is inconvenient and complicated. Relatives said that it is a difficulty, they don't know where they could get the money for the travel cost…But today, we do have to follow the policy.*
>
> KI no.13

In the community hospital, there was pain control with analgesic drugs and acupuncture by a trained physician. Compared to other diseases and other medicines, it was commented that there were few patients. Pain control does not include only a group of

medicines but requires various medicines and their several strengths and formulation to overcome several types of pain. Focusing on the opioid analgesics, it requires minimum specialized knowledge but close monitoring for pain control and serious adverse reactions. As a result, it might not be efficient to stock the medicines at every hospital, in particular the PCUs and community hospitals. The regional hospitals and provincial hospitals, as well as the cancer centre specialising in cancer should be the management centre of medicines for pain control. The suggestion also included prescribing a large amount of the medicines from the regional hospital or the cancer centre and establishing a monitoring system by the responsible PCU or hospital.

> *"Actually, we have a campaign on the top five diseases including hypertension and DM (diabetes mellitus). The highest incidence is diarrhea…but CA (cancer) is rare, it is around the last rank.…*
> *During the period that I'm a chief ward for 2-3 years, there are 5-6 cases of terminal stage cancer."*
>
> KI no.11

> *"We don't have these pain control medicines at the unit (PCU) because even in the regional hospital, the use rate is small. If we have in the PCU, it'll be rarely used.…"*
>
> KI no.10

> *"…I don't think that all hospitals should stock this drug group because not all hospitals that have cases.…Like this cancer centre which is the tertiary care specialised in cancer might have these drugs and setting up a system that the hospitals could buy the drugs from the cancer centre.…"*
>
> KI no.13

8.3.5 The places for care and the places for dying

The physicians and nurses suggested that the patient's homes were the main suitable place for terminal care and dying. Thai culture in expanded families is that the younger generation would take care of the older generation. The next of kin or relatives should take care of the patients and this responsibility should not be totally transferred to others or even health personnel. It was the shared responsibility between the relatives and health professionals. That is, home is the place in which this cultural structure,

particularly in the north-eastern region, would be better retained than in the health facilities. However, it required well prepared supportive care at the patient's home, for example, pain control management, mobile oxygen support for patients with difficulty in breathing from lung cancer. This should also be a compromising consideration which accommodated patients' and their care givers' requirements and household context as well as the availability of the health resources, for example, bed occupancy at that moment. In addition, the scarce hospital beds should be allocated to the patients in need with good prognosis. Also, it is inconvenient to the patient's relatives if the dying patients remain hospitalised. During the period of deterioration, the nearest hospital could be the place for the palliative care and end of life care which does not require any advanced expertise. Referring to the cancer centre, where the patients must go to, results in difficulties in travelling.

> *"I think home is…because of the familialisation, feeling of relaxation. But it is also that they (the patients) were able to stay without too much suffering…they should have medicines…umm…there should be a unit taking this special care in order to bring them (the patients') into calmness…for being alive or supporting the oxygen (mask or cannula) at their home and don't let them having much pain."*
>
> KI no.2

> *"When the patients wanna stay in the ward, the doctor said O.K. as she wants because she couldn't accept anything right now. She couldn't accept in going back home. Another case is that the patients do not have relative at all. A patient with end stage cervical cancer was left…the relatives left her being alone in our hospital….We had to contact her relatives after her death but no one came…"*
>
> KI no.12

In the cultural context, some health professionals mentioned that the north-eastern people had a belief in dying at home. This supports the concept that patients would prefer dying at home than other places, particularly in people living in rural areas. It was also a supportive care for patients' relatives.

"Mostly, relatives will take them (the patients) home because here, there is a faith that if a patient died, they couldn't bring back to the village. So they do have to carry alive patients.…

Even if the patient was dead, they want us to prepare the patient pretended as alive in carrying back home…Even we already issued the death certificate but we do have supportive care to the relatives….There are a lot of cases like this."

KI no.3

8.3.6 Differences in services by health insurance schemes and suggestion on improving the health systems for cancer patients

The perception about the differences in health services provided to beneficiaries of the three health insurance schemes emerged in the discussion with a few health professionals. One key informant did not agree to record and to note his/her opinion. However, the views of these health professionals were in the same direction, that is, in general, the CSMBS provided the best benefits to their beneficiaries. There was not much difference between the SHI and the UC in the case of cancer. In contrast, it might have no difference between the UC and the CSMBS for pain control.

"Yeah…different…a lot…coz…who said money couldn't buy life…there are some medicines that limited to UC. The CSMBS beneficiaries' survival rate is higher…The CSMBS is the best, isn't it? Next is the SHI but the SHI for cancer is not different from the UC, except the referral case which the primary hospital could be fully charged so that it wouldn't refer…"

KI no.1

"We must control the expenditure through the budget limited…that is we must accept that benefit of each scheme isn't equal. We couldn't say equality because the background of each scheme is not equal."

KI no.2

"It's good in terms that everyone gets the services, that is, patients without money also get the services…before the UC, patients who have no money, first, be unable to come and, second, pay out of pocket which most of them

are unable…The referral system is improved. The referred cases are the case that really required our specialised care which in contrast to before the UC which the patients came by themselves…

At pain clinic, there is no difference because for whichever your card (scheme) is I treat like this…I guarantee that we have no difference, whatever you are, the UC, CSMBS I didn't treat the CSMBS first…"

KI no.13

A few health professionals also suggested improving the health systems which includes both the financing and services for patients for all stages of cancer. This could be categorised in three issues, namely the referral system; care for patients at advanced stage; and financing and payment mechanism of the UC.

In the referral system, improvements in two-way communications between the primary referring hospital and the referred hospital in the referral system, particularly the plan of palliative care were suggested.

"We are trying to do a two-way communication, that is, at least we'll describe the treatment plan in the referral form to the primary hospitals (community hospitals) including drugs…When referring, at least, they should ring us that what we could do for the patients because sometimes…it's a pity that they come here but we could help similar to the primary hospitals."

KI no.4

"…In fact, it was set up, the centre for referring, so, there should be a phone call in all cases referred for coordination…it might include a fax of investigation as well as the communication between physicians at both hospitals about the suggestion (on the case management or treatment), for example…"

KI no.14

Another idea regarding health services for all stages of cancer patients included additional cancer centres in some areas of the country, that is the upper and the lower part of the north-eastern region. This is due to the difficulties in travelling by patients residing in the provinces far from the existing cancer centres. These specialised health

facilities had advantages of expertise on the disease over other tertiary care hospitals which had responsibility to all diseases. This might be an extended unit from the tertiary hospitals like the Ubonratchthani model. That is, the cancer centre had collaboration and coordination with the regional hospital for sharing the resources.

> *"…Umm…I think…first, we should have a new centre. I think there are less numbers of centre…In the lower north-eastern region, there might be a centre at Surin (a province) including new radiation equipment. There are also not enough centre in the upper north-eastern region…it might be at Mukdaharn (a province)…if there are not enough, the centre here has been so crowded and the patients get difficulties in travelling. It should have more health professionals, place and equipments…umm…what else…those for operating…."*
>
> KI no.2

> *"…Cancer centre in Thailand?...I think, there might be another centre in E-sarn (North-eastern region)…in my opinion, it should be NakornPhanom (province) but it might have insufficient capability…the distance between NakornPhanom and here is 300 km. and Surin (province) might be another place (for a new centre) because of the distance, both are nearly 300 km.… Only at UdonThani, KhonKhan and Korat (provinces in the north-eastern region) where (the health facilities) could provide comprehensive treatments for cancer."*

> *"…The importance is that the mental support which takes time. And actually, it must be home visit because the patients are not able to travel. Even in the areas nearby Ubon, it must be home visit. If they communicate to us, the nearest hospital should take the action. It depends on the technique (technical approach). If it is implemented, nurses probably are the key service providers…."*
>
> KI no.5

A key informant would prefer co-payment for both the UC and the CSMBS. It might help the beneficiaries in realising the monetary value of health services and saving the government budget.

"…I would desire that this system (the UC scheme) was cancelled because…at least the patients should have co-payment so that they could help in saving (the budget) because all investigations have cost and expenditure."

KI no.4

Due to the increasing trend in migration of working adults from rural areas to cities, the elders stayed at home with young children as nucleus families. As a result, the concept of hospice care was agreed upon in principle by most of the key informants. This might also diminish the overload on the scarce health resources shared with other diseases, e.g. bed occupancy, and stress of the care giver as well as interruption in earning of the next of kin. That is, if there were health facilities and health professionals taking specific care of the patients during their late stage and end of life period, it might be an option for improving health service, particularly in big cities. However, there should also be a specific or additional budget for this new service (of hospice care). There was also a disadvantage of this specific facility that the terminally ill patients would see death more frequently and this would decrease their willpower and might increase their fear of death. This also supports the idea that home is the best place for dying. In contrast, a key informant would prefer that hospice care be incorporated into the current in-hospital service. It was emphasised that the concept of palliative care should be encompassed into health-service provision by health personnel. This hospice would not only be specifically for the cancer patients but also other chronic diseases. This is due to the experience on refusal for long hospitalisation from all levels of care. It might be a private room that the patients are allowed to stay in with their relatives and engage in any activities they require, for instance, religious activities. Thus, the patients close to death were separatedand they would not scare other patients in general ward.

For the hospice care at home, it might be possible to strengthen volunteers in the village or the community to help health personnel in providing care. This home hospice might require a 24-hour consultative phone line for the relatives of the patients approaching death.

"For now it is not, it is too quick but it might be good in the future because nowadays offspring haven't stayed in the village. The one who should take care of their mom and dad haven't stayed, so if there is a unit supporting

this social condition, I personally agree. Actually, it should start now because if the problem arises, it might be too late...."

KI no.9

"Hospice?…Cancer is increasing…in particular the end stage so there is health needs…regional hospitals and cancer centres must have…provincial hospitals should also have but the district hospitals (community hospitals) might be a network for referring but the problem is who will do these..…I think provincial hospitals and regional hospitals should have this care. The cancer centres must provide this care if they want to."

KI no.5

"…It's very good, in fact it should have one hospice per province because there are always these patients but not much…It could be in hospitals, that is, an independent unit supported with an Act…or what it should be?...It should have physicians, nurses…it might be a part…a small ward in provincial hospitals…Otherwise, 4-5 beds would be reserved for this group of patients who could go nowhere or who are afraid of dying at home..…"

KI no.4

"…It might not good because the patients have frequently seen dying…death of friends, so if patients at the terminal stage stay together, they might see their friends pass away and fear for."

KI no.12

"…Yes, it should incorporate in the existing health facilities. It could set up as a ward but isn't necessary to be a separated facilities…It's necessary for temporary stay of the chronic cases which the care givers feel burden…like…"if I continue in taking care, I will burn out…please let me take a break…let me sleep like a log and then I'll get back"…It should be like that..…"

KI no.10

"…Actually, hospitals always have limited numbers of bed, so I will count the patients' homes as hospice. I'll allow the relatives of the nearly dying

patients to ring me when required. It also needs 24-hour phone because it wouldn't happen during the office hour…."

KI no.13

8.4 Summary of research findings and study limitations

8.4.1 Summary of research findings

This study summarized viewpoints on health care provided for cancer, especially at the terminal stage, provided by 18 key informants in the regional and community hospitals and the cancer centre in Ubonratchathani province. On average, the key informants had 11.1 years of experience in health services for cancer patients. Some issues according to the study's objectives and new issues emerging during data analysis included disclosure or telling the truth regarding diagnosis and prognosis; route of health care and treatment; palliative care and pain control for prolonging life versus prolonging death in the advanced stage of cancer; the place for care and the place for dying; and difference in services by health insurance schemes and suggestions on improving the health systems for cancer patients.

Disclosure of definite diagnosis and prognosis of cancer was mostly carried out by physicians at the regional hospital or the cancer centre despite the patients having started their access to treatment at a community hospital. It was the patient's relatives or next of kin to whom physicians disclosed both diagnosis and prognosis including treatment while the patients were usually informed only of the diagnosis and treatment. Often was the case that the relatives did not agree on disclosure of the diagnosis, as a result the patients might be informed of the disease as tumour. However, due to the deterioration of the disease, especially in advanced stage, patients themselves probably perceived the cancer. The demand on, and details of disclosure also depended on the compromise of different demands and the assessment of the patients and relatives characteristics, age, medical condition, residential area and education level as well as health insurance scheme.

Like other diseases, the route of health care and treatment for cancer patients usually starts at a primary care unit including private clinic and community hospitals, in accordance with the programmatic registration of their health insurance scheme. The referral system was the key bridging structure of the health services classified into three

levels of care including advanced tertiary care; however, it should be strengthened. Once the patients had a definite diagnosis of cancer at the tertiary care level, they could continue their treatment at the tertiary care health facilities until either ending up at such facilities, or being referred back to the community hospital for palliative or supportive treatment during the terminal stage. Recently, both the regional hospital and cancer centre set up the palliative care unit and pain control clinic. This palliative care also included chemotherapy and radiation therapy while the pain clinic provided medicines for pain relief. The community hospital also provided pain control with some medicines for pain relief and acupuncture. It was commented that the claimed expenditure limited at the maximum of 700 Baht per out-patient visit was not adequate for the actual expense of pain relief medicines due to the expensive and increasing prescription and the amount of opioid analgesics.

In accordance with health care at the terminal stage, physicians also gave their views on the concepts of prolonging life versus prolonging death. The former is determined with palliative care in maintaining the quality of life of patients, which might result in prolonging life for a few months while the latter refers to cardiopulmonary resuscitation with medical and mechanical support or 'intubation'.

The patient's relatives took part of the responsibility in addition to the health personnel in caring for patients in the terminal stage. This was related to the Thai culture in the issues of expanded family and younger generation which should take care of the older generation. Home was the best place for health care at the terminal stage as well as the place for dying. The reason for this is that patients would feel relaxed and familiarised with. This is different from hospitals, as it was the place that patients could stay without limitation of numbers of visitors, time, as well as travel limitations. However, selecting the places was a compromised decision between preferences, conditions and family context of patients and their relatives.

It was mentioned that health services under the health insurance schemes and benefit packages were different in the views of health care providers. The health service package for cancer according to CSMBS scheme was the best, whereas the UC and SHI schemes were likely equal. However, there might not be differences between the CSMBS and the UC in medicine items for pain control, but there were differences in the amount prescribed. It was also suggested that there should be one or two new cancer

centres in the north-eastern region to reduce the geographical imbalances. The palliative care concept should be introduced to all health personnel, particularly in the PCUs as well as the home-based hospice care. The hospice facilities would be a new requirement in the near future because of the changing Thai lifestyle, and family or household structure, especially in the city areas.

8.4.2 Data and methodological limitations of the study

The difficulties in conducting the interviews for the study were found to be the time constraint in interviewing, particularly of interviewees who were physicians. This constraint also resulted in losing an interview with a head of pharmacy unit at the community hospital. Even though it was out of the scope of this study, opinions of the executive members of the hospitals should also be sought out. It would help in providing further suggestions on the health service system in relation with the financing system.

8.5 Discussion

This subsection describes the discussion mainly on the professionals' views on current practice, place of care and place of death. The discussion on the health care service for terminally ill patients and the previously mentioned issues as a whole is deferred to Chapter Nine.

No terminology of bad news in medicine was found, but it was determined around the information of diagnosis of incurable cancer; diagnosis of cancer; prognosis in dying patients; diagnosis and prognosis in terminally ill; incurability in undisclosed cancer; diagnosis of incurable diseases including, for instance, AIDS. Breaking the bad news or telling the truth was a concern regarding moral dilemmas due to its perspectives on patients rights as well as its consequence for the patients as the recipients of such bad news (Donovan 1993; Wattanachote 1997).

Telling the truth in this study was consistent with Sengprasert (2003) who found that most of key informants, physicians at the National Cancer Institute in Bangkok, always told the truth to the patients relatives prior to the patients. However, it was the patients right to know and to make co-decisions on treatment with the physicians. Disclosure of the diagnosis made no concern on further discussion of treatment and care with the

patients. In the case that the relatives asked the doctor to conceal the information, such request including the usefulness of disclosure should be clarified with and indicated to the relatives. However, it was revealed that in the case of terminal stage, a physician accommodated the relative's request where no specific treatment was available or the patients were in poor mental health (Sengprasert 2003).

In consideration of the moral judgment in line with ethical theories, Saruayiam (1998) reported that the Thai moral judgment is similar to the western culture but it also takes into account the Buddhist ethics. This study employed an in-depth interview of 7 physicians and 7 nurses working at 2 advanced tertiary care hospitals and the National Cancer Institute located in Bangkok. Two concepts in telling the truth were summarised as telling all truth to patients and telling as seen appropriate based on individual cases. This latter concept not only included telling partial truth, but also telling everything to the patients or telling the truth to relatives (Saruayiam 1998).

The practice in disclosure of the diagnosis-treatment-prognosis by the physicians in this study fell into the model 3, individualised disclosure categorised by Donovan (1993). The first two models were non-disclosure and full-disclosure. Table 8.2 shows three such models compared in terms of doctor-patient relationship; management decision making style; doctor-patient communication; underlying assumption; disadvantages; advantage; and summing up (Donovan 1993). This individualised disclosure had taken into account the individual patient's requirements on the amount of information disclosed and the times of disclosure as indicated in subsection 8.3.1.

There was an issue revealed in this study and other studies in Thailand that even though patients were told about the information of their diseases, health professionals gave the precedence of telling the truth to the patient's relatives rather than to the patients. It was the relatives of the patients that played an important role in decision making about this truth that was told. So far, this finding was not found or mentioned in any western guidelines or references (Lederberg and Joshi 2005; Sadock and Sadock 2007; Tulsky and Arnold 2007).

Table 8.2 Comparison between three disclosure models

	Non-disclosure	Full disclosure	Individualized disclosure
Doctor-patient relationship	Paternalistic	Paternalistic	Partnership
Management decision making style	Physician only	Patient only	Joint
Doctor-patient communication	Poor	Fair	Good
Underlying assumptions	1. appropriate for doctor to decide what is best for patient 2. patients do not want to hear bad news about themselves 3. patients need to be protected from bad news	1. patient has right to full information about self and doctor had obligation to give it 2. all patients want to know bad news about themselves 3. patients should decide what treatment is best for them	1. people are different 2. it takes time to absorb and adjust to bad news 3. partnership relationship as basis for decision making is in patient's best interests
Disadvantages	1. opportunity to adjust denied 2. trust in doctor undermined 3. opportunities for helpful interventions lost 4. patient compliance less likely 5. barriers between partners 6. may acquire wrong information 7. leads to avoidance, isolation and perception of rejection 8. patient sense of control lost	1. discussion of options in detail frighten and confuse some 2. insisting on informing may undermine defences e.g. denial 3. full information may have negative emotional consequences for some	1. it is a very time consuming process 2. it drains caregivers' emotional resources
Advantages	1. easier and less time consuming for doctor 2. suits those people who prefer not to know their condition	1. promotes doctor-patient trust 2. promotes family support and allows time to put affairs in order 3. helps those who cope by finding out maximum information	1. amount of information given and rate of disclosure tailored to needs of the individual 2. supportive relationship with doctor is developed
Summing up	1. assumptions cannot be supported from literature 2. negative impact on lives of most patients	1. assumptions are no valid for a significant group 2. could be harmful to some especially if done abruptly 3. ethical problems in medicines	1. appears to be the ideal model

Source: Table 1 and Table 4 in (Donovan 1993)

Health professionals preferred home as the place of care and the place of death for patients with terminal cancer. This preference took into account the patient's quality of life, patients and their family contexts and the social and cultural norm as well as the scarce resources of health care providers. However, they also agreed and suggested to have new interventions such as hospice health facility to accommodate the social structure and population changes in the near future, and one to two new cancer centres in the north-eastern region.

In using home as the place of care and place of death for terminally ill patients, particularly the cancer patients, strengthening health care services was suggested. This included particularly the concept of palliative care, pain control and hospice care in health professionals at the primary care level. However, it was commented that in the management for pain relief medicines, there might not be a need to stock all medicines at the PCU or community hospitals. Not only the pain relief medicines, but also the medical supplies and devices should be available to reduce patient suffering and to maintain patient's quality of life. Therefore, there should be a better mechanism to support the palliative care and pain control at home. Further discussion will be presented in the next chapter.

8.6 Conclusion

This chapter revealed the health services for cancer patients provided by the three levels of health care in Ubonrachthani province. The study employed a qualitative approach to address the service system including the referral system among such levels of care for cancer patients at both the early stage and late stage. It revealed the current practice of health professionals, particularly physicians, on the disclosure of diagnosis-treatment-prognosis, suggestions on place of care and place of death as well as improving health services on palliative care for terminally ill cancer patients.

CHAPTER NINE

DISCUSSION AND CONCLUSION

This last chapter comprises of two main sections of discussion and conclusion. The former presents the final discussion on the overall research integrating four studies including hospitalisation and claimed expenditure in the last year of life; utilisation of and household expenditure for ambulatory care and acute care; current practice and preferences of patients with advanced cancer and their care givers; and current practice and views of health professionals on health services for terminally ill patients. The discussion is focused on two main issues including the study design, methodology and data of the research, and the key findings of the four studies. The last section is the conclusion of the findings, policy implication and research questions for further studies.

9.1 Discussion

The research was set up to respond to the research questions (Chapter Three, section 3.5) including:

1). Is there any inequity among Thai people in health care during the end of life period?

2) What are the factors influencing that inequity?

3) How do terminally ill cancer patients and their families cope with financing and their preferences for healthcare during that period?

4) What new policy directions need to be developed or changes made in the current policy and practices in Thailand?

This research then has specific objectives to prove the research questions on equity in health in three aspects, including payment, access to services and services provided, during the last period of life (see Chapter Three, subsection 3.1.4). Such equity was revealed by estimating the estimated utilisations and expenditure as well as the influencing factors, which were conceptualized on the basis of tripartite stakeholders including households, health care providers and third party payers in health care financing systems (Morris, Devlin et al. 2007). The research employed quantitative methods to reveal those estimated utilisations, expenditure and factors, details shown in

Chapter Five and Chapter Six. Using the qualitative approach, the coping mechanism with financial barriers and the preferences of terminally ill cancer (as the 'tracer disease') patients and their families were explored and described in Chapter Seven. In addition, the research sought views of the health professionals as the health care providers on services for such group of paitents. Beyond informing the quantitative evidence on equity, the findings from the two qualitative studies could also suggest the policy implications for health service provided to terminally ill cancer patients in Ubonratchathani province, where the research took place.

9.1.1 Research design, methodological issues and data

9.1.1.1 Research design

The research was designed to employ the mixed method of quantitative study and qualitative approach. These methods each have limitations of the nature and appropriateness to each type of research questions of each approach. The former provides the reality but the later addresses the ontological perspective (Mason 2002). Meanwhile the quantitative method is mainly used to quantify the magnitude of a phenomenon of interest, for example, determining the proportion of event, the qualitative approach can provide details of and reasons for positive and negative response to such event (Jones 1995). As a result, this mixed method of quantitative and qualitative approaches are widely used in many areas of research, currently in medical science and social science.

9.1.1.2 Methodological issues of the quantitative methods

Focusing on the two quantitative studies of the research, the first study intended to explore the data of the third party payers and the second study focused on the household payment. The strength of the research is on making use of datasets which could be nationally representative and it was designed to retrieve the national data from the health insurers and households which represent the third party side and the patient side. The national representative has an advantage in evidence-based policy recommendation at the national level. In other words, such representation already accounted for individuals distributed throughout the country. The data collection period of both studies inclusively covered the episodes occurring within a year, and thus, the seasonal effect did not need to be considered as a confounding factor. However, a weakness of

the research is on both datasets which referred to different time periods of health experience before death, as well as their inconsistency. That is, the duration of the health insurance claim dataset was one year whereas the recall period of the household survey was three months for ambulatory care and six months for acute care. The claims dataset also could not link the registered records of every beneficiary of all health insurance schemes; as a result, the propensity of using the health services and having expenditure could not be estimated.

Two of the research studies, claimed data and household survey, were designed as a retrospective cross-sectional study for a year during 2005-2006. As a result, it was not possible to explore any time trend in or variation across time of hospitalisation and expenditure. Under this circumstance, a time-series study, that is, including a few years of retrospective data, could fix the effect of over-time change by including the year as an additional independent variable (Zweifel, Felder et al. 1999; Seshamani and Gray 2004b). This analysis could portray the retrospective trend and better forecast the future estimation.

In particular in the insurance claims dataset on hospitalisation and expenditure, this research was able to analyse data from only the two out of three health insurance schemes, the UC and CSMBS (details in Chapter Two, subsection 2.2.4.1 2) and Chapter Five, section 5.1). It would have been better to have the SHI dataset in a comparable manner to the other two. This health insurance scheme which benefits the working-age population might reveal differences in mortality pattern, utilisation of and expenditure for health resources.

The household dataset was specifically designed as an addition to the Survey of Population Change which is a ten-year routine survey. This useful survey did not include only patients' utilisation of health services and households expenditure on direct medical cost, but also travelling cost and lodging for the care givers for the last visit for ambulatory care and last hospitalisation. It might detect changes in such patterns of use and expenditure and respond to the health service policy in time. This is necessary research for health policy makers, due to the fact that the utilisation and expenditure of this group of dying patients, an average of 0.6 percent of the annual population in Thailand, have been shown in many countries to require greater health resources than survival patients (Calfo, Smith et al.; Riley and Lubitz 1989; Lubitz and Riley 1993;

Garber, MaCurdy et al. 1998; Hogan, Lunney et al. 2001; Hoover, Crytal et al. 2002; Lunney, Lynn et al. 2002; Seshamani and Gray 2004c). In order to have such dataset as a time series, this survey should be repeated in greater frequency. Another option is for collecting this informaion is the Health and Welfare Survey (HWS) which is a biennial household survey of sickness, health care utilisation and health insurance could include a question regarding to the decedents of the households as a unit of survey or household member.

To have comparable data of health care utilisation and expenditure of a decedent supported from both sides, the third party payers and the households, a new research design and research methods might be necessary. For example, it might be a specific mapping of data using the citizen identification numbers (CID) as common reference between the household dataset and the health insurance datasets. However, this individual data mapping requires ethics approval. The research might be conducted prospectively or retrospectively with different pros and cons. The prospective or longitudinal or cohort design should encounter problems about unreliable memories of the informants. As a result, all episodes of health care utilisation and expenditure occurring during the study period will be accurate. However, difficulties include seeking the patients who are dying, which should be the main inclusion criteria of the study. In contrast, the retrospective research will have limitations on poor reliable memories recalled for all episodes, particularly the informants from the household side. Identifying the decedents and tracing back their utilisations and expenditure are easier compared to the prospective method. Nonetheless, it should be taken into consideration that retrospective study might have a systematic recall bias, which occurs when one group has better memory than the other groups due to having more experience (Bland 2000). This would be the case in particular in the case-control study which might apply to the decedents and the survivors in the area of this study.

9.1.1.3 Methodological issues of the qualitative approach

The two studies employing a qualitative approach focused on advanced stage cancer patients, their care givers, and health professionals in a province. These studies helped in exploring the health services from the views of households, patients and their informal care givers (demand side). In order to have a broader view of the Thai health service systems for terminally ill cancer patients, other research sites, e.g. other

provinces with similar referral systems of the regional hospital and the cancer centre; provinces in other regions of the country should be included in the research. However, the number of participants, in particular the patients and their care givers in each setting might be adjusted according to the principle of validity and reliability in qualitative method.

Regardless of the study time frame, the research design of both studies was limited with a few issues. Even though the study employed purposive sampling in the attempt to recruit patients with some different characteristics, i.e. socioeconomic status as the poor and the rich; geography as urban and rural areas; and the three health insurance schemes, UC, CSMBS and SHI, the study could not seek out patients with these completely mixed characteristics, accordingly. Such characteristics were the factors partly influencing the expenditure for the end of life which might be underpinned by the different view and practice of patients and their care givers (see Chapter Three, section 3.2.1). For example, the recruitment was limited to only one SHI for those residing in urban area but could not have the SHI in the rural area. In addition, the study could not differentiate between the rich and the poor among patients. A few criteria for identifying patients' wealth status should be developed in further research. The research also did not include terminally ill patients with other diseases, for example, the end stage of organ failure. Compared to cancer, these groups of patients might require different health care, for example, they would rather need end of life care or palliative care without pain control. Hence, having views of dying from other diseases might lead to more comprehensive recommendation for national policy on health services than from a single disease.

9.1.1.4 Secondary data of the claimed dataset and household survey

The research actually made use of three datasets in which two of the datasets, the death certified record of decedents and the hospitalisation data were combined as one—the claimed dataset (Chapter Five). The other dataset was the household survey, analysed as described in Chapter Six.

In the combined dataset of the study in Chapter Five, there were some limitations. First, the dataset could not include those decedents who had not sought any in-hospital acute care as well as all zero claims during the last year of life. This additional data would provide the propensity of utilisation and expenditure incurred to the health insurance

schemes. This would also be consistent with the data of the household survey. Next, compared to the household survey, there were much fewer variables of individual data. The dataset should include, for example, the residential area of the decedents as well as the geographical data of their place of death, and the socioeconomic status of residential area. The appropriate unit of such area might be available as province or district. In addition, when the place of death is a hospital, further categorization should be made into different level of care available, for example, the advanced or specialised hospitals, tertiary care hospitals and secondary care hospitals. Such groups of care level might better reflect the hospital capacity in relation to the expenditure at each level of care. It has been reported by others in other countries that this variation had an effect on the health service systems including expenditure for decedents (Hogan, Lunney et al. 2001; Shugarman, Campbell et al. 2004; Wennberg, Fisher et al. 2004). However, the insurance claims dataset itself may be limited to only the data which is necessary to the reimbursement system. Perhaps, individual record mapping on this information to other datasets should be considered simultaneously with the possibility of ethical approval.

The household survey dataset in the study of Chapter Six had a greater number of variables than the combined dataset of the hospitalisations and claimed expenditure. However, the geographical data could be categorised into only 5 regions. The categorisation into provincial levels was not recommended due to the sample size estimation of the survey which was based on regions. Further estimation, taking into account the provincial level, was likely to reduce the limitations on explanation of the factors which determined the health care utilisations and household expenditure.

The quality of identifying cause of death indicated in both datasets seems to be poor. Nearly one-third of all causes in the combined dataset and one-fourth in the household survey dataset were reported as ill-defined causes including senility. These high proportions of ill-defined causes reflect the poor performance of and quality of identifying the cause of death in the country. This identification requires further exploration, explanation and improvement because it is an important indicator of the health system (Commission on Social Determinants of Health 2008; World Health Organization 2008).

Causes of death in this research could not be compared to the causes of death from other studies in the country due to the methods of defining the causes. This study employed

broader categories, such as communicable diseases and non-communicable diseases, due to the fact that the retrospective interview was conducted and responded by lay people, i.e. non-health personnel and the decedents' caregiver or household member, respectively. This differed from other specific studies on causes of death which identifying causes of death classified by health professionals (details in Chapter One, section 1.3.2) (Chooprapawan, Porapakkham et al. 2000; Thai working Group on Burden of Disease and Injuries 2007; Project on Setting Priorities Using Information on Cost-Effectiveness (SPICE 2004-2009) 2009). However, the causes of death recorded by the ICD10 in the insurance claimed dataset linked to the death certification dataset were likely to be much more accurate (Chapter Five). This death certification or the citizen identification number dataset should be useful to the household survey and it could provide the details of diseases as well as the different patterns in utilisation and expenditure among causes of death as such. This methodology on the linkage by death certification and the identification number requires another study for which ethics approval would need to be taken into consideration.

The economic status of households is a crucial variable in monitoring equity. The household survey dataset provides the income, in kind contributions and assets which are a set of data in measuring the household living standards. Even though the survey collected assets and analysed with principal component analysis, the study in Chapter Six selected the sum of income and in kind contributions as a measure for household living standards. This is the reason for less percentage of data loss. The sum of income and in kind contributions, and the asset index score were ranked and categorised into quintiles and both measures of living standards showed a weak positive relationship (Spearman correlation was 0.4, details in Appendix 4, section A4.4 c)). This weak relationship might reflect less reliability of both measures in this dataset. Employing the principal components analysis technique, the asset index selected the first principal component. As a result, several assets which have high monetary value but a few household have and indicated wealthy status, for example, monetary value of the land, might not be taken into account. Apart from the countable assets, this technique also requires an appropriate intermediate variables transferring from some original variables. However, the asset index quintile is suggested to be used in measuring living standards of households instead of the sum of income and in kind if there are difficulties in data collecting. Further, the monetary terms of income and in kind contributions as a

continuous variable was another choice of the direct measure of the household economic status. The income measure was criticised that it, likes the consumption or expenditure data, is difficult to collect. The informal sector in developing countries is more common, and as a result many households have multiple and continually changing sources of income and home production is widespread. Even in the developed countries, income data collection often has to deal with the problems of self-employment, informal economic activities and widespread reluctance to disclose information on income (O'Donnell, van Doorslaer et al. 2008d).

9.1.1.5 Primary data from the patients, primary care givers and health professionals

Difficulties were found during the study in terms of interviewing the patients and the care givers including finding patients who were CSMBS or SHI beneficiaries. In this study, there were sixteen UC, three CSMBS and one SHI beneficiaries. Perhaps, there were two reasons that both health insurance schemes have much fewer enrollees than the UC scheme; therefore, there was less chance of finding them as well (see Chapter Two, Table 2.7). Specific to the SHI scheme which recruits only the working age group, the mortality rate as well as rate of illness from cancer of such young group is rare compared to the UC and the CSMBS beneficiaries who are older (see Appendix A4.5, Table A4.4).

The study on the patients and the care givers was limited in recruitment of the variation of patients' characteristics, for example, residing in the rural areas, especially the poor, as partly indicated in subsection 9.1.1.3. In terms of the deviant cases which will express their opposite view to the others, the study could recruit only a minority ethnic patient who is the UC beneficiary subtype alien but was unable to confirm with the others on the constraints the case had confronted. Other ethnic minority groups and the patients from other religions which are not Buddhism also had not been found. The ethnic minority groups were the people who are prone to be underprivileged in access to public services, even in health care which is essential. In addition, this group may have differences of thought and experience which affects health care utilisation. For example, Bruera E, et al found that the African-American patients were 1.9 times more likely to die in hospitals than at home and some other researchers suggested that this preference might be due to them being less likely to accept physicians advice and preferred to select aggressive intervention as well as they were less likely to choose hospice

enrollment (Bruera, Russell et al. 2002); Eleazer GP, et al cited in (Bruera, Russell et al. 2002); Christakis NA and Escarce JJ cited in (Bruera, Russell et al. 2002). Meanwhile religions which usually have a complex but causal link with culture and folklore also play an important role in the management of the body after death which in turn determines the last period of human life, preferred place for dying and the health care provided (see Chapter Seven, subsection 7.4.3).

9.1.2 Discussion on the research main findings

In addition to the specific discussions in Chapter Five to Chapter Eight, this subsection focuses on the in-between research findings of such four chapters through the reseach questions mentioned in section 9.1, accordingly. There were mainly two topics including the findings of terminally ill patients as a whole and the findings focusing on terminally ill cancer patients.

