

# **RESEARCH REPORT**

**UNDERSTANDING THE DEMAND FOR MEDICAL CARE BY THE  
ELDERLY IN KEDAH: A PREPARATION TOWARDS  
POPULATION AGEING.**

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**UNIVERSITY GRANT**

**SHAMZAEFFA SAMSUDIN**

**NOREHAN ABDULLAH**

**SHRI DEWI A/P APPLANAIDU**

**NOR 'AZNIN ABU BAKAR**

**LIM HOCK EAM**

**RAHIMAH MAJID**

**UNIVERSITI UTARA MALAYSIA**

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### **Group leader:**

---

Dr. Shamzaeffa Samsudin

### **Members:**

---

Dr. Norehan Abdullah

---

Dr. Shri Dewi A/P Applanaidu

## **Members**

---

Assoc. Prof. Dr. Nor ‘Aznin Abu Bakar

---

Assoc. Prof. Dr. Lim Hock Eam

---

Assoc. Prof. Rahimah Majid

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*Shamzaeffa Samsudin*

*Norehan Abdullah*

*Shri Dewi a/p Applanaidu*

*Nor 'Aznin Abu Bakar*

*Lim Hock Eam*

*Rahimah Majid*

School of Economics, Finance and Banking

UUM College of Business

## ABSTRACT

Understanding factors that affect health care demand by the elderly is vital for a health system to be more responsive in providing care to this special group. Since health care demand studies at micro level are rather limited within Malaysia context, this research attempts to reduce the gap by focusing on elderly demand. The objectives of this study are to (i) profile the medical care utilisation of the elderly by demographic factors, (ii) identify the existence of income-related inequity in health care utilisation among older age groups, and (iii) identify the role of living arrangements of the elderly on health care utilisation among the elderly in Kedah state. There are two types of demand used for this study, which are doctor visits and inpatient stays. A multistage cluster sampling was used in selecting the sample for the study. A total number of 399 of respondents aged 62 to 98 were interviewed face-to-face using a structured questionnaire. The probit and Poisson model with robust variance estimates were used in estimating the demand equation. It is found that income, after controlling for other socioeconomic and health related factors, is statistically significant in affecting the likelihood of doctor visits, but not the frequency. There is no evidence of income-related inequity for inpatient stays. The role of living arrangement, as measured by marital status and the number of individual aged 18 and over living together, however, is not so profound. Some control variables, on the other hand, show a significant effect. This is evident that health condition is not the only factor that determines health care demand of the elderly in Kedah state. The findings from this analysis imply that the government's policy to reduce income inequality may indirectly control the income-related inequity in health care demand. In addition, support programs in the community need to be intensified to raise awareness of health and consequently reduce unnecessary visits to health services.

## ABSTRAK

*Memahami faktor-faktor yang mempengaruhi permintaan terhadap penjagaan kesihatan oleh warga tua adalah penting untuk menjadikan sistem kesihatan lebih responsif dalam menyediakan penjagaan kepada kumpulan khas ini. Dalam konteks Malaysia, kajian mengenai permintaan terhadap penjagaan kesihatan di peringkat mikro agak terhad, oleh itu kajian ini cuba untuk mengurangkan jurang tersebut dengan memberi tumpuan kepada permintaan oleh warga tua. Objektif kajian ini adalah untuk (i) melihat profil penggunaan penjagaan perubatan oleh warga tua mengikut faktor demografi, (ii) mengenal pasti kewujudan ketidaksaksamaan penggunaan penjagaan kesihatan akibat pendapatan di kalangan warga tua, dan (iii) mengenal pasti peranan susunan kehidupan ke atas penggunaan penjagaan kesihatan warga tua. Terdapat dua jenis permintaan yang digunakan dalam kajian ini, iaitu lawatan doktor dan kemasukan ke wad. Pensampelan pelbagai kelompok telah digunakan dalam pemilihan sampel untuk kajian. Dengan menggunakan soal selidik berstruktur, seramai 399 responden yang berumur 62-98 telah ditemubual secara bersemuka. Model Probit dan Poisson dengan anggaran varians yang robus telah digunakan untuk menganggar persamaan permintaan. Setelah faktor sosioekonomi dan faktor kesihatan lain yang berkaitan dikawal, telah didapati pendapatan, adalah signifikan dalam mempengaruhi kebarangkalian lawatan doktor, tetapi tidak kekerapan. Kesan pendapatan adalah tidak signifikan ke atas kemasukan ke wad. Peranan susunan kehidupan, yang diukur oleh status perkahwinan dan bilangan individu berumur 18 tahun dan ke atas yang tinggal bersama, walau bagaimanapun, adalah tidak ketara. Sebaliknya, beberapa pembolehubah kawalan telah menunjukkan kesan yang signifikan. Adalah jelas bahawa keadaan kesihatan bukan merupakan satu-satunya faktor yang menentukan permintaan terhadap penjagaan kesihatan oleh warga tua di negeri Kedah. Dapatan daripada analisis ini membayangkan bahawa dasar kerajaan untuk mengurangkan ketidakseimbangan pendapatan rakyat secara tidak langsung boleh mengawal ketidaksaksamaan permintaan penjagaan kesihatan akibat perbezaan tahap pendapatan. Di samping itu, program sokongan dalam masyarakat perlu dipergiatkan untuk meningkatkan kesedaran kesihatan dan seterusnya mengurangkan lawatan yang tidak perlu terhadap perkhidmatan kesihatan.*

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# CHAPTER 1

## 1 INTRODUCTION

### 1.1 Background of the study

In the 21<sup>st</sup> century, population ageing is one of the most significant trends. This trend can be seen not only in the developed and industrialized nations but also in developing countries. It is progressing fast in developing countries including countries that have a large population of young people. According to United Nations Population Fund (UNFPA) (2012), of the current 15 countries with more than 10 million older persons, seven of these are from developing countries. From the report, it is also found that life expectancy at birth is over 80 years in year 2012 in 33 countries as compared to only 19 countries five years ago. At present, only Japan has an older population of more than 30 per cent and by 2050 it is expected that 64 countries are going to reach that level. The economically active and healthy ageing population is important, as they would endlessly contribute to the advancement of a society.

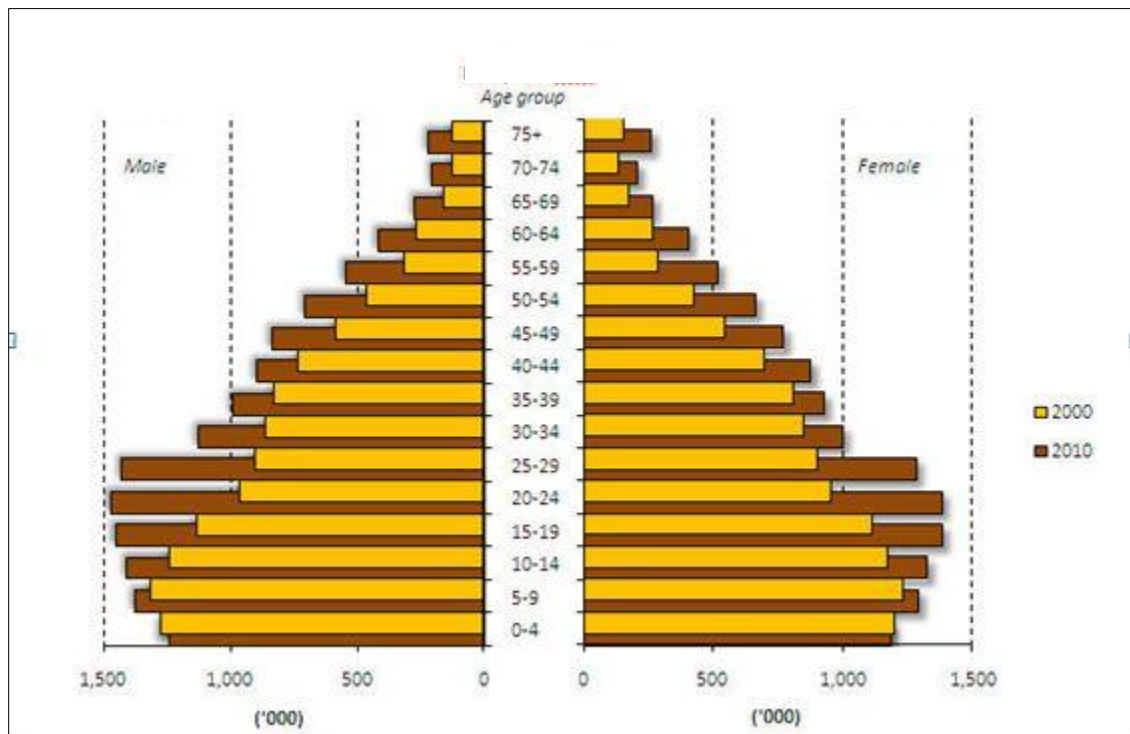
A population is classified as ageing when older people become a proportionately larger share of the total population. Declining fertility rates and increasing survival at older ages have led to population ageing. Ageing is seen as a triumph of development. People live longer because of improved nutrition, sanitation, medical advances, health care, education and economic well-being. It has important and far-reaching implications for all aspects of society. In 2010, Malaysia has about 2.1 million of older persons aged 60 and

above which representing 7.5% of the Malaysian population of 28 million. This number showed an increase compared to year 2000 with 1.45 million older persons or 6.2%. Based upon the projection rate and current trend, the Malaysian population is expected to reach 35 million by 2020, with 3.4 million being senior citizens (Department of Statistics (DOSM), 2011).

The age structure of the population largely depends on the changing trends in fertility, mortality and migration (Rabieyah & Hajar, 2003). The transition from high fertility and mortality rates causes predictable shifts in the age structure of the population in Malaysia. The age pyramid in Figure 1.1 shows the changes that took place during 2000 and 2010 in the age and gender compositions of the Malaysian population. It is clear that in 2010 the proportion of the young population continued to decline while the older age group increased.

The trend in Figure 1.1 clearly shows that there is a need for the nation to prepare in advance, especially in providing adequate facilities, infrastructure and healthcare for senior citizens. As a country that looks ahead, strategic plans using senior citizens as a resource in the course of preparing for the eventuality of an ageing nation.

**Figure 1.1: Number of Population by gender and Age Group, Malaysia, 2000 and 2010**



Source: Department of Statistics, 2011.

## 1.2 Elderly Population and Health Facts in Kedah

Kedah is a state in Malaysia which has a density of 1.9 million people (Bank Data Negeri/Daerah, 2010). It is located in the north part of Peninsular Malaysia. Kedah consists of 11 districts – Baling, Bandar Baharu, Kota Setar, Kuala Muda, Kubang Pasu, Kulim, Langkawi, Padang Terap, Sik, Yan and Pendang. The total land area of Kubang Pasu is 948 km<sup>2</sup>, which is comparatively smaller than that of Padang Terap with land area of 1357 km<sup>2</sup> (Statistik of Kedah Darulaman, 2010). Table 1.2 shows the percentage of population by age group in Kedah.

**Table 1.2: Percentage of Population by Age Group In Kedah**

	2006	2007	2008	2009	2010
0-14 years	33.7	33.5	33.4	33.3	29.3
15-64 years	61.1	61.3	61.4	61.5	64.5
65 years & above	5.2	5.2	5.2	5.3	6.2

Source: Department of Statistics, Malaysia (2009).

Referring to Table 1.2, there is an increase in the proportion of elderly population aged 65 years and above, from 5.2 % in 2006 to 6.2 % in 2010 (a growth of 16.98%). An increasing trend also appeared for the population of 15-64 aged group (a growth of 4.88%), while the population of 0-14 years aged group has decreased over the same period. In terms of population density, in 2010 alone 64.6 % of total population in Kedah are urban population and the remaining 35.4 % are rural population.

