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Poverty dynamics, health care utilization, and health expenditure in South Korea

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Abstract

The aim of the study was to examine the effects of poverty dynamics and the Medical Aid (MA) status change on health care use, health expenditure (out-of-pocket payments), and unmet need, using data from the Korea Health Panel 2008-2014 for the years of 2011-2013. Then, the study aimed to analyze the effect of catastrophic health expenditure (CHE) on the first poverty spell length and the total poverty duration among the poor at the poverty line of less than 50% of the median income level (MIL), using the Korean Welfare Panel Study 2008-2016 through the panel generalized estimating equations population-averaged model. The study then examined the effect of CHE on exit from poverty among the poor at the poverty line of less than 40% of MIL, analyzing data from the Korean Welfare Panel Study 2008-2016 through a discrete time event history analysis.

This study was the first attempt to explore the effect of poverty dynamics on health care use, health expenditure, and unmet need. The study showed that the persistent poor had difficulties in access to having emergency visits and hospitalization. The persistent poor spent less total health expenditure at all the poverty lines, and less outpatient health expenditures at some poverty lines and reported more unmet need for all reasons and for the economic reason. The recurrent poor had less inpatient care, spent less total health expenditure, and reported the largest unmet need for the economic reason. Considering how important receiving proper health care services timely to improve and sustain health and well-being is, the results raise some concerns that the persistent poor and potentially the recurrent poor would be at risk of having worse health status and well-being.

As for the effects of the MA status change on health care use, health expenditure, and unmet need, the continuous MA had more outpatient visits, less medical check-ups, more emergency visits, more inpatient care, less health expenditure, and more unmet need; the new MA group who can have relatively high benefit coverage of services by reduction of co-payment compared to the continuous health insurance beneficiaries had more outpatient visits and stayed longer at a hospital; the new HI group who may have relatively low benefit coverage level decreased their inpatient care use, which may also affect the result of unmet need.

The study was the first exploratory study to examine the effect of catastrophic health expenditure on the first poverty spell length and the total

poverty duration, and on exit from poverty. Households with occurrence of CHE at the thresholds of 30-40% were more likely to be at risk of lengthening their first poverty spell, even after controlling other predictors of poverty duration. Households with occurrence of CHE at the threshold of 30% were likely to stay longer in the total poverty duration, with smaller effect sizes of CHE compared to those at the first poverty spell. This would suggest that effects of CHE were more critical for the first poverty spell.

Effects of CHE on poverty exit were different between exit to near-poverty and exit to non-poverty. Households facing CHE were less likely to exit from poverty to near-poverty at the thresholds of 20-30%; however, effects of CHE were not associated with exiting from poverty to non-poverty. Considering the majority of types of exit from poverty were exit to near-poverty (about 70%), this result would raise concerns that occurrences of CHE may pose a big threat to their already limited household budget. Combined loss of income due to ill health, financial burden due to health care use may force the poor to be stuck at poverty.

The key approach to achieving better access to care and financial protection should be to develop prepayment systems by extending benefit packages and reducing co-payments. Reduction of incidence of CHE by expanding coverage of the national health insurance may be one of more feasible ways of reducing poverty and improving well-being of the people in a society, along with other sectors' policies for poverty reduction.

Keywords: Poverty; poverty dynamics; health care utilization; health expenditure; unmet need; catastrophic health expenditure; exit from poverty; Korea.
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I. Introduction

1. Background

Universal health coverage (UHC) includes financial protection from catastrophic health expenditure and impoverishment due to health care utilization and ensuring access to essential health services(World Health Organization 2015). In September 2015, the United Nations General Assembly adopted the 17 Sustainable Development Goals (SDGs); target 3.8 of SDG 3 includes achieving universal health coverage. Target 3.8 has two monitoring indicators, including 3.8.1 on coverage of essential health services and 3.8.2 on the share of a country's population with catastrophic health expenditure (CHE), defined as household total health expenditure as a share of household total consumption or income. In 2010, 808 million people (11.7% of the world's population) suffered CHE at the 10% threshold, with 2.6% of the total world population (179 million people) suffering CHE at the 25% threshold. Incidence of CHE has been on the increase between 2000 and 2010(World Health Organization and the International Bank for Reconstruction and Development / The World Bank 2017 2017). Impoverishment is not an official SDG UHC monitoring indicators, but is also included in the UHC monitoring report by the World Health Organization and the World Bank; it links UHC directly to the first SDG goal, i.e. to end poverty in all its forms everywhere. Impoverishment can be measured as the change in poverty headcount with and without out-of-pocket payments (OOP) included in consumption or income. It is assumed that households facing impoverishment due to OOP were forced by ill health events to divert spending from other budget items, such as food, housing, and clothing, to health expenditure, leading to consumption smoothing and poverty(World Health Organization and the International Bank for Reconstruction and Development / The World Bank 2017 2017).

No health system in the world can afford the full cost of health services from the prepaid and pooled funds through taxes and insurance contributions. Most countries require some co-payments at the point of service, restraining moral hazard(Yardim, Cilingiroglu et al. 2010). However, OOP have consequences for health care utilization, which would pose some threats to household living standards. This would depend on the unpredictability of OOP, the magnitude relative to resources in a household and their distribution compared to that of household income. If the cost of care put people at risk of financial catastrophe, the principle of financial risk protection will be violated. Such catastrophic health expenditure can be defined as those in excess of a substantial fraction of the household budget(Xu, Evans et al. 2003; van Doorslaer E 2007; World Health Organization 2010). Three components must be present for CHE to incur: the availability of health services that require OOP, low household capacity to pay, and lack of prepayment systems for risk pooling(World Health Organization 2005). CHE is conditional on health care utilization and shows the financial risk related to access to care. This would imply that the measurement of CHE captures only financial risks for those seeking health services, but it fails to show for those who do not seek health services when needed due to limited capacity to pay(Yardim, Cilingiroglu et al. 2010; Kavosi, Rashidian et al. 2012; Edoka, McPake et al. 2017).

In the lack of prepayment systems for risk pooling, households have to rely on OOP, maybe through savings and other informal resources to smooth consumption to deal with ill health events(Flores G 2008). Households having illness face several components of economic risks of illness: health expenditure, indirect cost of health seeking, and loss of income. In order to deal with the economic risks, households may use coping strategies, which leads to consequences for consumption and poverty(Sparrow 2014; Mitra, Palmer et al. 2016). Financial coping strategies include savings, depletion of

assets, borrowing and transfers, etc. Although financial coping strategies may protect consumption from health shocks in the short term, the long-term impact of financial coping strategies can be substantial. Depletion of assets could have negative effects on future earnings, and indebtedness due to health expenditure incurred has been found to be one of the major factors into poverty and remaining in poverty(Flores G 2008).

The economic consequences of ill health and health care utilization can be different across households with their socio-economic status(McIntyre, Thiede et al. 2006; Leive and Xu 2008; Kruk, Goldmann et al. 2009; Sparrow 2014; Wagstaff and Lindelow 2014; Mitra, Palmer et al. 2016). Illness imposes a higher level of risk on the low-income groups, because “the body is poor people’s main asset, but one with no insurance”(Bloom and Canning 2003). If their main asset is affected by disease or injury, the poor are unable to carry out normal activities including earning money needed to provide themselves and other family members with food and health services. Combined with loss of income due to ill health, substantial health expenditure may push many households into poverty or force those who are already poor into deeper poverty(Whitehead, Dahlgren et al. 2001; Bloom and Canning 2003; McIntyre, Thiede et al. 2006; Krishna 2007 a). Evidence shows that ill health and health care expenditure was the single most common reason for becoming poorer across low-, middle-, and high-income countries(Bloom and Canning 2003; Krishna 2007 a; Krishna 2007 b).

The poor threatened by a “medical poverty trap” are forced to make sub-optimal choices that have negative effects on their health. Even though the poor have significantly worse health conditions than the non-poor(Gupta, Verhoeven et al. 2003), the poor tend to forgo or delay seeking care until they need emergency health services, because of financial burden; this often leads to seeking care at a more expensive level such as at hospitals(Bloom and Canning 2003; Krishna 2007 a).

The Koreans are paying the highest co-payment rate among the 20 Organization for Economic Cooperation and Development (OECD) countries where co-payments need to be paid; a share of out-of-pocket payments is as high as 35% in the total health expenditure(Jones R 2010). Given high OOP, concerns on access to care and financial risk protection have been growing, especially for low-income households(Kwon 2007; Jones R 2010). To address the issues, the Government has made efforts to reduce OOP since 2004, especially pronounced the late 2000s, through expanding the benefit coverage and reducing cost-sharing. However, the policies for reducing co-payments cover only the insured services, which would raise some concerns that the financial burden from OOP for the uninsured services can still be heavy, particularly for the poor(Kwon, Lee et al. 2015).

Effects of poverty dynamics and the MA status change have not been much considered in the previous literature on health service. The majority of health care studies provided snapshot information on poverty status and the MA status based on cross-sectional data. The status of poverty and the MA seems to be static at one point, but in fact, changes of the status of the MA and poverty dynamically occur. Evidence shows that about 75% of those who began a poverty spell exit from poverty within two years(Ku 2005). Studies showed that there were differences of the characteristics between the persistent poor, the recurrent poor, and the transient poor(Muffels, Fouarge et al. 2000; Fouarge and Layte 2005; Dartanto and Nurkholis 2013). It is possible that type of poverty would affect behaviors and preferences of the poor in many situations including health seeking. Studies not accounting for dynamics of poverty and the MA status may be likely to overestimate their effects on health care(Muffels, Fouarge et al. 2000). Evidence shows that the long-term income is more important for health than the current income levels(Benzeval and Judge 2001); this would have some impacts on health care use, health expenditure, and unmet needs of an individual; however,

there is a paucity of researches on this area.

Moreover, those with MA may be considered to be the most disadvantaged group in a society for which Government provides some benefits through pro-poor policies with public funding. They have different financial incentives because of low co-payment policies for health care use compared to those with the national health insurance; therefore, if the status of the MA is changed, that would affect the patterns of health care use, health expenditure, and unmet needs of the MA beneficiaries. Evidence shows that the disruption of the health insurance status itself affects health care use and unmet needs(Federico, Steiner et al. 2007). However, little is known about this issue in South Korea.

Differentiating types of poverty includes some time dimensions of poverty; but it still focuses on poverty transition, i.e. entry and exit of poverty for a fixed period of time, rather than poverty duration. It also does not consider right the censoring issue where many of the poor at the end of the observation period may have stayed in poverty for some time after that. Therefore, considering a duration perspective that identifies spells of poverty should be needed for researches on poverty.

This leads us to the next topic of this study. High financial burden due to illness and related out-of-pocket payments is one of the key factors of poverty(Muffels, Fouarge et al. 2000; Dartanto and Nurkholis 2013). Duration of poverty could be a result of health status and health expenditure. Occurrence of catastrophic health expenditure may have a negative impact on persistence of poverty among the poor, which would serve as a poverty trap. Exit rate from poverty for those who experience CHE may differ from those who do not experience CHE, but there has been no research on this yet. Moreover, endogeneity issues including reverse causality issue should be carefully addressed to examine the effect of CHE on persistence of poverty

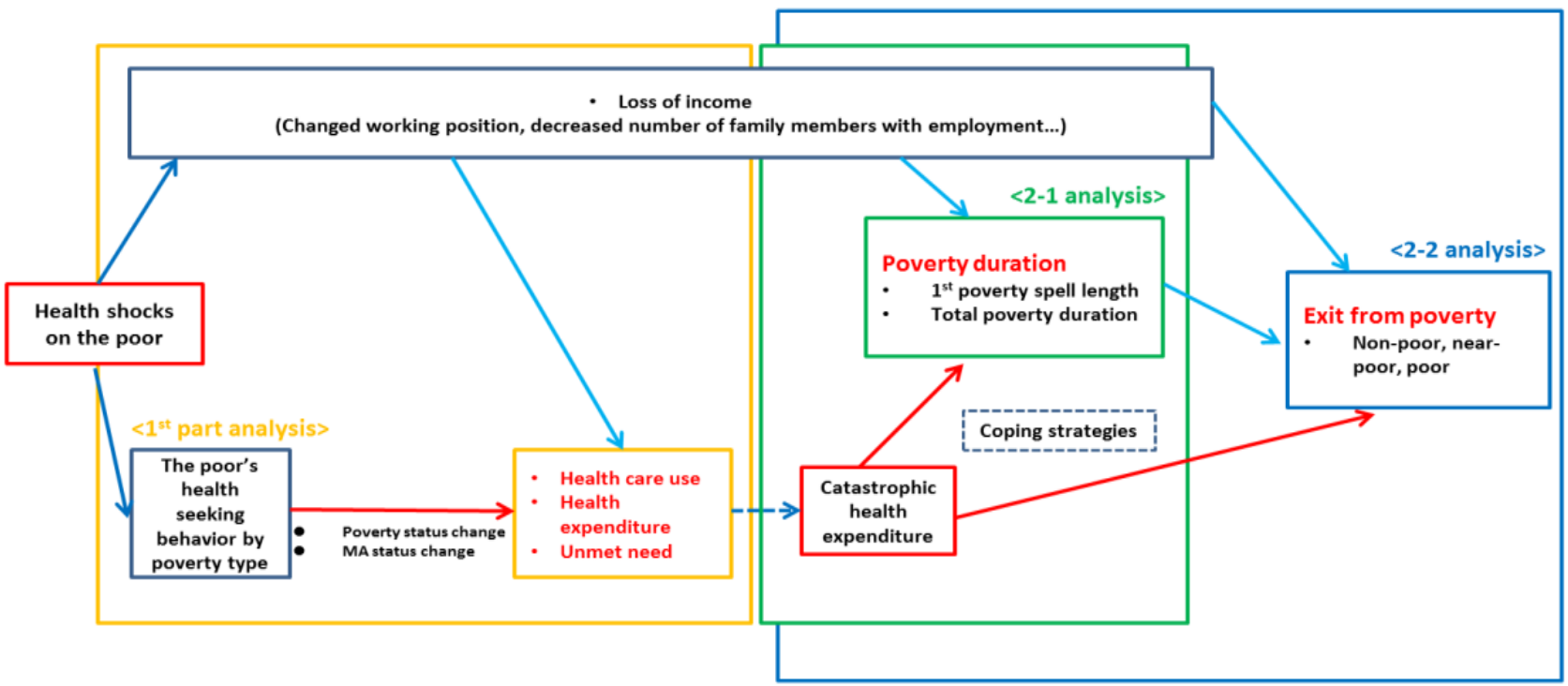
among the poor.

While growing researches on catastrophic health expenditure and its impoverishment effect have been conducted, the impact of CHE on poverty persistence for the poor remains under-researched internationally and nationally. There have been some researches on impact of catastrophic health expenditure on transitioning to poverty(Shin, Shin et al. 2010; Song and Shin 2010; Song and Shin 2014; Lee 2015; Woo and Shin 2015; Kim and Kwon 2016) and on persistence of poverty(Song and Shin 2010; Song and Shin 2014; Kim and Kwon 2016). However, results were inconsistent depending on the studies and data sources. Furthermore, these studies have limitations on the research method; they did not take into account poverty duration, and all used multivariate logistic regressions. Researches on the effect of CHE on poverty duration and exit from poverty have not yet been found to my knowledge.

2. Research objectives of the study

The study aims to examine the effect of poverty dynamics and the MA status change on health care utilization, health expenditure, and unmet need, analyzing data from the Korea Health Panel 2008-2014 for the years of 2011-2013. And then, the study aims to analyze the effects of occurrence of catastrophic health expenditure on the first poverty spell length and the total poverty duration among the poor at the poverty line of less than 50% of the median income level (MIL), using the Korean Welfare Panel Study 2008-2016 through the panel generalized estimating equations population-averaged model. Furthermore, the study aims to examine the effect of CHE on exit from poverty among the poor at the poverty line of less than 40% of MIL, analyzing data from the Korean Welfare Panel Study 2008-2016 through a discrete time event history analysis.

Figure 1. Research framework



Note: MA stands for the Medical Aid program.

II. Literature review

Great attentions for the Universal Health Coverage (UHC) have been paid over the years. Broadly speaking, UHC means all people receiving health services when they need, while at the same time ensuring that the health care use does not lead to financial hardship. Most countries have embraced this UHC agenda, expanding the UHC three dimensions (population coverage, effective service coverage, and cost-sharing)(World Health Organization 2015).

In South Korea, a social health insurance was first introduced in 1977. With rapid economic growth, universal population coverage was rapidly achieved in 1989 along with limited benefit coverage; benefit coverage has also been extended since then(Kwon 2007; Lu, Leung et al. 2007; Jones R 2010). The National Health Insurance (NHI) offers an extensive benefit package covering outpatient care as well as inpatient care including traditional medicine(Lu, Leung et al. 2007). As for inpatient care, the co-payment rate is fixed by 20%. For outpatient care, co-payment rates range from 30% to 60%(Jones R 2010). The Koreans are paying the highest co-payment rate among the 20 Organization for Economic Cooperation and Development (OECD) countries where co-payments need to be paid(Jones R 2010).

Given high OOP, concerns on access to care and financial risk protection have been growing, especially for lower income households(Kwon 2007; Jones R 2010). To address the issues, the Government has made efforts to reduce OOP since 2004, especially pronounced the late 2000s, through expanding the benefit coverage and reducing cost sharing. A series of health policies have been introduced and have revolved around expanding benefit package items and reducing cost sharing for people with catastrophic diseases and the disadvantage groups (the elderly, pregnant women, children, etc.). For

example, ceiling on cumulative OOP for six months (only applied to the insured services) was introduced in July 2004; the initial uniform ceiling was changed to three levels of ceiling depending on income level as of January 2009; since January 2014, the three levels were divided into seven levels(Kwon, Lee et al. 2015). Other policies for reducing co-payments were also implemented such as the reduction of co-insurance rates from 10% to 5% for cancer patients as of December 2009 and for cardio-vascular disease patients as of January 2010(Korea Ministry of Health and Welfare 2012). Consequently, those health policies might have had a positive influence on increasing access to care and financial risk protection. However, the policies for reducing co-payments apply to only the insured services, thus raising concerns that the financial burden due to health expenditure for the uninsured services can still be substantial, particularly for the worse-off(Kwon, Lee et al. 2015).

In this section, we examined findings from literature on health care use, health expenditure, and unmet among the poor, using the Andersen's model. And then, we focused on poverty dynamics and its heterogeneity among the poor. Furthermore, we looked into the concepts of catastrophic health expenditure, poverty duration, and exit from poverty, and their relationship.

1. Health care use, health expenditure, and unmet need among the poor

The utilization of health services may be determined not only by health needs or health conditions of an individual, but also by characteristics of the individual including socioeconomic status. From a perspective of the behavioral sciences, individual behavior can be seen as a function of characteristics of the individual, the societal impact (the environment where he or she lives), and some sort of interaction of the individual and societal forces(Andersen and Newman 2005). Taking this point of view, Andersen and

Newman (2005) presented that the health services utilization can be determined by the characteristics of health system at the societal level (volume and distribution of resources, including health personnel, structures, equipment, and materials used in providing health services; access and structure of organization, such as levels of benefit coverage/co-payment systems, the referral systems), and by the individual determinants, such as predisposing factors (age, sex, education levels, etc.), enabling factors (income, health insurance, residential region, etc.), and illness level (symptoms, disability, general state, etc.). The use of health services can also depend on the type (hospital, physician, medications, etc.), purpose (primary care, secondary care, tertiary care, etc.), and unit (contact, volume, episodic care) of health services (Figure 2).

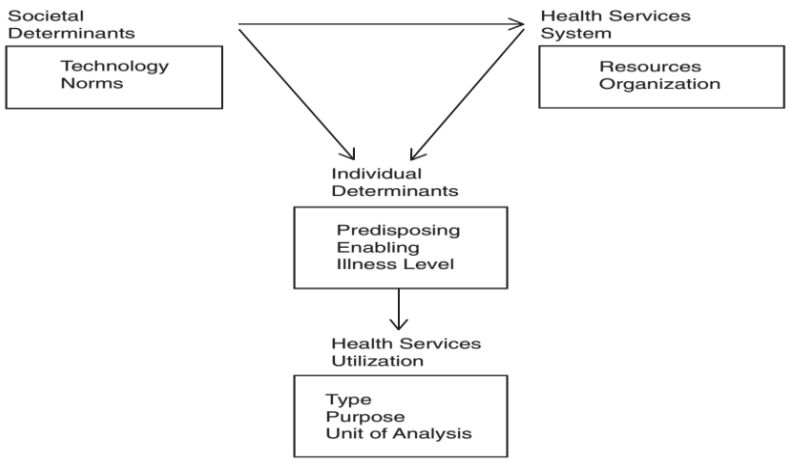
This framework suggested by Andersen and Newman have been used as a good starting point to explaining determinants of an individual's health care utilization. For predisposing factors, age, sex, and marital status of the demographic variables are related to health and illness. People in different age groups, sex, and marital status have different amounts and types of diseases and as a result, different distribution and patterns of health service utilization. Social status of an individual including education, occupation, and the number of family members may be associated with the life style of the individual and the physical and social environment where he/she lives and related behavior patterns, leading to different patterns of health care use.

Although these characteristics of an individual are important, enabling factors, such as income, health insurance, residential areas, private health insurances, permit the individual to seek health services. Income, type and coverage levels of health insurance, and private health insurances may affect an individual's capacity to pay for health services. Often, expanding the coverage of the public/national health insurance may be related to reduce the effect of these enabling factors on health services that can be much

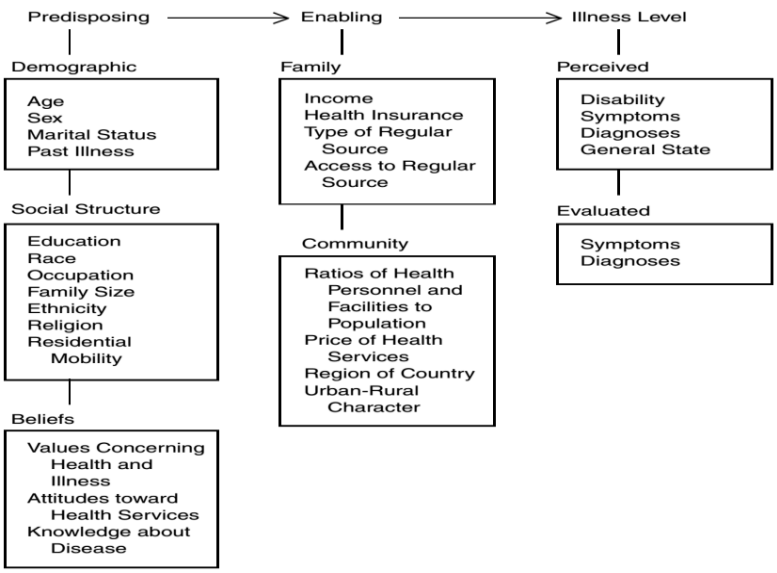
different across income levels, leading to improvement of income-related equalities in health service utilization. Residential areas may be related to accessibility and availability of health services for an individual.

Figure 2. Framework for viewing health service utilization

1) Framework



2) Individual determinants of health service utilization



Source: Adapted from Andersen and Newman, 2005.

Illness levels suggest the most direct reason of seeking health care; an individual must have illness or the probability of having illness for health care use to occur. Illness levels can be measured by self-assessed health, activity limitation due to diseases/injuries, the number of chronic diseases, diagnosis of certain diseases, disability, etc. Based on these three components of the framework, the determinants of an individual's health care utilization can be grouped differently, such as demographic factors, socio-economic factors, and health needs factors, as seen in literature.

With regard to type of health services, an individual's determinants have a different effect on the distribution of outpatient care, medical checkups, emergency care, and inpatient care, which may lead to different distribution of health expenditure and unmet need(McWilliams, Zaslavsky et al. 2003; Andersen and Newman 2005; Hadley 2007; McWilliams, Meara et al. 2007; Kim, Kwon et al. 2013; Kim, Kim et al. 2014; Kim and Kwon 2014; Choi, Park et al. 2015; Kim, Lee et al. 2015). For example, outpatient care can be more affected by the enabling factors or socio-economic status of the individual than inpatient care; this is because inpatient care may be more related to levels of severity of diseases of an individual and more initiated by health providers.

Motivations and inspiration of literature on health care utilization were mainly related to the societal values that all people have a right to health care (based on their health need) regardless of their ability to pay, which is the heart of the concept of UHC; and that the poor or the disadvantaged groups have difficulties in access to care. Equity has been one of the important goals in the health sector(Kutzin, Cashin et al. 2010; World Health Organization 2010). And yet inequalities between the poor and the rich remain. The poor are likely to have higher rates of mortality and morbidity than the rich; yet they tend to use health services less, even though they have higher health needs. And the poor are likely to spend more on health

services as a share of income or budget than the rich(O'Donnell, van Doorslaer et al. 2008).

Much literature on health care utilization by income levels has been performed. Some focused on the predictors of health care utilization among the poor/the disadvantaged groups(Simpson, Owens et al. 2005; Muirhead, Quinonez et al. 2009). As mentioned before, the poor have worse health conditions and greater need for health care, thereby consuming more health care services; therefore, inequality in use of health care should be incorporated this and standardized for differences in need. Since 2000, much literature on health care utilization by income levels has revolved around horizontal inequity in health care utilization and expenditure, which is the concentration index of the need-standardized use. It is based on the principle of "equal treatment for equal need, i.e. people in equal need should be treated equally regardless of their income" (van Doorslaer and Wagstaff 1992; van Doorslaer E 2004) and measured by the horizontal inequity index proposed by Wagstaff and van Doorslaer (HIwv index) (2000). This index can be investigated for statistical significance and be easily displayed graphically; it sensitively reflects distributional changes of the population across income and represents the socio-economic aspects of inequality in health care(Gundgaard 2006).

Some explored horizontal inequity in health care utilization for cross-countries by comparing with the variations in the degree of horizontal inequity(van Doorslaer and Wagstaff 1992; van Doorslaer, Wagstaff et al. 2000; van Doorslaer, Koolman et al. 2002; van Doorslaer and Jones 2004; van Doorslaer and Koolman 2004; van Doorslaer, Koolman et al. 2004; van Doorslaer E 2004; van Doorslaer, Masseria et al. 2006; Lu, Leung et al. 2007); others provided the evidence on equity in health care use in a specific country(Wagstaff and van Doorslaer 2000; Ohkusa and Honda 2003; van Ourti 2004; Morris, Sutton et al. 2005; Allin, Masseria et al. 2006; Gundgaard

2006; Leu and Schellhorn 2006; Crespo-Cebada and Urbanos-Garrido 2012; Macinko and Lima-Costa 2012). In general, the majority of studies on horizontal inequity in health care utilization were focusing on the adult population and were analyzing by type and level of care such as a general practitioner, a medical specialist, dental care, and inpatient care.

With regard to outpatient care use, a significant extent of income-related inequity favoring the rich emerged in visits to a medical specialist and a dentist. And there was an equitable or pro-poor distribution of having a visit to a general practitioner. For inpatient care and medical expenditure, although inconclusive, a pro-poor or equitable distribution was found in general. Some non-need variables such as having a private health insurance, higher education, and city dwellers contributed to pro-rich inequity in health care utilization, especially in the use of a medical specialist and dental care.

Evidence shows that polices for reducing OOP and expanding benefit coverage in South Korea have contributed to improvement in access to care and health care utilization for the Korean population on average(Bae 2010; Kwon, Lee et al. 2015). However, this benefit may be distributed differently across income levels, thus increasing unintended socioeconomic inequalities in health systems(Yardim, Cilingiroglu et al. 2010; Kavosi, Rashidian et al. 2012; Kim, Kwon et al. 2013; Kim, Kim et al. 2014; Kim and Kwon 2014).

Previous literature on equity in health care utilization and health expenditure in South Korea focused on examining effects of expanding benefit coverage and reducing cost sharing on health care utilization and expenditure across income groups between two periods (before and after policies) mostly by disease group(Kim, Kim et al. 2014; Kim and Kwon 2014). One of the key studies is a study done by Kim and Kwon (2014)(Kim and Kwon 2014). They examined the effect of the expanded benefit coverage for cancer patients in 2005 on the utilization of inpatient and outpatient service in tertiary care

hospitals, using a triple difference-in-difference (DID) and comparing cancer patients as a treatment group with those of liver disease and those of cardio-cerebrovascular disease as control groups and the low income groups with the high income groups. The result showed that expanding benefit coverage partially improved income-related inequalities in inpatient admissions at tertiary-care hospitals, but not in outpatient visits.

In South Korea, much research was also inclined to examine income-related inequity in medical care use and expenditure using the HIwv index by sub-group: by age group, by disease, by region, etc.(Kwon, Yang et al. 2003; Lee 2005; Shin and Kim 2006; Lu, Leung et al. 2007; Kim, Choi et al. 2008; Lee 2009; Lee 2010; Rhim and Lee 2010; Kim, Shin et al. 2011; Lee and Park 2011; Kim 2011a; Kim 2011b; Choi 2012; Jeon and Kim 2012; Kim 2012a; Kim 2012b). There was a relative paucity of research on horizontal inequity by level and type of care(Kim, Kwon et al. 2013; Huh and Hwang 2014; Kim, Hin Moi Youn et al. 2014). Kim and Kwon (2013) examined income-related inequalities of health care use and expenditure, analyzing data from the 2005 and 2010 Korean National Health and Nutrition Examination Survey and showed that the equitable distribution of overall health care utilization with pro-poor tendencies and modest pro-rich inequity in the amount of medical expenditures in 2010; non-need variables, such as income, education, private insurance, and occupational status, contributed considerably to pro-rich inequality in health care over the period between 2005 and 2010.

Lee et al. (2009) examined the factors related to health care use in the poor and the general populations, using the data from the Korean Welfare Panel Study; they showed that the poor suffered limited access to care, and that the enabling factors, such as income and health insurance status, had an effect on the utilization of health care in the poor, while the predisposing factors, such as job status and education levels, affected the general population(Lee, Lee et al. 2009).

Until now, we have mainly looked into income-related inequalities in health care utilization and health expenditure in order to examine the distribution of those among the poor. However, there are limitations particularly with the HIwv index; as Allin et al. (2010) suggested, some inequalities after controlling needs may not necessarily imply inequity because these variations may be explained partly by individuals' informed choices and preferences; information on the effectiveness or the quality of the services used is not considered(Allin, Grignon et al. 2010). With these limitations of the conventional methods, the direct questioning of self-reported unmet need for health care in the past certain period can be used to assess accessibility of health care and the extent of inequity in access to and use of services(Allin and Masseria 2009; Allin, Grignon et al. 2010).