9.1.2.1 Health care utilisation of and expenditure for terminally ill patients

Despite some limitations on comparison across studies were found, the two studies of the 2005-2006 claims dataset and household survey were able to reveal an overview of utilisation and expenditure of the health insurance schemes and the households for decedents over the period of the last year and the last six months of life.

(1) Factors determining hospitalisation and expenditure during the last year and last six months of life

Like other periods of life, it was clear that during the last six months of life, none of all decedents sought health care as well as experienced expenditures on health care. Consequently, the study has shown the propensity and intensity of using acute care and having expenditure of the decedents. In addition to the decedent or household side, the research could reveal the intensity of using acute care and the expenditure for the last year of life incurred the health insurance schemes, the third party payers.

In accordance with the factors influencing health which were mentioned in the research conceptual framework, Table 9.1 shows all factors explored in this research in Chapter Five and Chapter Six. The common factors that determined the intensity of using acute care reported both by households and health insurers in the last year or the last six months included age and cause of death, whereas the factors in propensity to use health

care included age, occupation, place of death and health insurance scheme. Other factors found from the health insurance data analysis, determining intensity, included gender and comorbidity. These factors, particularly age and gender in the health insurance side, were also found in previous studies employing descriptive statistics or regressions (Roos, Montgomery et al. 1987; Shugarman, Campbell et al. 2004; Hanratty, Jacoby et al. 2008; Payne, Laporte et al. 2009) (see also Chapter Three, section 3.2.1). Further research on the propensity of hospitalisation including factors on geography, demography and socioeconomics of the individuals and health care providers; and the comorbidity of the decedents might confirm whether the findings reported in this thesis are confounded and/or further explained by the additional factors. These proposed research areas might support the evidence on variation across areas of the country. Hence, this fact finding could guide tailor-made policy and interventions for specific problems of such area, for instance.

Table 9.1 Factors included both in the insurance claims dataset and household survey tested as significant determinants of propensity and intensity of hospitalisation

Factors		Health insurance scheme (last year)	Decedents and households (last six months)	
		Intensity	Propensity	Intensity
Geography	Region	-	×	×
	Municipality	-	×	×
Demography	Age at death	✓	✓	✓
	Gender	✓	×	×
Socioeconomics	Head of household	-	×	×
	Education	-	×	×
	Occupation	-	✓	×
	Wealth status	-	×	×
Others	Comorbidity	✓	-	-
	Cause of death	✓	×	✓
	Place of death	✓	✓	×
	Health insurance scheme	✓ (CSMBS and UC)	✓	×

✓ = yes; × = no; - = not available

Table 9.2 indicates the determinants of the propensity and intensity of expenditure for hospitalisation, both claimed and out of pocket. Age, gender, cause of death, place of

death and health insurance scheme were the main determinants of expenditure while region, age and three socioeconomic factors, place of death and health insurance had an influence on the propensity of paying out of pocket. Similar to the discussion on the propensity and intensity of hospitalisation, such factors determined expenditure in other developed countries.

Table 9.2 Factors included in both claimed dataset and household survey tested as significant determinants of expenditure for hospitalisation

Factors		Health insurance scheme (last year)	Decedents and households (last six months)	
		Intensity	Propensity	Intensity
Geography	Region	-	✓	✓
	Municipality	-	×	×
Demography	Age at death	✓	✓	✓
	Gender	✓	×	✓
Socioeconomics	Head of household	-	×	×
	Education	-	✓	×
	Occupation	-	✓	×
	Wealth status	-	✓	×
Others	Comorbidity	✓	-	-
	Cause of death	✓	×	✓
	Place of death	✓	✓	✓
	Health insurance scheme	✓ (CSMBS and UC)	✓	✓

✓ = yes; × = no; - = not available

(2) Factors determining visiting ambulatory care and expenditure during the last three months of life

Many studies have not reported evidence on costs and use of services beyond the hospitalisation and its expenditure; this research, specifically Chapter Six explored the propensity and intensity of ambulatory care visits during the last three months of life. According to Table 6.13 in Chapter Six, the main determinants of the propensity and intensity of visiting ambulatory care included cause of death, place of death and health insurance scheme. Meanwhile, the factors determining household expenditure for ambulatory care included age, being head of household, occupation, cause of death, place of death, and health insurance scheme. Other determinants affecting such visit and

expenditure included municipality, gender, education, living standards and using complementary medicines.

Using complementary medicine was a determining factor for the total number of visits because essentially, this type of care requires more frequent visits than the institutional health facilities which mostly have fewer follow up appointments. The care providers of complementary medicines mostly reside in the village, thus, it is much easier to travel to clinics/shops for complementary medicines than the health facilities in the municipality. This also determined the out of pocket payment because it is unlikely to provide some services, for example, some types of alternative medicines, in health facilities as well as the others might not be adopted in the health facilities even it is the policy. For example, some herbal medicines are included in the list of national essential medicines for which is referrably covered by the benefit package of all health insurance schemes (see Table 2.7, Chapter Two). However, if the herbal medicines are not included in the hospital formulary list, there is still no medicine available in the health facilities. Thus patients have to buy from the drug stores, if needed.

(3) Seeking acute care and expenditure during the last year and the last six months of life

Among the CSMBS and the UCE and the UCP beneficiaries who sought in-hospital acute care during the last year and the last six months of life, Table 9.3 summarises the average hospitalisations and rate per month of such decedents. Even though this average hospitalisation was not directly comparable because of the overlapping of periods and different variables in the datasets, to some extent the rate per month could implicitly reflect that the closer to time of death, the greater the seeking or hospitalisation was. It was indicated that the hospitalisation rate per month during the last year was 0.23 and increasing to 0.49 during the last six months. This might be due to the fact that closer to dying, the severity of diseases usually increased and, as a result, much more health care was needed. This finding was in line with other predictions of likelihood of hospitalisation during the four quarters of the year of death, in which the quarter including the date of death had positive effect. That is, the decedents in the last quarter of life had more than fifty percent chance for hospitalisation while it was eleven to seventeen percent during the second to the fourth quarters (Seshamani and Gray 2004a). This finding of the greater average hospitalisation during the last six months than the last year also similarly presents across most of the age groups at death, both types of the

UC beneficiaries, place of death, and some cause of death. However, this finding could only be confirmed by a study designed to reveal numbers of hospitalisation along a certain period of time up to death, which was not possible in this research.

Table 9.3 Mean hospitalisations (95% confidence interval) of decedents seeking care during the last year (claimed dataset) and the last six months of life by factors (household survey)

	Last year	Rate per month	Last six months	Rate per month
Average	2.8 (2.8, 2.8)	0.23	3.0 (2.7, 3.3)	0.49
Gender				
Male	2.7 (2.7, 2.7)	0.22	3.2 (2.7, 3.8)	0.54
Female	2.9 (2.9, 2.9)	0.24	2.6 (2.4, 2.8)	0.43
Age group (yrs.)				
< 5	3.2 (3.1, 3.3)	0.27	3.7 (1.1, 6.2)	0.61
5 to <10	3.4 (3.1, 3.6)	0.28	3.9 (-0.3, 8.1)	0.65
10 to <20	2.7 (2.6, 2.8)	0.22	1.7 (0.7, 2.6)	0.28
20 to <30	2.8 (2.7, 2.9)	0.23	6.6 (-0.2, 13.4)	1.10
30 to <40	2.8 (2.7, 2.8)	0.23	3.4 (1.5, 5.3)	0.57
40 to <50	2.9 (2.9, 3.0)	0.25	2.3 (1.5, 3.1)	0.39
50 to <60	3.1 (3.0, 3.1)	0.26	2.9 (2.3, 3.5)	0.49
60 to <70	3.0 (3.0, 3.0)	0.25	3.5 (2.7, 4.4)	0.59
70 to <75	2.8 (2.8, 2.9)	0.24	3.1 (2.3, 4.0)	0.52
75 to <80	2.6 (2.5, 2.6)	0.21	2.4 (2.0, 2.8)	0.40
>=80	2.2 (2.2, 2.2)	0.18	2.5 (2.0, 3.1)	0.42
Health insurance scheme				
CSMBS	2.8 (2.8, 2.8)	0.23	2.6 (2.1, 3.1)	0.43
UCE	2.7 (2.7, 2.7)	0.23	2.8 (2.5, 3.0)	0.46
UEP	2.9 (2.8, 2.9)	0.24	3.6 (2.7, 4.6)	0.60
Place of death				
Public hospitals	2.8 (2.8, 2.8)	0.23	2.6 (2.2, 3.0)	0.43
Private hospitals	2.5 (2.4, 2.6)	0.21	3.0 (2.1, 3.8)	0.50
Home	2.7 (2.7, 2.8)	0.23	3.4 (2.8, 3.9)	0.56
Others			3.1 (2.0, 4.2)	0.52

Table 9.3 Mean hospitalisations (95% confidence interval) of decedents seeking care during the last year (claimed dataset) and the last six months of life by factors (household survey) (cont.)

	Last year	Rate per month	Last six months	Rate per month
Cause of death				
Ill-defined	2.7 (2.6, 2.7)	0.22	2.1 (1.2, 3.1)	0.36
Communicable ds.	2.7 (2.7, 2.7)	0.22	3.0 (2.3, 3.6)	0.49
Non-communicable ds.	2.9 (2.9, 2.9)	0.24	2.9 (2.5, 3.2)	0.48
Injuries	1.6 (1.5, 1.6)	0.13	1.4 (1.1, 1.7)	0.24
Senility	2.1 (2.1, 2.1)	0.18	2.4 (2.0, 2.7)	0.39
Cancer	3.5 (3.5, 3.6)	0.30	3.8 (2.6, 4.9)	0.63

In addition to hospitalisation, Table 9.4 shows the expenditure of decedents seeking care incurred by health insurance schemes and households and the payment proportionate to the reference category. Due to the different period of the expenditure, the research could not reveal the average total proportionate expenditure incurred by both payers. However, it is likely that the health insurance schemes paid more for younger decedents than the older ones whereas the household paid increasingly more when age increased, compared to the decedents at age less than five years. Health insurers and households paid for the UC beneficiaries less than the CSMBS beneficiaries. In other words, the payments for the CSMBS from the health insurance scheme and the household were highest, compared to the UCE and the UCP. It is interesting that dying at home seems to be associated with reduced expenditure not only of health insurers but also households, compared to dying in hospitals. This finding might partly support the concept of good death at home and saving the cost for both the health insurers and out of pocket (Clark 2003). Apart from ill-defined cause of death, the health insurers as well as household spent the least amount of expenditure for senility death.

Table 9.4 Mean expenditure (95% confidence interval) of decedents seeking care during the last year (by health insurers) and the last six months of life (by household) by factors

	Last year	Ratio	Last six months	Ratio
Average	64107 (63564, 64649)		11596 (4455, 18737)	
Gender				
Male*	64025 (63292, 64759)	1	16082 (3939, 28224)	1
Female	64205 (63398, 65011)	1.0	5712 (3571, 7853)	0.4
Age group (yrs.)				
<5*	130189 (119962, 140417)	1	886 (-440, 2212)	1
5 to <10	104849 (93004, 116695)	0.8	0	0.0
10 to <20	94157 (86367 101947)	0.7	23318 (-24571, 71207)	26.3
20 to <30	61085 (57295, 64874)	0.5	21822 (6513, 37130)	24.6
30 to <40	51251 (49531, 52971)	0.4	5370 (1218, 9522)	6.1
40 to <50	62296 (60715, 63877)	0.5	2289 (-377, 4956)	2.6
50 to <60	65798 (64475, 67120)	0.5	11061 (-301, 22423)	12.5
60 to <70	66903 (65704, 68102)	0.5	6611 (-1089, 14310)	7.5
70 to <75	66604 (65034, 68174)	0.5	4593 (2289, 6896)	5.2
75 to <80	62368 (60927, 63808)	0.5	31311 (-14008, 76631)	35.3
>=80	57587 (56344, 58829)	0.4	12807 (5886, 19728)	14.5
Health insurance scheme				
CSMBS*	119995 (117925, 122064)	1	15185 (5360, 25010)	1
UCE	50439 (49891, 50987)	0.4	12496 (1049, 23943)	0.8
UCP	56788 (55875, 57703)	0.5	7422 (3851, 10992)	0.5
Place of death				
Public hospitals*	84481 (83492, 85469)	1	14976 (482, 29470)	1
Private hospitals	110973 (105896, 116049)	1.3	79292 (21514, 137071)	5.3
Home	43699 (43210, 44188)	0.5	4192 (1735, 6650)	0.3
Others			634 (-449, 1717)	0.0
Cause of death				
Ill-defined*	50918 (49928, 51908)	1	64 (-43, 172)	1
Communicable diseases	85620 (84000, 87240)	1.7	31508 (-4721, 67737)	490.6
Non-communicable disease	65350 (64334, 66365)	1.3	6630 (3325, 9934)	103.2
Injuries	46687 (44652, 48721)	0.9	9884 (-959, 20728)	153.9
Senility	32381 (31528, 33233)	0.6	5397 (1280, 9514)	84.0
Cancer	80780 (79345, 82215)	1.6	8159 (4200, 12118)	127.0

*Reference for ratio

(4) Inequality in access to and expenditure for services provided during the last period of life

In addition to the factors determining utilisation and expenditure of health insurers and household that the thesis revealed, the consequence of the differences the factors determined probably means inequality in terms of access to care and finance of health care. With the multivariate regression technique and various factors indicated in Table 9.1 and Table 9.2, however, the health insurance schemes and wealth status were the main focus in this research. Keeping other factors constant, the health insurance schemes determined significantly variations in all propensity and intensity of the utilisation and household expenditure for ambulatory care and acute care and intensity of hospitalisation. That is, the CSMBS beneficiaries, compared to the UCE and the UCP beneficiaries, were likely to have greater chance in access to ambulatory care but less frequency in numbers of visits; less chance of paying but paying greater amount for such visits; non-significant difference in access hospitalisation and numbers of hospitalisation; and less chance in paying but non-significant difference in amount paid for such hospitalisations (Table 6.9, Chapter Six). On the other hand, Table 9.5 shows expenditure and the ratio of the CSMBS to the UC for hospitalisations per capita per year for beneficiaries who accessed care in 2001, 2003 by Prakongsai (2008), compared to dying beneficiaries who accessed care between 2005 and 2006. The ratios indicated that the public resource spending via the Comptroller General's Department (CGD) for the CSMBS beneficiaries was double of such spending via the National Health Security Office for the UC beneficiaries including even the dying beneficiaries found in this research. The author reported the mean unit costs per ambulatory visit and per hospitalisation per capita per year in 2001 and in 2003 which revealed the inequality of such public subsidy. In addition, the review on the government budget spending for the least number of beneficiaries also supported this finding on the public resource subsidy for the CSMBS beneficiaries (see Table 2.7, Chapter Two). In contrast to expenditure, this research found small difference in numbers of hospitalisation under the CSMBS versus the UCP and the UCE while the study on the 2005 Health and Welfare Survey in general population found that the CSMBS beneficiaries were likely to have greater numbers of hospitalisation than the UC beneficiaries (Thammatacharee 2009).

In conclusion, the thesis revealed that the factors which determined the differences of utilisation and expenditure during the last period of life as indicated in Table 9.1 and

Table 9.2. The four main determinants included age at death, cause of death, place of death and health insurance scheme. In light of equity or equality, this thesis aims to reveal a few issues which should be concomitantly considered including health is the basic right of all ordinary Thai people as stated in the latest 2007 Constitution; health care financing; and seven categories of avoidable and unavoidable factors suggested by Whitehead (2000). Age at death seems to fall in the category of natural, biological variation as well as casue of death which is likely an original ill health in the category of natural selection, regardless of health-damaging behaviour. Both unavoidable categories would not normally be indicated as inequities. Place of death was a complexation of patients and care givers preference, family context, health professionals' suggestions, and service system provided to the patient. As a consequence, these were avoidable as well as unavoidable health and social features. It is difficult to decide whether or not the differences in utilisation and expenditure by different places of death were fair. Health insurance scheme which represent different financing systems including tax and government budget subsidising for health care is an avoidable issue. The significant determination on such utlisation and expenditure of the health insurance scheme might be due to the inequality of the concept and mandate of each scheme and the system superior the healt service system rather than the service system or healt care provided itself.

Table 9.5 Expenditure and ratio of the CSMBS to the UC for hospitalisations per capita per year

	2001*		2003*		2005-2006**	
	Expenditure	Ratio	Expenditure	Ratio	Expenditure	Ratio
CSMBS	11,939 - 22,166	3.25	10,078 - 28,221	2.03	119,995	2.11 - 2.38
UC	3,669 - 6,812		4,960 – 13,889		50,439 - 56,788	

Note: * per beneficiaries accessing care; ** per dying beneficiaries accessing care
Sources: Table 6.2 and Table 6.3 in Prakongsai (2008); Table 2.7 in Chapter Two; and Table 5.2 in Chapter Five

(5) Place of death

Discussion of the place of death related to the terminal stage of life or at the end of life in the research could not be ignored. Even though the place of death might not be the place of care, it can partly determine the place of care during the terminally ill period through the care plan or the service system design. Some places of death which are

usually compared included home and dwelling room (e.g. apartment), hospital, nursing home, hospice and others. Among other factors affecting place of death, dying at home was mentioned as a desire of the terminally ill or elderly patients. Consequently, it has been seen as a key issue indicating quality of care at the end of life or patient centred death as well as a determinant of good death (Pierson, Curtis et al. 2002; Kikule 2003; Editorial 2008).

In general, this research found that approximately 54 percent of decedents in 2005-2006 died at home. This percentage gradually declined from 59 percent over nearly the past two decades. On the contrary, however, dying in hospital had been rising from 28 percent to 39 percent over such period (Figure 1.3, Chapter One). This majority of deaths at home was similar to the findings from other developing countries but was opposite to that of the developed countries. For example, 50 percent to 71.2 percent of terminally ill patients in rural Tanzania in 1994 died at home (Ngalula, Urassa et al. 2002) and deaths in 2003 of six European countries ranged from 33.9 percent in the Netherlands to 62.8 percent in Wales. However, the trend over time of dying at home in Thailand was decreasing but was increasing in developed countries. That included Canada having a declining trend in hospitalised death which was the majority from 77.7 percent in 1994 to 60.6 percent in 2004 while non-institutional places like private residences rose from 19.3 percent to 29.4 percent (Wilson, Truman et al. 2009); home deaths in Japan fell from approximately 82 percent in 1951 to 13 percent in 2002 and death in hospital correspondingly increased over such period (Yang, Sakamoto et al. 2006); and between 1990 and 1998, home deaths in the US rose from 17 percent to 22 percent and hospital deaths declined from 54 percent to 41 percent (Flory, Young-Xu et al. 2004).

However, several publications criticised the differences found in preference of dying at home versus the actual place of death, and variation from country to country. This is due to the influence of multiple factors including the different preference between patients and care givers; the health services provided or ability to provide care at home; nature of illness and treatment required; patient family support and social support; and health policy which affected care for terminally ill patients e.g. financing policy which allows home based care (Fukui, Kawagoe et al. 2003; Thomas, Morris et al. 2004; Tang, Liu et al. 2005). In addition, some studies employing multivariate analysis confirmed the correlation of characteristics of patients and of health facilities against place of

death. For example, decreasing in home deaths is related to increasing in numbers of beds in hospitals and the utilisation of hospitals; higher probability of home death is found when age increased; patients with cardiovascular diseases, cancer and lower respiratory diseases had higher probability of dying at home (Cohen, Bilsen et al. 2006; Yang, Sakamoto et al. 2006; Cohen, Bilsen et al. 2008). The contradictory trend over time of the place of death between developed and developing countries might partly depend on the advancement of system design for and the scarcity on infrastructure of health services. In countries, mostly developed, there are home-based health services with professional and/or well-trained care givers whereas patients in developing countries do have to seek professional care at health facilities.

Like this research, there was interesting evidence about the influence of health insurance schemes and wealth status on place of death which had not been found in other studies. It was reported that a smaller percentage of the CSMBS beneficiaries who were the oldest decedents and of the UCP who were in working age died at home, at 42.3 percent and 41.5 percent, respectively. Meanwhile 69 percent of uninsured and 63 percent of the UCE decedents died at home (Figure 6.4 panel B, Chapter Six). On wealth status, death at public hospitals increased as income quintile increased. Thirty percent of the richest group which was the least proportion compared to others died at home while 61 percent died in hospital (subsection 6.3.2 and Figure 6.3 panel A, Chapter Six). Perhaps this disparity indicated differences in accessibility to care and expenditure incurred by households in relation to cause of death.. On the one hand, these diseases allow some time for preparing care at terminal stage as well as requiring care givers, compared to other causes of death. On the other hand patients in Q5, the well-off group was expected to have the least financial hurdle, compared to others. Further details provided (Table A4.10, Appendix 4) that nearly half of decedents (43.8 percent) categorised in Q5 were CSMBS beneficiaries and more than half of decedents in Q5 died from non-communicable disease including cancer (31.9 percent and 22.2 percent). These quantitative findings were confirmed by the views of patients with terminal stage cancer (section 7.5, Chapter Seven) and the health professionals (section 8.5, Chapter Eight) that CSMBS payment mechanism as fee for service and its benefit package allows privileged treatment over the other health insurance schemes. This means that the CSMBS beneficiaries would have least financial constraint and have greatest chance in access to health care, compared to the others. In addition, care givers

view which was accounted as an important decision by health professionals also played significant role in determining the place for care and place for dying. Although selecting the places was a compromised decision between preferences, conditions and family context of patients, their relatives and health professionals, it could not denied that the availability of informal care givers and family context were outweighed, particularly in patients with chronic diseases requiring long term professional care.

Further research specifically designed to place of care and place of death in relation to the health insurance schemes, wealth status and cause of death including other factors might support this hypothesis in the setting of Thailand.

This research has shown that the place of death was a determinant strongly related to access to care and expenditure for both ambulatory care and acute care, and for the health insurers side and the household side, as mentioned earlier (see Table 9.3 and Table 9.4; Table 5.5 and Table 5.6 in Chapter Five; and Table 6.5 to Table 6.8 in Chapter Six). Table 9.6 summarises the effects of places of death on access and expenditure for hospitalisations and ambulatory visits from both the supply and demand sides. On the health insurer side, it was predicted that dying at home including elsewhere likely had equal numbers of hospitalisations, with nearly equal payment to dying at private hospitals but less payment than to public hospitals. On the household side, dying at home resulted in fewer of ambulatory visits than private hospitals and other places but greater numbers than public hospitals; greater chance in paying out of pocket for ambulatory care than public hospitals; less chance of hospitalisation but non significant difference in numbers of hospitalisation; and less chance in paying out of pocket than both types of hospitals but non-significant difference in payment value. Focusing on acute care which requires greater resources than ambulatory care as reported in some studies (Lubitz and Riley 1993; Stooker, van Acht et al. 2001; Hoover, Crytal et al. 2002), dying at home might be able to save costs to the health care providers resulting in savings for third party payers as well as households. In addition to the direct medical cost, other direct and indirect cost incurred by households might reduce, for instance, travelling cost of decedents and care givers, cost of lodging and foods for care givers while caring for in-hospital decedents. However, it might not be that all decedents are able to die at home. Other factors also affect determination of the place of death, for example, physical condition of decedents themselves; family and

household context; the cause of death and comorbidity; and the availability of home-based health service.

Table 9.6 The effect of place of death on utilisation and expenditure by health insurance side and household side

	Health insurances		Households							
	Acute care (last year)		Ambulatory care (last 3 months)				Acute care (last 6 months)			
			Utilisation		Expenditure		Utilisation		Expenditure	
	Hospitalisation	Expenditure	Prob.	Value	Prob.	Value	Prob.	Value	Prob.	Value
Home (ref.)										
Public hospitals	(-)	(+)**	(-)	(-)*	(-)**	(-)**	(+)**	(-)	(+)*	(+)
Private hospitals	(-)**	(-)**	(+)	(+)	(+)	(+)**	(+)**	(+)	(+)*	(+)
Others	Including in home		(-)*	(+)	(-)	(-)	(-)**	(+)	(+)	(-)*

Note: * $p < 0.05$; ** $p < 0.01$; Ref. = reference;

(+) and (-) = direction of the coefficient of such independent variable relative to the its reference and dependent variable

9.1.2.2 Health service for terminally ill cancer patients, the case of Ubonratchthani province

Cancer is a disease which has a more clearly defiined terminal phase than other diseases (see Figure 1.4, Chapter One). Therefore, improving health service or health care for the terminal patients, it is usual to select cancer as a starting point. The evidence also revealed that incidence of cancer is increasing worldwide including Thailand, and that the metastasis of cancer leads to suffering from chronic pain (World Health Organization 2004; World Health Organization 2008). However, it was commented that terminal care could be expanded to patients with other chronic diseases including organ failure such as chronic renal failure, and HIV/AIDS, for instance, when it becomes clear that health care is needed, but can no longer provide a cure (Franks, Salisbury et al. 2000; Kikule 2003; Zallman, Sanchez et al. 2003). Nonetheless, for the reason mentioned, cancer was selected to be the tracer disease in this research and as a starting point for improving health services. This research further explored details of terminally ill cancer patients by applying the multivariate regressions in Chapter Five and Chapter Six to predict the expenditure during the last period of life. In addition, the findings from Chapter Seven and Chapter Eight provided explanations on and understanding of the perception and family and household context of the patients in Ubonratchthani.

With triangulation technique among patients, care givers, provided in Chapter Seven, and the health professionals, in Chapter Eight, the following issues are the key findings concomitantly presented with discussion.

(1) Telling the truth and decision making for treatments

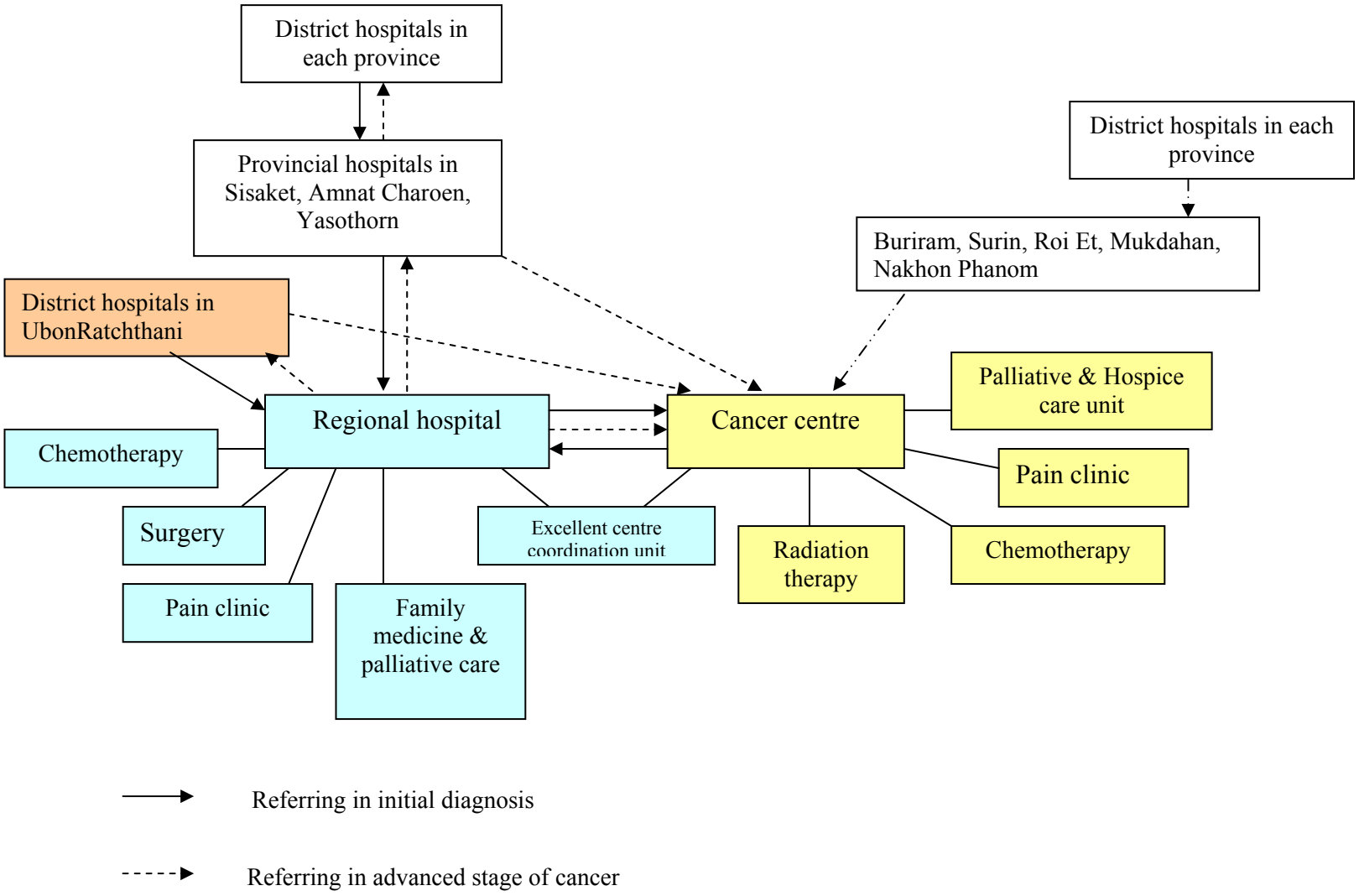
Giving the diagnosis of cancer, particularly advanced stage of cancer and its prognosis is addressed as bad news because the word 'cancer' seems to be the disease that threatens life with the meaning of death, compared to the term 'tumour'. The way in which the physicians give diagnosis and prognosis, in principle, was to first tell patients relatives who knew the details of the disease progress. Patients know the diagnosis later on, either from the physicians or their relatives or even from their own perception of deterioration of the illness and confirmation by physicians. So far, this style of breaking bad news has not been reported in any publications written by western authors (Downie and Randall 2004). In contrast, it was mentioned in the publication reviewed in eastern countries, e.g. Japan in the Far East and the eastern Mediterranean countries (Kazdaglis,

Arnaoutoglou et al. 2010). It implied that health professionals give patients relatives priority in breaking bad news as well as keeping awareness and modifying the 'how much of the bad news' towards the concept of individualized disclosure to the patients (Donovan 1993). However, the Thai patients still have their own right, with the support from their close relatives, in making a decision for treatments which often follow the physicians' suggestion, compared to patients in some eastern Mediterranean countries. This difference in style was indicated to be due to the difference in cultures and religious backgrounds, as well as the view from political science, for example, of the paternalism in many eastern countries including some countries in Western Europe (Kazdaglis, Arnaoutoglou et al. 2010).

(2) Route of health service for treatments of cancer and the referral system

It would help with further interpretation to describe the health service system for cancer patients in the province. Figure 9.1 depicts such health service and referral system in Ubonratchthani province. Both the regional hospital and cancer centre are excellent centres working together by the coordination office. Focusing on the advanced stage of cancer, the patients could be referred up to either regional hospital or cancer centre or the patient could be referred down to their primary health facilities at either regional hospital or district hospitals or ending up at the cancer centre with the supply of radiation therapy, pain clinic, palliative care and hospice care. This is because care for cancer patients requires expertise, but not at the terminal stage which needs only the trained health personnel in the area of palliative care including pain control medication. The route of health service for cancer was likely flexible for the patients with short cuts compared to other diseases. Patients with other diseases from a remote and small community hospital were referred to the bigger advanced community hospital which acted as a hub of the zone. However, some details of the referral system should be improved as mentioned by the key informants in Chapter Eight.

Figure 9.1 Diagram of health service system and referral system for cancer care in Ubonratchthani province



(3) Preference of place of death

Focusing on cancer, the patients in the terminal stage of the disease received no curative treatments but only palliative care (see Chapter Three, subsection 3.3.1). The palliative care service was conceptualised for the sake of improving on quality of life of patients and their families. As a result, place of care and place of death were unavoidably part of the discussion for this chronic disease with a clear terminal phase.

This research revealed that 37.5 percent of cancer patients died in hospitals and 62.3 percent died at home (Figure 6.4 C, Chapter Six) but 39.9 percent of the patients who sought acute care during their last year of life died in hospitals and 60.1 percent died elsewhere including home (Figure 5.2, Chapter Five). Moreover, compared to other regions, the greatest proportion of cancer patients resided in the north-east died at home, that is, 79.1 percent. This markedly higher proportion than average for Thailand was supported by the findings from patients and care giver interviewing in Chapter Seven. It indicated that even though there was different view on place of death between the patients and their care givers, the patients' desire was the priority. The cultural issues in the Northeast also supported death at home: even if the patients had nearly died in hospital, they were transported back home. However, this cultural facet was not a concern of patients and their care givers residing in the city.

Compared to other countries, such proportion of hospital death in this research differed from the 2003 death certificate records in the Flanders, Belgium (59.5 percent); Sweden (85.1 percent); Scotland (57.4 percent); England (49.5 percent); and Wales (59.8 percent) while in-hospital death in the Netherlands was 30.8 percent. However, the remainder of these proportions could not be directly interpreted as death at home because there were other types of institutional places which the study could not distinguish from homes or private residences, for example, nursing home, care home and hospice (Cohen, Bilsen et al. 2008).

Changes in place of death over time were also an issue often analysed. The declining trend in hospital death of cancer patients in developed countries was reported, for example Nova Scotia, Canada from 1992 to 1997 (80.2 percent to 69.8 percent) (Burge, Lawson et al. 2003); Canada between 1994 and 2004 (85 percent to 68.5 percent) (Wilson, Truman et al. 2009); The US between 1980 and 1998 (70 percent to 37 percent) (Flory, Young-Xu et al. 2004); However, death in hospitals and other

institutional places in England between 1985 and 1994 was reported in slightly increased trend from 70.4 percent to 72 percent (Higginson, Astin et al. 1998).

As with deaths from all causes, factors determining the place of death for cancer patients were of interest among health service providers. Many factors which showed the impact on the place of death included age, sex, primary care workload and pressure on the services of GPs, head of household in social class IV or V, ethnic minorities, high-dependence households, cancer site, region, admission to a palliative care programme, receiving palliative radiation, length of survival from initial diagnosis and living situation (living alone or living together with someone) (Higginson, Jarman et al. 1999; Burge, Lawson et al. 2003; Ahlner-Elmqvist, Jordhoy et al. 2004).

(4) Utilisations and expenditure during terminal stage of life in patients who sought health care

Utilisation and expenditure during the terminal illness for cancer patients were the facets considered together with place of death. Although the thesis could not reveal the use of and expenditure for both types of care of the specific case of terminally ill cancer patients in Ubonrachthani province, the econometric modellings in Table 5.5 and Table 5.6 (Chapter 5) and Table 6.5 to Table 6.8 (Chapter 6) could partly show some related finding. Decedents dying from cancer had greatest chance in seeking care among other causes of death, compared to ill-defined cause. In seeking ambulatory care, the decedents had significantly greater chance and numbers of use and nonsignifcant chance of out of pocket and the payment value than the decedents with ill-defined cause during the last quarter of life. For hospitalisation, cancer decedents had significantly greatest numbers of hospitalisation and expenditure incurred health insurers during the last year. The decedents also had significantly the greatest chance in access but numbers of hospitalisation. Households also had the greatest chance of paying but with nonsignificant value of expenditure during the last two quarters of life.

