



저작자표시-비영리-변경금지 2.0 대한민국

이용자는 아래의 조건을 따르는 경우에 한하여 자유롭게

- 이 저작물을 복제, 배포, 전송, 전시, 공연 및 방송할 수 있습니다.

다음과 같은 조건을 따라야 합니다:



저작자표시. 귀하는 원저작자를 표시하여야 합니다.



비영리. 귀하는 이 저작물을 영리 목적으로 이용할 수 없습니다.



변경금지. 귀하는 이 저작물을 개작, 변형 또는 가공할 수 없습니다.

- 귀하는, 이 저작물의 재이용이나 배포의 경우, 이 저작물에 적용된 이용허락조건을 명확하게 나타내어야 합니다.
- 저작권자로부터 별도의 허가를 받으면 이러한 조건들은 적용되지 않습니다.

저작권법에 따른 이용자의 권리는 위의 내용에 의하여 영향을 받지 않습니다.

이것은 [이용허락규약\(Legal Code\)](#)을 이해하기 쉽게 요약한 것입니다.

[Disclaimer](#)

Master's Thesis of Public Health

Effects of the Public Transfer and Asset Income on the Health Care Utilization of the Retirees

공적 이전소득 및 자산 소득이
은퇴 중고령 가구의 의료이용에 미치는 영향

August 2016

Inuk Hwang

Department of Health Policy and Management
Graduate School of Public Health
Seoul National University

Effects of the public transfer and asset income on the health care utilization of the retirees

지도 교수 이 태 진

이 논문을 보건학 석사 학위논문으로 제출함

2016년 5월

서울대학교 보건대학원
보건학과 보건정책관리전공
황 인 옥

황 인 옥의 보건학 석사 학위논문을 인준함

2016년 6월

위 원 장 양 봉 민 (인)

부위원장 김 창 엽 (인)

위 원 이 태 진 (인)

Abstract

Background

Retirement brings changes in the household income level and composition. Although previous studies have suggested that the composition of retirement income is heterogeneous, the public transfer and asset income have been consistently reported as two major income sources for the retirees. Despite the changes in income, health care spending remains a major household expenditure item of the retirees. Although the characteristics of retirement income are examined in depth, studies on effects of the source of retirement income on health care utilization are limited. This study aims to estimate effects of the public transfer income and asset income on health care utilization of the retirees. In addition, determinants of health care utilization of the retirees are examined.

Methods

The study sample is drawn from the Korean Retirement and Income Survey data in 2011 and 2013. The sample consists of households in which the head is 50 and over and retired (n=909). Dependent variables are household health care utilization status and health care spending. Health care spending is log transformed. Independent variables include dependent income sources, share of asset income, share of pension income, share of social security income, total household income, sex, age, education level, marital status, chronic diseases status, disability status, limitations on Activities of Daily Living status, private health insurance status, and number of family members. K-means cluster analysis was used to cluster the sample into four income dependent groups (asset, private transfer, pension, social security) based on their household income composition. Two-Part Model analysis was used to estimate the effect of household characteristics on health care utilization.

Results

The results of the Two-Part Model analysis suggest that the dependent income source and the share of pension income and social security income are significant predictors of health care utilization of the retirees. Compared to the asset income dependent, the odds of using health services significantly decreased for the social security income dependent. In addition, the health care spending significantly decreased for the pension income dependent and the social security income dependent. Increase in the share of social security income significantly decreased the odds of using health services. Increase in the share of pension income and social security income both significantly decreased the health care spending. The Need and demographics were strong predictors of the odds of using health services. The Enabling, demographics, and Need characteristics were strong predictors of the health care spending.

Conclusions

The findings of this study are the following. First, the household income compositions of the retirees in Korea are heterogeneous. Although pension income and social security income were the primary source of retirement income, retirees still heavily rely on private transfers. Second, the income composition of the retirees is significant predictor of the health care utilization. Both the share of each income source and the dependent income source has strong implications on the retirees' use of health care. Third, the Need characteristics and number of demographics were important predictors of the odd of using health services. The health care spending was significantly affected by household characteristics of Need, Predisposing, and Enabling in nature.

Keyword : retirement, health care utilization, income source, public transfer income, asset income, KReIS

Student Number : 2014-23393

Table of Contents

I. Introduction	1
1. Background	1
2. Purpose of Research.....	5
3. Hypothesis	5
II. Literature review	6
1. Determinants of Health Care Utilization of the Retirees ...	6
2. Income Structure of the Retiree Households.....	8
3. Source of Households Income and Health Care Utilization	12
4. Two Part Model Analysis of Health Care Utilization	14
III. Materials and Methods	16
1. Data Source and Sample Selection	16
2. Variables and Outcomes.....	18
3. Statistical Analysis	23
IV. Results	27
1. Characteristics of the Study Sample.....	27
2. Predictors of Health Care Utilization of the Retirees	36
V. Discussion and Conclusion	43
Bibliography	47
Abstract in Korean	50

Tables

[Table 1] Composition of household income in the KReIS	19
[Table 2] Independent variables and definitions used in the study	21
[Table 3] Dependent variables and definitions used in the study	22
[Table 4] Demographic and clinical characteristics of the study sample	29
[Table 5] Result of the K-means cluster analysis	30
[Table 6] Comparison of household characteristics between the clusters	33
[Table 7] Pearson correlation coefficients using the independent variables	34
[Table 8] Pearson correlation coefficients using the independent variables (continued)	35
[Table 9] Predictors of health care utilization estimated using the Two-Part Model (share of each type of income included)	38
[Table 10] Predictors of health care utilization estimated using the Two-Part Model (dependent income source included)	41

Figures

[Figure 1] Study sample identification	17
[Figure 2] K-means cluster analysis on two-dimensional data	24

I. Introduction

1. Background

Income is an important determinant of health care utilization, along with other individual and societal characteristics (Andersen, 1995; Andersen & Newman, 2005). Societal determinants include health services system, health care goods and services, and relevant technologies. Individual determinants can be grouped into Predisposing, Enabling, and Need characteristics (Andersen, 1995; Andersen & Newman, 2005). As an ‘Enabling’ condition, family income allows individuals to utilize health services by providing means to pay for out-of-pocket spending of health services.

It is important to examine the relationship between family income and health care utilization in order to achieve the public policy goal of ‘equitable health services distribution.’ It is so because 1) equitable services distribution requires individual demographics and Need characteristics, rather than Enabling conditions, be emphasized and 2) family income is considered to be ‘mutable’ condition of the individual health care utilization (Andersen & Newman, 2005). Mutable or ‘mutability’ refers to the extent to which a component can be altered to influence the distribution of health services (Andersen & Newman, 2005). In other words, it is more feasible to consider an alteration in family income than a change in the age structure of a country.

Retirement is a complex process in which the retirees fully or partially withdraw from the labour force and experience changes in household income. Loss of labour earnings is reflected in the income level of the retirees, which is 40 to 75% of the pre-retirement income, on average (Grad, 1990; Kim, 1998; Lee & Shin, 2003).

Not only do the elderly retirees have lower income than the workers, their income composition is also different. In case of workers, labour earnings comprise most of the household income, reaching up to 89%. Public transfer income (public pension, other social security, occupational pension) and asset income (interest, dividends, resources derived from real assets) assume relatively little chunk of the total household income (Bardasi, Jenkins, & Rigg, 2002; Lee & Shin, 2003). On the other hand, the sources of retirees' income are diverse. Although the classification is somewhat conflicting between studies, asset income, private intergenerational transfer, pensions, and social security income have been generally known to comprise the retirement income. And the public transfer income and asset income have been consistently known to be two major sources of retirement income (Borsch-Supan & Reil-Held, 1997; Bardarsi, Jenkins, & Rigg, 2002; Choi, 2007; Kim, 1998; Lee & Shin, 2003; Nam & Kwon, 2008; Seo & Song, 2015).

Unlike the changes in income during the transition into retirement, the household consumption patterns remain relatively the same. Health care expenditures have been consistently reported to be one of the top 3 expenditure items of the retirees or the elderly (65+) households (Butrica, Goldwyn, & Johnson, 2005; Kim, 1998; Lee & Shin, 2003; Moehrle, 1990; Yun & Kim, 2010). With the labour earnings foregone, the retirees must fuel the health care spending from alternative sources of income.

In short, elderly retirees rely on multiple sources of income for the household consumption. However, the effect and implication of relying on different source of income for health care spending are expected to be different. For instance, the health care utilization patterns for two households that have identical income level can be very different, if one relies on labour earnings or asset income and the other relies on private intergenerational transfers from children.