**Figure 1.2: Government Health Facilities in Kedah**



Source : Department of Health, Kedah (2011)

Figure 1.2 illustrates the distribution across districts. Throughout the state, there are nine public hospitals as shown in Figure 1.2 labelled as ‘H’. The general or state hospital is Hospital Sultanah Bahiyah (HSB) which is situated in Kota Setar district. It acts as a referral to 12 health clinics in Kota Setar and Pendang vicinity, 8 public hospitals and 11 private hospitals in Kedah. Besides HSB, there are two other hospitals with specialist which are Hospital Sultan Abdul Halim (HSAH) in Sungai Petani (Kuala Muda district)

and Hospital Kulim. The remaining 6 hospitals are classified as district hospitals without specialist. Table 1.3 shows the selected health indicators in Kedah between 2006 and 2010. There are mixed directions of the indicators. Some indicators show a positive improvement every year while some have ups and downs. Among health indicators that have shown a positive move are the dengue rate and percentage of new diabetic patients with diabetes complications.

**Table 1.3: Health Indicators in Kedah (2006-2010)**

<b>Health Indicator</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
Mother's death rate ( / 1000 live birth)	0.54	0.61	0.66	0.6	na
Baby's death rate ( / 1000 live birth)	6.17	6.90	7.20	5.06	na
Children death rate ( / 1000 children 1-4 years)	0.15	0.12	0.13	0.1	na
Percentage of primary school students which does not need dental	59.5%	65.7%	67.20%	67.8%	69.5%
Percentage of secondary school students which does not need dental treatment	82.0%	80.7%	76.90%	76%	82.48%
Cholera rate (number of case / 100,000 population)	0	0.05	0	0	0.10
Dengue rate (Number of case / 100,000 population)	139.4	136.8	87.53	37.45	40.00
Percentage of new diabetic patients with diabetes complications	23%	25%	18.40%	13.3%	12.1%

Source: Statistics of Kedah Darulaman (2011)

The dengue rate fell significantly from 139 cases per 100,000 populations in 2006 to only 37 cases in 2009, but a small increase in 2010 with 40 cases. The percentage of new diabetic patients with complication has also notably decreased from 23% in 2006 to



12.1% in 2010. The overall health care facilities in Kedah are shown in Tables 1.4 and 1.5. While there is no addition of new government hospital in Kedah between 2004 and 2010, the number of private hospitals has been decreased from 12 hospitals in 2004 to only 10 hospitals in 2009 and 2010.

The number of beds in government and private hospitals does not show significant changes. Although the number of beds in public hospitals, on average, has increased between 2004 and 2010, the increase was smaller than the increase in population. For example, in 2004, the ratio of population for every bed in public hospitals is 864 while in 2010, the ratio has increased to 903.

The number of clinics as shown in Table 1.4 also does not show any significant difference. However, the number of medical practitioners has increased every year in both public and private sectors. For example, we can see there is a substantial increase in the number of government doctors between 2004 and 2009. This shows the great effort of the government in ensuring the adequacy of health care supply in the country as the ratio of population per public doctors has also decreased over the years.

**Table 1.4: Numbers of hospitals and beds at government and private hospitals in Kedah (2004-2009)**

<b>HealthFacilities</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>
Government Hospital	9	9	9	9	9	9	9
Number of beds	2097	2109	2109	2214	na	2211	2263
Population:bed ratio (public)	864	876	892	867	na	905	903
Private Hospital	12	14	12	12	11	10	10
Number of beds	425	482	463	463	433	437	524
Population:bed ratio (private)	4266	3834	4064	4144	4522	4576	3901

Source: Source: Department of Statistics, Malaysia (2010)

**Table 1.5: Numbers of clinics and human resources in Kedah (2002-2009)**

<b>Facilities /Year</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	
Health Clinics	57	57	55	53	53	53	51	
Rural Clinics	224	224	224	224	224	224	224	
<b>Medical Profession Services</b>								
Doctors	Government	507	597	853	822	na	1124	1276
	Population: Doctor ratio (Public)	3576	3096	2206	2334	na	1779	1602
	Private	447	457	444	461	na	482	482
	Population: Doctor ratio (Private)	4056	4044	4239	4162	na	4149	4241
Dentists	Government	50	57	71	88	na	113	129
	Private	47	51	47	50	na	51	51
Nurses	Government	2206	2384	2755	3015	na	3187	3428

Source: Department of Statistics, Malaysia (2009, 2010)

By referring to information about an increasing number of aging populations in Kedah and the availability of health facilities in the state, Kedah need an efficient health support system. The question is how much can the state government address the health problems associated with an aging population? What steps should be taken to ensure that health issues among the elderly guaranteed? Thus, an analysis of the demand for health care among the elderly is timely and crucial.

### **1.3 Problem Statement**

With the number and proportion of older persons growing faster than any other age group, and in an increasing range in Malaysia, specifically in Kedah state there are concerns about the capacities of societies to address the challenges associated with this demographic shift in terms of health care demand. The older generation is not a homogenous group for which providing a specific health care fits to all. It is important not to standardize older people as a single category but to recognize that the older population is just as diverse as any other age group, in terms of, for example, age, sex, ethnicity, education, income and health. Each group of older persons, such as those who are poor, women, men, oldest old, indigenous, illiterate, urban or rural, has particular needs and interests that must be addressed specifically through tailored health care providence. It is a need to explore the current ageing population and their medical needs in Kedah.

Is the ageing population a burden to the government, especially in providing health services? This depends on whether the increase in the life expectancy is associated with

more ill-health, disabilities or mobility problems that have been translated into an increase in utilisation of health services or not. The elderly are more prone to health problems such as osteoporosis, heart disease and dementia. Mobility problems are also prominent among the elderly, which includes the ability to walk, climbing the stairs, bathing and dressing or carrying groceries. If these health problems increase the need for health care, one may expect the shortage of health care supply if the health system fails to respond to the rapid changing in demand. Besides, the increase in medical or health care needs will also put extra burden to the government in terms of costs in providing those care. Direct engagement between primary care givers and the elderly are also important as health needs are sometimes hidden, which can either be hidden from the patient or from the doctors. Socioeconomic factors, e.g. income and education level may also significantly influence public care utilisation by the elderly which signify the existence of inequity problem in health care utilisation. This is because health care should, ideally, depending on health status, not socioeconomic factors.

People with poor health status, regardless their socioeconomic background, are expected to utilise health care more than those with excellent health, otherwise we might expect that there might be hidden needs or accessibility problems in the system. In some cases we may encounter that people with excellent health consume more health services than those with health problems.

Therefore a health care demand model is needed in order to identify how health status, type of illnesses, mobility problems, income, education level, gender, marital status or

living arrangements of the elderly or supply variables affect the demand. Analysis of demand is very important for formulating policies and strategies for the health sector as it will promote appropriate utilisation of the resources and financial stability as well as to improve the well-being of the people. Though health care demand model has been developed and discussed lengthily in health care literature, within Malaysia framework especially in Kedah state, it is yet to be explored and developed.

#### **1.4 Objectives of the Study**

The overall objective of the study is to model the demand for health care by the elderly within Malaysia framework, specifically in Kedah state.

The specific objectives of this study are:

- i) to profile health status and medical care utilisation among the elderly group;
- ii) to identify the existence of income-related inequity in health care utilisation among older age groups;
- iii) to identify the role of living arrangements of older age groups on health care utilisation

#### **1.5 Significance of the Study**

Studies on health care demand by the elderly are important for the health system to be more responsive in providing health care to those needed. The number and proportion of people in older populations in many countries has increased over time as a result of an increase in the life expectancy and decrease in mortality rate. The model will be useful for MOH, LPKN, Ministry of Higher Education (MOHE) and also the elderly as well.

## **1.6 Organization of the Study**

The study comprises of five chapters, which are organised as follows: The following chapter (Chapter 2) reviews literature on ageing and the relationship with health care demand. The methodology employed in the study and the data utilised in the analysis are described in Chapter 3. The penultimate chapter (Chapter 4) presents the findings of the study. The concluding chapter (Chapter 5) summarizes and highlight some policy implications from this study.

## CHAPTER 2

### 2 LITERATURE REVIEW

#### 2.1 Introduction

Based on the definition in the Mosby Medical Encyclopaedia (cited in Santerra & Neun, 2007), health is defined as “a state of physical mental and social well-being and the absence of disease or other abnormal condition”. In economics, health is viewed as a durable good, which is ‘good health’ as suggested by Grossman (1972) in his model of demand for health. People demand health for both as a consumption commodity and as an investment commodity. Individuals consume health care to improve their stock of health and stay healthy.

Assuming that individual are endowed with a given health capital which varies among individual, an individual would invest in health care services to increase his or her health capital. This health capital according to Grossman depreciates with age at an increasing rate and its level may be increased by investing in health care services. Since health care and other health inputs are demanded to produce health, it implies that demand for healthcare is a derived demand. Health care consists of various goods and services that maintain and promote physical, mental and social well-being of individuals. Examples of health care goods and services include prescription drugs, dentures, surgeries, medical consultations and examinations, and treatments. Health care is an input in the production of health and as such, the consumption or utilisation of health care will therefore depend

on several factors. Among the factors are age, gender, education, lifestyle, health status and supply factors. The demand for health and health care services has attracted considerable interest in recent years because of the increase in health expenditures and because of the rising cost in health sector. In the past few decades, the share of the elderly in the total population has increasing in both the developed and developing countries.

The elderly are said to be the heavy users of health services because they are more prone to health problems – noncommunicable and chronic health disease. This would mean that the elderly needs various types of health care services. Therefore, it is crucial to understand and analyse the determinants of health care demand by the elderly. In the following section, the determinants of health care demand in general and by the elderly in particular will be reviewed, followed by the methods of analyses used in health care demand studies in the literature.

## **2.2 Determinants of Health Care Demand**

Based on the behavioural model of health services utilisation, factors that influence the demand or utilisation of health care can be divided into three main groups, which are predisposing, enabling and need factors (Aday & Andersen, 1974; Andersen & Newman, 1973). Predisposing factors is individual characteristics that exist within individuals before their illness, and accordingly this reflects the tendency for some individuals to utilise more health care services than others. The variables include age, gender, religion, educational level, marital and retirement status, and living arrangement. The enabling



factors describes the means or conditions that facilitate individuals in obtaining care such as income, occupation, insurance coverage, transportation and health care supply. Individuals that have sufficient resources will more likely to use health services. While the need factors refer to factors that have direct influence on health care demand. Individuals must perceive some need that stimulates them for using health services. The need for care could be self-perceived or evaluated health conditions that require medical attention.

### *2.2.1 Predisposing Factors*

It is observed that individuals with different demographic and social-economic characteristics will lead to a distinct lifestyle. Different lifestyle does have an influence on individuals' health conditions, and therefore, types and amount of illness will vary among individuals and so does the utilisation of health care services.

#### *Demographic Factor*

Age and gender are considered as the important factors influencing demand for health care. When people grow older, they will be more vulnerable to ill-health and chronic diseases. As suggested by Grossman (1972), health conditions of individuals deteriorate with age and the deterioration rate is increasing as they grew older and they tend to demand for health care in order to increase their health capital. Hence, a direct relationship should be observed between age and the demand for health care. However, the effect of the age variable should be interpreted carefully and cannot easily be compared between studies as different studies concentrate on different age-groups.

A positive relationship between age and health care demand has been confirmed in some studies (for example Laroche, 2000; Pohlmeier & Ulrich, 1995; Wolinsky; Coe, Miller, Prendergast, Creel, & Chavez, 1983; Evashwick, Rowe, Diehr & Branch, 1984; Deb & Trivedi, 1997; and Windmeijer & Santos-Silva, 1997). Pohlmeier and Ulrich (1995) study on the demand for health care services in Germany employs variables such as gender, age, sex, marital status, and education to capture the predisposing factors, and income, private medical insurance, and employment to capture for access to medical services (enabling factors). They found a strong convex relationship between age and health care utilisation – general practitioner (GP) and specialists, in which the number GP visits increases for age above mid-thirties while number of visits to specialist is at minimum at age 46. However, by using hurdle model the relationship between age and visits to GP is only for the contact decision, and visits to a physicians does strictly increases with age.