Unmet need can be referred to as an indicator of "the differences between those services judged necessary to deal appropriately with defined health problems and those services actually being received…an unmet need is the absence of any, or of sufficient, or of appropriate care and services" (adapted from (Carr and Wolfe 1976)). Measuring unmet need in a population can be divided into two approaches: clinical and subjective. The clinical unmet need is based on a clinical assessment of whether appropriate care was not provided to an individual; this is specific to a narrow set of treatments and illness levels. On the other hand, the subjective unmet need is based on individuals' subjective assessments of whether they did not receive the health services they need; this can be a more feasible way of measuring unmet need through exiting surveys where information on the reasons for the unmet need is often included that can be used to developing policy action. In some cases for minority and lower socioeconomic groups where physicians may have imperfect information about patient's health conditions based on patients' communication of symptoms, it can be better because it is reported by the individual who are better able to estimate their health

status(Carr and Wolfe 1976; Allin, Grignon et al. 2010). Unmet need may be reported despite high health care utilization if these services are substandard in terms of quality, effectiveness, appropriateness; the lower income groups may receive less than optimal care(Allin, Grignon et al. 2010).

Most literature on unmet need have been performed in the United States(Silver and Stein 2001; Diamant, Hays et al. 2004; Kenney, McFeeters et al. 2005; Litaker and Love 2005; Shi and Stevens 2005; Pagán and Pauly 2006; Baggett, O'connell et al. 2010). Unmet need within the past 12 month with survey questions has been used. These US studies showed that being uninsured and low income were the strongest predictor of unmet need. Studies for other regions, such as Europe or Canada, also showed that unmet needs were associated with worse health condition and lower income(Koolman 2007; Allin and Masseria 2009; Allin, Grignon et al. 2010).

In South Korea, literature has been conducted using survey questions in various data sources(Shin and Shon 2009; Kim and Huh 2011; Kim and Lee 2012; Choi, Park et al. 2015; Choi and Lee 2015; Huh and Lee 2016; Yoo 2017). Yoo (2017) used the Korea National Health and Nutrition Examination Survey 2014 and showed that 10.6% of respondents reported unmet needs, and the factors associated with unmet needs were sex, age group, low income, unemployed status, poor perceived health status, and health-related quality of life (EQ-5D index). Huh and Lee (2016) used the Korea Health Panel 2011-2013 and presented that with prevalence of unmet need of 14.9% in 2011 and 17.6% in 2013, females, those with low education levels, and those with lower income were more likely to report unmet needs. Choi and Lee (2015) used the Korea Welfare Panel 2013 and showed that 3.3% of the near poor, 4.1% of the MA beneficiaries, and 0.6% of those with the national health insurance reported unmet need, and that factors associated with unmet need were the MA, lower income levels, housing type, and experiencing of inability to pay for the health insurance contribution. Kim and Lee (2012)

examine data from the Korean Welfare Panel Survey 2009 and showed that 1.4% of the households reported unmet needs, and households with lower education levels, those with lower income, those with chronic diseases, having the aged 65+ in household were likely to report more unmet needs. Overall, those with low income, low education levels, and worse health conditions were likely to report unmet needs in South Korea.

Kim et al. (2019) conducted a systematic review of 45 studies published before 15 December 2017 in South Korea to examine the current status of and factors related to unmet health needs in Korea; they found that increasing trends for reporting unmet needs of adults (14.9% in 2011, 16.4% in 2012, and 17.6% in 2013) and unmet needs due to financial reasons of adults (28% in 2011, 36.4% in 2012, and 35.7% in 2013) based on the Korea Health Panel; and they presented that the factors related to unmet needs were sex, age, education level, presence of spouse, household income, national health insurance, self-assessed health, chronic diseases, depression, and activity limitation(Kim, So et al. 2019).

In the previous literature on health care utilization, health expenditure, and unmet needs, poverty status has been included as a snapshot of the current income level. However, poverty is not a static phenomenon and inherently dynamic(Plotnick 1983; O'Neill, Bassi et al. 1987; Blank 1989; Stevens 1994; Jenkins 1995; Bane and Ellwood 1996; Hulme, Moore et al. 2001; Fouarge and Layte 2005; Krishna 2007 a; Krishna 2007 b; Thorat 2017). People who experienced poverty, and then they escaped poverty for some time, but then many often go back to poverty. Evidence presented that the long-term income is more critical for health than the current income levels(Benzeval and Judge 2001), which would have some effects on health care utilization, health expenditure, and unmet needs; yet, little is known about this area. In the next section, we will further discuss the concept of poverty dynamics.

Health care utilization, health expenditure, and unmet need among the Medical Aid beneficiaries

Most countries provide some forms of public assistance programs for the poor to address poverty, support basic needs (including health needs) and improve quality of life; the same holds true for South Korea. In South Korea, the National Basic Livelihood Security System (NBLSS), non-contributory transfers, was introduced in 2000 (evolved from the Livelihood Protection Law in 1961), and provide the targeted population with seven types of cash and in-kind benefits (including the Medical Aid), covering about 3% of the total population (about 1.5 million people in 2016)(Ministry of Health and Welfare & Statistics of the Republic of Korea 2017). NBLSS is a strict means-tested program for those under the certain threshold of income levels(Ku, Im et al. 2010; Lee 2010; Ahn, Ku et al. 2011; Jeon, Noguchi et al. 2017).

Along with the National Health Insurance (NHI) funded by insurance contributions, the Medical Aid (MA) scheme is financed by the central and local governments and administered by the National Health Insurance Corporation (NHIC). There are two types of MA beneficiaries, depending on being capable of working; type 1 is for those without being capable of working (accounting for 70% in 2016), type 2 for those with being capable of working (accounting for 30% in 2016). Since 2007, the co-payment rates for inpatient care are zero for type 1 and 10% for type 2 (for the NHI beneficiaries, 20%); the co-payment rates for outpatient care are from $0.8 (1,000 KRW) to $1.6 (2,000 KRW) for type 1 and from $0.8 (1,000 KRW) to 15% for type 2 (for the NHI, 30-60%). $0.4 (500 KRW) per prescription should be paid for pharmacy for type 1 and 2. To reduce financial burdens, the Government introduced the Healthy Life Maintenance Aid program for type 1 and a copayment exemption program in 2007(Ministry of Health and Welfare of the Republic of Korea 2018).

The Medical Aid program in South Korea is a public medical assistance program for the most disadvantaged group who are beneficiaries of the National Basic Livelihood Security System (NBLSS) with zero to little cost-sharing for the insured health services(Ministry of Health and Welfare of the Republic of Korea 2018). The poor have more health needs, and they have a high price elasticity for health services; evidence showed that increased copayments could significantly reduce health care utilization particularly among persons with low incomes or chronic conditions(Wallace Neal T., McConnell K. John et al. 2008). Based on this, it can be assumed that the Medical Aid beneficiaries with lower co-payment would have more health care utilization compared to the NHI counterparts.

In South Korea, recently there has been growing literature on the MA beneficiaries that revolved around impact of MA on health care utilization and cost(Ahn, Kim et al. 2011; Lee and Lim 2013; Choi, Park et al. 2015; Kim, Lee et al. 2015; Kim, Kim et al. 2016; Kim, Lee et al. 2016; Lee 2016; Yoo, Ahn et al. 2016; Jeon, Noguchi et al. 2017). Some examined the effect of introducing a co-payment scheme for outpatient care for type 1 in 2007, which showed that the number of outpatient visits was reduced after the policies(Lee and Lim 2013; Yoo, Ahn et al. 2016). Most studies showed that the MA beneficiaries were more likely to use more health care utilization compared to the NHI beneficiaries(Ahn, Kim et al. 2011; Choi, Park et al. 2015; Kim, Lee et al. 2015; Kim, Kim et al. 2016; Kim, Lee et al. 2016; Lee 2016; Yoo, Ahn et al. 2016; Jeon, Noguchi et al. 2017), even when using the propensity score matching method(Kim, Lee et al. 2015; Lee 2016). Some presented that the MA beneficiaries were less likely to have higher health care costs(Choi, Park et al. 2015; Lee 2016; Jeon, Noguchi et al. 2017) and to have higher percentages of medical costs to income or consumption compared to the NHI beneficiaries(Choi, Park et al. 2015; Jeon, Noguchi et al. 2017). Some presented that the MA beneficiaries were less likely to have catastrophic

health expenditure compared to the NHI beneficiaries(Kim 2008; Sohn, Shin et al. 2010; Kim and Lee 2012; Lee and Lee 2012; Lee and Lee 2015).

Jeon et al. (2017) examined disability, poverty, and role of the basic livelihood security system (MA) on health services utilization among the elderly in South Korea using the Korea Welfare panel Study data 2005-2014; they showed that within the same disability status, the low-income without MA were less likely to have inpatient care, but their financial burden due to health care was the highest across the three income groups (low-income, middle-income, and high-income); the low-income elderly with disability but not having MA were the most vulnerable group. Choi et al. (2015) explored health care utilization and costs among MA enrollees, the poor not enrolled in MA, and the near poor in South Korea using the 2012 Korea Welfare Panel Study; they showed that the poor without MA tended to receive less health care utilization compared to those with MA, and that the poor without MA and the near poor were likely to spend more health expenditure and have higher share of health expenditure to income compared to the MA beneficiaries.

Some presented that the MA beneficiaries were more likely to report unmet need(Kim and Huh 2011; Choi and Lee 2015; Huh and Lee 2016). Huh and Lee (2016) used the Korea Health Panel 2011-2013 and showed that those with MA tended to report unmet needs for all reasons and for the economic reason. Choi and Lee (2015) used the Korea Welfare Panel 2013 and showed that those with MA and the near poor with the national health insurance were more likely to have unmet needs compared to those with the national health insurance. Kim and Huh (2011) used the 2006 National Household Living Environment Survey to identify factors associated with unmet needs through multivariate logistics regression analyses; and they showed that the poor with MA and the near poor were more likely to report unmet needs.

So far, status of the MA in the previous literature has been included mostly as one of the types of health insurance status in South Korea. According to the 2012 NBLSS report, those under the system for less than 1 year accounted for 12.4%, those for 1-2 years, 14.5%, and those for more than 10 years, 24.5% of the total number of beneficiaries(Kim, Kim et al. 2016). Often, the people escaping the system do reenter into the system. These changes of the MA status may affect health care utilization, health expenditure, and unmet needs.

Studies on status changes of health insurance have been performed(McWilliams, Zaslavsky et al. 2003; Federico, Steiner et al. 2007; McWilliams, Meara et al. 2007; Ginde, Lowe et al. 2012; Baicker, Taubman et al. 2013). Baicker et al. (2013) examined the effects of the 2008 Medicaid expansion in Oregon, the United States, for low-income adults based on lottery drawings from a waiting list, using the randomized controlled study method. They found that the Medicaid coverage was significantly associated with increased probabilities of a diagnosis of diabetes and uses of diabetes medication, and increased outpatient visits and many preventive services use (cholesterol-level screening, pap smear in women, mammography in women aged 50+, PSA test in men aged 50+), and nearly eliminated catastrophic health expenditure. McWilliams et al. (2007) used the Health and Retirement Study of the United States and employed propensity-score methods to compare health care utilization and expenditure for previously insured and uninsured Medicare beneficiaries; they found that the previously uninsured in the Medicare at the age of 65 had greater increases in the numbers of outpatient visits and hospitalizations, and in total health expenditure than the previously insured. McWilliams et al. (2003) used the Health and Retirement Study of the United States and shoed that the difference in cholesterol testing, mammography in women, prostate examination in men between the continuously insured and the continuously uninsured adults had

been decreased after gaining the Medicare.

Ginde et al. (2012) analyzed the 2009 National Health Interview Survey of the United States to explore the effect of health insurance status change on emergency department use; and they found that the newly insured visited more emergency visits than the continuously insured, and the newly uninsured tended to visit more emergency visits compared to the continuously uninsured; they showed that recent health insurance status change was associated with greater emergency use for the newly insured (particularly for the Medicaid beneficiaries) and the newly uninsured. Federico et al. (2007) used the telephone interviews of 920 families with 710 usable data to examine the effect of the numbers and types of disruptions (the continuously uninsured, the intermittently insured, the continuously insured) in the State Children's Health Insurance Program in the United States on health care use and unmet need for a prescription medication, and showed that there was a gradient between greater insurance disruption and less access to care, less utilization, and greater unmet needs.

Little is known about the effects of the MA status dynamics on health care utilization, health expenditure, and unmet need in South Korea(Kim, Kim et al. 2016; Kim, Lee et al. 2016). Kim et al. (2016) examined impact of continuous MA utilization on the number of outpatient visits using the 2008-2012 Korean Welfare Panel Study (KOWEPS) and found that the number of outpatient visits per year was 0.051 (p-value=0.434) fold higher among those with MA for one year, 0.267 fold higher for two years (p-value=0.000), and 0.562 fold higher (p-value<0.0001) for more than three years compared to the NHI beneficiaries(Kim, Kim et al. 2016).

Kim et al. (2016) investigated the impact of health insurance status changes on health care utilization patterns using the 2006-2012 Korean Welfare Panel Study (KOWEPS); the number of outpatient visits per year was 1.363 times

higher (p-value <0.0001) in the continuous MA than in the continuous health insurance group; the number of hospitalization per year was 1.56 times higher (p-value <0.001) in the new MA and 0.636 times lower (p-value <0.001) in the new health insurance group than the continuous health insurance group; the number of hospital stays per year was 0.567 times lower (p-value =0.021) in the new health insurance group than in the continuous health insurance group(Kim, Lee et al. 2016). Studies on this issue should be needed to fully understand on the effect of the MA status dynamics on health care utilization by type of care, health expenditure, and unmet needs.

2. Poverty dynamics

2.1. Measurements and types of poverty

Measurements of poverty

Poverty is difficult to define and measure. The definition of poverty mostly commonly mentioned is “Persons, families, and groups of persons whose resources (material, cultural, and social) are so limited as to exclude them from the minimum acceptable way of life in the Member State to which they belong.” (Cited in (Nyasulu 2010)). Definition of poverty and measurements of poverty may be different. Poverty can be defined differently based on values, interests, perspectives, etc., and is a construction of specific societies. Measurements of poverty are related to techniques to operationalize definitions of poverty in order to identify the poor for some purposes(Smith and Middleton 2007). In this study, definition of poverty is beyond the scope of this study, and we focus on measurements of poverty, particularly monetary indicators of poverty.

Whether methods are objective or subjective may be one of the approaches of measuring poverty. The subjective approach suggests that poverty must be defined by the poor or the community where many members are in poverty.

This can be used to assess the situation of a certain household in the multi-dimensional ways and inform the choice of poverty lines, economies of scales, and regional cost-of-living differences, which can be used to complement the objective approach based on observed income and consumption data(Smith and Middleton 2007; Nyasulu 2010).

The monetary approach to measuring poverty is the most commonly used where poverty is defined as a shortfall in consumption or income from some poverty line. It is the minimum rights approach that a certain basic income is considered a right, rather for the freedom of choice it offers; it is assumed that the monetary approach can more or less proxy other dimensions of welfare and poverty, representing a convenient short-cut method with data available(Laderchi, Saith et al. 2003). The monetary indicators of poverty can be divided into income and consumption. Consumption can be better than income; this is because it approximates welfare more than income, and it is also more related to a person's long-term income, avoiding some short-term ups and downs in income and access to resources. However, from the minimum rights perspective, income measures have been mostly used. Income is regarded as an indirect measure of poverty where those with income below a certain level are deprived of basic items and opportunities needed to achieve a minimum acceptable way of life(Laderchi, Saith et al. 2003; Smith and Middleton 2007). Rowntree (1910), Townsend (1979), and Gordon (1989) also define poverty in terms of the income and ability to meet a certain standard of living. Rowntree (1910) suggested that poverty can be defined as a "situation where the total earnings of a family are insufficient to obtain the minimum necessaries for the maintenance of merely physical efficiency"(cited in (Nyasulu 2010)).

A critical issue of the monetary approach is how to set the poverty line where the poor is differentiated from the non-poor. From one end, there is the absolute poverty line where a poverty line is set based on minimal

requirements in the areas of interest identified in absolute terms, i.e. based on some basic needs considered essentials for survival. For example, Rowntree (1910) defined a poverty line based on the estimated monetary requirements for a nutritionally adequate diet and needs for clothing and rent(Laderchi, Saith et al. 2003). Orshansky (1965) employed the cost of the Economy Food Plan as the central criteria of poverty, which became the official US poverty standard in the 1960s and remains central to the minimal living standard today(O'Boyle 1999). However, it can be difficult to identify such needs regardless of societal standards, which would imply that most absolute indicators of poverty include some relative components. On the other hand, the relative poverty line can be more acceptable from a political point of view because people's toleration of poverty and governments' willingness to provide some interventions is mostly relative to the average standards of the society(Laderchi, Saith et al. 2003). In most developed countries, relative poverty lines are generally adopted. In general, relative poverty can be defined as a condition where household income is a certain percentage below the median income levels; the thresholds of the median incomes may vary in the range of 40-60%, and the OECD threshold of 50% is generally used(Oxley, Thai-Thanh et al. 2000; Valletta 2006). Different thresholds would change poverty rates, the trends of poverty over time would mostly remain unchanged(Oxley, Thai-Thanh et al. 2000; Smith and Middleton 2007).

Types of poverty

Poverty dynamics research has contributed to challenging the traditional view of the poor as homogenous and static. Poverty is not a static phenomenon and inherently dynamic(Plotnick 1983; O'Neill, Bassi et al. 1987; Blank 1989; Stevens 1994; Jenkins 1995; Bane and Ellwood 1996; Hulme, Moore et al. 2001; Fouarge and Layte 2005; Krishna 2007 a; Krishna 2007 b; Thorat 2017). For example, the same group of people experience poverty, but

they do so again in different periods, going back to poverty shortly after their previous exit. Since how poverty statuses evolve over time matters, durational aspect of intensity of poverty should be part of the definition of poverty(Hulme, Moore et al. 2001; Fouarge and Layte 2005).

Duration of poverty is important to further understand the impact of poverty in the short and long run. Using longitudinal data, we can understand the factors leading people into and from poverty and the impact of poverty(Fouarge and Layte 2005). Evidence shows that the majority of poverty spells were short, but many of persons escaping poverty return to poverty relatively quickly and minority groups often experience persistent poverty(Stevens 1994; Fouarge and Layte 2005).

Some efforts were made to categorize types of poverty in the past(Walker and Ashworth 1994; Muffels, Fouarge et al. 2000; Jenkins, Rigg et al. 2001). Walker and Ashworth (1994) used data from the Panel Study of Income Dynamics for 15 years and defined seven types of poverty on childhood poverty: i) no poverty; ii) transient poverty, one spell of poverty lasting one year; iii) occasional poverty, more than one spell of poverty but none lasting more than one year; iv) recurrent poverty, repeated spells of poverty with some lasting over one year; v) persistent poverty, one spell of poverty lasting between two and 13 years; vi) chronic poverty, multiple poverty spells never separated by more than a year of relative prosperity; and vii) permanent poverty, poverty lasting continuously for 15 years.

Jenkins et al. (2001) employed data from the British Household Panel Survey for 9 years, and defined five types of poverty: i) no poverty; ii) poor at one interview; iii) recurrently poor, either observed poor at two interviews separated by least one spell of non-poverty, or three to six spells of poverty separated by at least two spells of non-poverty; iv) short-term persistent poverty, either two consecutive spells of poverty, or three to six spells

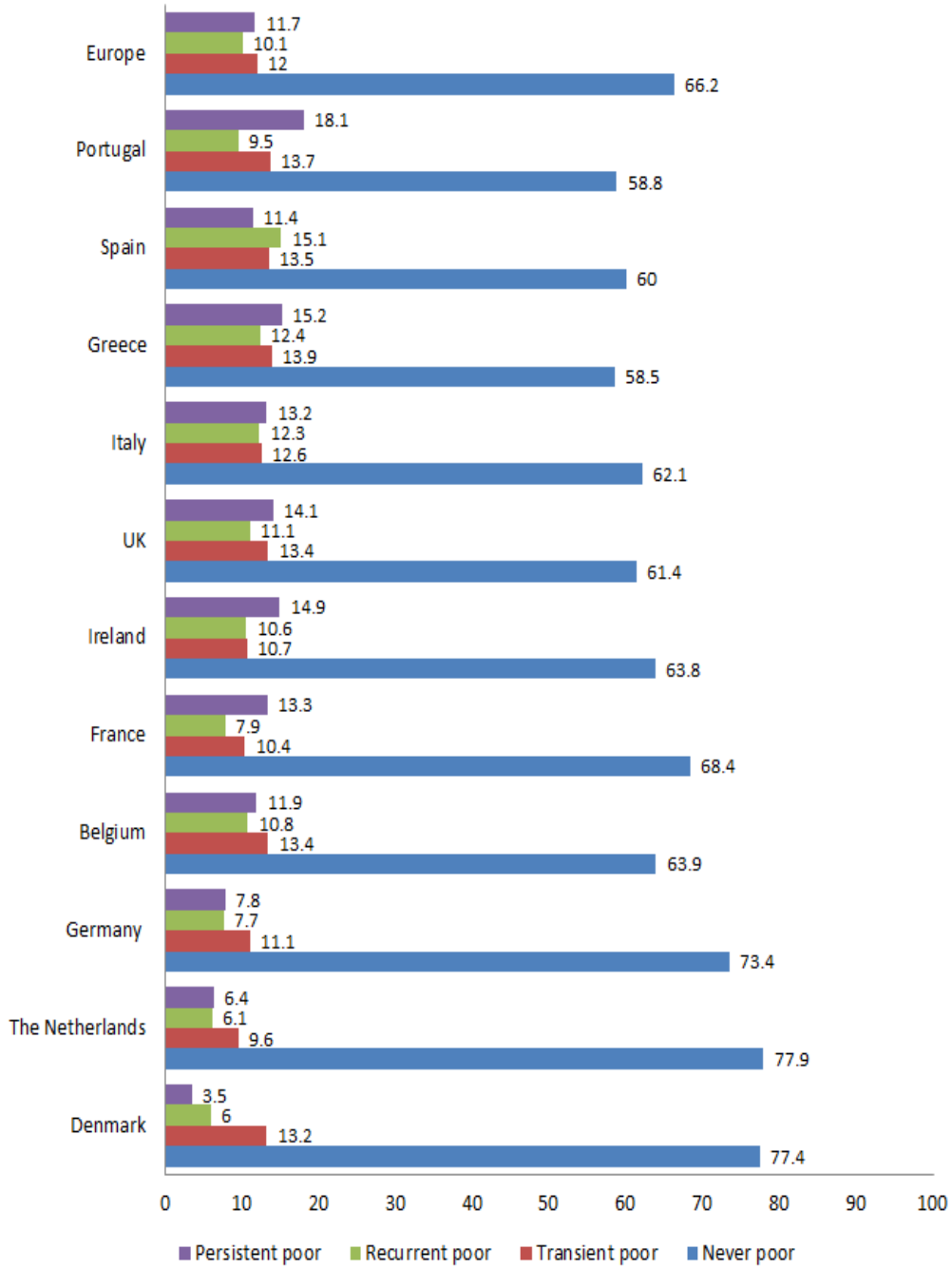
separated by at least two spells of non-poverty; and v) long-term persistent poverty, seven to nine waves.

Muffels et al. (2000) also used the data from the British Household Panel Survey for 5 years, and categorized poverty into four types: i) the persistent non-poor, never poor over the five year window of observation; ii) transient poor, once poor; iii) recurrent poor, more than one spell of poverty but never longer than two consecutive years; and iv) persistent poor, poor for a consecutive period of at least three years.

Fouarge and Layte (2005) used the typology of poverty suggested by Muffels et al. (2000) and calculated prevalence of each type of poverty in 1994-1998 in Europe using the User Data Base of the European community Household Panel (Figure 3). They found that a third of the EU population experienced poverty at least once over the period, and Greece and Portugal had the highest poverty incidence and the highest rate of persistent poverty.

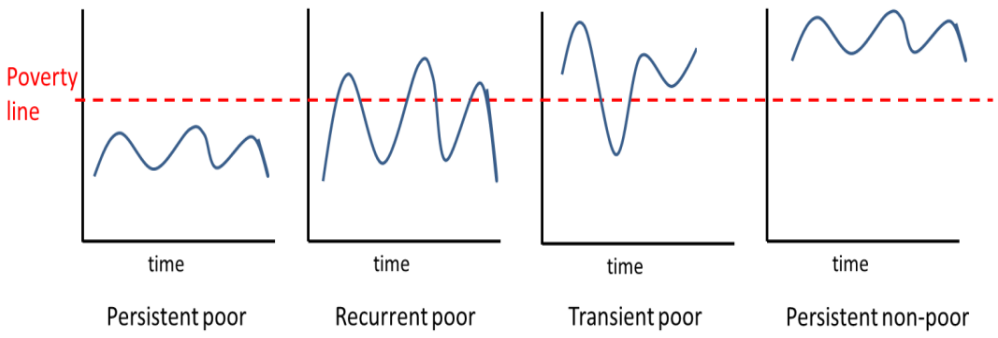
Evidence shows that there were differences between the persistent poor, the recurrent poor, and the transient poor; the persistent poor were more likely to be a household with a separated head, a lower income, a lower education level, less annual working hours, a higher age of household head, higher unemployment and disability; the degree of the effects was larger for the persistent poor than for the recurrent poor, while the effects for the recurrent poor were stronger than for the transient poor(Muffels, Fouarge et al. 2000; Fouarge and Layte 2005; Dartanto and Nurkholis 2013).

Figure 3. Poverty profiles in Europe (poverty line: less than 60% of the median income) (%), 1994-1998



Source: The author created the Figure based on the table from Fouarge and Layte (2005).

Figure 4. Type of poverty dynamics



Source: The author's based on the concept of types of poverty suggested by Muffels et al. (2000).

The differentiation between chronic and transient poverty is critical for policy implication purposes; if chronic poverty is large, the appropriate strategy would be dealing with redistribution and providing basic physical and human capital infrastructure; if transient poverty is predominant, the strategy should be towards providing safety nets, such as health insurance and Medical Aid policies, and coping mechanisms to mitigate the vulnerability of the poor(Dartanto and Nurkholis 2013). Furthermore, it is possible that type of poverty would affect behaviors and preferences of the poor in many situations including health seeking; studies on effects of types of poverty on health care have not been conducted yet, to my knowledge.

2.2. Poverty dynamics

Differentiating types of poverty incorporates some time dimensions of poverty, but it is still about poverty transition focusing on entry and exit of poverty for a fixed period of time, rather than poverty duration or distributions of time spent below the poverty line. Moreover, it did not take account of the fact that many of the poor at the end of the observation period may have remained in poverty for some time after that, i.e. right

censoring issue. Such spells were treated in the same way as a single year of poverty in the middle of the period(Stevens 1999; Fouarge and Layte 2005). Therefore, taking into account a duration perspective that identifies spells of poverty should be needed.

It is likely that income dynamics below the mean of the distribution are not the same as those above the mean. The spell approach below (the hazard rate model) focusing on individuals in a certain share of the income distribution or those below the poverty line may capture dynamics and total time in poverty at the same time(Stevens 1999).

Poverty duration and its related factors

Bane and Ellwood (1986) first applied exit probability analyses to poverty spells data using the 1970-1982 Panel Study of Income Dynamics of the United States. They focused on individual spells of poverty, i.e. consecutive years where a household's income was less than the poverty line, and calculated the probability of exiting these poverty spells, taking into account duration dependence in the hazard rate; their approach is suited to examine the effects of time-varying factors on poverty persistence and clarify differences between the poverty duration for those who were currently poor and for those who have just entered into poverty. They showed that an average spell length was shorter when analyzing people staring a new spell of poverty. They found that most of those currently poor are in the middle of long poverty duration, although most of those who entered into poverty will have a short spell of poverty(Bane and Ellwood 1986; Stevens 1999).

Evidence shows that most people who start a poverty spell escape it quickly(Bane and Ellwood 1986; Stevens 1994; Stevens 1999; Rank and Hirschl 2001; Fouarge and Layte 2005; Cellini, McKernan et al. 2008; Devicienti 2011). However, as mentioned above, many who leave poverty do not do so permanently. Stevens (1994, 1999) showed that reentries into

poverty were relatively prevalent; she found that more than 50% of those who previously exited from poverty will return to poverty within five years. Stevens (1999) used the Panel Study of Income Dynamics of the United States 1968-1988 and extended the hazard model (the spell approach) of Bane and Ellwood (1986) by incorporating multiple spells of poverty. She argued that the more important question is how long people are poor rather than how long poverty spells last. Rank and Hirschl (2001) used the 1968-1992 Panel Study of Income Dynamics and also showed differences between consecutive years in poverty and total time in poverty over the observation period. They found that the cumulative percentage of the aged 20-40 facing five or more consecutive years in poverty was 3.7%, while that of those facing five or more total years in poverty over the same period was 12.6%.

There have been some concerns about the lack of theories appropriately analyzing poverty dynamics; this is because a theory of poverty may be complex to model. Duncan (1984) argued that a well-explained theory of poverty would require many interrelated theories of family composition, earnings, asset accumulation, the macro-economy, and so on(Cited in (Cellini, McKernan et al. 2008).

However, from many empirical studies, there has been a general consensus on factors associated with poverty persistence(Ashworth, Hill et al. 1994; Jarvis and Jenkins 1997; Stevens 1999; Muffels, Fouarge et al. 2000; Oxley, Thai-Thanh et al. 2000; Devicienti 2001; Hulme, Moore et al. 2001; Jenkins, Rigg et al. 2001; Rank and Hirschl 2001; Jenkins, Schluter et al. 2003; Fouarge and Layte 2005; McKernan and Ratcliffe 2005; Valletta 2006; Smith and Middleton 2007; Cellini, McKernan et al. 2008; Devicienti 2011; Dartanto and Nurkholis 2013; Şeker and Dayıoğlu 2015; Thorat 2017). Factors related to persistent poverty can be divided into two: decreased household income and increased household need. Income can be limited if parental responsibilities are needed or there is a lack of available family members with employments,

or household head has inability to work or low education levels, thereby restricting job opportunities. Household needs can be increased if there are young and dependent children or the aged or the sick.

Evidence showed that children, lone parents, the elderly, workless households, disabled people and people with ill health have been at most risk of persistent poverty(Smith and Middleton 2007). Poverty risks are higher for women than men. Female-headed households were found to have longer spells of poverty and total time in poverty compared to married-couple households(Stevens 1999; Smith and Middleton 2007; Cellini, McKernan et al. 2008). Poverty risks for the elderly were also increased for women, those who had histories of unemployment and low pay, and those with low education levels. Age is also an important factor because it may be related to individuals' opportunities and wage potentials in the labor market, representing 'human capital'(Muffels, Fouarge et al. 2000); ages between 35 and 54 were considered to be of poverty resistance(Smith and Middleton 2007).