In addition, although pension and social securities are both

generally classified as public transfers, it is important to distinguish them as independent retirement income sources. Pension is based on entitlement - pre-retirement labour force participation status for occupational pensions, age requirement for old age pension, and so on. On the other hand, social securities are income subsidies, usually given to low income groups. Thus, the nature of income and the characteristics of the recipients are likely to be very different for pension and social securities.

Although many existing studies have examined the income status and income composition of the retirees, only limited number of studies drew attention to the effect of the sources of household income on health care utilization. Research by Seo and Song (2015) examined the effect of multiple sources of income on consumption items of the retiree households. The study results suggested that the effect of each source of income is different for household health care spending. Similar results have been observed in other studies (Kim & Choe, 1999; Park & Hwang, 2014; Seo & Song, 2015; Yang & Choe, 2009).

However, these studies have number of limitations. First, these studies estimated the marginal propensity to consume (mpc) health care out of each type of income. However, since health care utilization is determined by the overall household income, estimating the mpc of each source of income is inadequate, although it provides important clues. Second, all studies failed to include the household and individual characteristics that are important determinants of health care utilization.

This study focuses on examining the fact that sources of income are important determinants of health care utilization, along with the overall household income. I examined the effects of sources of household income by estimating 1) the effect of dependent income source and 2) the effect of pension, social security, and asset income separately. The dependent income

sources are defined based on the result of cluster analysis. The effect of each source of income is estimated using the share of each type of income.

2. Purpose of Research

The purpose of this study is to examine 1) effects of the shares of asset income and public transfer income and 2) the effect of dependent income source on the health care utilization of the retiree households in Korea. In addition, it aims to examine the determinants of health care utilization of the retiree households in Korea.

3. Hypothesis

1. The Need characteristics will affect the odds of probability of using health services. The Enabling and Predisposing characteristics will affect the household health care spending.
2. The share of pension income, the share of social security income, and the share of asset income will have different effect on household health care utilization.
3. Each dependent income source will have different effect on household health care utilization.

II. Literature reviews

1. Determinants of the health care utilization of the retirees

One's health care utilization is not only the result of individual health concerns, but the product of individual and societal factors that shape the path of health care use. In his well-known model, Ronald Anderson suggested that the health services utilization is a product of individual determinants (Predisposing, Enabling, and Need in nature) and health care system (resources and organization) that are shaped by the societal determinants of technology and norms (Andersen, 1995; Andersen & Newman, 2005). In addition, individual determinants are also affected by the health care system.

Predisposing characteristics exist prior to the onset of illness and are what determine one's propensity to use health services. It includes demographics (age, sex, and so on), social structure (education, race, and so on), and health beliefs (values concerning health and illness and so on). Enabling characteristics are means that make health services resources available to the individual. It includes family attributes (income, health insurance and so on) and attributes at the community level (health personnel to population ratios and so on). Lastly, the Need characteristics refer to the perceived or clinically evaluated illness and are the most immediate cause of health services use (Andersen & Newman, 2005). Based on such theory, one's socioeconomic status, the characteristics of the community, and the Need characteristics, have been examined (Aday & Andersen, 1974; Andersen, McCutcheon, Aday, Chiu, & Bell, 1983; Phillips, Morrison, Andersen, & Aday, 1998). As previously mentioned, examining the effect of family income on health care utilization is important to achieve the public policy goal

of equitable health services distribution.

(Lee, Lee, Jeon, & Jung, 2009) compared the inpatient and outpatient services utilization of the poor and the non-poor in Korea and concluded that Enabling characteristics were important determinants of services utilization in the poor, whereas Predisposing characteristics were important determinants in the non-poor population. Kim (2008) studied the health services utilization of the elderly (60+) in Korea and concluded that the probability and level of inpatient and outpatient services use are significantly affected by the patient's health insurance status. (Yoon, Kim, Chang, Cho, & Song, 2010) examined the health care spending for household in which the head is 50 and over and found that income, health status, sex, and employment status were important predictors of health care spending.

Fernández-Olano et al. (2006) studied the use of health services by elderly (64 and over) in Spain and found that the general practitioner visits were associated with a perceived unmet need for care, a negative self-reported health status, and a lower educational level. Research by Hurd and McGarry (1997) examined the number of outpatient visits and the length of stay of the elderly in U.S(65+). It concluded that both the probability and the level of utilization were significantly affected by patient's income and health insurance status.

2. Income structure of the retiree households

Typically, retirement brings two major changes in the family income - decrease in the absolute amount and the structural shifts. Due to loss of labour earnings, the income level decreases from the pre-retirement level, on average. Therefore, alternative sources of income become more important.

Research by Grad (1990) studied the income change at retirement for persons aged 55 or older in U.S, focusing on the degree of retirement (full or partial) and the receipt of Social Security and other formal benefits. It noted that the income of full retiree is at 46 percent of the pre-retirement income if they receive one retirement benefit and at 60 percent if they receive more than one benefit. For partial retirees who collected no benefits before the retirement transition, the income level actually increased following the retirement if one continued working and started collecting benefits. The poverty rate increased in the full retirement cases and decreased in the partial retirement cases. To compare changes in the sources of income, the study divided income into three types - earnings, asset income, and all transfer sources. The transfers include Social Security benefits, employer pensions, public assistance, and veterans' benefits. For this particular sample, the share of transfers increased more than two-fold and the share of earning decreased considerably following the retirement. The share of asset income stayed relatively the same.

Research by Börsch-Supan and Reil-Held (1997) suggested that there is a large degree of heterogeneity in the level and the composition of retirement income. The study compared post-retirement income to pre-retirement disposable income in 9 OECD countries (Australia, France, Germany, Italy, Japan, Netherlands, Sweden, U.K, U.S) and found that the ratio is around 75% in all countries except U.K and U.S where it was lower. The ratio was

generally lower in the lowest income quintile. For example, the ratio is 74.8% in quintile 5 and 103.3% in quintile 1 in Italy. In addition, the study examined the composition of retirement income for five income categories: social security, occupational pensions, earnings, asset income, and private intergenerational transfers. On average, the public transfers (social security and occupational pensions) were the largest source of retirement income. In general, the share of transfer incomes (public and private intergenerational transfers) was greater than the share of self-provided income. Lastly, the study points out the effect of public pension scheme design on the retirement income. In addition to the replacement rate of the public pension in retirement, the pension formula has implications on the substitution of retirement income. For instance, if pension formulae is strictly earnings-related, the pension income can be very low if one experienced a short or interrupted earnings history and thus individuals could be forced to work in old age (often part-time).

Research by Bardasi et al. (2002) examined the transition into retirement and the probability of becoming poor in Britain for individuals aged 50–69 using the British Household Panel Survey data of 1991–1999. The study suggested that being retired has strong association with a higher probability of being in a low income group. The probability of the retirees belonging to a low income group was roughly two times higher than the workers group and nearly five times higher than the workers. By sources of income, the benefit income (referring to all cash benefits from the government) was the primary source of income (65.7%) of the retired, followed by pension (24.9%), and investment income (9.6%), net earnings (9.6%), and private transfer income (0.4%). In other words, pensions and benefits make up more than 90% of the household income of retired people in the U.K. On the other hand, labour earnings comprise 89% of total household income of the workers, on average.

Research by Choi (2007) examined the income of elderly

households, in which the head is 60 and over, using the Korean Labor and Income Panel Survey. In 2004, the average household income for elderly households was roughly 12 million won, which is only 40% of the average household income for the overall households. In addition, transfer incomes (except the public pension income) were the biggest source of income for elderly households (50%), followed by labour earnings (28.4%), asset income (11.3%), public pension income (9.7%), and others (0.5%). On the other hand, the labour earnings were the biggest source of income for the non-elderly households. Among the transfer income of the elderly households, the private intergenerational transfer was the largest (67.7%). The rest were public transfers including pension and other social securities. Among the asset income, property income was roughly three times bigger than the financial asset income.

Research by Kim (1998) compared the household income and expenditure of the retiree and workers elderly households using the Korea Household Panel Survey data in 1994. In this study, the total household income was 11.7 and 15.7 million Won for the retiree and workers households, respectively. For the retiree, labour earnings were the primary source of income, followed by the asset income and transfer income. In this particular study, most of the transfer income was comprised of the private transfer income since the first payment of National Pension scheme in Korea was made in 1998, which is four years later than the study period. The health care expenditure was 3rd largest expenditure item for the retiree and 4th for the workers.

Research by Lee and Shin (2003) compared the economic status of the retiree and employed elderly households using the Korean Labor and Income Panel Study data in 2000. The total income of the retiree was 6.9 million won, which was nearly 1/2 of the employed households' income. The public transfer income (36.0%) was the largest source of income in the retired households, followed by private transfer income (33.3%), and the asset income

(30.4%). The labour earnings were the major source of income (86.1%) in the employed households. The health care expenditure was 3rd largest expenditure item in both the retiree and employed households. The study also examined the family income structure of the retiree households by subjective economic status. The subjectively well-off household had higher proportion of financial and public transfer income and lower proportion of private transfer income among the total income.