Windmeijer and Santos-Silva (1997), and Laroche (2000) seems to also agree with Grossman's that age to be positive significant explanatory variable which suggest that health deteriorates as one gets older. Deb and Trivedi (1997) result indicates that age increases with hospital stays but hospital outpatient visits decreases with age. Nevertheless, Sarma (2009) result suggests the opposite whereby age is generally insignificant for both GP and specialist visits. The ageing population and the changing age structure of the workforce is said to also influence the rate at which services are provided. Watson, Reid, Roos and Heppner (2004) evaluates whether demographic changes among patients and family physicians have any influence on the utilisation rate

and physician-to-population ratio. Using billing-, demographic- and encounter data from Winnipeg, Watson et al. (2004) evaluate any changes in utilisation and physician workloads between 1991/92 and 2000/01. They find that the age structure of the Winnipeg population changed dramatically, as the younger proportion declined and the older proportion increased. Age-specific visit rates grew among the older population and declined among the younger. However, actual visits to family physicians declined 3% over the 10-year period, even though one would expect a 2% increase if age-specific rates of use in 1991/92 were applied to predict utilisation of physicians ten years later.

Reinhardt (2003) whose study is based on the Medical Expenditure Panel Surveys (MEPS) data in the US, he finds that "the aging of a nation's population by itself is not likely to be a major driver of increases in the demand for health care and of national health spending." If only the age structure of the population changes over the period 2000-2030, holding all other things constant, the average annual per capita health spending would be projected to grow at an average annual compound growth rate of 0.4 %.

Looking at the per capita health expenditures in different age groups, some studies found that per capita health expenditures among the oldest-old (those aged 85 years and above) are the highest among the other age group in the elderly population. Fuchs (1998) reports that the oldest-old group of the elderly in the US spends two times higher than those in the age group 75- 84 and three times higher than those in the age group 65-74. Other similar studies also included age in their analysis, for example in the OECD countries,

Canada (Marzouk, 1991), and England and Wales (Seshamani & Gray, 2002). Mahal and Berman (2001) provides a review of previous studies on the relationship between ageing and health spending in developed countries and the methods used in assessing and projecting the impact of ageing population on future health expenditures. Evidence shows that per person health expenditures among the elderly are increasing in age and the rate of increases are greatest for the older groups.

As for gender, evidence from the studies that include gender in their estimation show that female demand more health care services than men due to childbearing do, and certain diseases are more common in women than in men. Sarma and Simpson (2006) findings on the utilisation of different types of health care in Canada, and Windmeijer and Santos-Silva (1997) estimates on the number of visits to the doctor in the United Kingdom give support to this argument where they found that females are more frequent users of health services than men.

Disparities between genders in access to health care services have been studied in several countries. The time constraints and opportunity costs faced by women are higher than for men thus deterring them from accessing health services. Women usually need their husbands' permission to seek health care and they also do not have easy access to household funds. Study by Mwabu, Ainsworth and Nyamete (1993) found that distance and user fee were both factors that reduced demand for health care but men were less constrained than women. Meanwhile Hutchinson (1999) found that an increase in a

woman's earning in a household resulted in a decrease in the use of modern curative services, which this reflect a greater value for her work than the time spent seeking care.

### *Socio-economic Characteristics*

Education, marital status, employment status are the important determinants of health care demand and its effect have been studied in many studies. Education contributes to health by equipping people with knowledge and improves people's ability to understand the importance of avoiding unhealthy behavior and the ability to make use of the services available. As such, more people that are educated tend to get a specialist service rather than a general practitioner. On the other hand, those with higher education would be able to improve their health efficiently, and therefore they demand less health care. This argument is in line with Grossman's proposition that education is assumed to increase the productivity of producing health.

Some studies show a direct relationship between education attainment and the demand for health care. Guralnik, Land, Blazer, Fillenbaum, and Branch (1993) showed that education is one of the most important factors influencing good health and life expectancy. The result of the study suggests that education has a positive impact on life expectancy among older adults. Life expectancy of 65 years old adults with at least 12 years of education is three years longer than those adults of similar age but with less than 12 years of education. Ssewanyana, Nabyonga and Lawson (2006) in their study on Uganda found that the higher the level of education, the higher the probabilities of seeking modern health care. Similar empirical evidence was also found in Dev and

Trivedi (1997). While Pohlmeier and Ulrich (1995) and Windmeijer and Santos-Silva (1997) find that higher education reduces the contact decision for doctor visit and increases the visit to specialist. Laroche (2000) suggests that people with lower educational attainment are much more likely to consult general practitioners or be hospitalised than are those with higher education. This finding contradicts that of Lim, Jacobs and Klarenbach (2005), who conclude that lower education is associated with less use of health care services. Gertler and Van der Gaag (1990) show that for both adults and children, the level of education has a non-significant impact on the use of modern health care.

Marital status is no less important in the health care demand model and has been included some studies. It is found that being married may increase or decrease the demand for doctors. Sarma and Simpson (2006), Deb, Munkin and Trivedi (2006) and Nandakumar, Chawla and Khan (2000) found that marital status increases the probability of doctor visits and GPs, while some studies (for example Gurmu, 1997; Windmeijer & Santos-Silva, 1997; Gerdtham & Trivedi, 2001; and Dev & Trivedi, 1997) reported the unimportance of marital status on utilisation of health care. In Wan and Odell (1981) study, marital status had some adverse effect on health. Widower, divorcee or being separated tends to visit the physician more often than individual who never married or married. So as in the case of those living alone, results show that they had more visits to the physician compared to those who lived with others.

Employment has a significant effect on a person's health. Some researchers argue that employment may cause poor health based on the intuition that employment tends to reduce the amount of leisure spent on health-producing activities, increase work-related accidents and work-related stress. Pohlmeier and Ulrich (1995) agree to the fact that working place characteristics does have significant effect on visits to a general practitioner. They found that less physical work, little stress and high self-determination leads to a fewer visits to general practitioner. However, when other variables of working conditions like shift work, night shift, work experience or hazardous environmental conditions were tested, no significant impact of these variables on health care utilisation is found.

Some researchers point out the importance of other variables on health care demand, for example, the distance to a health care provider. Time costs include the cost of travel to and from a health provider, waiting time and the delays in getting an appointment. A study in Eastern Africa, Bryant (1972) reports a close correlation between the proximity of health facilities and their use. He found that in Uganda, the average number of outpatient visits per person to health facilities reduced by half for every 3.2 km in the case of a hospital, every 2.4 km in that of a dispensary, and every 1.6 km in the case of a first-aid post.

WHO (1989) asserts that the amount of costs borne by the patient depends on several factors, among them the proximity of the health establishment and the number of steps a patient has to go through to receive drugs or care. The negative impact of distance on

health care demand has also been highlighted by Novartis Foundation (2003) in a study conducted in the Ségou region of Mali and by Sarma (2009). Being relatively far away from health centres is a constraint to seeking modern health care. Acton (1975) also point out the important role of non-monetary factors, such as the distance to the health facility and the time taken to receive treatment. Households are loath to consume health care if this consumption is time-consuming: the opportunity cost of that time is simply too high. This result is confirmed Dor, and Van der Gaag. (1988) in the Côte d'Ivoire. In the absence of user fees, health care is rationed by distance to the care.

Besides all of the above determinants, the quality of modern health care also has been identified as a key determinant of its use. Indeed, a number of studies have concluded that improvement of the quality of health facilities would lead to increase in the number of people visiting them for medical care (Gilson, 1997; Baltusseen et al., 2002; Nyonator and Kutzin, 2003; Levy-Bruhl et al., 1997; Audibert and Mathonnat, 2000; Meuwissen, 2002; Chawla and Ellis, 2000; Fournier and Haddad, 1997).

### ***2.2.2 Enabling Factors***

The enabling variables will determine access to health care, and may cause variation in their pattern of health care utilisation. The ability of a person to utilise health care depends on their financial capability that may come from family resources like income and community resources. Income is another variable that affects the demand for health care. Types of income that were used in previous empirical studies include family income, personal income, equivalised income and household income. Higher income



increase individuals' purchasing power, and should allow them to demand and utilise health services, and thus enjoy good health. Alderman and Gertler (1989), in their study indicate that individuals from households with a relatively high income stand a higher probability of seeking medical care than those from poor households.

Lim et al. (2005), in their study also reveal a link between income and health care utilisation. High-income individuals were more likely to seek medical attention from several practitioners than people earning less than \$30,000 per annum. They were also less likely to report suffering from long-term activity limitations than were individuals with lower income. This suggests that there might exist barriers to appropriate care for low-income groups. While in Laroche (2000), higher incomes and educational attainment are linked to better health. People with higher incomes were also less likely to report suffering from long-term activity limitations than were individuals with lower income.

This is an interesting finding when compared to the results of Lim. Do individuals with higher income have overall better health, or do they feel better because they visit the doctor more often? Lim's results suggest the latter while Laroche's findings reveal no role for income in the use of health services. One possible factor explaining the different results may be the fact that the two independent studies were conducted several years apart. Another reason may be that Laroche uses expected income as an independent variable in estimating utilisation of health care services. She regresses income on a number of explanatory variables such as sex, occupation and marital status. The expected income

term is used as one of the explanatory variables in estimating the utilisation of physicians. This is in contrast to Lim who uses total personal income in determining the utilisation of health care services. On the other hand, some researchers came to a conclusion that high income reduces the utilisation for specific health care services but not others. In Italy, Atella, Brindisi, Deb and Rosati (2004) suggest that high income people are less likely to visit GP as this group prefer private specialist than GP. Studies in Germany also suggest the similar effect that high income people prefer services by specialist than GP.

In recent studies, the importance of income on demand for health care has diminished with the increase in the availability of insurance coverage. Windmeijer and Santos-Silva (1997) finds that the effect of income is non-linear, in which health care demand is lower in both the higher and lowest income groups. Sarma and Simpson (2006) in their study found an insignificant role of family income in determining health care utilisation, and the same conclusion was also suggested in Dev and Trivedi (1997). Akin, Griffin, Guilkey and Popkin (1986) found that income did not significantly determined the choice of health care facilities in Phillipines, and Heller (1976) who studied for Malaysia also found the same conclusion.

It is also important in understanding the equity issues in health care utilisation. Even when there is evidence of significant impact of income on health care utilisation, there might be evidence of inequity as utilisation should be based on the needs rather than other factors. Van Doorslaer, Masseria, and Koolman (2006) study on income equity study in Canada, they find that low-income groups are more intensive users of the health

care system than higher income groups in most OECD countries. They also find that higher income people are more likely to seek specialist care than lower income people. Using self-reported health levels, age and sex as proxies for standardized doctor's visits; van Doorslaer measured inequity in utilisation of health care by disposable income. For Canada, higher income people have a higher probability of seeing a doctor than for lower income people given the same need.

In addition, there is a pro-rich tendency as regards to the probability of contacting a specialist. However, regarding indices for conditional number of visits (mean doctor visit frequency), Canada's pattern favours the poor among those with at least one visit per year. Similar results can be found for specialists and GPs – once people do see a practitioner, low-income people are more likely to consult more often. Nevertheless, for medical specialists, the distribution is significantly in favour of the higher income groups. This research paper suggests that socio-economic differences in utilisation are not trivial and appear to translate into different outcomes by income.

Another enabling factor that has a substantial influence on the demand for health care is insurance coverage. Health insurance determines the level of access, and the availability of health insurance increases the demand for health care. Therefore, this variable is often included in studies that are based on public-private health care financing system. Research has shown that individuals with health insurance tend to consume more health care services than those who had no insurance. In Deb and Trivedi (1997) study, utilisation of health care services (physicians and non-physicians) in an office and out-

patient setting is higher for those with supplementary private insurance than individuals without extra coverage. Sarma and Simpson (2006) found that insurance has significantly determined doctor utilisation for healthy users and insignificant for the less healthy. Some studies found that there is no significant effect between the insured and uninsured or between types of insurance. Wan and Odell (1981) study on the elderly in Baltimore County, Maryland found no relationship between insurance coverage and physician visits as most of the respondents are covered by Medicare, Medicaid, or private insurance. In other studies, in which the datasets are based on tax-financed system, such as Italy, UK, Sweden, Portugal and Spain, the role of insurance status in health demand is not prominent, and do not include an insurance variable in their analysis.