(5) Financial constraint to the health service provided and inequality in access to and expenditure for pain relief medicines and financial burden to households

Compared to the era prior to UC in 2001, it was revealed that access to care of the Thai people in 2003, particularly the beneficiaries of the MWS and the HCS which are likely equal to the UC beneficiaries and the majority is the poor had increased. In addition, the

financial constraint of household in access to health services reduced. However, some barriers to access to care by geography remained, specifically for the poor in rural areas (Vasavid, Tisayaticom et al. 2004; Prakongsai 2008).

Similar to previous study findings mentioned earlier, it was reported that the terminally ill cancer patients and their care givers addressed the advantage of the UC. They realized that the UC removes their financial barrier in access to treatment and health care since any stage of cancer until the palliative care in the late stage of cancer, and the patients could live longer. This reflected the equitable access to health care, compared to the CSMBS and the SHI which were more advance in development than the UC. However, some financial constraint of the UC beneficiaries remains as indicated in qualitative findings from terminally ill cancer patients in Chapter Seven and Chapter Eight.

With triangulation technique, this thesis provided the useful evidence on the financial constraint of the patient and the health facility for pain relief medicines. It was indicated that the UC beneficiaries had a limit of 700 Baht per prescription per day while advanced cancer patients with pain required increasing pain relief medicines from time to time. In addition, such medicines particularly the morphine derivatives were expensive and were available in all strengths and dosage forms at tertiary care level. This limitation led to more frequently unnecessary visits of the patients or the care givers to the hospitals. That means an increase in household expenditure for travelling by the patients and the care givers. This phenomenon was primarily explored and it was found that this limitation on claimed expenditure from health insurance scheme had been specified to the referral system between the community/general/provincial/regional hospitals under the Office of the Permanent Secretary and hospitals and specialised institutes under other Departments of the MoPH. In addition, it was also limited to the referral systems of the hospitals under the Office of the Permanent Secretary in different provinces, that is, the provincial hospitals to the regional hospitals, for instance. This MoPH guideline could not applicable to the health facilities out side the MoPH as well as it had been apply to not only the cancer but also all other diseases (Ministry of Public Health 2007 (2550 B.E.)). Comprehensive study on pain control in advanced stage cancer including cost per prescription or visit of other diseases, the unmet needs and the magnitude of the costs incur to referring hospitals, the referred hospitals and the household might better guide policy recommendation.

Even though the palliative care could not be exactly determined by time close to death, the last six months and the last three months of life should cover the period of palliative care to the end of life, especially the cancer patients. Thus, findings of seeking care and household expenditure from household survey in Chapter Six as well as the perception of the patients, their care givers and health professionals in Chapter Seven and Chapter Eight could imply to palliative care. That is, it could be concluded that there was likely equitable access to the palliative care during the last period of life among the poorest to the wealthiest Thai. Rather, some inequitable access and incurring expenditure were due to the health insurance schemes.

(6) Importance of the informal care givers for the terminally ill cancer patients

It was indicated that demand for care was increasing as the chronic diseases and aging population increased. Individual demand also increased at time close to deah. Apart from professional care or institutional care, normal care at health facilities, various types of care were addressed including services from social workers and home-care worker, home-care poroviders, complementary health care providers, chaplaincy terams and support groups as well as patient families and friends. These care providers might be different according to health service systems of an individual country. In Thailand, these care providers except the latter group were not popular in the past decades, but therafter increasing as volunteers in the communities, villages or health facilities. During the illness period, patients' families, household employees through housemaids are the primary care givers for daily activities of the patients. The care from this group of care givers, so-called 'informal care', plays a vital role in health care for terminally ill patients, however, they also have cost of care (McCrone 2009). The finding from this thesis was that, for example, a familiy member quit a job in a remote province in order to take care of a member who was ill was similar to some findings of previous studies. Grunfeld et al (2004) found that 69 percent of employed care givers had an adverse impact on work and 77 percent lost their work due to care giving responsibilities during the terminal stage of breast cancer patients (Grunfeld, Coyle et al. 2004). It was also indicated in this thesis that the informal care giver being the breadwinner was likely to turn to the full-time care giver when the patients' disease developed into the advanced stage of cancer. This informal care cost may well be greater in the social perspective if the care giver was a breadwinner as same as the case of the patient as a breadwinner. A family falling in this situation would be prone to being a catastrophic household.

However, time spending and trend of this cost towards time close to death likely varied for such incurable diseases and the level of patients' physical function, for example, duration requires informal care in patients with dementia or Alzheimer's might be longer than patients with advance stage cancer (Zarit 2004; McCrone 2009).

Quantifying such burden of care givers, time spent, informal care cost and economic evaluation, this informal care should be further explored in order to design the appropriate health service delivery including palliative care for the patients during terminal stage.

(7) Services for the terminally ill cancer patients

As mentioned earlier in Chapter Three, subsection 3.3.1, there are many terms used for the care for the terminally ill patients including palliative care, end of life care, hospice care, etc. However, such terms have the same main concept of holistic care and the quality of life of the patients and their families. This research, therefore, selected the term 'palliative care' to represent of all those forms of care because of its worldwide definition through the World Health Organization. This term seems to be the umbrella term for other forms of care which are likely specific to narrower period of life, to diseases, to country or to old age group. Due to its broader term, the discussion on palliative care focuses on the relief of suffering which was mentioned in the patients' perspective stated in Chapter Seven as well as the suggestion on strengthening the health care service for terminal cancer patients by the health professionals in Chapter Eight. In addition, those issues are unavoidably linked to the setting or the place of care and place of death associated with the service provided.

Cancer in Thailand is still in the top rank of causes of death and has an upward trend on incidence in the future (see Chapter One, subsetion 1.3.2 and Chapter Two, subsection 2.3.1). In addition, this research revealed that terminally ill cancer patients were expected to use health services nearly equally to other non-communicable diseases but markedly greater than ill-defined causes of death (that is, 13 times and 43 times higher chance of ambulatory care and acute care utilisation, respectively—Table 6.5 and Table 6.6 in Chapter Six). That is, the health care and service including palliative care for terminally ill patients needs to be well prepared to cope with this increasing group of patients in terms of both numbers of patients and frequency of the utilisation.

In the concept of palliative care, the research revealed that the regional hospital and the cancer centre had set up a palliative care programme for their cancer patients, developing a more advance pain clinic and palliative care service. As the cancer centre had high cost radiation technology providing radiation therapy and the specialty to cancer, this comprehensive pain management during the terminal stage was superior in palliative care compared to the regional hospital. The programme in the regional hospital was newer starting with the pain clinic and the palliative care ward in the responsibility of the family medicine physician. However, the service seems less comprehensively available to other causes of suffering, for example, the mobile oxygen due to the shortness of breath in patients with lung cancer, while the community hospital is unlikely to have full palliative care but rather supportive care with some pain relief medicines. It was argued by the health care providers in the community hospital (see Chapter Eight, section 8.3.4) that cancer was not the priority of the endemic diseases in the district like hypertension and diabetes were. Thus, many of resources were firstly allocated on such preventable prioritised diseases. Although cancer patients were a smaller group in community hospitals, the broad concept of palliative care was applicable to various chronic diseases which show the terminal phase towards the end of life. As a result, strengthening palliative care would be useful to the health services of community hospitals to some degree.

Apart from pain, palliative care itself also includes overcoming the suffering from emotional and distress symptom (e.g. fear from no hope of cure), other physical symptoms and weakness, social problem including financial constraints (Sepulveda, Habiyambere et al. 2003; Larsson and Wijk 2007). In addition, it addressed not only the care for suffering of patients but also their care givers and families (World Health Organization 2009). That is, these issues are also the palliative care in which health personnel should not omit.

Chronic pain is a physically and psychologically hazardous symptom. It is the major symptom that terminal stage cancer patients suffer and complain about (Singer, Martin et al. 1999; Kikule 2003; Sepulveda, Habiyambere et al. 2003). Although the patients received pain control treatment, its effectiveness should be monitored. For example, it was also found in Botswana that even if patients got treatment, pain persisted because of use of only mild analgesics (Sepulveda, Habiyambere et al. 2003). That is, above the availability of the care, quality and sufficiency of pain control and the pain relief

medicines, as well as the unmet needs which were out of the scope of this research, must be evaluated in order to better policy development. Policies for palliative care, including the national drug control policy for the pain relief medicines, particularly the opioids which might be restrictively regulated, would be the constraint in access to medicines as indicated in Romania (Mosoiu, Ryan et al. 2006). It should be a further research area for the terminally ill patients in Thailand.

Palliative care services must be provided with a coordination of the care settings, both institutions and non-institutions including home, hospital, hospice, nursing home and other institutions (Davies and Higginson 2004). In fact, patients during the terminal stage in which illness is deteriorating until death need supportive and frequent care by care givers and professional health carers. As stated, even though the reasons underpinning death at home were different in developing and developed countries, several studies concluded that home is the best place of care for the terminal stage in relation to the place of death (Davies and Higginson 2004; Editorial 2008). In the Thai setting which has only one hospice in the country and some nursing homes within the city areas, this research suggested that home should be the main place of palliative care with support and guidance from health care providers including occasional institutional care. This home care was also in line with the views of patients, their care givers and health professionals indicated in this research (Chapter Seven and Chapter Eight). Home care needs well-informed and trained care givers who are willing to take care of the patients at all times, in particular in times close to death. Additionally, supervision from health personnel, e.g. nurses, is also required along with the care at home because of the development of the worse symptoms as well as analgesic dose adjustment. Telephone-based nursing intervention were recommended to be an efficient tool for early problem detection before the patients developing to the advanced symptom or crisis as well as the care givers being in panic as indicated in the findings of Chapter Seven. This intervention would further reduce unnecessary numbers of ambulatory visits and readmission in hospitals (Cox & Wilson (2003) cited in (Larsson and Wijk 2007).

Focusing on care at home and pain management, pain relief medicines are the key tool of pain control. Given that there were no constraints on prescribing under the national drug policy for narcotic substances as well as financial constraint policy for ambulatory visit reimbursement in the UC was removed, the drug delivery as well as the policy for other pain relief medicines in the province should be redesigned to correspond to such

place of care. This is also another research area to explore. Cost saving from the home care compared to the existing conventional care spending, the quality of life and the effectiveness, and efficiency might be the goal of this home care programme. Monitoring the expenditure incurred by the system including health insurers, health care providers and households that shift from current hospital care to home care can possibly be another research area which would support the idea for home care. However, findings might not always prove the concept, for example in the US, evaluation on the expenditure for hospice service and the effect of hospice on other services show that hospice was cost-neutral or cost-saving to significant saving for the last year of life among the enrollees with cancer but it was additional cost among other enrollees without cancer to the Medicare when compared to non-enrollee to the hospice (Emanuel, Ash et al. 2002; Campbell, Lynn et al. 2004).

It is a fact that care at home needs the support from families and availability of care givers. One patient also probably needs more than one care giver. Many patients in Thailand could not meet such criteria, and so other optional care and the places of care might be the alternative, for example, the conventional hospital, nursing home as well as hospice mentioned in advanced developing countries and developed countries. This concept of places of care was likely to be supported by the social and economic change included change in population structure into old age society; the nucleus family in particular the people living in city and urban areas; and the migration of the working age population from rural to urban areas, as a result there were only the old age group and the children in the rural areas. However, culture also plays some role in preference to the place of care as indicated in a study in Taiwan that in-patient hospice had the negative image of a death ward (Tang, Liu et al. 2005). In addition, such care should not be designed for not only the cancer case but also terminal stage patients with other chronic diseases. Further research on the magnitude and trend of such change might make clearer the demand for such service system. Community care by the volunteers in the patients' community was another suggestion which should be explored.

9.2 Conclusion

The last period of life has explicitly been shown to use a high level of health resources in many developed countries. It shows higher proportion of spending and greater frequency in utilisation than other period of life up to the time closest to death. The

pattern and spending at the beginning of this research in Thailand were not known. In order to partly respond to this question, research questions were developed based on the available information in the country. The research was designed to employ mixed methods comprised of cross-sectional quantitative analysis during 2005-2006 national data and the qualitative approach among key stakeholders during 2007 in a Thai province.

The research met its objectives in estimation of nationwide per capita expenditure for treatment in the last period of life incurred by health insurers and households. The health insurers in this research included the CSMBS for civil servant and government employee beneficiaries, the SHI for the employees in formal sector, the UCE for the UC beneficiaries who were neither CSMBS nor the SHI, and the UCP beneficiaries who had to pay 30 Baht for user fee. Disparity of the expenditure by household income as well as the health seeking behaviour was also revealed. In addition, the research estimated the utilisation of the ambulatory care and acute care. To understand the current practice among health professionals, patients and their relatives, the research focused on the terminally ill cancer patients in a province. As a result, it recommends further improvement of the health care provided to this group of patients.

Regarding the conceptual framework which focused on the tripartite players (health insurers, health providers, and patients and households) in health financing and health services and the factors affecting those, the research has indicated the factors determining the expenditure of the health insurers and the households in Thailand. However, this research could identify only the demand side factors, that is, of patients and households which were included in the datasets analysed. Those factors including geography, demography, socioeconomics and other conditions significantly played a different role in determining propensity and intensity, utilisation and expenditure, and ambulatory care and acute care. However, the main determinants were age at death, health insurance scheme, cause of death and place of death. The cause of death and comorbidity were the factors that markedly affected the variation of demand on hospitalisation whereas age at death and health insurance scheme in addition to the two former factors determined disparity in spending of public resources among decedents who sought care. Age at death and cause of death determined the disparity in propensity of seeking ambulatory care whereas cause of death, health insurance scheme and using complementary medicine determined the different of numbers of cares during the last

quarter of life. In seeking acute care, age at death, cause of death and place of death affected the propensity of hospitalisation but age and cause clearly showed the effect during the last half year of life. The propensity of household payment for ambulatory care was determined by age, being head of household, occupation, cause, place and health insurance scheme whereas the intensity was determined by many factors including region, urban area, age, gender, being head of household, occupation, cause, place and health insurance. In household payment for acute care, many factors included region, age, education, income quintile, occupation, cause, place, and health insurance scheme had an effect on the propensity of such payment while region, age, gender, cause, place and health insurance scheme determined the intensity of out of pocket.

Even though data on factors on the health care provider side was unavailable, the in-depth interview study disclosed that the differences in benefit package and payment of health insurance scheme drove the different treatment the patients received. That is, the research confirmed the strong effect of the health insurance scheme in determining households and patients, third party payers, and health care providers in health service and financing via use and expenditure, respectively.

In addition, the research also indicated the inequality in access to ambulatory care and acute care, and public subsidy through the health insurance schemes. The CSMBS beneficiaries who sought care were expected to spend double that of the UC beneficiaries in public money for acute care during the last year of life. Focusing on the wealth status, there was likely an insignificant regressive utilisation of but progressiveness in ability to pay out of pocket for both type of care.

In exploring the practice of health professionals, terminal stage cancer patients and their relatives as well as the health service in Ubonratchthani. Similar to other countries in Asia and some European countries, the patients' relative was indicated as a priority in telling the diagnosis and prognosis as well as in decision making for the treatment of the patients with advanced stage of cancer. This practice was different from the case of the patients with early stage. Cultural issues, (which may differ in other Thai provinces), also played significant role, particularly in time close to death or at the end of life period. That is, hospitalised patients were likely to travel back to die at home. In addition, home was the place of preference to die. It was also recommended by most of the patients and their care givers, and health professionals to be the place for care at the

terminal stage. At present, the cancer centre was addressed to be the most favoured place for care and it had the most advanced and comprehensive palliative care and pain control management for terminally ill patients.

All UC beneficiaries interveiwed seemed satisfied with this newest health insurance in the circumstance that it provided the opportunity in access to institutional health service as well as the chance to live longer. However, the research found that there was a financial constraint in the UC beneficiaries who were treated with morphine. This expensive medicine was limited in prescribing with the limited maximum at 700 Baht per ambulatory visit. As a result, the patients with advanced chronic pain who required more and more morphine got insufficient morphine in one visit. The problem was alleviated with an increase in the frequency of visits but resulting in increased travelling cost of the care givers as well as the patients.

9.3 Policy implication on health services for terminally ill patients

The findings of the research provided some evidence for recommendations to Thai policy makers.

The UC scheme which is achieving its goal in ensuring access to health care for all should be sustainable with strong support from government. It was proved that the insurance provided the opportunity in access to care of the worse-off households.

Health insurance schemes played a significant role in determining access and expenditure incurred to public spending and private households. It was not surprising that there was an inequality in public spending, out of pocket payment and access to care across the health insurance schemes, that is, the CSMBS and the UC. It was due to the difference in payment mechanism, fee for service versus capitation, as well as the benefit packages that determined the access and expenditure and the population who are eligible. This greater payment and access might be overused or the less payment might be underused. As a result, the standard practice and medication guideline should be available nationwide as a benchmark for the palliative care. To achieve the equity in public spending, such determinants should be similar or harmonised. It would also, in line with the practice guidelines, help in protection of the moral hazard, that is, the excess use of services.

Pain control was an important treatment of the palliative care with which a proportion of cancer patients were likely to be confronted. Policy on the narcotic drugs should support and facilitate this group of patients who suffer the most from the disease. Specifically to the UC scheme, it was indicated that only the health facilities in different contracting units under the MoPH were affected by the reimbursement ceiling of 700 Baht per ambulatory visit. This matter requires further exploration. However, there was another policy option that this pain control treatment might be integrated into the benefit package for high cost care for cancer patients. This will remove the barrier of ceiling of 700 Baht per ambulatory visit.

Controlling pain was one of the aims of achieving good quality of life of such health care and patients. In addition, policy to improve or to strengthen better management and service for pain control, concomitant with the patients' preference in dying at home, could facilitate such patients centre of care. The appropriate home care might mitigate numbers of visits and hospitalisation of this group of patients; however, it might be a shifting of the workload of the specialists in conventional care to health professionals in family medicine or primary care units or the palliative home care team. This is due to the fact that the health care must be continued even though place of care was changed. In addition, the conventional care in hospitals must remain because not all patients could be cared for at home. Care at home also still requires some professional services and hospital resources for the advanced symptoms. To provide seamless care for patients, some contents of referral systems should be improved.

9.4 Recommendation for further research

So far this research was a first study which explored the nationwide access to and expenditure for care during the last period of life. Many previous studies aim to reveal the attitudes or preferences of health professionals, patients and care givers towards the end of life. Thus, many further questions remain. Apart from remaining reseach topics suggested simutaneously with discussion in section 9.1.2, the following topics were also areas for further researches.

In quantitative research, many topics include the relation and pattern of utilisation and expenditure and the proximity to death, the survival to decedent ratio of expenditure. These might help in the projection of the future expenditure required for the patients as

indicated that the estimation of the health expenditure should include time to death (Stearns and Norton 2004; Seshamani and Gray 2004c).

The study on the proportion between the health insurance or public spending and the household payment for patients during the last period of life might help to understand the role of public resource and households towards different health insurance schemes, resulting in revealing the efficiency of the spending.

The study on direct and indirect cost incurred by households was also an interesting area. This is due to the fact that the more visits to health facilities, the higher expenditure the households needs to pay. This could increase the trouble for a 'catastrophic' household as well as the direct medical cost, so that relief of the latter through insurance may be only part of the solution for the poorest households. In addition, since the terminal illness threatens life, almost all patients, particularly who are young perceiving this fact were likely to stay longer. This is due to the fact that people wish to live with their beloved ones. They usually seek other service and care which might help, that is, the food supplement or complimentary medicine. These products might not really benefit the consumers' health. They are usually expensive and thus might trouble the household. Even though health insurances ensure the access to health service and reduce expenditure that burdens the households. Such households have more income for other essentials. Thus, further study on the expenditures the households pay for these products is also interesting.

With qualitative approach, a study on the perspectives of the policy makers who are another key stakeholder should be further explored. This group plays a significant role in policy implementation including the improvement of health services for terminally ill patients as recommeneded in this research.

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APPENDIX 1

GLOSSARY

A1 Terms Defined

Following terms are those used interchangeably in the thesis.

Communicable diseases	means infectious diseases including maternal, perinatal and nutrition conditions
Complementary medicines	includes pharmacy, self medication, herbal medicines, traditional medicines and alternative medicines
Decedents	or deceased including dying person and patients before death, terminally ill patients
Dependent variable	or explained variable, outcome variable, regressand, response variable
Expenditures	means costs, charges, expenses
Head of household	Means a person who is the head in social meaning whether or not he/she is a breadwinner
Health expenditure	or health care cost
Health facilities	includes private clinic and polyclinic, health center, primary care unit (PCU), community or district hospital, general or provincial hospital, regional hospital, specialized hospital, university hospital
Household	Means a group of people who live in the same house, regularly eat together from the same cooking (whether or not they are in the same family)
Independent variable	or explanatory variable, regressor, covariate
Injuries	includes poisoning and other external causes of morbidity and mortality
Inpatient service	means acute care, hospitalisation, admission at available health facility

Medical cost	is expenditures or cost paid for medical treatment including medicine, x-ray, laboratory investigation, surgery, medical supplies, for instances
Non-communicable disease	means chronic non-communicable illnesses
Out-patient care	means ambulatory care, both in health facilities or complementary medicine
Utilisation	means visiting for ambulatory care and hospitalisation for acute care at any health facility and complementary medicine by decedents
Exchange rate in 2006[a]	1 USD = 34.5182 Baht 1GBP = 69.0678 Baht 1 International dollar = 12.12 (in 2005)

[a] www.bot.or.th (accessed date: 31 March 2010)

APPENDIX 2

REGRESSION

A2.1 Ordinary least square

Ordinary least square (OLS) is based on the minimization of the sum of squared residuals between the estimated value and the actual value of the outcome variable.

Since this method is under the assumption of normal distribution, the hypothesis tests are F statistic for all coefficients of the model and t statistic for individual coefficient of each variable. The former is 'the ratio of two independent chi-squares, each divided by its degree of freedom' (Kennedy 1998). The null hypothesis is that the coefficient parameters are zero, $\beta_i = \ldots = \beta_k = 0$, and the alternative hypothesis is that at least one of the $\beta_i \neq 0$. The latter is 'the distance between regression estimate and hypothetical value divided by standard deviation of the regression estimate' (Dougherty 2002). The null hypothesis is the mean of estimator β ($\hat{\beta}$) is equal to its true β and its alternative hypothesis is $\hat{\beta}$ is not equal to true β (or hypothetical β). In other words, the null hypothesis by t tests is $\beta_i = 0$, or $\beta_k = 0$, individually.

A2.2 Maximum likelihood (ML)

An alternative method to OLS, based on the maximum likelihood approach, relaxes the assumption of the OLS of normal distribution of all variables, mean of residual equals to zero and homoscedasticity (more detail is indicated in the section of multiple linear regression). Generally, it is called a large-sample method. In principle, the maximum likelihood estimates the value of unknown parameters in which the probability of observing the given y's as maximum as possible (Dupont 2002; Gujarati 2003). The hypothesis testing for the explanatory power of the model uses the likelihood ratio test in which distributed as chi-square statistic. The null hypothesis is that all joint coefficients are equal to zero. The test for an individual coefficient is t statistic (Dougherty 2002) and the null hypothesis is the same as t statistic in OLS.

A2.3 Multiple linear regression

The relationship between a dependent variable and independent variables of the model is generated by the OLS. The general equation of the linear regression is

$$y = f(x_1, x_2, \ldots, x_i) + \varepsilon$$

$$y = \beta_1 + \beta_2 x_1 + \ldots + \beta_k x_i + \varepsilon.$$

Where y denotes a dependent variable as continuous data and $x_1, \ldots, x_i$ are independent variables. β coefficients are fixed quantities as parameters of the equation. β_1 is constant and ε is defined as disturbance or residual term.

The assumptions about the best predicted result of coefficient of general linear regression are (Kennedy 1998; Dougherty 2002; Greene 2008)

- A linear relationship exists between a dependent variable and independent variables
- The residual of one observation is distributed independently from residuals of other observations
- There is no relationship between residuals and independent variables
- Residuals are normally distributed
- The mean of the residuals of all observations equals zero
- The variance of the residuals is same for all observations so called homoscedasticity
- The observations on the independent variable can be considered fixed in repeated samples
- The number of observations is greater than the number of independent variables
- There is no exact relationship between the independent variables

Diagnostics of the model

The goodness of fit of the model is specified by test of F statistic and t statistic as mentioned in OLS. In addition, R^2 is informative measure for the relationship of explanatory variables and an outcome variable, reported in proportion of the explanation of a set of x on y. The higher the R^2 the better explain of such set of x on y. Another indicator, adjusted R^2 in which the R^2 is adjusted by the degree of freedom when another explanatory variable is added into the model (Kennedy 1998; Dougherty 2002;

Greene 2008). However, since sometimes a rise in adjusted R^2 does not follow as it was suggested, the adjusted R^2 has lost preference as a diagnostic test (Dougherty 2002).

In the following, each regression model for specific type of data and model selection criteria or goodness of fit are described under individual models.

A2.4 Generalized linear model (GLM)

This general model was developed by restructuring the relationship between the linear predictor which is seemingly non-linear and the response. The assumption about normality of general linear model is relaxed and each GLM family member is linearized by link function and variance function. Both functions would be mapped to a probability distribution which is a member of the exponential family (Acock 2006; Hardin and Hilbe 2007). Put simply, the GLM consists of

1) a random component for the response variable, y which its distribution is a member of exponential family;

2) a linear predictor that is a linear function of regressors,

$$\eta_i = \alpha + \beta_1 x_{i1} + \beta_2 x_{i2} + \ldots + \beta_k x_{ik};$$

3) a smooth and inverse linearizing link function g(·) which transforms the expectation of the response variable, $\mu = E(y_i)$ to the linear predictor,

$$g(\mu_i) = \eta_i = \alpha + \beta_1 x_{i1} + \beta_2 x_{i2} + \ldots + \beta_k x_{ik}\,.$$

The exponential family provides modeling for continuous, discrete, proportional, count and binary outcomes. Such models include the Gaussian or normal, binomial, Poisson, gamma, inverse Gaussian, geometric, and negative binomial family. By maximum likelihood method, the estimation of y in the standard form of log likelihood is

$$LR(\theta, \phi : y_1, y_2, \ldots, y_n) = \sum_{i=1}^{n} \left\{ \frac{y_i \theta i - b(\theta)}{a(\phi)} + c(y_i, \phi) \right\},$$

θ denotes the canonical (natural) parameter which simplify the GLM, ϕ is the scale or ancillary parameter required to produce standard error. The $a(\phi)$ is a scale factor (Hardin and Hilbe 2007; Fox 2008). This section, mentioned models for

continuous data, i.e. Gaussian distribution and log like and Gamma distribution and models for count data, i.e. Poisson and negative binomial.

A2.4.1 Model for continuous data

a) Gaussian distribution

It was usually referred to as the normal density with symmetric bell shape. Its normal cumulative distribution function is a member of the exponential family and is a basis for GLM. The μ is the same as xβ as identity link. That is, there is a straightforward identity between the fitted value and the linear predictor. The form of log likelihood function of the model in terms of linear predictor (xβ) is

$$LR(\mu,\sigma^2;y)=\sum_{i=1}^{n}\{\frac{y_i x_i\beta-(x_i\beta)^2/2}{\sigma^2}-\frac{y_i^2}{2\sigma^2}-\frac{1}{2}\ln(2\pi\sigma^2)\}$$

b) Gamma distribution and log link

This GLM model, so-called log-gamma model is used for continuous data for which its value is greater than or equal 0, e.g. healthcare cost. Even though length of stay (LOS), health data is discrete data and generally modeled by Poisson or negative binomial, the log-gamma model is acceptable when there are many LOS values. Presently, this log-gamma model is preferred to the Gaussian regression with log transformation since it needs not to have any external transformation. The form of log likelihood function of this model in term of linear predictor is

$$LR(x\beta;y,\phi)=\sum_{i=1}^{n}\left\{\frac{y_i/\exp(x_i\beta)+x_i\beta}{-\phi}+\frac{\phi+1}{\phi}\ln y_i-\frac{\ln\phi}{\phi}-\ln\Gamma\left(\frac{1}{\phi}\right)\right\}.$$

c) Poisson distribution and log link

The Poisson distribution is one of the exponential family in GLM and it could be employed to the expenditure data (see details of the model in the next subsection) (Manning and Mullahy 2001).

A2.4.2 Models for count data (Poisson family)

a) Poisson model

Poisson is a model for count or rate data, length of stay is an example for health data. The canonical link of the model is log, so the inverse link is exp(η) in which the linear predictor. The mean and variance function are equal. If the variance is more than mean, that is overdispersed, more details are described later. The model in log likelihood function is formed as

$$LR(x\beta; y) = \sum_{i=1}^{n} \{y_i(x_i\beta) - \exp(x_i\beta) - \ln\Gamma(y_i + 1)\},$$

where Γ is a gamma distribution. The model is popular in epidemiological studies like rate of morbidity, it includes zero count in the model and allows offset as an exposure (in epidemiological term). Thus, it can not directly model other types of count data, for example number of admission and length of stay which are of interest. In this case, the ***zero-truncated Poisson model*** is suggested and its reshaped log likelihood is

$$LR(x\beta : y \mid y > 0) = \sum_{i=1}^{n} (yi(x_i\beta) - \exp(x_i\beta) - \ln\Gamma(y_i + 1) - \ln[1 - \exp\{-\exp(x_i\beta)\}])$$

That is the probability of a Poisson 0 count is subtracted from 1.

Overdispersion is a problem of discrete outcome models because continuous models fit the scale (or dispersion) parameter ϕ while none of this scale is in discrete model. That is, in this research, the model probable to have this problem is the Poisson family in which variance is equal to mean. If the variance is larger than mean that is overdispersion which rather occurs than underdispersion, vise versa. There are two types of overdispersion, i.e. apparent and true overdispersion. The former may be caused by omitting crucial explanatory variables; data contain outlier; failure to include enough interaction term; a predictor needs to be transformed; and assumption of linear relationship in which the actual one is quadratic. Overdispersion can be easily investigated through the value of deviance or Pearson chi-square divided by degree of freedom. The value of more than 1 indicates overdispersion but smaller amounts are of little concern. However, if the real dispersion value is larger than 2.0, an adjusted standard errors is required. Otherwise, it is suggested turning to negative binomial model or quasi-Poisson (Hardin and Hilbe 2007; Fox 2008). However, the latter is based on non-exponential family which is beyond the scope of this research. Therefore, the negative binomial is mentioned next.

b) Negative binomial

By maximum likelihood method, the negative binomial is a Poisson-gamma mixture model in which accommodating overdispersed Poisson data. That is, the model is rather log link than canonical and identity link. It has an ancillary parameter and its value (α) which solves the overdispersion through. In addition, the variance function is adjusted in term of the mean by two methods, i.e. constant mean (NB-1: constant overdispersion) and mean square (NB-2: variable overdispersion). This research would apply only the NB-2 which is used more often in applied research and it accommodates within the GLM framework (Long and Freese 2006; Hardin and Hilbe 2007).

$$LR(x\beta; y, \alpha) = \sum_{i=1}^{n} \left\{ y_i \ln\left(\frac{\alpha \exp(x_i\beta)}{1 + \alpha \exp(x_i\beta)} \right) - \frac{\ln(1 + \alpha \exp(x_i\beta))}{\alpha} + C_i \right\}$$

Like Poisson regression, the ***zero-truncated negative binomial model*** was suggested to be more appropriate for non-zero count data. Also, the concept is the same that subtraction probability of a 0 count from 1, as indicated in the rescaled equation as follows:

$$LR(x\beta : y \mid y > 0) = \sum_{i=1}^{n} \left[LR_{NB} - \ln\left\{ -\alpha \exp(x\beta) + 1/\alpha \right\} \right]$$

Table A2.1 summarises variance, scale parameter, the link functions and its inverse in which are appropriate to probability distributions of GLM. Thus the model selected and tested would be within the scope of these link functions.

Table A2.1 Variance, scale parameter, link function and inverse link of each distribution in this research

Distribution	Variance V(μ)	Link η = g(μ)	Inverse link
Poisson	μ	Log: ln(μ)	exp(η)
Negative binomial	$\mu + \alpha\mu^2$	negative binomial: $\ln\{\alpha\mu/(1+\alpha\mu)\}$	$e^{\eta}/\{\alpha(1-e^{\eta})\}$
Gaussian	1	identity: μ log: ln(μ)	η exp(η)
Inverse Gaussian	μ^3	canonical: $-1/(2\mu^2)$ identity: μ log: ln(μ)	$(-2\eta)^{-1/2}$ η exp(η)
Gamma	μ^2	Log: ln(μ)	exp(η)

Source: Summarized from Hardin et al (2007)

Diagnostics of the model

Firstly, goodness of fit of the GLM is measured by deviance, a chi-square statistic. It is twice that of the difference between the log likelihood of the model of interest and the saturated (or full parameters) model

$$S = -2\ln(Lm/Lf)$$

given S = scale deviance;

Lm = likelihood of the model with full parameters;

Lf = likelihood of the fitted model.

The values of parameters which minimize the deviance are the values that fit the model. These values of the parameters are the same values that maximize the likelihood. Link function, the fit of appropriate link function of each distribution has to be assessed by changes in the deviance value as well. The wrong link function is a systematic misspecification of the model. However, there is no single point that identifies the appropriate line. For example, this assessment is to compare between the usual log-link and identity link for Poisson regression. Tests for link function include Pearson

correlation test checking for systematic bias in fit on raw scale; and Pregibon link test and Modified Hosmer & Lemeshow test checking linearity of response on scale of estimation. Ideally, these tests should indicate insignificant p-values (Glick 2008). Test for the appropriate family for the data is required and Modified Park Test is recommended. It tests a family given a specific link function. The test predicts the square of residual as a function of the log of the predictions. As a result, the value of coefficient of the log of the prediction recommends family. If the coefficient is approximately equal 0, the recommended family is Gaussian; if the coefficient is around 1, the family is Poisson; if the coefficient is around 2, the family is gamma; and if the coefficient is around 3, the family is inverse Gaussian (Glick 2008).

Next is the residual analysis which tests that the residual distribution is normal, approximately. There are many formulas for residual analysis e.g. Anscombe residuals, variance-stabilizing residuals, and Pearson residuals, however, this research used the Pearson residual which is equal to Pearson chi-square statistic. Dependencies of variance could be revealed by the standard plot between the Pearson residuals and individual predictor or the outcome value.

Hardin et al (2007) suggested that in addition, the best fit of the competing model (or non-nested model) could be detected by the Akaike Information Criterion (AIC) and Bayesian Informaiton Criterion (BIC). The AIC comparison is that the lower the value, the better fitting the model and a difference which is over 2 suggested that models with smaller values is preferable. Like AIC, the model with lower BIC value is better fit. There is also a level of preference for BIC by determining the difference of its absolute value. Degree of 0-2, 2-6, 6-10 or more than 10 differences indicated weak, positive, strong and very strong preferences, respectively (Hardin and Hilbe 2007; Glick 2008).