Study by Seo and Song (2015) examined the sources of income and expenditure items of the household in which the head is 55 and over using the Korea Labor and Income Panel Survey data from 2009 to 2012. The study examined the income structure of households, in which labour earnings are zero, and found that the public transfer income was the largest source of income (38%), followed by private transfer income and other incomes including the asset income.

3. Source of household income and health care utilization

Although studies on the income level and income composition of the retirees are well documented, only limited number of studies drew attention to effects of the sources of household income on health care utilization.

Research by Lee (2015) examined the heterogeneity of income and consumption between income groups. In addition, it examined the effect of income sources on household consumption for elderly aged 60 and over. The study classified the sources of income into wage earning/self-employment income, public transfer income, private transfer income, and other incomes that are non-periodic in nature. The study results suggested that the increase in the share of pension income and the share of other non-periodic income significantly increased the household consumption. And increase in the share of other non-periodic income significantly increased the household health care spending.

Research by Yang and Choe (2009) examined the relationship between the sources of households income and expenditure items based on the theory of ‘mental accounting¹,’ using the Korea Family Income and Expenditure Survey in 2007. The study concluded that different types of household income (labour earnings, self-employed income, asset income, transfer income, other income) have distinguishing implications on each household item (food, housing, health care, and so on). The labour earnings, transfer income, and other type of income were significantly associated with the increase in health care spending whereas self-employment and asset income were not.

¹ According to (Thaler, 1999), mental accounting refers to the phenomenon in which different sources of household income has different implications on household expenditure items

Research by Kim and Choe (1999) examined the effect of different types of household income on household expenditures using the Korea Household Panel Survey data in 1996. The study results suggest that different types of income (labour earnings, asset income, transfer income, and other income) have different effects on household expenditure items. The study results suggested that the transfer (public and private) income significantly affected the health care spending whereas the labour earnings, asset income, and other type of income did not.

Research by Seo and Song (2015) studied the effect of different types of household income (labour earnings, private transfer income, public transfer income, property income, asset income, other income) on health care expenditure and other household consumption for households with the head aged over 55 using the Korean Labor and Income Survey data from 2009 to 2012. The study results suggested that the labour earnings and the private transfer income significantly affected the household health care spending whereas public transfer income, other type of income did not. In addition, it concluded that the effect of each type of income is different for each consumption item.

4. Two Part Model analysis of health care utilization

There are two widely used measures of health care utilization - 1) frequency or duration of services and 2) the cost of services. The measure of frequency or duration is used in large survey data due to advantages of being relatively easy to recall and quantify. The measure of cost has advantages of reflecting the quality and intensity of services utilized. However, it is currently not feasible to collect data on out-of-pocket costs and thus difficult to construct an accurate health care utilization data.

One of the characteristics of health care utilization data is that it does not follow the standard normal distribution. It includes considerable number of observations valued at 0 and is usually skewed to the right. In other words, there exist considerable cases of not using the health care services and the majority of the utilization is concentrated in the specific population groups (i.e elderly).

In the 'one-part model' , which analyzes the entire sample using the OLS regression regardless of health care utilization status, cases of health care utilization=0 are still included. Although this model has advantages of being relatively easier to interpret the results, considerable number of zeros (in health care utilization status) could produce biased results.

Considering the characteristics of the health care utilization data, I employ the Two-Part Model, which analyzes 1) the probability of using the health care at least once 2) the volume of care utilized separately. In the first part, the probability of using the health care services is estimated using the panel logistic regression analysis. In the second part, the cost of services utilized, for those whom used the services at least once, is estimated using the panel OLS regression analysis. Two-Part Model has been widely used in

the studies of health care utilization since 1) it is adequate to analyze the health care data 2) it has been known that the decision to use health care and the volume of services utilized are affected by different household characteristics. According to Diehr et al.(1999), which studied the methods for analyzing health care utilization and costs, the decision to utilize health care depends on individual determinants (Predisposing and Need) while the volume of utilization depends on the health care system and socio-economics status.

Research by Hurd and McGarry (1997) used the Two-Part Model to analyze the effects of patient' s health insurance and socioeconomic status on the outpatient visits and the length of stay of the elderly American patients. The study results suggested that both the probability of using the health care at least once and the volume of care utilized are significantly affected by the health insurance and socioeconomic status. In addition, (Diehr, Yanez, Ash, Hornbrook, & Lin, 1999) has suggested that using the Two-Part Model improves the explanatory power of the analysis and derives more accurate results compared to using the one part model.

III. Materials and Methods

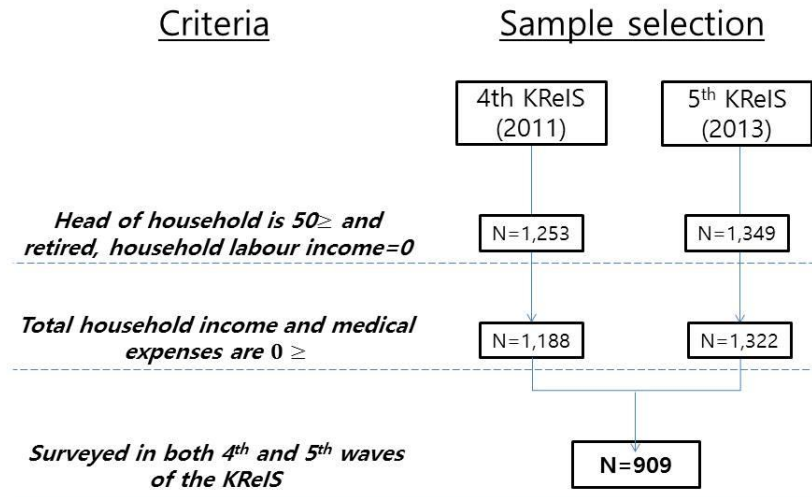
1. Data Source and sample selection

The data was drawn from the 4th (2011) and 5th (2013) waves of the Korean Retirement and Income Study (KReIS). KReIS is bi-annual longitudinal survey on employment and retirement, health, demographics, and old-age income security. It is managed by the National Pensions Services. The survey data is collected once a year. The retirees are asked to provide written answers in the printed survey questionnaires under the supervision of professional interviewers.

The KReIS targets the households with members aged 50 and over. 5,110 households and 8,644 individuals were initially selected for the survey. Since the KReIS consists of 1) the household survey on household income and spending and 2) the individual survey on health related status, two are merged to estimate the effect of household income on health care utilization.

Among the 4,105 and 3,809 households surveyed in 4th and 5th KReIS, respectively, households in which the head is 50+, retired, and not working are selected ($n=1,253$ and $1,349$ in 4th and 5th waves, respectively). Households with incomplete or missing data on household income, medical spending, and other key variables were excluded, leaving 1,188 and 1,322 households in 4th and 5th waves of the KReIS. Lastly, only the households that are surveyed in both 4th and 5th waves are selected, leaving 909 households to be studied.

Figure 1. Study sample identification



2. Variables and Outcomes

2.1 Definition of retirement

According to Yun and Kim (2010), existing studies have defined retirement based on the following four criteria; 1) the respondent's feedback on the respective questionnaire, 2) change in working hours or income level, 3) leaving the job that was longest in employment duration, and 4) the combination of age and working hours.

In this study, the household head is considered retired if he or she classified him or herself as retired in the respective survey questionnaire. Although this definition is subjective, it is expected to be an accurate definition of retirement since 1) only those who are not involved in economic activities and actively looking for employment are designed to answer the questionnaire and 2) over 95% of the study sample are 60 and over, as will be discussed in the results section. In addition, households that reported any labour earnings were excluded.

2.2 Independent variables

In the statistical analysis, the following independent variables are included - total household income, share of asset income, share of pension income, share of social security income, dependent income source, sex, age, marital status, education level, status on chronic diseases, status on disability, status on private health insurance, income level, and number of household members.

The income reported in the KReIS is as following. Asset income includes financial income (interest or dividends incurred from

saving and equity) and property income (rent paid by tenants. Transfer income includes public pension incomes, payment from the government based on the National Basic Livelihood Security Act, and other social security payments. In this study, transfer income is divided into pension income and social security income (the National Basic Livelihood Security Act payment and other social security payments) in order to take into account the different nature of 1) the public transfer income accruing from entitlement and 2) income subsidies for low income groups.

The sources of household income are represented in two ways to estimate their effects on the health care utilization. First, individual sources of income are represented by the share of a particular type of income (i.e share of asset income). Second, the composition on household income is represented by the dependent source of income group. As previously mentioned, the share of pension and the share of social securities were distinguished given their contrasting nature.