Exit from poverty and its related factors

One of the concerns about poverty is how fast people leave poverty that results duration of poverty spells. Literature showed that the longer a person stays in poverty, the less likely it is that he or she will exit from poverty. Bane and Ellwood (1986) found that the probability of leaving poverty were 45% for the first year, 29% for the second year, and 21% for the fourth year. Devicienti (2011) used the 1991-2006 British Household Panel Survey and showed that the probability of exit from poverty were 56% for the first year, 37% for the second year, 29% for the third year, and 29% for the fourth year.

The decreased exit rates after the first few years could happen for two reasons: heterogeneity of the group and duration dependency. The poor comprise the short-term and long-term poor. It is possible that the poor are

very heterogeneous from the start; some have more skills, abilities, or motivation to exit quickly than others. On the other hand, poverty experience may change preference and behavior of the poor, i.e. duration dependency. Evidence showed that the first two years seem critical; it is more likely that those remaining after two years tend to be the long-term poor either due to their characteristics or due to their preference or behavioral changes(Blank 1989; Bane and Ellwood 1996).

Literature has reached a general agreement on factors related to exit from poverty(Ashworth, Hill et al. 1994; Jarvis and Jenkins 1997; Stevens 1999; Muffels, Fouarge et al. 2000; Oxley, Thai-Thanh et al. 2000; Devicienti 2001; Hulme, Moore et al. 2001; Jenkins, Rigg et al. 2001; Rank and Hirschl 2001; Jenkins, Schluter et al. 2003; Fouarge and Layte 2005; McKernan and Ratcliffe 2005; Valletta 2006; Smith and Middleton 2007; Cellini, McKernan et al. 2008; Devicienti 2011; Dartanto and Nurkholis 2013; Şeker and Dayıoğlu 2015; Thorat 2017). Most important factors associated with exit from poverty have been employment and household need (including family composition). Income changes are more significant for poverty entries and exits than demographic changes; demographic changes are more important for poverty entries than exits(Smith and Middleton 2007). Employment changes and earnings are more related to poverty exits than household structure and composition changes. Among households headed by working-age adults, the most important factors of exit from poverty was household head's increased earnings(Bane and Ellwood 1986; Jenkins, Rigg et al. 2001; Jenkins, Schluter et al. 2003; Smith and Middleton 2007). McKernan and Ratcliffe (2005) found that increased number of family member with employment had nearly equally important effects on poverty exits. The importance of employment changes can vary among the subgroups such as lone parents, older people, etc(Smith and Middleton 2007). For education attainments, lower education levels are related to greater risk of poverty persistence; higher education

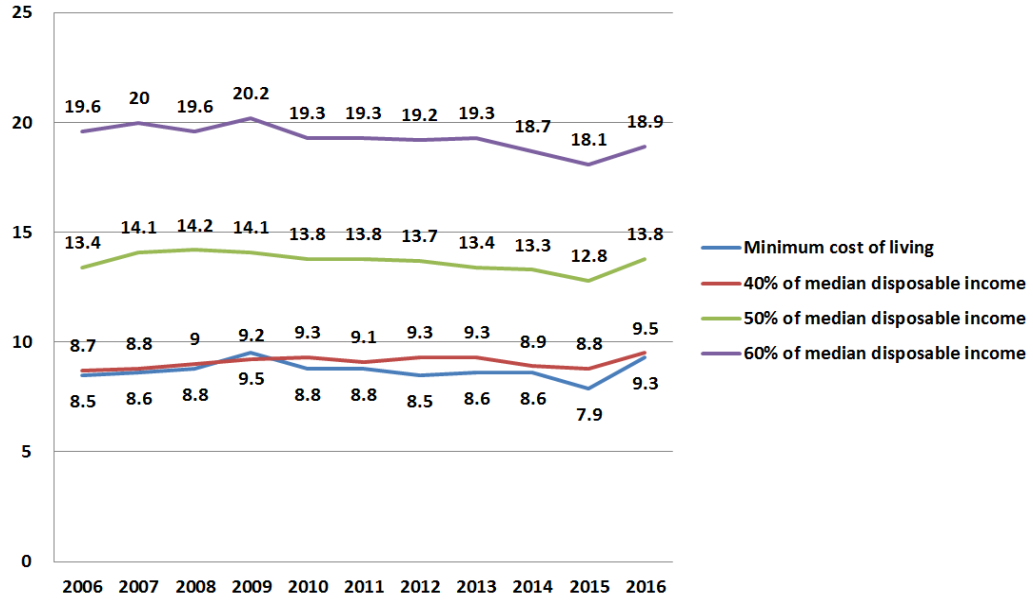
levels are associated with a lower likelihood of poverty entries, and with increased likelihood of poverty exit for the adult population who enter poverty. Some suggest that educational attainment played a more significant role in protecting people from poverty, rather than as an event triggering exit from poverty(Smith and Middleton 2007). McKernan and Ratcliffe (2005) found that increases in educational attainment have a great effect on poverty exits.

Demographic changes as an exit trigger can be difficult to explain. The effect of demographic changes for lone parents can be explained in terms of transition from lone-parent to coupled-parent households. However, decreased in the number of dependent children can be explained in terms of decreased in household need, but its share of exit triggers may be trivial. Loss of a partner among the elderly can represent a decrease in household need or changes in labor supply in household. Households with children who become independent and leave home are likely to have a fluctuating income level(Smith and Middleton 2007). Health and disability affect household need. However, because the poor with worse health condition are typically the disadvantaged, health improvements will not necessarily mean that individuals become better-off(Jenkins, Rigg et al. 2001; Smith and Middleton 2007).

2.3. Poverty dynamics and its related factors in South Korea

Figure 5 shows household (static) poverty rates in South Korea over the past decade. Poverty rates in Korea have been nearly stagnant over time. Static poverty rates have been increased since 2006, but around the economic crisis in 2008, static poverty rates showed some peaks across various poverty lines. Since then poverty rates have tended to decrease, with lowest estimates in 2015 and then increased again in 2016.

Figure 5. Household static poverty rates in South Korea (%), 2006-2016



Source: Korea Institute for Health and Social Affairs, 2017.

Studies on poverty dynamics in South Korea have been conducted mostly since 2000; availability of several panel surveys has contributed to this(Hong 2004; Ku 2005; Lee 2005; Lee and Ban 2009; Ku, Im et al. 2010; Lee 2010; Seok 2010; Ahn, Ku et al. 2011). Most studies used the Korea Labor and Income Panel Study or the Korea Welfare Panel Study. Ku (2005) was the first study that employed the discrete-time hazard model based on the method by Bane and Ellwood (1986). He used data from the 1998-2003 Korea Labor and Income Panel Study and found that the probability of exit from poverty was 58% for the first year, 36% for the second year, 31% for the third year, and 23% for the fourth year. He also showed that households headed by the elderly and non-aged women were likely stay longer in poverty, while households headed by non-aged male were likely to experience short-term poverty. Evidence showed that age, sex, education levels, marital status, having dependent children, types of working position, the number of family members with employment, etc. were associated with poverty duration and exits.

3. Catastrophic health expenditure and poverty persistence

3.1. Measurement and economic consequences of catastrophic health expenditure

High levels of out-of-pocket payments (OOP) have consequences for health care use(van Doorslaer E 2004). Health care expenditure affects household living standard, because of its unpredictability and uncertainty, which has a negative effect on welfare of a household(van Doorslaer E 2007). Such financial burden of a household can be indicated as 'catastrophic health expenditure', i.e. OOP relative to a household's total income or consumption(Wagstaff A 2003; Xu, Evans et al. 2003). Low levels of incidence of CHE might indicate that people get needed care but do not suffer from financial hardship as a result; however, it could also mean that people forgo needed care(Yardim, Cilingiroglu et al. 2010; Kavosi, Rashidian et al. 2012; Edoka, McPake et al. 2017; Wagstaff, Flores et al. 2017).

Recently, the concept of CHE has been used in researches on health care expenditure across countries(Wagstaff A 2003; Xu, Evans et al. 2003; van Doorslaer E 2007; Flores G 2008). CHE can be measured in different ways. For defining a household capacity to pay, Xu et al. (2003) suggested that a household capacity to pay can be defined as a household non-subsistence spending(Xu, Evans et al. 2003). Wagstaff and van Doorslaer (2003) proposed that a family's capacity to pay can be defined as a household's total income subtracting actual food expenditure(Wagstaff A 2003). Based on the characteristics of the data and availability of variables, studies used a household's total income or disposable income(Cheong and Lee 2012; Lee HJ 2012; Lee 2015), or disposable income subtracting food expenditure(Song and Shin 2010; Cheong and Lee 2012; Song and Shin 2014; Lee 2015; Woo and Shin 2015), or total consumption spending subtracting food

expenditure(Lee TJ 2003; Sohn, Shin et al. 2010). There is no agreed ways to measure ability to pay. One key point is that if it is reasonable that households may borrow or use savings to fund their health expenditure, then capacity to pay should be measured using consumption. A consumption based measure of capacity to pay may lead to more pro-rich results than an income-based measure(Wagstaff, Flores et al. 2017). For choosing a threshold for CHE, generally, OOP fractions of a household capacity to pay of 10-40% have been used based on characteristics of data and preferences of researchers(Lee TJ 2003; Wagstaff A 2003; Xu, Evans et al. 2003; van Doorslaer E 2007; Flores G 2008; Sohn, Shin et al. 2010; Song and Shin 2010; Cheong and Lee 2012; Lee HJ 2012; Alam K 2014; Song and Shin 2014; Lee 2015; Woo and Shin 2015).

It is not easy to find out a relationship between catastrophic health expenditure and poverty. This is because households may finance OOP from coping strategies, although CHE reduce welfare of a household. Households may be able to draw on reduced consumption of other goods, savings or assets, or some transfers from friends and relatives to meet unexpected health expenditure, at least in the short term(van Doorslaer E 2007; Flores G 2008; Alam K 2014; Sparrow 2014; Lee 2015; Woo and Shin 2015; Mitra, Palmer et al. 2016). Different types of households tend to have different access to coping mechanisms. Effects of economic risks of health shocks have been found to be more pronounced on the poor and households with low education levels(Mitra, Palmer et al. 2016). The poor may have less savings and lower levels of other resources. Evidence shows that borrowing seems to be a primary coping strategy for the poor to deal with economic consequences of ill health, which may lead to potential long-term effects. Moreover, future income can be affected by reduced assets and savings for consumption smoothing and funding health expenditure(Sparrow 2014).

Households that use coping strategies to reduce the negative effect of high

OOP in the short term are potentially vulnerable to poverty. More severely economically constrained households may be forced to reduce the basic consumptions and/or be pushed into poverty; those who are already poor may be forced into deeper poverty(Whitehead, Dahlgren et al. 2001; Bloom and Canning 2003; McIntyre, Thiede et al. 2006; van Doorslaer E 2007; Flores G 2008; Song and Shin 2010; Alam K 2014; Song and Shin 2014; Lee 2015; Woo and Shin 2015; Mitra, Palmer et al. 2016).

3.2. Catastrophic health expenditure and persistence of poverty

High financial burden due to health care expenditure was one of the key factors of transition to poverty along with bankruptcy and family breakup in South Korea like other countries(Shin, Shin et al. 2010). However, there is a relative paucity of research on impact of catastrophic health expenditure on transitioning to poverty(Shin, Shin et al. 2010; Song and Shin 2010; Song and Shin 2014; Lee 2015; Woo and Shin 2015; Kim and Kwon 2016) and on persistence of poverty(Song and Shin 2010; Song and Shin 2014; Kim and Kwon 2016), and results were inconsistent depending on the studies and data sources. While there has been a great deal of research on catastrophic health expenditure and its impoverishment effect, the impact of CHE on persistence of poverty for those who are already poor remains under-researched internationally and nationally.

In the Korean literature, many researches on CHE and poverty used a relative poverty line (mostly, less than 50% of median income)(Song and Shin 2010; Song and Shin 2014; Woo and Shin 2015) or an absolute poverty line (less than or equal to the minimum cost of living) or a variable of less than 40% of median income in data, according to characteristics of data and preferences of researchers. Kim and Kwon (2016) analyzed the data from the Korea Health Panel 2008-2011 through a multivariate logistic regression, based on the 2009 (2010) data set with independent variables in 2008 (2009), CHE

variables in 2009 (2010), and poverty status in 2010 (2011); they showed that households facing CHE were more likely to experience transition to poverty at threshold levels of 5% and 20% with statistical significance. Households facing CHE seemed to experience persistence of poverty, but it was not statistically significant.

Lee (2015) analyzed the impact of CHE on impoverishment through a discrete time event analysis using the data from the Korean Labor Income Panel Study 2003-2012 and showed that households experiencing CHE were 1.88 times as more likely to be pushed into poverty than households without CHE. Woo and Shin (2015) used the data from the Korean Welfare Panel Study 2008-2013 and presented that households with CHE were more likely to be poor(Woo and Shin 2015).

Song and Shin (2014) used the data from the Korean Welfare Panel Study 2007-2012 using a multivariate logistic regression and showed that households with CHE were more likely to experience transition to poverty and persistence of poverty. Occurrence of CHE was associated with transition to poverty (1.81-4.89 odds ratios) and persistence of poverty (1.53-2.58 odds ratios). Song and Shin (2010) used the data from the Korean Welfare Panel Study 2006 and 2008 and investigated impact of occurrence of CHE in 2006 on transition to poverty and persistence of poverty in 2008; thresholds of CHE more than 28% were associated with transition to poverty but not with persistence of poverty. Shin et al. (2010) used the data from the Korean Welfare Panel Study and showed that CHE were not associated with transition to poverty (becoming the MA beneficiary was defined as a poverty line).

However, these studies have limitations on study methods; they did not consider the duration of poverty, and all used multivariate logistic regressions, not taking into account reverse causality between catastrophic health

expenditure and poverty. Furthermore, studies on exit from poverty were outdated(Hong 2004; Ku 2005; Lee 2005; Lee and Ban 2009; Seok 2010), and they have not considered the impact of catastrophic health expenditure on exit from poverty. Incidence of CHE may have an impact on poverty persistence by increasing household needs. Further research should be needed to explore this issue.

III. Research frameworks and methods

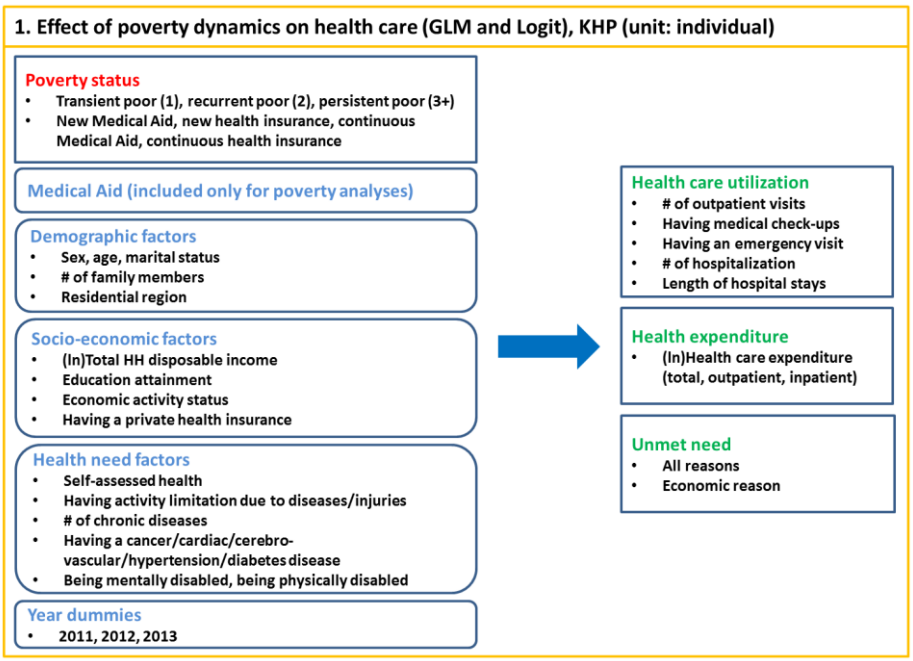
1. Research frameworks

1.1. The effect of poverty dynamics and the Medical Aid status change on health care use, health expenditure, and unmet need in South Korea

1.1.1. Framework

The first part of the study analyzes the data from the Korea Health Panel (KHP) 2008-2014 for the years 2011-2013 and examines the effect of poverty dynamics and the MA status change on health care use, health expenditure, and unmet need.

Figure 6. Framework for analyzing the effect of poverty dynamics and the Medical Aid status change on health care use, health expenditure, and unmet need in South Korea



1.1.2. Hypotheses

Compared to the transient poor, those experiencing more poverty occurrences would have less health care utilization, less health expenditure, and more unmet need.

Compared to the continuous health insurance group, the continuous Medical Aid would have more health care utilization, less health expenditure, and more unmet need; I assumed that the continuous MA would have general patterns of those with the current MA in the literature, i.e. those with MA have more health care use, less health expenditure, and more unmet need.

The new MA would have more health care use, less health expenditure, and less unmet need; the new MA who now have more benefit coverage compared to those with the national health insurance would use more health care without paying high health expenditure based on the previous literature; however, there is a paucity of studies on the effect of unmet need, so I assumed that using more health care and having less health expenditure would lead to lowering their unmet need.

The new HI would have less health care use, less health expenditure, and more unmet need. The new HI have less benefit coverage compared to those with MA, and are more likely to be those with low income levels compared to the continuous HI group. Based on Kim et al. (2016), the new HI would have less health care use; the new HI who experienced disruptions of the health insurance status would have greater unmet needs, based on Federico et al. (2007); I assumed that having less health care would lead to having less health expenditure, although there is a paucity of researches for health expenditure.

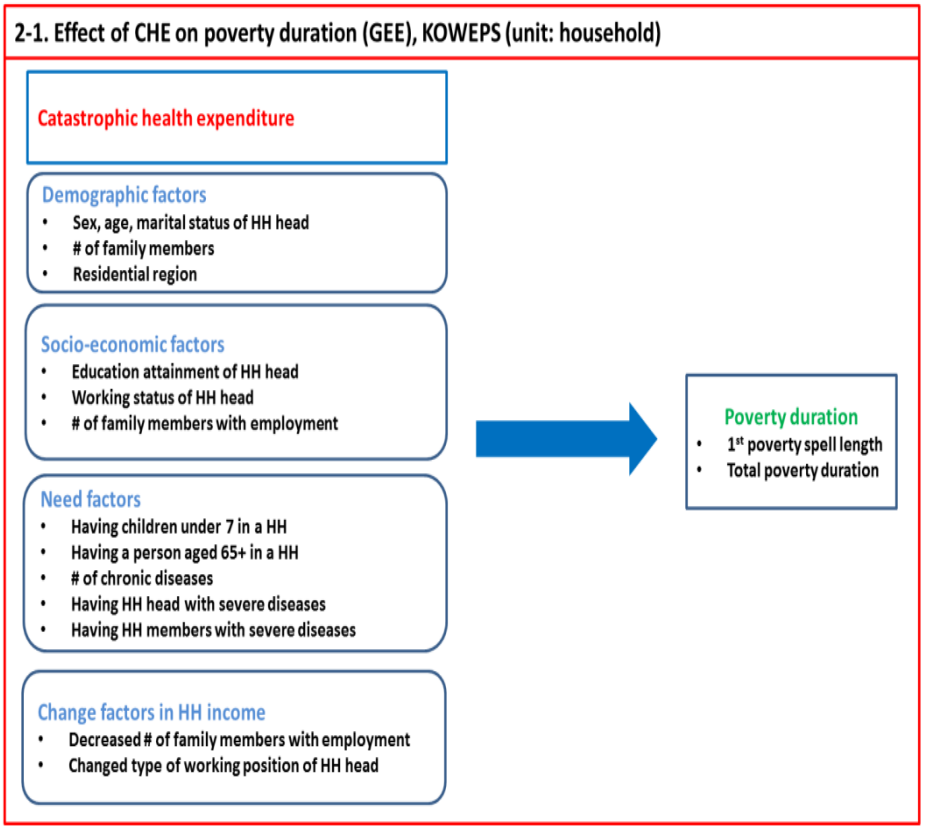
1.2. The effect of catastrophic health expenditure on persistence of poverty in South Korea

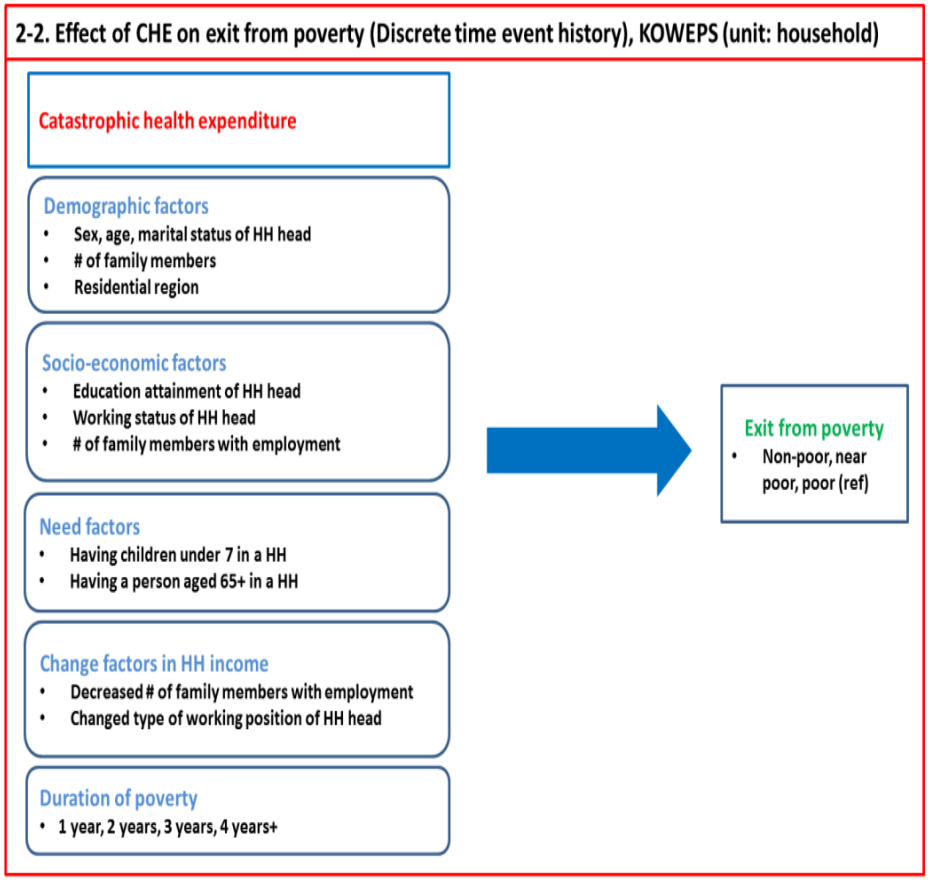
1.2.1. Framework

In the second part of the study, the impact of occurrence of CHE on poverty duration among the poor will be empirically examined through generalized estimating equations (GEE), using the data from the Korean Welfare Panel Study (KOWEPS) 2008-2016 (2-1).

Then, the study explores the impact of occurrence of CHE on exit from poverty (poor, near-poor, non-poor) among the poor through a discrete time event history analysis, using the data from the Korean Welfare Panel Study (KOWEPS) 2008-2016 (2-2).

Figure 7. Framework for the effect of catastrophic health expenditure on persistence of poverty among the poor in South Korea





1.2.2. Hypotheses

Occurrence of catastrophic health expenditure would have effects on lengthening poverty duration.

Occurrence of catastrophic health expenditure would have a negative effect on exit from poverty for the poor.

2. Research methods

2.1. The effect of poverty dynamics and the Medical Aid status change on health care use, health expenditure, and unmet need in South Korea

2.1.1. The effect of poverty dynamics and the Medical Aid status change on health care use, health expenditure, and unmet need

2.1.1.1. Data source

Data from the Korea Health Panel (KHP) 2008-2014 were used. The Korea Health Panel is an annual longitudinal panel survey conducted by the National Health Insurance Corporation and the Korean Institute for Health and Social Affairs that started in 2008. The KHP is a nationally representative survey with about 7,000 households, using systematic two-stage stratified cluster sampling on the 2005 census data. The survey consists of detailed information on general characteristics, economic and employment status, health care utilization and health care expenditure(Korean National Health Insurance Corporation and Korea Institute for Health and Social Affairs 2017). Individual units aged 20 years old and more were used for analyzing data.

2.1.1.2. Variables

Dependent variables

Dependent variables included the number of outpatient visits per year, having a medical check-up per year, having an emergency visit per year, the number of hospitalization per year, and length of hospital stays per year, (ln)Health care expenditure (total, outpatient, inpatient) per year, and unmet need (all reasons, economic reason) within the previous 12 months.

Health expenditure included direct health expenditure (out-of-pocket payments by the patient), such as inpatient care costs, outpatient care costs, emergency care costs, and costs for prescription drugs, excluding transportation costs, caregiver costs, medical device costs, costs for non-prescription drugs, etc.

Independent variables

The primary independent variable was poverty status: i) the transient poor, the recurrent poor, the persistent poor, and the persistent non-poor; and ii) the new Medical Aid (from the health insurance to the Medical Aid), the new health insurance (from the Medical Aid to the health insurance), the continuous Medical Aid, and the continuous health insurance. As for the first poverty status, various poverty lines were employed: less than 40% and 50% of the median income level. Based on Muffels et al. (2000)(Muffels, Fouarge et al. 2000), the persistent non-poor means those who were never poor over the four years of observation; the transient poor, once poor; the recurrent poor, more than one year of poverty but never longer than two consecutive years; persistent poor, poor for at least three consecutive years. Using poverty statuses in 2008-2013 to analyze the 2011-2013 data for this study, the poverty statuses in the previous three years and the current year were used to determine the poverty status in the current year; for example, poverty statuses in 2008-2011 were employed to determine the poverty status in 2011. For analyses, the persistent non-poor were excluded.

The second poverty status was categorized based on health insurance status change, such as the new MA (from the HI to the MA), the new HI (from the MA to the HI), the continuous MA, and the continuous HI; the health insurance status in the previous year was compared to the health insurance status in the current year over the period 2011-2013; for the health insurance status in 2011, health insurance statuses in 2010-2011 were used, for example.

The Medical Aid status was included only for poverty analyses (the first poverty status analyses). Other independent variables included demographic factors (sex, age, marital status, the number of family members, residential region), socio-economic factors (total household disposable income-log form, education attainment, economic activity status, having a private health insurance), health need factors (self-assessed health, having activity

limitation due to diseases/injuries, the number of chronic diseases, having cancer/cardiac/cerebro-vascular diseases/hypertension/diabetes, and being mentally/physically disabled; being mentally disabled covers intellectual disability-정신지체 1-3급-, developmental disability-발달장애 1-3급-, and mental disorder-정신장애 1-3급-)(Sohn, Shin et al. 2010; Cheong and Lee 2012; Kavosi, Rashidian et al. 2012; Kim and Lee 2012; Lee and Lee 2012; Lee 2015; Woo and Shin 2015; Kim and Kwon 2016; Edoka, McPake et al. 2017), and year dummies. Unmet need variables were available from 2011; the item classification for the number of having chronic diseases was changed from 2014, hence data for the years from 2011 to 2013 were analyzed.

Household total disposable income included income from earning, wealth, social insurance, financial income, private transfers, public transfers, etc. The Korea Health Panel income measure was self-reported annual household income in the previous year (e.g., data for the year 2012 reported the income of the year 2011). We adjusted the income data reflecting the relevant income of the years properly. It was transformed into (log) income per equivalent adult using the square root equivalence scale, which divided household income by the square root of family size(OECD 2008). Table 1 presents the description of variables for the first part analysis.

Table 1. Description of variables for the first part analysis

Dependent variable	Detail
The number of outpatient visits per year	Continuous variable
Having a medical check-up per year	Yes=1, 0 otherwise
Having an emergency room visit per year	Yes=1, 0 otherwise
The number of hospitalization per year	Continuous variable
Length of hospital stays per year	Continuous variable
(ln)Health care expenditure (total, outpatient, inpatient) per year	Continuous variable
Unmet need (all reasons, economic reason) within the previous 12 months	Yes=1, 0 otherwise
Independent variable	Detail
Poverty status	1. Transient poor (ref), recurrent poor, persistent poor
	2. Continuous health insurance (ref), new Medical Aid, new health insurance,

	continuous Medical Aid
Medical Aid status (included only for poverty analyses)	Medical Aid, National health insurance (ref)
Demographic factors	
Sex	Male (ref), Female
Age	20-44 (ref), 45-64, 65-74, 75+
Marital status	Married (ref), single, widowed/divorced/separated
Number of family member	Living alone, 2, 3+ (ref)
Residential region	Seoul, metropolitan cities, others (ref)
Socio-economic factors	
(ln)Total household disposable income	Income per equivalent adult using square root equivalence scale; continuous variable
Education attainment	Elementary school, high school, college and more (ref)
Economic activity status	No working=1, working=0 (ref)
Having a private health insurance	Yes=1, 0 otherwise
Health need factors	
Self-assessed health	Good (ref), fair, bad
Having activity limitation due to diseases/injuries	Yes=1, 0 otherwise
The number of chronic diseases	Continuous variable
Having cancer	Yes=1, 0 otherwise
Having a cardiac disease	Yes=1, 0 otherwise
Having a cerebro-vascular disease	Yes=1, 0 otherwise
Having hypertension	Yes=1, 0 otherwise
Having diabetes	Yes=1, 0 otherwise
Being mentally disabled	Yes=1, 0 otherwise
Being physically disabled	Yes=1, 0 otherwise
Year dummies	2011 (ref), 2012, 2013

2.1.1.3. Methods

This analysis focused on type of poverty on health care utilization, health care expenditure, and unmet need. The effect of type of poverty on health care utilization and health care expenditure was examined using a generalized linear regression (GLM). For health care utilization, a generalized linear regression with the negative binomial function was used, because health care utilization variables had skewed distributions and overdispersion. For health expenditure, GLM with log-link function for gamma distribution was applied (Equation 1). For having a medical check-up and an emergency visit, and unmet need, a multivariate logistic regression was used (Equation 2).

$$Y_i = \beta_0 + \beta_1 \text{Poverty status}_i + \beta_2 X_i + \varepsilon_i \ , \quad (1)$$

where Y_i indicates the number of outpatient visits, the number of hospitalization, length of hospital stays, and (ln)Health care expenditure within the previous 12 months; Poverty status_i indicates a categorical variable of poverty status (the transient poor (ref), the recurrent poor, the persistent poor; the continuous health insurance (ref), the new Medical Aid, the new health insurance, the continuous Medical Aid); X_i indicate covariates; ε_i, an error term.

$$\text{Log}\left(\frac{Y_i}{1-Y_i}\right) = \beta_0 + \beta_1 \text{Poverty status}_i + \beta_2 X_i + \varepsilon_i \ , \quad (2)$$

where Y_i indicates having a medical check-up and an emergency visit, and unmet need within the previous 12 months; Poverty status_i means a categorical variable of poverty status (the transient poor (ref), the recurrent poor, the persistent poor; the continuous health insurance (ref), the new Medical Aid, the new health insurance, the continuous Medical Aid); X_i indicate covariates; ε_i, an error term. All analyses used clustered robust standard errors. All the estimates were obtained using STATA 14.0.