A2.5 Simple logistic regression

In this section, only the binary outcome variable is mentioned. The logistic regression is a member of exponential family of distribution in generalized linear regression model (GLM). There are only two discrete values of outcome, i.e. 0 and 1, so the OLS cannot be used. This binary outcome is unable to meet the assumption of general linear model, i.e. normal distribution of residuals, homoscedasticity and residual mean equals zero. Thus, fitting the model, the maximum likelihood technique, described in section ‘hypothesis testing for coefficient’ is used instead. By log transformation, the outcome

variable, y, is estimated in the form of log odds ratio (p/1-p), probability of an event lies between 0 and 1:

$$\ln(y) = \ln(p/1\text{-}p) = Z = \beta_1 + \beta_2 x_i$$

$$p = e^Z/(1 + e^Z)$$

where y denotes a binary outcome variable, that is 1 as an interested event and 0 otherwise; x_i represents the independent variable and P is a probability of an interested event (Gujarati 2003).

Diagnostics of the model

R^2 is not appropriate in maximum likelihood technique and this dichotomous outcome variable in which the value would limit from 0 to 1. However, the pseudo R^2 could be presented in the analysis output. By comparison, the ratio between log likelihood of all joint coefficients and log likelihood of the intercept only, and subtract to 1, the value of pseudo R^2 would be very small. In addition, there is no natural interpretation (Dougherty 2002). Apart from hypothesis testing by likelihood ratio and t statistic which are the main diagnostic tools of the model, goodness of fit could be tested by Wald's test and Lagrange multiplier or score test (Kennedy 1998). Both statistics are also to some extent of chi-square statistics. Given a sufficiently large sample size of all three tests, i.e. likelihood ratio, score test and Wald's are equal. It was, nonetheless, suggested, when available, that the likelihood ratio is most preferred since there is no effect of parameter transformation. The Wald's test is easiest in calculation but should be used when it is only an available one (Dupont 2002).

APPENDIX 3

CLAIMED EXPENDITURE

Table A3.1 List of causes of death by diseases and injuries classification and its ICD-10 code

	Disease group	ICD-10 Codes
I	***Communicable, maternal, perinatal and nutrition conditions***	***A00-B99, D50-D539, E00-E02, E031, E40-E649, G00-G058, H65-H669, J00-J22, N70-N739, O00-O99, P00-P969***
A	Infectious and parasitic diseases	A00-B99, G00-G058, N70-N739, P370
B	Respiratory infections	J00-J22, H65-H66
C	Maternal conditions	O00-O998
D	Conditions arising during the perinatal	P00-P37, P371-P969
E	Nutritional deficiencies	D50-D539, E00-E02, E031, E40-E46, E50-E649
II	***Non-communicable diseases***	***C00-C97,D00-D489,D55-D899,E030,E032-E079, E10-E169, E20-E349, E65-E899, F00-F99, G06-G99, H00-H619, H68-H959, I00-I99, J30-J989, K00-K929, L00-L989, M00-M999, N00-N64, N75-N999, Q00-Q999***
F	Malignant neoplasms	C00-C97
G	Benign neoplasms	D00-D48
H	Diabetes mellitus	E10-E149

Table A3.1 List of causes of death by diseases and injuries classification and its ICD-10 code (cont.)

	Disease group	ICD-10 Codes
I	Endocrine and metabolic disorders	D55-D899, E030, E032-E079, E15-E169, E20-E349, E65-E899
J	Mental disorders	F04-F050, F058-F69, F80-F998
K	Neurological disorders	F00-F03,F70-F79,G06-G98, F051
L	Sense organ diseases	H00-H619, H68-H959
M	Cardiovascular diseases	I00-I99
N	Respiratory diseases	J30-J989
O	Digestive diseases	K20-K938
P	Genito-urinary diseases	N00-N649, N75-N999
Q	Skin diseases	L00-L998
R	Musculoskeletal diseases	M00-M999
S	Congenital anomalies	Q00-Q999
T	Oral conditions	K00-K149
III	***Injuries***	***V01-X58, X60-Y09, Y35-Y871, Y88-Y891, Y90-Y98***
A	Unintentional injuries	V01-X58, Y40-Y86, Y88-Y891, Y90-Y98
B	Intentional injuries	X60-Y09, Y35-Y369, Y870-Y871
	Redistribution categories	X59, Y10-Y34, Y872, Y899
IV	***N-code injuries***	***S00-S999, T00-T999***
	Ill-defined non-injury conditions	***R00-R99 except R54***
V	***Senility***	***R54***

Table A3.2 Correlation matrix of all variables of interest

	Expenditure	Length of stay	Numbers of admission	Gender	Death age group	Places of death	Causes of death	Comorbidity	Charlson index
Expenditure	1								
Length of stay	0.7035**	1							
Numbers of admission	0.2868**	0.4935**	1						
Gender	0.0008	0.0129**	0.0360**	1					
Death age group	-0.0322**	-0.0506**	-0.0872**	0.1008**	1				
Places of death	0.1633**	0.0774**	-0.0021	-0.0196**	-0.1123**	1			
Causes of death	0.0120**	0.0494**	0.0594**	-0.0115**	0.0602**	-0.1266**	1		
Comorbidity	0.2673**	0.1934**	0.0564**	0.0348**	-0.0260**	0.1811**	-0.0978**	1	
Charlson index	0.1640**	0.2608**	0.3719**	0.0200**	-0.1127**	0.0414**	0.0997**	0.2549**	1

Table A3.3 Descriptive statistics of some variables by health insurance groups

		Mean	S.E.	S.D.	Minimum	Maximum	50Ptile	75Ptile	90Ptile
Claimed expenditure	All	64,106.5	276.8	124,658.0	10	6,741,127	25,437	64,289	152,976
	CSMBS	119,994.5	1,056.0	198,682.2	200	6,741,127	52,098	136,889	301,449
	UCE	50,438.9	279.7	96,303.2	10	2,990,939	21,032.7	51,268.9	117,857
	UCP	56,788.7	466.4	103,142.0	10	2,979,576	25,463.5	60,103	130,816
Length of stay	All	20.8	0.06	29.2	1	365	11	26	51
	CSMBS	30.9	0.21	39.7	1	365	17	40	75
	UCE	18.1	0.07	25.4	1	363	10	22	44
	UCP	20.1	0.12	27.1	1	364	11	25	50
Numbers of admission	All	2.8	0.005	2.5	1	50	2	3	6
	CSMBS	2.8	0.013	2.5	1	47	2	4	6
	UCE	2.7	0.007	2.4	1	50	2	3	5
	UCP	2.9	0.012	2.6	1	39	2	4	6
Numbers of comorbidities in last admission	All	2.5	0.005	2.2	0	12	2	4	6
	CSMBS	2.9	0.012	2.3	0	12	2	4	6
	UCE	2.5	0.006	2.2	0	12	2	3	5
	UCP	2.5	0.010	2.2	0	12	2	4	5
Charlson comorbidity index	All	1.7	0.005	2.2	0	16	1	2	6
	CSMBS	1.9	0.012	2.3	0	16	1	3	6
	UCE	1.4	0.006	1.9	0	16	1	2	4
	UCP	2.1	0.012	2.6	0	16	1	3	6

Table A3.4 Descriptive statistics of claimed expenditures by Charlson comorbidity index

Variables	Percentage of decedents and mean claimed expenditures							
	All		CSMBS		UCE		UCP	
Numbers of decedents (n)	202,858		35,396		118,548		48,914	
	% n	Baht	% n	Baht	% n	Baht	% n	Baht
Charlson comorbidity index								
0	42.0	40,820.0	34.3	72,683.3	43.6	33,770.5	43.5	39,761.9
1	20.0	66,678.6	22.1	105,874.7	21.2	56,052.8	15.4	61,558.6
2	14.5	78,941.1	16.5	135,794.2	15.4	60,975.9	11.0	78,213.8
>=3	23.5	94,272.3	27.1	181,656.4	19.8	72,960.1	30.1	71,172.0

Table A3.5 Statistical tests and values of zero-truncated Poisson model versus zero-truncated negative binomial model for hospitalisations

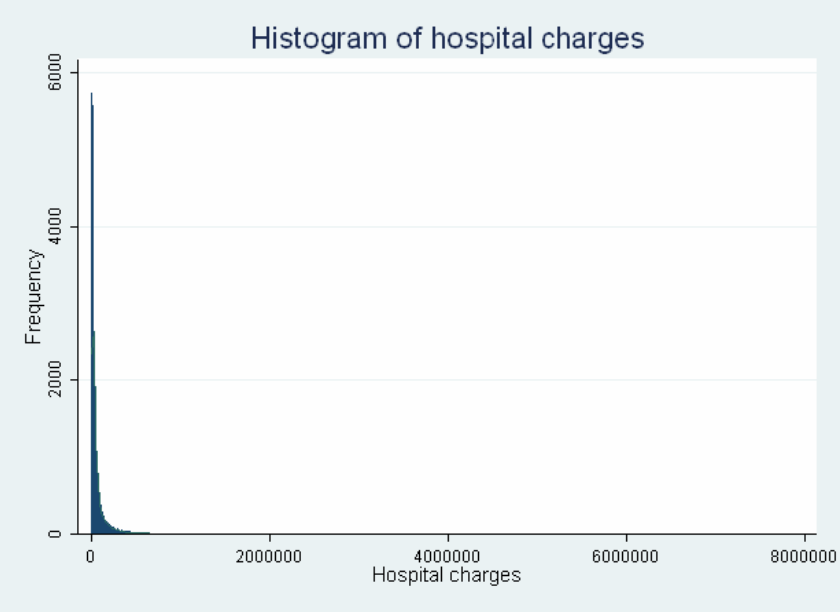
Model:	Zero-truncated Poisson		Zero-truncated negative binomial	
Variables	Coefficient	Std. Err.	Coefficient	Std. Err.
Age 5_10	0.0258	0.0616	-0.0379	0.0739
Age 10_20	-0.0615	0.0471	-0.1528**	0.0567
Age 20_30	-0.0510	0.0368	-0.0765	0.0446
Age 30_40	-0.1310**	0.0329	-0.1611**	0.0396
Age 40_50	-0.1248**	0.0315	-0.1448**	0.0379
Age 50_60	-0.1170**	0.0312	-0.1272**	0.0375
Age 60_70	-0.1842**	0.0301	-0.1956**	0.0360
Age 70_75	-0.2343**	0.0307	-0.2539**	0.0368
Age 75_80	-0.3126**	0.0310	-0.3467**	0.0372
Age >=80	-0.5015**	0.0310	-0.5810**	0.0372
Male	-0.0846**	0.0070	-0.0920**	0.0087
Communicable ds.	-0.0265*	0.0121	-0.0151	0.0148
Non-communicable ds.	0.0729**	0.0106	0.0932**	0.0131
Injuries	-0.9145**	0.0313	-1.0601**	0.0359
Senility	-0.1358**	0.0163	-0.1772**	0.0200
Cancer	0.3247**	0.0107	0.4093**	0.0134
Place of death, public hosp.	-0.0065	0.0082	-0.0159	0.0101
Place of death, private hosp.	-0.0459**	0.0102	-0.0531**	0.0125
UCE	-0.0287**	0.0096	-0.0318**	0.0120
UCP	-0.1031**	0.0131	-0.1230**	0.0165

Table A3.5 Statistical tests and values of zero-truncated Poisson model versus zero-truncated negative binomial model for hospitalisations (cont.)

Model:	Zero-truncated Poisson		Zero-truncated negative binomial	
Variables	Coefficient	Std. Err.	Coefficient	Std. Err.
1 comorbidity	0.0981**	0.0122	0.1170**	0.0152
2 comorbidity	0.1515**	0.0123	0.1889**	0.0153
3 comorbidity	0.1997**	0.0128	0.2523**	0.0159
4 comorbidity	0.2136**	0.0146	0.2647**	0.0180
>=5 comorbidity	0.2313**	0.0126	0.2880**	0.0156
Constant	1.0674**	0.0328	0.6586**	0.0405
Test for overdispersion ($\alpha = 0$)		0.4391**		
Pseudo R^2		0.04		
Number of observations		101513		101513
Wald χ^2		5188.39**		5372.71**
ll(null)		-212119.5		-184145.2
ll(model)		-203632.5		-180880.9
AIC		407317		361815.8
BIC		407564.7		362073
Wald test for group variables (χ^2)				
Age		925.99**		809.54**
Causes of death		2677.51**		2815.91**
Places of death		45.11**		51.95**
Health insurances		64.2**		58.66**
Comorbidities		443.83**		458.33**

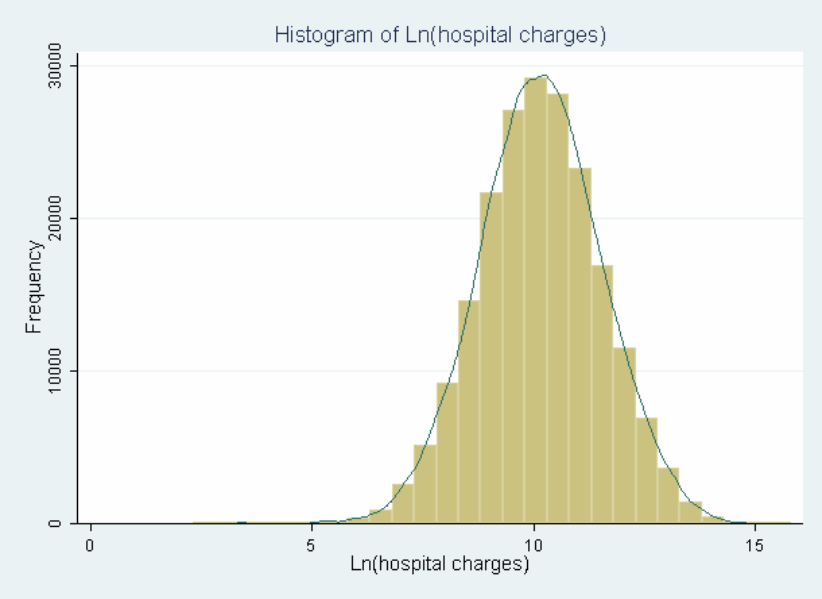
Figure A3.1 Histogram of independent variable (expenditure) in raw scale and log scale

A: Raw scale



Skewness = 7.549921; Kurtosis = 142.6821

B: Log scale



Skewness = -0.04958; Kurtosis = 3.04466

Table A3.6 Statistical tests and values of models for claimed expenditure

Model:	OLS		LnOLS with Duan's smearing factor		GLM (Gamma-log)		GLM (Poisson-log)	
Variables	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Age 5-10	-23411.03*	11870.1	-0.1918*	0.0788	-0.3645**	0.0861	-0.1689	0.0956
Age 10-20	-33870.65**	10214.3	-0.3413**	0.0572	-0.4162**	0.0750	-0.2607**	0.0856
Age 20-30	-58528.98**	8790.1	-0.4527**	0.0500	-0.6704**	0.0685	-0.5477**	0.0768
Age 30-40	-75716.32**	8351.9	-0.5937**	0.0462	-0.9015**	0.0587	-0.8473**	0.0658
Age 40-50	-71014.51**	8378.5	-0.5051**	0.0451	-0.8043**	0.0567	-0.7499**	0.0641
Age 50-60	-69133.06**	8385.4	-0.4783**	0.0446	-0.7720**	0.0558	-0.7244**	0.0635
Age 60-70	-67683.23**	8338.0	-0.4322**	0.0436	-0.7388**	0.0544	-0.6950**	0.0623
Age 70-75	-67245.06**	8394.6	-0.4501**	0.0441	-0.7481**	0.0553	-0.6964**	0.0634
Age 75-80	-72230.25**	8411.7	-0.4995**	0.0443	-0.8105**	0.0553	-0.7667**	0.0637
Age >= 80	-75356.94**	8440.9	-0.6231**	0.0442	-0.9168**	0.0553	-0.8180**	0.0640
Male	398.69	749.5	-0.0135	0.0078	0.0181	0.0107	0.0056	0.0115
Communicable ds.	13254.34**	1454.2	0.2488**	0.0134	0.1870**	0.0178	0.2020**	0.0205
Non-communicable ds.	4187.82**	1017.8	0.1786**	0.0116	0.1267**	0.0157	0.0962**	0.0176
Injuries	-18147.91**	1802.8	-0.3480**	0.0217	-0.2693**	0.0321	-0.2998**	0.0356
Senility	-2127.11	1171.3	-0.0847**	0.0165	-0.1488**	0.0243	-0.1639**	0.0250
Cancer	29117.24**	1195.9	0.5627**	0.0129	0.4403**	0.0168	0.4365**	0.0181
Place of death, public hosp.	20993.47**	786.1	0.3256**	0.0090	0.3171**	0.0120	0.3298**	0.0125
Place of death, private hosp.	-5124.48**	1298.6	-0.1400**	0.0114	-0.0931**	0.0143	-0.1150**	0.0144
UCE	-61893.99**	1517.6	-0.7226**	0.0110	-0.7679**	0.0137	-0.7439**	0.0149
UCP	-60381.60**	1910.3	-0.6520**	0.0153	-0.6963**	0.0201	-0.6869**	0.0217

Table A3.6 Statistical tests and values of models for claimed expenditure (cont.)

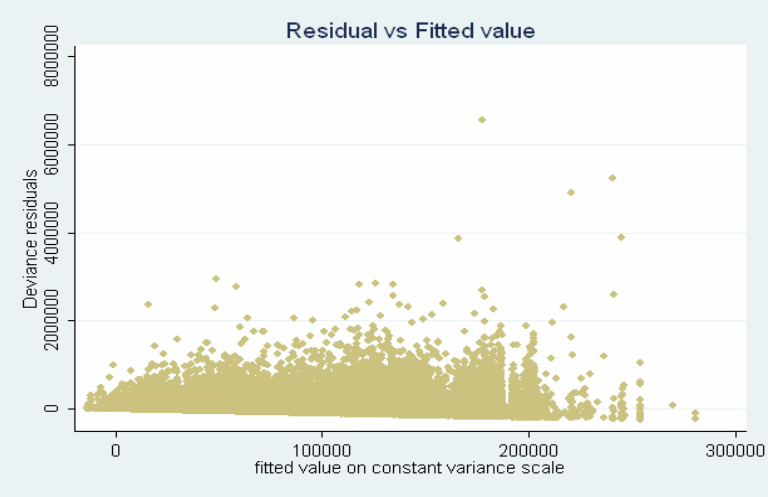
Model:	OLS		LnOLS with Duan's smearing factor		GLM (Gamma-log)		GLM (Poisson-log)	
Variables	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
1 comorbidity	5956.11**	809.5	0.1862**	0.0131	0.1558**	0.0186	0.1514**	0.0204
2 comorbidities	13009.18**	896.6	0.4045**	0.0133	0.3359**	0.0193	0.3149**	0.0204
3 comorbidities	24444.16**	1070.4	0.6461**	0.0139	0.5183**	0.0190	0.5115**	0.0207
4 comorbidities	31595.27**	1375.0	0.7942**	0.0157	0.6495**	0.0221	0.6119**	0.0232
>=5 comorbidities	77755.55**	1559.5	1.2436**	0.0139	1.0944**	0.0188	1.0541**	0.0200
Constant	141930.40**	8807.9	10.3963**	0.0465	11.5665**	0.0590	11.5210**	0.0704
Duan's smearing factor: LnOLS				2.0812				
Number of observations		101513		101513		101513		101513
R^2		0.122		0.2146				
F statistic		266.08**		1110.33**				
Residual df						101487		101487
Deviance						148023.573		8.73E+09
Pearson						286067.5105		1.6E+10
Log likelihood (null)		-1335237		-176690.7		.		.
Log likelihood (model)		-1328631		-164432.7		-1205523		-4.36E+09
AIC		2657314		328917.4		2411098		8.73E+09
BIC		2657562		329165.2		2411346		8.73E+09

Table A3.6 Statistical tests and values of models for claimed expenditure (cont.)

Model:	OLS		LnOLS with Duan's smearing factor		GLM (Gamma-log)		GLM (Poisson-log)	
Variables	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Modified Park Test for GLM family (χ^2)								
Coefficient						1.6362		1.6548
Family:						Chi2		Chi2
Gamma						32.27**		30.09**
Poisson						98.69**		108.08**
Inverse Gaussian or Wald						453.54**		456.15**
Gaussian NLLS						652.79**		690.28**
Results of tests for GLM Log link						*p-value*		*p-value*
Pearson Correlation test						0.000		0.067
Pregibon Link Test						0.035		0.038
Modified Hosmer and Lemeshow						0.145		0.249
Root Mean Square Error		117028.8		116896.5		116602.9		116456.4
Mean Absolute Error		57960.8		57737.3		57176.7		57063.6
Wald test for group variables (χ^2)								
Age		21.02**		41.31**		434.79**		329.92**
Causes of death		202.71**		642.97**		1183.10**		1139.51**
Places of death		437.99**		744.81**		921.40**		903.79**
Health insurances		832.53**		2174.43**		3183.65**		2518.96**
Comorbidities		622.91**		2144.86**		4776.57**		4090.59**

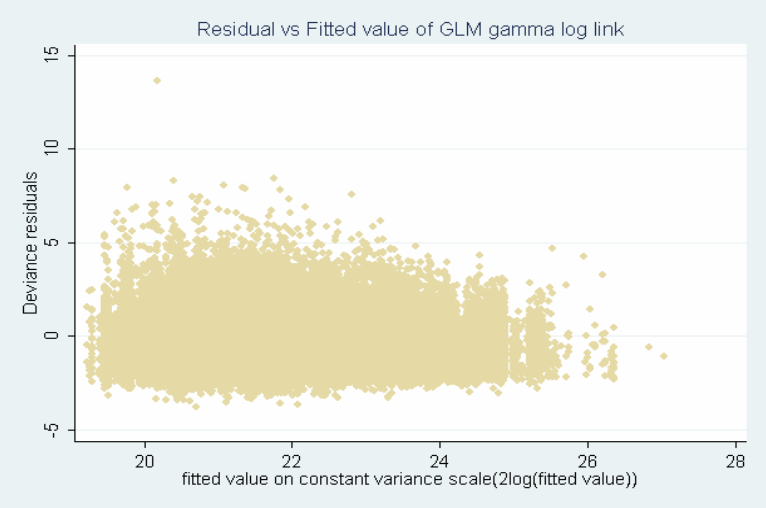
Figure A3.2 Scatter plot of estimated mean (fitted values) versus residual of four models

A: OLS



B: OLS of log transformed data with Duan's smearing factor

C: GLM gamma log link



D: GLM Poisson log link

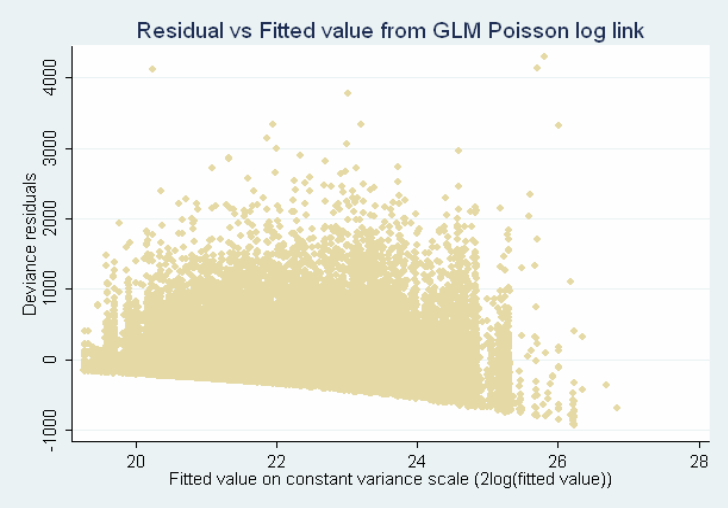
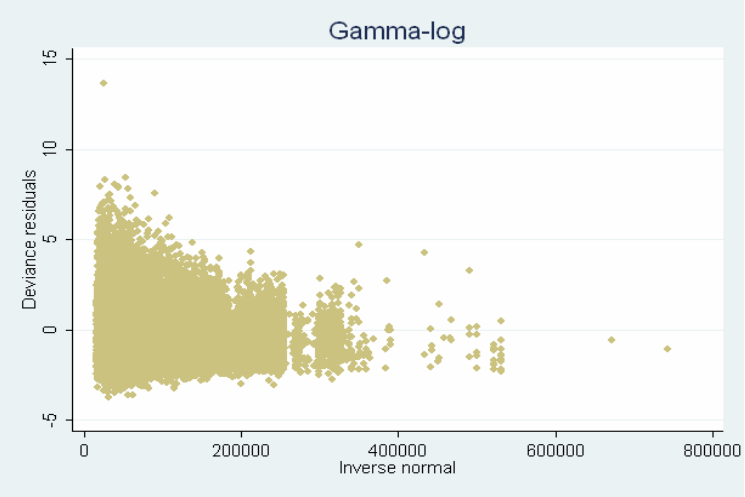
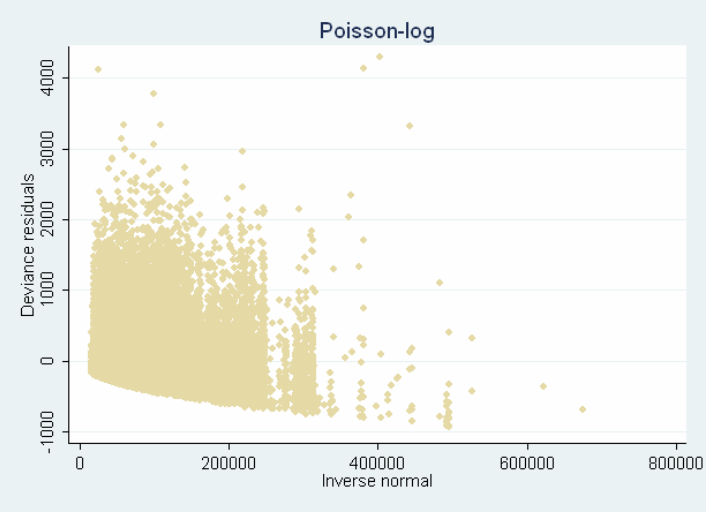


Figure A3.3 Plots of predicted value versus residual of the two GLM models (scatter plot and standardized normal probability plot)

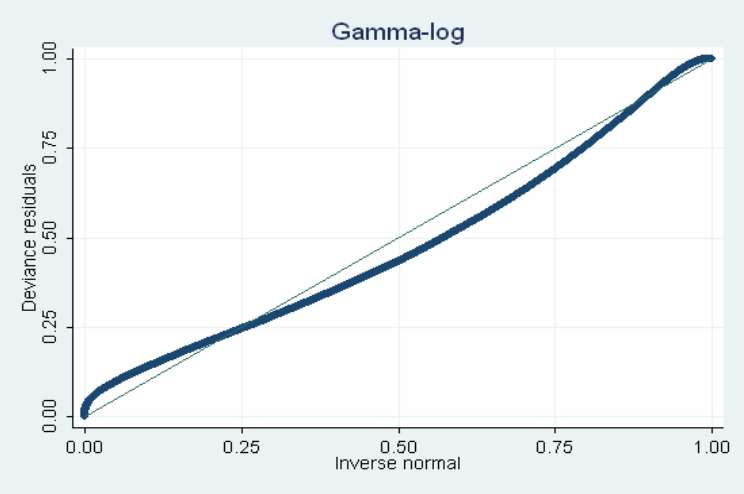
A: Gamma log link (scatter plot)



B: Poisson log link (scatter plot)



C: Gamma log link (standardized normal probability plot)



D: Poisson log link (standardized normal probability plot)

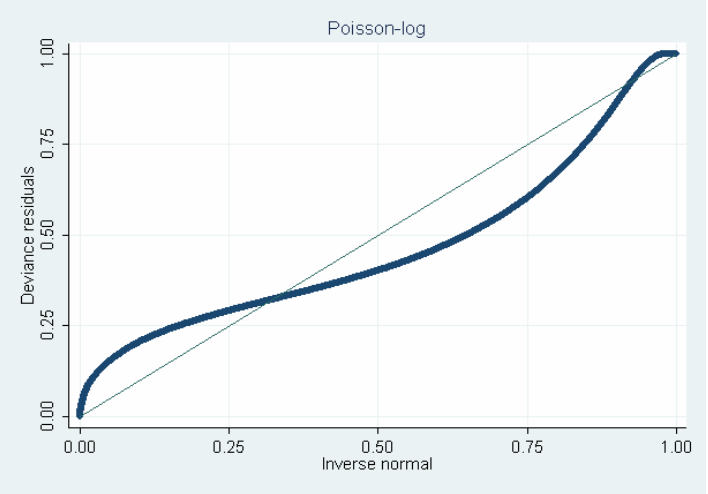


Table A3.7 Descriptive statistics of length of stay and numbers of admission by various variables

Characteristics	Length of stay				Numbers of admissions			
	All	CSMBS	UCE	UCP	All	CSMBS	UCE	UCP
N	202,858	35,396	118,548	48,914	202,858	35,396	118,584	48,914
Average	20.8	30.9	18.1	20.1	2.77	2.81	2.72	2.85
Gender								
Male	20.5	30.0	18.3	18.7	2.69	2.77	2.70	2.62
Female	21.2	31.9	18.0	22.2	2.87	2.86	2.75	3.21
Death age groups (yrs.)								
< 5	38.7	30.3	39.8	24.4	3.18	1.96	3.29	2.98
5 to <10	31.5	53.8	30.4	34.4	3.38	4.95	3.32	2.00
10 to <20	22.5	25.3	23.0	21.4	2.69	2.53	2.71	2.67
20 to <30	20.5	35.4	19.7	20.4	2.78	2.86	2.70	2.80
30 to <40	19.7	28.7	20.4	19.0	2.79	3.07	2.99	2.71
40 to <50	21.0	32.9	19.4	20.0	2.94	3.33	3.04	2.85
50 to <60	21.8	33.2	19.4	20.5	3.08	3.36	3.14	2.99
60 to <70	21.6	32.3	19.4	21.3	3.00	3.16	2.99	2.76
70 to <75	21.1	31.7	18.2	16.1	2.82	2.90	2.81	2.07
75 to <80	19.9	30.4	16.4	20.9	2.58	2.69	2.54	2.27
>=80	18.3	28.6	14.2	13.2	2.19	2.30	2.14	1.92
Causes of death								
Ill-defined causes	18.5	27.1	16.5	17.9	2.67	2.66	2.69	2.62
Communicable ds.	24.7	37.6	23.1	20.2	2.68	2.64	2.70	2.67
Non-communicable ds.	19.5	27.6	18.0	17.7	2.89	2.70	2.93	2.93
Injuries	10.8	17.1	10.4	9.3	1.58	1.81	1.61	1.47
Senility	13.4	21.0	11.8	10.4	2.10	2.19	2.09	1.85
Cancer	29.2	40.8	24.5	29.0	3.55	3.79	3.37	3.68

Table A3.7 Descriptive statistics of length of stay and numbers of admission by various variables (cont.)

Characteristics	Length of stay				Numbers of admissions			
	All	CSMBS	UCE	UCP	All	CSMBS	UCE	UCP
Places of death								
Elsewhere	18.2	25.5	16.0	20.7	2.75	2.75	2.67	3.02
Public hospitals	23.7	34.4	21.1	19.5	2.81	2.86	2.83	2.72
Private hospitals	22.1	25.5	22.3	20.4	2.51	2.52	2.44	2.59
Comorbidities in last admission								
None	15.6	23.6	13.3	16.4	2.50	2.73	2.41	2.60
1	16.8	24.6	14.8	17.0	2.66	2.76	2.60	2.75
2	19.0	27.0	16.8	18.7	2.76	2.78	2.72	2.87
3	22.2	32.8	18.9	20.4	2.87	2.86	2.85	2.94
4	23.1	31.5	20.9	22.3	2.96	2.85	2.95	3.06
>=5	31.1	42.9	27.6	28.3	2.97	2.87	2.99	3.01
Charlson comorbidity index								
0	13.2	12.0	12.0	12.7	1.84	1.83	1.85	1.82
1	20.0	18.4	18.4	17.7	2.59	2.35	2.66	2.58
2	25.6	22.2	22.2	27.0	3.39	3.21	3.33	3.77
>=3	32.0	28.2	28.2	29.4	4.20	4.18	4.24	4.14
Numbers of admission								
1	8.7	14.5	7.7	7.3				
2	16.2	25.6	14.0	15.0				
3	24.0	35.8	20.7	23.0				
4	31.0	45.1	27.2	29.5				
>=5	48.5	63.4	43.9	47.9				

APPENDIX 4

HOUSEHOLD EXPENDITURE

A4.1 Sample selection, and sample and population estimations (Economic and Social Statistics Bureau 2007)

Regarding the survey design as a stratified two-stage sampling indicated in Chapter Six, subsection 6.2.2, the 2,050 samples from 109,966 blocks and villages in Bangkok and 4 regions over the country were independently selected. As a result that there was no exact information regarding which areas and households were expected to have decedents or newborn babies during the survey period, a new listing of private households in the enumeration was made for every block/village selected to serve as the sampling frame for the remaining parts of the survey. Owing to the need for a sufficient sample covering births and deaths, the private households in the sampling frame were classified in the second stage of sampling in accordance with the high to low probabilities of births and deaths of household members. Below are such three groups of households:

- Group one: households with infants (age less than one year), or elderly (aged 80 or above), or pregnant women;
- Group two: households with children aged - 5 years, or younger elderly (aged 60-79); and
- Group three: households with older children and adults aged 6-59 years or unable to enumerate households, or vacant houses.

Next, sequential selection was conditionally applied to households from group one to group three. That is group one was the main selection, followed by group two and three until there was a sufficient number of 30-50 households per block/village. Consequently, eighty two thousand out of the 354,678 households in 2,050 sample blocks/villages were included in the survey. All special households were also assigned to be samples.

The samples of the survey could be inferential to the population by employing ***weighting factor***s. Two weighting factors were generated for inferences from individual

samples to population and from household samples to household population. Details of estimation for the weighting factor for individuals which were employed in the study are presented below. The weighting factor for households was used in the measuring of household living standards which was out of the scope of this study.

Given that

h = 1, 2, 3, 4, 5 (region)

i = 1, 2 (area of municipality)

j = 1, 2, 3,…, m_{hi} (block/village)

k = 1, 2, 3 (household group),

estimation of the total numbers of individuals with X characteristic of the i^{th} area, h^{th} region is:

$$\hat{X}_{1hi} = \frac{x'_{1hi}}{y'_{1hi}} Y_{1hi},$$

where

$$x'_{1hi} = x'_{11hi} + x'_{12hi};$$

$$y'_{1hi} = y'_{11hi} + y'_{12hi}; \text{ and}$$

$$x'_{11hi} = \sum_{j=1}^{m_{hi}} \sum_{k=1}^{3} \frac{N_{1hijk}}{n_{1hijk}} x_{11hijk} \text{ and } y'_{11hi} = \sum_{j=1}^{m_{hi}} \sum_{k=1}^{3} \frac{N_{1hijk}}{n_{1hijk}} y_{11hijk} \text{ for private household}$$

$$x'_{12hi} = \sum_{j=1}^{m_{hi}} \frac{N_{2hij}}{n_{2hij}} x_{12hij} \text{ and } y'_{12hi} = \sum_{j=1}^{m_{hi}} \frac{N_{2hij}}{n_{2hij}} y_{12hij} \text{ for special household}$$

x_{11hijk} is total numbers of enumerated population with X characteristic in a private household of k^{th} household group, j^{th} block/village, i^{th} area and h^{th} region.

x_{12hij} is total numbers of enumerated population with X characteristic in a special household of k^{th} household group, j^{th} block/village, i^{th} area and h^{th} region.