Table 1. Composition of household income in the KReIS

Type of income		Description
Labour earnings		Earnings incurred from employment or self-employment
Financial income		Income incurred from financial assets (interests, dividends, etc)
Property income		Income incurred from real assets (rents, etc)
Public transfer income	<i>Pension income</i>	Occupational pensions, old age pensions, etc
	<i>National Basic Livelihood Acts payment</i>	The National Basic Livelihood Act payments in cash
	<i>Other social security payments</i>	Other periodic cash payments from the government
Other income		All other income

Total household income (in million won) was adjusted for the household size using the square root scale².

The share of asset income refers to the proportion of asset income among the total household income, presented in percentage (%). The share of pension income refers to the proportion of public pension income. The share of social security income refers to the proportion of the rest of public transfer income.

Based on the composition of household income, each household was grouped into four groups of dependent income sources using the k-means cluster analysis: asset income dependent, private transfer dependent, pension income dependent, social security income dependent.

Age of the household head was grouped into four categories: 50–59, 60–69, 70–79, 80 and over. Marital status of the head was grouped into two categories: married and others. Marital statuses of divorced, widowed, and never married or single were grouped into others. Based on the educational qualifications, households are grouped into four categories: elementary school or lower, middle school, high school, and college or higher. All categories are defined based on one's graduation status; for instance, if one attended a college but did not graduate, he or she is classified under high school for education level.

For variables on health-related status (chronic disease, disability, ADL, private health insurance), the household is classified into 'yes,' meaning it is present in the household, if any member of the family has it.

² Square root scale is being more employed in the recent OECD publications

Table 2. Independent variables and definitions used in the study

Variables		Definitions
Share of asset income		% of asset income among the total household income (<i>continuous</i>)
Share of pension income		% of pension income among the total household income (<i>continuous</i>)
Share of social security income		% of social security income among the total household income (<i>continuous</i>)
Dependent income source		1 if asset income dependent 2 if private transfer dependent 3 if pension income dependent 4 if social security income dependent
Predisposing	Sex	0 if female 1 if male
	Age (yr)	1 if 50–59 2 if 60–69 3 if 70–79 4 if 80 and over
	Marital status	0 if others ³ 1 if married
	Education level	1 if graduated from elementary school or never attended school 2 if graduated from middle school 3 if graduated from high school 4 if graduated from college of higher
Enabling	Household income	Total household income adjusted for household size (<i>in million Won, continuous variable</i>)
	Private health insurance status	0 if none in the family 1 if any
	Number of family members	(<i>Continuous variable</i>)
Need	Chronic diseases status	0 if none in the family 1 if any
	Disability status	0 if none in the family 1 if any
	Limitations on Activities of Daily Living (ADL)	0 if none in the family 1 if any

³ Single, divorced, or widowed

2.3 Dependent variables

In the analysis, household health care utilization status and health care spending are estimated. Health care utilization status is determined by the health care spending incurred in the last year - 1 if any, 0 if none. Annual household health care spending was log transformed.

Table 3. Dependent variables and definitions used in the study

Dependent variables	Definitions
Health care utilization status	1 if health care spending ≥ 1 0 if health care spending = 0
Health care spending (log)	If health care utilization status=1, log(health care spending in Won)

3. Statistical Analysis

Analysis of descriptive statistics, k-means cluster analysis, and the Two-Part Model analysis were carried out to estimate the effect of sources of household income on the health care utilization.

First, in order to examine the demographic and clinical characteristics of the sample, descriptive statistics such as frequency and mean were computed for dependent and independent variables. In addition, the household characteristics of the entire sample and each cluster of dependent income source were compared.

Second, K-means cluster analysis using the four variables (% of asset, private transfer, pension, and social security) was performed to group the sample into four clusters (K=4) based on their income composition or dependency on a particular type of income.

Merriam-Webster Online Dictionary defines cluster analysis as ‘a statistical classification technique for discovering whether the individuals of a population fall into different groups by making quantitative comparisons of multiple characteristics. K-means cluster analysis is one of the most widely used algorithms for clustering today. According to Jain (2010), K-means cluster analysis finds a partition such that the squared error between the empirical mean of a cluster and the points in the cluster is minimized. The goal of K-means is to minimize the sum of the squared error over all K clusters,

$$J(C) = \sum_{k=1}^K \sum_{x_i \in C_k} \|x_i - \mu_k\|^2$$

According to the research by Jain and Dubes (1988), the main steps of K-means analysis are as follows:

1. Select an initial partition with K clusters; repeat steps 2 and until cluster membership stabilizes.
2. Generate a new partition by assigning each pattern to its closest cluster center.
3. Compute new cluster centers.

The graphical representation of the K-means cluster analysis is as follows (Jain, 2010).

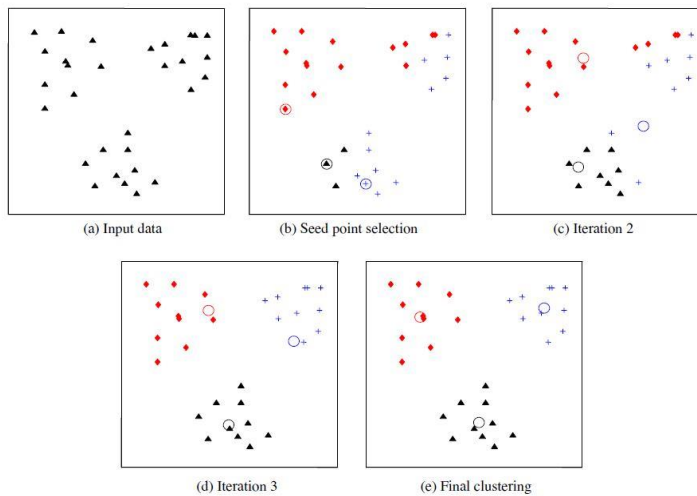


Fig. 4. Illustration of K-means algorithm. (a) Two-dimensional input data with three clusters; (b) three seed points selected as cluster centers and initial assignment of the data points to clusters; (c) and (d) intermediate iterations updating cluster labels and their centers; (e) final clustering obtained by K-means algorithm at convergence.

Figure 2. K-means cluster analysis on two-dimensional data. source: Jain (2010)

Third, based on the assumption that the determinants of initial health care use and the volume of health care utilization thereafter will differ, the Two-Part Model was used to examine the effect of household characteristics on 1) the probability of using the health care at least once 2) the volume of care utilized. Two separate Two-Part Model analyses were performed using 1) variables on the share of each type of income and 2) dependent income source

as the key independent variable.

In the first part, as the health care utilization status follows a binomial distribution where possible outcomes are ‘used’ or ‘never used,’ panel logistic regression was used to estimate the effect of household characteristics on the health care utilization status. In the second part, panel OLS regression was used to estimate the effect of household characteristics on the health care spending.

The regression equations for the Two-Part Model analysis using the **variables on the share of each type of income** are as follows:

- 1st Part: $\text{Log} \left(\frac{P}{1-P} \right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$
- 2nd Part: $\text{Log} (Y|y > 0) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$

(P: probability of using the health care at least once, Y: Annual household health care spending)

(X₁: share of asset income, X₂: share of pension income, X₃: share of social security income, X₄: other independent variables)

(X₄: sex, age, marital status, education level, household income, private health insurance status, number of family members, chronic diseases status, disability status, limitations on ADL)

The regression equations for the Two-Part Model analysis using **the dependent income source** are as follows:

- 1st Part: $\text{Log} \left(\frac{P}{1-P} \right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$
- 2nd Part: $\text{Log} (Y|y > 0) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$

(P: probability of using the health care at least once, Y: Annual

household health care spending)

(X_1 : dependent income source, X_2 : other independent variables)

(X_2 : sex, age, marital status, education level, household income, private health insurance status, number of family members, chronic diseases status, disability status, limitations on ADL)

IV. Results

1. Characteristics of the study sample

1.1 Demographic and clinical characteristics

Demographic and clinical characteristics of the study sample are summarized in Table 4. As discussed in the previous section, demographics of the household head are used to represent that of the household. The clinical characteristics are determined based on health and private health insurance status of the family members.

In this study sample, the annual household income was 8.319 million Won, on average. The average share of asset, private transfer, pension, and social security incomes were 12.3%, 34.0%, 38.5%, and 10.2%, respectively. Shares of the asset income dependent, private transfer dependent, pension income dependent, and social security income dependent were 18.6%, 37.3%, 30.0%, and 14.1%, respectively.