2.2. The effect of catastrophic health expenditure on persistence of poverty in South Korea

2.2.1. The effect of catastrophic health expenditure on poverty duration among the poor

2.2.1.1. Data source

Data from the Korea Welfare Panel Study (KOWEPS) 2008-2016 were used. The KOWEPS is an annual longitudinal panel survey for about 7,000 households started in 2006 and conducted by the Korea Institute for Health and Social Affairs and Seoul National University. All members of the

household aged 15 years and older completed the individual questionnaire if possible. Based on the 2005 census data, it is a nationally representative sample using a systematic two-stage stratified cluster sampling method; this included post-stratification weights based on the 2005 census data, weighted by a primary sampling unit; the survey was intended to oversample low-income households (those with less than 60% of median income) by allocating the 50% of the sample to the low-income groups(Korea Institute for Health and Social Affairs and Seoul National University 2017). This data cover detailed information on general characteristics, economic status, social security, welfare need, health care utilization and health expenditure, which would be suitable for this study. Household units were used for analyses. Household heads aged 20 years old and more were used for analyzing data.

2.2.1.2. Variables

Dependent variables

Dependent variables were the first poverty spell length and the total poverty duration. Poverty was defined in each year at the poverty line of less than 50% of the median income level (MIL). The first poverty spell length was the years of poverty duration in the first poverty spell observed in data. The total poverty duration included the total years in poverty of a household observed in data.

Independent variables

The major independent variable was the occurrence (a binary variable) of catastrophic health expenditure. Catastrophic health expenditure is defined as health expenditure exceeding 20%, 30%, and 40% of household total expenditure excluding actual food consumption.

Other independent variables included demographic factors (sex, age, marital

status of household head, the number of family members, residential region), socio-economic factors (education attainment, working status of household head, and the number of family members with employment), need factors (having children under 7 in a household and having a person aged 65 years old and more in a household, the number of chronic diseases, having household head with severe diseases-cancer, cardiac diseases, stroke, cerebro-vascular diseases-, and having household members with severe diseases), change factors in household income (decreased number of family members with employment, changed type of working position of household head)(Ku, Im et al. 2010; Lee 2010; Sohn, Shin et al. 2010; Ahn, Ku et al. 2011; Cheong and Lee 2012; Kavosi, Rashidian et al. 2012; Kim and Lee 2012; Lee and Lee 2012; Lee 2015; Woo and Shin 2015; Kim and Kwon 2016; Edoka, McPake et al. 2017). Table 2 shows description of variables for 2-1 analysis.

Table 2. Description of variables for 2-1 analysis

Dependent variables	Detail
Poverty duration (years)	1st poverty spell length (continuous variable)
	Total poverty duration (continuous variable)
Independent variables	**Detail**
Catastrophic health expenditure	Yes=1, 0 otherwise
Demographic factors	
Sex of household head	Male (ref), Female
Age of household head	20-44 (ref), 45-64, 65-74, 75+
Marital status of household head	Married (ref), single, widowed/divorced/separated
The number of family members	Living alone, 2, 3+ (ref)
Residential region	Metropolis=1, rural/sub-urban=0 (ref)
Socio-economic factors	
Education attainment of household head	College and more=1, 0 otherwise
Working status of household head	Working=1, no working=0
The number of family members with employment	Continuous variable
Need factors	
Having children under 7 in a household	Yes=1, 0 otherwise
Having a person aged 65 years old and more in a household	Yes=1, 0 otherwise

No. of chronic diseases	Continuous variable
Having HH head with severe diseases	Yes=1, 0 otherwise
Having HH members with severe diseases	Yes=1, 0 otherwise
Change factors in household income	
Decreased number of family members with employment	Yes=1, 0 otherwise
Changed type of working position of household head	Yes=1, 0 otherwise

2.2.1.3. Methods

The KOWEPS data for the poor households used in the study were more than eight years unbalanced panel data. We used a panel Generalized Estimating Equations (GEE) population-averaged model with the exchangeable correlation of error terms (all observations over time have the same correlation) to consider heteroscedasticity and autocorrelation issues to have consistent estimators. In the GEE population-averaged model, the average effect of covariates on the response in a population is of an interest(Gardiner, Luo et al. 2009; Jeon, Noguchi et al. 2017). For selecting models, we tested the fixed effect model and the random effect model using the Hausman test; the fixed effect model was proven to be a better model. But the fixed effect model uses a within-subject transformation over time, and inference on the effect of time-constant covariates is not possible; the fixed model analysis removes observations that have too few repeated items. If evaluating a treatment effect is of an interest, this might be a serious disadvantage of the fixed effect analysis(Gardiner, Luo et al. 2009).

The dependent variables were count data, such as the first poverty spell length (years) and the total poverty duration (years); we performed GEE population-averaged model with log-link function for Poisson distribution (Equation 3):

$$Y_{it} = \mu_{it} + \varepsilon_{it} \ , \quad g_{(\mu_{it})} = \beta_0 + \beta_1 \mathrm{CHE_{it}} + \beta_2 \mathrm{X_{it}} \ , \qquad (3)$$

where for household i and time t, Y_{it} indicates the first poverty spell

length (years) and the total poverty duration (years); g is a link function; $\mathrm{CHE_{it}}$ indicates a variable of catastrophic health expenditure; $\mathrm{X_{it}}$ indicate covariates; ε_{it}, an error term. All analyses incorporated the Huber-White estimators for robustness. All the estimates were obtained using STATA 14.0.

2.2.2. The effect of catastrophic health expenditure on exit from poverty among the poor

2.2.2.1. Data source

Data from the Korea Welfare Panel Study (KOWEPS) 2008-2016 for the poor were used to analyze data of the years of 2008-2016. Household units were used for analyses.

2.2.2.2. Variables

Dependent variables

The dependent variable was exit from poverty (non-poor, near-poor, poor (ref)). Poverty was defined in the exit year with the poverty line of less than 40% of the median income level (MIL). Table 3 shows the definition of poverty status.

Table 3. Definition of poverty status

Poverty line	Poverty status	Detail
40% of the median income level (MIL)	Poor	<40% of MIL
	Near-poor	40-60% of MIL
	Non-poor	>60% of MIL

Independent variables

The major independent variable was the occurrence (a binary variable) of catastrophic health expenditure. Catastrophic health expenditure is defined as health expenditure exceeding 20%, 30%, and 40% of household total expenditure excluding actual food consumption.

Other independent variables included demographic factors (sex, age, marital status of household head, the number of family members, residential region), socio-economic factors (education attainment, working status of household head, the number of family members with employment), need factors (having children under 7 in a household and having a person aged 65 years old and more in a household), change factors in household income (decreased number of family members with employment, changed type of working position of household head), and duration of poverty (1 year, 2 years, 3 years, 4 years and more)(Ku, Im et al. 2010; Lee 2010; Sohn, Shin et al. 2010; Ahn, Ku et al. 2011; Cheong and Lee 2012; Kavosi, Rashidian et al. 2012; Kim and Lee 2012; Lee and Lee 2012; Lee 2015; Woo and Shin 2015; Kim and Kwon 2016; Edoka, McPake et al. 2017). Table 4 shows description of variables for 2-2 analysis.

Table 4. Description of variables for 2-2 analysis

Dependent variables	Detail
Poverty status at the exit year	Non-poor, near-poor, poor (ref)
Independent variables	Detail
Catastrophic health expenditure	Yes=1, 0 otherwise
Demographic factors	
Sex of household head	Male (ref), Female
Age of household head	20-44 (ref), 45-64, 65-74, 75+
Marital status of household head	Married (ref), single, widowed/divorced/separated
The number of family members	Living alone, 2, 3+ (ref)
Residential region	Metropolis=1, rural/sub-urban=0 (ref)
Socio-economic factors	
Education attainment of household head	College and more=1, 0 otherwise
Working status of household head	Working=1, no working=0
The number of family members with employment	Continuous variable
Need factors	
Having children under 7 in a household	Yes=1, 0 otherwise
Having a person aged 65 years old and more in a household	Yes=1, 0 otherwise
Change factors in household income	
Decreased number of family members with employment	Yes=1, 0 otherwise
Changed type of working position of household head	Yes=1, 0 otherwise
Duration of poverty	1 year (ref), 2 years, 3 years, 4 years+

2.2.2.3. Methods

First, poverty exit probability (or hazard rates) was estimated using the life table analysis based on person-year data. The life table analysis assumed that exit from poverty occur at a uniform rate within the intervals (in this case, on a year basis), and then one can derive an estimate for the midpoint of each interval(Jenkins 2008). In this study, the likelihood of a poverty exit occurring in the next year of the end year of the poverty spell, conditional on the spell lasting to the beginning of poverty duration, was defined as the hazard rates (or poverty exit rates).

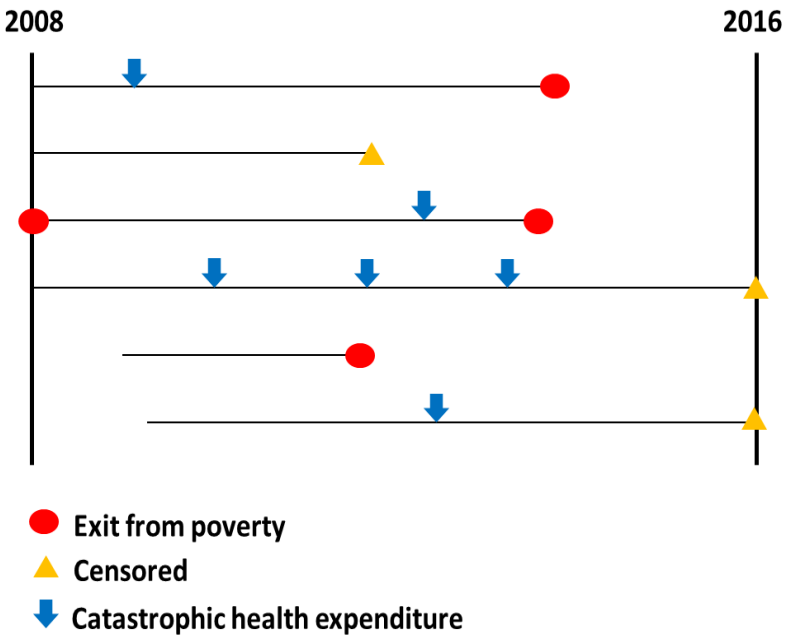
The impact of occurrence of catastrophic health expenditure on exit from poverty was examined using a discrete time event history analysis. With the discrete time hazard model, a multinomial logit model was used for determinants of exit from poverty.

One of important characteristics of data used for a discrete time event history analysis is the structure of the data set; event history data include the length of time a unit spends in a state prior to experiencing an event and an indicator presenting whether or not the observation is right-censored(Allison 1982; Box-Steffensmeier and Jones 1997). Units are tracked at some specified starting point until each unit experiences an event; if a unit does not experience an event by the time the final observation period is finished, the unit is considered right-censored (line 4 and 6 in Figure 8). If the right-censoring is assumed to be independent from experiencing an event, then including the right-censored data would not cause any bias or problems. However, as seen in the line 2 in Figure 8, if right-censored data occur due to attrition bias, then excluding the right-censored data would cause selection bias.

The left-censoring problem occurs when observations of units start after the unit has already entered a certain state (e.g., a poverty state). If one's prior

history has an effect on the probability of experiencing an event, results based on data that include lots of left-censored units will generate incorrect estimates(Allison 1982; Box-Steffensmeier and Jones 1997). Some researchers analyzed data excluding the left-censored units(Allison 1982; Box-Steffensmeier and Jones 1997; Ku 2005), which can cause selection bias and loss of information(Iceland 1997; Cellini, McKernan et al. 2008). In this study, based on the previous literature, left-censored data were included(Guo 1993; Lee 2010; Ahn, Ku et al. 2011).

Figure 8. Characteristics of censored data



A discrete time event history analysis is a method using a survival analysis, applied in a social science area. In a discrete time event history analysis, estimates for the underlying hazard probability of a unit experiencing an event need to be calculated.

An event can happen only at discrete times; it is assumed that the probability of event T occurring at t is observable. The discrete time hazard probability

function is defined as the conditional probability that a unit experiences an event in time period t, given that a household, i, did not experience the event prior to t. This can be expressed as follows (Equation 4):

$$\lambda_{it} = Pr(T_i = t | T_i \geq t,\ \alpha, \beta' X_{it}) \ , \tag{4}$$

where λ_{it} denotes the discrete-time hazard function; i, a household; t, time; T, event (exit from poverty). α denotes a baseline probability of an event occurring when the covariate is equal to zero; $\beta'X$, a matrix of covariates and their associated parameters.

This probability can be parameterized to have a logistic dependence on the covariates; thus, the hazard probability can be placed into the logistic form by taking the logistic transformation (Equation 5):

$$\text{Log}\left(\frac{\lambda_{it}}{1-\lambda_{it}}\right) = \alpha(t) + \beta' X_{it} \ . \tag{5}$$

This formulation shows the conditional log-odds of an event occurring at t depend on the baseline term $\alpha(t)$, i.e., a function of time t (year dummies in this study), and the covariates X. In this study, a 'multinomial logit' model of competing risks was used. The competing risk model provides a method of addressing issues where there are different types of events (mutually exclusive multiple destinations). It is known that if the interval hazard rate is relatively small, then the 'multinomial logit' model of competing risks offered a close approximation to a proportional hazards model for interval-censored data where one assumed that the continuous time hazard rate was constant within each interval(Jenkins 2008). All the estimates were obtained using STATA 14.0.

IV. The effect of poverty dynamics and the Medical Aid status change on health care use, health expenditure, and unmet need in South Korea

1. Results

1.1. General characteristics of the study sample

The general characteristics of the study sample (N=35,778) used in the analysis were presented in Table 5. We used the pooled data of the three years (2011-2013), and the distributions of the variables in each year were similar over the period; we mainly discussed the results from the year of 2013. The population was separated evenly down the gender line over the three years, with 47.7% males and 52.3% females in 2013. The average age of the sample population was 51.9 years old in 2013, coming from the aged 20-44 years old of 37% and the aged 45-64 years old of 35% in the total population; the shares of the aged 65 years old were increased over time, with the aged 65-74 years old of 16% and the aged 75 years old and more of 12% in 2013. The majority of the population were married (about 67%), and the proportion of the people living alone has been increased over time (7.3% in 2013). About 43% of the population lived in metropolis (Seoul or metropolitan cities).

Annual total household disposable income per equivalent adult was 24,351,920 KRW in 2013. About 63% of the population in 2013 were educated at high school levels and below. About half the population was working (58%) in 2013. Many had private health insurances (about 68%).

15.6% of the population described their self-assessed health as bad (related categories were “bad” and “very bad”), and 7% of the population had activity

limitation due to disease/injuries in 2013. The average number of chronic diseases was two, with the population having more than three chronic diseases of 32% in 2013. The shares of the population with cancer, cerebro-vascular diseases, hypertension, and diabetes was 1.7%, 5.1%, 5.8%, 36.6%, and 14.5%. Since 2012, the classification system for disease codes in the KHP was changed; the cautious interpretation should be needed for the year of 2011. The shares of the population with mental disability and physical disability were 0.6% and 7.2% in 2013, respectively.

About 4.1% of the population were the Medical Aid (MA) beneficiaries in 2013. Poverty rates in 2011-2013 at the threshold of less than 50% of the median income level (MIL) were 14.5%, 15.4%, and 14.9%; 9.3%, 10.1%, and 9.4% at the threshold of less than 40% of the MIL. these estimates had 1-2 percentage differences from those in the Statistical Yearbook of Poverty 2017 based on the Household Survey data by the National Statistics(Korea Institute for Health and Social Affairs 2017). For poverty status change at a point in time, the majority of the population were the persistent non-poor (about 70-80% at various thresholds); the stricter poverty lines were, the higher estimates were. The transient poor were comprised of 6-10%, and the recurrent poor were 4-7% of the population; both shares were decreased over time. The persistent poor were 5-10% at various poverty lines. For the Medical Aid beneficiaries status change, the new Medical Aid (from the national health insurance status to the MA) comprised 0.1-0.3% of the population; the new health insurance (from the MA to the national health insurance), 0.4-0.5% of the population; the continuous MA were 4-4.5% of the population; the continuous health insurance, 95% of the population.

Table 6 shows the features of health care utilization and expenditure. With regard to health care utilization, more than 80% of the population had outpatient visits, and the average number of outpatient visits among the patients was 20.3, 21.3, 22 per year in 2011-2013; the average number of the

visits among the general population was 16.7, 17.7, and 18.6 per year in 2011-2013, respectively. About 20% of the population had medical check-ups, and 8-9% of the population had an emergency room visit per year. About 14-15% of the population had any hospitalization per year; the average number of hospitalization among the patients was about 2, 1.9, and 1.8 per year in 2011-2013; the average number of hospitalization among the general population was 0.28 per year in 2011-2012 and 0.26 per year in 2013. About 14-15% of the population had any hospital stay in 2011-2013; the average length of hospital stays among the patients was around 29-32 days per year in 2011-2013; the average length of stays among the general population was 3.9-4.7 days in 2011-2013. The average total health expenditure (out-of-pocket payments) per person was 675,354.8 KRW in 2013; outpatient health expenditure (out-of-pocket payments) per person was 534,770.9KRW; inpatient health expenditure (out-of-pocket payments) per person, 1,503,499 KRW. About 17.5% of the population reported unmet need for all reasons within the previous 12 months; for those who have unmet need for all reasons, more than 32% of the population reported unmet need due to the economic reason.

Table 5. General characteristics of the study sample for the first part analysis (unit: individual)

	2011		2012		2013	
	N	%	N	%	N	%
	Mean (SD)		Mean (SD)		Mean (SD)	
Total no. of individuals (N=35,778)	12,456	100	11,927	100	11,395	100
Total no. of households (N=15,500)	5,312	100	5,202	100	4,986	100
Demographic factors						
Male	5,961	47.86	5,692	47.72	5,435	47.7
Female	6,495	52.14	6,235	52.28	5,960	52.3
Age (Years)	50.8 (17.2)		51.38 (17.43)		51.93 (17.75)	
20-44	4,917	39.47	4,550	38.15	4,204	36.89
45-64	4,365	35.04	4,179	35.04	3,980	34.93
65-74	1,983	15.93	1,903	15.95	1,843	16.17
75+	1,191	9.56	1,295	10.86	1,368	12.01
Marital status						
Married	8,570	68.8	8,120	68.08	7,685	67.44
Widowed/divorced/separated	1,527	12.26	1,488	12.48	1,458	12.8
Single	2,359	18.94	2,319	19.44	2,252	19.76
No. of family members						
Living alone	816	6.55	821	6.89	834	7.32
Two	3,020	24.26	2,966	24.88	2,910	25.55
Three+	8,615	69.19	8,134	68.23	7,647	67.13
Residential region						
Seoul	1,765	14.18	1,660	13.93	1,568	13.77
Metropolitan cities	3,680	29.56	3,445	28.89	3,290	28.88
Others	7,006	56.26	6,816	57.18	6,533	57.35
Socio-economic factors						
Total household disposable income per equivalent adult (KRW)	22,860,620 (16,120,370)		24,182,390 (18,854,300)		24,351,920 (16,960,960)	
Education attainment						
Elementary school	2,764	22.19	2,626	22.02	2,489	21.84
High school	5,217	41.88	4,938	41.4	4,682	41.09
College and more	4,475	35.93	4,363	36.58	4,224	37.07
Economic activity status						
No working	5,298	42.53	5,028	42.16	4,783	41.97
Working	7,158	57.47	6,899	57.84	6,612	58.03
Private insurance						
Yes	8,330	66.88	8,018	67.23	7,738	67.91
No	4,126	33.12	3,909	32.77	3,657	32.09
Health need factors						
Self-assessed health						
Good	4,774	43.63	4,528	43.22	4,147	40.9
Fair	4,475	40.9	4,189	39.98	4,416	43.55
Bad	1,692	15.47	1,760	16.8	1,577	15.55
Having activity limitation due to diseases/injuries	698	5.91	654	5.77	763	7.03
No. of chronic diseases	1.84 (2.28)		1.84 (2.25)		2.02 (2.4)	

	2011		2012		2013	
	N	%	N	%	N	%
	Mean (SD)		Mean (SD)		Mean (SD)	
0	4,844	38.89	4,603	38.59	4,103	36.01
1	2,402	19.28	2,311	19.38	2,195	19.26
2	1,666	13.38	1,549	12.99	1,454	12.76
3+	3,544	28.45	3,464	29.04	3,643	31.97
Having cancer	661	8.68	110	1.5	123	1.68
Having a cardiac disease	572	7.51	339	4.62	370	5.06
Having a cerebro-vascular disease	778	10.22	406	5.53	425	5.82
Having hypertension	2,729	35.85	2,641	35.98	2,677	36.64
Having diabetes	1,054	13.85	1,030	14.03	1,059	14.49
Being mentally disabled	75	0.6	68	0.57	65	0.57
Being physically disabled	907	7.28	848	7.11	822	7.21
Medical Aid status						
Medical Aid	612	4.92	536	4.5	472	4.14
NHI	11,814	95.08	11,391	95.5	10,923	95.86
Poverty rates						
<50% of the median disposable income	1,795	14.53	1,828	15.43	1,685	14.88
<40% of the median disposable income	1,152	9.32	1,201	10.14	1,062	9.38
Poverty status change						
<50% of the median disposable income						
Persistent non-poor	8,476	72.28	8,300	73.9	8,241	76.5
Transient poor	1,199	10.22	1,069	9.52	862	8.01
Recurrent poor	878	7.49	648	5.77	510	4.73
Persistent poor	1,174	10.01	1,214	10.81	1,159	10.76
<40% of the median disposable income						
Persistent non-poor	9,362	79.93	9,149	81.58	9,007	83.33
Transient poor	1,076	9.19	892	7.95	743	6.87
Recurrent poor	600	5.12	502	4.48	421	3.9
Persistent poor	675	5.76	672	5.99	638	5.9
Medical Aid status change						
Continuous health insurance	11,551	94.77	11,217	95.17	10,753	95.29
New Medical Aid	39	0.32	15	0.13	23	0.2
New health insurance	52	0.43	41	0.35	60	0.53
Continuous Medical Aid	546	4.48	513	4.35	449	3.98

Note: 1,100 KRW=1 USD. SD stands for standard deviation.

Table 6. Health care utilization and expenditure (unit: individual)

	2011		2012		2013	
	N	%	N	%	N	%
	Mean (SD)		Mean (SD)		Mean (SD)	
Total no. of individuals (N=35,778)	12,456	100	11,927	100	11,395	100
Total no. of households (N=15,500)	5,312	100	5,202	100	4,986	100
No. of outpatient visits per year						
Probability of visits	10,226	82.1	9,923	83.2	9,630	84.51
Average no. of visits (excluding zero)	20.34 (27.08)		21.32 (27.22)		21.95 (28.24)	
Average no. of visits (including zero)	16.7 (25.75)		17.74 (26.07)		18.55 (27.15)	
Having medical check-ups per year	2,290	18.38	2,369	19.86	2,277	19.98
Having an emergency room visit per year	1,071	8.6	1,058	8.87	1,002	8.79
No. of hospitalization per year						
Probability of hospitalization	1,722	13.82	1,742	14.61	1,649	14.47
Average no. of hospitalization (excluding zero)	2.02 (2.44)		1.92 (1.79)		1.82 (1.69)	
Average no. of hospitalization (including zero)	0.28 (1.14)		0.28 (0.96)		0.26 (0.91)	
Length of hospital stays per year						
Probability of having a hospital stay*	1,696	13.62	1,733	14.53	1,645	14.44
Average length of hospital stays (excluding zero)	28.52 (53.58)		29.95 (59.99)		32.30 (77.63)	
Average length of hospital stays (including zero)	3.88 (22.05)		4.35 (25.18)		4.66 (31.6)	
Total health expenditure per person per year	606,286.2 (1,581,770)		654,545.7 (1,387,467)		675,354.8 (1,388,553)	
Outpatient health expenditure per person per year	470,538.7 (776,720.2)		506,117.6 (810,801.8)		534,770.9 (862,865.1)	
Inpatient health expenditure per person per year	1,494,190 (2,316,677)		1,552,622 (2,236,643)		1,503,499 (2,235,839)	
Unmet need within the previous 12 months						
All reasons	1,700	15.17	1,753	16	1,831	17.48
Economic reason	530	32.1	634	36.95	583	32.85

Note: 1,100 KRW=1 USD. SD stands for standard deviation. Health expenditure only covers out-of-pocket payments.

*: The number of the people who stayed in a hospital and the number of the people who had any hospitalization were different because of missing values in length of hospital stays.

1.2. Effects of poverty dynamics on health care utilization

Table 7 shows the effects of poverty dynamics on health care utilization at various poverty lines. In terms of poverty status change, compared to the transient poor, the persistent poor were less likely to have outpatient visits without statistical significance. Having more poverty experiences was not associated with having medical check-ups. For having an emergency visit, the persistent poor at the poverty line of less than 40% of MIL were less likely to visit an emergency room compared to the transient poor (0.76 odds ratio); with the generous poverty line, this turned out to be not statistically significant. Poverty status change had a significant effect on hospitalization; those with more poverty experiences had less hospitalization. The persistent poor at all poverty lines and the recurrent poor at the poverty lines of less than 40% of MIL were less likely to have hospitalization with statistical significance. With regard to length of hospital stays, those had more poverty were not associated with length of stays at hospitals[1].

We further examined the effect of poverty status change on the number of outpatient and inpatient care utilization using the two part model in order to analyze whether those with more poverty experiences had difficulties in accessing health care (an initial contact, patient-driven decision) or having subsequent utilizations (doctor-driven decision), as seen in Table A7 in appendix. For the two-part model, the first part that examines the effect of having any health care utilization used multivariate logistic regressions, and the second part that examines the number of health care utilization used ordinary least squares regressions. We found that the persistent poor had difficulties in accessing health care utilization; they were less likely to have

[1] For the sensitivity analysis, we included the persistent non-poor in the sample (the persistent non-poor as a reference; please see Table A5 in appendix); all the estimates for health care use except length of stays at a hospital for the recurrent poor were not statistically significant. The recurrent poor were less likely to stay longer at hospitals.

any hospitalization and any hospital stays at the poverty line of less than 50% of MIL, and less likely to have any outpatient visits and to have fewer hospitalizations at the poverty line of less than 40% of MIL. The recurrent poor had difficulties in access to outpatient visits at all poverty lines[2].

In sum, poverty status change played some roles in health care utilization. Particularly, the persistent poor tended to have less emergency visits and less hospitalization than the transient poor. Considering their high health needs, those who had more poverty experiences had more difficulties in health care utilization.

In terms of the Medical Aid status, those with MA status tended to have more outpatient visits, emergency visits, and more inpatient care, but not to have medical checkups. Females were likely to have more outpatient visits and medical check-ups, but not likely to have emergency visits and inpatient care. Compared to the aged 20-44 group, the older groups were likely to have more outpatient visits and have medical checkups. The aged 45-74 groups were less likely to have an emergency visit; the aged 45-64 group was less likely to have hospitalization, while the aged 75 years old and more was more likely to stay longer at a hospital. Those without a spouse had less outpatient visits and medical check-ups; those who were not married had less emergency visits and inpatient care. Those with the fewer number of family members had more outpatient care and medical check-ups and less hospitalization. Those lived in rural areas tended to have more outpatient visits, less medical checkups, more emergency visits, and more inpatient care.

Total household disposable income had effects on more outpatient care and emergency visits. As for education attainment, those with lower education

[2] We further examined it by including the persistent non-poor in the sample (the persistent non-poor as a reference; please see Table A8 in appendix); all the results were not statistically significant except the number of outpatient visits for the recurrent poor; the recurrent poor had more outpatient visits.

had more health care utilization except medical check-ups. Those with no working status tended to have less medical check-ups and more inpatient care. Those with having a private health insurance had more health care utilization.

People with bad self-assessed health had more health care utilization except medical check-ups and length of stays; people with fair self-assessed health had more outpatient visits and medical check-ups, but less emergency visits and inpatient care. Those with activity limitation due to diseases/injuries had more health care utilization except medical check-ups. Those who had more chronic diseases tend to have more health care use. People with cancer had more emergency care and inpatient care. People with cardiac and cerebro-vascular diseases had less outpatient care (and more emergency visits for cardiac disease patients). Those with hypertension tended to have more outpatient visits, while those with diabetes tended to have more inpatient care. Those with mental disability tended to stay longer at a hospital; those with physical disability were likely to have more outpatient visits and inpatient care.