N_{1hijk} is total numbers of listing private households in k^{th} household group, j^{th} block/village, i^{th} area and h^{th} region.

N_{2hij} is total numbers of listing members in special households in j^{th} block/village, i^{th} area and h^{th} region.

n_{1hijk} is total numbers of sample private households in k^{th} household group, j^{th} block/village, i^{th} area and h^{th} region.

n_{2hij} is total numbers of sample members of special households in j^{th} block/village, i^{th} area and h^{th} region.

m_{hi} is numbers of sample blocks/villages in i^{th} area and h^{th} region.

y_{11hijk} is total numbers of enumerated population from samples of private households in k^{th} household group, j^{th} block/village, i^{th} area and h^{th} region.

y_{12hij} is total numbers of enumerated population from special households in j^{th} block/village, i^{th} area and h^{th} region.

Y_{1hi} is total numbers of population estimated from Thai population in i^{th} area and h^{th} region.

A4.2 Summary of translated questionnaire in the 7th Survey of Population Change

Confidential

Logo of National Statistical Office

The survey of Population change B.E.2548-2549 (A.D.2005-2006)

Topics of the question in the questionnaire

1. Geographic area of household and survey record, household type (private or special)
2. Date of interview
3. Interview summary table
4. ***Part 1:*** General information of members of the household (order in rank starting with head of household)
   - 4.1. For all members: Title, name-surname, identify number from Identification Card, registered status in registration booklet, date of birth (date, month, year), age, gender, relationship to head of household (head, spouse, unmarried child, married child, child in law, grandchild, parent or parent in law, other relative, resident or servant, member in special household), residency status (permanent resident, temporary leave, temporary resident, temporary resident and leave, out migrant, death)
   - 4.2. For private household and persons age of 0 to 18 years old: parents' residency status (absence, death, vanishing, unknown parents)
   - 4.3. For persons age of 6 years and over: education (highest year completed, none), period of educational or vocational study, literacy (able/unable, Thai, English, Chinese, Japanese, Malaysian-Yawi, others (identify)…)
   - 4.4. For persons age of 15 years and over (working during 12 months prior to date of interview): main occupation, type of the job, working status (employer, own account worker, unpaid family worker, government employee, state enterprise employee, private employee, cooperative group), income, i.e. net monetary income on monthly average and monetary value

A4.2 Summary of translated questionnaire in the 7th Survey of Population Change (cont.)

4.5 For persons aged 13 and over:

4.5.1 marital status (single, married or unmarried, widowed, divorced, separated, married with unknown status, priest

4.5.2 For females:

4.5.2.1 children (excluding adoption): total number, number of living, number of deceased

4.5.2.2 For persons aged below 50: contraception (none, pills, emergency pills, injection, implantation, intrauterine device, condom, female sterilization, male sterilization, safe period, others (identify)…, not known)

4.5.2.3 Pregnancy: no, yes (number of months, delivered, miscarriage)

5. ***Part 2:*** Birth (2^{nd} to 5^{th} round), for newborn baby

5.1 Residency: birth and living in household, birth but deceased, birth and migration/temporary resident and leave

5.2 Place of delivery: public hospital, private hospital, health centre/ primary care unit, maternal and child health centre, midwifery centre /clinic, house, car/boat/ship, others (identify)…

5.3 Birth certificate: received, have not received, have not registered

5.4 Name-surname of father and mother of new born baby in the registration booklet: yes, no

6. ***Part 3:*** Death (2^{nd} to 5^{th} round)

6.1 Date of death

6.2 Place of death: public hospital, private hospital, health centre/primary care unit, clinic, house, on the way, drowning, others (identify)

6.3 Cause of death

6.4 Death certification: received, have not received, have not registered

6.5 Number of death certification

6.6 Migration in-out

7. Respondent: his/herself, proxy

A4.2 Summary of translated questionnaire in the 7th Survey of Population Change (cont.)

8. ***Part 4:*** Dwelling place and living condition and asset of private household (1st round)

8.1 Materials used of dwelling unit: cement, wood, wood and cement/brick, non-permanent local materials, reused materials e.g. box, crate

8.2 Tenure: land and house owner, house owner on rental land, house owner on public land, leasing, rent, paying rent by other, rent free

8.3 Number of rooms: total rooms (except bathroom/shower room/rest room/toilet), bedrooms

8.4 Electricity (including battery origin and other generators): have, no have

8.5 Fuel for cooking: no cooking, charcoal, firewood, kerosene, gas, electrics, others (identify)…

8.6 Toilet: flushing, latrine, flushing and latrine, pit/adapted bucket or others, no have

8.7 Drinking water: bottled water, in-let piped water, in house well, external piped water, public well, river/stream/canal, rain, others (identify)…

8.8 Water supply: bottled water, in-let piped water, in house well, external piped water, public well, river/stream/canal, rain, others (identify)…

8.9 Waste elimination: rubbish service, burning, landfill, animal feeds, composting, disposing into river/canal, disposing on vacant/public land, others (identify)…

8.10 Asset of household member (identify number of each ownership): wooden or metallic bed, gas cooker, electric cooker, microwave oven, electric kettle, refrigerator, electric iron, electric rice cooker, electric fan, radio, television, video/CD player, washing machine, air conditioner, bath water heater, computer, telephone (including PCT), mobile phone, facsimile, car, small truck/pickup truck/van, agricultural truck/machine, motorboat, motorcycle, bicycle

A4.3 Summary questions of the Survey on Healthcare Utilisation of and Household Expenditure for Decedents prior to Death in 2005-2006

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Logo of National Statistical Office, International Health Policy Program-Thailand, and National Health Security Office

Survey on Healthcare Utilisation of and Household Expenditure for Decedents Prior to Death between 2548-2549 B.E. (2005-2006 A.D.)

Question topics

1. Geographic information of household and survey record, household type (private or special)
2. Demographic information of respondents and decedents referred to the SPC Part 1
3. Interview date
4. Interview summary table
5. Cause of death (choices copied from SPC)
6. Grouping cause of death (communicable, non-communicable, accident, suicide, homicide, others (please specify)…)
7. Health insurance of the decedents, main and second (none, Civil Servant Medical Benefit Scheme, Social Security Scheme, Universal Coverage Scheme with 30 Baht exemption, Universal Coverage Scheme 30 Baht co-payment, private, employer, others (please specify)…)
8. Care (care giver in everyday life prior to death, excluded during illness: none, relative, maid, nurse/nurse assistant, neighbour, others (please specify)…)
9. Part 1: Ambulatory care use during the three months prior to death
    a. Usage of ambulatory care (use or no use)
    b. Total amount of ambulatory care use and health care costs incurred each health facility (traditional/herbal medicine, alternative medicine, self medication, health centre/primary care unit (PCU), district hospital, regional/general hospital, university hospital, other special hospital, private

A4.3 Summary questions of the Survey on Healthcare Utilisation of and Household Expenditure for Decedents prior to Death in 2005-2006 (cont.)

c. Type of last ambulatory service used (traditional/herbal medicine, alternative medicine, self medication, health centre/primary care unit, district hospital, regional/general hospital, university hospital, other special hospital, private polyclinic/clinic, private hospital, others (please specify)…)

d. Expenditure of last visit (household health care cost, travelling cost, other relevance cost e.g. lodging, unavailable drugs or medical supplies in the benefit packages)

e. Utilisation of health insurance in last visit (none, CSMBS, SSS, UC, private, employer, no use)

10. Part 2: Hospitalisation during six months prior to death

a. having hospitalisation (use/no use)

b. Total numbers of hospitalisations, total numbers of referral

c. Numbers of hospitalisations and its expenditure for each type of health facility (district hospital, regional/general hospital, university hospital, other special care hospital, private polyclinic/clinic, private hospital, others (please specify)…)

d. Type of last hospitalisation (district hospital, regional/general hospital, university hospital, other special hospital, private polyclinic/clinic, private hospital, others (please specify)…)

e. Length of stay for last hospitalisation

f. Household expenditure for last hospitalisation (health care cost, travelling costs, other relevance costs e.g. lodging, unavailable drugs or medical supplies in the benefit packages)

g. Utilisation of health insurance in last hospitalisation (none, CSMBS, SSS, UC, private, employer, no use)

h. Reasons for not using health facilities (monetary constraint, inconvenience of travelling, sudden death, patient's preference, end stage of illness and preference of death at home, others (please specify)…)

11. Respondents: care givers, other household members, non-household members

A4.4 2005-6 population living standards

a) Measuring living standards by income

In the SPC Part 1, all household members aged at least 15 reported their working status and were asked about their average monthly income and income received in in-kind for both working and/or investment during the past 12 months. By summing up all income for all members, the household income was generated. As a result of Deaton's suggestion, household incomes were adjusted. After such adjustment, per capita monthly income was reallocated to household individual member and was ranked into quintiles.

Notes: In Deaton's recommendation, adults and children unequally demanded and shared household resources. In addition, economies of scale of households are affected by household consumptions/expenditure/income (Deaton 1997), that is, household size could be adjusted into adult equivalents (AE) by a formula:

$AE = (A + \alpha K)^{\theta}$

where

A is a number of adult;
K is a number of child;
α is the cost of children and
θ reflects the degree of economies of scale

Deaton A suggested that half of the cost of an adult is the cost of a child (Deaton 1997). The EQUITAP working group recommended setting the θ equals to 0.75 estimating from Indian and Pakistani data, that is, 0.72 and 0.87, respectively[bbb].

[bbb] The Indian and Pakistani data are estimated in Deaton Angus (1997). The analysis of household surveys, a microeconometric approach to development policy. Page 264. In addition, 'Deaton and Zaidi (2002) propose values in the region of 0.3 to 0.5 for α and 0.75 to 1.0 for θ, given that food accounts for a large proportion of total consumption, and economies of scale are relatively limited.' (O'Donnell, O., E. van Doorslaer, et al. (2008d). Chapter 6: Measurement of Living Standards. Analyzing health equity using household survey data: a guide to techniques and their implementation. O. O'Donnell, E. van Doorslaer, A. Wagstaff and M. Lindelow. Washington, D.C., The World Bank.

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b) Measuring living standards by household assets and characteristics

Regarding the data in Part 4 of the SPC, the head of the household was interviewed about household housing and assets (details described in Part 4 of the SPC questionnaire, Appendix 4, A4.2). There were 7 questions with 43 choices in qualitative and 27 questions in quantitative indicators. To construct the asset index, the study applied Principal Component Analysis (PCA) technique (O'Donnell, van Doorslaer et al. 2008d) by SPSS15. Household characteristics were mostly in type of qualitative indicators, for example, the tenure of dwelling which has seven types, i.e. house and land ownership, house owner on rental land, house owner on public land, house and land leasing, house and land renting, renting paid by others, rent free. Such indicators were, therefore, re-categorized into simply binomial variables. For instance, tenure of dwelling was modified into dwelling ownership, i.e. the score was either 1 is 'yes' or 0 is 'no'. As a result, the variables were reduced from 72 to 35 variables, and PCA extracted such 35 variables into 8 components/factors and the first factor selected represents the highest linear combination of 27 variables. Those variables include number of televisions, mobile phones, electric fans, beds, telephones, washing machines, air conditioners, computers, refrigerators, bedrooms, water heaters, video players, microwaves, cars, rooms, electric irons, gas stoves, electric kettles, radios, electric pots, motorcycles, electronic stoves, small trucks and fax machines; accessibility to government available cooking fuel, rubbish elimination, accessibility to sanitized and in-house water supply.

Table A4.1 Example for the modification of qualitative asset indicators into binary dummy variable for PCA

	Set of questions	Modified binary dummy variables
1st example	Tenure of dwelling	Household ownership
	• House and land ownership	1
	• House owner on rental land	0
	• House owner on public land	0
	• House and land leasing	0
	• House and land renting	0
	• Renting paying by sponsor	0
	• Rent free	0
2nd example	Drinking water	Accessibility to sanitary and convenient drinking water
	• Bottled water	1
	• In house tap water	1
	• In house well	1
	• Village tap water	0
	• Village well	0
	• Stream/river	0
	• Rain	0

c) Correlation of the 2 measurements

The population 64,633,529 (99.9 percent) and 62,000,045 (95.9 percent) out of 64,675,145 provided data on income and household assets, respectively. That is, the study has 0.1 percent and 4.1 percent missing data. Table A4.2 shows the range of monthly income and factor score of asset index, numbers and percentages of population in each level of quintile. The Spearman correlation coefficient between both living standards was 0.40 with the significance level at p less than 0.01 percent (Table A4.3). It was indicated as a weak relationship in accordance with the findings in the correlation between living standards indices based on principal component analysis and consumption comment by O'Donnell et al (2008d).

Table A4.2 Population quintile classified by income per capita and household assets per capita

Quintile	Income	Population	%	Factor score[a]	Population	%
1	0.0 to 1,294.1	12,890,894	19.9	-3.64 to -0.78	12,400,924	20.0
2	1,294.6 to 2,473.5	12,961,581	20.1	-0.78 to -0.13	12,398,224	20.0
3	2,473.6 to 3,983.8	12,928,100	20.0	-0.13 to 0.29	12,399,059	20.0
4	3,984.1 to 6,848.7	12,935,880	20.0	0.29 to 0.73	12,401,763	20.0
5	6,849.6 to 118,918.3	12,917,074	20.0	0.73 to 9.76	12,400,455	20.0
Total		64,633,529	100.0		62,000,425	100.0

a: the same figure showed in consecutive interval are different at more than 4 digits.

Table A4.3 Correlation between population quintile by income and by household assets

	Household asset index quintile						Total
Income quintile		1	2	3	4	5	
1	population	5,182,422.0	3,152,398.0	1,893,187.0	1,256,791.0	670,966.0	12,155,764.0
	%	**41.8**	25.4	15.3	10.1	5.4	19.6
2	population	3,655,654.0	2,935,414.0	2,485,149.0	1,950,025.0	1,570,368.0	12,596,610.0
	%	29.5	**23.7**	20.1	15.7	12.7	20.3
3	population	1,806,397.0	2,473,218.0	2,783,259.0	2,872,954.0	2,552,845.0	12,488,673.0
	%	14.6	20.0	**22.5**	23.2	20.6	20.2
4	population	1,029,104.0	1,921,041.0	2,627,967.0	3,254,558.0	3,600,268.0	12,432,938.0
	%	8.3	15.5	21.2	**26.3**	29.0	20.1
5	population	714,965.0	1,905,572.0	2,605,035.0	3,058,027.0	4,000,029.0	12,283,628.0
	%	5.8	15.4	21.0	24.7	**32.3**	19.8
Total	population	12,388,542.0	12,387,643.0	12,394,597.0	12,392,355.0	12,394,476.0	61,957,613.0
	%	100.0	100.0	100.0	100.0	100.0	100.0

Symmetric Measures

		Value	Asymp. Std. Error(a)	Approx. T(b)	Approx. Sig.
Interval by Interval	Pearson's R	0.40	0.00	3,400.2	0.000[c]
Ordinal by Ordinal	Spearman Correlation	0.40	0.00	3,401.5	0.000[c]
N of Valid Cases		61,957,613.0			

a Not assuming the null hypothesis.

b Using the asymptotic standard error assuming the null hypothesis.

c Based on normal approximation.

A4.5 Descriptive statistics

Table A4.4 Mean (confident interval) lifespan of decedents categorised by gender, income quintile and health insurances

Lifespan (yrs.)	Mean (CI)
All	62.7 (60.8, 64.6)
Gender	
Male	58.0 (55.0, 60.9)
Female	68.5 (66.5, 70.6)
Income quintile	
Q1	66.9 (63.8, 69.9)
Q2	66.8 (63.1, 70.5)
Q3	56.2 (49.8, 62.7)
Q4	57.6 (54.7, 60.6)
Q5	60.7 (57.6, 63.8)
Health insurances	
Uninsured	65.5 (59.9, 71.1)
CSMBS	70.1 (67.9, 72.2)
SPrEm	37.4 (32.4, 42.4)
UCE	68.5 (65.0, 72.0)
UCP	48.6 (46.3, 50.8)

Table A4.5 Male and female age specific mortality rate

Age group	Male					Female				
	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5
<5	0.49	0.04	0.95	0.36	0.16	0.07	0.05	0.04	0.06	0.07
5 to <10	0.01	0.04	0.22	0.00	-	0.00	0.00	0.00	0.15	-
10 to <20	0.22	0.04	0.21	0.18	0.10	0.01	0.00	0.01	0.00	0.01
20 to <30	0.55	0.37	0.15	0.09	0.14	0.09	0.17	0.03	0.04	0.06
30 to <40	0.43	0.31	0.31	0.31	0.05	0.17	0.15	0.56	0.08	0.01
40 to <50	1.02	0.25	0.50	0.33	0.34	0.20	0.29	0.39	0.13	0.17
50 to <60	0.64	1.14	1.09	1.39	0.54	0.46	0.42	0.17	0.10	0.73
60 to <70	1.58	1.42	2.78	1.37	0.75	1.38	1.42	1.25	1.65	1.16
70 to <75	2.93	6.64	4.71	3.04	2.30	3.67	1.91	2.28	1.95	2.13
75 to <80	6.29	5.72	6.95	2.71	3.85	3.63	4.68	5.31	2.44	2.67
>=80	8.45	14.54	6.73	6.97	11.66	8.26	11.58	7.98	8.89	7.20
Total	1.06	0.76	0.79	0.51	0.34	0.85	0.60	0.50	0.29	0.34

Table A4.6 Age specific mortality rate by regions

Bangkok:

Age group	Q1	Q2	Q3	Q4	Q5
<5	-	-	0.1	0.2	0.3
5 to <10	-	-	-	-	-
10 to <20	-	-	0.05	-	0.04
20 to <30	-	-	0.2	-	0.1
30 to <40	-	0.9	0.3	0.1	0.05
40 to <50	0.3	0.1	0.3	0.2	0.2
50 to <60	0.5	0.7	1.5	0.3	0.7
60 to <70	0.6	0.7	2.2	1.4	1.0
70 to <75	1.2	1.8	5.5	3.1	1.3
75 to <80	2.5	4.1	1.1	2.8	2.1
>=80	6.2	8.1	4.9	5.4	7.2
Total	0.6	0.5	0.6	0.3	0.3

Central region:

Age group	Q1	Q2	Q3	Q4	Q5
<5	0.2	-	0.03	0.2	0.04
5 to <10	0.1	-	0.03	0.2	-
10 to <20	0.2	-	0.03	0.2	0.1
20 to <30	0.1	0.3	0.1	0.1	0.1
30 to <40	1.3	0.3	0.2	0.1	0.0
40 to <50	0.3	0.2	0.2	0.1	0.3
50 to <60	0.2	2.3	0.5	0.8	0.4
60 to <70	2.3	3.0	1.1	1.0	0.5
70 to <75	2.9	5.5	4.7	0.6	0.9
75 to <80	3.2	4.9	4.5	3.5	3.7
>=80	8.4	12.3	6.9	6.7	7.8
Total	1.3	1.1	0.4	0.3	0.2

Table A4.6 Age specific mortality rate by regions (cont.)
North:

Age group	Q1	Q2	Q3	Q4	Q5
<5	0.05	0.05	0.1	0.05	-
5 to <10	-	-	-	0.1	-
10 to <20	0.3	-	0.5	-	0.02
20 to <30	0.5	0.7	0.1	-	-
30 to <40	0.3	0.1	1.2	0.6	0.04
40 to <50	1.5	0.4	0.8	0.4	0.05
50 to <60	0.8	0.9	1.0	0.4	0.4
60 to <70	1.7	1.2	1.4	4.3	1.2
70 to <75	5.3	1.0	3.0	3.5	0.6
75 to <80	5.6	5.5	8.7	3.3	1.2
>=80	10.0	14.7	8.9	9.2	7.2
Total	1.6	0.8	1.0	0.6	0.2

North-east

Age group	Q1	Q2	Q3	Q4	Q5
<5	0.4	0.05	1.6	0.6	0.1
5 to <10	-	0.03	0.3	-	-
10 to <20	0.1	0.1	0.02	0.01	0.02
20 to <30	0.1	0.2	0.04	0.03	0.3
30 to <40	0.2	0.2	0.3	0.3	0.03
40 to <50	0.3	0.2	0.5	0.0	0.4
50 to <60	0.3	0.4	0.5	0.1	1.1
60 to <70	1.3	1.2	3.1	0.9	2.1
70 to <75	2.7	6.8	2.9	5.2	7.1
75 to <80	5.0	5.8	7.4	0.3	6.7
>=80	7.2	13.7	7.7	15.6	6.9
Total	0.6	0.6	0.8	0.3	0.6

Table A4.6 Age specific mortality rate by regions (cont.)

South:

Age group	Q1	Q2	Q3	Q4	Q5
<5	0.1	0.1	0.1	0.03	0.1
5 to <10	-	0.1	-	-	-
10 to <20	-	-	-	0.1	-
20 to <30	3.0	-	0.1	0.2	-
30 to <40	0.1	0.2	0.3	0.1	0.0
40 to <50	0.2	0.3	0.2	0.5	0.3
50 to <60	2.3	0.2	0.1	2.2	0.5
60 to <70	0.4	0.8	2.1	1.1	0.3
70 to <75	2.6	1.4	2.0	0.8	2.9
75 to <80	4.4	2.9	4.4	2.0	2.5
>=80	9.3	7.5	7.5	5.8	18.3
Total	1.5	0.4	0.4	0.5	0.3

Table A4.7 Age specific mortality rate across income quintile by education levels

No education:

Age group	Q1	Q2	Q3	Q4	Q5
<5	0.3	0.04	0.5	0.2	0.1
5 to <10	-	0.1	-	-	-
10 to <20	-	-	-	-	-
20 to <30	0.6	-	-	-	-
30 to <40	0.8	0.1	0.1	1.1	-
40 to <50	0.4	0.2	-	-	-
50 to <60	0.3	1.1	0.7	0.3	0.5
60 to <70	1.5	1.1	2.6	1.4	2.0
70 to <75	3.4	3.0	3.6	3.5	1.1
75 to <80	6.8	6.2	7.2	3.5	2.8
>=80	9.0	14.4	7.9	8.2	14.2
Total	1.6	1.2	1.1	0.7	0.8

Table A4.7 Age specific mortality rate across income quintile by education levels (cont.)

Primary level:

Age group	Q1	Q2	Q3	Q4	Q5
<5	-	-	-	-	-
5 to <10	0.01	0.02	0.2	0.1	-
10 to <20	0.1	0.02	0.1	0.1	0.1
20 to <30	0.7	-	0.1	0.1	0.3
30 to <40	0.2	0.2	0.3	0.1	0.04
40 to <50	0.5	0.3	0.5	0.2	0.1
50 to <60	0.6	0.7	0.6	0.9	0.5
60 to <70	1.6	1.2	2.0	1.6	1.0
70 to <75	3.5	4.5	3.3	2.3	1.9
75 to <80	4.1	4.8	5.8	2.3	3.4
>=80	7.9	10.7	7.2	8.2	6.2
Total	0.9	0.6	0.7	0.5	0.4

Higher education:

Age group	Q1	Q2	Q3	Q4	Q5
<5	-	-	-	-	-
5 to <10	-	-	-	-	-
10 to <20	0.2	0.03	0.1	0.1	0.02
20 to <30	0.1	0.4	0.1	0.1	0.1
30 to <40	0.4	0.3	0.7	0.2	0.03
40 to <50	1.1	0.2	0.2	0.3	0.3
50 to <60	0.3	0.9	0.4	0.0	0.7
60 to <70	0.6	5.0	0.8	0.7	0.7
70 to <75	1.2	-	4.2	0.7	3.9
75 to <80	5.2	-	2.1	1.0	2.4
>=80	6.4	19.0	8.7	8.4	6.6
Total	0.3	0.4	0.3	0.1	0.2

Table A4.8 Age specific mortality rate across income quintile categorised by occupation

Economically inactive:

Age group	Q1	Q2	Q3	Q4	Q5
<5	0.3	0.04	0.5	0.2	0.1
5 to <10	0.01	0.02	0.1	0.1	-
10 to <20	0.1	0.01	0.1	0.1	0.1
20 to <30	0.7	0.6	0.1	0.0	0.1
30 to <40	1.2	0.9	2.2	0.2	-
40 to <50	1.7	1.0	0.4	0.2	0.2
50 to <60	1.3	1.4	0.6	0.5	1.9
60 to <70	1.9	2.1	2.6	2.0	1.5
70 to <75	3.5	5.6	5.0	2.5	2.8
75 to <80	5.4	6.1	5.6	2.3	3.5
>=80	8.7	13.3	7.8	8.5	8.7
Total	1.4	1.0	0.9	0.5	0.6

Professional:

Age group	Q1	Q2	Q3	Q4	Q5
<5	-	-	-	-	-
5 to <10	-	-	-	-	-
10 to <20	-	-	-	-	-
20 to <30	-	-	0.1	-	-
30 to <40	-	-	0.1	0.1	-
40 to <50	0.2	1.0	-	0.4	0.2
50 to <60	0.1	0.1	1.1	1.3	0.5
60 to <70	-	3.8	2.4	1.5	0.3
70 to <75	-	-	1.2	6.9	-
75 to <80	-	-	2.2	2.6	0.6
>=80	2.1	3.3	2.3	2.8	9.3
Total	0.1	0.9	0.6	0.5	0.2

Table A4.8 Age specific mortality rate across income quintile categorised by occupation (cont.)

Others:

Age group	Q1	Q2	Q3	Q4	Q5
<5	-	-	-	-	-
5 to <10	-	-	-	-	-
10 to <20	0.1	0.1	-	-	-
20 to <30	0.04	0.1	0.1	0.1	0.1
30 to <40	0.1	0.1	0.3	0.2	0.05
40 to <50	0.4	0.2	0.5	0.2	0.3
50 to <60	0.3	0.7	0.5	0.7	0.3
60 to <70	1.0	0.8	1.6	1.2	0.5
70 to <75	3.0	2.3	1.3	1.2	-
75 to <80	0.1	1.2	7.8	4.1	0.9
>=80	3.7	2.1	4.7	4.7	5.9
Total	0.4	0.4	0.5	0.3	0.2

Table A4.9 Number of decedents and percentage of using care and of paying out of pocket categorised by various variables

Variables	Decedents N (%)	Ambulatory care		Acute care	
		% users	% payers*	% users	% payers*
Total	382,933	58.6	65.6	57.0	42.2
Death age (yrs.)					
<5	9,618 (2.5)	10.8	54.5	33.9	25.4
5 to <10	2,004 (0.5)	13.1	33.8	8.7	0.0
10 to <20	8,388 (2.2)	8.5	89.7	22.6	40.0
20 to <30	11,614 (3.0)	49.2	81.4	49.7	83.0
30 to <40	22,631 (5.9)	60.2	82.1	44.8	60.7
40 to <50	36,952 (9.6)	58.5	74.4	57.3	67.0
50 to <60	51,386 (13.4)	56.9	77.0	72.2	61.9
60 to <70	59,112 (15.4)	68.4	54.5	62.6	40.4
70 to <75	49,112 (12.8)	64.7	67.7	67.2	22.5
75 to <80	45,589 (11.9)	67.7	61.7	64.8	24.4
>=80	86,527 (22.6)	56.8	59.0	45.3	32.7
Gender					
Male	211,904 (55.3)	54.6	66.0	58.4	43.8
Female	171,030 (44.7)	63.5	65.3	55.2	40.1
Region					
Bangkok	23,367 (6.1)	60.9	70.9	62.5	83.3
Central	75,734 (19.8)	52.9	69.9	54.0	48.9
North	106,448 (27.8)	62.1	55.3	59.9	43.2
North-east	134,239 (35.1)	58.4	69.9	56.6	32.6
South	43,145 (11.3)	59.3	69.8	53.4	33.0
Municipality					
Urban	84,915 (22.2)	60.1	66.7	60.8	55.2
Rural	298,018 (77.8)	58.2	65.4	55.9	38.2
Head of household					
No	204,782 (53.5)	57.1	69.4	51.8	44.9
Yes	178,151 (46.5)	60.4	61.6	63.0	39.6

Table A4.9 Number of decedents and percentage of using care and of paying out of pocket categorised by various variables (cont.)

Variables	Decedents N (%)	Ambulatory care		Acute care	
		% users	% payers*	% users	% payers*
Education					
Uneducated	83,796 (21.9)	53.8	62.5	45.1	40.0
Primary level	251,125 (65.6)	60.3	66.8	60.3	38.7
Higher level	48,012 (12.5)	57.9	64.3	60.3	63.0
Occupation					
Economically inactive	254,597 (66.5)	58.1	60.9	51.5	32.6
Professionals	18,955 (4.9)	42.5	74.1	72.5	75.2
Others	109,381 (28.6)	62.6	74.9	67.2	53.0
Income quintile					
Q1	121,012 (31.7)	56.8	58.9	58.8	28.9
Q2	86,549 (22.7)	61.5	74.6	56.4	45.4
Q3	81,622 (21.4)	54.7	67.3	53.0	49.5
Q4	51,186 (13.4)	58.5	72.3	62.0	48.5
Q5	41,723 (10.9)	64.5	54.5	54.3	52.4
Health insurances					
Uninsured	15,740 (4.1)	44.0	91.5	40.3	83.0
CSMBS	52,582 (13.7)	66.7	36.3	67.7	30.8
SPrEm	11,679 (3.0)	62.4	80.0	28.5	70.8
UCE	207,180 (54.1)	60.1	58.7	56.5	17.4
UCP	95,753 (25.0)	52.8	97.4	58.3	95.0
Places of death					
Public hospitals	135,875 (36.9)	56.2	57.0	76.3	45.8
Private hospitals	15,238 (4.1)	68.1	88.8	58.7	91.1
Home	197,266 (53.6)	64.6	67.4	49.9	36.0
Others	19,858 (5.4)	12.7	65.9	4.0	61.5

Table A4.9 Number of decedents and percentage of using care and of paying out of pocket categorised by various variables (cont.)

Variables	Decedents N (%)	Ambulatory care		Acute care	
		% users	%payers*	%users	%payers
Causes of death					
Ill-defined	7,693 (2.0)	17.0	71.3	11.2	37.2
Communicable ds.	56,071 (14.6)	66.9	58.4	75.9	43.2
Non-communicable ds.	125,232 (32.7)	61.3	63.1	64.9	46.5
Injuries	40,387 (10.5)	13.1	76.8	21.5	45.5
Senility	89,641 (23.4)	56.4	64.8	36.3	23.8
Cancer	63,909 (16.7)	82.7	74.1	82.0	45.6

* As a percentage of users

Table A4.10 Distribution in percentage of decedents across income quintile by various variables

	Decedents (N = 387,128)					**Ambulatory care (N = 223,591; 57.8%)**					**Acute care (N = 217,628; 56.2%)**				
	Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**
Total	*121,865*	*87,489*	*82,780*	*51,670*	*43,324*	*68,792*	*53,234*	*44,673*	*29,964*	*26,929*	*71,158*	*48,799*	*43,279*	*31,731*	*22,662*
% Access						*56.4*	*60.8*	*54.0*	*58.0*	*62.2*	*58.4*	*55.8*	*52.3*	*61.4*	*52.3*
Death age (yrs.)															
<5	*2.0*	*0.5*	*5.5*	*3.4*	*1.5*	12.5	21.0	4.2	23.7	6.2	58.5	9.8	13.6	35.2	88.0
5 to <10	*0.1*	*0.3*	*1.4*	*1.2*		100.0	0.0	7.9	14.1		100.0	0.0	7.9	0.0	
10 to <20	*2.4*	*0.7*	*2.9*	*3.2*	*2.1*	2.6	0.0	2.8	22.4	21.5	39.7	0.0	6.4	24.4	21.5
20 to <30	*2.8*	*3.8*	*1.8*	*2.7*	*4.9*	26.7	81.6	37.7	35.1	48.9	32.4	81.6	38.8	70.1	18.7
30 to <40	*3.6*	*4.7*	*10.8*	*8.5*	*1.9*	79.9	57.3	60.4	50.3	19.2	62.5	48.3	19.0	77.8	37.0
40 to <50	*7.9*	*6.7*	*11.9*	*9.4*	*14.4*	42.7	77.5	45.6	79.6	63.3	46.6	73.0	51.3	60.0	60.3
50 to <60	*6.5*	*13.7*	*11.2*	*23.0*	*26.1*	44.3	57.4	55.0	60.3	58.7	86.5	79.8	63.0	75.8	52.0
60 to <70	*15.1*	*13.6*	*18.1*	*17.8*	*11.7*	61.2	60.2	76.1	74.7	73.9	61.4	60.0	73.6	49.8	59.0
70 to <75	*16.2*	*15.6*	*10.4*	*8.5*	*7.8*	58.8	68.0	67.0	63.2	65.1	71.1	58.7	72.7	68.0	51.6
75 to <80	*16.9*	*12.0*	*12.4*	*5.3*	*7.2*	66.6	55.6	67.3	62.7	85.5	62.7	52.3	63.8	92.7	66.2
>=80	*26.7*	*28.5*	*13.7*	*16.9*	*22.5*	60.8	57.7	41.7	45.7	64.8	46.6	38.3	48.1	48.8	49.0
Gender															
male	*51.9*	*54.4*	*59.8*	*62.8*	*48.9*	53.0	56.9	53.5	55.5	50.0	55.4	63.1	53.3	67.8	48.7
female	*48.1*	*45.6*	*40.2*	*37.2*	*51.1*	60.2	65.5	54.7	62.2	73.8	61.6	47.0	50.8	50.6	55.7
Region															
Bangkok	*1.8*	*1.5*	*5.5*	*8.8*	*25.3*	39.9	50.7	64.9	62.9	62.6	64.4	87.6	56.4	63.6	59.8
Central	*13.7*	*23.5*	*17.7*	*27.6*	*25.1*	54.1	53.6	60.3	38.9	52.4	45.1	56.5	71.0	46.4	44.0
North	*35.2*	*25.9*	*31.2*	*23.3*	*8.4*	64.0	55.5	61.0	68.2	57.7	63.9	63.1	47.6	63.1	58.5

Table A4.10 Distribution in percentage of decedents across income quintile by various variables (cont.)