Health care utilisation may also be influenced by the supply variables such as hospital beds and physician density per certain number of population. The inclusion of the supply side variables is important in order to determine whether supply variables have significant effect in inducing more demand, thus supporting the hypothesis of supply-induced demand. Sarma and Simpson (2006) and Pohlmeier and Ulrich (1995) tested the hypothesis, and they found a positive impact of physician density on the utilisation of non-hospitalization health care. Gurm (1997), on the other hand, uses the availability level of health services by rating them between 0 (zero) for low access to 100 (hundred) points for high access but found no significant different between access level.

### ***2.2.3 Need Factors***

The need variables capture the need for the use of health care services, and is measured by symptoms of illness perceived by individuals. Due to operational problems, many

studies use proxies to represent need factors such as self-reported health, functional limitations, or perceived health levels. Health status is the most important variable that determines the utilisation of health care. Measures that were used by most researchers in their study are self-perceived health, number of chronic diseases, and disability status. Pohlmeier and Ulrich (1995) finds a significant positive relationship between health status and demand for health care when their results show that individuals' with chronic disease visits to GP is 72% higher than those with no chronic complaints.

Evidence obtained by Santos-Silva and Windmeijer (2001), and Dev and Trivedi (1997) are also consistent with that of Pohlmeier and Ulrich (1995). They found that self-perceived health increase the number of physicians visit in an office setting, and disability has an influence on the emergency rooms and inpatient care. Results obtained by Dunlop, S, Coyte and McIsaac (2000) and Sarma and Simpson (2006) also indicate that self-perceived health status and number of health problems were the variables most strongly associated with both visits to GPs and specialists.

In another study on the utilisation of health care services by the elderly in Taiwan, Liu, Tian and Yao (2012) focused on the elderly persons with National Health Insurance. Using latent class analysis, they examined the effect of different health profiles on the utilisation of health care services and the associated factors. Health status indicators were measured by health conditions, limitations, and functional impairments. Four health profiles were identified and they found that different health profiles of the elderly have a significant effect on the utilisation and expenditure on health care services. The high

comorbidity group tends to utilise more services in the ambulatory care than the relative healthy group, while the functional impairment group had relatively high probabilities of needing care assistance. In terms of expenditure for in-patient care, the frail group accounted higher health care expenditures.

### **2.3 Method of Analysis**

The nature of data on health care utilisation may have an influence on the modeling techniques used in empirical studies. Individual's choice of whether to seek for health care or not depends on their health conditions, which will then determine the utilisation of health care services. Since people seek medical care when they get sick, the data available are characterized by a high proportion of zero counts that came from those who do not need to visit a doctor or other types of services. Also, the data for those who provides information on the needs for health care services (positive observations) tend to skewed towards zero. Further, health care is a heterogeneous commodity as there are differences among the types of health care services.

In due to these issues, previous empirical works have used a variety of specifications to estimate health care demand. In most empirical studies, the estimation technique employed is related to the count data framework that utilises Poisson or negative binomial specification. Winkelmann (2004b) used Poisson and negative binomial (NB) specification in evaluating the health care reform and demand for doctor visits in Germany between the periods of 1996–1998. As Poisson model does not allow for unobserved heterogeneity which may cause overdispersion, and ignores the panel

structure of the data, Winkelmann applied probit-Poisson-log-normal model and finite mixture models. The parameters in the model were estimated using maximum likelihood. In another study paper, Winkelmann (2004a) also used Poisson and negative binomial models. The parameters are estimated by pseudo-maximum likelihood.

Sarma and Simpson (2006) provide an overview of different econometric methods suitable to model utilisation of health care services. Since a large proportion of zeroes characterize the distribution of doctors' visits, the conventional normal distribution underlying OLS regression may not provide the best theoretical basis in estimating utilisation. To find the best-suited econometric specification, Sarma and Simpson (2006) test the performance of three models: the zero inflated negative binomial models, the hurdle model and a latent class model characterized by two latent classes. It is the latter model that performs the best for doctor and GP visits; therefore, this model is used to estimate utilisation of health services.

The latent class model allows for modeling unobserved heterogeneity across individuals, splitting the population into different health groups, in this case one for high health care users (the less healthy) and one for low users (the healthy). Other methods of analyses being employed are the multinomial logit which is used by Deininger and Mpuga (2003), Lawson (2003) in Uganda, Mbanefoh and Soyibo (1994) in Nigeria, Akin et al. (1986) in the Philippines, multinomial probit used by Akin et al. (1995) in Nigeria, nested logit framework used by Lindelow (2002) in Mozambique, Sahn, Younger and Genicot (2003) in Tanzania, and Mwabu et al. (1993) in Kenya. By using the multinomial logit model,

problem exists as it suffers from the Independent Irrelevant of Alternative (IIA) restriction, where the IIA property assumes that all alternative subgroups are not correlated at all and the cross price elasticities are constant across subgroups, and as such it leads to biased estimates.

Later studies then have employed alternative specifications that are not restricted by the IIA property, which includes the multinomial probit and nested logit. The nested multinomial logit model which is an extension to the simple multinomial discrete choice model has been used by many researchers as their framework for estimation of health care demand. It allows correlation among similar subgroups but not with sub-groups of differing alternatives such as no care or self-treatment. Mwabu et al. (1993) also used the same framework to estimate an indirect utility function of health care demand for the case of Kenya.

Deb and Trivedi (1997) proposed the finite mixture model as an alternative method of modeling health care utilisation. They argue that the FMNB is a better approach to model health care use as the technique distinguishes between users and non-users of health care. Pohlmeier and Ulrich (1995), and Gurmu (1996) has performed two-part negative binomial distributed hurdle model. While Bago d'Uva (2006) study explores different approaches of econometric models using data from the Rand Health Insurance Experiment, United States: the hurdle and finite mixture negative binomial model (FMNB); FMNB-Pan and FMH-Pan for the panel data models.



## **2.4 Conclusion**

This chapter provides the review on health care demand in the literature. The review reveals the variables and methods that are commonly employed in previous studies pertaining to the demand and utilisation of health services. The determinants of health care demand can be categorized into three main categories: the predisposing, enabling, and need variables. Among the variables included in most studies to account for these categories are demographic and socio-economic factors, income, insurance coverage, supply side variables, and health status. While the types of health care utilisation that commonly used in the literature are general practitioner (GP) and specialist utilisation. Empirical studies indicate the importance of health status in determining the utilisation of health care services. However, other variables that affect the demand for health care are found to have mixed results. As for the modelling techniques used in previous studies, count data framework is frequently employed mainly the negative binomial models, hurdle model and finite mixture model.

## CHAPTER 3

### 3 RESEARCH METHODS

#### 3.1 Introduction

Our analysis begins by first presenting the theoretical framework of health and health care demand in Section 3.2. The processes of data collection and the selection of variables are discussed in Section 3.3 and 3.4 respectively. Section 3.5 explores the data using the descriptive approach in order to identify the distribution of health and health care variables. The empirical specification is discussed in Section 3.6.

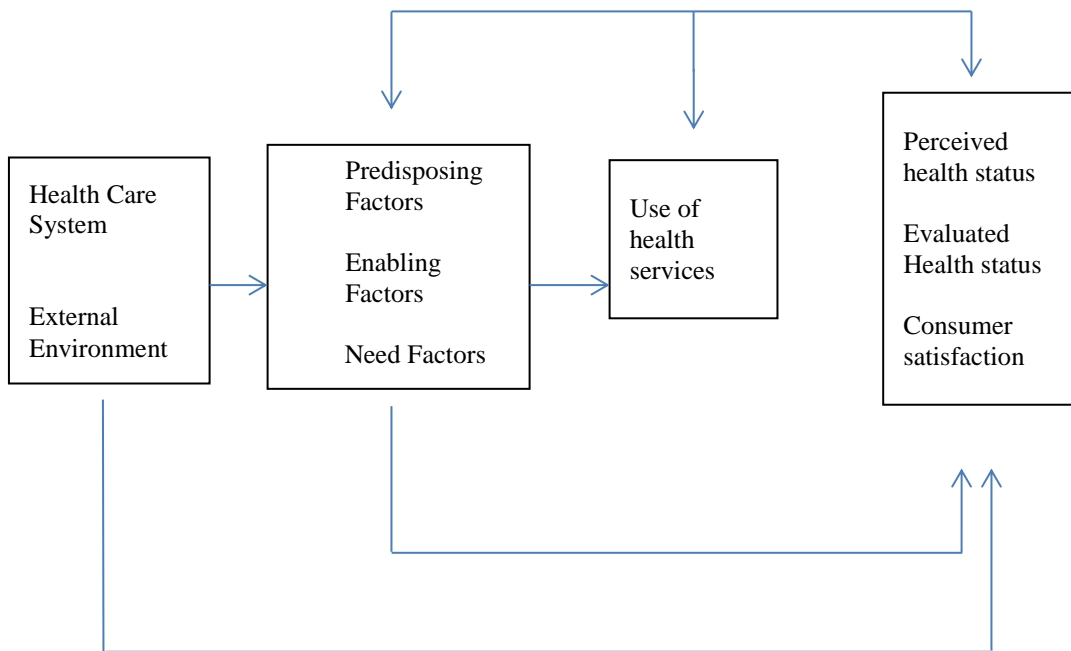
#### 3.2 Theoretical Framework

In order to understand the determinant of health care demand by the elderly, one need to first understand the concept of health production. This is due to the fact that demand for health care is mainly derives from the condition of one's health. Many studies on health demand have referred to the work of Grossman (1972) . According to Grossman model (GM), one derives utility based on the intertemporal utility function that depends on the total consumption of healthy time and total consumption of other goods. Health in this model is discussed in the light of human capital theory where health capital is subject to depreciation overtime. Depreciation rate depends on the age of a person and this is an indication that the stock of health will deteriorate when one grows older. This stock, however, can be improved via investment activities such as consuming medical care and healthy food, engaging in healthy lifestyle and avoiding health-damaging activities such

as drinking (alcohol) and smoking that would decrease the health stock. Therefore, the demand for medical care is essential in coping up the loss in health capital. The health care utilisation framework by Aday and Andersen (1974) has been used as a foundation for empirical analysis in this study. The framework, as shown in Figure 3.1, provides a useful guide in understanding the important variables in utilisation process. Generally, factors that influence utilisation of health care can be divided into three main groups, i.e., predisposing, enabling and need factors. Predisposing factors is individual characteristics that exist within individuals before their illness, e.g., socio-cultural characteristics, beliefs, age and gender.

Enabling factors consist of logistical aspect of obtaining care, e.g., income, insurance availability and health care supply while the need factors are factors that have direct influence on health care demand. Need could be self-perceived or evaluated health conditions that require medical attention. The ability of a person to utilise health care depends on the resources that available to him or her, that may come from family resources like income and community resources.