Table 7. Effect of poverty status change on health care utilization

	No. of outpatient visits		Having medical check-ups		Having an emergency visit		No. of hospitalization		No. of length of hospital stays	
	Poverty line: Median disposable income									
	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%
	Exp(β) (95% CI)		Odds ratio (95% CI)		Odds ratio (95% CI)		Exp(β) (95% CI)		Exp(β) (95% CI)	
Poverty status (ref: Transient poor)										
Recurrent poor	1.01(0.93-1.09)	0.995(0.92-1.07)	1.12(0.94-1.32)	1(0.86-1.16)	0.82(0.63-1.06)	1.15(0.93-1.43)	0.81(0.64-1.03)*	1.01(0.83-1.23)	0.82(0.62-1.08)	0.90(0.69-1.18)
Persistent poor	0.96(0.88-1.06)	0.997(0.92-1.08)	1.04(0.86-1.25)	0.99(0.85-1.15)	0.76(0.59-0.99)**	0.86(0.68-1.08)	0.74(0.57-0.95)**	0.83(0.66-1.03)*	0.99(0.71-1.37)	0.86(0.64-1.16)
Medical Aid (ref: No)	1.31(1.17-1.46)***	1.31(1.18-1.45)***	0.70(0.55-0.89)**	0.72(0.58-0.89)**	1.26(0.98-1.62)*	1.38(1.09-1.74)**	1.32(1.03-1.71)**	1.34(1.06-1.71)**	1.82(1.31-2.53)***	1.86(1.36-2.54)***
Female (ref: Male)	1.20(1.11-1.30)***	1.21(1.12-1.30)***	1.14(0.98-1.32)*	1.17(1.03-1.34)**	0.67(0.55-0.82)***	0.69(0.58-0.83)***	0.75(0.62-0.91)**	0.74(0.62-0.88)**	0.72(0.55-0.95)**	0.69(0.55-0.88)**
Age (ref: 20-44 years old)										
45-64	1.25(1.09-1.43)**	1.29(1.15-1.45)***	2.69(2.11-3.41)***	2.39(1.94-2.95)***	0.59(0.42-0.81)**	0.69(0.52-0.92)**	0.70(0.53-0.94)**	0.79(0.61-1.03)*	1.20(0.75-1.93)	1.30(0.87-1.94)
65-74	1.65(1.41-1.93)***	1.68(1.46-1.92)***	3.11(2.33-4.14)***	2.81(2.20-3.60)***	0.44(0.30-0.65)***	0.58(0.41-0.81)**	0.80(0.57-1.12)	0.84(0.62-1.13)	1.05(0.63-1.77)	1.17(0.75-1.83)
75+	1.66(1.40-1.97)***	1.65(1.42-1.92)***	2.26(1.64-3.12)***	1.90(1.44-2.52)***	0.81(0.54-1.19)	0.93(0.65-1.32)	1.02(0.70-1.49)	1.06(0.76-1.48)	1.69(0.98-2.92)*	1.97(1.22-3.16)**
Marital status (ref: Married)										
Widowed/divorced/separated	0.84(0.75-0.95)**	0.86(0.77-0.95)**	0.67(0.53-0.83)***	0.66(0.55-0.80)***	0.85(0.62-1.18)	0.96(0.73-1.26)	0.95(0.69-1.30)	0.90(0.68-1.19)	1.23(0.84-1.82)	1.28(0.90-1.81)
Single	0.49(0.42-0.57)***	0.50(0.44-0.56)***	0.60(0.45-0.81)**	0.47(0.36-0.62)***	0.43(0.29-0.65)***	0.43(0.30-0.61)***	0.37(0.25-0.55)***	0.36(0.25-0.51)***	0.40(0.21-0.78)**	0.42(0.24-0.73)**
No. of family members (ref: Three+)										
Living alone	1.19(1.04-1.36)**	1.16(1.03-1.32)**	1.97(1.53-2.53)***	2.11(1.70-2.63)***	1.21(0.84-1.73)	1.12(0.81-1.54)	1.31(0.95-1.79)*	1.36(1.03-1.78)**	0.94(0.63-1.40)	0.85(0.59-1.22)

	No. of outpatient visits		Having medical check-ups		Having an emergency visit		No. of hospitalization		No. of length of hospital stays	
	Poverty line: Median disposable income									
	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%
	Exp(β) (95% CI)		Odds ratio (95% CI)		Odds ratio (95% CI)		Exp(β) (95% CI)		Exp(β) (95% CI)	
Two	1.13(1.02-1.24)**	1.13(1.04-1.23)**	1.41(1.19-1.67)***	1.47(1.27-1.69)***	1.05(0.82-1.34)	1.04(0.85-1.29)	1.43(1.14-1.80)**	1.40(1.14-1.72)**	1.06(0.79-1.44)	0.97(0.73-1.28)
Residential region (ref: Others)										
Seoul	0.88(0.80-0.97)**	0.89(0.81-0.97)**	1.27(1.03-1.56)**	1.22(1.02-1.46)**	0.54(0.39-0.75)***	0.52(0.39-0.70)***	0.59(0.44-0.79)***	0.54(0.41-0.70)***	0.54(0.37-0.78)**	0.45(0.32-0.64)***
Metropolitan cities	0.92(0.84-1.003)*	0.91(0.84-0.98)**	1.23(1.06-1.42)**	1.20(1.06-1.37)**	0.74(0.60-0.91)**	0.73(0.61-0.87)**	0.73(0.59-0.89)**	0.71(0.59-0.86)***	0.97(0.73-1.28)	0.84(0.65-1.08)
ln(Total household disposable income per equivalent adult)	1.08(1.02-1.14)**	1.08(1.02-1.13)**	1.19(1.06-1.34)**	1.18(1.06-1.32)**	1.17(0.98-1.40)*	1.18(0.99-1.41)*	1.11(0.94-1.31)	1.13(0.97-1.33)	1.11(0.92-1.35)	1.14(0.94-1.39)
Education attainment (ref: College and more)										
Elementary school	1.31(1.14-1.51)***	1.28(1.13-1.44)***	0.90(0.71-1.15)	0.91(0.74-1.12)	1.69(1.18-2.42)**	.145(1.06-1.99)**	1.63(1.18-2.25)**	1.65(1.25-2.19)***	3.08(1.88-5.03)***	3.21(2.09-4.93)***
High school	1.13(1.001-1.28)**	1.13(1.01-1.25)**	0.90(0.73-1.11)	0.97(0.81-1.16)	1.59(1.17-2.16)**	1.36(1.04-1.79)**	1.46(1.11-1.92)**	1.47(1.15-1.88)**	2.01(1.28-3.15)**	2.16(1.44-3.23)***
No working (ref: Working)	1.05(0.97-1.13)	1.03(0.96-1.09)	0.72(0.62-0.83)***	0.76(0.67-0.86)***	1.25(1.02-1.53)**	1.14(0.95-1.36)	1.55(1.28-1.87)***	1.52(1.29-1.79)***	1.74(1.35-2.23)***	1.79(1.41-2.25)***
Having a private insurance	1.14(1.06-1.24)**	1.12(105-1.20)**	1.55(1.33-1.80)***	1.50(1.32-1.70)***	1.08(0.88-1.32)	1.04(0.87-1.24)	1.22(0.996-1.50)*	1.13(0.95-1.36)	1.45(1.14-1.84)**	1.29(1.04-1.61)**
Self-assessed health (ref: Good)										
Fair	1.21(1.14-1.30)***	1.22(1.15-1.29)***	1.17(1.01-1.36)**	1.16(1.02-1.32)**	0.80(0.65-0.99)**	0.80(0.67-0.97)**	0.76(0.62-0.93)**	0.77(0.64-0.92)**	0.57(0.44-0.74)***	0.55(0.44-0.69)***
Bad	1.53(1.39-1.68)***	1.53(1.41-1.66)***	0.97(0.81-1.17)	1.04(0.88-1.22)	1.46(1.16-1.85)**	1.45(1.18-1.79)***	1.26(1.002-1.59)**	1.30(1.06-1.59)**	1.17(0.89-1.55)	1.10(0.86-1.40)
Having activity limitation due to diseases/injuries (ref: No)	1.22(1.09-1.38)**	1.20(1.08-1.34)**	0.89(0.71-1.10)	0.85(0.70-1.03)*	1.52(1.19-1.95)**	1.64(1.32-2.05)***	1.85(1.48-2.33)***	1.84(1.50-2.26)***	2.84(2.08-3.88)***	3.11(2.32-4.17)***
No. of chronic diseases	1.18(1.16-1.20)***	1.18(1.16-1.20)***	1.07(1.03-1.10)***	1.08(1.04-1.11)***	1.14(1.09-1.19)***	1.12(1.07-1.16)***	1.09(1.05-1.14)***	1.09(1.05-1.13)***	1.05(0.996-1.11)*	1.06(1.01-1.12)**

	No. of outpatient visits		Having medical check-ups		Having an emergency visit		No. of hospitalization		No. of length of hospital stays	
	Poverty line: Median disposable income									
	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%
	Exp(β) (95% CI)		Odds ratio (95% CI)		Odds ratio (95% CI)		Exp(β) (95% CI)		Exp(β) (95% CI)	
Having cancer (ref: No)	0.88(0.75-1.02)*	0.91(0.79-1.04)	0.99(0.69-1.43)	0.85(0.62-1.18)	1.71(1.12-2.60)**	1.56(1.07-2.29)**	2.29(1.57-3.35)***	2.12(1.50-2.99)***	2.27(1.34-3.87)**	1.80(1.14-2.85)**
Having a cardiac disease (ref: No)	0.87(0.76-0.99)**	0.90(0.79-1.04)	0.88(0.68-1.15)	0.82(0.64-1.04)	1.21(0.90-1.64)	1.28(0.97-1.68)*	1.15(0.85-1.56)	1.21(0.93-1.58)	0.92(0.63-1.34)	0.99(0.70-1.41)
Having a cerebro-vascular disease (ref: No)	0.87(0.78-0.98)**	0.88(0.79-0.98)**	0.98(0.77-1.24)	0.94(0.76-1.17)	1.16(0.86-1.56)	1.19(0.91-1.55)	1.02(0.9-1.33)	0.96(0.75-1.24)	1.06(0.77-1.46)	0.94(0.70-1.27)
Having hypertension (ref: No)	1.15(1.07-1.25)***	1.16(1.08-1.25)***	0.93(0.79-1.09)	0.95(0.83-1.09)	0.97(0.79-1.21)	0.96(0.79-1.16)	1.07(0.88-1.31)	1.06(0.89-1.27)	1.09(0.83-1.44)	1.06(0.82-1.36)
Having diabetes (ref: No)	1.03(0.93-1.15)	1.03(0.94-1.13)	0.89(0.73-1.09)	0.87(0.73-1.04)	1.10(0.86-1.41)	1.03(0.82-1.29)	1.35(1.08-1.69)**	1.29(1.05-1.58)**	1.85(1.36-2.51)***	1.59(1.20-2.11)**
Being mentally disabled (ref: No)	1.16(0.82-1.63)	1.23(0.89-1.69)	0.66(0.22-1.97)	0.63(0.27-1.48)	0.69(0.27-1.80)	0.55(0.22-1.40)	1.28(0.47-3.45)	1.17(0.49-2.78)	5.76(1.87-17.71)**	6.24(2.35-16.57)***
Being physically disabled (ref: No)	1.13(1.004-1.28)**	1.16(1.04-1.30)**	1.01(0.83-1.24)	0.97(0.81-1.16)	1.15(0.89-1.49)	1.12(0.88-1.41)	1.29(1.02-1.63)**	1.26(1.02-1.57)**	1.52(1.13-2.05)**	1.61(121-2.13)**
Year dummy (ref: 2011)										
2012	1.01(0.96-1.06)	1.02(0.98-1.07)	1.05(0.91-1.22)	1.02(0.90-1.16)	1.13(0.94-1.36)	1.19(1.01-1.40)**	1.19(1.0002-1.42)*	1.21(1.03-1.42)**	1.40(1.12-1.76)**	1.42(1.14-1.76)**
2013	1.003(0.95-1.06)	1.03(0.98-1.08)	1.11(0.97-1.28)	1.07(0.95-1.21)	0.89(0.72-1.09)	0.96(0.80-1.15)	1.06(0.89-1.27)	1.04(0.88-1.22)	1.31(1.02-1.68)**	1.22(0.97-1.54)*

*p<0.1, **p<0.05, ***p<0.01

Note: Exp(β) means exponentiated coefficients; CI stands for confidence intervals; SE, standard errors.

1.3. Effects of poverty dynamics on health expenditure and unmet need

The effects of poverty dynamics on health expenditure and unmet need were presented in Table 8. In terms of poverty status change, the persistent poor and the recurrent poor tended to spend less total health expenditure compared to the transient poor (by 6% and 5% at the poverty line of less than 40%; and by 5% and 4% at the poverty line of less than 50%); the persistent poor were less likely to spend outpatient health expenditure by 1% at the poverty lines of less than 50% of MIL. As with unmet need, the persistent poor reported more unmet need for all reasons at all poverty lines. The persistent poor reported unmet need 1.28 and 1.25 odds ratio higher than the transient poor at various poverty lines. With stricter poverty lines, this trend was aggregated. Poverty status change had a significant effect on unmet need due to the economic reason at almost all poverty lines; the recurrent poor tended to report the highest unmet need due to the economic reason compared to the transient poor; the persistent poor also reported more unmet need due to the economic reason compared to the transient poor[3].

Those with MA status were likely to spend less health expenditure and reported more unmet need due to the economic reason. Females spent more health expenditure. As people got older, total health expenditure had been increased. The older groups reported less unmet need for all reasons; however, the aged 45-64 years old and the aged 65-74 years old groups reported unmet need for the economic reason (about 1.7 odds ratio higher

[3] For the sensitivity analysis, we included the persistent non-poor in the sample (the persistent non-poor as a reference; please see Table A6 in appendix); the results were similar. The transient poor reported more unmet need for the economic reason at all poverty lines; at the poverty line of less than 40% of MIL, the transient poor had the highest level of unmet need for the economic reason.

than the reference group). Those without a spouse reported less health expenditure. The widowed/divorced/separated reported more unmet need for all reasons (1.26 odds ratio) and unmet need for the economic reason (about 1.9 odds ratio). Those with the fewer number of family members reported higher health expenditure (especially, inpatient health expenditure), and less unmet need for the economic reason. Those living in metropolitan cities spent a bit less total health expenditure; those living in Seoul and metropolitan cities reported more unmet need due to the economic reason (1.4-1.6 odds ratio).

Total household disposable income had a small effect on increasing health expenditure; those with higher disposable income reported less unmet need for all and the economic reason. Lower education attainment levels were associated with low levels of inpatient health expenditure and higher unmet need. Those with no working status reported to have less unmet need for all reasons but more unmet need due to the economic reason.

Those with worse self-assessed health spent more health expenditure and more unmet need for all reasons and the economic reason. People with activity limitation due to diseases/injuries had more health expenditure and unmet need for all reasons. Those with more chronic diseases spent more health expenditure, and reported less unmet need for the all reasons. Those having cancer, hypertension, and diabetes spent more health expenditure; those having a cerebro-vascular disease reported less unmet need for all reasons. People with mental disability spent less outpatient expenditure and inpatient expenditure. Those with physical disability spent more total health expenditure and reported less unmet need.

Table 8. Effect of poverty status change on health expenditure and unmet need

	ln(Total health expenditure)		ln(Outpatient health expenditure)		ln(Inpatient health expenditure)		Unmet need (All reasons)		Unmet need (Economic reason)	
	Poverty line: Median disposable income									
	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%
	Exp(β) (95% CI)		Exp(β) (95% CI)		Exp(β) (95% CI)		Odds ratio (95% CI)		Odds ratio (95% CI)	
Poverty status (ref: Transient poor)										
Recurrent poor	0.95(0.92-0.99)**	0.96(0.93-0.99)**	1.001(0.99-1.02)	0.99(0.98-1.01)	0.998(0.95-1.05)	0.98(0.94-1.03)	0.92(0.77-1.11)	1.01(0.86-1.19)	1.34(0.95-1.90)*	1.71(1.24-2.34)**
Persistent poor	0.94(0.91-0.98)**	0.95(0.92-0.98)**	0.99(0.97-1.004)	0.99(0.98-1.001)*	0.98(0.92-1.04)	0.98(0.94-1.02)	1.28(1.06-1.54)**	1.25(1.06-1.46)**	1.28(0.90-1.82)	1.59(1.16-2.19)**
Medical Aid (ref: No)	0.90(0.85-0.94)***	0.91(0.87-0.95)***	0.81(0.79-0.83)***	0.81(0.79-0.83)***	0.88(0.82-0.93)***	0.90(0.85-0.96)***	1.09(0.89-1.34)	1.09(0.90-1.31)	1.37(0.93-202)	1.43(1.01-2.02)**
Female (ref: Male)	1.15(1.11-1.19)***	1.16(1.12-1.19)***	1.04(1.02-1.05)***	1.04(1.02-1.05)***	1.02(0.96-1.08)	1.03(0.98-1.08)	1.11(0.95-1.30)	1.08(0.94-1.24)	0.82(0.61-1.10)	0.89(0.70-1.14)
Age (ref: 20-44 years old)										
45-64	1.03(0.97-1.09)	1.06(1.01-1.11)**	1.01(0.99-1.04)	1.02(0.996-1.03)	0.99(0.91-1.08)	0.98(0.91-1.06)	0.94(0.74-1.20)	0.93(0.76-1.15)	1.68(1.07-2.62)**	1.66(1.13-2.43)**
65-74	1.10(1.03-1.17)**	1.13(1.07-1.19)***	1.001(0.97-1.03)	1.01(0.98-1.03)	1.03(0.93-1.15)	1.03(0.94-1.13)	0.77(0.57-1.03)*	0.69(0.54-0.90)**	1.69(0.98-2.93)*	1.39(0.86-2.24)
75+	1.10(1.03-1.18)**	1.13(1.07-1.20)***	0.97(0.94-1.01)	0.98(0.95-1.01)	1.05(0.94-1.17)	1.04(0.94-1.14)	0.69(0.50-0.94)**	0.64(0.48-0.84)**	1.03(0.57-1.87)	0.97(0.58-1.63)
Marital status (ref: Married)										
Widowed/divorced/separated	0.88(0.84-0.92)***	0.88(0.85-0.92)***	0.99(0.97-1.01)	0.99(0.98-1.01)	0.99(0.93-1.06)	0.98(0.92-1.03)	1.19(0.95-1.49)	1.26(1.03-1.53)**	1.87(1.23-2.87)**	1.84(1.29-2.63)**
Single	0.61(0.56-0.66)***	0.64(0.60-0.68)***	0.95(0.92-0.99)**	0.96(0.94-0.99)**	0.95(0.78-1.15)	0.93(0.79-1.09)	1.002(0.77-1.31)	1.08(0.85-1.36)	1.48(0.86-2.56)	1.35(0..85-2.14)
No. of family members (ref: Three+)										
Living alone	1.16(1.10-1.23)***	1.15(1.09-1.20)***	1.003(0.98-1.03)	1.01(0.98-1.03)	1.08(0.99-1.18)*	1.08(0.997-1.16)*	0.97(0.75-1.25)	0.94(0.75-1.19)	0.45(0.27-0.76)**	0.48(0.31-0.76)**

	ln(Total health expenditure)		ln(Outpatient health expenditure)		ln(Inpatient health expenditure)		Unmet need (All reasons)		Unmet need (Economic reason)	
	Poverty line: Median disposable income									
	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%
	Exp(β) (95% CI)		Exp(β) (95% CI)		Exp(β) (95% CI)		Odds ratio (95% CI)		Odds ratio (95% CI)	
Two	1.09(1.05-1.13)***	1.08(1.05-1.12)***	1.02(1.003-1.03)**	1.02(1.004-1.04)**	1.07(0.999-1.14)*	1.07(1.01-1.13)**	1.01(0.85-1.21)	1.07(0.91-1.24)	0.73(0.52-1.04)*	0.87(0.64-1.17)
Residential region (ref: Others)										
Seoul	0.97(0.92-1.02)	0.98(0.93-1.02)	1.003(0.98-1.03)	1(0.98-1.02)	1.01(0.95-1.06)	1.01(0.96-1.06)	0.95(0.75-1.25)	1.13(0.93-1.38)	1.59(1.01-2.49)**	1.44(0.998-2.07)*
Metropolitan cities	0.99(0.96-1.02)	0.97(0.94-1.001)*	1.01(0.99-1.02)	1.003(0.99-1.01)	0.95(0.90-1.01)	0.96(0.92-1.01)	1.03(0.88-1.21)	1.10(0.96-1.27)	1.21(0.91-1.62)	1.39(1.08-1.79)**
ln(Total household disposable income per equivalent adult)	1.06(1.03-1.08)***	1.05(1.03-1.08)***	1.02(1.01-1.03)***	1.02(1.01-1.03)***	1.01(0.98-1.05)	1.02(0.99-1.05)	0.86(0.76-0.96)**	0.83(0.74-0.92)**	0.49(0.38-0.64)***	0.54(0.43-0.69)***
Education attainment (ref: College and more)										
Elementary school	1(0.94-1.06)	0.99(0.94-1.04)	0.99(0.96-1.01)	0.99(0.96-1.01)	0.88(0.80-0.97)**	0.92(0.85-0.996)**	1.41(1.08-1.84)**	1.41(1.12-1.77)**	2.15(1.30-3.54)**	1.63(1.07-2.48)**
High school	0.998(0.97-1.02)	1(0.95-1.05)	0.99(0.97-1.01)	0.99(0.97-1.01)	0.94(0.88-1.002)*	0.97(0.92-1.03)	1.07(0.85-1.34)	1.07(0.88-1.29)	2.18(1.46-3.27)***	1.69(1.19-2.39)**
No working (ref: Working)	0.996(0.97-1.2)	0.99(0.97-1.02)	1.01(0.998-1.02)*	1.01(0.998-1.02)	1.01(0.98-1.05)	1.02(0.99-1.05)	0.76(0.65-0.88)***	0.75(0.66-0.86)***	1.64(1.24-2.16)***	1.77(1.39-2.25)***
Having a private insurance	1.09(1.06-1.13)***	1.09(1.06-1.12)***	1.02(1.003-1.03)**	1.01(1.002-1.02)**	1.01(0.97-1.05)	1.03(0.99-1.06)	1.04(0.89-1.22)	1.05(0.92-1.20)	1.14(0.84-1.55)	1.01(0.79-1.31)
Self-assessed health (ref: Good)										
Fair	1.07(1.04-1.10)***	1.07(1.04-1.09)***	1.03(1.02-1.04)***	1.02(1.01-1.04)***	1.004(0.96-1.05)	1.01(0.97(1.05)	1.63(1.39-1.90)***	1.74(1.51-1.99)***	0.96(0.71-1.30)	1.02(0.78-1.33)
Bad	1.11(1.08-1.14)***	1.11(1.08-1.13)***	1.06(1.04-1.08)***	1.06(1.04-1.07)***	1.04(0.99-1.08)	1.04(1.004-1.08)**	2.60(2.17-3.12)***	2.87(2.44-3.39)***	1.28(0.93-1.77)	1.29(0.97-1.70)*
Having activity limitation due to diseases/injuries (ref: No)	1.05(1.01-1.09)**	1.05(1.02-1.08)**	1.01(0.99-1.03)	1.002(0.99-1.02)	1.02(0.97-1.08)	1.03(0.98-1.07)	1.95(1.61-2.36)***	2.01(1.69-2.38)***	0.86(0.61-1.21)	0.88(0.65-1.19)

	ln(Total health expenditure)		ln(Outpatient health expenditure)		ln(Inpatient health expenditure)		Unmet need (All reasons)		Unmet need (Economic reason)	
	Poverty line: Median disposable income									
	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%
	Exp(β) (95% CI)		Exp(β) (95% CI)		Exp(β) (95% CI)		Odds ratio (95% CI)		Odds ratio (95% CI)	
No. of chronic diseases	1.04(1.04-1.05)***	1.04(1.03-1.04)***	1.02(1.02-1.03)***	1.02(1.02-1.03)***	1.01(1.003-1.02)**	1.01(1.001-1.01)**	0.97(0.93-1.002)*	0.96(0.93-0.99)**	1.01(0.95-1.08)	1.02(0.96-1.09)
Having cancer (ref: No)	1.08(1.04-1.12)***	1.09(1.05-1.13)***	1.03(1.003-1.05)**	1.03(1.01-1.05)**	1.05(0.99-1.11)*	1.05(1.001-1.10)**	0.82(0.55-1.25)	0.90(0.63-1.29)	0.54(0.19-1.52)	0.60(0.25-1.43)
Having a cardiac disease (ref: No)	0.98(0.96-1.01)	0.99(0.97-1.01)	1.1(0.996-1.03)	1.01(1.0002-1.03)**	0.99(0.95-1.04)	0.99(0.95-1.03)	1.06(0.81-1.39)	1.04(0.80-1.34)	1.28(0.78-2.11)	1.17(0.75-1.83)
Having a cerebro-vascular disease (ref: No)	1.01(0.98-1.05)	1.02(0.99-1.05)	1.01(0.99-1.03)	1.01(0.99-1.02)	0.97(0.91-1.04)	0.97(0.92-1.03)	0.65(0.49-0.88)**	0.69(0.53-0.89)**	1.06(0.62-1.84)	1.11(0.70-1.76)
Having hypertension (ref: No)	1.07(1.04-1.10)***	1.07(1.05-1.10)***	1.02(1.01-1.04)**	1.02(1.01-1.04)***	1.002(0.97-1.04)	1.01(0.98-1.05)	0.87(0.74-1.04)	0.91(0.78-1.06)	1.21(0.88-1.67)	1.19(0.90-1.57)
Having diabetes (ref: No)	1.04(1.02-1.07)**	1.03(1.01-1.06)**	1.03(1.01-1.04)***	1.03(1.02-1.04)***	1.01(0.97-1.06)	1.01(0.97-1.05)	0.94(0.76-1.16)	0.89(0.74-1.07)	0.91(0.61-1.35)	0.89(0.62-1.27)
Being mentally disabled (ref: No)	0.92(0.71-1.21)	0.97(0.78-1.20)	0.77(0.66-0.90)**	0.82(0.72-0.92)**	0.47(0.19-1.17)	0.53(0.26-1.08)*	0.67(0.39-1.14)	0.66(0.39-1.13)	0.66(0.18-2.38)	0.85(0.28-2.54)
Being physically disabled (ref: No)	1.06(1.02-1.10)**	1.06(1.03-1.10)***	1.003(0.98-1.02)	1.002(0.99-1.02)	0.997(0.95-1.05)	1.01(0.97-1.05)	0.99(0.81-1.23)	0.96(0.79-1.16)	0.70(0.48-1.01)*	0.72(0.52-1.004)*
Year dummy (ref: 2011)										
2012	1.01(0.98-1.03)	1.01(0.99-1.03)	1.02(1.01-1.03)**	1.01(1.003-1.02)**	1.02(0.98-1.06)	1.02(0.99-1.05)	1.20(1.05-1.38)**	1.211.07-1.36)**	0.86(0.65-1.12)	1.001(0.79-1.27)
2013	0.995(0.97-1.02)	1.01(0.99-1.04)	1.01(0.99-1.02)	1.01(0.999-1.02)*	1.004(0.96-1.05)	1(0.96-1.04)	1.44(1.25-1.66)***	1.41(1.24-1.60)***	0.78(0.59-1.04)*	0.89(0.69-1.14)

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

Note: Exp(β) means exponentiated coefficients; CI stands for confidence intervals; SE, standard errors. Health expenditure only covers out-of-pocket payments.

1.4. Effects of the Medical Aid status change on health care utilization

Table 9 showed the effects of the Medical Aid status change on health care utilization. With regard to MA status change, the continuous MA showed the trend of the general MA effects in the previous section (1.1.2); they had more outpatient visits, less medical check-ups, more emergency visits, and more inpatient care use. The new MA group seemed to follow the trend of the continuous MA but was likely to have more outpatient visits and stay longer at a hospital with statistical significance; compared to the continuous MA, the effect sizes of the new MA for outpatient visits and longer hospital stays were much higher. The new health insurance group was less likely to stay longer at a hospital by 52% compared to the continuous health insurance group[4 5].

Effects of other variables were more or less the same with the results of the previous section (1.1.2). Compared to the results from the 1.1.2 section, higher total house income was associated with the higher likelihood of inpatient care use. Lower education levels were associated with less medical

[4] We also further analyzed the effect of the Medical Aid status change on the number of outpatient and inpatient care utilization using the two part model, as seen in Table A11 in appendix. For the two-part model, the first part that analyzed the effect of having any health care use employed multivariate logistic regressions, and the second part that examines the number of health care utilization employed ordinary least squares regressions. The results showed that the continuous MA group used more outpatient visits, were more likely to have any hospitalization and any hospital stays and to stay longer at hospitals. The new HI group used more outpatient visits. Other variables were not statistically significant.

[5] For the sensitivity analysis, we excluded the continuous health insurance group in the sample (the continuous Medical Aid group as a reference; please see Table A9 in appendix). We found that compared to the continuous Medical Aid, the new HI group were less likely to stay longer at hospitals.
Furthermore, we also examined the effect of the MA status change on the number of outpatient and inpatient care use using the two part model as seen in Table A12 in appendix. The new HI group had difficulties in accessing inpatient care use (both having any hospitalization and any length of hospital stays).

checkups. Those with no working had more outpatient visits with statistical significance. Those with bad self-assessed health stayed longer at a hospital. People with activity limitation had difficulty in having medical checkups. Those with cancer had more medical checkups and those with cerebro-vascular diseases had more emergency visits. Those with mental disability had more outpatient visits and less emergency visits, while those with physical disability had less medical checkups and more emergency visits.