	Decedents (N = 387,128)					Ambulatory care (N = 223,591; 57.8%)					Acute care (N = 217,628; 56.2%)				
	Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**
Region															
North-east	*40.1*	*41.7*	*34.3*	*16.9*	*29.0*	53.1	70.8	44.3	43.3	77.3	60.3	52.3	47.2	71.2	57.1
South	*9.3*	*7.5*	*11.3*	*23.4*	*12.2*	49.3	48.6	48.8	79.1	48.3	47.3	40.9	49.4	69.4	38.0
Municipality															
Urban	*14.5*	*15.4*	*21.2*	*30.7*	*50.6*	54.4	64.2	67.0	56.5	55.0	60.2	62.1	61.1	56.6	58.7
Rural	*85.5*	*84.6*	*78.8*	*69.3*	*49.4*	56.8	60.2	50.5	58.6	69.5	58.1	54.6	49.9	63.5	45.8
Head of household															
No	*43.0*	*53.7*	*57.6*	*66.0*	*57.7*	50.5	69.2	43.9	59.6	63.3	56.1	46.5	44.4	60.0	50.3
Yes	*57.0*	*46.4*	*42.4*	*34.0*	*42.3*	61.0	51.2	67.6	54.9	60.6	60.1	66.5	63.0	64.2	55.1
Education															
Uneducated	*26.0*	*24.7*	*20.7*	*16.0*	*16.0*	57.6	61.9	33.4	39.5	64.1	46.9	41.5	37.7	51.0	47.6
Primary level	*67.8*	*65.1*	*68.7*	*70.7*	*43.8*	56.6	62.0	57.3	64.3	66.1	62.8	58.3	60.2	62.2	46.2
Higher	*6.2*	*10.2*	*10.7*	*13.3*	*40.2*	49.5	50.7	72.4	46.7	57.1	58.2	74.2	29.3	69.7	60.8
Occupation															
Economically inactive	*82.5*	*68.6*	*56.1*	*46.7*	*63.3*	54.4	62.4	53.3	51.7	67.4	56.8	46.4	43.2	48.0	52.9
Professionals	*0.2*	*4.1*	*4.1*	*10.6*	*14.3*	100.0	25.1	66.8	16.9	59.3	62.4	74.6	66.5	76.5	71.6
Others	*17.3*	*27.3*	*39.8*	*42.8*	*22.4*	65.7	62.3	53.5	75.0	49.1	66.1	76.4	63.6	72.3	38.4
Places of death															
Public hospitals	*31.9*	*30.6*	*40.0*	*45.8*	*50.2*	52.1	56.6	50.2	56.0	66.0	80.0	81.7	70.4	72.0	68.0
Private hospitals	*1.2*	*3.3*	*6.1*	*3.3*	*11.0*	36.7	12.4	92.9	73.1	82.7	46.2	80.0	13.1	91.0	87.1

Table A4.10 Distribution in percentage of decedents across income quintile by various variables (cont.)

	Decedents (N = 387,128)					Ambulatory care (N = 223,591; 57.8%)					Acute care (N = 217,628; 56.2%)				
	Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**
Home	*63.2*	*63.4*	*46.6*	*43.2*	*30.4*	64.3	68.4	60.9	51.1	67.4	53.3	46.2	50.1	52.6	29.9
Others	*3.7*	*2.7*	*7.4*	*7.7*	*8.4*	3.0	16.0	5.3	40.3	7.8	6.6	0.0	5.8	0.0	4.3
Health insurances															
Uninsured	*5.9*	*2.0*	*1.6*	*4.1*	*8.3*	37.8	52.3	50.0	25.8	61.6	38.7	11.1	23.2	34.0	68.5
CSMBS	*14.6*	*5.5*	*5.9*	*13.6*	*43.8*	66.2	71.3	55.6	51.2	74.9	67.7	54.2	73.7	68.8	69.3
SPrEm	*0.6*	*0.5*	*6.6*	*4.9*	*6.5*	57.8	100.0	86.4	33.4	37.4	57.8	71.1	16.6	41.8	26.0
UCE	*64.6*	*62.0*	*53.2*	*44.5*	*21.6*	55.5	63.7	57.1	70.9	64.7	60.5	50.0	58.8	63.5	34.3
UCP	*14.3*	*30.1*	*32.7*	*33.0*	*19.8*	61.1	55.2	44.5	52.6	51.6	50.5	72.7	48.7	63.6	46.4
Causes of death															
Ill-defined	*1.6*	*3.1*	*3.0*	*1.8*	*4.7*	26.2	7.7	14.5	12.8	4.9	17.9	6.6	10.9	0.0	2.6
Communicable ds.	*11.6*	*13.3*	*21.2*	*15.9*	*10.9*	63.2	78.7	57.1	72.9	73.3	83.5	77.2	65.8	74.6	88.2
Non-communicable ds.	*34.6*	*31.5*	*31.4*	*33.7*	*31.9*	56.7	57.5	68.1	56.4	69.5	66.2	69.8	59.1	65.9	52.5
Injuries	*8.5*	*7.5*	*13.6*	*12.1*	*13.7*	0.2	40.5	3.5	19.2	14.3	26.9	31.3	15.3	12.5	22.2
Senility	*29.1*	*31.5*	*14.9*	*13.9*	*16.6*	57.8	57.7	43.7	50.0	72.9	35.5	35.6	33.8	38.9	43.8
Cancer	*14.6*	*13.1*	*16.0*	*22.6*	*22.2*	84.3	82.7	81.8	79.1	79.8	88.5	74.7	77.1	90.1	69.9
Complementary med.															
No	*73.7*	*72.8*	*63.5*	*63.3*	*80.8*										
Yes	*26.3*	*27.2*	*36.5*	*36.7*	*19.2*										

Table A4.11 Distribution in percentage of decedents and percentage of decedents accessing care across health insurances by various variables

Variables	Decedents (N = 382,993)					Ambulatory care (N = 224,389; 58.6%)					Acute care (N = 218,269; 57.0%)				
	Uninsured	**CSMBS**	**SPrEm**	**UCE**	**UCP**	**Uninsured**	**CSMBS**	**SPrEm**	**UCE**	**UCP**	**Uninsured**	**CSMBS**	**SPrEm**	**UCE**	**UCP**
N	*15,740*	*52,582*	*11,679*	*207,180*	*95,753*	*6,930*	*35,069*	*7,289*	*124,505*	*50,596*	*6,349*	*35,592*	*3,329*	*117,155*	*55,843*
% Access						44.0	66.7	62.4	60.1	52.8	40.3	67.7	28.5	56.5	58.3
Death age (yrs.)															
<5	*6.4*	*0.5*		*3.2*	*1.7*	15.3	79.9		9.2	3.6	61.2	100.0		32.1	14.6
5 to <10				*1.0*					13.1					8.7	
10 to <20	*0.4*	*1.4*	*11.3*	*0.7*	*5.1*	100.0		7.2	12.7	7.7		100.0	7.2	39.5	10.8
20 to <30	*1.4*	*0.1*	*13.8*	*1.5*	*6.9*			52.8	27.0	60.8			45.4	22.5	65.8
30 to <40	*6.5*	*0.2*	*38.2*	*2.3*	*12.7*	6.0		91.3	69.4	50.2	73.6	28.3	7.4	66.9	47.4
40 to <50	*9.0*	*8.8*	*23.8*	*3.7*	*21.3*	55.3	86.8	40.5	56.2	55.7	33.5	88.6	34.0	46.2	59.2
50 to <60	*5.8*	*16.0*	*6.8*	*6.6*	*28.9*	71.0	64.6	79.3	63.6	50.2	92.5	65.2	84.7	77.2	70.9
60 to <70	*16.5*	*13.6*	*5.7*	*16.8*	*14.5*	38.5	43.4	76.8	76.9	65.2	39.4	64.6	82.6	62.1	66.4
70 to <75	*11.3*	*9.8*		*19.4*	*2.1*	57.5	74.7		62.4	90.8	49.2	62.0		68.9	62.7
75 to <80	*12.4*	*17.2*		*15.5*	*2.6*	63.7	74.1		66.1	67.6	26.4	75.2		66.7	32.9
>=80	*30.4*	*32.5*	*0.4*	*29.3*	*4.1*	40.7	69.1		54.7	56.0	26.3	60.9		42.1	49.4
Gender															
Male	*51.3*	*55.5*	*50.8*	*49.5*	*69.1*	47.3	66.1	32.8	59.1	45.3	42.4	67.4	34.6	60.2	55.9
Female	*48.7*	*44.5*	*49.2*	*50.5*	*30.9*	40.6	67.4	93.0	61.0	69.6	38.2	68.1	22.2	53.0	63.6
Region															
Bangkok	*25.3*	*9.3*	*13.1*	*2.4*	*8.3*	57.8	67.9	58.7	47.0	67.3	68.6	61.4	58.4	63.3	60.4
Central	*18.4*	*20.7*	*33.5*	*16.7*	*24.4*	39.6	57.9	40.1	61.9	41.1	26.5	57.8	33.8	54.4	58.5
North	*23.8*	*24.2*	*42.3*	*28.2*	*27.8*	45.2	69.8	88.5	64.0	51.6	48.3	83.6	10.3	59.8	59.6
North-east	*23.0*	*31.3*	*2.8*	*40.7*	*30.9*	39.7	74.0	89.1	57.2	55.3	27.4	67.1	89.1	54.2	60.8
South	*9.6*	*14.5*	*8.3*	*12.0*	*8.6*	23.6	57.5	16.4	61.0	67.2	3.7	60.7	32.6	58.6	42.5

Table A4.11 Distribution in percentage of decedents and percentage of decedents accessing care across health insurances by various variables (cont.)

Variables	Decedents (N = 382,993)					Ambulatory care (N = 224,389; 58.6%)					Acute care (N = 218,269; 57.0%)				
	Uninsured	**CSMBS**	**SPrEm**	**UCE**	**UCP**	**Uninsured**	**CSMBS**	**SprEm**	**UCE**	**UCP**	**Uninsured**	**CSMBS**	**SprEm**	**UCE**	**UCP**
Municipality															
Urban	*45.1*	*35.3*	*37.3*	*14.8*	*25.3*	54.0	62.4	35.8	60.9	63.6	57.9	69.4	40.7	61.0	58.2
Rural	*54.9*	*64.7*	*62.7*	*85.2*	*74.7*	35.8	69.1	78.2	60.0	49.2	25.9	66.8	21.2	55.8	58.4
Head of household															
No	*64.2*	*45.4*	*75.6*	*51.6*	*57.5*	37.8	62.9	68.8	59.1	52.2	36.0	68.1	23.4	49.0	57.5
Yes	*35.8*	*54.6*	*24.4*	*48.4*	*42.5*	55.2	69.8	42.7	61.2	53.7	48.1	67.3	44.3	64.6	59.4
Education															
uneducated	*39.9*	*11.7*	*0.7*	*28.8*	*12.1*	31.8	79.0	100.0	52.6	58.1	41.6	56.2	100.0	44.0	46.5
Primary level	*47.1*	*60.5*	*28.6*	*68.4*	*69.9*	53.3	62.6	43.3	63.6	54.0	33.6	64.7	44.8	62.1	58.4
Higher	*13.0*	*27.7*	*70.7*	*2.8*	*18.1*	48.1	70.3	69.8	52.7	44.7	61.0	79.1	21.3	51.4	66.0
Occupation															
Economically inactive	*78.2*	*80.9*	*53.5*	*77.8*	*33.7*	42.3	66.8	78.3	56.2	57.9	37.8	66.4	18.0	50.9	46.3
Professionals	*6.9*	*8.0*	*9.2*	*2.0*	*8.8*	71.8	71.0	11.1	44.7	27.6	87.3	76.7	25.2	59.0	81.2
Others	*14.9*	*11.1*	*37.3*	*20.2*	*57.5*	40.2	62.7	52.3	76.6	53.8	32.1	70.7	44.4	78.0	61.9
Income quintile															
Q1	*45.5*	*33.7*	*5.9*	*37.8*	*18.2*	37.8	66.2	57.8	55.5	61.1	38.7	67.7	57.8	60.5	50.5
Q2	*10.8*	*9.1*	*3.5*	*25.9*	*27.4*	52.3	71.3	100.0	63.7	55.2	11.1	54.2	71.1	50.0	72.7
Q3	*8.5*	*9.2*	*45.9*	*21.0*	*28.0*	50.0	55.6	86.4	57.1	44.5	23.2	73.7	16.6	58.8	48.7
Q4	*13.3*	*13.2*	*21.4*	*11.0*	*17.8*	25.8	51.2	33.4	70.9	52.6	34.0	68.8	41.8	63.5	63.6
Q5	*22.0*	*34.8*	*23.4*	*4.3*	*8.7*	61.6	74.9	37.4	64.7	51.6	68.5	69.3	26.0	34.3	46.4

Table A4.11 Distribution in percentage of decedents and percentage of decedents accessing care across health insurances by various variables (cont.)

Variables	Decedents (N = 382,993)					Ambulatory care (N = 224,389; 58.6%)					Acute care (N = 218,269; 57.0%)				
	Uninsured	**CSMBS**	**SPrEm**	**UCE**	**UCP**	**Uninsured**	**CSMBS**	**SPrEm**	**UCE**	**UCP**	**Uninsured**	**CSMBS**	**SPrEm**	**UCE**	**UCP**
Places of death															
Public hospitals	*16.0*	*51.0*	*25.5*	*32.6*	*43.0*	43.6	67.0	35.2	55.2	52.7	49.5	80.9	38.4	75.6	78.5
Private hospitals	*14.1*	*3.1*	*43.3*	*1.2*	*4.8*	58.3	72.0	93.6	53.0	51.8	81.8	59.3	16.7	70.6	86.5
Home	*69.0*	*42.3*	*15.3*	*63.0*	*41.5*	42.8	69.8	89.1	65.0	65.3	31.1	57.3	72.6	48.5	54.5
Others	*0.9*	*3.6*	*16.0*	*3.2*	*10.7*		24.8	18.2	3.2	15.7		6.1	13.9	4.8	1.3
Causes of death															
Ill-defined	*4.7*	*1.9*	*0.4*	*0.9*	*4.2*	19.7	19.1		39.4	5.8		21.4		17.3	8.0
Communicable ds.	*20.2*	*12.0*	*7.2*	*15.5*	*14.2*	47.5	84.7	93.4	65.7	64.5	79.8	90.6	80.8	69.4	83.4
Non-communicable ds.	*22.9*	*35.3*	*47.1*	*29.1*	*38.9*	54.1	74.0	93.2	60.0	53.2	44.5	76.1	13.9	65.3	68.1
Injuries	*8.9*	*9.7*	*28.3*	*5.9*	*19.2*	58.4	1.5		14.7	14.1	21.7	28.1	7.6	32.4	14.9
Senility	*33.9*	*21.7*	*0.4*	*33.1*	*4.5*	24.0	73.7		55.3	68.9	9.8	54.1		35.4	36.5
Cancer	*9.4*	*19.3*	*16.6*	*15.5*	*19.0*	83.1	71.9	71.0	83.2	89.2	93.6	78.0	84.1	83.9	79.7
Complementary med.															
No	*79.8*	*86.4*	*27.9*	*66.6*	*74.9*										
Yes	*20.2*	*13.6*	*72.2*	*33.4*	*25.1*										

Table A4.12 Means of numbers of visits for ambulatory care in 3 months and means of numbers of hospitalisations for acute care in 6 months prior to death across income quintile by various variables

Variables	Ambulatory care (N = 387,128)					Acute care (N = 387,128)				
	Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**
Average	*3.5*	*4.6*	*7.6*	*4.6*	*3.8*	*1.8*	*1.9*	*1.6*	*1.7*	*1.3*
Death age (yrs.)										
<5	0.4	0.7	0.2	1.0	0.2	3.1	0.3	0.3	0.4	1.2
5 to <10	4.0		0.2	0.4		7.0		0.1		
10 to <20	0.1		0.1	1.0	2.2	0.4		0.1	0.5	1.3
20 to <30	0.7	34.4	5.0	1.3	3.6	0.8	0.0	0.8	1.6	0.6
30 to <40	5.3	2.5	43.2	3.1	0.6	1.1	0.0	0.5	3.5	0.7
40 to <50	1.4	4.9	3.9	4.2	2.1	1.8	8.6	0.7	2.0	1.1
50 to <60	2.3	3.3	2.3	10.6	4.6	2.6	1.7	1.4	2.2	1.0
60 to <70	4.2	3.3	5.9	2.7	3.9	2.8	1.5	3.2	1.0	2.2
70 to <75	5.3	5.8	3.8	3.7	6.3	2.2	3.5	3.0	1.7	2.1
75 to <80	4.1	2.2	3.0	2.7	4.7	1.4	1.2	1.6	2.2	1.2
>=80	3.3	2.7	1.7	2.9	3.5	1.3	1.6	1.0	1.1	1.3
Gender										
male	2.8	5.7	2.9	5.5	3.3	1.7	2.6	1.7	2.0	1.4
female	4.3	3.3	14.9	3.0	4.2	1.9	1.0	1.4	1.1	1.2
Region										
Bangkok	2.2	3.5	3.6	3.2	5.1	2.1	1.8	1.1	1.3	1.7
Central	4.3	3.6	3.4	2.5	3.3	1.9	2.3	2.3	1.4	1.1

Table A4.12 Means of numbers of visits for ambulatory care in 3 months and means of numbers of hospitalisations for acute care in 6 months prior to death across income quintile by various variables (cont.)

Variables	Ambulatory care (N = 387,128)					Acute care (N = 387,128)				
	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5
North	3.3	6.6	17.9	3.9	2.3	1.6	2.8	1.3	1.6	1.9
North-east	3.4	4.5	2.4	2.6	3.8	2.2	1.3	1.4	2.7	1.1
South	4.3	1.9	3.3	9.5	2.8	0.7	0.9	1.9	1.7	0.8
Municipality										
Urban	3.0	6.9	2.9	3.0	4.1	1.9	2.5	1.5	1.3	1.8
Rural	3.6	4.2	8.9	5.3	3.4	1.8	1.8	1.6	1.9	0.8
Head of household										
No	3.4	6.3	10.5	5.2	3.3	1.7	1.5	1.1	1.7	1.3
Yes	3.6	2.7	3.8	3.4	4.4	1.8	2.3	2.2	1.6	1.2
Education										
Uneducated	3.5	2.6	2.5	2.4	2.2	1.1	1.3	1.2	0.9	1.0
Primary level	3.5	3.8	3.3	5.2	3.8	2.0	1.7	1.8	1.6	1.4
Higher	3.4	14.7	44.6	3.7	4.4	2.9	4.6	0.5	3.2	1.2
Occupation										
Economically inactive	3.3	5.1	11.0	2.7	3.9	1.5	1.8	1.6	1.2	1.4
Professionals	2.6	1.4	2.9	1.1	4.7	3.3	2.2	1.6	1.8	1.3
Others	4.5	3.8	3.5	7.6	2.7	3.1	2.0	1.5	2.3	0.8
Places of death										
Public hospitals	2.3	3.3	2.4	2.2	3.5	2.2	2.6	1.8	1.6	1.4

Table A4.12 Means of numbers of visits for ambulatory care in 3 months and means of numbers of hospitalisations for acute care in 6 months prior to death across income quintile by various variables (cont.)

Variables	Ambulatory care (N = 387,128)					Acute care (N = 387,128)				
	Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**
Private hospitals	2.9	0.7	77.6	4.7	7.5	1.2	2.4	0.4	2.0	2.3
Home	4.5	5.8	4.2	3.5	3.5	1.8	1.7	1.8	1.9	1.1
Others	0.1	0.2	0.4	0.7	0.2	0.2		0.2		0.1
Health insurances										
Uninsured	1.6	7.4	1.8	0.7	9.3	1.5	0.2	0.3	0.5	1.3
CSMBS	2.9	3.8	2.3	2.1	3.8	1.9	1.2	2.7	1.9	1.5
SPrEm	5.8	1.8	71.8	5.7	2.3	8.1	0.9	0.3	2.6	1.3
UCE	3.6	3.5	2.8	7.0	2.9	1.8	1.2	1.7	1.5	1.1
UCP	4.3	7.0	3.8	2.6	2.9	1.7	3.5	1.4	2.0	1.1
Causes of death										
Ill-defined	0.8	0.2	1.4	0.7	0.2	0.6	0.1	0.1	0.0	0.2
Communicable ds.	3.2	3.0	2.5	3.7	3.1	2.8	2.3	1.7	2.7	1.5
Non-communicable ds.	3.7	3.6	18.5	2.3	4.1	1.9	2.4	1.6	1.5	1.5
Injuries		8.1	0.1	0.2	0.2	0.3	0.5	0.2	0.3	0.4
Senility	3.3	2.1	1.2	2.7	2.7	0.8	1.0	0.8	0.7	0.9
Cancer	6.1	13.4	7.6	12.2	7.2	3.7	3.5	3.6	2.7	1.9
Complementary med.										
No	5.0	6.0	6.0	4.0	5.2					
Yes	9.5	11.5	11.5	14.4	8.6					

Table A4.13 Means of numbers of visits for ambulatory care in 3 months and means of numbers of hospitalisations for acute care in 6 months prior to death across health insurances by various variables

Variables	Ambulatory care (N = 382,993)					Acute care (N = 382,993)				
	Uninsured	**CSMBS**	**SPrEm**	**UCE**	**UCP**	**Uninsured**	**CSMBS**	**SPrEm**	**UCE**	**UCP**
Average	*3.8*	*3.1*	*35.1*	*3.8*	*4.6*	*1.1*	*1.8*	*1.5*	*1.6*	*2.1*
Death age (yrs.)										
<5	0.6	2.4		0.4	0.1	0.6	1.0		1.4	0.2
5 to <10				0.4					0.3	
10 to <20	3.0	0	0.6	0.8	0.3	0	1.0	0.2	1.0	0.2
20 to <30	0	0	5.1	0.7	18.9	0	0	1.8	0.5	4.8
30 to <40	0.1	0	85.0	3.5	3.1	1.5	0.8	0.1	1.3	2.0
40 to <50	4.2	2.4	5.5	1.3	4.3	0.5	2.6	2.5	0.8	1.4
50 to <60	8.0	4.5	3.7	8.7	3.0	6.3	1.7	1.4	1.8	2.3
60 to <70	2.9	2.2	6.1	4.2	5.1	0.4	2.7	8.9	2.0	2.7
70 to <75	6.5	1.9		5.3	6.7	1.8	1.3		2.2	2.8
75 to <80	4.4	3.7		3.2	3.9	0.7	1.5		1.6	1.8
>=80	3.8	3.2	0	2.7	2.6	0.6	1.5	0	1.1	1.2
Gender										
Male	4.5	2.7	3.6	3.9	4.5	1.3	1.8	2.2	1.7	2.3
Female	3.1	3.6	67.7	3.7	4.7	0.9	1.7	0.8	1.4	1.7
Region										
Bangkok	7.5	2.5	4.4	2.6	4.2	1.2	1.2	2.5	2.0	1.5
Central	1.5	3.0	3.3	4.2	2.9	0.6	1.4	2.1	1.5	2.9

Table A4.13 Means of numbers of visits for ambulatory care in 3 months and means of numbers of hospitalisations for acute care in 6 months prior to death across health insurances by various variables (cont.)

Variables	Ambulatory care (N = 382,993)					Acute care (N = 382,993)				
	Uninsured	**CSMBS**	**SPrEm**	**UCE**	**UCP**	**Uninsured**	**CSMBS**	**SPrEm**	**UCE**	**UCP**
North	2.8	3.1	78.8	3.0	7.1	1.2	3.0	0.9	1.5	2.1
North-east	3.6	3.6	1.9	3.3	4.2	1.7	1.5	1.1	1.7	2.0
South	1.5	2.7	1.0	6.7	3.3	0.1	1.2	0.7	1.5	0.8
Municipality										
Urban	5.5	3.4	2.3	4.0	3.7	1.0	1.9	1.4	1.6	2.2
Rural	2.4	3.0	54.6	3.7	4.9	1.1	1.7	1.6	1.6	2.1
Head of household										
No	3.5	3.0	45.3	4.2	5.0	0.6	1.8	1.2	1.3	2.1
Yes	4.3	3.2	3.6	3.3	4.0	1.9	1.7	2.6	1.9	2.2
Education										
Uneducated	1.3	2.7	4.0	3.0	3.3	0.8	1.0	1.0	1.2	0.9
Primary	4.3	2.8	2.3	4.1	3.8	1.4	1.9	0.9	1.7	2.0
Higher	9.8	3.9	48.7	2.9	8.6	0.9	1.9	1.8	1.0	3.4
Occupation										
Economically inactive	3.8	3.0	61.8	3.1	7.2	0.8	1.7	0.5	1.4	2.8
Professionals	6.2	4.3	0.9	2.2	1.9	1.2	1.1	1.9	1.6	2.1
Others	2.9	2.9	5.4	6.4	3.5	2.4	2.5	2.9	2.3	1.7
Income quintile										
Q1	1.6	2.9	5.8	3.6	4.3	1.5	1.9	8.1	1.8	1.7

Table A4.13 Means of numbers of visits for ambulatory care in 3 months and means of numbers of hospitalisations for acute care in 6 months prior to death across health insurances by various variables (cont.)

Variables	Ambulatory care (N = 382,993)					Acute care (N = 382,993)				
	Uninsured	**CSMBS**	**SPrEm**	**UCE**	**UCP**	**Uninsured**	**CSMBS**	**SPrEm**	**UCE**	**UCP**
Q2	7.4	3.8	1.8	3.5	7.0	0.2	1.2	0.9	1.2	3.5
Q3	1.8	2.3	71.8	2.8	3.8	0.3	2.7	0.3	1.7	1.4
Q4	0.7	2.1	5.7	7.0	2.6	0.5	1.9	2.6	1.5	2.0
Q5	9.3	3.8	2.3	2.9	2.9	1.3	1.5	1.3	1.1	1.1
Places of death										
Public hospitals	1.1	3.2	2.3	2.5	2.8	0.9	2.1	1.2	1.8	2.3
Private hospitals	8.6	2.6	81.3	2.8	3.6	1.2	1.0	0.5	2.6	2.6
Home	3.7	2.9	9.5	4.1	7.9	1.2	1.6	7.0	1.4	2.7
Others	0	1.0	0.5	0.3	0.2	0	0.1	0.1	0.2	0
Causes of death										
Ill-defined	0.4	0.5	0	1.4	0.6	0	0.7	0	0.4	0.1
Communicable ds.	2.7	2.6	10.3	2.9	3.1	1.8	2.8	2.6	1.9	2.7
Non-communicable ds.	6.3	3.2	70.1	3.7	3.3	0.7	1.8	0.3	1.8	2.3
Injuries	4.6	0	0	2.7	0.9	0.4	0.6	0.1	0.4	0.2
Senility	1.4	3.0	0	2.6	2.0	0.3	1.0	0	0.9	0.8
Cancer	9.8	5.4	8.5	7.8	13.6	4.7	2.5	6.9	2.8	3.9
Complementary med.										
No	6.5	4.2	7.3	4.5	7.5					
Yes	17.6	8.1	75.2	9.9	12.4					

Table A4.14 Means of household expenditure for ambulatory care in 3 months and means of household expenditure for acute care in 6 months prior to death among decedents accessing care across income quintile by various variables

Variables	Ambulatory care (N = 223,591)					Acute care (N = 217,628)				
	Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**
Average	2,857	3,617	3,399	1,997	8,899	8,510	6,533	21,001	12,357	53,521
Death age (yrs.)										
<5	0	270	742	2,489	5,000	1	0	1,548	3,011	39,459
5 to <10	0		0	3,620		0		0		
10 to <20	0		3,000	129	68,046	0		5,000	1,281	240,412
20 to <30	36	26,316	3,676	1,872	4,188	53,298	18,418	10,711	2,719	3,009
30 to <40	2,903	859	6,956	135	217	2,908	2,601	2,585	5,844	43,213
40 to <50	664	1,389	2,878	814	12,292	960	28	242	2,821	9,933
50 to <60	16,150	7,073	773	2,922	5,189	10,729	1,876	7,973	27,499	32,194
60 to <70	4,324	1,778	5,666	1,880	13,490	7,859	6,235	2,331	2,465	139,360
70 to <75	1,693	1,179	2,730	3,130	11,402	6,191	1,620	3,160	24,627	40,373
75 to <80	1,660	1,148	1,333	845	2,520	9,754	12,589	113,102	1,665	9,786
>=80	1,826	2,305	1,167	2,525	8,937	10,614	12,420	11,544	5,140	82,730
Gender										
Male	3,787	6,034	1,323	2,362	10,162	11,459	6,226	31,822	14,746	62,631
Female	1,973	1,106	6,421	1,449	8,080	5,643	7,025	4,096	6,959	45,897
Region										
Bangkok	5,037	3,779	7,319	6,535	22,879	123,731	53,271	17,686	71,847	153,226
Central	3,993	1,901	1,132	2,158	3,220	13,415	4,486	71,805	4,896	10,415

Table A4.14 Means of household expenditure for ambulatory care in 3 months and means of household expenditure for acute care in 6 months prior to death among decedents accessing care across income quintile by various variables (cont.)

Variables	Ambulatory care (N = 223,591)					Acute care (N = 217,628)				
	Q1	Q2	Q3	Q4	Q5	Q1	Q2	Q3	Q4	Q5
North	1,431	7,875	4,028	713	3,872	4,904	13,339	5,491	11,229	48,622
North-east	4,106	2,334	3,899	1,360	5,183	5,671	218	1,360	744	5,971
South	1,878	3,077	1,711	1,906	2,236	4,603	3,846	6,538	7,465	5,982
Municipality										
Urban	1,570	2,034	2,759	4,863	14,159	24,234	10,693	6,989	30,914	81,693
Rural	3,066	3,924	3,628	771	4,639	5,749	5,671	25,619	5,017	16,534
Head of household										
No	1,432	3,288	4,277	1,177	7,271	6,471	3,380	5,831	7,942	59,184
Yes	3,747	4,131	2,625	3,729	11,218	9,945	9,085	35,493	20,371	46,469
Education										
Uneducated	822	738	1,590	2,752	7,033	5,440	9,572	7,896	54,622	29,833
Primary level	3,749	3,000	3,091	1,935	6,563	4,245	2,449	24,241	4,776	55,291
Higher	1,622	16,952	6,588	1,686	12,679	69,405	22,947	10,739	11,159	59,409
Occupation										
Economically inactive	2,134	3,706	2,742	2,529	7,890	7,931	9,439	40,847	22,572	68,044
Professionals	4,957	369	9,555	7,224	21,823	554	14,489	3,789	7,596	40,236
Others	5,673	3,590	3,530	1,304	2,849	10,990	923	3,908	6,198	12,844
Places of death										
Public hospitals	1,779	1,470	1,057	1,217	4,287	6,317	4,330	36,768	19,572	13,585

Table A4.14 Means of household expenditure for ambulatory care in 3 months and means of household expenditure for acute care in 6 months prior to death among decedents accessing care across income quintile by various variables (cont.)

Variables	Ambulatory care (N = 223,591)					Acute care (N = 217,628)				
	Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**
Private hospitals	9,965	8,483	8,952	11,743	32,470	166,871	45,214	34,501	20,249	180,377
Home	3,268	4,511	4,021	2,215	6,469	7,924	4,921	1,951	6,546	76,740
Others	90	23	0	48	2,443	27		8,329		2,246
Health insurances										
Uninsured	21,307	4,517	30,074	16,005	44,676	64,681	0	8,294	41,326	281,232
CSMBS	1,665	1,842	1,244	3,272	5,724	11,394	5,923	5,433	11,921	24,645
SPrEm	0	335	8,047	4,499	6,281	200,000	289	11,298	5,625	70,029
UCE	1,806	1,622	2,656	1,033	4,000	2,261	7,119	31,874	14,964	44,125
UCP	3,881	8,815	2,131	2,156	8,506	11,834	5,945	4,865	7,776	12,710
Causes of death										
Ill-defined	179	120	1,060	2,789	55,699	0	30	185		0
Communicable ds.	1,704	3,135	1,061	820	20,559	11,562	8,331	65,509	28,023	50,096
Non-communicable ds.	2,179	1,940	6,077	3,124	7,781	5,805	3,389	2,335	7,810	63,409
Injuries	1,420	1,849	1,023	28	1,147	3,211	32	25,248	3,111	35,309
Senility	1,106	579	750	1,665	3,332	1,339	11,120	8,199	4,465	10,705
Cancer	7,110	12,545	2,664	1,937	9,062	17,893	8,126	3,941	10,971	69,072
Complementary med.										
No	2,972	4,238	2,935	1,887	9,084					
Yes	2,550	1,980	4,208	2,194	7,903					

Table A4.15 Means of household expenditure for ambulatory care in 3 months and means of household expenditure for acute care in 6 months prior to death among decedents accessing care across health insurances by various variables

Variables	Ambulatory care (N = 224,389)					Acute care (N = 218,269)				
	Uninsured	**CSMBS**	**SPrEm**	**UCE**	**UCP**	**Uninsured**	**CSMBS**	**SPrEm**	**UCE**	**UCP**
Death age (yrs.)	26,776	3,397	6,530	1,925	4,988	138,209	15,185	43,584	12,496	7,422
<5	0	3,500		555	5,346	36,483	0		897	1,745
5 to <10				1,225					0	
10 to <20	3,000		33,525	58,144	129		684	67,989	74,910	1,503
20 to <30			4,528	1,393	18,528			11,289	0	25,371
30 to <40	3,000		9,121	263	1,952	661	12,000	3,964	0	8,338
40 to <50	10,788	10,803	2,673	90	1,981	6,235	7,115	6,762	18	1,326
50 to <60	93,082	1,824	673	1,134	6,038	182,805	14,753	39,049	16,707	7,005
60 to <70	59,066	5,667	0	2,939	3,779	251,263	35,805	174,687	722	5,791
70 to <75	16,506	990		1,647	9,764	132,416	12,828		3,404	9,843
75 to <80	1,198	659		1,750	2,242	98,504	12,523		38,378	1,699
>=80	19,981	3,344		1,793	1,535	218,189	13,306		12,237	17,650
Gender										
Male	25,646	2,811	2,569	1,796	6,993	110,807	19,723	57,013	18,980	9,315
Female	28,159	4,112	7,971	2,048	2,071	170,264	9,594	22,043	5,278	3,701
Region										
Bangkok	50,722	8,043	1,425	10,696	6,456	262,804	99,329	10,858	120,421	19,100
Central	4,814	1,344	2,625	2,203	3,308	28,203	1,621	84,184	39,814	6,474
North	3,179	1,005	9,574	1,166	8,446	39,815	14,220	43,911	6,561	6,748

Table A4.15 Means of household expenditure for ambulatory care in 3 months and means of household expenditure for acute care in 6 months prior to death among decedents accessing care across health insurances by various variables (cont.)