The number of households with male head and female head were nearly even (51.8 and 48.2%, respectively). The study sample was relatively old. Most were aged between 70 and 79 (55.1%) since only the retirees are included in the sample. Those aged between 60 and 69 were the second largest group in the sample (23.4%). According to the marital status, nearly even number of individuals were classified under married and others (48.9% and 51.1%, respectively). Most household heads received only elementary school or lower level of education (61.3%), although some graduated from high school (16.2%) and college or higher (10.0%).

Clinical characteristics of the sample are also presented in Table 4. Nearly 2/3 of the households had members with one or more chronic diseases. However, only 16.1% of the households had members with disabilities. Lastly, 20.2% of the households had members with limitations on Activities of Daily Living (ADL).

Annual health care spending by household characteristics are also presented in Table 4. Households with male head spent 1.977 million won, which is nearly double the amount of what female headed households spent. Among the age groups, those aged between 70 and 79 spent the most and those aged 80 and over spent the least. Households, in which the spouse is present, spent 2.018 million won, whereas other households only spent 1.063 million won. Graduates from middle school, high school, and college spent comparable amounts on health care. The health care spending was considerably higher for households with chronic diseases. Households with disabilities actually spent less than those without and households with limitations on ADL spent slightly more than those without. Households with private health insurance spent more on health care than those without. Lastly, households with higher income spent more on health care.

Table 4. Demographic and clinical characteristics of the study sample

Characteristics (n=909)	No. (%)	Health care spending (in 10,000 Won)
Household Income ⁴	813.9 million Won	
Share of asset income	(12.3)	
Share of private transfer	(34.0)	
Share of pension	(38.5)	
Share of social security	(10.2)	
Sex		
Female	438 (48.2)	114.1
Male	471 (51.8)	197.7
Age (yr)		
50-59	27 (3.0)	158.6
60-69	213 (23.4)	156.3
70-79	501 (55.1)	161.2
80 and over	168 (18.5)	135.6
Marital status		
Others ⁵	464 (51.1)	106.3
Married	445 (48.9)	201.8
Education level		
Elementary school or lower	557 (61.3)	119.1
Middle school	114 (12.5)	220.5
High school	147 (16.2)	215.8
College or higher	91 (10.0)	218.8
Chronic diseases status		
No	305 (33.7)	112.2
Yes	603 (66.3)	180.9
Disability Status		
No	763 (83.9)	160.5
Yes	146 (16.1)	141.3
Private insurance status		
No	804 (88.5)	154.0
Yes	105 (11.5)	183.7
Limitations on Activities of Daily Living		
No	725 (79.8)	155.5
Yes	184 (20.2)	165.0
Dependent income source		
Asset income	169 (18.6)	
Private transfer	339 (37.3)	
Pension income	273 (30.0)	
Social security income	128 (14.1)	

⁴ Adjusted for household size using square root scale

⁵ Include divorced, widowed, and single persons

1.2 Result of cluster analysis

The result of k-means cluster analysis is presented in Table 5. Based on the composition of household income, each household was assigned to one of the following four clusters or groups - asset income dependent, private transfer income dependent, pension income dependent, and social security income dependent.

The average share of respective income in each group (share of asset income in the asset dependent group, for example) was much higher than the share of other types of income. The pension income dependent grouped exhibited relatively higher dependency on its major source of income.

For the asset income dependent group, the average share of asset income among the total income was 69.2%. For the private transfer dependent group, the share of private transfer income was 69.1%, on average. For the pension income dependent group, the share of pension income was 78.4%, on average. For the social security dependent group, the share of social security income was 73.6%.

Table 5. Results of the K-means cluster analysis

	Asset income (%)	Private transfer (%)	Pension income (%)	Social security income(%)	Other income (%)	Total (%)
<i>1. Asset dependent</i>	69.2	10.9	16.5	0.3	3.1	100.0
<i>2. Private transfer dependent</i>	2.6	69.5	23.6	1.0	3.3	100.0
<i>3. Pension dependent</i>	4.9	11.5	78.4	1.4	3.8	100.0
<i>4. Social security dependent</i>	0.7	7.1	17.6	73.6	1.0	100.0

1.3 Comparison of household characteristics between the clusters

The results of k-means cluster analysis revealed the heterogeneity of elderly retirees' dependent income sources. In order to examine the relationship between the household characteristics and the type of dependent income source, descriptive statistics for the independent variables were computed for each cluster (Table 6).

The average household income was the highest in the asset income dependent (12.776 million Won), followed by the pension income dependent (9.663 million Won), the private transfer dependent (6.324 million Won), and the social security income dependent (4.576 million Won). The asset income dependent and the pension income dependent were relatively rich, compared to the entire sample, as their household income was higher than the overall mean. In comparison, the private transfer dependent and the social security dependent groups were relatively poor.

The demographics in each cluster exhibited notable contrasts. The share of male headed household was the highest in the asset income dependent (66.7%) and the lowest in the social security income dependent (32.2%). The shares of male headed households were higher than the average in the asset income dependent and the pension income dependent and lower than the average in the private transfer dependent and social security income dependent. The age structures were relatively similar across the clusters, although the share of 80 and over was the highest in the private transfer dependent. According to the marital status, the share of married was the highest in the asset income dependent (66.7%) and the lowest in the social security income dependent (21.1%). The shares of married were higher than the average in asset income dependent

and pension income dependent and lower than the average in private transfer dependent and social security income dependent. Education level of the clusters revealed similar patterns - the share of college educated was the highest in the pension income dependent. The share was higher than average in the asset income dependent and the pension income dependent.

The clinical characteristics also exhibited distinguishing patterns across the clusters. However, the shares of family members with chronic diseases were relatively similar across the clusters and did not exhibit pacific patterns. The share of family members with disabilities was the highest in the social security income dependent (32.8%) and was the lowest in the asset income dependent. The share of family members with private health insurance was the highest (18.4%) in the asset income dependent and the lowest (5.5%) in the social security dependent. The share of family members with limitations on ADL was the highest in the social security dependent (35.9%) and the lowest in the asset income dependent (15.6%).

Table 6. Comparison of household characteristics between the clusters

	Sample n=909	Asset income dependent n=141	Private transfer dependent N=350	Pension income dependent N=290	Social security income dependent N= 121
Characteristics	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
Household Income ⁶	813.9	1277.6	632.4	966.3	457.6
Sex					
Female	438 (48.2)	47 (33.3)	205 (58.6)	98 (33.8)	88 (68.8)
Male	471 (51.8)	94 (66.7)	145 (41.4)	192 (66.2)	40 (32.2)
Age (yr)					
50–59	27 (3.0)	5 (3.6)	10 (2.8)	9 (3.1)	3 (2.3)
60–69	213 (23.4)	44 (31.2)	65 (18.6)	80 (27.6)	24 (18.8)
70–79	501 (55.1)	76 (53.8)	196 (56.0)	154 (53.1)	75 (58.6)
80 and over	168 (18.5)	16 (11.4)	79 (22.6)	47 (16.2)	26 (20.3)
Marital status					
Others ⁷	464 (51.1)	47 (33.3)	207 (59.1)	109 (37.6)	101 (78.9)
Married	445 (48.9)	94 (66.7)	143 (40.9)	181 (62.4)	27 (21.1)
Education level					
Elementary school or lower	557 (61.3)	64 (45.4)	260 (74.2)	140 (48.2)	93 (72.7)
Middle school	114 (12.5)	19 (13.5)	42 (12.0)	37 (12.8)	16 (12.5)
High school	147 (16.2)	35 (24.8)	38 (10.9)	62 (21.4)	12 (9.4)
College or higher	91 (10.0)	23 (16.3)	10 (2.9)	51 (17.6)	7 (5.4)
Chronic diseases					
No	305 (33.7)	38 (27.0)	110 (31.4)	113 (39.0)	45 (35.2)
Yes	603 (66.3)	103 (73.0)	240 (68.6)	177 (61.0)	83 (64.8)
Disability					
No	763 (83.9)	132 (93.6)	302 (86.3)	243 (83.8)	86 (67.2)
Yes	146 (16.1)	9 (6.4)	48 (13.7)	47 (16.2)	42 (32.8)
Private insurance					
No	804 (88.5)	115 (81.6)	321 (91.7)	247 (85.2)	121 (94.5)
Yes	105 (11.5)	26 (18.4)	29 (8.3)	43 (14.8)	7 (5.5)
ADL					
No	725 (79.8)	119 (84.4)	290 (82.9)	234 (80.7)	82 (64.1)
Yes	184 (20.2)	22 (15.6)	60 (17.1)	56 (19.3)	46 (35.9)
# of family members	1.6	1.8	1.5	1.8	1.3

⁶ Adjusted for household size using square root scale, in ten thousands won

⁷ Include the divorced, widowed, and single persons

1.4 Correlation analysis

Before proceeding to the Two-Part Model analysis, the Pearson's correlation coefficients between independent variables are examined in Table 7 and Table 8. Most correlation coefficients were significant at 95% level. The absolute values of all coefficients were small enough to carry out the Two-Part Model analysis without the problem of multicollinearity.