Table 9. Effect of the Medical Aid status change on health care utilization

	No. of outpatient visits	Having medical check-ups	Having an emergency visit	No. of hospitalization	No. of length of hospital stays
	Exp(β) (95% CI)	Odds ratio (95% CI)	Odds ratio (95% CI)	Exp(β) (95% CI)	Exp(β) (95% CI)
Medical Aid status (ref: Continuous health insurance)					
New Medical Aid	1.40(1.06-1.84)**	0.90(0.46-1.76)	1.59(0.76-3.29)	1.51(0.75-3.01)	2.65(0.85-8.31)*
New health insurance	1.15(0.94-1.42)	0.997(0.61-1.63)	1.18(0.66-2.09)	0.84(0.47-1.52)	0.48(0.26-0.89)**
Continuous Medical Aid	1.25(1.12-1.38)***	0.74(0.60-0.90)**	1.36(1.10-1.68)**	1.36(1.08-1.70)**	1.84(1.31-2.58)***
Female (ref: Male)	1.31(1.26-1.37)***	1.25(1.17-1.34)***	0.77(0.69-0.85)***	0.75(0.66-0.84)***	0.67(0.57-0.78)***
Age (ref: 20-44 years old)					
45-64	1.22(1.16-1.28)***	1.63(1.50-1.78)***	0.78(0.68-0.89)***	1.01(0.86-1.18)	1.27(1.03-1.58)**
65-74	1.59(1.49-1.72)***	2.01(1.78-2.27)***	0.75(0.62-0.90)**	1.17(0.95-1.45)	1.41(1.06-1.89)**
75+	1.55(1.41-1.70)***	1.43(1.22-1.67)***	1.06(0.85-1.32)	1.42(1.12-1.82)**	2.72(1.87-3.94)***
Marital status (ref: Married)					
Widowed/divorced/separated	0.83(0.77-0.89)***	0.60(0.53-0.68)***	1.07(0.90-1.26)	1.03(0.85-1.24)	1.94(1.48-2.55)***
Single	0.55(0.62-0.59)***	0.24(0.21-0.28)***	0.63(0.53-0.75)***	0.46(0.37-0.58)***	0.60(0.45-0.80)***
No. of family members (ref: Three+)					
Living alone	1.22(1.12-1.34)***	2.39(2.04-2.81)***	1.03(0.82-1.29)	1.01(0.82-1.24)	0.54(0.40-0.73)***
Two	1.15(1.10-1.20)***	1.36(1.26-1.47)***	1.14(1.01-1.28)**	1.25(1.09-1.43)**	0.91(0.75-1.11)
Residential region (ref: Others)					
Seoul	0.98(0.93-1.03)	1.07(0.98-1.17)	0.71(0.61-0.82)***	0.71(0.56-0.89)**	0.72(0.50-1.05)*
Metropolitan cities	0.96(0.92-0.998)**	1.05(0.98-1.12)	0.85(0.76-0.94)**	0.84(0.75-0.95)**	0.88(0.75-1.03)
ln(Total household disposable income per equivalent adult)	1.08(1.05-1.12)***	1.36(1.28-1.44)***	1.19(1.09-1.30)***	1.22(1.11-1.36)***	1.17(1.03-1.34)**
Education attainment (ref: College and more)					
Elementary school	1.27(1.19-1.36)***	0.85(0.76-0.95)**	1.35(1.13-1.60)**	1.54(1.27-1.86)***	2.43(1.87-3.17)***
High school	1.14(1.08-1.19)***	0.93(0.86-1.003)*	1.29(114-1.46)***	1.36(1.16-1.59)***	1.72(1.39-2.12)***

	No. of outpatient visits	Having medical check-ups	Having an emergency visit	No. of hospitalization	No. of length of hospital stays
	Exp(β) (95% CI)	Odds ratio (95% CI)	Odds ratio (95% CI)	Exp(β) (95% CI)	Exp(β) (95% CI)
No working (ref: Working)	1.05(1.01-1.09)**	0.83(0.77-0.89)***	1.11(0.997-1.23)*	1.53(1.35-1.73)***	1.89(1.58-2.26)***
Having a private insurance	1.10(1.05-1.15)***	1.44(1.33-1.56)***	1.06(0.95-1.19)	1.10(0.96-1.26)	1.21(1.01-1.44)**
Self-assessed health (ref: Good)					
Fair	1.25(1.21-1.29)***	1.15(1.08-1.23)***	0.92(0.83-1.01)*	0.91(0.81-1.01)*	0.76(0.66-0.89)***
Bad	1.59(1.51-1.68)***	1.07(0.97-1.17)	1.52(1.33-1.74)***	1.69(1.42-2.01)***	1.73(1.35-2.23)***
Having activity limitation due to diseases/injuries (ref: No)	1.31(1.20-1.43)***	0.86(0.74-0.99)**	1.75(1.48-2.08)***	2.17(1.80-2.63)***	3.04(2.34-3.96)***
No. of chronic diseases	1.22(1.21-1.23)***	1.08(1.06-1.09)***	1.10(1.07-1.13)***	1.09(1.06-1.11)***	1.10(1.06-1.14)***
Having cancer (ref: No)	1.02(0.93-1.11)	1.17(0.996-1.38)*	1.30(1.02-1.64)**	2.04(1.59-2.62)***	1.62(1.18-2.23)**
Having a cardiac disease (ref: No)	0.91(0.84-0.999)**	0.80(0.68-0.94)**	1.37(1.13-1.68)**	1.15(0.94-1.41)	1.03(0.75-1.41)
Having a cerebro-vascular disease (ref: No)	0.83(0.77-0.89)***	0.91(0.79-1.04)	1.25(1.04-1.51)**	1.09(0.89-1.33)	1.02(0.78-1.34)
Having hypertension (ref: No)	1.20(1.15-1.26)***	1.0004(0.92-1.09)	0.98(0.86-1.11)	1.08(0.93-1.26)	1.13(0.88-1.46)
Having diabetes (ref: No)	1.02(0.96-1.08)	0.85(0.76-0.95)**	1.02(0.87-1.19)	1.09(0.93-1.27)	1.15(0.90-1.46)
Being mentally disabled (ref: No)	1.29(1.02-1.64)**	0.59(0.27-1.30)	0.38(0.16-0.90)**	0.99(0.46-2.12)	7.84(3.32-18.50)***
Being physically disabled (ref: No)	1.14(1.05-1.24)**	0.87(0.77-0.99)**	1.25(1.06-1.48)**	1.32(1.12-1.56)**	1.77(1.40-2.24)***
Year dummy (ref: 2011)					
2012	1.08(1.05-1.11)***	1.08(1.01-1.16)**	1.06(0.96-1.18)	1.13(1.01-1.27)**	1.23(1.05-1.43)**
2013	1.08(1.05-1.11)***	1.06(0.995-1.13)*	1.01(0.92-1.12)	1.01(0.89-1.14)	1(0.85-1.18)

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

Note: Exp(β) means exponentiated coefficients; CI stands for confidence intervals; SE, standard errors.

1.5. Effects of the Medical Aid status change on health expenditure and unmet need

The effects of the Medical Aid status change on health expenditure and unmet need were presented in Table 10. In terms of MA status change, the continuous MA group showed the similar trend of the general effects of MA in the previous section (1.1.3); the group was likely to spend less health expenditure (by 12% for total health expenditure, 20% for outpatient health expenditure, and 11% for inpatient health expenditure) and more unmet need for all reasons and for the economic reason. The new MA group showed the similar trend of the continuous MA group but was only statistically significant in case of outpatient health expenditure (by 12%). The new health insurance group tended to spend less outpatient health expenditure (by 3%) and reported much higher unmet need for all reasons (1.7 odds ratio) and the economic reason (3.43 odds ratio)[6].

The effects of other variables were more or less similar to the results of the previous section (1.1.3). Compared to the results from the 1.1.3 section, females reported more unmet need for all reasons and less unmet need for the economic reason. The aged 45-74 groups spent more outpatient health expenditure, while the aged 75+ group spent less outpatient health expenditure. Those without a spouse spent less inpatient health expenditure. Those who were never married reported more unmet need for all reason. Those with no working status spent more total health expenditure. Those with more chronic diseases reported more unmet need for the economic reason.

[6] For the sensitivity analysis, we excluded the continuous health insurance group in the sample (the continuous Medical Aid group as a reference; please see Table A10 in appendix); the new HI group spent more outpatient out-of-pocket payments compared to the continuous MA group.

Table 10. Effect of the Medical Aid status change on health expenditure and unmet need

	ln(Total health expenditure)	ln(Outpatient health expenditure)	ln(Inpatient health expenditure)	Unmet need (All reasons)	Unmet need (Economic reason)
	Exp(β) (95% CI)	Exp(β) (95% CI)	Exp(β) (95% CI)	Odds ratio (95% CI)	Odds ratio (95% CI)
Medical Aid status (ref: Continuous health insurance)					
New Medical Aid	0.94(0.84-1.06)	0.88(0.82-0.94)***	0.86(0.66-1.13)	0.90(0.48-1.68)	1.21(0.32-4.60)
New health insurance	0.96(0.86-1.06)	0.97(0.94-1.001)*	1.01(0.88-1.15)	1.68(1.11-2.55)**	3.43(1.52-7.70)**
Continuous Medical Aid	0.88(0.84-0.91)***	0.80(0.78-0.82)***	0.89(0.84-0.95)***	1.24(1.04-1.48)**	1.36(0.97-1.90)*
Female (ref: Male)	1.17(1.15-1.20)***	1.03(1.02-1.03)***	1.02(0.99-1.04)	1.15(1.06-1.24)**	0.87(0.73-1.02)*
Age (ref: 20-44 years old)					
45-64	1.05(1.02-1.07)***	1.02(1.01-1.03)***	0.998(0.97-1.03)	1.06(0.95-1.17)	1.50(1.20-1.87)***
65-74	1.11(1.08-1.14)***	1.01(0.999-1.02)*	1.02(0.98-1.06)	0.76(0.65-0.89)***	1.66(1.20-2.28)**
75+	1.12(1.08-1.16)***	0.98(0.96-0.99)**	1.001(0.95-1.06)	0.72(0.60-0.87)***	0.96(0.66-1.39)
Marital status (ref: Married)					
Widowed/divorced/separated	0.88(0.85-0.90)***	0.99(0.98-1.01)	0.94(0.90-0.98)**	1.11(0.97-1.26)	1.73(1.33-2.26)***
Single	0.67(0.65-0.70)***	0.98(0.97-0.99)***	0.95(0.90-1.01)*	0.87(0.76-0.99)**	1.22(0.92-1.61)
No. of family members (ref: Three+)					
Living alone	1.13(1.09-1.17)***	1.003(0.99-1.02)	1.09(1.03-1.15)**	1.03(0.87-1.22)	0.44(0.30-0.63)***
Two	1.06(1.04-1.08)***	1.02(1.01-1.02)***	1.03(1.01-1.06)**	0.97(0.88-1.06)	0.74(0.60-0.91)**
Residential region (ref: Others)					
Seoul	0.99(0.97-1.01)	1.004(0.99-1.01)	0.99(0.95-1.03)	1.02(0.92-1.14)	1.43(1.13-1.80)***
Metropolitan cities	0.99(0.97-1.01)	1.0002(0.99-1.01)	0.98(0.96-1.03)	1.13(1.04-1.23)**	1.53(1.29-1.80)***
ln(Total household disposable income per equivalent adult)	1.08(1.07-1.10)***	1.02(1.01-1.03)***	1.02(0.999-1.034)*	0.76(0.71-0.81)***	0.32(0.28-0.38)***
Education attainment (ref: College and more)					
Elementary school	1.01(0.99-1.04)	1.002(0.99-1.01)	0.96(0.93-0.998)**	1.30(1.14-1.49)***	1.47(1.11-1.95)**
High school	1.01(0.99-1.03)	1.007(1.0002-	0.98(0.95-1.004)*	0.99(0.90-1.09)	1.55(1.26-1.91)***

	ln(Total health expenditure)	ln(Outpatient health expenditure)	ln(Inpatient health expenditure)	Unmet need (All reasons)	Unmet need (Economic reason)
	Exp(β) (95% CI)	Exp(β) (95% CI)	Exp(β) (95% CI)	Odds ratio (95% CI)	Odds ratio (95% CI)
		1.01)**			
No working (ref: Working)	1.03(1.01-1.04)**	1.02(1.01-1.02)***	1.02(0.997-1.04)*	0.74(0.69-0.81)***	1.58(1.34-1.87)***
Having a private insurance	1.12(1.10-1.15)***	1.01(1.01-1.02)***	1.02(0.994-1.04)	1.05(0.97-1.15)	0.82(0.69-0.99)**
Self-assessed health (ref: Good)					
Fair	1.10(1.08-1.11)***	1.02(1.02-1.03)***	1.02(1.001-1.05)**	1.78(1.65-1.92)***	1.15(0.97-1.35)
Bad	1.12(1.11-1.14)***	1.05(1.04-1.06)***	1.05(1.03-1.08)***	2.82(2.54-3.14)***	1.67(1.37-2.04)***
Having activity limitation due to diseases/injuries (ref: No)	1.06(1.03-1.08)***	1.01(0.997-1.02)	1.04(1.01-1.07)**	2.07(1.81-2.37)***	0.89(0.69-1.14)
No. of chronic diseases	1.05(1.05-1.06)***	1.02(1.02-1.024)***	1.01(1.002-1.01)**	0.96(0.93-0.98)***	1.06(1.01-1.11)**
Having cancer (ref: No)	1.06(1.04-1.09)***	1.03(1.02-1.04)***	1.07(1.04-1.10)***	0.85(0.68-1.07)	0.94(0.50-1.78)
Having a cardiac disease (ref: No)	0.999(0.98-1.02)	1.02(1.01-1.03)***	1.004(0.97-1.04)	1.04(0.86-1.25)	1.32(0.90-1.92)
Having a cerebro-vascular disease (ref: No)	1.01(0.98-1.03)	1.004(0.994-1.01)	0.99(0.96-1.03)	0.91(0.75-1.09)	1.22(0.87-1.70)
Having hypertension (ref: No)	1.08(1.07-1.10)***	1.03(1.02-1.04)***	1.01(0.99-1.04)	0.85(0.77-0.94)**	1.08(0.88-1.33)
Having diabetes (ref: No)	1.03(1.02-1.05)***	1.02(1.02-1.03)***	1.01(0.98-1.03)	0.90(0.79-1.03)	0.86(0.65-1.14)
Being mentally disabled (ref: No)	1.12(0.97-1.30)	0.85(0.79-0.93)***	0.59(0.35-0.995)**	0.68(0.42-1.08)	0.96(0.36-2.59)
Being physically disabled (ref: No)	1.06(1.04-1.09)***	0.999(0.99-1.01)	0.998(0.96-1.03)	1.04(0.90-1.20)	0.87(0.65-1.15)
Year dummy (ref: 2011)					
2012	1.03(1.01-1.04)***	1.01(1.01-1.02)***	1.02(1.0004-1.04)**	1.07(0.998-1.15)*	1.17(0.99-1.37)*
2013	1.03(1.02-1.04)***	1.01(1.01-1.02)***	1.01(0.99-1.03)	1.20(1.11-1.29)***	0.95(0.81-1.12)

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

Note: Exp(β) means exponentiated coefficients; CI stands for confidence intervals; SE, standard errors. Health expenditure only covers out-of-pocket payments.

2. Discussions

In this part of the study, we examined the effects of poverty dynamics and the Medical Aid status change on health care use, health expenditure, and unmet need, analyzing data from the Korea Health Panel 2008-2014 for the years of 2011-2013. Poverty status was categorized into two parts: i) poverty status change (poverty dynamics) including the transient poor, the recurrent poor, and the persistent poor, using various poverty lines; and ii) the MA status change such as the new MA (from the HI to the MA), the new HI (from the MA to the HI), the continuous MA, and the continuous HI. We included the MA status change in this study, because the MA group is a primary targeted group that the Government provides some benefits under pro-poor policies for the poor, and they may have different financial incentives due to low co-payment policies compared to people with the health insurance status.

Poverty can be measured by many different indicators, using income levels, consumption levels, etc. In this study, we used disposable income levels to define poverty status, because we thought the disposable income levels, which contain various income sources (earned incomes, savings, and other income sources available), may be a good proxy to a household's potential capacity to pay for paying a set of goods and services, compared to the consumption levels.

The MA status was included in the poverty status change analysis; the current MA status itself may affect the poor's health seeking behavior due to low copayment policies. Other variables, such as demographic factors, socio-economic factors, health need factors, that affect health care use, health expenditure, and unmet need were also included to reduce omitted variable bias. Statuses with having various severe diseases (cancer, cardiac, cerebro-

vascular diseases) that might demand intensive services and have catastrophic effects on individuals were included. Statuses with having hypertension and diabetes were also included because the prevalence of the two diseases was high among the poor and the continuous care is needed to manage them. Lastly, statuses with disability were divided into those with mental disability and physical disability; types of disability may have different needs, leading to different patterns of health care use.

2.1. Effect of poverty dynamics on health care use, health expenditure, and unmet need

For poverty dynamics with the persistent non-poor of 70-80%, the prevalence of poverty types was the transient poor of 6-10%, the recurrent poor of 3-7%, and the persistent poor of 5-10% of the population at various poverty lines. At the poverty line of less than 50% of the median income level, a share of the transient poor in the population was 8%; the recurrent poor, 4.7%; the persistent poor, 10.8%; the persistent non-poor, 76.5% in 2013. Compared to the study done by Muffels et al. (2000) that examined the poverty dynamics in the Netherlands, Germany, and the United Kingdom using data from the years of 1990-1995, the proportion of the transient poor in Korea was smaller than those of the three countries (the Netherlands, 9.7%; Germany, 8.4%; UK, 13.4%); the proportion of the recurrent poor in Korea was similar to that of the Netherlands (4.4%) and smaller than those of Germany (5.4%) and UK (9.5%); the proportion of the persistent poor was much larger than those of other countries (the Netherlands, 4%; Germany, 3.8%; UK, 5.5%). The higher proportion of the persistent poor would imply the need of developing educational and health policies for poor children and offering stable money transfers for poor adults to improve redistribution in the society(Arranz and Cantó 2010; Dartanto and Nurkholis 2013). The persistent poor were more likely to be older, single, those with the fewer number of family members, living in a rural area, low income levels,

elementary school education levels, unemployed, have more chronic diseases, and more having mental disability, as seen in appendix (Table A1 and A2), which was consistent with literature(Muffels, Fouarge et al. 2000).

For the Medical Aid beneficiary status change, the new Medical Aid comprised 0.2% of the population; the new health insurance, 0.53%; the continuous MA, 3.98%; the continuous health insurance, 95.29% in 2013. Compared to the MA status change in the study of Kim et al. (2016) using the Korean Welfare Panel Study (the new MA, 0.53%; the new HI, 0.95%; the continuous MA, 5.17%, the continuous HI, 93.35% in 2012)(Kim, Kim et al. 2016), the relative proportions among the groups were similar between the two studies, but the proportions of the new MA, the new HI, and the continuous MA were almost 1.5-2 times higher than those in this study; the difference would come from the data sources, since the Korean Welfare Panel Study disproportionately included the larger number of individuals with low income levels. The new MA were more likely to be widowed/divorced/separated, with more family members, living in metropolitan cities, lower education levels, have cancer and diabetes, and mentally and physically disabled (please see Table A3 and A4 in appendix).

With regard to the effects of poverty dynamics on health care use, health expenditure, and unmet need, even after controlling effects of the current income level and the current MA status, those with more poverty experiences had difficulties in having emergency visits and hospitalization. In the line of this, the persistent poor spent less total health expenditure at all poverty lines, and less outpatient health expenditures at some poverty lines and reported more unmet need for all reasons and for the economic reason, which was robust among the general population (please see Table A5 and A6 in appendix). It should also be noted that the recurrent poor had less inpatient care, spent less total health expenditure, and reported the highest unmet need for the economic reason. Given the fact that those with more

poverty experiences reported higher levels of unmet need for all reasons and for the economic reason, having more poverty experiences may affect the poor's health seeking behaviors; those with having more poverty experiences had difficulties in access to health services, particularly due to the economic reason.

However, poverty status was not associated with the number of outpatient visits, having medical checkups, and the length of stays. These results were contrary to the hypotheses that those with more poverty experiences would have less health care use. It is likely that those with more poverty experiences may use outpatient care because of relative affordability of having outpatient visits and medical checkups compared to those of inpatient care and emergency visits. Zhang et al. (2007) examined perceptions of tuberculosis and health seeking behavior in rural Inner Mongolia, China using the twenty focus group discussions with 105 farmers and found that most participants treated themselves and delayed seeking health services, considering their disease to be minor, which may continue for up to 6 months and be exacerbated by socio-economic status; 51% of survey respondents reported that they would choose the village doctor as the first contact point because of easier accessibility and convenience. Compared to outpatient visits, having an emergency visit and the number of length of stays at a hospital may have much uncertainty in terms of cost and time. It is likely that more poverty experiences may have limited the patients' affordability of higher levels of health care, due to high treatment costs and opportunity costs which can be prohibitive for poorer people(Zhang, Liu et al. 2007). Generally, the length of stays at a hospital is related to the severity of stages of a disease rather than other factors; this would explain that the poverty experiences were not associated with the length of stays at a hospital in this study.

Evidence shows that persistent poverty is more harmful for health than the

occasional events, and the long-term income is more critical for health than the current income(Benzeval and Judge 2001). The results in this study raised concerns that the persistent poor would be at risk of having much worse health and well-being, because they could not receive proper treatments for illness in a timely manner. Perhaps, the poor with repeated exposure to social inequities and income constraints could have low social confidence and eroded a sense of personal efficacy that may be needed to maintain health-seeking behavior(Montgomery and Hewett 2005). Zhang et al. (2007) showed that many focus group discussions participants could identify someone they had known who died of TB because of low capacity to pay for treatment; repeated exposure to those cases suffering from high financial burden of paying for health services would discourage those with poverty experiences to seek health care. To my knowledge, this study was the first exploratory study to examine the effect of poverty dynamics on health care use, health expenditure, and unmet need, so we cannot compare the results with previous literature; further study including qualitative studies should be needed in this area to analyze mechanisms for how the persistent poor have low access to health care.

The recurrent poor group would be at risk of falling into the persistent poor group; recognizing the recurrent poor would highlight the needs of policies in place that are effective to keep the people out of poverty with adopting a dynamic focus and following-up trajectories over time. Persistent poverty is more likely to be perilous to the well-being of people, including health, than transient poverty(Smith and Middleton 2007). Until now, social policies and health policies have not differentiated between the types of poverty and not considered the time dimension of poverty status. This would lead to the situations where target initiatives at the persistent poor could not be developed nor evaluated to examine how initiatives work in health care areas. This study would be a starting point to raise this issue and develop further

future research areas and appropriate policies.

Those with MA were likely to have more outpatient visits, less medical check-ups, more emergency visits, and more inpatient care, spend less out-of-pocket payments (OOP), and reported more unmet need, which were consistent with literature(Ahn, Kim et al. 2011; Kim and Huh 2011; Choi, Park et al. 2015; Kim, Lee et al. 2015; Huh and Lee 2016; Kim, Kim et al. 2016; Kim, Lee et al. 2016; Lee 2016; Yoo, Ahn et al. 2016; Jeon, Noguchi et al. 2017). Using more health care use and spending less OOP may be related to low co-payment policies for the MA beneficiaries, maybe leading to moral hazard; it is possible that patients with MA used more (patient-initiated) outpatient visits because of moral hazard. On the other hand, considering high levels of unmet need for the economic reason and higher health needs profiles among the MA beneficiaries, they might have many heath care utilizations but receive low quality of care (if total OOP can be regarded as levels of intensity of care).

For the sake of simplicity, the results of other variables were not much to mention, because they were well-established results in the area of health care. However, it should be noted that there seemed to be the most disadvantaged groups for health care use and unmet need, such as the aged 45-74 groups, the widowed/divorced/separated, those living in rural areas, those with lower education levels, the unemployed, etc.; they seemed to have more health care use but reported more unmet need for the economic reason. Health policies catered to those groups should be called for.

2.2. Effect of the Medical Aid status change on health care use, health expenditure, and unmet need

As for the effects of the MA status change on health care use, health expenditure, and unmet need, the general results confirmed the hypotheses;

the continuous MA had more outpatient visits, less medical check-ups, more emergency visits, more inpatient care, less health expenditure, and more unmet need, which was similar to the trend of the general MA effects. The new MA tended to follow the trend of the continuous MA, but was likely to have more outpatient visits and stayed longer at a hospital with much higher effect sizes. Kim et al. (2016) examined the effect of the health insurance status change on the number of outpatient visits, the number of hospitalizations, and the length of stays, using the Korean Welfare Panel Study 2007-2012; the continuous MA had more outpatient visits, the new MA had more hospitalizations, and the new HI had less hospitalization and less length of stays(Kim, Lee et al. 2016). Compared to the results from Kim et al. (2016), we confirmed that the continuous MA was more likely to have outpatient visits, and have more inpatient care with statistical significance. The new MA had more outpatient visits with statistical significance. The effects of the new MA and the new HI on the number of hospitalization turned out to be not different from zero. The new HI stayed shorter at a hospital, which was consistent with literature. The new MA and the continuous MA stayed longer at a hospital with statistical significance. The difference between the two studies may come from the data source and the sample size of the study. Since the Korea Health Panel used in this study is known for more accurate information on health care and health care expenditure, we can say that our results may be more reliable; for the sample size issue, the number of the MA holders in the Korea Health Panel was smaller than that of the Korean Welfare Panel Study, which might affect the statistical significance in this study. However, this study was meaningful in terms of the first attempt to explore this issue using the Korea Health Panel; further research should be needed once more data are accumulated in the future.

For health care expenditure and unmet need, the continuous MA spent less

health expenditure and reported more unmet need for the economic reason. The new MA and the new HI spent less outpatient health care expenditure. The new HI reported unmet need for all reasons and for the economic reason; in particular, the effect sizes of unmet need for all reasons and for the economic reason were the largest among the groups (1.7 odds ratios and 3.43 odds ratios, respectively), meaning that the new HI group suffered from the unmet need severely.

In this study, the new MA group who can have relatively high benefit coverage of services by reduction of co-payment compared to the health insurance beneficiaries had more outpatient visits and stayed longer at a hospital; the new HI group who may have relatively low benefit coverage level decreased their inpatient care use, which may also affect the result of high unmet need. This result was consistent with previous studies that examined the effects of health insurance coverage on health care use and unmet need(McWilliams, Zaslavsky et al. 2004; Federico, Steiner et al. 2007; Hadley 2007; McWilliams, Meara et al. 2007; Baicker, Taubman et al. 2013).

It is likely that the new MA group had higher health needs with more health problems that might lead to loss of their jobs and obtaining of the MA status, which may result in more outpatient visits and inpatient care; the low co-payment of the MA may also contribute to increased health care use(Hadley 2007; McWilliams, Meara et al. 2007; Ginde, Lowe et al. 2012). It is possible that the new HI group decreased their stays at a hospital because of facing the financial barriers to inpatient care use. Given the fact that they have higher unmet need for the economic reason in this study, it would be unintended effects of the MA's administrative policies that do not consider the beneficiaries' health needs. This is consistent with previous studies examining the effect of increased co-payment on reduction of health care use(Xu, Evans et al. 2006; Lagarde and Palmer 2008; Lee and Lim 2013; Yoo, Ahn et al. 2016). Federico et al. (2007) examined the effect of disruptions in

insurance coverage on health care use and unmet need in the State Children's Health Insurance Program and showed that increasing numbers of disruptions were related to less health care use and greater unmet medical need compared to the continuously insured.

However, having medical check-ups among the new MA and the new HI groups was not different from zero, and the continuous MA were less likely to have medical check-ups, which are not consistent with previous studies(Faulkner and Schauffler 1997; McWilliams, Zaslavsky et al. 2003). Baicker et al. (2013) showed that the Medicaid coverage affected increased preventive services, using a randomized controlled study (the Oregon Experiment). McWilliams et al. (2004) presented that difference in use of cholesterol testing, mammography, and prostate examination was reduced between the previously uninsured and the previously insured in the Medicare program. Faulkner and Schauffler (1997) showed that those who had full coverage for preventive care received more preventive services/medical check-ups compared to those who had no coverage for preventive care. It is possible that the new MA and the continuous MA may have already higher levels of disease stages that need more specialized care (outpatient care or inpatient care) rather than basic services or medical check-ups. The new MA and the new HI were more likely to have an emergency visit in this study, although they were not statistically significant. Ginde et al. (2012) examined the effect of health insurance status change on emergency department visit among the US adults and showed that the newly insured group visited more emergency visits, particularly among the Medicaid beneficiaries. It is possible that the sample sizes for using an emergency visit might affect the statistical significance; future research should be needed to confirm the result.

In this study, the new MA spent less outpatient health expenditure, and total health expenditure was not different from zero among the new MA

compared to the continuous HI group; however, compared to the continuous MA, the new MA groups spent a little more outpatient health expenditure, which is consistent with the previous study done by McWilliams et al. (2007) that examined the effect of health insurance coverage on health expenditure comparing the previous insured with the previous uninsured group in the Medicare program and showed total health expenditure among the previous uninsured was increased. It is likely that the new MA had more health care use, but the intensity of care may not be high; the new MA might also be able to use health care without incurring heavy burden of out-of-pocket payments. The new HI group spent less outpatient health expenditure compared to the continuous HI group; the new HI group who might face financial barriers to care might have reduced their outpatient health expenditure, which was supported by their higher unmet need for the economic reason.

3. Limitations

While the study adds to the body of evidence of poverty dynamics and the MA status change on health care use, health expenditure, and unmet need, there are several limitations.

First of all, information on health care use, health expenditure, and unmet need may have low reliability due to recall bias, because the Korea Health Panel is based on self-reported data. However, the Korea Health Panel is known for their data accuracy on health care use and health expenditure, because they request interviewees to provide receipts to improve data accuracy and reliability.

Secondly, the analysis does not account for quality of care, intensity of care, and appropriateness of care because of lack of data. Hopefully, future research may contribute to this area.

Thirdly, the categories for poverty status and the MA status changes can be arbitrary, because there is lack of information on indication of the point in time for poverty status changes and the MA status changes; there is a possibility that an individual experiences multiple poverty and MA status changes within a year. But this issue exists in all cross-sectional studies using the survey data.

Fourthly, this study needed information on income and the MA status over the period; we deleted data if individuals had missing values for them which might lead to the issue of representativeness of the sample.

V. The effect of catastrophic health expenditure on persistence of poverty in South Korea

1. The effect of catastrophic health expenditure on poverty duration among the poor

1.1. Results

1.1.1. General characteristics of the study samples

Table 11 presents the prevalence of catastrophic health expenditure at the thresholds of 20-40% by income quintile in 2008-2016, using data from the Korean Welfare Panel Study. The prevalence of CHE over time has been fluctuated but increased since 2014; the total prevalence of CHE at the thresholds of 20-40% was 12.5%, 6.8%, and 4.1% in 2016. More than 70% of occurrence of CHE came from the two poorer income quintiles (the 1st and 2nd income quintiles) across the thresholds.

Table 12 shows general characteristics of the study samples at the poverty line of less than 50% of the median income level (MIL). The study samples were divided into two categories: the first poverty spell and the total poverty duration. In each category, there were two subgroups for analyses: households without severe diseases (cancer, cardiac diseases, stroke, cerebro-vascular diseases), and the poor without the Medical Aid (MA).

With regard to the poor in the first poverty spell, occurrence of catastrophic health expenditure (CHE) at various thresholds (20-40%) was 25.53%, 13.13%, and 6.88%.

The share of females was higher than that of males. The average age was 72.65 years old; 81% of the observations were the aged 65 years old and

more. 69% of the observations were those without a spouse; the majority of the observations were those living alone (61%) and living in rural/sub-urban areas (64%). The majority of the observations received high school education level and below (95%), and many were unemployed (77.4%). The number of family members with employment was 0.2 person per household. 1.22% and 84.3% of the observations had children under seven years old and the aged 65 years old and more in a household, respectively. The average number of chronic diseases in a household was 1.22. Household having household head with severe diseases and having household members with severe diseases were 9.64% and 3.63%, respectively. 9.35% of the observations reported that the number of family members with employment had been decreased. 10.4% of the observations showed that the types of a household head' working position were changed. 26.5% of the observations had the Medical Aid status. 40.7% of the observations were in their first year of poverty duration; 27% of the observations had four years and more of poverty experiences.

As for households without severe diseases in their first poverty spell, distributions of most variables were similar to those for the poor in their first poverty spell. Occurrence of CHE was 22.9%, 11.2%, and 5.7% at various thresholds (20-40%). It seemed that households without severe diseases were likely to be more females, more those without a spouse, more those living alone, more those who are working, more having children under 7, less having the aged 65+ in household, having less chronic diseases, fewer decreased number of family members with employment, etc.

In terms of the poor without MA in their first poverty spell, distributions of most variables were also similar to those for the poor in their first poverty spell. However, they experienced higher proportions of having CHE across thresholds compared to the poor in their first poverty spell. Occurrence of CHE was 30.9%, 16%, and 8.5%. Compared to the general poor in their first poverty spell, the poor without MA were likely to be older, those with a

spouse, more family members, more those living in rural/sub-urban areas, those with college and more education levels, those who are working, more family members with employment, more having a person aged 65+ in household, having more chronic diseases, less having household head with severe diseases, more having household members with severe diseases, more decreased number of family members with employment, more changed types of working position of household head, and more those in their first year of poverty duration, and less those in their poverty duration with four years and more (25.24%).