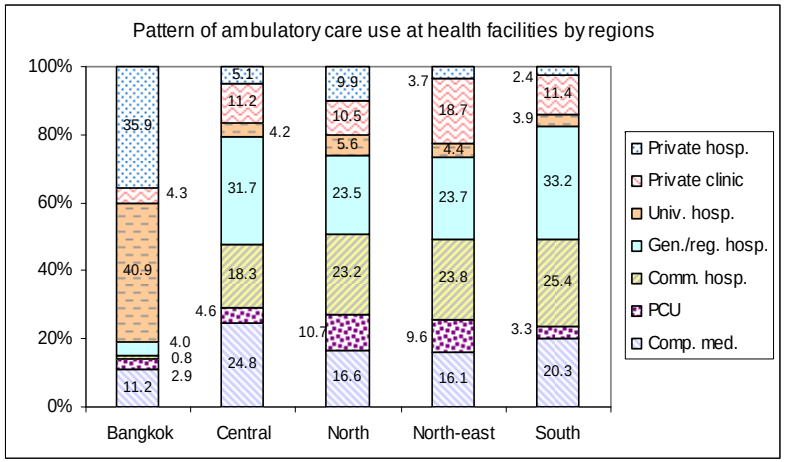
Variables	Ambulatory care (N = 224,389)					Acute care (N = 218,269)				
	Uninsured	**CSMBS**	**SPrEm**	**UCE**	**UCP**	**Uninsured**	**CSMBS**	**SPrEm**	**UCE**	**UCP**
North-east	36,665	5,228	471	2,045	3,679	65,764	4,269	289	1,043	4,463
South	15,055	2,584	1,183	1,666	1,777	37,605	7,262	4,818	3,846	13,282
Municipality										
Urban	33,151	3,841	2,977	2,236	3,981	179,870	30,833	18,947	24,669	8,377
Rural	18,860	3,178	7,495	1,870	5,429	61,472	6,327	71,671	10,176	7,100
Head of household										
No	16,328	2,656	7,607	1,754	4,102	115,040	15,561	22,140	5,784	8,721
Yes	39,614	3,952	1,149	2,102	6,152	169,362	14,869	78,760	17,932	5,723
Education										
Uneducated	6,383	1,472	3,540	904	3,808	32,272	11,190	0	14,827	6,204
Primary level	26,836	2,624	1,096	2,317	4,026	84,124	14,004	32,485	11,540	4,324
Higher	67,888	5,814	7,936	884	10,501	467,409	18,493	54,924	20,131	18,571
Occupation										
Economically inactive	17,125	2,042	8,613	1,930	7,298	149,329	15,020	28,444	17,581	12,585
Professionals	55,525	17,599	0	886	5,541	124,665	14,398	76,623	805	10,278
Others	56,467	2,332	2,406	1,971	3,484	86,526	16,918	47,724	558	4,580
Income quintile										
Q1	21,307	1,665	0	1,806	3,881	64,681	11,394	200,000	2,261	11,834
Q2	4,517	1,842	335	1,622	8,815	0	5,923	289	7,119	5,945

Table A4.15 Means of household expenditure for ambulatory care in 3 months and means of household expenditure for acute care in 6 months prior to death among decedents accessing care across health insurances by various variables (cont.)

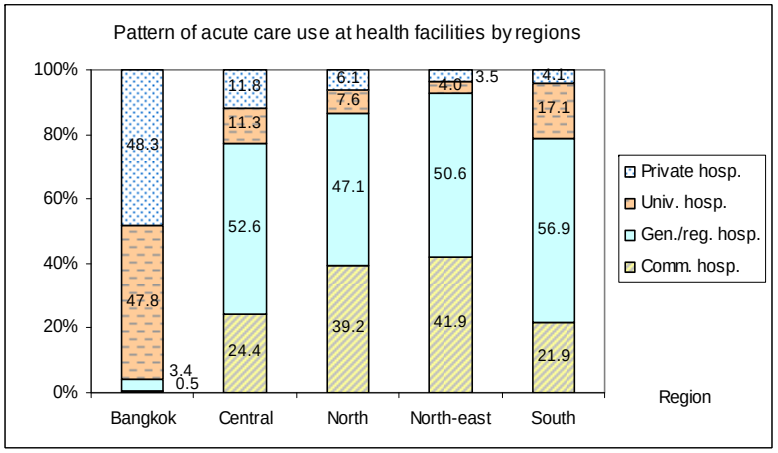
Variables	Ambulatory care (N = 224,389)					Acute care (N = 218,269)				
	Uninsured	**CSMBS**	**SPrEm**	**UCE**	**UCP**	**Uninsured**	**CSMBS**	**SPrEm**	**UCE**	**UCP**
Q3	30,074	1,244	8,047	2,656	2,131	8,294	5,433	11,298	31,874	4,865
Q4	16,005	3,272	4,499	1,033	2,156	41,326	11,921	5,625	14,964	7,776
Q5	44,676	5,724	6,281	4,000	8,506	281,232	24,645	70,029	44,125	12,710
Places of death										
Public hospitals	3,452	3,520	4,251	1,295	1,484	58,608	11,596	26,622	21,898	6,337
Private hospitals	56,668	18,856	9,324	16,904	13,410	253,985	225,842	36,090	126,290	21,979
Home	24,482	2,160	1,254	2,036	7,560	109,074	5,954	69,758	3,023	6,556
Others		1,427	0	230	35		3,000	12,000	0	60
Causes of death										
Ill-defined	1,971	28,144		514	1,345		0		0	173
Communicable ds.	7,096	11,548	1,783	1,783	2,188	38,762	28,770	12,917	45,214	5,892
Non-communicable ds.	33,298	1,410	8,494	2,497	3,904	176,076	15,836	9,642	4,435	4,918
Injuries	778	8,229		1,740	761	3,772	20,136	78,744	2,408	15,236
Senility	7,943	1,988		765	1,153	64,965	2,981		6,265	1,479
Cancer	80,334	2,061	1,936	2,960	9,248	333,290	13,240	66,724	4,432	12,316
Complementary med.										
No	30,894	3,413	684	2,056	4,923					
Yes	12,190	2,867	8,786	1,664	5,246					

Figure A4.1 Pattern of health care use at health facilities among different regions and causes of death

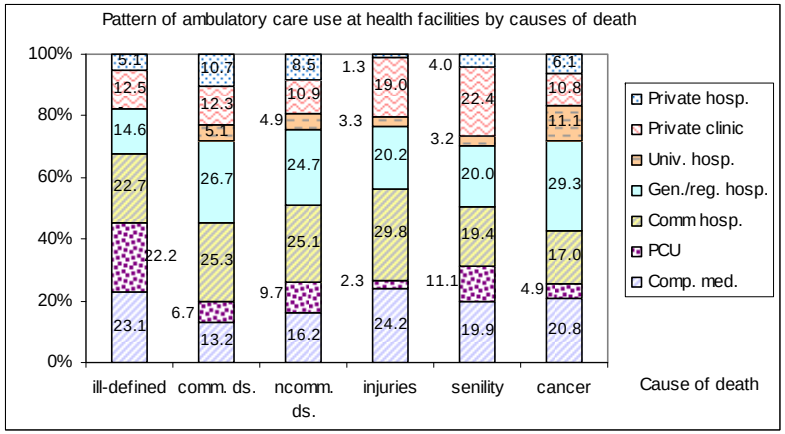
A: Use of ambulatory care at health facilities by regions



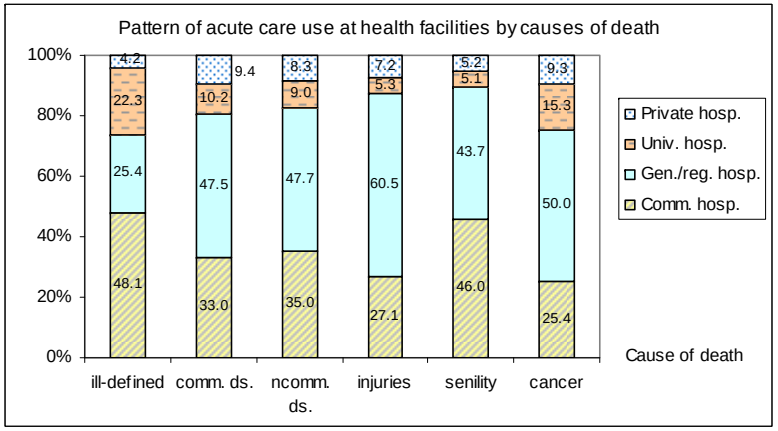
B: Use of acute care at health facilities by regions



C: Use of ambulatory care at health facilities by causes of death



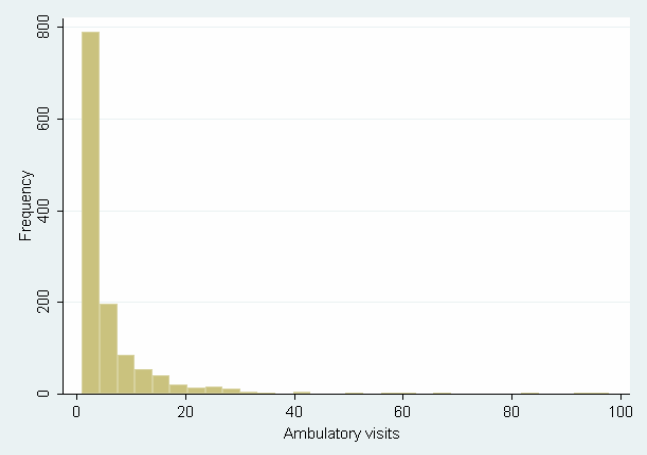
D: Use of acute care at health facilities by causes of death



A4.6 Multivariate analysis for ambulatory visits; hospitalisations; and household expenditure

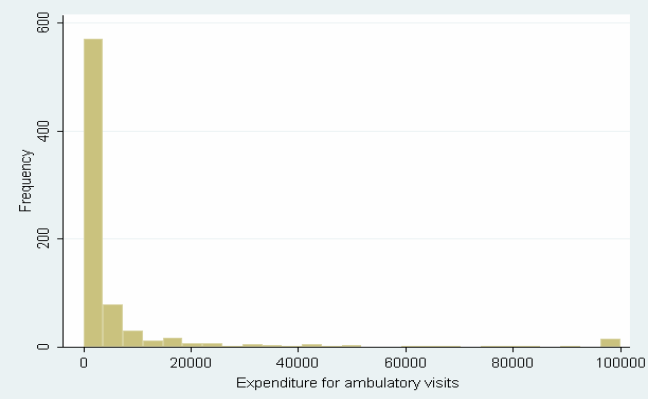
Figure A4.2 Histogram of ambulatory visits and expenditure on raw scale and natural log scale (excluding zero)

A: Numbers of visits (raw scale)



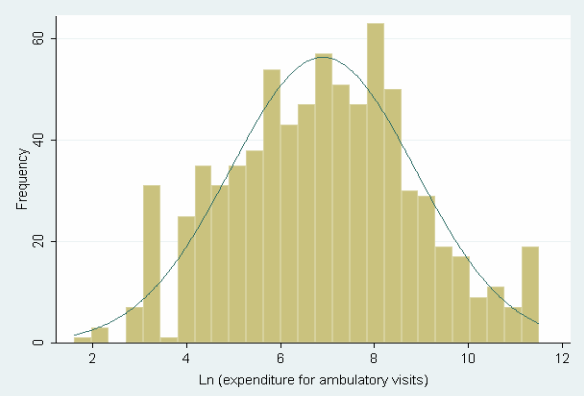
Skewness = 5.3919; Kurtosis = 46.2025

B: Expenditure for ambulatory visits (raw scale)



Skewness = 4.4079; Kurtosis = 23.1376

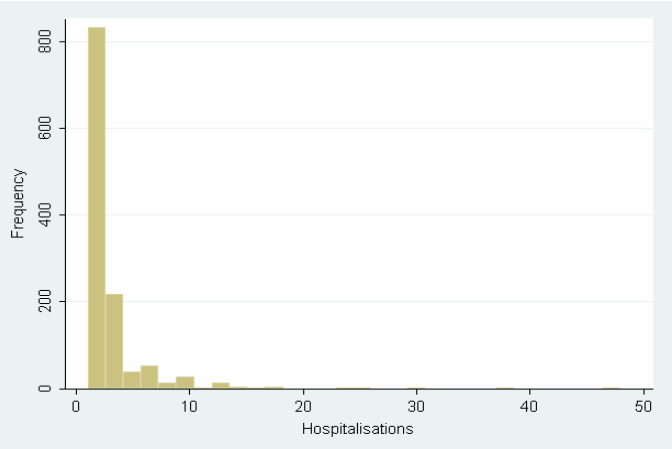
C: Expenditure for ambulatory visits (natural log scale)



Skewness = 0.1130; Kurtosis = 2.5899

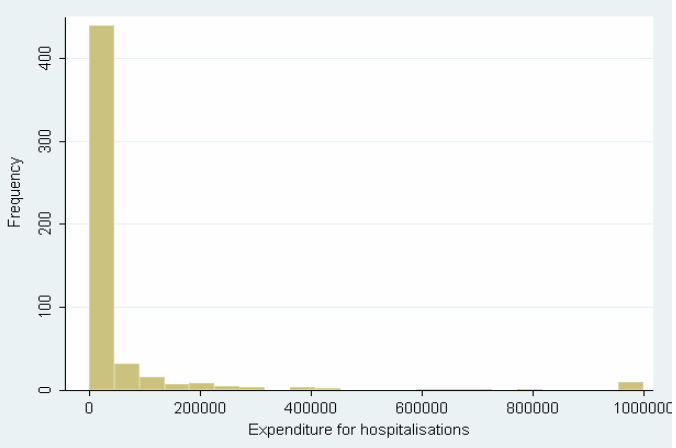
Figure A4.3 Histogram of hospitalisations and expenditure on raw scale and natural log scale (excluding zero)

A: Numbers of hospitalisation (raw scale)



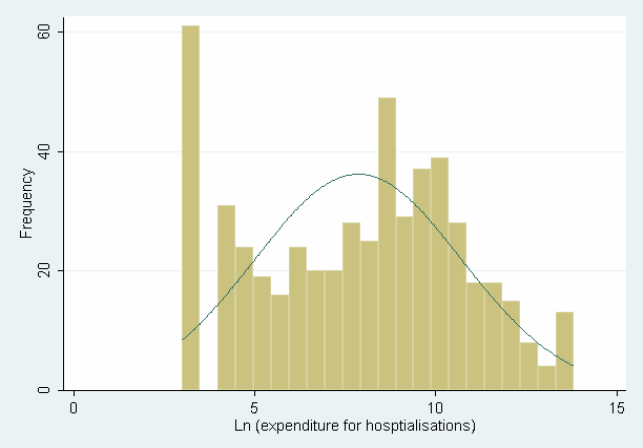
Skewness = 5.5920; Kurtosis = 55.6194

B: Expenditure for hospitalisations (raw scale)



Skewness = 5.0961; Kurtosis = 30.2511

C: Expenditure for hospitalisations (natural log scale)



Skewness = -0.0507; Kurtosis = 2.0261

Table A4.16 Correlation matrix of all variables

	Having op visit	No. of visits	Having hospitalisation	No. of hospitalisation	Having OP expense	OP expense	Having IP expense	IP expense	Regions
Having OP visit	1								
No. of visits	.**	1							
Having hospitalisation	0.22**	0.07**	1						
No. of hospitalisation	0.08**	0.17**	.**	1					
Having OP expense	.**	0.20**	-0.01	0.05	1				
OP expense	.**	0.27**	0.0671	0.20**	.**	1			
Having IP expense	-0.03	0.09*	.**	0.08**	0.42**	0.16**	1		
IP expense	-0.05	0.16**	.**	0.12**	0.0528	0.58**	.*	1	
Regions	0.01	-0.04	-0.05*	-0.03	-0.03	-0.21**	-0.20**	-0.21**	1
Urban	-0.03	-0.01	-0.08**	0.01	-0.01	-0.13**	-0.14**	-0.14**	0.28**
Male	-0.03	-0.02	0.03	0.05	-0.01	0.01	0.02	0.02	0.02
Age group	0.03	-0.07*	-0.06**	-0.05	-0.12**	-0.03	-0.22**	0.12**	0.05*
Head of household	0.04	-0.01	0.04*	0.01	-0.08**	0.05	-0.11**	0.05	0.06**
Education	0.02	0.07*	0.11**	0.06*	0.04	0.13**	0.16**	0.10*	-0.11**
Occupation	-0.03	-0.01	0.02	0.00	0.09**	-0.05	0.18**	-0.11*	-0.01
Inc. quintile	0.01	0.01	0.03	0.00	0.07*	0.21**	0.21**	0.10*	-0.21**
Places of death	-0.05*	0.05	-0.40**	0.04	0.06*	0.00	-0.07*	-0.02	0.08**
Health insurances	0.01	-0.01	-0.01	0.06	0.16**	-0.24**	0.12**	-0.26**	0.06**
Cause of death	-0.02	0.08**	-0.11**	0.03	0.04	0.00	-0.03	0.07	0.02
Having complem med.	.*	0.28**	-0.05	0.02	0.43**	-0.08*	-0.01	-0.04	0.01

Table A4.16 Correlation matrix of all variables (cont.)

	Urban	Male	Age group	Head of household	Education	Occupation	Inc. quintile	Places of death	Health insurances	Causes of death	Having complem. med.
Having OP visit											
No. of visits											
Having hospitalisation											
No. of hospitalisation											
Having op expense											
OP expense											
Having IP expense											
IP expense											
Regions											
Urban	1										
Male	-0.01	1									
Age group	0.06**	-0.21**	1								
Head of household	0.05*	0.24**	0.16**	1							
Education	-0.1557*	0.287**	-0.31**	0.04	1						
Occupation	-0.03	0.16**	-0.42**	-0.02	0.27**	1					
Inc. quintile	-0.27**	0.01	-0.15**	-0.13**	0.18**	0.14**	1				
Places of death	0.10**	-0.03	0.13**	-0.02	-0.13**	-0.08**	-0.09**	1			
Health insurances	0.15**	0.02	-0.18**	-0.01	-0.06**	0.17**	-0.14**	0.05*	1		
Causes of death	0.06**	-0.08**	0.28**	0.06**	-0.11**	-0.12*	-0.04*	0.23**	-0.04	1	
Having complem. med.	0.08**	-0.02	0.04	-0.02	-0.02	-0.03	-0.03	0.10**	0.06*	0.13**	1

Table A4.17 Statistical tests and values of logistic regression (Part I); zero-truncated Poisson model versus zero-truncated negative binomial model (Part II) for numbers of ambulatory visits

Model:	Part I		Part II			
	Logistic regression		Zero-truncated Poisson		Zero-truncated negative binomial	
Variables	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Region, central	0.122	0.527	0.403	0.297	-0.080	0.232
Region, north	0.458	0.443	0.586**	0.216	0.064	0.207
Region, north-east	0.265	0.452	0.399	0.238	-0.090	0.253
Region south	0.398	0.412	-0.173	0.252	-0.553*	0.243
Urban	0.230	0.206	0.108	0.149	-0.016	0.119
Age 5-10	4.406**	1.409	-1.109	0.642	-0.634	0.479
Age 10-20	1.605	1.402	-0.330	0.496	0.025	0.460
Age 20-30	5.754**	1.513	-0.660	0.524	-0.320	0.451
Age 30-40	3.223*	1.329	-0.708	0.455	-0.636	0.414
Age 40-50	3.127*	1.383	-0.692	0.428	-0.599	0.351
Age 50-60	2.353*	1.190	-0.670	0.448	-0.538	0.385
Age 60-70	3.114*	1.212	-0.359	0.411	-0.075	0.278
Age 70-75	2.860**	1.085	-0.043	0.354	0.091	0.290
Age 75-80	2.871**	1.104	-0.282	0.427	-0.118	0.359
Age >=80	2.921**	1.014	-0.091	0.414	0.142	0.313
Male	-0.129	0.156	0.163	0.140	-0.104	0.135
Head of household	0.068	0.270	-0.288*	0.126	-0.175	0.175
Education, primary	0.225	0.356	0.169	0.105	0.069	0.147

Table A4.17 Statistical tests and values of logistic regression (Part I); zero-truncated Poisson model versus zero-truncated negative binomial model (Part II) for numbers of ambulatory visits (cont.)

Model:	Part I		Part II			
	Logistic regression		Zero-truncated Poisson		Zero-truncated negative binomial	
Variables	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Education, higher	-0.809	0.532	1.200**	0.220	1.111**	0.306
Occupation, professionals	-0.560	0.709	0.017	0.272	0.215	0.362
Occupation, others	0.266	0.421	-0.109	0.146	0.080	0.154
Income, Q2	0.218	0.366	0.111	0.130	0.003	0.161
Income, Q3	0.176	0.267	0.032	0.203	-0.092	0.191
Income, Q4	-0.140	0.312	-0.080	0.172	-0.210	0.223
Income, Q5	0.774	0.404	-0.698**	0.167	-0.775**	0.179
Communicable ds.	2.679**	0.648	0.705	0.460	0.651	0.424
Non-communicable ds.	1.906**	0.551	1.173*	0.462	1.040*	0.402
Injuries	-0.974	0.755	1.589	0.934	1.668	0.988
Senility	1.6118*	0.741	0.196	0.465	0.138	0.414
Cancer	2.567**	0.635	1.322**	0.437	1.225**	0.359
Place of death, public	-0.359	0.220	-0.569**	0.205	-0.421*	0.191
Place of death, private	0.074	0.690	0.440*	0.215	0.531	0.355
Place of death, others	-2.046*	0.816	-0.704	1.080	0.204	0.988
Uninsured	-1.091*	0.454	0.797*	0.336	0.601	0.368
SPrEm	1.119	0.706	1.176**	0.325	1.112*	0.542
UCE	-0.381	0.317	0.295	0.196	0.148	0.151
UCP	-0.278	0.419	0.824**	0.267	0.719**	0.224

Table A4.17 Statistical tests and values of logistic regression (Part I); zero-truncated Poisson model versus zero-truncated negative binomial model (Part II) for numbers of ambulatory visits (cont.)

Model:	Part I		Part II			
	Logistic regression		Zero-truncated Poisson		Zero-truncated negative binomial	
Variables	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Complementary med.			0.414	0.134	0.583**	0.138
Constant	-4.313**	1.350	0.247	0.502	0.712*	0.360
Test for overdispersion ($\alpha = 0$)				0.793**		
Numbers of observations		1075		627		627
Wald χ^2		1486.85**		82480.98**		47371.79**
Pseudo R2		0.2072				
ll(null)		-723.877		.		-361213
ll(model)		-573.8708		-460715.8		-320039
AIC		1223.742		921509.5		640158
BIC		1412.985		921682.7		640336
Wald test for group of variables (χ^2)						
Region		2.09		42.66**		30.11**
Age		29.39**		12.77		13.12
Education		5.62		30.37**		13.22**
Occupation		2.34		0.56		0.53
Income quintile		8.47		33.53**		35.08**
Causes of death		41.26**		45.90**		60.59**
Places of death		15.42**		28.81**		12.50*
Health insurances		10.04*		21.38**		18.46**

Table A4.18 Statistical tests and values of logistic regression (Part I); zero-truncated Poisson model versus zero-truncated negative binomial model (Part II) for numbers of hospitalisations

Model:	Part I		Part II			
	Logistic regression		Zero-truncated Poisson		Zero-truncated negative binomial	
Variables	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Region, central	-0.172	0.416	0.614*	0.293	0.547	0.352
Region, north	0.049	0.459	0.256	0.235	0.143	0.315
Region, north-east	-0.200	0.420	0.519*	0.252	0.465	0.356
Region, south	-0.148	0.472	-0.186	0.360	-0.184	0.466
Urban	0.159	0.287	-0.036	0.238	0.064	0.233
Age 5-10	2.237	1.202	-19.162**	1.262	-21.030**	0.930
Age 10-20	-0.040	1.361	0.060	0.812	0.264	0.850
Age 20-30	3.656**	1.362	0.161	0.424	0.305	0.636
Age 30-40	2.603*	1.260	-0.188	0.523	-0.274	0.679
Age 40-50	1.992	1.130	-0.709	0.754	-0.760	0.735
Age 50-60	1.899	1.070	0.144	0.519	0.257	0.622
Age 60-70	1.950	1.205	-0.166	0.443	-0.103	0.501
Age 70-75	2.958**	1.160	-0.289	0.491	-0.189	0.501
Age 75-80	2.990**	1.120	-0.574	0.465	-0.489	0.543
Age >=80	2.476*	1.107	-0.473	0.433	-0.439	0.466
Male	0.259	0.280	0.143	0.157	0.139	0.196
Head of household	0.174	0.223	0.029	0.165	-0.010	0.178
Education, primary	0.005	0.206	-0.148	0.285	-0.193	0.246

Table A4.18 Statistical tests and values of logistic regression (Part I); zero-truncated Poisson model versus zero-truncated negative binomial model (Part II) for numbers of hospitalisations (cont.)

Model:	Part I		Part II			
	Logistic regression		Zero-truncated Poisson		Zero-truncated negative binomial	
Variables	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Education, higher	-0.418	0.571	0.503*	0.225	0.581	0.355
Occupation, professionals	0.959	0.568	-0.981**	0.377	-0.720	0.415
Occupation, others	1.093**	0.356	-0.236	0.180	-0.254	0.235
Income, Q2	-0.583*	0.280	0.019	0.141	-0.069	0.184
Income, Q3	-0.355	0.367	-0.021	0.187	-0.112	0.213
Income, Q4	-0.592	0.433	-0.162	0.237	-0.268	0.285
Income, Q5	-1.134**	0.388	-0.422	0.380	-0.498	0.428
Communicable ds.	3.464**	0.749	-0.305	0.345	-0.126	0.372
Non-communicable ds.	2.957**	0.792	-0.228	0.359	-0.157	0.349
Injuries	1.509	0.819	-1.791**	0.360	-1.984**	0.390
Senility	2.286**	0.669	-0.363	0.384	-0.371	0.375
Cancer	3.760**	0.798	0.093	0.396	0.232	0.423
Place of death, public hosp.	1.110**	0.351	-0.037	0.123	-0.002	0.175
Place of death, private hosp.	1.324*	0.601	0.037	0.459	0.191	0.591
Place of death, others	-2.367**	0.716	0.612	0.458	0.783	0.584
Uninsured	-0.806	0.552	-0.122	0.263	-0.304	0.304
SPrEm	-2.925*	1.128	-0.971	0.503	-0.784	0.693
UCE	-0.446	0.440	-0.324	0.211	-0.342	0.239

Table A4.18 Statistical tests and values of logistic regression (Part I); zero-truncated Poisson model versus zero-truncated negative binomial model (Part II) for numbers of hospitalisations (cont.)

Model:	Part I		Part II			
	Logistic regression		Zero-truncated Poisson		Zero-truncated negative binomial	
Variables	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
UCP	0.027	0.453	-0.089	0.277	-0.193	0.338
Constant	-4.791**	1.188	1.537*	0.601	1.117	0.799
α					1.358	0.542
Test for overdispersion ($\alpha = 0$)			0.870			
Numbers of observations		1075		619		619
Wald χ^2		2241.7**		2482.0**		2404.0**
Pseudo R^2		0.2653				
Log likelihood (null)		-730.5	.			-233015.8
Log likelihood (model)		-536.7		-267953.0		-222495.5
AIC		1149.4		535982.1		445069.0
BIC		1338.7		536150.4		445241.7
Wald test for group of variable (χ^2)						
Region		0.84		8.37		5.76
Age		37.12**		270.08**		860.43**
Education		0.79		7.45		3.91
Occupation		9.66**		6.91		3.25

Table A4.18 Statistical tests and values of logistic regression (Part I); zero-truncated Poisson model versus zero-truncated negative binomial model (Part II) for numbers of hospitalisations (cont.)

Model:	Part I	Part II	
	Logistic regression	Zero-truncated Poisson	Zero-truncated negative binomial
Income quintile	9.02	1.35	1.81
Causes of death	34.31**	56.76**	36.46**
Places of death	22.88**	1.89	1.96
Health insurances	11.33*	8.63	3.11

Table A4.19 Statistical tests and values of logistic regression for propensity of having expenditure for ambulatory visit (Part I)

Model:	Logistic regression	
Variables	Coefficient	Std. Err.
Region, central	0.699	1.208
Region, north	0.172	1.088
Region, north-east	1.020	1.109
Region south	0.888	1.131
Urban	0.190	0.329
Age 5-10	-1.400	1.219
Age 10-20	(dropped)	
Age 20-30	-4.353**	1.593
Age 30-40	-3.219**	1.208
Age 40-50	-2.496*	1.044
Age 50-60	-1.659	1.645
Age 60-70	-1.568	1.096
Age 70-75	-1.058	1.153
Age 75-80	-0.631	1.256
Age >=80	-0.838	1.118
Male	-0.222	0.414
Head of household	-1.046**	0.401
Education, primary	-0.006	0.432
Education, higher	-0.118	0.612
Occupation, professionals	3.289**	1.035
Occupation, others	0.266	0.493
Income, Q2	0.265	0.577
Income, Q3	-0.661	0.388
Income, Q4	-0.384	0.610
Income, Q5	-0.220	0.725
Communicable ds.	0.532	1.565
Non-communicable ds.	0.489	1.208
Injuries	2.337	1.575
Senility	0.734	1.274
Cancer	1.628	1.511

Table A4.19 Statistical tests and values of logistic regression for propensity of having expenditure for ambulatory visit (Part I) (cont.)

Model:	Logistic regression	
Variables	Coefficient	Std. Err.
Place of death, public hosp.	-1.218**	0.425
Place of death, private hosp.	1.381	0.978
Place of death, others	-0.960	1.310
Uninsured	5.760**	1.422
SPrEm	2.030	1.219
UCE	-0.112	0.458
UCP	6.185**	1.012
Complementary med.	4.840**	1.370
Constant	0.201	1.889
Numbers of observations		623
Wald χ^2		1397.6
Pseudo R^2		0.5122
Log likelihood (null)		-396.7
Log likelihood (model)		-193.5
AIC		463.1
BIC		631.6
Wald test for group of variable (χ^2)		
Region		3.37
Age		26.50**
Education		0.06
Occupation		10.11**
Income quintile		4.13
Cause of death		11.34*
Place of death		11.69**
Health insurance		46.63**

Table A4.20 Statistical tests and values of models for household expenditure for ambulatory visits (Part II)

Model:	OLS		LnOLS with Duan's smearing factor		GLM (Gamma-log)		GLM (Poisson-log)	
Variables	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Region, central	-8181.11*	3238.66	-0.503	0.468	-0.764	0.495	-1.336*	0.523
Region, north	-8225.32*	3513.61	-0.425	0.491	-0.509	0.468	-0.927*	0.434
Region, north-east	-7783.94*	3541.00	-0.864	0.468	-1.099*	0.437	-1.183*	0.468
Region, south	-8653.71*	3090.73	0.140	0.408	0.009	0.430	-1.176**	0.365
Urban	-3593.55**	1245.70	-0.247	0.349	0.103	0.237	-0.822**	0.304
Age 5-10	4579.31	8156.93	2.128	1.159	-0.907	1.507	0.531	1.052
Age 10-20	11221.48	12572.65	-1.681	1.555	-1.301	0.807	0.671	0.707
Age 20-30	10579.49	8140.10	1.700	1.375	0.957	1.025	1.828	1.005
Age 30-40	-3107.78	3170.52	-1.173	1.168	-1.651**	0.601	-0.654	0.862
Age 40-50	-3791.49	3362.00	-1.209	1.098	-2.226**	0.642	-1.166	0.752
Age 50-60	83.42	4957.24	-0.903	1.161	-1.221	0.694	0.040	0.752
Age 60-70	-51.73	3273.74	-0.870	1.173	-0.901	0.595	-0.111	0.707
Age 70-75	-4542.50	3575.75	-1.154	1.046	-1.696**	0.451	-1.061	0.744
Age 75-80	-4096.70	3502.57	-0.348	1.170	-1.523**	0.490	-0.727	0.752
Age >=80	-1668.12	2573.19	-0.409	1.117	-1.178*	0.503	-0.167	0.693
Male	1314.64	1564.07	0.215	0.260	0.125	0.182	0.631**	0.196
Head of household	1880.43	1318.95	0.029	0.183	0.525**	0.201	0.451*	0.183
Education, primary	3035.81	1883.21	0.525*	0.236	0.410	0.219	0.286	0.274
Education, higher	8860.633*	3677.00	0.637	0.397	0.257	0.583	0.576	0.406
Occupation, professionals	2996.14	4511.56	-0.774	0.613	-1.301**	0.499	-0.665	0.404
Occupation, others	710.19	2629.66	0.080	0.558	0.377	0.394	0.735	0.434

Table A4.20 Statistical tests and values of models for household expenditure for ambulatory visits (Part II) (cont.)

Model:	OLS		LnOLS with Duan's smearing factor		GLM (Gamma-log)		GLM (Poisson-log)	
Variables	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Income, Q2	1694.77	2191.16	0.483	0.362	0.009	0.314	0.095	0.427
Income, Q3	787.53	1732.08	0.658	0.438	0.386	0.321	0.700	0.481
Income, Q4	-2523.97	1698.62	-0.023	0.360	-0.468	0.369	0.178	0.435
Income, Q5	2728.03	2679.31	0.124	0.456	0.312	0.522	0.216	0.359
Communicable ds.	-1804.80	7479.53	0.603	0.888	-1.500	1.415	-1.373	0.970
Non-communicable ds.	-768.02	7082.63	0.985	0.899	-0.960	1.371	-0.658	0.976
Injuries	-12429.27	9653.10	0.308	1.027	-2.084	1.503	-2.147	1.147
Senility	-4735.66	7603.40	-0.445	1.008	-2.707	1.482	-2.407*	1.135
Cancer	2042.56	7152.74	1.163	0.920	-1.278	1.463	-1.371	1.054
Place of death, public hosp.	-4057.72	2308.69	-0.654	0.358	-1.201**	0.241	-1.583**	0.358
Place of death, private hosp.	9097.30	4799.06	2.056**	0.511	1.258**	0.485	1.416**	0.310
Place of death, others	-6496.75	3804.81	-2.65*	1.292	-1.967	1.519	-1.627	1.351
Uninsured	20637.85*	8432.28	0.863	0.646	0.976	0.569	0.8012*	0.346
SPrEm	-12807.78*	4964.54	-1.259	0.721	-1.359	0.717	-1.668*	0.689
UCE	-4504.43	2352.79	-0.860**	0.281	-0.826**	0.258	-0.621*	0.309
UCP	-8108.81	4495.98	-1.658**	0.594	-1.132**	0.418	-1.220*	0.534
Complementary med.	-3096.86*	1498.96	-0.373	0.332	-0.050	0.206	-0.568*	0.243
Constant	18413.18*	8002.18	7.877**	1.285	11.745**	1.339	10.898**	1.116
Duan's smearing factor: LnOLS				4.505				
Numbers of observations		628		388		388		388
R^2		0.3589		0.3835				

Table A4.20 Statistical tests and values of models for household expenditure for ambulatory visits (Part II) (cont.)