Table 7 Pearson correlation coefficients among the independent variables

	Total household income	Asset (%)	Pension (%)	Social security (%)	Dependent income source	Sex
Total household income	1.0000					
Asset (%)	0.2962*	1.0000				
Pension (%)	0.0696*	-0.2970*	1.0000			
Social security (%)	-0.1607*	-0.1954*	-0.2714*	1.0000		
Dependent income source	-0.1470*	-0.6205*	0.3648*	0.6524*	1.0000	
Sex	0.2372*	0.1638*	0.1759*	-0.1845*	-0.0792*	1.0000
Age	-0.1457*	-0.1085*	-0.0321	0.0139	0.0451	-0.0641*
Marital status	0.2316*	0.2093*	0.1558*	-0.2395*	-0.1419*	0.8123*
Education level	0.5492*	0.2240*	0.1762*	-0.1151*	-0.0308	0.4721
Chronic diseases	0.0149	0.0432	-0.0819*	-0.0131	-0.0714*	0.0678*
Disabilities	-0.0632	-0.1156*	-0.0289	0.2340*	0.1944*	0.0800*
Private health insurance	0.2598*	0.0907*	0.0401	-0.0611	-0.0552	0.1143*
ADL	-0.0974*	-0.0498	-0.0470	0.1884*	0.1355*	0.0529
# of family members	0.1472*	0.1545*	0.1414*	-0.1524*	-0.0666*	0.6562*

Table 8 Pearson correlation coefficients among the independent variables (continued)

	Age	Marital status	Education level	Chronic diseases	Disabilities	Private health insurance	ADL	# of family members
Age	1.0000							
Marital status	-0.0926*	1.0000						
Education level	-0.1580*	0.4187*	1.0000					
Chronic diseases	-0.0139	0.0782*	-0.0237	1.0000				
Disabilities	0.0244	0.0811*	-0.0238	0.0897*	1.0000			
Private health insurance	-0.2826*	0.1418*	0.2459*	0.0608	-0.0269	1.0000		
ADL	0.0756*	- 0.0775*	-0.0775*	0.2082*	0.4433*	-0.0878*	1.0000	
# of family members	-0.1591*	0.3523*	0.3523*	0.0902*	0.1336*	0.1564*	0.0869*	1.0000

2. Predictors of health care utilization of the retirees

2.1 Two-Part Model analysis including the share of each type of income

In Table 9, the results of the Two-Part Model analysis including **the variables on the share of each type of income** is presented. The results of panel logistic regression analysis are presented in $\exp(\beta)$, which should be interpreted as odds of the probability of utilizing health services for each independent variable. The value of R^2 for panel OLS regression analysis was equal to 0.2597, which indicates that roughly 26% of the entire sample is being explained by the model used. The shares of each income (asset, pension, social security) were included in this analysis. If the sum of shares of each income is equal to 100%, the analysis cannot be carried out due to issue of multicollinearity. Therefore, the share of private transfer was not included in the analysis.

Increase in the share of social security income significantly decreased the odds of using services by 0.971 times. Increase in the share of pension income and the share of social security income both significantly decreased the health care spending. However, the size of decrease was larger for the social security income.

While the probability of initial health care services use is affected mainly by demographic and Need characteristics, the volume of health care utilization was associated with Enabling, Predisposing, and Need characteristics.

Among the Enabling characteristics, a million Won increase in the household income significantly increased the health care spending by 1.7%. Having private health insurance actually decreased the odds of using health services by 0.255 times.

Among the Predisposing characteristics, the head of household being male significantly decreased the odds of using health services by 0.411 times. Being married significantly increased the odds of using health services by 3.814 times and the health care spending by 21.2% compared to being divorced, widowed, or single. Higher levels of education were significantly associated with higher health care spending. Middle school graduates, high school graduates, and college graduates spent 17.6%, 33.0%, and 27.5% more than the elementary school graduates. Lastly, the each additional household member increased the health care spending by 14.2%.

Among the Need characteristics, having one or more chronic diseases significantly increased the odds by 1.971 times and the spending by 27.4%. Having one or more members with ADL conditions significantly increased the health care spending by 19.3%.

Table 9. Predictors of health care utilization estimated using the Two-Part Model (share of each type of income included)

Characteristics	Panel Logistic Regression (RE)		Panel OLS Regression (RE)	
	Exp (β)	P-value	β	P-value
Household income (in million Won)⁸	1.038	0.259	0.017	0.000***
Sex				
Female				
Male	0.411	0.064*	-0.033	0.723
Age (yr)				
50-59				
60-69	1.718	0.555	0.006	0.970
70-79	1.098	0.915	0.047	0.784
80 and over	0.572	0.543	0.032	0.856
Marital status				
Others ⁹				
Married	3.814	0.028***	0.212	0.038**
Education level				
Elementary school or lower				
Middle school	0.956	0.929	0.176	0.041**
High school	1.268	0.667	0.330	0.000***
College or higher	0.883	0.872	0.275	0.013**
Chronic diseases status				
No				
Yes	1.971	0.046**	0.274	0.000***
Disability Status				
No				
Yes	1.984	0.159	0.035	0.632
Private insurance status				
No				
Yes	0.255	0.011**	0.026	0.744
Limitations on ADL				
No				
Yes	0.839	0.872	0.193	0.002***
Number of family members	0.901	0.770	0.142	0.013**
Share of asset income	1.012	0.264	0.001	0.477
Share of pension	0.996	0.535	-0.003	0.002***
Share of social security	0.971	0.000***	-0.007	0.000***
Year	1.128	0.406	-0.025	0.199

*: p<0.1, **: p<0.05, ***: p<0.001

Wald chi2=47.00, p=0.0002; chibar²=6.88, p=0.004, R2=0.2597

⁸ Adjusted for household size using the square root scale

⁹ Include the divorced, widowed, and single persons

2.2 Two-Part Model analysis including the types of dependent household income

In Table 10, the results of Two-Part Model analysis including **the dependent income source** is presented. The value of R^2 for panel OLS regression analysis was equal to 0.2506, which indicates that roughly 25% of the entire sample is being explained by the model used.

The asset income dependent was set as the reference group for dependent income source in this regression analysis. The results suggest that clusters grouped based on the income composition are significant predictors of health care utilization of the retirees. Compared to the asset income dependent, the odds of using health services decreased for the private transfer dependent, pension income dependent, and social security income dependent, although it was significantly so only for the social security dependent. Compared to the asset income dependent, the health care spending significantly decreased by 17.0% in the pension income dependent and 52.0% in the social security income dependent.

The results suggest that while the probability of initial health care services use is affected mainly by demographic and Need characteristics, the volume of health care utilization is associated with Enabling, Predisposing, and Need characteristics.

Among the Enabling characteristics, a million Won increase in the household income significantly increased the health care spending by 1.8%. Having private health insurance actually decreased the odds of using health services by 0.264 times.

Among the Predisposing characteristics, the head of household being male significantly decreased the odds of using health services by 0.412 times. Being married significantly increased the odds of

using health services by 3.806 times and the health care spending by 22.0% compared to being divorced, widowed, or single. Higher level of education was significantly associated with higher health care spending. Middle school graduates, high school graduates, and college graduates spent 17.9%, 31.9%, and 24.2% more than the elementary school graduates. Lastly, the each additional household member increased the health care spending by 14.4%.

Among the Need characteristics, having one or more chronic diseases significantly increased the odds by 1.902 times and the spending by 28.7%. Having one or more members with ADL conditions significantly increased the health care spending by 19.1%.