With regard to the poor with the total poverty duration, distributions of many variables were more or less similar to those for the poor in their first poverty spell. However, the poor experienced more CHE. Occurrence of CHE was 27%, 14%, and 7.3%. Compared to the poor in their first poverty spell, it seemed that the poor with the total poverty duration were likely to be older, more the widowed/divorced/separated, more those living alone, more those living in rural/sub-urban areas, more those with high school education levels and below, fewer number of family members with employment, less having children under 7, more having the aged 65+ in household, having more chronic diseases, more having household members with severe diseases, more decreased number of family members with employment, more changed types of working position of household head, less those with MA, less those in their first poverty duration (29.3%), and more those with poverty experiences of four years and more. For households without severe diseases and the poor without MA for the total poverty duration, distributions of most variables echoed those of their counterparts in the poor in their first poverty spell.

Table 11. Prevalence of catastrophic health expenditure by income quintile (%), 2008-2016

Catastrophic health expenditure	Income quintile					Total
	1st quintile (poorest)	2nd quintile	3rd quintile	4th quintile	5th quintile (richest)	
2008						
≥20%	4.59	3.24	1.66	1.15	0.62	11.27
≥30%	2.59	1.73	0.85	0.50	0.25	5.93
≥40%	1.52	1.01	0.59	0.29	0.12	3.53
2009						
≥20%	4.46	2.71	1.68	0.75	0.70	10.3
≥30%	2.34	1.51	0.77	0.33	0.22	5.18
≥40%	1.24	0.84	0.50	0.18	0.16	2.92
2010						
≥20%	4.38	3.06	1.59	0.84	0.60	10.47
≥30%	2.38	1.73	0.80	0.47	0.27	5.64
≥40%	1.16	0.94	0.43	0.34	0.09	2.96
2011						
≥20%	5.23	3.62	1.50	0.95	0.65	11.95
≥30%	2.66	2.05	0.82	0.35	0.31	6.19
≥40%	1.45	1.11	0.51	0.16	0.10	3.34
2012						
≥20%	5.65	3.61	1.47	0.75	0.50	11.98
≥30%	3.05	1.99	0.74	0.30	0.23	6.31
≥40%	1.61	1.06	0.41	0.12	0.11	3.31
2013						
≥20%	5.41	3.89	1.71	1.00	0.56	12.57
≥30%	2.86	2.07	0.86	0.42	0.17	6.37
≥40%	1.50	1.16	0.35	0.23	0.07	3.32
2014						
≥20%	5.23	3.26	1.88	0.80	0.61	11.78
≥30%	2.91	1.87	0.91	0.27	0.20	6.17
≥40%	1.51	1.07	0.46	0.12	0.07	3.23
2015						
≥20%	5.67	3.59	1.65	1.00	0.40	12.31
≥30%	3.06	2.37	0.67	0.42	0.11	6.63
≥40%	1.60	1.34	0.35	0.26	0.03	3.57
2016						
≥20%	5.92	3.68	1.45	0.89	0.56	12.51
≥30%	3.24	2.19	0.73	0.43	0.16	6.75
≥40%	1.97	1.36	0.36	0.26	0.09	4.05

Table 12. General characteristics of the study samples for 2-1 analysis

	1st poverty spell (poverty line: <50% of MIL)						Total poverty duration (poverty line: <50% of MIL)					
	The poor		HH without severe diseases		The poor without MA		The poor		HH without severe diseases		The poor without MA	
	N	%	N	%	N	%	N	%	N	%	N	%
	Mean (SD)		Mean (SD)		Mean (SD)		Mean (SD)		Mean (SD)		Mean (SD)	
Total no. of observations	8,338	100	7,272	100	6,129	100	11,562	100	10,070	100	8,785	100
Total no. of households	3,383	100	3,040	100	2,834	100	3,392	100	3,138	100	3,014	100
Catastrophic health expenditure												
≥20%	2,129	25.53	1,664	22.88	1,894	30.9	3,110	26.9	2,459	24.42	2,818	32.08
≥30%	1,095	13.13	814	11.19	982	16.02	1,613	13.95	1,212	12.04	1,470	16.3
≥40%	574	6.88	417	5.73	519	8.47	840	7.27	619	6.15	768	8.74
Demographic factors of HH head												
Sex												
Male	3,465	41.56	2,832	38.94	2,632	42.94	4,746	41.05	3,862	38.35	3,679	41.88
Female	4,873	58.44	4,440	61.06	3,497	57.06	6,816	58.95	6,208	61.65	5,106	58.12
Age (Years)	72.65(11.51)		72.67(11.64)		73.49(11.44)		73.33(11.23)		73.33(11.38)		74.33(10.91)	
20-44	270	3.24	245	3.37	205	3.34	319	2.76	293	2.91	228	2.6
45-64	1,296	15.54	1,126	15.48	766	12.51	1,652	14.28	1,439	14.29	986	11.22
65-74	2,433	29.18	2,097	28.84	1,739	28.37	3,216	27.82	2,758	27.39	2,340	26.64
75+	4,339	52.04	3,804	52.31	3,419	55.78	6,375	55.14	5,580	55.41	5,231	59.54
Marital status												
Married	2,588	31.06	2,020	27.8	2,213	36.12	3,560	30.81	2,759	27.41	3,086	35.14
Widowed/divorced/separated	5,341	64.11	4,882	67.18	3,736	60.99	7,477	64.71	6,836	67.93	5,459	62.17
Single	402	4.83	365	5.02	177	2.89	517	4.48	469	4.66	236	2.69
No. of family members												
Living alone	5,091	61.06	4,685	64.43	3,555	58	7,133	61.69	6,556	65.1	5,217	59.39
Two	2,574	30.87	2,021	27.79	2,058	33.58	3,552	30.72	2,789	27.7	2,900	33.01
Three+	673	8.07	566	7.78	516	8.42	877	7.59	725	7.2	668	7.6
Residential region												
Metropolis	3,016	36.17	2,658	36.55	1,979	32.29	4,016	34.73	3,509	34.85	2,707	69.19

	1st poverty spell (poverty line: <50% of MIL)						Total poverty duration (poverty line: <50% of MIL)					
	The poor		HH without severe diseases		The poor without MA		The poor		HH without severe diseases		The poor without MA	
	N	%	N	%	N	%	N	%	N	%	N	%
	Mean (SD)		Mean (SD)		Mean (SD)		Mean (SD)		Mean (SD)		Mean (SD)	
Rural, Sub-urban	5,322	63.83	4,614	63.45	4150	67.71	7,546	65.27	6,561	65.15	6,078	30.81
Socio-economic factors of HH head												
Education attainment												
High school and lower	7,928	95.08	6,925	95.23	5,792	94.5	11,034	95.43	9,632	95.65	8,349	95.04
College and more	410	4.92	347	4.77	337	5.5	528	4.57	438	4.35	436	4.96
Primary economic status												
Working	1,884	22.6	1,691	23.25	1,661	27.1	2,651	22.93	2,379	23.62	2,369	26.97
No working	6,454	77.4	5,581	76.75	4,468	72.9	8,911	77.07	7,691	76.38	6,416	73.03
Type of working position												
Regular	25	0.3	23	0.32	25	0.41	30	0.26	28	0.28	29	0.33
Irregular	719	8.62	665	9.14	582	9.5	991	8.57	919	9.13	821	9.35
Self-employed	1,140	13.67	1,003	13.79	1,054	17.2	1,630	14.1	1,432	14.22	1,519	17.29
Unemployed	6,454	77.41	5,581	76.75	4,468	72.89	8,911	77.07	7,691	76.37	6,416	73.03
No. of family members with employment	0.2(0.46)		0.2(0.46)		0.23(0.5)		0.19(0.45)		0.19(0.45)		0.22(0.48)	
Need factors												
Having children under 7 in a household	102	1.22	95	1.31	83	1.35	120	1.04	113	1.12	98	1.12
Having a person aged 65 years old and more in a household	7,028	84.29	6,104	83.94	5,330	86.96	9,921	85.81	8,604	85.44	7,798	88.76
No. of chronic diseases in household	1.22(0.61)		1.17(0.6)		1.23(0.63)		1.23(0.60)		1.18(0.59)		1.23(0.61)	
Having household head with severe diseases	804	9.64	NA		569	9.28	1,111	9.61	NA		831	9.46
Having household members with severe diseases	303	3.63	NA		262	4.27	439	3.80	NA		374	4.26
Changing factors in household income												
Decreased number of family members with employment	780	9.35	653	8.98	648	10.57	1,133	9.8	955	9.48	948	10.79
Changed type of working position of	866	10.39	763	10.49	743	12.12	1,288	11.14	1,129	11.21	1,119	12.74

	1st poverty spell (poverty line: <50% of MIL)						Total poverty duration (poverty line: <50% of MIL)					
	The poor		HH without severe diseases		The poor without MA		The poor		HH without severe diseases		The poor without MA	
	N	%	N	%	N	%	N	%	N	%	N	%
	Mean (SD)		Mean (SD)		Mean (SD)		Mean (SD)		Mean (SD)		Mean (SD)	
household head												
Medical Aid status												
Medical Aid	2,209	26.49	1,940	26.68	0	0	2,777	24.02	2,443	24.26	0	0
NHI	6,129	73.51	5,332	73.32	6,129	100	8,785	75.98	7,627	75.74	8,785	100
Duration of poverty												
1 year	3,391	40.67	2,915	40.09	2,665	43.48	3,390	29.32	4,376	43.46	4,085	46.51
2 years	1,638	19.64	1,418	19.5	1,189	19.4	2,404	20.79	2,071	20.57	1,789	20.36
3 years	1,056	12.66	916	12.6	728	11.88	1,809	15.65	1,264	12.55	1,056	12.02
4 years	748	8.97	670	9.21	494	8.06	1375	11.89	855	8.49	662	7.54
5 years	547	6.56	490	6.74	358	5.84	1029	8.9	579	5.75	437	4.97
6 years	399	4.79	353	4.85	292	4.76	720	6.23	397	3.94	333	3.79
7 years	235	2.82	214	2.94	142	2.32	426	3.68	232	2.3	162	1.84
8 years	189	2.27	174	2.39	126	2.06	274	2.37	174	1.73	126	1.43
9 years	135	1.62	122	1.68	135	2.2	135	1.17	122	1.21	135	1.54

Note: MIL stands for the median income level; MA, Medical Aid; NHI, national health insurance; SD, standard deviation; HH, household; severe diseases included cancer, stroke, cerebro-vascular diseases, and cardiac diseases.

1.1.2. Effect of catastrophic health expenditure on the first poverty spell length among the poor

Table 13 shows the effects of catastrophic health expenditure on the first poverty spell length among the poor at the poverty line of less than 50% of the median income level (MIL).

Occurrence of CHE was positively associated with the first poverty spell length except CHE at the threshold of 20%. The most significant effect of occurrence of CHE across various thresholds was found at the threshold of 30%.

The most significant variables related to the first poverty spell length were age groups and marital status; the aged 65+ groups were likely to have longer poverty duration, particularly in case of the aged 75+ group; those without a spouse, especially those who were never married, were likely to stay longer in poverty. Working status of household head and the number of family members with employment were strongly negatively associated with the first poverty spell duration; households with household head working and households with more family members with employment were likely to stay shorter in their first poverty spell. Households with decreased number of family members with employment were likely to stay shorter in their first poverty spell; this would imply that the variable of 'deceased number of family members with employment' seemed to function as a variable of 'having potential additional human resource in a household', given the fact the majority of the observations were those living alone. Changed types of working position of household head was also positively associated with the first poverty spell length, meaning that households with changed types of working position of household head were likely to stay longer in poverty. Other variables were not statistically significant.

Table 14 presents the effects of CHE on the first poverty spell length among the subgroups (households without severe diseases and the poor without the Medical Aid). Compared to the general poor, for households without severe diseases, the effect of CHE at the threshold of 30% was only positively associated with the first poverty spell length. Particularly, the effect size of CHE at the threshold of 30% was higher than that of the general poor group. For this subgroup, working status of household head, changed types of working position of household head, the number of family members with employment, and decreased number of family members with employment had more significant effects on the first poverty spell length, compared to those among the poor. The effects of other variables with statistical significance among the poor were a bit decreased; households with two members in household compared to households with three members were likely to stay shorter in their first poverty spell among households without severe diseases (please see Table A14 in appendix for more information).

With regard to the poor without MA, occurrences of CHE at the thresholds of 30-40% were positively associated with the first poverty spell length; the effect sizes were increased compared to the general poor. Working status of household head was negatively associated with the first poverty spell length; interestingly, the effect of working status of household head was more important than that of the general poor. Households with more family members with employment were also likely to stay shorter in their first poverty spell. Changed types of working position of household head and decreased number of family members with employment turned out to be not statically significant. Other variables showed similar distributions to those in the general poor, although the aged 45-64 (Model 1-3) was also positively associated with the first poverty spell length (please see Table A15 in appendix for more information).

Table 13. Effect of catastrophic health expenditure on the first poverty spell length among the poor (poverty line: less than 50% of the MIL)

	Model 1	Model 2	Model 3
	CHE(THE/hcp≥20%)	CHE(THE/hcp≥30%)	CHE(THE/hcp≥40%)
	β (SE)	β (SE)	β (SE)
Catastrophic health expenditure	0.031(0.025)	0.067(0.029)**	0.066(0.039)*
Female (ref: Male)	0.151(0.092)	0.152(0.092)*	0.154(0.092)*
Age (ref: 20-44 years old)			
45-64	0.266(0.185)	0.268(0.185)	0.268(0.184)
65-74	0.996(0.345)**	0.994(0.344)**	0.996(0.344)**
75+	1.739(0.341)***	1.738(0.340)***	1.740(0.341)***
Marital status (ref: Married)			
Widowed/divorced/separated	0.383(0.120)**	0.386(0.120)**	0.381(0.120)**
Single	0.885(0.190)***	0.886(0.190)***	0.888(0.190)***
No. of family members (ref: Three+)			
Living alone	0.003(0.182)	0.001(0.182)	0.002(0.183)
Two	-0.218(0.172)	-0.221(0.172)	-0.220(0.172)
Metropolis (ref: Rural, Sub-urban)	-0.009(0.062)	-0.009(0.062)	-0.009(0.061)
College and more (ref: No)	0.122(0.114)	0.130(0.114)	0.124(0.113)
Working of HH head (ref: No)	-0.171(0.048)***	-0.169(0.048)***	-0.169(0.049)***
No. of family members with employment	-0.224(0.056)***	-0.223(0.056)***	-0.223(0.056)***
Having children under 7 in a household (ref: No)	-0.246(0.511)	-0.255(0.515)	-0.255(0.512)
Having a person aged 65 years old and more in a household (ref: No)	-0.347(0.373)	-0.343(0.371)	-0.345(0.372)
Decreased number of family members with employment (ref: No)	-0.105(0.047)**	-0.106(0.047)**	-0.104(0.047)**
Changed type of working position of HH head (ref: No)	0.056(0.032)*	0.056(0.032)*	0.055(0.032)*
No. of chronic diseases in HH	0.037(0.044)	0.037(0.044)	0.038(0.044)
Having HH head with severe diseases	-0.041(0.041)	-0.45(0.043)	-0.044(0.043)
Having HH members with severe diseases	0.096(0.092)	0.094(0.092)	0.098(0.092)
Intercept	-0.551(0.240)**	-0.554(0.239)**	-0.551(0.239)**
Wald chi2	1366.66***	1355.10***	1358.73***
No. of observations	8,336	8,336	8,336
No. of subjects	3,383	3,383	3,383

*p<0.1, **p<0.05, ***p<0.001.

Note: CHE stands for catastrophic health expenditure; THE, total health expenditure; hcp, household capacity to pay; SE, standard errors; HH, household.

Table 14. Effect of catastrophic health expenditure on the first poverty spell length among the poor, subgroups (poverty line: less than 50% of the MIL)

	Model 1	Model 2	Model 3
	CHE(THE/hcp≥20%)	CHE(THE/hcp≥30%)	CHE(THE/hcp≥40%)
	β (SE)	β (SE)	β (SE)
The poor (50%<MIL)			
Catastrophic health expenditure	0.031(0.025)	0.067(0.029)**	0.066(0.039)*
Working of HH head (ref: No)	-0.171(0.048)***	-0.169(0.048)***	-0.169(0.049)***
Changed type of working position of HH head (ref: No)	0.056(0.032)*	0.056(0.032)*	0.055(0.032)*
No. of family members with employment	-0.224(0.056)***	-0.223(0.056)***	-0.223(0.056)***
Decreased number of family members with employment (ref: No)	-0.105(0.047)**	-0.106(0.047)**	-0.104(0.047)**
Wald chi2	1366.66***	1355.10***	1358.73***
No. of observations	8,336	8,336	8,336
No. of subjects	3,383	3,383	3,383
HH without severe diseases (cancer, stroke, cardiac diseases, etc)			
Catastrophic health expenditure	0.021(0.028)	0.072(0.033)**	0.060(0.046)
Working of HH head (ref: No)	-0.184(0.048)***	-0.183(0.048)***	-0.183(0.048)***
Changed type of working position of HH head (ref: No)	0.065(0.035)*	0.065(0.035)*	0.065(0.035)*
No. of family members with employment	-0.228(0.058)***	-0.226(0.058)***	-0.227(0.058)***
Decreased number of family members with employment (ref: No)	-0.184(0.048)***	-0.121(0.051)**	-0.120(0.051)**
Wald chi2	1112.50***	1108.59***	1106.88***
No. of observations	7,271	7,271	7,271
No. of subjects	3,040	3,040	3,040
The poor without MA			
Catastrophic health expenditure	0.040(0.027)	0.072(0.030)**	0.072(0.041)*
Working of HH head (ref: No)	-0.204(0.051)***	-0.203(0.051)***	-0.203(0.051)***
Changed type of working position of HH head (ref: No)	0.019(0.034)	0.018(0.034)	0.018(0.034)
No. of family members with employment	-0.201(0.056)***	-0.202(0.056)***	-0.202(0.056)***
Decreased number of family members with employment (ref: No)	-0.070(0.048)	-0.071(0.048)	-0.069(0.048)
Wald chi2	1012.65***	1012.37***	1011.14***
No. of observations	6,127	6,127	6,127
No. of subjects	2,834	2,834	2,834

*p<0.1, **p<0.05, ***p<0.001.

Note: CHE stands for catastrophic health expenditure; THE, total health expenditure; hcp, household capacity to pay; SE, standard errors; HH, household.

1.1.3. Effect of catastrophic health expenditure on the total poverty duration among the poor

Table 15 presents the effects of catastrophic health expenditure on the total poverty duration among the poor at the poverty line of less than 50% of the median income level (MIL). The distributions of effects of variables were similar to those for the first poverty spell length.

Occurrence of CHE at the threshold of 30% was positively associated with the total poverty duration. Compared to the effects of CHE on the first poverty spell length, the effect sizes of CHE were decreased; this would imply that the effect of CHE was more important for the first poverty spell.

Variables with the most significant effects related to the total poverty duration were also age groups and marital status; the aged 45+ groups were likely to have longer poverty duration compared to the aged 20-44, particularly in case of the aged 75+ group. Those without a spouse were likely to stay longer in poverty, especially those who were never married.

Working status of household head and the number of family members with employment were strongly negatively associated with the total poverty duration. Those with decreased number of family members with employment were likely to have shorter total poverty duration; again, it seemed that the variable of 'deceased number of family members with employment' was likely to function as a variable of 'having potential additional human resource in a household', considering that the majority of the observations were those living alone. Changed types of working position of household head was also positively associated with the total poverty duration, which means that households with changed types of working position of household head were likely to stay longer in poverty.

Compared to the results of the first poverty spell length, households with two members were likely to stay shorter in poverty across Models; the number of chronic diseases turned out to be statistically significant with positive relation to the total poverty duration across all thresholds of CHE. Other variables were not statistically significant.

Table 16 shows the effects of CHE on the total poverty duration among the subgroups (households without severe diseases and the poor without the Medical Aid). For households without severe diseases, the effect of CHE at the threshold of 30% was only positively associated with the total poverty duration. Compared to the general poor, the effect size of CHE at the threshold of 30% was a bit higher. For this subgroup, working status of household head, the number of family members with employment, and decreased number of family members with employment were negatively associated with the total poverty duration; the changed types of working position of household head turned out to be not statically significant. Working status of household head had more significant effects on the total poverty duration compared to those among the poor. Those with more chronic diseases among households without severe diseases were likely to stay longer in the total poverty duration than the general poor. The effects of other variables with statistical significance among the general poor were a bit decreased (please see Table A17 in appendix for more information).

As for the poor without MA, occurrence of CHE at the thresholds of 30% turned out to be not statically significant. Working status of household head was negatively associated with the total poverty duration; notably, the effect of working status of household head was more important than that of the general poor. Households with more family members with employment and decreased number of family members with employment were also likely to stay shorter in the total poverty duration. Changed types of working position of household head turned out to be not different from zero. Other variables

showed similar distributions to those in the general poor, although the effect sizes of the aged 45-74 groups and the number of chronic diseases were increased (please see Table A18 in appendix for more information).

Table 15. Effect of catastrophic health expenditure on the total poverty duration among the poor (poverty line: less than 50% of the MIL)

	Model 1	Model 2	Model 3
	CHE(THE/hcp≥20%)	CHE(THE/hcp≥30%)	CHE(THE/hcp≥40%)
	β (SE)	β (SE)	β (SE)
Catastrophic health expenditure	0.015(0.016)	0.033(0.019)*	0.033(0.026)
Female (ref: Male)	0.070(0.039)*	0.070(0.039)*	0.071(0.039)*
Age (ref: 20-44 years old)			
45-64	0.362(0.091)***	0.362(0.091)***	0.362(0.091)***
65-74	0.581(0.150)***	0.580(0.149)***	0.580(0.149)***
75+	1.156(0.148)***	1.155(0.148)***	1.156(0.148)***
Marital status (ref: Married)			
Widowed/divorced/separated	0.182(0.053)**	0.183(0.053)**	0.182(0.053)**
Single	0.614(0.087)***	0.616(0.087)***	0.614(0.087)***
No. of family members (ref: Three+)			
Living alone	0.065(0.082)	0.064(0.082)	0.066(0.082)
Two	-0.166(0.066)**	-0.168(0.066)**	-0.166(0.066)**
Metropolis (ref: Rural, Sub-urban)	0.004(0.026)	0.004(0.026)	0.004(0.025)
College and more (ref: No)	-0.001(0.062)	0.0002(0.062)	-0.001(0.062)
Working of HH head (ref: No)	-0.177(0.028)***	-0.177(0.028)***	-0.177(0.028)***
No. of family members with employment	-0.170(0.029)***	-0.170(0.029)***	-0.170(0.029)***
Having children under 7 in a household (ref: No)	-0.113(0.196)	-0.115(0.196)	-0.115(0.196)
Having a person aged 65 years old and more in a household (ref: No)	-0.004(0.137)	-0.004(0.137)	-0.003(0.137)
Decreased number of family members with employment (ref: No)	-0.064(0.025)**	-0.065(0.025)**	-0.064(0.025)**
Changed type of working position of HH head (ref: No)	0.036(0.020)*	0.035(0.020)*	0.036(0.020)*
No. of chronic diseases in HH	0.052(0.025)**	0.052(0.025)**	0.052(0.025)**
Having HH head with severe diseases	-0.005(0.028)	-0.007(0.028)	-0.006(0.028)
Having HH members with severe diseases	0.071(0.047)	0.069(0.047)	0.071(0.047)
Intercept	-0.115(0.112)	-0.115(0.112)	-0.114(0.112)
Wald chi2	2231.69***	2230.09***	2226.66***
No. of observations	11,560	11,560	11,560
No. of subjects	3,392	3,392	3,392

*p<0.1, **p<0.05, ***p<0.001.

Note: CHE stands for catastrophic health expenditure; THE, total health expenditure; hcp, household capacity to pay; SE, standard errors; HH, household.

Table 16. Effect of catastrophic health expenditure on the total poverty duration among the poor, subgroups (poverty line: less than 50% of the MIL)

	Model 1	Model 2	Model 3
	CHE(THE/hcp≥20%)	CHE(THE/hcp≥30%)	CHE(THE/hcp≥40%)
	β (SE)	β (SE)	β (SE)
The poor (50%<MIL)			
Catastrophic health expenditure	0.015(0.016)	0.033(0.019)*	0.033(0.026)
Working of HH head (ref: No)	-0.177(0.028)***	-0.177(0.028)***	-0.177(0.028)***
Changed type of working position of HH head (ref: No)	0.036(0.020)*	0.035(0.020)*	0.036(0.020)*
No. of family members with employment	-0.170(0.029)***	-0.170(0.029)***	-0.170(0.029)***
Decreased number of family members with employment (ref: No)	-0.064(0.025)**	-0.065(0.025)**	-0.064(0.025)**
Wald chi2	2231.69***	2230.09***	2226.66***
No. of observations	11,560	11,560	11,560
No. of subjects	3,392	3,392	3,392
HH without severe diseases (cancer, stroke, cardiac diseases, etc)			
Catastrophic health expenditure	0.018(0.018)	0.037(0.021)*	0.035(0.029)
Working of HH head (ref: No)	-0.182(0.028)***	-0.182(0.028)***	-0.182(0.028)***
Changed type of working position of HH head (ref: No)	0.030(0.021)	0.029(0.021)	0.029(0.021)
No. of family members with employment	-0.169(0.029)***	-0.169(0.029)***	-0.169(0.029)***
Decreased number of family members with employment (ref: No)	-0.063(0.027)**	-0.063(0.027)**	-0.063(0.027)**
Wald chi2	1814.54***	1815.30***	1810.94***
No. of observations	10,069	10,069	10,069
No. of subjects	3,138	3,138	3,138
The poor without MA			
Catastrophic health expenditure	0.004(0.017)	0.019(0.019)	0.023(0.026)
Working of HH head (ref: No)	-0.191(0.026)***	-0.190(0.026)***	-0.190(0.026)***
Changed type of working position of HH head (ref: No)	0.016(0.020)	0.016(0.020)	0.016(0.020)
No. of family members with employment	-0.158(0.027)***	-0.158(0.027)***	-0.158(0.027)***
Decreased number of family members with employment (ref: No)	-0.049(0.025)**	-0.049(0.025)**	-0.049(0.025)*
Wald chi2	1915.34***	1909.63***	1907.18***
No. of observations	8,783	8,783	8,783
No. of subjects	3,014	3,014	3,014

*p<0.1, **p<0.05, ***p<0.001.

Note: CHE stands for catastrophic health expenditure; THE, total health expenditure; hcp, household capacity to pay; SE, standard errors; HH, household.

2. The effect of catastrophic health expenditure on exit from poverty among poor

2.1. Results

2.1.1. General characteristics of the study sample for 2-2 analysis

Table 17 presents general characteristics of the study samples at the poverty line of less than 40% of MIL. The analysis for the poor at the poverty line of less than 40% of MIL used 12,254 person-year data.

Occurrence of catastrophic health expenditure (CHE) at various thresholds was 25.76%, 13.09%, and 6.59% at the thresholds of 20-40%.

The proportion of females was higher than that of males. The average age was 72.76 years old; 80% of the observations were the aged 65 years old and more. 70% of the observations were those without a spouse; the majority of the observations were those living alone (64%) and living in rural/sub-urban areas (65.3%). Many received high school education level and lower (95%), and were unemployed (80%). The majority of types of working position of household head were the unemployed (80%). The number of family members with employment was 0.18 person per household. 1.3% and 84% of the observations had children under seven years old and the aged 65 years old and more in a household, respectively. 9.4% of the observations reported that the number of family members with employment had been decreased compared to that in the previous year. 10.33% of the observations showed that the types of a household head' working position were changed. 25.1% of the observations had the Medical Aid status. 55.9% of the observations were their first year of poverty duration; 13.11% of the observations had four years and more of poverty experiences.

Table 17. General characteristics of the study sample for 2-2 analysis

	The poor (poverty line: <40% of MIL)	
	N	%
	Mean (SD)	
Total no. of observations	4,232	100
Total no. of households	2,364	100
Catastrophic health expenditure		
≥20%	1,090	25.76
≥30%	554	13.09
≥40%	279	6.59
Demographic factors of HH head		
Male	1,696	40.08
Female	2,536	59.92
Age (Years)	72.76(11.72)	
20-44	142	3.36
45-64	673	15.9
65-74	1,150	27.17
75+	2,267	53.47
Marital status		
Married	1,222	28.88
Widowed/divorced/separated	2,791	65.95
Single	214	5.06
No. of family members		
Living alone	2,710	64.04
Two	1,186	28.02
Three+	336	7.94
Residential region		
Metropolis	1,469	34.71
Rural, Sub-urban	2,763	65.29
Socio-economic factors of HH head		
Education attainment		
High school and lower	4,022	95.04
College and more	210	4.96
Primary economic status		
Working	844	19.94
No working	3,388	80.06
Type of working position		
Regular	12	0.28
Irregular	306	7.23
Self-employed	526	12.43
Unemployed	3,388	80.06
No. of family members with employment	0.18(0.45)	
Need factors		
Having children under 7 in a household	55	1.3
Having a person aged 65 years old and more in a household	3,551	83.91
Changing factors in household income		
Decreased number of family members with employment	398	9.4
Changed type of working position of household head	437	10.33
Medical Aid status		
Medical Aid	1,061	25.07
National Health Insurance	3,171	74.93
Duration of poverty		
1 year	2,366	55.91
2 years	854	20.18
3 years	457	10.8
4 years	246	5.81
5 years	154	3.64
6 years	75	1.77
7 years	49	1.16
8 years	31	0.73

Note: MIL stands for the median income level; SD, standard deviation; HH, household.

2.1.2. Life table among the poor

Table 18 showed the life table including survival rate (remaining in poverty) and annual poverty exit rates (hazard rates) among the poor at the poverty line of less than 40% of MIL. Of a total of 4,232 observations, 1,961 observations exited poverty with the survival rate of 42.5% at the last study year (the 8th year). Annual poverty exit rate of the first year of poverty duration was 38.6%; annual poverty exit rates had been decreased over time; particularly, the first three years seemed important for the poverty exit momentum.

Table 18. Life table among the poor (poverty line: less than 40% of the median income level)

Poverty duration (year)	No. of observations at the beginning	No. of observations with poverty exit	Censored observations	Survival rate (remaining in poverty)	Standard error	Annual poverty exit rate	Standard error
1	4232	1341	168	0.6767	0.0073	0.3856	0.0103
2	2723	323	471	0.5888	0.0078	0.1389	0.0077
3	1929	159	477	0.5335	0.0082	0.0987	0.0078
4	1293	63	305	0.5040	0.0086	0.0568	0.0072
5	925	41	354	0.4764	0.0091	0.0564	0.0088
6	530	19	137	0.4568	0.0098	0.0420	0.0096
7	374	10	116	0.4423	0.0105	0.0322	0.0102
8	248	5	243	0.4248	0.0127	0.0403	0.0180

2.1.3. Effect of catastrophic health expenditure on exit from poverty among the poor

Table 19 showed the effect of catastrophic health expenditure on exit from poverty among the poor at the poverty line of less than 40% of MIL, taking into account other control variables.