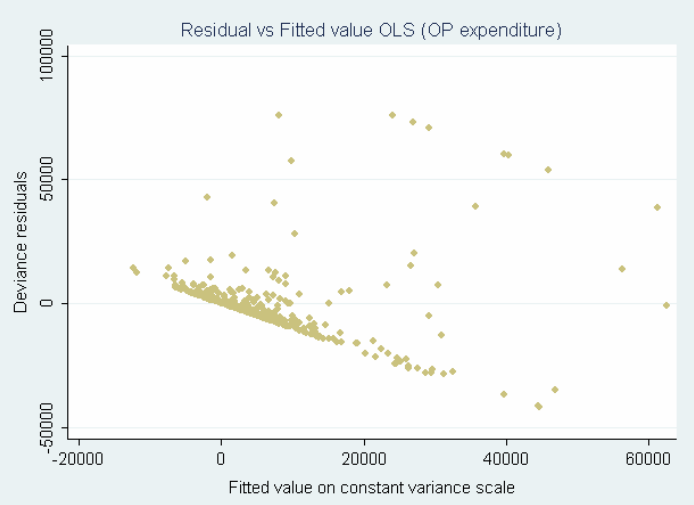
Model:	OLS		LnOLS with Duan's smearing factor		GLM (Gamma-log)		GLM (Poisson-log)	
Variables	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
F statistic		29.14		.				
Deviance						157443.18		453353495
Pearson						176800.75		714317030
Log likelihood (null)		-6966.7		-815.5		.		.
Log likelihood (model)		-6827.1		-721.7		-706382.6		-2.27E+08
AIC		13730.2		1519.3		1412843		454000000
BIC		13899.0		1669.8		1412998		454000000
Modified Park Test for GLM family (χ^2)								
Coefficient						1.946		1.078
Family:								
Gamma						0.0663		67.839**
Poisson						20.667**		0.479
Gaussian NLLS						87.418**		92.574**
Inverse Gaussian or Wald						25.616**		294.653**
Results of tests for GLM log link						*p-value*		*p-value*
Pearson Correlation test						0.000		0.000
Pregibon Link test						0.7955		0.0566
Modified Hosmer and Lemeshow						0.0004		0.0018
Root Mean Square Error		15826.8		58837.8		100103.3		28793.5
Mean Absolute Error		9457.1		19733.0		13035.0		13035.0

Table A4.20 Statistical tests and values of models for household expenditure for ambulatory visits (Part II) (cont.)

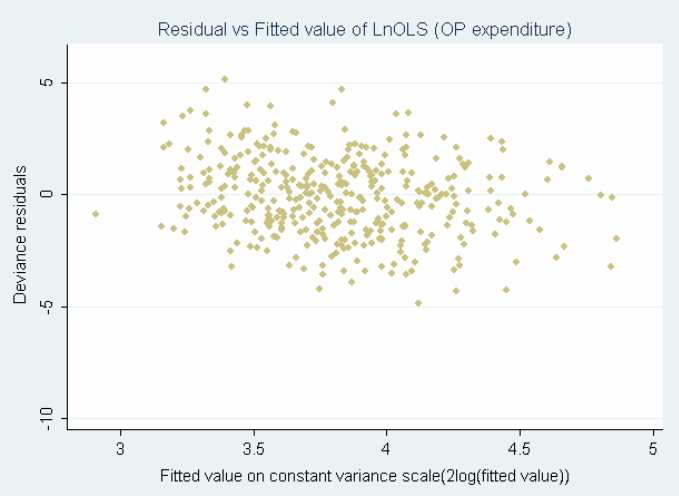
Model:	OLS		LnOLS with Duan's smearing factor		GLM (Gamma-log)		GLM (Poisson-log)	
Variables	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Wald test for groups of categorical variable (χ^2)								
Region		1.99		1.67		20.6**		13.93**
Age		0.86		4.48**		80.08**		59.15**
Education		3.18*		2.75		3.54		2.01
Occupations		0.28		1.07		8.47*		9.67**
Income quintile		1.70		1.88		13.75**		4.57
Causes of death		2.62*		6.13**		42.91**		36.7**
Places of death		3.23*		11.1**		36.12**		34.87**
Health insurances		3.55**		7.23**		62.04**		63.85**

Figure A4.4 Scatter plot of estimated mean (fitted values) versus residual of four models of expenditure for ambulatory visits

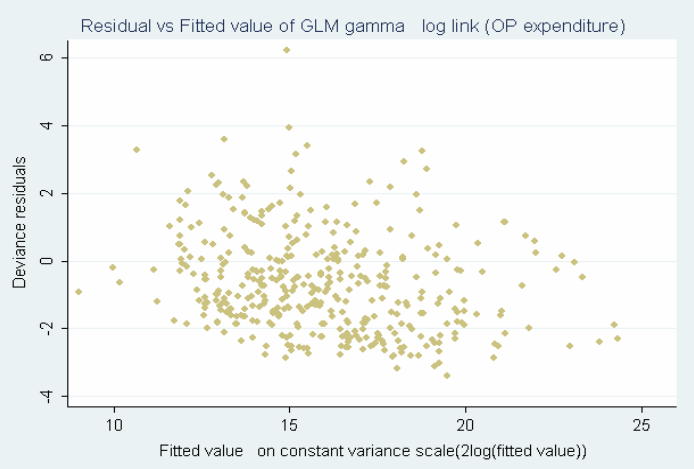
A: OLS



B: OLS of log transformed data with Duan's smearing factor



C: GLM gamma log link



D: GLM Poisson log link

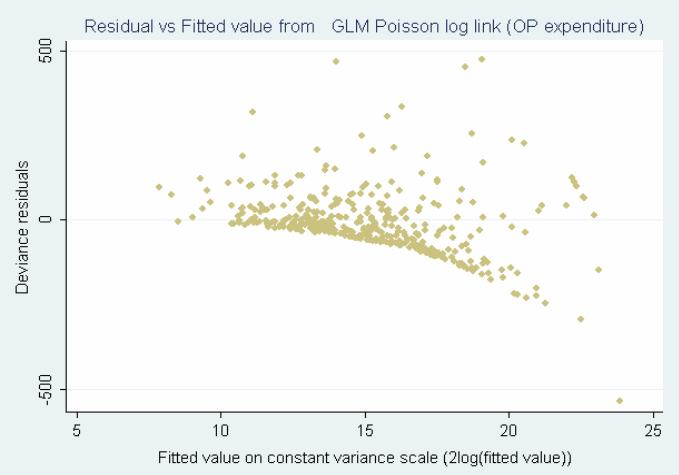
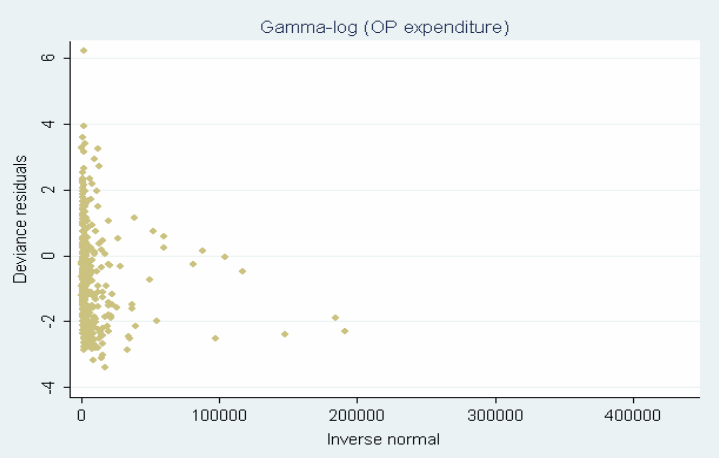
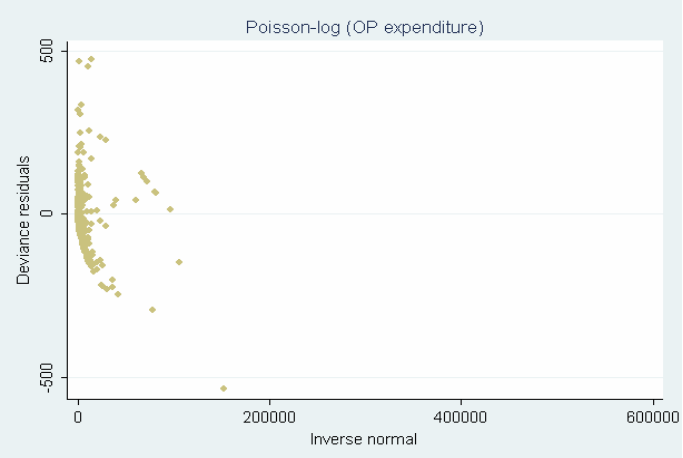


Figure A4.5 Plots of predicted value versus residual of the two GLM models of expenditure for ambulatory visits (scatter plot and standardized normal probability plot)

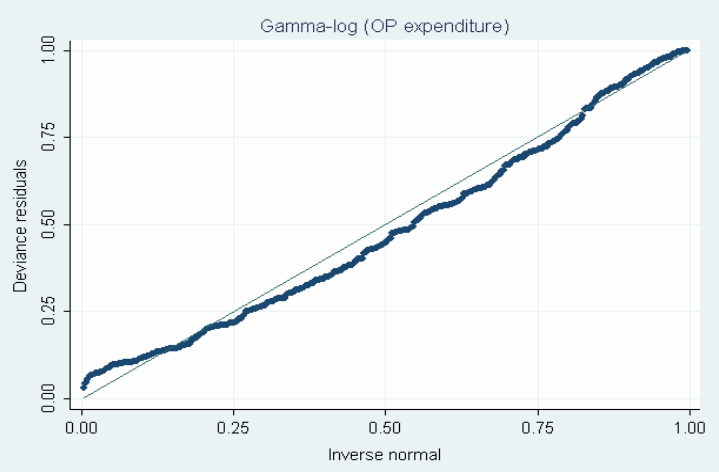
A: Gamma log link (scatter plot)



B: Poisson log link (scatter plot)



C: Gamma log link (standardised normal probability plot)



D: Poisson log link (standardised normal probability plot)

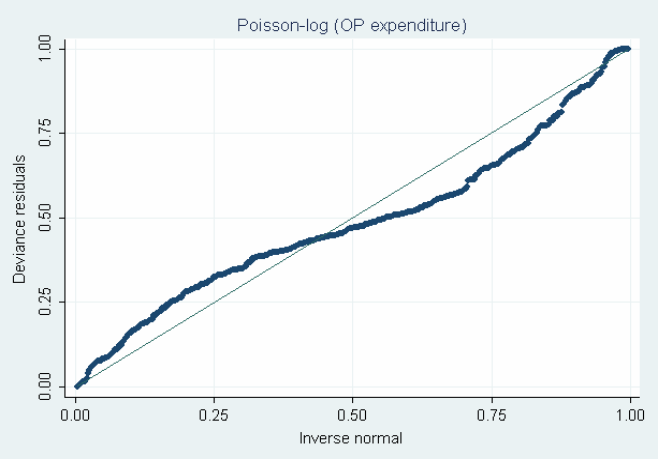


Table A4.21 Statistical tests and values of logistic regression for propensity of having expenditure for acute care

Model:	Logistic regression	
Variables	Coefficient	Std. Err.
Region, central	-1.661**	0.578
Region, north	-0.898	0.600
Region, north-east	-1.588*	0.699
Region, south	-0.633	0.868
Urban	-0.119	0.381
Age 5-10	*(dropped)*	
Age 10-20	*(dropped)*	
Age 20-30	0.494	1.197
Age 30-40	-1.452	1.209
Age 40-50	-1.546	1.363
Age 50-60	1.176	1.162
Age 60-70	-0.300	0.959
Age 70-75	2.011	1.026
Age 75-80	1.279	1.090
Age >=80	1.443	0.990
Male	-0.176	0.481
Head of household	0.195	0.388
Education, primary	-0.428	0.378
Education, higher	1.019	0.770
Occupation, professionals	1.722	0.894
Occupation, others	-0.758	0.561
Income, Q2	0.053	0.540
Income, Q3	1.086	0.610
Income, Q4	1.151	0.610
Income, Q5	1.330*	0.557
Communicable ds.	5.387**	1.496
Non-communicable ds.	5.245**	1.245
Injuries	7.093**	1.915
Senility	5.819**	1.254
Cancer	6.977**	1.294

Table A4.21 Statistical tests and values of logistic regression for propensity of having expenditure for acute care (cont.)

Model:	Logistic regression	
Variables	Coefficient	Std. Err.
Place of death, public hosp.	0.811*	0.345
Place of death, private hosp.	2.457*	1.072
Place of death, others	0.222	0.881
Uninsured	3.821**	0.935
SPrEm	0.767	1.488
UCE	-0.402	0.294
UCP	8.776**	0.985
Constant	-7.353**	2.033
Numbers of observations		614
Wald χ^2		4562.1**
Pseudo R^2		0.5773
Log likelihood (null)		-422.8
Log likelihood (model)		-178.697
AIC		429.4
BIC		588.5
Wald test for group of variable		
Region		11.18*
Age		16.34*
Education		11.36**
Occupation		7.73*
Income quintile		10.67*
Causes of death		41.4**
Places of death		9.56*
Health insurances		94.27**

Table A4.22 Statistical test and value of models for household expenditure for acute care

Model:	OLS		LnOLS with Duan smearing factor		GLM (gamma-log)		GLM (Poisson-log)	
Variables	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Region, central	-46105.9	35154.1	-0.171	0.830	-0.976	0.908	-1.062*	0.462
Region, north	-69614.2*	28223.4	-0.341	0.638	-1.372	0.878	-1.293**	0.489
Region, north-east	-58226.0	24781.5	-1.243*	0.569	-2.468**	0.639	-1.667**	0.503
Region, south	-84690.2*	32702.0	-0.024	0.714	-0.443	0.665	-1.851**	0.559
Urban	-26951.7**	9689.1	-0.140	0.366	0.354	0.461	-0.551	0.412
Age 5-10	*(dropped)*		*(dropped)*		*(dropped)*		*(dropped)*	
Age 10-20	99099.4	62537.9	-0.308	1.640	0.772	0.875	2.802*	1.142
Age 20-30	70018.0	59582.1	1.106	1.490	3.533**	0.921	4.174**	0.973
Age 30-40	54707.4	49369.0	0.182	1.098	2.553*	1.154	1.989	1.127
Age 40-50	72917.4	52582.6	-1.290	1.029	0.347	1.024	0.667	1.025
Age 50-60	102999.1	57844.7	0.886	0.988	2.982**	1.127	3.588**	0.717
Age 60-70	98417.8	51281.1	-0.069	1.020	2.925**	0.990	2.769**	0.853
Age 70-75	63119.7	40986.5	0.568	0.744	2.460**	0.859	2.007**	0.712
Age 75-80	183221.3*	88765.5	2.663**	0.829	5.155**	1.030	3.658**	0.822
Age >=80	108912.2*	52539.0	0.646	0.690	2.247**	0.647	2.538**	0.805
Male	19686.3	18428.6	0.656	0.350	0.744	0.407	0.769**	0.284
Head of household	1123.1	16634.4	-0.650	0.344	-1.111*	0.450	-0.139	0.264
Education, primary	39610.1	31860.2	0.659	0.504	0.373	0.524	0.216	0.292
Education, higher	78396.5	48309.8	1.698*	0.672	1.175	0.870	0.657	0.402
Occupation, professionals	-86307.9*	35430.0	0.754	0.684	-0.233	0.721	-0.661	0.554
Occupation, others	-38994.3*	17500.1	-0.651	0.490	-1.252*	0.572	-0.960	0.491

Table A4.22 Statistical test and value of models for household expenditure for acute care (cont.)

Model:	OLS		LnOLS with Duan smearing factor		GLM (gamma-log)		GLM (Poisson-log)	
Variables	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Income, Q2	-4042.9	13116.1	-0.008	0.736	-1.664	0.855	-0.592	0.510
Income, Q3	28680.6	25395.3	0.206	0.447	-1.138*	0.474	-0.195	0.503
Income, Q4	16953.1	20503.8	0.336	0.611	-1.079	0.608	-0.277	0.559
Income, Q5	36145.7	27692.9	0.017	0.611	-0.929	0.658	0.165	0.462
Communicable ds.	20666.5	29976.1	2.307*	0.879	3.870**	1.276	2.095	1.129
Non-communicable ds.	-28557.6	21909.8	2.416*	0.982	3.953**	1.113	1.306	1.032
Injuries	-34146.9	26533.1	2.435	1.798	5.042**	1.424	1.094	1.635
Senility	-72582.4	43555.9	1.812	1.022	3.234**	1.161	0.650	0.998
Cancer	-17473.6	27649.3	2.685**	0.972	4.579**	1.191	0.731	1.229
Place of death, public hosp.	23863.3	15301.9	0.771*	0.386	0.919	0.644	0.061	0.317
Place of death, private hosp.	53912.4	44842.4	1.764*	0.747	1.298	0.708	0.614	0.413
Place of death, others	-9345.3	47375.8	-1.413	1.020	-3.900**	1.303	-1.754*	0.843
Uninsured	149621.4*	70876.7	2.996**	0.692	3.029**	0.769	1.603**	0.448
SPrEm	44549.2	42936.1	0.053	0.997	0.502	0.681	-0.942	1.453
UCE	73657.4*	32843.5	1.133*	0.561	1.581*	0.662	0.871	0.508
UCP	11794.7	33142.1	-1.656**	0.584	-0.376	0.565	-1.461	0.807
Constant	-64856.8	61532.0	4.487**	1.456	3.816*	1.675	7.034**	1.935
Duan's smearing factor; LnOLS				8.454				
Numbers of observations		438		273		273		273
F statistic		4		.				
R^2		0.2867		0.5825				

Table A4.22 Statistical test and value of models for household expenditure for acute care (cont.)

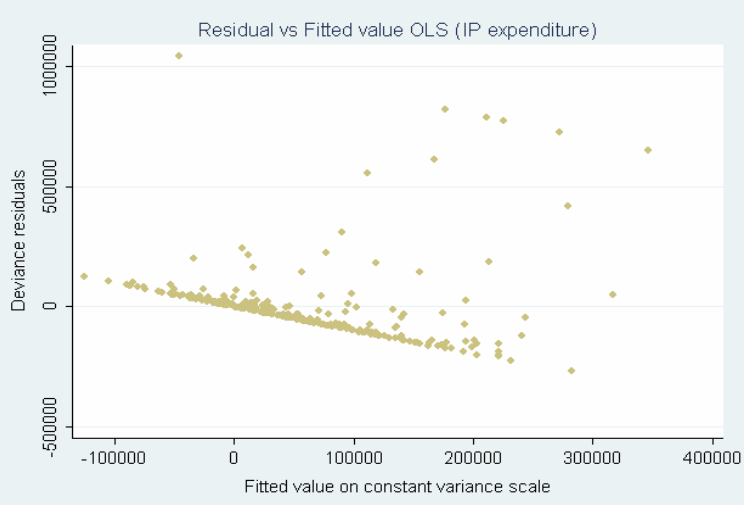
Model:	OLS		LnOLS with Duan smearing factor		GLM (gamma-log)		GLM (Poisson-log)	
Variables	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Deviance						139736.66		2295731027
Pearson						150662.3		1.0057E+10
Log likelihood (null)		-5807.325		-673.9961		.		.
Log likelihood (model)		-5733.32		-554.7707		-524288.6		-1.15E+09
AIC		11540.64		1179.541		1048651		2.30E+09
BIC		11691.68		1305.873		1048785		2.30E+09
Modified Park Test for GLM Family (χ^2)								
Coefficient						2.062		0.899
Family:								
Gamma						0.4		33.9**
Poisson						130.7**		0.3
Gaussian NLLS						492.8**		22.7**
Inverse Gaussian						102.0**		123.6**
Results of tests of GLM Log link						*p-value*		*p-value*
Pearson Correlation						0.000		0.338
Pregibon Link Test:						0.000		0.000
Modified Hosmer and Lemeshow						0.054		0.000
Root Mean Square Error		132465.8		833226.1		1250699.9		187284.3
Mean Absolute Error		77890.5		300077.0		307199.8		58094.9

Table A4.22 Statistical test and value of models for household expenditure for acute care (cont.)

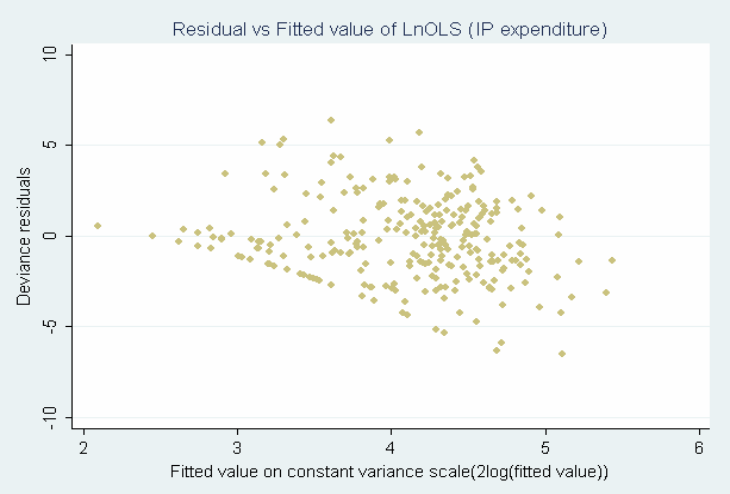
Model:	OLS		LnOLS with Duan smearing factor		GLM (gamma-log)		GLM (Poisson-log)	
Variables	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.	Coefficient	Std. Err.
Wald test for group of variables (χ^2)								
Region		1.73		2.35		34.53**		12.55*
Age		1.01		3.49**		113.66**		79.84**
Education		1.32		3.2*		2.02		2.72
Occupation		3.10*		2.83		7.87*		4.15
Income quintile		1.42		0.25		7.04		3.71
Causes of death		0.85		2.01		22.33**		41.99**
Places of death		1		4.31**		58.05**		20.3**
Health insurances		3.90*		18.58**		39.64**		54.41**

Figure A4.6 Scatter plot of estimated mean (fitted values) versus residual of four models of expenditure for acute care

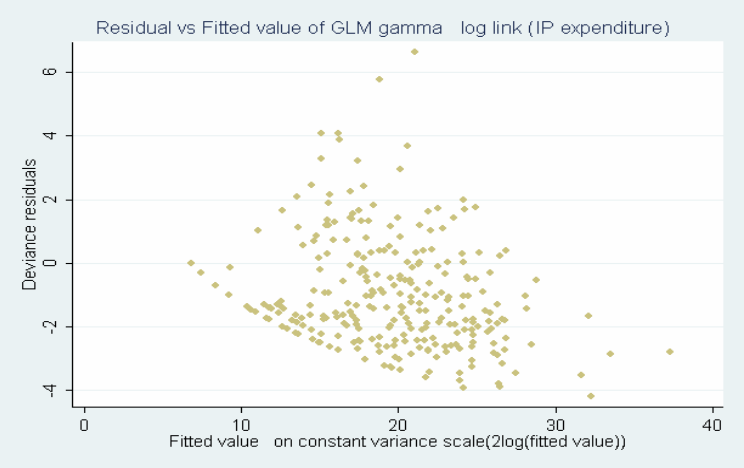
A: OLS



B: OLS of log transformed data with Duan's smearing factor



B: GLM gamma log link



C: GLM Poisson log link

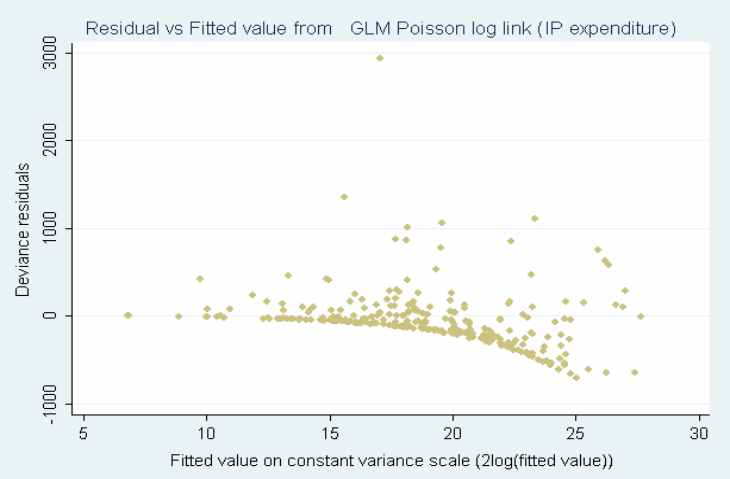
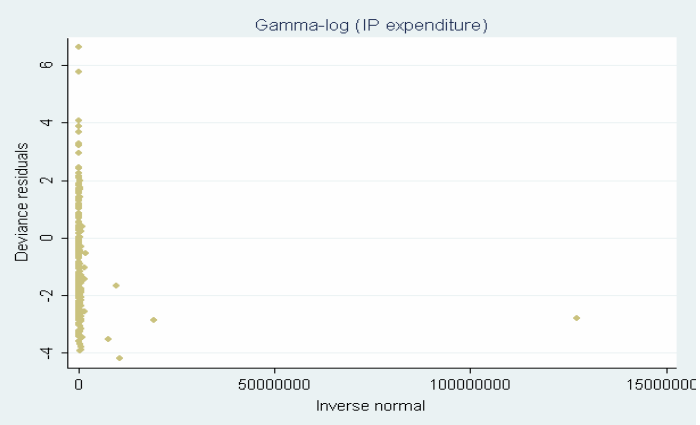
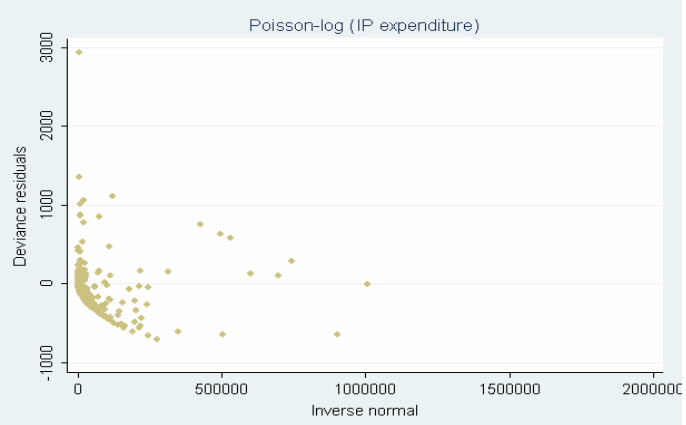


Figure A4.7 Plots of predicted value versus residual of the two GLM models of expenditure for acute care (scatter plot and standardized normal probability plot)

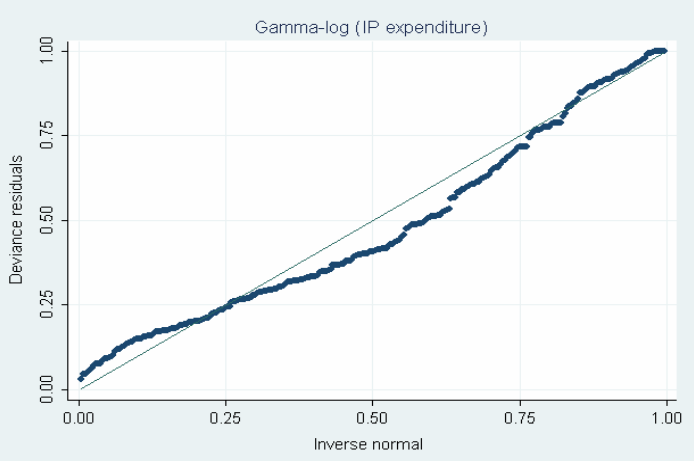
A: Gamma log link (scatter plot)



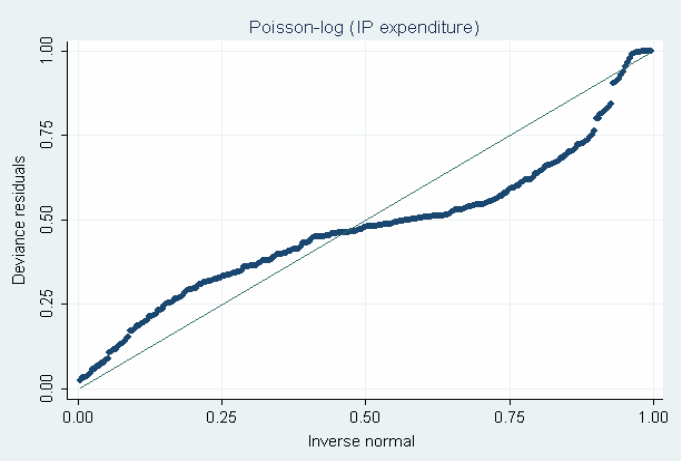
B: Poisson log link (scatter plot)



C: Gamma log link (standardized normal probability plot)



D: Poisson log link (standardised normal probability plot)



APPENDIX 5

TERMINALLY ILL PATIENTS' PERSPECTIVE

A5. 1 Information leaflet (English language translation of Thai version used in

Information leaflet

Date 30 August, 2006 Version 3

You are being invited to participate in a part of the research entitled 'Current practice, financing and policy on terminally ill patients in Thailand'. It aims to understand your doctor, your care giver and your own view about decision on medical and non-medical intervention at the end of terminally ill cancer patient's life, favourite place to stay at the final period of your life and satisfaction for good caring for your comfort during such period.

If you agree to participate in this study, you will be interviewed privately wherever, whenever and whatever you satisfy. We may have to talk at least 60 minutes and I may get back to you more than once. Since the topic may precipitate your sorrow, therefore, you can stop our conversation anytime or refuse/withdraw your participation whenever you want or be unhappy to talk with me. Your interview will be recorded, transcribed and then may be quoted in the findings without your name and family name but study ID code or abbreviation will be used instead. You can review and/or correct your transcript and can request for your own copy. Such cassette and transcript will be kept confidentially during study period for 5 years and then destroy since then.

This study will help understanding of patients' view and demand in terminal stage of life. In addition, it will be beneficial to mange the health service for the terminally ill patient in both urban and rural area of Thailand. The study is a partial thesis of Ms.Chutima Akaleephan, a PhD student at University of East Anglia, United Kingdom. Currently I am working at International Health Policy Programme-Thailand, Ministry of Public Health, Tiwanont road, Amphur Muang, Nonthaburi 11000. Tel. number: +66 2590 2366, Fax. number: +66 2590 2385. Mobile phone number: +66 xxxx xxxx.

A5.2 Informed consent form

Centre Number: …….
Participant Number: ……

Current practice, financing and policy on terminally ill patients in Thailand

Please initial box

1. I confirm that I have read and understand the information sheet dated…… version …. for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care (for the patient) or legal rights being affected. ☐

3. I understand that relevant sections of any of my data collected during the study, may be looked at by responsible individuals from International Health Policy Program-Thailand, from regulatory authorities or from University of East Anglia, United Kingdom where it is relevant to my taking part in this research. I give permission for these individuals to have access to my records. ☐

4. I agree to take part in the above study ☐

_____	_____	_____
Name of Participant	Date	Signature
_____	_____	_____
Name of Person taking consent (if different from research)	Date	Signature
_____	_____	_____
Researcher	Date	Signature

When completed, 1 for participant; 1 for researcher

A5.3 Guide questions for interviewing

1) Guide questions for patients

Background information (to learn patients' social context and background of patients' perception)

- How many people in your family?
- What's your relation to other members in your family?
- When you are sick, who takes the responsibility of your health expenditure, including this illness? Do you have any health insurance schemes?
- What's your religion or beliefs, your racial background, age, highest education?

Current practice (to learn patients' view and perceive of physician practice i.e. treatment, telling the truth of diagnosis and illness stage, advice and patients' decision making process and influential factors)

- How do you make a decision on any medical intervention (e.g. on your own, consult to your family, depends on your doctor or other doctor for third opinion)?

Place for dying (to learn preferred place, reasons and influential factors, and patients' satisfaction)

- Some people prefer to die at home, whereas other people prefer to die in a hospital, a hospice, or a nursing home. One day, if you need to consider this issue, where would you prefer to be?
- Why do you choose (home, hospital, inpatient hospice, or others) as the preferred place?

Preference of dying (to learn patient's preference treatment or satisfaction before dying, concept of good death which will relate to two former topics)

- One day, if you know that you are going to die, what will make you be happy at that moment? (Concept of good death)
- One day, if it looked as of you were not going to recover from the illness, will you express your preference for a certain medical action at the end of your life to the doctor or nurse or your family (e.g. extending life, palliative care, withholding treatment), why or why not?

Advance directive (an optional topic, if possible)

- What do you think about a written declaration of your intention on life sustaining treatment (withdraw or withhold lived supporting machine, life saving medication to prolong life or cardiopulmonary resuscitation) in case you are unconscious and critically ill at the end of life?

2) Guide questions for patient's primary caregivers

Background information (to learn patients' social context and background of patients' perception)

- How many people are in your family?
- What's your relationship to patients and other members in your family?
- Who takes the responsibility of the patients' health expenditure, including this illness? Do they have any health insurance schemes?
- What's your religion or beliefs, your racial origin, age, highest education?

Current practice (to learn caregivers' views and perception of physician practice i.e. treatment, telling the truth of diagnosis and illness stage, advice and decision making process for the patients and influential factors)

- How do patients make a decision on any medical action (e.g. on your own, consult to your family, depends on your doctor or other doctor for third opinion)?

Place for dying (to learn caregivers' views on patients' preferred place, reasons and influential factors, and patients' satisfaction)

- Some people prefer to die at home, whereas other people prefer to die in a hospital, a hospice, or a nursing home. One day, if you need to consider this issue, where would you prefer the patient to be?
- Why do you choose (home, hospital, inpatient hospice, or others) as the preferred place?

Preference of dying (to learn caregivers' views on patients' preferred treatment or satisfaction before dying, concept of good death which will relate to two former topics)

- One day, if you know that the patient is going to die, what will make the patient be happy at that moment? (Concept of good death)
- One day, if it looked as if the patient was not going to recover from the illness, will the patient express his/her preference for a certain medical action at the end

of his/her life to the doctor or nurse or you (e.g. extending life, palliative care, withholding treatment), why or why not?

Advance directive (an optional topic, if possible)

- What do you think if the patient does a written declaration of his/her intention on life sustaining treatment (withdraw or withhold lived supporting machine, life saving medication to prolong life or cardiopulmonary resuscitation) in case you are unconscious and critically ill at the end of life?

APPENDIX 6

HEALTH PROFESSIONALS' PERSPECTIVE

Guide questions for health professionals (mainly physician)

Background information (to learn health professionals' working experiences)

- What hospital services are provided for terminally ill patients? Is there any palliative care unit?

- What (and how) is your current role relevant to terminally ill patients? How many years do you deal with the unit (or terminally ill patients)?

Current practice (to learn physician practice i.e. treatment, telling the truth of diagnosis and illness stage, advice and patients' decision making process and influential factors)

- How do you inform the patients about their terminal illness? (e.g. diagnosis, prognosis, treatment plans)

- How do you make the decision to tell the truth? (What are your criteria? What is the constraint? Is there any difficulty in this practice?)

- How (or when) do you practice in prolonging patients' life, withhold or withdraw the medical supports?

Place for dying patients (to learn health professionals' views on patients' preferred place, reasons and influential factors, and patients' satisfaction)

- In your view, what is the suitable place for terminally ill patients who are going to die? (and why do you choose that?)

Patients' preferences (to learn health professionals' views on patients' preferred treatment or satisfaction before dying, concept of good death which will relate to two former topics)

- One day, if you know that your patients are going to die, what will make them be happy at that moment?

Advance directive (an optional topic, probably cutting off)

- What do you think if the patient does a written declaration of his/her intention on life sustaining treatment (withdraw or withhold lived supporting machine, life saving medication to prolong life or cardiopulmonary resuscitation) in case the patient is unconscious and critically ill at the end of life?