Table 10. Predictors of health care utilization estimated using the Two-Part Model (dependent income source included)

Characteristics	Panel Logistic Regression (RE)		Panel OLS Regression (RE)	
	Exp (β)	P-value	β	P-value
Household income (in million Won)	1.043	0.195	0.018	0.000***
Sex				
Female				
Male	0.412	0.059*	-0.042	0.657
Age (yr)				
50-59				
60-69	2.054	0.422	0.013	0.941
70-79	1.415	0.686	0.064	0.708
80 and over	0.754	0.751	0.056	0.755
Marital status				
Others ¹⁰				
Married	3.806	0.025**	0.220	0.032**
Education level				
Elementary school or lower				
Middle school	1.039	0.940	0.179	0.039**
High school	1.296	0.635	0.319	0.000***
College or higher	0.949	0.945	0.242	0.029**
Chronic diseases status				
No				
Yes	1.902	0.054*	0.287	0.000***
Disability Status				
No				
Yes	1.826	0.205	0.011	0.882
Private insurance status				
No				
Yes	0.264	0.012**	0.030	0.710
Limitations on ADL				
No				
Yes	0.844	0.677	0.191	0.002***
Number of family members	0.949	0.844	0.144	0.012**
Dependent income source				
Asset income				
Private transfer income (pension) income	0.384	0.240	-0.084	0.274
(social security) income	0.264	0.102	-0.170	0.031**
	0.044	0.000***	-0.520	0.000***
Year	1.128	0.399	-0.028	0.163

*: p<0.1, **: p<0.05, ***: p<0.001

Wald chi2=47.87, p=0.0002, chibar²=6.44, p=0.006, R2=0.2506

¹⁰ Include the divorced, widowed, and single persons

2.3 Summary of the results of Two-Part Model analyses

In sum, the probability of using health services was significantly associated with sex, marital status, status on chronic diseases, and status on private health insurance. The household head being male and having private health insurance decreased the odds of using health services. Being married and having chronic diseases increased the odds of using health services.

Also, the household health care spending was significantly associated with the household income, marital status, education level, status on chronic diseases, limitations on ADL, number of family members.

Increased in the share of social security income significantly decreased the odds of using health services. Increase in the share of pension and social security income significantly decreased the health care spending. The size of decrease was larger for the social security income. However, dependent income source was significantly associated with the health care utilization of the retiree. Compared to the asset income dependent, the odds of using services decreased by 0.044 times for social security income dependent. The health care spending decreased by 17.0% for pension income dependent and by 52.0% for social security dependent, after adjusting for the household income and other characteristics.

V. Discussion and conclusion

Due to rapid aging and limited old age income security measures in Korea, retirees are faced with issues that adversely affect their well-being in old age, including old age poverty. In addition to the lack of societal measures, the burden of health care spending is likely to worsen the quality of life of elderly retirees. Given such settings, this study aimed to examine the effect of public transfer and asset income based on the assumption that the source of household income has strong implications on health care utilization of the elderly retiree households.

Using the Korean Retirement and Income Survey data of 2011 and 2013, this study was able to derive the following results and conclusions regarding the income and health care utilization of the retirees.

First, the analysis on household income composition suggested household incomes of the retirees are heterogeneous in Korea. In this study, the average share of asset, private transfer, pension, and social security incomes were 12.3%, 34.0%, 38.5%, and 10.2%, respectively. Shares of the asset income dependent, private transfer dependent, pension income dependent, and social security income dependent were 18.6%, 37.3%, 30.0%, and 14.1%, respectively.

The most recent study on the income source of elderly household in Korea is the research by Lee & Lee (2014), which used the Korean Welfare Panel Study (KWPS) data in 2013. Similar to this study, Lee & Lee used K-means cluster analysis to group the households into 6 groups based on the type of dependent income source. The shares of the private transfer dependent and the social security dependent were comparable in both studies.

However, the shares of the asset income and the pension income dependent are much higher in this study. There are few explanations for this difference. First, the characteristics of the sample are different. Unlike the sample in Lee & Lee (2014), the sample included in this study consists of households in which labour earnings are zero. As labour earnings disappear, income gap between high income group and low income group widens. In other words, households that had asset income before retirement are more likely to be classified by asset income dependent after the labour earnings disappear. Second, the definitions of household income are different in KReIS and KWPS. For example, old age pension is classified under pension income in KReIS and under social security income in KWPS.

These figures suggest that the public transfer income is the primary source of income for retirees in Korea. The public transfer income being the primary source of the retired has been presented in number of domestic and international studies (Bardasi et al., 2002; Choi, 2007; Grad, 1990; H. S. Lee & Shin, 2003). However, the study results also suggested that the dependency of retiree households on private transfer is still high in Korea (37.3% of the sample are dependent on private transfer). In contrast, Börsch-Supan and Reil-Held (1997) has suggested that the share of private transfers and other non-public transfers were less than 1/2 of the share of public transfer income in 9 OECD countries. These results suggest that the public measure on old age income security is urgently needed as Korea is experiencing one of the highest rate of aging in the world.

The results of K-cluster analysis revealed number of interesting findings. The demographic and clinical characteristics of the households in each income dependent group were contrasting. For instance, the household characteristics of the high income (asset dependent) and low income (social security income dependent) groups were very different. The share of male headed

households was nearly two times higher in the asset dependent. The share of married was over three times higher in the asset dependent. The share of individuals with disabilities was 7.7% in the asset income dependent and 32.8% in the social security dependent. The share of individuals with limitations on ADL was 16.6% in the asset income dependent and 36.7% in the social security dependent.

Second, the results of Two-Part Model analysis suggested that the 1) each source of income and 2) dependent source of income are significantly associated with the health care utilization of the retirees. The shares of pension and social security income were negatively associated with the health care utilization of the retiree. While increase in the share of social security income significantly decreased the odds of using health services and the health care spending, increase in the share of pension income significantly decreased the health care spending only. In addition, compare to the asset dependent, the odds of using health services were significantly lower in the social security income dependent. The health care spending was also significantly lower in the pension income and the social security dependent. These results suggest that the source of income and the income composition of the retiree households have not only economic implications but also on the use of health care services. Especially, the negative impact of public transfer income (pension and social security) addresses the need to examine the effect of old age income security measure in Korea on the health and well-being of the elderly retirees.

Third, the results of Two-Part Model analysis suggested that 1) the demographic and Need characteristics were important predictors of the odds of using health services and 2) the health care spending was significantly associated with Enabling, Predisposing, and Need characteristics. Among the Need characteristics, presence of chronic diseases significantly increased the odds of using services and the health care spending. In

addition, limitations on ADL significantly increased the health care spending. Such health conditions have been previously reported to increase the health care utilization of the elderly (Chung, 2012; Fernández-Olano et al., 2006; Son, 2004; Yoon et al., 2010). However, similar to the results of (Kahng, 2010; Yoon et al., 2010), having household members with disability was not significantly associated with using health services use. Since this study was not able to examine the degree of disability observed in the sample, further research including types and severity of disability is warranted.

This study has following limitations. First, it was able to consider variables that are known to affect the health care utilization of the retirees. Although previous studies have shown that the public health insurance status (Oh & Sung, 2010; Seok, 2012), it was not included in the study due to limitations in the data. In addition, the study was not able to include characteristics that represent the health status of the household more accurately. Second, it was not able to consider the effect of income that are included in the sub-categories of asset and public transfer income. For instance, the National Pension income, old age security income, disability security income, and other incomes are included in the public pension income category under the public transfer income. But, due to limited data, it was not considered in the study. Third, there exists potential problem of a reverse causality of health status and retirement decision. Although there is a possibility of deciding to retire due to ill health in old age, health status prior to retirement was not considered due to limitations in the data.

Bibliography

- Aday, L. A., & Andersen, R. (1974). A framework for the study of access to medical care. *Health services research, 9*(3), 208.
- Andersen, R. M. (1995). Revisiting the Behavioral Model and Access to Medical Care: Does It Matter? *Journal of health and social behavior, 36*, 1-10.
- Andersen, R. M., McCutcheon, A., Aday, L. A., Chiu, G. Y., & Bell, R. (1983). Exploring dimensions of access to medical care. *Health services research, 18*(1), 49.
- Andersen, R. M., & Newman, J. F. (2005). Societal and Individual Determinants of Medical Care Utilization in the United States. *The Milbank Quarterly, 83*(4), 1-28.
- Börsch-Supan, A., & Reil-Held, A. (1997). *Retirement income: level, risk, and substitution among income components*. Retrieved from
- Bardasi, E., Jenkins, S. P., & Rigg, J. A. (2002). Retirement and the income of older people: a British perspective. *Ageing and Society, 22*(2), 131-159.
- Butrica, B. A., Goldwyn, J. H., & Johnson, R. W. (2005). *Understanding spending patterns in retirement*. Retrieved from Washington, United States:
- Choi, H. M. (2007). *Sources of Elderly Households' Income*. Retrieved from
- Chung, W. (2012). Medical spending at end-of-life. *The Korean Journal of Health Economics and Policy, 18*(4), 149-168.
- Diehr, P., Yanez, D., Ash, A., Hornbrook, M., & Lin, D. (1999). Methods for analyzing health care utilization and costs. *Annual review of public health, 20*(1), 125-144.
- Fernández-Olano, C., Hidalgo, J. D. L.-T., Cerdá-Díaz, R., Requena-Gallego, M., Sánchez-Castaño, C., Urbistondo-Cascales, L., & Otero-Puime, A. (2006). Factors associated with health care utilization by the elderly in a public health care system. *Health policy, 75*(2), 131-139.
- Grad, S. (1990). Income change at retirement. *Soc. Sec. Bull., 53*, 2.
- Hurd, M. D., & McGarry, K. (1997). Medical insurance and the use of health care services by the elderly. *Journal of health economics, 16*(2),

129-154.