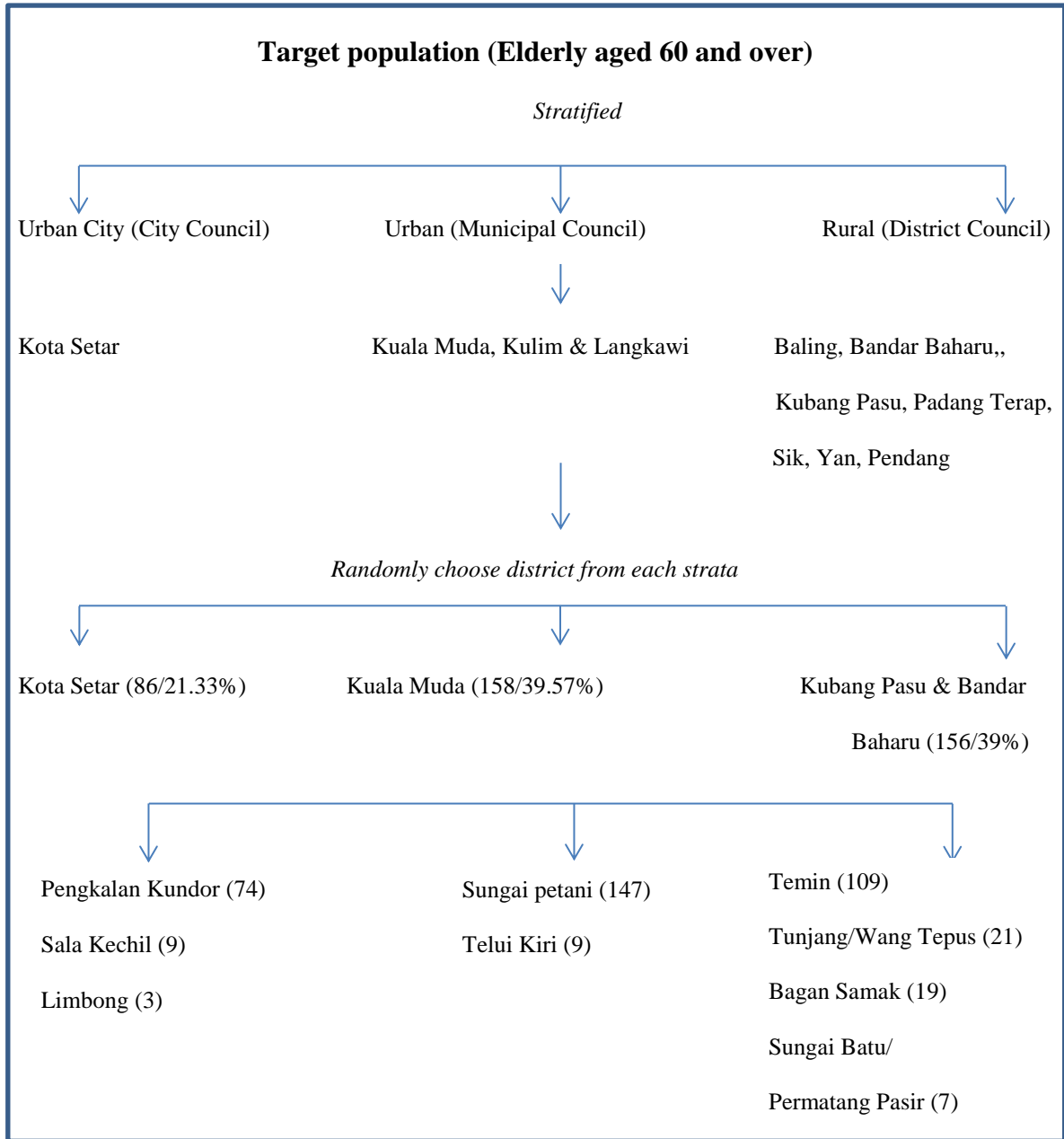
The utilisation of care that will be focused in this study consists of two types – the doctor visit (for outpatient care) and inpatient care. Independent variables are selected based on the review in Chapter 2. These variables are divided into three main groups that we will presented later in this section.



**Figure 3.1: Aday & Anderson framework for medical care access**

### 3.3 Data

This study concentrates on health care utilisation in the state of Kedah. The multistage cluster sampling was used in selecting the sample for the study. The process is diagrammatically shown in Figure 3.2. All districts in Kedah were first divided into three strata, based on the status of the municipal council of the district: urban city (City Council), urban (Municipal Council) and rural (District Council). Next, one district (two in the case of rural), was randomly selected from each stratum. The number of respondents chosen was proportionate to the number of total population in each stratum. Later, for all districts chosen, the *mukims* (sub-districts) were listed down and arranged in ascending order based on the number of population. We later picked the sub-district at the top, median and bottom of the list.



**Figure 3.2: Sampling process**

The next stage was to select the targeted area. By selected mukim, all housing estates and *kampung* (village) have been listed out. The list was furnished by the Municipal Council of each district. At this stage, the quota sampling technique was used based on the number of respondents determined in the previous stage. Each numerator had randomly picked one living quarter from the listed kampung or housing estate to find the first respondents aged 60 and over, followed by the next house and so on. If the house has no occupant of that age group, the next house would be selected. The number of respondents by district and mukim are shown in parentheses in Figure 3.2. The survey was conducted in October 2012. A total of 400 respondents were interviewed face-to-face using a structured questionnaire<sup>1</sup>.

### **3.4 Selection of Variables**

#### *Dependent variables*

There are two health services modelled in this study which are doctor consultation/visit (DOCTOR) and overnight hospital admission (INPATIENT). In this study, these two services represent the demand for formal health services of the elderly. The reference period for reporting is one month before the interview taken place for DOCTOR and twelve months for INPATIENT. Respondents were asked if they had ever visited a doctor or were hospitalised in the month (12 months for INPATIENT) before the

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<sup>1</sup>Questions/items in the questionnaire were adapted from the Malaysia Health and Morbidity Survey III and British Household Survey 2006. The questionnaire was pre-tested before the fieldwork is carried out.

interview. For doctor visit, the number of visits (N\_DOCTOR) was also asked which permits us to utilise, besides logistic model, the count data model.

### *Exploratory variables*

Exploratory variables have been selected based on the literature discussed in Chapter 2. Exploratory variables are divided into three main categories based on Aday & Anderson (1974) framework. These three categories are known as predisposing, enabling and need factors. Predisposing factors consist of inherent factors that exist within individuals and other socioeconomic factors that we assume exist prior to illness. In this study, the predisposing factors are age, gender, ethnicity, education level and economic activity. The engagement in exercise activities, diet and smoking behaviour are also included in this category as proxies of individual attitude towards health care seeking behaviour. They measure, controlling other factors, the direct effect of individuals' attitudes toward health care. We presume that those who exercise and vegetarians are among those with positive attitudes towards health and health care, and those who smoke are the opposite.

Other factors that include individual, family and community resources that are able to influence health care use are categorised as enabling factors. We include marital status, income, living arrangement, social capital, medical insurance, district, over-the-counter (OTC) market and alternative care in this category. We include marital status and living arrangement as enabling factors rather than in predisposing factors because we want to identify the role of partners or family members as a source of alternative care to formal care or it can be treated as a source of moral support to individual in seeking care.

Social capital is measured by the informal interaction with the community and the level of trust placed for the society. The district variable is included as a proxy for health care supply or it can also be considered a predisposing factor if it represents the overall socioeconomic status of the people. The over-the-counter services and alternative health care which represent supply of care may act as a substitute or complementary to doctor visits.

The last category according to Aday & Anderson framework is the need factors. Factors that represent the need for medical care may include perceived need by individuals or evaluated needs by medical provider. Need factors used in this study comprises three self-reported health conditions, i.e. self-assessed health status, the existence of longstanding health problems and the highest three types of health problem reported. The definition of each variable is explained in Chapter 4.

### **3.5 Descriptive Analysis**

Prior to empirical analysis of health care demand, this section begins by presenting the profile of the health status of the respondents. This is because health care demand is mainly derived from the condition of health. In this study, health status is measured by self-assessed health (SAH) and the prevalence of longstanding illness. The distribution of health is also presented by gender and age group. This is followed by the frequency distribution and pattern of health care utilisation by gender, age-category and ethnic group. There are four types of utilisation considered for descriptive analysis which are doctor visit (DOCTOR), alternative care and traditional healers (ALT), ward admission



(INPATIENT) and the utilisation of over the counter (OTC) market. Respondents were asked whether they had utilised these services over the reference period. The reference period of all services is one month before the interview except for admission which is twelve months. Then, the summary statistics of dependent and exploratory variables for the empirical models are presented.

### 3.6 Empirical Specification

#### 3.6.1 Probit Model

The probit model is used to estimate the demand of elderly on health care. Assume that for each elderly, there is a latent variable that represents his or her unobserved demand on health care. This unobserved demand is associated with variables such as socio-demographic characteristics of the elderly ( $x_i$ ). Let  $y^*$  represent this latent variable and assume that  $y^*$  is a linear function of  $x_i$ , then,

$$y_i^* = \sum_{i=1}^n \beta x_i + u_i \tag{3.1}$$

where

$y^*$  = unobserved demand on health care

$x$  = independent variables

$u$  = error term

Let  $y$  be the random variable that represents the observed outcomes such that value of  $y$  is observed as:

$y = 1$  if the elderly seeks outpatient medical treatment (during the last one month)

= 0 if otherwise

Assume that the error term in the latent equation (3.1) follows a normal distribution, we have the probit model. The probability that the elderly have observed outcome of demand for health care ( $y=1$ ) or otherwise ( $y=0$ ) is given as below:

$$\begin{aligned}\text{Prob}(y = 1) &= \text{Prob}(y^* > 1) = \text{Prob}(x'\beta + u > 0) = \text{Prob}(u < x'\beta) = \Phi(x'\beta) \\ \text{Prob}(y = 0) &= 1 - \text{Prob}(y = 1) = 1 - \Phi(x'\beta)\end{aligned}$$

The  $\Phi$  is the cumulative standard normal distribution function. The maximum likelihood parameter estimates (MLE) are obtained by maximising the following log likelihood function with respect to  $\beta$ :

$$LF(\beta) = \sum_{i=1}^n y_i \ln(\Phi(x'_i \beta)) + (1 - y_i) \ln(1 - \Phi(x'_i \beta)) \quad (3.2)$$

The model will be estimated with the robust variance estimates (Huber/White/sandwich estimator of variance).

### 3.6.2 *Count data model*

Count model is used to model the number of visit to health care which in this study would be the number of doctor visit. The initial empirical model for health care demand,  $Y$ , is specified as below:

$$E(Y = y_i | x_i) = \exp(x_i' \beta), \quad i = 1 \dots N \quad (3.3)$$

where  $y_i$  is the realised demand for health care for individual  $i$  and  $x_i$  is a vector of characteristics of individual  $i$ , assumed to be exogenous, that determine  $y_i$ . Since the dependent variable is restricted to non-negative integer values, count data models are required. The most popular of these models are the Poisson and Negative Binomial (NB) models.

Suppose the number of occurrences for  $y_i$ , given  $x_i$ , is Poisson distributed with density:

$$f(y_i | x_i) = \frac{e^{-\lambda_i} \lambda_i^{y_i}}{y_i!}, \quad y_i = 0, 1, 2, \dots \quad (3.3)$$

with the consequence that

$$E(y_i | x_i) = \lambda_i = \exp(x_i' \beta) = V(y_i | x_i) \quad (3.4)$$

Equation (3.4) shows the equality of the conditional mean and conditional variance (equidispersion). Count data may turn out to be overdispersed because of unobserved heterogeneity; a different reason for occurrences of the same consequent events; or the number of the events are dependent on the number of events occurs in the previous units. In these cases, the restrictive assumption of the Poisson model that its mean equals variance is violated.

In the case of overdispersion, the NB model could be used as an alternative to the Poisson model. Suppose, for every individual  $i$ , we introduce the random term that may cause by specification error or unobserved heterogeneity,  $\varepsilon_i$ , into the conditional mean function of the Poisson model as the following

$$\begin{aligned} E[y_i | x_i, \varepsilon_i] &= \exp(x_i \beta + \varepsilon_i); & y_i > 0, 1, 2, \dots \\ &= \lambda_i \nu_i; & \lambda_i = \exp(x_i \beta) \text{ and } \nu_i = \exp(\varepsilon_i) \end{aligned}$$

Conditional on  $x_i$ , and with some algebraic manipulations,  $Y$  has a negative binomial (NB) distribution with the density function given by

$$\Pr(y_i | x_i) = \frac{\Gamma(y_i + \psi_i)}{\Gamma(y_i + 1)\Gamma(\psi_i)} \left( \frac{\psi_i}{\lambda_i + \psi_i} \right)^{\psi_i} \left( \frac{\lambda_i}{\lambda_i + \psi_i} \right)^{y_i}, \quad y_i = 0, 1, 2, \dots$$

where  $\Gamma(\cdot)$ , is a *gamma* function; the index  $\psi_i = (1/\alpha)\lambda_i^k$ ;  $\alpha > 0$  is an overdispersion parameter and  $k$  is a constant. The mean and variance functions are specified as

$$E(y_i | x_i) = \lambda_i \quad \text{and} \quad V(y_i | x_i) = \lambda_i + \alpha \lambda_i^{2-k}$$

There are two variance functions depending on  $k$ . If we set  $k=1$ , the variance becomes proportional to the mean (known as the NB1 model) while by setting  $k=0$ , the variance

becomes a quadratic function of the mean (known as the NB2) model . We fitted both Poisson and NB models using STATA 11. The negative binomial model, however, failed to converge. Therefore, we will only discuss the result from the Poisson model in the next chapter.

## CHAPTER 4

### 4 RESULT AND ANALYSIS

#### 4.1 Introduction

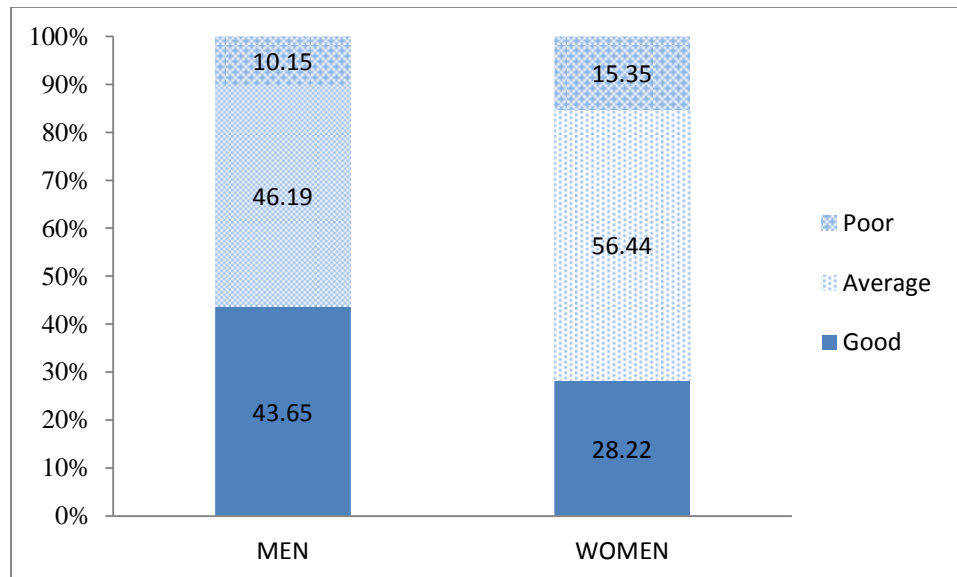
This chapter presents the descriptive analysis of the study in Section 4.2 to 4.4. Section 4.2 focuses on the analysis of the health status of the respondents while Section 4.3 discusses the pattern of their healthcare utilisation. Section 4.4 presents the summary statistics of selected variables that are used in econometric models. The results from econometric models are discussed in Section 4.5.

#### 4.2 Descriptive Analysis of Health Status

The two key variables that represent the level of health of the respondents in this analysis are self-assessed health (SAH) and self-reported longstanding health problems. Respondents were asked to rate their overall health as 1 (good), 2 (average) or 3 (poor), over the last twelve month before the interview. More than half (51.38%) of the 399 respondents assessed their health as average, 35.84% assessed as good while the remaining 12.78% rated their health as poor.

In order to get more understanding of the distribution of SAH, we further explore its distribution by gender and age groups. A total of 197 of men and 202 of women had been interviewed. Figure 4.1 shows that while the majority of men and women assessed their health as average, in terms of percentage, women show a higher percentage than

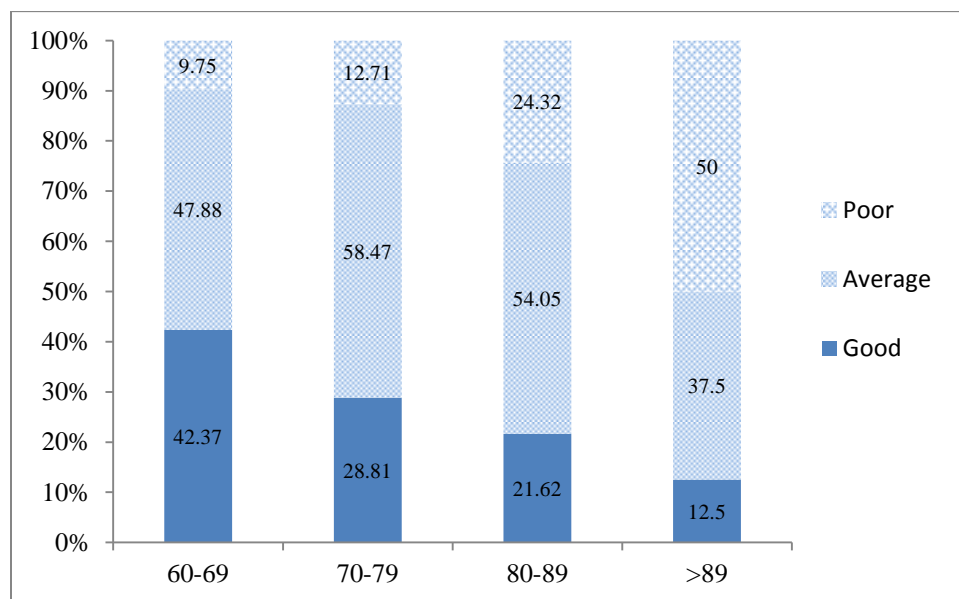
men. As for ‘good’ category, 43.65% of men have regarded themselves as having good health, way above the percentage of women that is only 28.22%. The least reported status for both gender is poor health. On average, men have better self-assessed health with mean value of 1.66 compared to women with 1.87 mean value.



**Figure 4.1: Self-assessed health by gender**

Figure 4.2 shows the distribution of SAH by age groups. In order to do this, age had been divided into ten-year age groups as shown in the histogram. It has shown clear pattern that those in lower age group had assessed their health better than those of higher group. For example, 42.37% of respondents in the age group 60-69 assessed their health as good as compared to only 28.81% in the age group 70-79. The percentage of good health has consistently fallen in the next two age groups. At the same time, the percentage of poor SAH had risen with age.

Besides SAH, health status may also be measured by the prevalence of longstanding illness. Table 4.1 shows the percentage, in ascending order, of respondents that suffered from identifiable longstanding health problems. Three health problem with the highest percentage were high blood pressure (39.6%), problems with arms, legs, hands, feet, knee, back or neck, arthritis and rheumatism (32.1%), and suffering from diabetes (23.6%). Other health problems had no more than 10% case.



**Figure 4.2: Self-assessed health by age group**

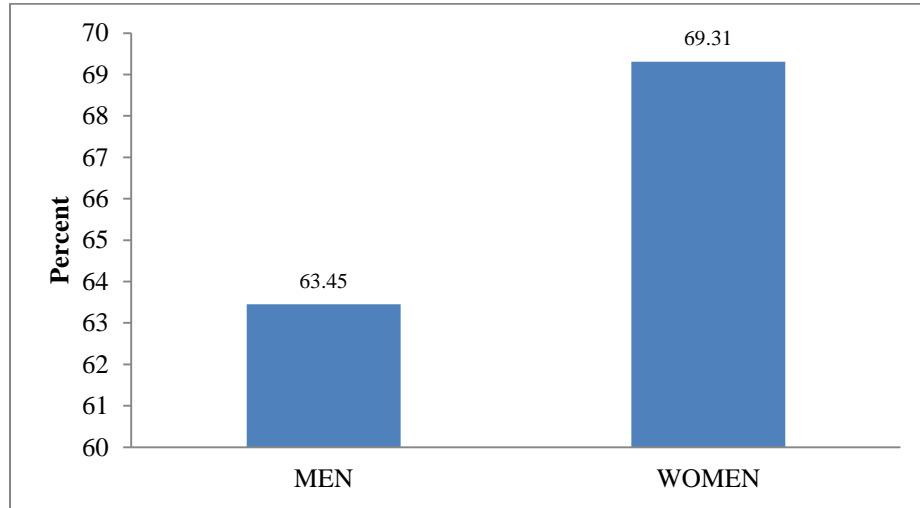


**Table 4.1 Reported longstanding health problems**

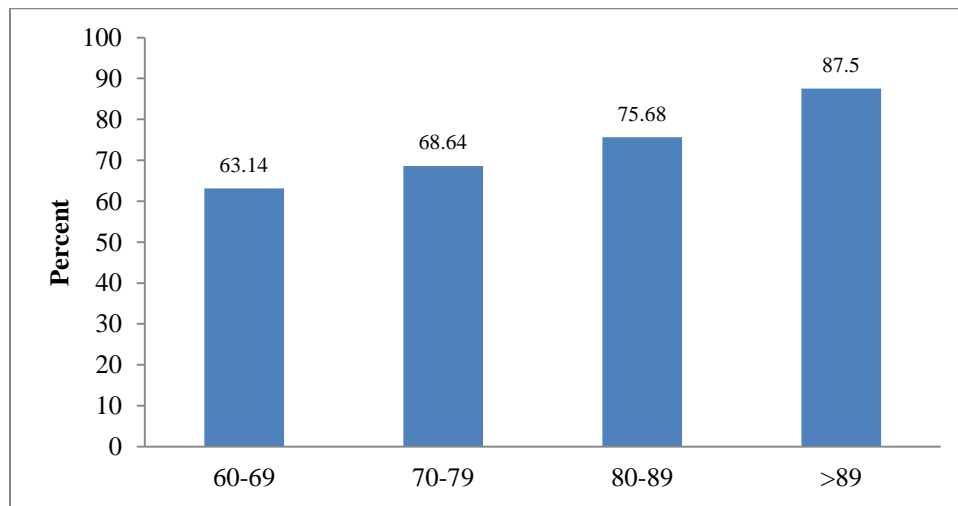
<b>Type of Health Problems</b>	<b>Percent (%)</b>
Problems with high blood pressure.	39.6
Problems or disability concerning arms, legs, hands, feet, knee, back or neck. This includes arthritis and rheumatism.	32.1
Suffering from diabetes.	23.6
Problems with heart.	7.77
Problems in seeing other than needing glasses to read normal size print.	6.77
Problems with chest/breathing, asthma, bronchitis.	4.26
Problems with stomach/liver/kidneys or indigestion.	3.51
Suffering from migraine or frequent headache	2.76
Suffered from stroke	2.26
Difficulty in hearing.	2.01
Problem with skin or suffering from skin allergies.	2.01
Problems with blood circulation.	1
Suffering from cancer	0.75
Suffering from anxiety, depression or bad nerves.	0.5

Next, we will discuss the distribution of longstanding illness by gender and age groups. From Figure 4.3, it shows that majority of respondents from each category had suffered from at least one longstanding health problem and the prevalence of health problems in women was greater than men. The distribution of health problems by age group has shown a similar trend as in SAH. Figure 4.4 shows that the higher the age group is, the higher the prevalence of health problems. For example, 87.5% of respondents aged over

89 years had suffered from at least one health problems as compared to 63.14% for age group 60-69 years.