- Jain, A. K. (2010). Data clustering: 50 years beyond K-means. *Pattern recognition letters*, 31(8), 651-666.
- Jain, A. K., & Dubes, R. C. (1988). Algorithms for clustering data: Prentice-Hall, Inc.
- Kahng, S. (2010). The trajectory of outpatient medical service use and its predictors. *Korean Journal of Social Welfare*, 62(3), 83-108.
- Kim, H. R., & Choe, H. (1999). The influences of household income and asset in the consumption spendings according to housing tenure. *Family and Environment Research*, 37(10), 91-106.
- Kim, J. G. (2008). Factors affecting the choice of medical care use by the elderly person. *Journal of Korean Society of Gerontological Social Welfare*, 39, 273-303.
- Kim, Y. J. (1998). The comparative analysis of income, spending and asset between retired elderly households and employed elderly households. *Family and Environment Research*, 36(7), 57-67.
- Kim, Y. S. (2002). Economic Status of the Poor Elderly Households in Urban. *Journal of Consumer Studies*, 13(3), 95-119.
- Lee, H., Lee, T., Jeon, B., & Jung, Y. (2009). Factors related to health care utilization in the poor and the general population. *The Korean Journal of Health Economics and Policy*, 15(1), 79-106.
- Lee, H. S., & Shin, S. M. (2003). The Economic Status of Retired Elderly Households. *The Korean Home Management Association*, 21(4).
- Lee, S. (2015). Income composition and expenditure inequality of the elderly household by income class. *Journal of the Population Association of Korea*, 38(2), 85-111.
- Lee, S. R., & Lee, S. A. (2014). The effects of household income types and sources on the depression and self-respect in elderly Korean. *Korean Journal of Social Welfare Studies*, 45(3), 71-95.
- Moehrle, T. (1990). Spending patterns of the elderly: employed and nonemployed. *Monthly Labor Review*, 113(5), 34-41.
- Nam, S. H., & Kwon, S. (2008). Asset Distribution, Inequality, and Poverty among Elderly Households in Korea. *Health and Social Affairs Research*, 28(2), 3-32.

- Oh, J., & Sung, Y. (2010). A study on the factors influencing health care expenditure of elderly households: Focusing on the elderly single and elderly couple households. *Journal of Korean Management Association*, 28(1), 159-174.
- Park, J. S., & Hwang, D. S. (2014). Analysis of households' mental accounting according to main income source and to income quintile. *Journal of Consumer Studies*, 25(1), 115-143.
- Phillips, K. A., Morrison, K. R., Andersen, R., & Aday, L. A. (1998). Understanding the context of health care utilization: assessing environmental and provider-related variables in the behavioral model of utilization. *Health services research*, 33(3 Part I), 571-596.
- Seo, Y. B., & Song, H. J. (2015). Analysis of the Effect of Income Source of the Middle-aged and Elderly Household on Consumption. *Korean Journal of Public Finance*, 8(3), 119-147.
- Seok, S. (2012). The impact of death -related costs on health-care expenditure in Korea. *Health and Social Welfare Review*, 32(2), 402-426.
- Shin, S. H., Kim, C. S., & Kim, J. K. (2004). The comparison of household health care spending and income elasticity by ability to pay level. *Korean Journal of Health Policy and Administration*, 14(4), 75-87.
- Son, Y. (2004). A study of medical services usage between the retired elderly and employed elderly. *Journal of Welfare for the Aged*, 26, 165-190.
- Thaler, R. H. (1999). Mental accounting matters. *Journal of Behavioral decision making*, 12(3), 183.
- Yang, S., & Choe, H. (2009). An analysis of mental accounting in household consumption spendings. *Consumer Policy and Education Review*, 5(4), 37-58.
- Yoon, J. H., Kim, S. W., Chang, Y. H., Cho, H. S., & Song, H. J. (2010). A Panel Data Analysis of the Determinants of Health Care Spendings among Older Single-person Households. *Journal of Consumer Studies*, 21(4), 193-218.
- Yun, J., & Kim, H. J. (2010). The Relationship between Retirement and Household Consumption. *Economic Analysis*, 17(1).

국문초록

공적 이전소득 및 자산 소득이 은퇴 중고령 가구의 의료이용에 미치는 영향

황 인 옥

보건학과 보건정책관리학 전공

서울대학교 보건대학원

연구배경

은퇴는 가구 소득수준 및 소득구성의 변화를 야기한다. 기존 연구는 은퇴 가구의 소득 구성은 매우 다양하나, 공적 이전소득과 자산소득이 은퇴 가구의 주요 소득원으로 일관되게 나타남을 지적한 바 있다. 소비 측면에서 볼 때, 보건의료비는 은퇴 가구의 주요 소비비목으로 알려져 있다. 그럼에도 불구하고, 기존 연구는 은퇴 가구의 소득 특성에 집중되어 있으며, 소득원 및 소득 구성이 의료이용에 미치는 영향에 대한 연구는 부족한 실정이다. 이에 본 연구는 은퇴 가구의 소득원 및 소득 구성이 의료이용에 미치는 영향을 고찰하고자 한다. 또한, 은퇴자의 의료이용의 결정요인을 살펴보고자 한다.

연구방법

본 연구는 국민노후보장패널조사(KReIS)의 4차(2011) 및 5차년도(2013) 자료를 활용했다. 가구주가 50세 이상이며 은퇴한 총 909 가구가 연구에 포함되었다. 종속변수는 가구 의료이용 여부 및 가구 의료비 지출이며 의료비 지출은 로그화하였다. 독립변수는 의존소득유형, 자산소득 비율, 공적연금 비율, 공공부조 소득 비율, 가구 균등화 소득, 성별, 나이, 교육수준, 혼인상태, 만성질환유무, 장애유무, 일상및사회활동제한(ADL) 여부, 민간 의료보험 가입 여부, 가구원수이다. 대상자를 소득 구성 및 주요 소득원에 따른 네 개의 소득 의존형 집단으로 구분하기 위해 K-평균 군집분석을 사용하였다. 마지막으로 투파트 모델(Two-Part Model)을 사용해 위에서 언급한 가구 특성이 의료이용에 미치는 영향을 분석하였다.

연구결과

투파트 모델 (Two-Part Model) 분석 결과, 의존 소득유형, 공적연금 비율, 공공부조 소득 비율이 은퇴 중고령 가구의 의료이용에 유의한 영향을 미치는 것으로 나타났다. 자산소득 의존형 가구에 비해 공공부조 소득 의존형 가구가 의료이용을 할 확률이 유의하게 감소했다. 또한, 자산소득 의존형 가구에 비해 공적연금 의존형 및 공공부조 소득 의존형 가구의 의료비 지출이 유의하게 감소했다. 공공부조 소득 비율의 증가는 의료이용 확률을 유의하게 감소시키는 부정적 영향이 있는 것으로 나타났다. 공적연금 비율 및 공공부조 소득의 비율 증가는 의료비 지출의 유의한 감소로 이어졌으며, 공공부조 소득 비율의 영향이 더 크게 부정적으로 나타났다. 은퇴 중고령 가구의 의료이용 결정요인을 살펴본 결과, 질병(Need) 요인 및 일부 인구학적 요인이 의료이용 확률의 유의한 결정요인으로 나타났으며, 가능(Enabling) 요인, 질병(Need)요인, 일부 인구학적 요인이 의료비 지출의 유의한 결정요인으로 나타났다.

결론

본 연구의 주요 결론은 다음과 같다. 첫째, 은퇴 가구의 소득 구성은 매우 다양하게 나타난다. 공적연금 소득 및 공공부조 소득이 은퇴 가구 소득의 가장 큰 부분을 차지하는 것으로 나타났으나, 사적 이전소득 또한 상당한 부분을 차지했다. 둘째, 은퇴 가구의 소득 구성은 의료이용에 유의한 영향을 미치는 것으로 나타났다. 자산소득, 공적연금소득, 공공부조소득의 비율 및 주요 소득원이 가구 의료이용의 주요 결정요인으로 나타났다. 셋째, 은퇴 중고령자 가구의 의료이용 확률은 질병요인 및 일부 인구학적 요인의 영향을 받았으나, 가구 의료비 지출은 가능요인, 소인성 요인, 질병 요인 모드의 영향을 받는 것으로 나타났다.

주제어 : 은퇴, 의료이용, 소득원, 공적 이전소득, 자산소득, 노후보장패널

학 번 : 2014-2339