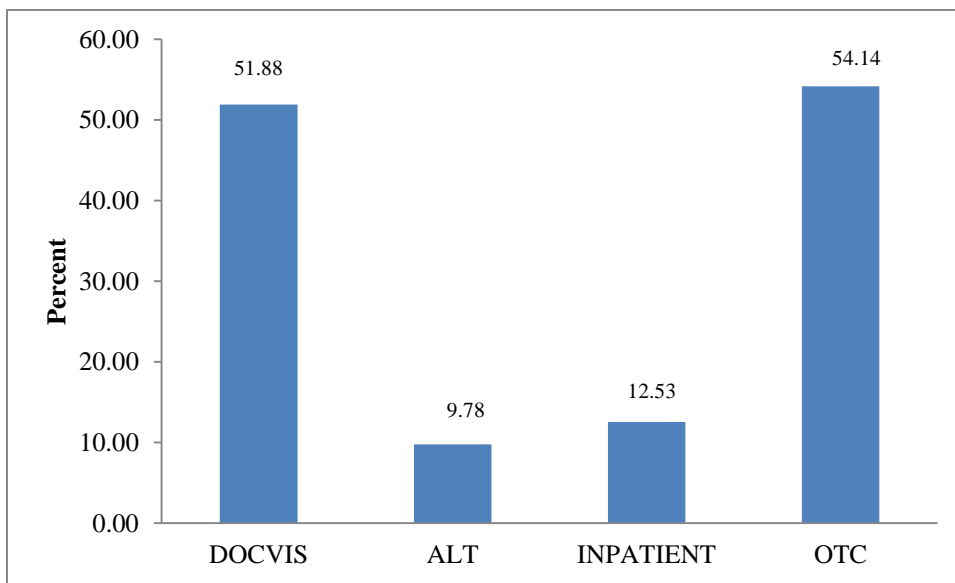
**Figure 4.3: Prevalence of Longstanding illness by gender**



**Figure 4.4: Prevalence of longstanding illness by age groups**

### 4.3 Descriptive Analysis of Healthcare Utilisation

In this section, the frequency of health care utilisation is presented in Figure 4.5. There are five types of utilisation, which are doctor visit (DOCTOR), alternative care (ALT), ward admission (INPATIENT) and over the counter market (OTC). It shows that more than half of the respondents had utilised doctor services and over the counter market. The utilisation of alternative health care services was not common to the respondents, as only 9.78% had utilised it. While 51.88% had visited the doctor, only 12.53% were admitted.

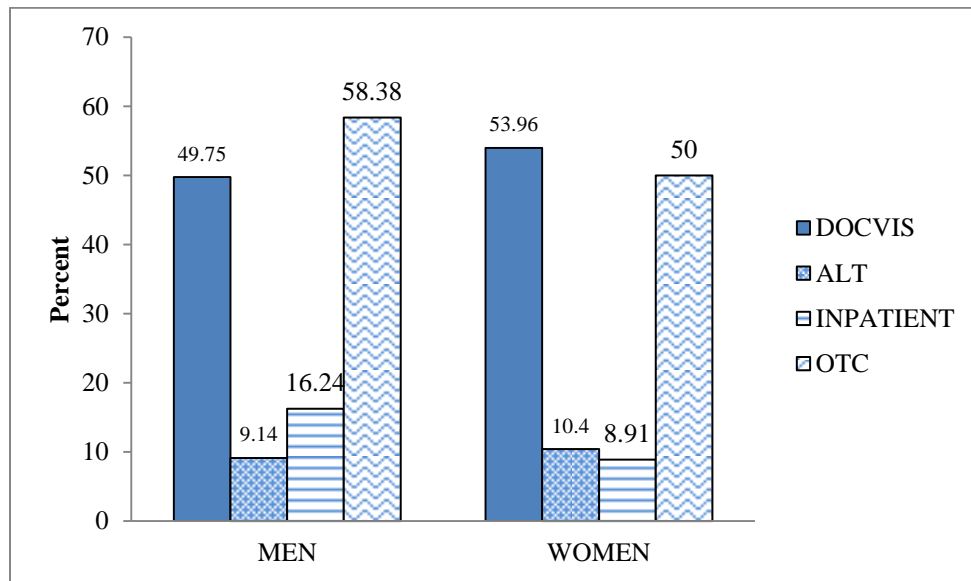


**Figure 4.5: Frequency of health care utilisation**

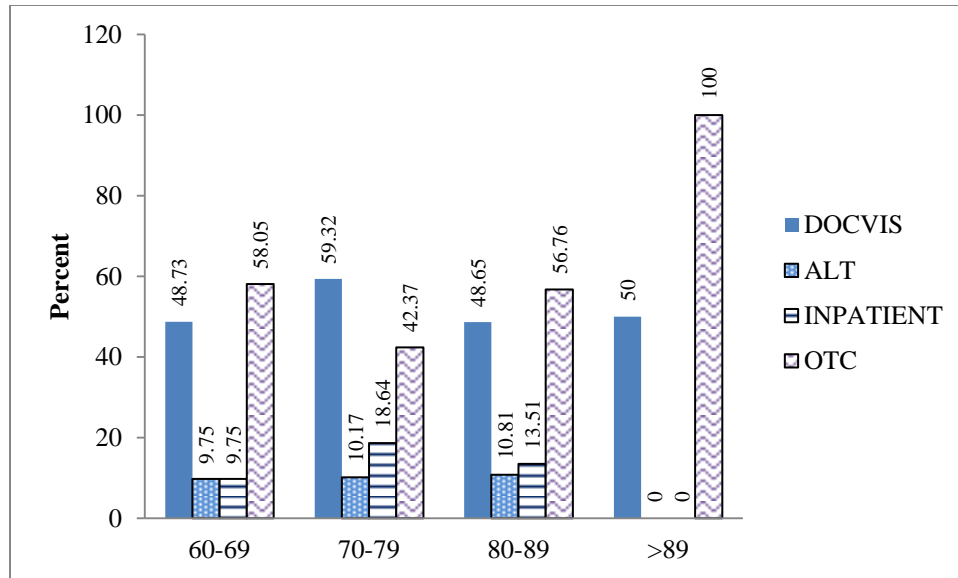
Figure 4.6 shows the frequency of utilisation by gender. It shows that men utilised OTC the most as compared to other services while doctor visit recorded the highest utilisation rate during the reference period for women. It shows that, visits to the doctor and the utilisation of over the counter medicine are among the important sources of care to the

elderly. The frequency of utilisation is further assessed by age groups as shown in Figure 4.7. Again, doctor and OTC were the most utilised services by all age groups. It is notable that all respondents above 89 years had utilised OTC service but none of them utilised alternative services or had been admitted to the hospital.

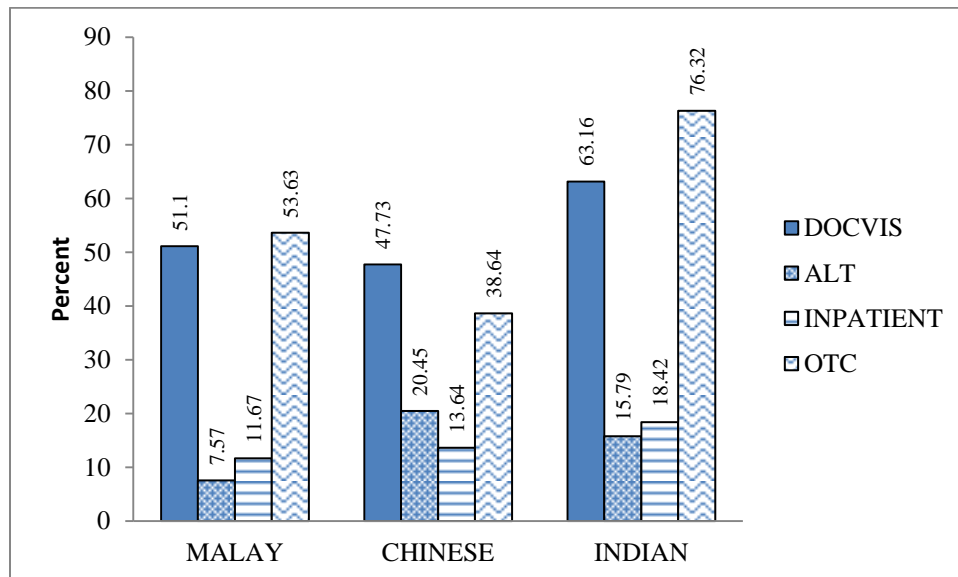
We extended the analysis by presenting the distribution of health care utilisation according to ethnic groups. The division by ethnic groups exhibits an interesting pattern. The utilisation of alternative treatments and traditional healers has been quite prevalent among the Chinese as compared to Malays and Indians. The utilisation rate for other services for Indians was higher than Malays and Chinese.



**Figure 4.6: Health care utilisation by gender**



**Figure 4.7: Healthcare utilisation by age groups**



**Figure 4.8: Healthcare utilisation by ethnic group**

#### 4.4 Summary statistic of dependent and independent variables

This section presents the summary statistics of the dependent and independent variables used for empirical analysis.

**Table 4.2: Dependent variables for health care demand models**

Variables	Definitions	Mean (Std. Dev)	Min	Max
DOCTOR	Doctor visits for the past one month before the interview.	0.52 (0.5)	0	1
N_DOCTOR	Number of doctor visits for the past one month before the interview.	0.59 (0.64)	0	3
INPATIENT	Inpatient stays for the past one month before the interview.	0.13 (0.33)	0	1

**Table 4.3: Independent variables for health care demand models**

Variables	Definitions	Mean	s.d	Min	Max
<b>I. Predisposing factors</b>					
AGE	Age in year	70.03	7.27	70.03	7.27
MALE	1 if gender is male, 0 female	0.49	0.50	0	1
MALAY	Ethnicity 1 - Malay 0 - Other	0.79	0.40	0	1
EDU	Highest Education level 1 - No formal school 2 - Primary school 3 - Completed form 3 4 - LCE 5- Completed form 5 6 - MCE 7- HSC/A-Level 8 - Certificates/Diploma 9 - First Degree 10 - Post - degree	2.31	1.47	1	9

Variables	Definitions	Mean	s.d	Min	Max
NO_WORK	Main economic activity 1- Not working 0 - self-employed, work in private or public sector.	0.79	0.41	0	1
SMOKER	Whether currently a smoker 1 - Yes 0 - No	0.20	0.40	0	1
VEGE	Whether a full-time vegetarian 1 - Yes 0 - No	0.02	0.15	0	1
EXCERSICE	Time allocation for exercising 1 = 0 hour 2 - <hour<=1 3 - 1<hour<=2 4 - 2<hour<3 5 - >3	2.03	1.30	1	5
<b>II. Enabling factors</b>					
INCOME	Total of individual income from all sources	601.91	741.50	0	7500
INSURANS	Whether have medical insurance 1 - Yes No - No	0.05	0.22	0	1
MARITAL STATUS	Marital status 1 - Married 0 - Never married, widowed or divorced	0.71	0.45	0	1
LIVE	Number of individuals aged 18 and above that are currently living together	1.85	1.42	0	7
CHAT	Whether had informal interaction with the society (e.g. chatting at coffee shop or at home) 1 - Yes 0 - No	0.58	0.49	0	1
TRUST	Whether living community can be trusted 1 - Yes 0 - No	0.94	0.23	0	1
HELP	Whether living community, in general, can help each other 1 - Yes 0 - No	0.94	0.23	0	1

Variables	Definitions	Mean	s.d	Min	Max
DISTRICT	District Kota Setar (reference variable)				
	KM - 1 if live is Kuala Muda, 0 otherwise	0.40	0.49	0	1
	KPBB - 1 if lives in Kubang Pasu and Bandar Baharu, 0 otherwise	0.39	0.49	0	1
OTC	Whether had utilised over the counter market for health care (e.g. pharmacy, <i>sinseh</i> , etc) 1 - Yes 0 - No	0.54	0.50	0	1
ALT	Whether had utilised alternative health services or traditional healers 1 - Yes 0 - No	0.10	0.30	0	1
<b>III. Needs factors</b>					
SAH	Self-assessed health 1 - Good 2 - Average 3 - Poor	1.77	0.66	1	3
LONG_ILL	Whether have longstanding health problems 1 - Yes 0 - No	0.66	0.47	0	1
BP	Whether reported of having high blood pressure 1 - Yes 0 - No	0.40	0.49	0	1
DIABETES	Whether reported of having high diabetes 1 - Yes 0 - No	0.24	0.42	0	1
ARMS	Whether reported of having problems with arms, legs, hands, feet, back, neck. 1 - Yes 0 - No	0.32	0.47	0	1



#### 4.5 Demand for health care: Probit Model

The probit model is estimated for the demand of health care. Table 4.2 presents the results of various goodness of fit tests for the estimated probit model. It is found that the estimated probit model is fit to the data significantly with the p-value of almost zero and pseudo R square of 0.36. The percentage correctly predicted is found to be 77.44% which is higher than the percentage correctly predicted using a naïve model (50%). There is also no evidence of general specification errors with p-value of 0.618. Thus, the estimated probit is found to have high goodness of fit statistically.

**Table 4.4: Goodness of fit statistics**

	P-value
Overall fit test (wald test)	0.0000
Pseudo R <sup>2</sup>	0.36
Percentage correctly predicted	77.44%
General specification test (H0: no specification error)	0.618

In terms of multicollinearity among independent variables, the values of Variance Inflation Factors (VIF) are found to be ranged from 1.08 to 2.16, which is below the value of 10. Hence, the estimated probit model does not suffer serious multicollinearity problem.

**Table 4.5: VIF**

Variables	VIF
KM	2.16
LONG_ILL	2.14
MALE	2
KPBB	1.99
EDU	1.89
INCOME	1.83
BP	1.71
SAH	1.65
RETIRED	1.5
MARRIED	1.48
ARMS	1.45
AGE	1.45
DIABETES	1.43
SMOKER	1.34
OTC	1.27
MALAY	1.25
EXERCISE	1.26
VEGE	1.16
LIVE	1.16
CHAT	1.14
INSURANS	1.11
ALT	1.09
PERCAYA	1.08
MEAN VIF	1.5

Table 4.5 presents the estimated probit model. The detail output of the estimated probit model is presented in Appendix 1. From Table 4.5, it shows that age, gender, income, marital status, social interaction, district and health status variables are statistically significant in determining the likelihood of doctor visit. This result implies that, besides health status, factors under predisposing and enabling groups may have also influenced demand.

As this study focuses on the elderly aged 60 and over, the influence of age cannot be compared directly with studies that covers all ages. Although age is always positively associated with demand (Pohlmeier & Ulrich, 1995; Wolinsky et al., 1983; Evashwick et al., 1984; and Deb & Trivedi, 1997), this study found the opposite. It suggests that the higher the age is, the less likely the visit to the doctor. This positive relationship, however, applies only within this selected age group, not compared with other age groups and therefore we are not able to generalise that health care demand rises as age increases.

The negative effect within the older age group may suggest that those who are very old may be facing mobility constraint, which refrain them from visiting a doctor. Besides, the very old population may prefer to get medication over the counter market rather than seeing a doctor.

**Table 4.6: The estimated probit model on doctor visit (DOCTOR)**

N=399

Variables	Coeff	p-value
<i>Predisposing factors</i>		
AGE	-0.022	0.076*
MALE	0.410	0.056*
MALAY	-0.084	0.655
EDU	0.058	0.450
RETIRED	-0.186	0.400
SMOKER	-0.306	0.146
VEGE	0.788	0.087*
EXERCISE	0.089	0.161
<i>Enabling factors</i>		
INCOME	0.000	0.070*
INSURANCE	-0.069	0.847
MARRIED	-0.370	0.069*
LIVE	0.018	0.740
CHAT	-0.514	0.001***
TRUST	0.022	0.940
KM	0.587	0.007***
KPBB	0.937	0.000
OTC	-0.369	0.035**
ALT	0.200	0.493
<i>Need factors</i>		
SAH	0.688	0.000***
LONG_ILL	0.709	0.002***

Variables	Coeff	p-value
BP	0.645	0.001***
DIABETES	0.381	0.066*
ARMS	0.362	0.055*
CONSTANT	-0.543	0.567
LogL	-177.93	

The symbol \*\*\*, \*\*, and \* denote 1.5.10% level of significance, respectively

From the result, it suggests that being a man, increases the likelihood of demand for this specific age group. This result, again, contradicts with many studies on health care demand which suggest women are more likely to demand health care (Sarma & Simpson, 2006; Windmeijer & Santos-Silva, 1997). This may be due to the fact that we control the effect of health status in the regression. The women in the old age group may be less mobile than men from the social viewpoint as they are more dependent on others.

In this study, total income has positively influenced demand, *ceteris paribus*. Therefore, there is evidence of income-related inequity for doctor visit. This may be because, the level of income may influence visit to private care or greater income may represent greater accessibility to health care (Alderman and Gertler, 1989; Lim et al., 2005; Laroche, 2000). Being married, on the other hand, reduces the likelihood of doctor visit. The existence and support from partners is seen as a substitute for formal care. Another factor that can be considered as a substitute of formal care is the utilisation of over the counter (OTC) medication. Respondents that utilise OTC are less likely to visit a doctor. This may be because, the elderly people are more convenient with OTC rather than

visiting the doctor. Relating to the social capital, elderly who engages in informal activities such as chatting in coffee shops are less likely to demand for health care. From this informal interaction, it is believed that the elderly could exchange ideas and view about life and health that may act as a substitute of formal care.

The inclusion of district variable is to pick up the effect of health care supply. The negative effect may represent the phenomenon of 'supply induced demand'. From the regression, however, we found that those in lower supply district are more likely to utilise doctor services. This finding implies that, in this case, district may present the socioeconomic status, rather than supply variable. Those who live in Kuala Muda (KM) and Kubang Pasu-Bandar Baharu (KPBB) are less likely to visit a doctor than those of Kota Setar. This interesting finding can be investigated further in future research.

All need factors are statistically significant in determining doctor visits. This result shows how strong the influence of health status in health care demand model. The self-assessed health (SAH), the existence of longstanding illness and the three most prevalence health problems among the respondents are used in the regression and they show the right sign as expected. Table 4.6 presents the regression result for another type of health care demand, i.e. hospitalisation or inpatient stays (INPATIENT). Unlike doctor visit, the effect of predisposing and enabling factors are not so prominent for inpatient stays, except for MALE and CHAT. This may be because the admission to the hospital is highly determined by the doctors based on one's health condition rather than other factors. Inevitably, health factors are important in determining inpatient stays. It is

found here that the diabetes sufferers are more likely to be hospitalised than the non-sufferers while ARMS and BP are not significant in determining hospitalisation.

**Table 4.7: The estimated probit model on inpatient stay (INPATIENT)**

N=399

Variables	Coeff	p-value
<i>Predisposing factors</i>		
AGE	0.001	0.948
MALE	0.732	0.002***
ETHNIC	-0.200	0.404
EDU	-0.078	0.394
RETIRED	-0.548	0.048
SMOKER	0.023	0.923
VEGE	0.372	0.544
EXERCISE	-0.003	0.973
<i>Enabling factors</i>		
INCOME	0.000	0.675
INSURANCE	-0.223	0.635
MARRIED	-0.269	0.300
LIVE	0.025	0.756
CHAT	-0.537	0.005***
TRUST	-0.258	0.438
KM	0.139	0.589
KPBB	0.002	0.994
OTC	-0.344	0.082
ALT	0.121	0.711

Variables	Coeff	p-value
<i>Need factors</i>		
SAH	0.533	0.001***
LONG_ILL	0.867	0.009***
BP	-0.216	0.310
DIABETES	0.727	0.002***
ARMS	-0.128	0.559
CONSTANT	-1.894	0.093
LogL		-110.346

The symbol \*\*\*, \*\*, and \* denote 1.5.10% level of significance, respectively

#### 4.6 Count Data Model

Count data model is used to determine factors that affect the frequency of use. It is found that being a vegetarian and the level of exercise, which are the proxy of health seeking behaviour, are positively determined the number of visits. As we expected, those who exercise or a vegetarian, have a positive attitude towards health and utilise health care more than those who do not exercise, *ceteris paribus*. Being married reduces the frequency of visit that suggests the role of partner a substitute of formal care. The accumulation of social capital through the engagement in informal interaction in the community proves to be vital in determining demand. Besides informal interaction, the level of trust in the society reduces the frequency of doctor visits. The good interaction with the surrounding community is somehow reduces the unnecessary need for formal care. As in probit model, district shows a similar pattern. Those in KM and KPBB utilise more doctor services than those in KS, but the effect is only significant for KM.



The frequency of visit is strongly determined by SAH and the prevalence of longstanding illness with 1% significant level. Besides, suffering from high blood pressure has also contributed significantly to the frequency of visits.

**Table 4.8: The estimated Poisson model on the frequency of doctor visit (N\_DOC)**

N=399

Variables	Coeff	p-value
<i>Predisposing factors</i>		
AGE	-0.008	0.205
MALE	0.197	0.072*
ETHNIC	-0.015	0.877
EDU	0.005	0.900
RETIRED	-0.133	0.293
SMOKER	-0.185	0.137
VEGE	0.394	0.031**
EXERCISE	0.062	0.061*
<i>Enabling factors</i>		
INCOME	0.0001	0.182
INSURANCE	0.017	0.923
MARRIED	-0.177	0.078*
LIVE	0.014	0.683
CHAT	-0.315	0.000***
TRUST	-0.037	0.789
KM	0.369	0.019**
KPBB	0.560	0.000***

Variables	Coeff	p-value
OTC	-0.179	0.062*
ALT	0.113	0.365
<i>Need factors</i>		
SAH	0.333	0.000***
LONG_ILL	0.903	0.000***
BP	0.304	0.001**
DIABETES	0.089	0.300
ARMS	0.107	0.237
CONSTANT	-1.669	0.001***
LogL	-300.012	

The symbol \*\*\*,\*\*, and \* denote 1.5.10% level of significance, respectively

## **CHAPTER 5**

### **5 CONCLUSION AND POLICY IMPLICATION**

#### **5.1 CONCLUSION**

The key finding of this research would be the effects of three types of factors in determining health care demand. These factors are known as predisposing, enabling and need factors. There are two types of demand modelled in this study, which are doctor visits and inpatient stays. We used probit and Poisson technique to estimate the models.

The first part of Chapter 4 presents the profile of health status and utilisation by selected demographic factors. This descriptive analysis serves as general overview of the distribution of health and health care of the elderly population in Kedah before proceeding to empirical analysis. The highlight from this analysis reveals three health problems with the highest percentage were high blood pressure (39.6%), problems with arms, legs, hands, feet, knee, back or neck, arthritis and rheumatism (32.1%) and diabetes (23.6%).

The aims of the empirical analysis are to determine the effect of individual income and living arrangement towards health care demand. From the probit model, it was found that income is significant only at 10% level in affecting the likelihood of doctor visit with a positive effect but not significant at all for inpatient stays. The effect of income though shows the same positive sign, also not significant in affecting the frequency of visit

(Poisson model). In analysing the effect of living arrangement which is proxied by the number of individual 18 year and above that live together (LIVE) and marital status (MARRIED), it is found that LIVE is not significant in all models. Being married is significantly reduced the likelihood of doctor visit but not the inpatient stay and the frequency of visit model. Interestingly, this study found the importance of social interaction (CHAT) in affecting the likelihood in all models. The informal interaction with the society reduces the likelihood and frequency of visits.

## **5.2 POLICY IMPLICATIONS**

This study is consistent with the report by the Ministry of Health in identifying the three most prevalence health problems among the elderly, which are (1) high blood pressure, (2) diabetes and (3) arms, legs, hands, feet, knee, back or neck, arthritis and rheumatism. In terms of policy implication, revitalized political commitment is required to make all these prevalence health problems control a global health priority. An aggressive strategy is needed to increase sustained control efforts by other health care providers.

In terms of inequity, income does affect the likelihood of visiting the doctor even though at the lower significant level. Due to the fact the government has already reduced the burden of the elderly by waving the registration cost for the elderly at the public hospitals, this study suggests a so-called “mobile hospital” that will supply the necessary medication for the elderly population who fails to visit the hospital on the appointment time. Besides, this type of services could help to identify the hidden needs of the elderly for health care services. Early detection of health problems will enable the patients and

government to minimise the increase in the treatment cost that would be involved if the problems were diagnosed at critical level.

The informal interaction with the society reduces the likelihood and frequency of visits. In this aspect, an integrated health programmes establishment can be established particularly at the location where there are majority of elderly population in Kedah to increase access to health care services for high blood pressure and two others. Besides these, health workers from the Ministry of Health should be trained in diagnosis and management of high blood pressure and others using standard guidelines, as they might as well also be involved in the programme. By engaging trained health workers in these informal interactions, such programme would be more benefited, thus, the health care demand by the elderly can be well-managed by the authority.

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