With regard to CHE, the multinomial log-odds of occurrence of CHE at the thresholds of 20% and 30% would be expected to decrease by 0.161 and 0.212 unit, respectively, for exit to near-poverty relative to poverty; in other words, those with occurrence of CHE at the thresholds of 20-30% was less likely to exit from poverty to near-poverty than those without occurrence of CHE. With the stricter thresholds of CHE, the effect sizes of the occurrence of CHE were diminished among the group moving from the poor to the near-poor; however, the statistical significance disappeared at the threshold of 40% (Model 3). The occurrence of CHE at all thresholds was not associated with exit from poverty to non-poverty.

Many control variables had an effect on exit from poverty except sex of household head and children under 7 in a household. Many control variables associated with the type of exit from poverty were different, meaning that the groups of moving from the poor to the near-poor or to the non-poor would have the different characteristics. These differences were robust to various thresholds of CHE.

A variable positively affecting exit from poverty to near-poverty was working status of household head. Variables negatively affecting exit from poverty to near-poverty were those living alone, households with a person aged 65 years old and more, and longer poverty duration.

In terms of variables that positively affect moving from poverty to non-poverty, there were those with college and more education levels, working

status of household head, more family members with employment, a household with decreased numbers of family members with employment, and a household head with changed types of working position. Households with some characteristics, such as older people (aged 45-64, aged 75+), those who were never married, those with fewer number of family members, those living in metropolis, households with a person aged 65 years old and more, and households with longer poverty durations, were less likely to exit from poverty to non-poverty.

Table 19. Effect of catastrophic health expenditure on exit from poverty (poverty line: less than 40% of the MIL)

	Model 1		Model 2		Model 3	
	CHE(THE/hcp≥20%)		CHE(THE/hcp≥30%)		CHE(THE/hcp≥40%)	
	β (SE)		β (SE)		β (SE)	
	Near-poor from poor	Non-poor from poor	Near-poor from poor	Non-poor from poor	Near-poor from poor	Non-poor from poor
CHE	-0.161(0.085)*	0.172(0.113)	-0.212(0.111)*	0.169(0.141)	-0.217(0.150)	0.130(0.189)
Female (ref: Male)	-0.016(0.109)	-0.016(0.148)	-0.018(0.109)	-0.015(0.148)	-0.023(0.109)	-0.010(0.148)
Age (ref: 20-44 years old)						
45-64	-0.128(0.284)	-0.492(0.289)*	-0.199(0.284)	-0.500(0.288)*	-0.120(0.284)	-0.497(0.288)*
65-74	0.511(0.370)	-0.113(0.397)	0.525(0.370)	-0.121(0.397)	0.525(0.371)	-0.114(0.396)
75+	0.160(0.372)	-0.666(0.400)*	0.170(0.372)	-0.670(0.399)*	0.167(0.373)	-0.662(0.399)*
Marital status (ref: Married)						
Widowed/divorced/separated	-0.022(0.170)	-0.029(0.204)	-0.015(0.169)	-0.035(0.203)	-0.005(0.169)	-0.049(0.203)
Single	-0.049(0.240)	-0.703(0.316)**	-0.036(0.240)	-0.715(0.315)**	-0.026(0.240)	-0.724(0.314)**
No. of family members (ref: Three+)						
Living alone	-0.595(0.216)**	-1.07(0.239)***	-0.596(0.216)**	-1.067(0.239)***	-0.598(0.216)**	-1.065(0.239)***
Two	-0.108(0.180)	-0.363(0.190)*	-0.108(0.180)	-0.358(0.189)*	-0.111(0.179)	-0.353(0.190)*
Metropolis (ref: Rural, Sub-urban)	0.005(0.077)	-0.187(0.106)*	0.006(0.077)	-0.187(0.106)*	0.010(0.077)	-0.191(0.106)*
College and more (ref: No)	-0.085(0.194)	0.543(0.204)**	-0.087(0.194)	0.543(0.204)**	-0.083(0.194)	0.539(0.204)**
Working of HH head (ref: No)	0.434(0.097)***	0.724(0.115)***	0.440(0.096)***	0.716(0.114)***	0.443(0.096)***	0.711(0.114)***
No. of family members with employment	0.025(0.094)	0.356(0.103)**	0.029(0.094)	0.350(0.103)**	0.031(0.094)	0.348(0.103)**
Having children under 7 in a household (ref: No)	-0.427(0.487)	-0.009(0.426)	-0.411(0.486)	-0.025(0.425)	-0.403(0.487)	-0.030(0.425)
Having a person aged 65 years old and more in a household (ref: No)	-0.421(0.255)*	-0.661(0.278)**	-0.429(0.255)*	-0.653(0.278)**	-0.434(0.255)*	-0.649(0.278)**
Decreased number of family members with employment (ref: No)	0.076(0.129)	0.365(0.149)**	0.080(0.129)	0.361(0.149)**	0.077(0.129)	0.364(0.149)**
Changed type of working position of household head (ref: No)	-0.117(0.128)	0.293(0.144)**	-0.112(0.128)	0.289(0.144)**	-0.111(0.128)	0.290(0.144)**
Duration of poverty (ref: 1 year)						
2 years	-0.413(0.092)***	-1.080(0.144)***	-0.412(0.092)***	-1.082(0.144)***	-0.412(0.092)***	-1.084(0.144)***
3 years	-0.524(0.120)***	-0.955(0.187)***	-0.521(0.120)***	-0.958(0.187)***	-0.521(0.120)***	-0.958(0.187)***
4 years and more	-0.822(0.120)***	-1.549(0.224)***	-0.821(0.120)***	-1.548(0.224)***	-0.819(0.120)***	-1.551(0.224)***

*p<0.1, **p<0.05, ***p<0.001.

Note: CHE stands for catastrophic health expenditure; THE, total health expenditure; hcp, household capacity to pay; SE, standard errors; HH, household.

3. Discussions

In this study, we examined the impact of the occurrence of catastrophic health expenditure (CHE) on the first poverty spell length and the total poverty duration among the poor at the poverty line of less than 50% of the equivalent disposable household median income level (MIL), analyzing data from the Korean Welfare Panel Study (KOWEPS) 2008-2016 through the panel generalized estimating equations population-averaged model. Then, we further examined the effect of the occurrence of CHE on exit from poverty (poverty, near-poverty, non-poverty) among the poor at the poverty line of less than 40% of MIL, analyzing data from the KOWEPS 2008-2016 through a discrete time event history analysis.

We chose to use the poverty line of less than 50% of MIL for the 2-1 analysis and the poverty line of less than 40% of MIL for the 2-2 analysis. The poverty line of less than 50% of MIL is commonly used in poverty analyses in general, and is used to define the near-poor in the revised National Basic Livelihood Security System since July 2015. We would like to incorporate the near-poor for the 2-1 analysis. As for the 2-2 analysis, the choice of measurement of poverty lines can be important to examine the determinants of poverty exit. Studies on poverty dynamics used various poverty lines, but stricter poverty lines, such as the poverty line of less than 40% of MIL, seem to be more meaningful and effective to examine the determinants of poverty exit among the poor(Ku 2005; Lee 2005; Lee 2010)[7].

[7] For the 2-1 analyses, we performed the analyses of poverty duration at the poverty line of less than 40% of MIL. But the analysis of the first poverty spell length was not able to be performed; this would be because the data set with fewer observations was mostly consisted of those with poverty duration of one year (about 50% of the observations), leading to the disproportionately unbalanced panel data set. As for the analysis of the total poverty duration, the results were similar to those in this study (please see more information in Table A19 in appendix).
For the 2-2 analyses, the poverty line of less than 50% of MIL would be too high for analyzing impacts of CHE on effective exit from poverty. We did perform this analysis,

With regard to measurements of CHE, occurrence of CHE is defined as health expenditure that exceeds 20%, 30%, and 40% of household total expenditure excluding actual food consumption. The incidence of occurrence of CHE at the threshold of 10% among the poor at the poverty lines of less than 50% and 40% of MIL was relatively high (about 50% of the observations), which may not be thought of as an effective and functioning indicator of the financial burden due to health care use among the poor; therefore, the threshold of 10% for CHE was not included. The thresholds of 30-40% may be considered effective indicators of the financial burden due to health care use among the poor; the threshold of 20% was included for sensitivity analysis (or reference). Generally, CHE at the threshold of 40% is frequently used when using the actual food spending(Dmytraczenko and Almeida 2015; World Health Organization 2015). CHE at the respective year (t year) was used in order to analyze the direct effect of CHE that occur in poverty status, because CHE at the previous year (t-1 year) might occur in non-poverty status.

The basis for the denominator of CHE should be determined by the assumption on whether the researcher thinks it makes sense for people to rely on their savings, assets or borrowing for health care use. If income is used, one can assume that people have no other resources other than income to pay for health care service. We chose consumption as the denominator of CHE because it is regarded as a better indicator of welfare of the poor, and it is deemed to be easier to measure accurately than income(Wagstaff, Flores et al. 2017; Cylus, Thomson et al. 2018). Furthermore, the dependent variables of the study were poverty status that was determined by disposable household income levels; we tried to examine the effect of CHE due to health care use on poverty persistence by choosing consumption as the denominator of CHE in order to detach some effects of household income, although consumption levels of household should be

but the results seemed to be problematic for interpretations (the results were not shown here).

related to household disposable income levels in some ways.

If health shocks hit the poor, loss of income in various forms occurs with health expenditure incurred; loss of income itself may have an effect on poverty persistence, although it may also occur regardless of health expenditure incurred such as getting laid off because of companies' issues or shutting down of stores run by the self-employed due to accidents or damage from fire or natural disasters. In order to take this account into the models in the study, working status of household head, the number of family members with employment, changed types of working position of household head, and decreased number of family members with employment were included.

For the 2-1 analysis of the effect of CHE on poverty duration, the number of chronic diseases, having household head with severe diseases (cancer, cardiac diseases, stroke, cerebro-vascular diseases), and having household members with severe diseases were included; these variables may have some effects on human capital in household; households with those characteristics may behave differently compared to households without them across the years of poverty duration. However, for the 2-2 analysis of the effect of CHE on exit from poverty, those variables were not included because we assumed that those variables do not have a direct effect on or association with exit from poverty, unless they have some effects on exit from poverty through incurring health expenditure or loss of income.

For the 2-1 analysis, the subgroup analyses for households without severe diseases and households without the Medical Aid were performed for sensitivity analyses. In South Korea, low co-insurance policies for severe diseases (cancer, cardiac diseases, stroke, cerebro-vascular diseases) were introduced since 2004 in order to reduce out-of-pocket payments for the patients. This would have some effects on levels of health care expenditure,

although these diseases are still known for catastrophic diseases that incur high levels of health expenditure. In line of that, the Medial Aid beneficiaries may have different financial incentives, because they are provided with medical benefits with zero to trivial cost-sharing for the insured health services.

We did examine the effect of CHE and its interaction term with households with severe diseases on the first poverty spell length and the total poverty duration (please see more information in Table A13 and A16 in appendix). However, the interaction terms at all the thresholds of CHE were not statically significant (Model 2, 4, and 6). Moreover, since the dependent variables were poverty duration, CHE and its interaction term with households with MA were not able to be included for analyses (if included, the interpretations would not make sense). We would like to compare these subgroups with their counterparts, but the sample sizes of their counterparts were small and the analyses for the counterparts were not able to be performed due to multicollinearity. We did try to do the subgroup analyses for households with severe diseases and households with MA by excluding some variables that caused multicollinearity such as education attainment, having a spouse, having children under seven in a household, and sex. However, the subgroup analysis of the first poverty spell length for households with severe diseases was not able to be performed; it is because the data set was severely unbalanced panel data with relatively shorter periods of the study years; those with poverty duration of one year accounted for more than 50% of the observations in the data set. The subgroup analysis of the total poverty duration showed that the occurrence of CHE at the thresholds of 20-40% was not associated with the total poverty duration (the results were not shown here). As for subgroup analyses for households with MA, the occurrence of CHE at the thresholds of 20-40% was not associated with the first poverty spell length and the total poverty

duration (the results were not shown here). Therefore, the results of the subgroup analyses in this study should be interpreted with cautions. Future research should be needed to contribute to this issue, once the data are accumulated in the future (maybe, data with at least 15-20 years should be needed).

3.1. Effect of catastrophic health expenditure on poverty duration among the poor

Now, we have a look at the analysis of the effect on CHE on poverty duration. Based on person-year data for the poor in their first poverty spell at the poverty line of less than 50% of MIL, occurrences of CHE at various thresholds were 25.5%, 13.1%, and 6.9% at the thresholds of 20-40%. For the poor at the poverty line of less than 50% of MIL in the total poverty duration analysis, occurrences of CHE at various thresholds were 26.9%, 14%, and 7.3% at the thresholds of 20-40%. It seemed that the observations for the total poverty duration analysis had more occurrences of CHE across the thresholds; this might be related to the fact that the total poverty duration analysis covered more observations that included the poor who were likely to reenter into poverty with multiple spells and may be vulnerable to CHE hits. Although it is difficult to compare the general population to the observations in a person-data form, the estimates showed that the poor were more exposed to experience CHE across poverty duration, which is consistent with previous studies where the poor disproportionately experienced CHE compared to the better-off(Sohn, Shin et al. 2010; Cheong and Lee 2012; Kim and Kwon 2016; Woorim Kim and Eun-Cheol Park 2018).

In terms of the analysis of the first poverty spell length, households with occurrence of CHE (except CHE at the threshold of 20%) were likely to stay longer in their first poverty spell. Effects of occurrence of CHE were comparable to the changed types of working position of household head

compared to the previous year, i.e. one of proxies to 'loss of income' variables. The fact that occurrence of CHE at the threshold of 20% was not statistical significant would imply that the thresholds of 30-40% would be better and effective indicators of financial hardship due to health care use among the poor in their first poverty spell; this was also confirmed through the subgroup analyses. One can say that households with occurrence of CHE would be at risk of lengthening their first poverty spell, even after controlling other predictors of poverty duration, such as working status of household head and the number of family members with employment.

The studies on poverty duration showed that the aged 65+ and those without a spouse stayed longer in their first poverty spell and in total poverty duration. With population ageing, this would be a big concern to the society, which may call for social policies and health policies to deal with the issue. Variables related to the labor market policies, such as working status of household head, the number of family members with employment, etc., would suggest that how important the labor market policies are in order to reduce the first poverty spell length. Both health policies for protecting the poor from financial risk due to health care use as well as social policies for engaging the poor into the labor market should be needed to poverty reduction.

As for the subgroup analyses, for both households without severe diseases and the poor without MA, occurrence of CHE at the thresholds of 30% (and 40% for the poor without MA) was positively associated with the first poverty spell length. Moreover, the effect sizes of these were higher than those for the general poor, meaning that the subgroups were more vulnerable to CHE hits that may make their first poverty spell longer. Health policies for financial protection related to CHE should be in place for these groups. Variables related to the labor market were also important as in case of the general poor; particularly, they were more critical than the general poor. Notably, for

the poor without MA, the number of family members with employment and especially, working status of household head at the respective year had a significant effect on the first poverty spell length with statistical significance; the aged 45-64 were likely to stay longer in their first poverty spell (unlike the general poor and the other subgroup), which may be related to unfavorable labor market conditions for these groups. These results would suggest that the poor without MA, i.e. the near-poor, would be the most vulnerable to the labor market and have less human resources in household in addition to having less social protection from the Government.

Now, we have a look at the analysis of the total poverty duration. While the first poverty spell means the poverty durations for those beginning the first spell observed in data, the total poverty duration means the total years in poverty of a household (in one or multiple spells) observed in data. If one looks only at the duration of a single spell of poverty, one might ignore the fact that the poor may have previously been in poverty or they may be in poverty again after the current poverty spell ends. Furthermore, effects of CHE and other variables at the first (or single) poverty spell may be different from those in the total poverty durations with multiple spells. As seen the results of the two analyses, people only experiencing the first poverty spell and people with the total poverty duration may have different characteristics, which might have led to differences in results between the two analyses.

Households with occurrence of CHE at the threshold of 30% were likely to stay longer in the total poverty duration; however, effect sizes of CHE were decreased compared to those at the first poverty spell. This would suggest that effects of CHE were more critical for the first poverty spell. It is likely that the poor with multiple poverty spell might forgo health services when needed, because they may have much limited household budget or resources available that they cannot afford to pay for health services, and/or they may change their health seeking behaviors due to their high income volatility and

their poverty experiences. Further research should be needed to explore this issue once data are accumulated in the future.

The older people and those without a spouse were vulnerable to longer stays in total poverty like the case of the first poverty spell. Compared to the analyses of the first poverty spell, the aged 45-64 was likely to stay longer in the total poverty duration. Unfavorable employment conditions for this age group or depreciated stock of human capital might be possible explanations for this result(Fouarge and Layte 2005). In line of it, working status of household head was a more important predictor of the total poverty duration. With less effect sizes, the number of family members with employment, decreased number of family members with employments, changed types of working position of household head also played a significant role in the total poverty duration. Labor market policies should be critical in order to reduction of the total poverty duration. Notably, households with more chronic diseases were likely to stay longer in the total poverty duration, unlike the first poverty spell. This result was also found in the subgroup analyses with larger effect sizes. This would imply that prevention and management of chronic diseases can be important policy interventions for reduction of the total poverty duration; as people age, preventive care and primary care should be highlighted even from a perspective of poverty reduction.

In terms of the subgroup analyses for the total poverty duration, the effect of CHE at the threshold of 30% was positively associated with the total poverty duration for households without severe diseases with a larger effect size, but it turned out to be not statistically significant for the poor without MA. As the National Health Insurance has been developed, the NHI expands benefit coverage and lowers co-insurance for severe diseases over the years; the result in this study showed that households without severe diseases might have suffered financial hardship due to health services, leading to longer

total poverty duration. Although the effect of CHE was not associated with the total poverty duration for the poor without MA, the result should be treated with caution, because the poor without MA might have given up receiving health services due to financial burden, which may raise more concerns. Compared to the general poor, working status of household head played more important roles in the total poverty durations for the subgroups, which was also the case even compared to the first poverty spell; changed types of working position of household head turned out to be not statistically significant among the subgroups. Along with the importance of the number of family members with employment for the total poverty duration, the current human resources in household related to the labor market were critical to reduction of the total poverty duration, particularly for the poor without MA through working status of household head.

3.2. Effect of catastrophic health expenditure on exit from poverty among the poor

With regard to the analysis for exiting from poverty at the poverty line of less than 40% of MIL, the majority of duration of poverty were within two years(Stevens 1994; Oxley, Thai-Thanh et al. 2000; Fouarge and Layte 2005; Ku 2005; Lee 2005; Şeker and Dayıoğlu 2015). One of the important concerns of researchers and policy makers is how fast people leave poverty (duration of poverty spells). The Life table showed the overall exit probabilities of poverty spells at each year of their duration. Annual poverty exit rates of the first two years of poverty duration were 38.6% and 13.9%. Annual poverty exit rates had been decreased over time; the first two years seemed to be critical, which is consistent with the previous literature(Stevens 1994; Oxley, Thai-Thanh et al. 2000; Fouarge and Layte 2005; Ku 2005; Lee 2005; Şeker and Dayıoğlu 2015). Ku (2005) showed that the first and second years of annual poverty rates at the poverty line of less than 40% of MIL were 58% and 36.3%, using the Korean Labor Panel Study 1998-2003; the difference

between the studies would come from the data source and the time period; the Korean Labor Panel includes only city residents who did not live in rural areas, who were more likely to be younger and have higher income levels compared to the rural area residents. Seker and Dayioglu (2015) showed that the first two years of annual poverty exit rates at the poverty line of less than 60% of MIL were 49.7% and 40.7% among the Turkey citizens using the survey data of the Income and Living conditions 2006-2009. Considering the fact that using the stricter poverty lines leads to higher poverty exit rates, the annual poverty exit rates in this study suggested relatively low rates of poverty exit in Korea over the period of 2008-2016.

In terms of CHE at the poverty line of less than 40% of MIL, effects of CHE on poverty exit depended on types of exit (exit to near-poverty and exit to non-poverty). For exit from poverty to near-poverty, occurrences of CHE at the thresholds of 20-30% were negatively associated with exit from poverty, which is consistent with the previous cross-sectional study(Song and Shin 2014; Kim and Kwon 2016). Song and Shin (2014) presented that poor households at t-1 year with CHE at t year were more likely to remain in poverty at t+1 year at the poverty line of less than 50% of MIL in a multivariate logistic regression analysis with a chronological approach, using the data from the Korean Welfare Panel Study 2007-2012. Considering the majority of types of exit from poverty were exit to near-poverty (about 70%), this result would raise concerns about the occurrences of CHE among the poor. Occurrences of CHE at the thresholds of 20-30% may pose a big threat to their already limited household budget. Combined loss of income due to ill health, financial burden due to health care use may force the poor to be stuck at poverty. Furthermore, the same CHE estimate of 20-30% would mean differently to the poor who have more limited sources and abilities to live in a society, compared to the non-poor. In this study, the occurrence of CHE at the threshold of 40% was not statistically significant; it is likely that

the level of the threshold of CHE was too high for the poor to afford so that many forgo health services, hence less occurrences of CHE at that threshold and as a result no association with exit to near-poverty.

On the other hand, for exit from poverty to non-poverty, occurrences of CHE at all thresholds of CHE were not statistical significant; this result is consistent with a study done by Song and Shin (2010) where they used the data from the Korean Welfare Panel Study 2006 and 2008 and investigated impact of occurrences of CHE in 2006 on persistence of poverty in 2008 and showed that those facing CHE was more likely to exit from poverty, although not statically significant(Song and Shin 2010). In some low-income countries, the better-off tended to use more health services and spent more health expenditure, leading to progressive values of out-of-pocket payments and incidence of CHE(van Doorslaer E 2007; Mills, Ataguba et al. 2012); it is possible that households with more resources and capacity use more health care services and spend more health expenditure, while the worse-off forgo health care use, thus leading to not experiencing CHE, which may raise more serious concerns.

In this study, the effects of CHE at the thresholds of 20-30% on exit from poverty to near-poverty at the poverty lines of less than 40% of MIL were only statistically significant. This would suggest that the thresholds of 20-30% may be a more effective and functioning indicator to reflect the poor's low capacity to pay. Cylus et al. (2018) analyzed data from 14 European countries and showed that with the budget share method and the actual food spending method, CHE was largely experienced by the richer households; the budget share method and the actual food spending method are similar to a flat income tax, requiring all people to pay the same share of their income in taxes, which do not acknowledge that the poor commit more resources to meet their basic needs including seeking health care; thus, the budget share method and the actual food spending method may lead to underestimating

financial hardship among the worse-off and overestimating financial hardship among the better-off(Cylus, Thomson et al. 2018).

Looking into other control variables that affect exit from poverty to near-poverty and to non-poverty, effects of other control variables also depended on the type of exit from poverty, meaning that the groups of moving from the poor to the near-poor or to the non-poor would have the different characteristics. Those who exit from poverty to near-poverty were likely to be more family members, household head with working status, less having a person aged 65+ in household, and shorter poverty duration; these variables had more significant effects on exit from poverty to near-poverty than that of CHE. Particularly, working status of household head and poverty duration had the most significant effects ($p<0.0000$) on exit to from poverty. The importance of working status of household head on exit from poverty would imply that the labor market policies would be critical to reduction of poverty. Moreover, the shorter poverty duration contributed to the higher likelihood of exit from poverty. This may reflect both unmeasured heterogeneity and the duration dependence; the poor are very heterogeneous from the start, those with more skills, abilities, or motivation may exit quickly than others. Duration dependence may work in some ways that falling into poverty may change preferences and behaviors of the poor as time goes. However, it should be noted that even after controlling the effects of those conventional predictors of exit from poverty, the effect of CHE had some roles in persistence of poverty among the poor. As mentioned earlier, the majority of types of exit were exit to near-poverty (about 70%). It should also be noted that those who exit from poverty to near-poverty may have the higher likelihood of reentering into poverty compared to those with exit to non-poverty. Health policies (particularly for financial hardship due to health expenditure) and social policies that can keep the people out of poverty should be needed.

With regard to exit from poverty to non-poverty, it seemed that those who exit from poverty to non-poverty were likely to be younger, those with a spouse, more family members, rural/sub-urban residents, those with higher education levels, household head with working status, more family members with employment, less having a person aged 65+ in household, changed types of working position of household head, less having decreased number of family members with employment (functioned as 'having more human resources in a household), and shorter poverty durations. Compared to the conditions of exit to near-poverty, those of exit to non-poverty seemed to demand more households' capacity and resources. Having a head in the aged 45-64 and in the aged 75+ compared to the aged 20-44 group slowed down exit from poverty to non-poverty; this is likely that less favorable labor market conditions for these groups or depreciated stock of human capital would be possible explanations for that. Having more human resources, including the married, more family members, the number of family members with employment, less having a person aged 65+ in household, and decreased number of family members with employment, would seem to be important to exit from poverty. As in case of exit to near-poverty, working status of household head was even more critical to exit from poverty to non-poverty, which is called for developing the labor market policies to exit from poverty. Poverty duration had an even more significant effect on exit from poverty than that in case of moving to near-poverty. Notably, the educational qualifications of household head had a significant effect on exit from poverty; it was even after controlling for the current working status of household head, meaning that the level of human capital was likely to have a large pay-off with regard to exit from poverty.

3.3. Summary

In sum, we examined the effects of CHE on persistence of poverty among the poor in the study. What we found was that households experiencing CHE

were likely to stay longer in their first poverty spell and the total poverty duration even after controlling for predictors of poverty such as working status of household head, the number of family members with employment, etc. Furthermore, households facing CHE were less likely to exit from poverty to near-poverty; however, effects of CHE were not associated with exiting from poverty to non-poverty. Events like exiting from poverty may demand some qualitative changes/characteristics that can make it happen. Dynamics of poverty duration and exit from poverty should be different, which may be worth further exploring in the future.

As seen in this study, the choice of thresholds of CHE can be more important for analyses with the poor than the general population; the threshold of 20% may be too low to capture properly financial hardship of the poor because many poor people experience CHE at the thresholds of 10-20%; the threshold of 40% may be too high for the poor, given their already very limited budget and their high unmet need for health services. Furthermore, CHE itself has some limitations to represent financial hardship due to health services among the poor; moreover, the measurement of CHE captures only financial hardship for those seeking health services, but it fails to indicate for those not seeking health services (unmet need).

4. Limitations

Although the study contributed to the literature by adding to the evidence of catastrophic health expenditure on persistence of poverty among the poor, there are several limitations.

Firstly, since there is lack of information on indication of the point in time for poverty changes based on a yearly data, the categories for poverty status can be arbitrary; thus, individuals experience intermittent poverty within a year. However, annual data seem to cancel out short-lived exits and returns, which

offer some positive aspects; few would say that a person who exits from poverty for only a month or two can be classified into one really having escaped it(Bane and Ellwood 1996). Other control variables provided in the survey are also in a yearly basis, which makes more sense to use annual data of poverty status.

Secondly, the study on exit from poverty only addressed the first spell of poverty exit. People may have more than one spell of poverty. It is also known that repeated spells of poverty are very common for people who have recently escaped long poverty spells(Stevens 1994; Bane and Ellwood 1996). However, it is likely that factors associated with exit from poverty work well in explaining the first spell of poverty durations, but those who come back for repeat spells tend to be less affected by these factors(Bane and Ellwood 1996). Future research on multiple spells should be needed once data are accumulated in the future.

Thirdly, this study is subject to left censoring of poverty duration. It is likely that some people who started poverty duration before the study starts (in this case, the year of 2008). Excluding the left-censoring data may be a solution to this issue, but considering the small number of the sample size and the fact that samples with left-censored data may be systematically different from the samples without left-censored data, leading to selection bias and loss of information(Iceland 1997; Cellini, McKernan et al. 2008). Based on the previous literature, left-censored data were included in this study(Guo 1993; Lee 2010; Ahn, Ku et al. 2011). The left-censoring issue can be a problem if many people who experienced poverty after the study starts already experienced multiple spells of poverty before 2008. But, this issue remains in all the survey data; if the panel data are accumulated in much longer periods of time, this issue can be properly dealt with.

Fourthly, the study cannot deal with depth of poverty or intensity of poverty

due to lack of data or limitations of research methods. However, we integrated intensity of poverty in some ways by analyzing the effects of CHE on the first poverty spell length and the total poverty duration and by differentiating types of poverty exits (near-poverty and non-poverty).

VI. Policy implications and conclusion

The study aimed to examine the effects of poverty dynamics and the Medical Aid status change on health care use, health expenditure, and unmet need, analyzing data from the Korea Health Panel 2008-2014 for the years of 2011-2013. Then, the study aimed to analyze the effects of occurrence of catastrophic health expenditure (CHE) on the first poverty spell length and the total poverty duration among the poor at the poverty line of less than 50% of the median income level (MIL), using the Korean Welfare Panel Study 2008-2016 through the panel generalized estimating equations population-averaged model. The study then examined the effect of CHE on exit from poverty among the poor at the poverty line of less than 40% of MIL, analyzing data from the Korean Welfare Panel Study 2008-2016 through a discrete time event history analysis.

This study was the first attempt to explore the effect of poverty dynamics on health care use, health expenditure, and unmet need. The study showed that even after controlling effects of the current income level and the current MA status, the persistent poor have difficulties in access to health care use, especially emergency visits and hospitalization. In the line of this, the persistent poor spent less total out-of-pocket payments at all the poverty lines, and less outpatient out-of-pocket payments at some poverty lines and reported more unmet need for all reasons and for the economic reason. The recurrent poor had less inpatient care, spent less total out-of-pocket payments, and reported the largest unmet need for the economic reason. Considering the significance of receiving proper health care services timely to improve and sustain health and well-being, the results raise some concerns that the persistent poor (and potentially the recurrent poor) would be at risk of having worse health status and well-being. Further research, including qualitative studies, should be needed in this area to explore more detail on

mechanisms of how poverty dynamics affect access to health care.

Those with more poverty experiences tend to have limited social and financial resources to which they resort when needed for seeking health care. However, they may have more difficulties in accessing to health care due to higher direct and indirect medical costs and opportunity costs. One of feasible approaches to addressing this issue would be expanding benefit packages and reducing out-of-pocket payments. Furthermore, population coverage of the Medial Aid program should be extended; whether the persistent poor are or not could be included in some ways in criteria of selecting the Medical Aid beneficiaries.

Understanding poverty dynamics brings about profound policy implications to reduce poverty. Using longitudinal measures of poverty provides a better, deeper perspective on poverty in short-, medium-, and longer-term, telling a different story than the usual snapshots that generally suggest that poverty is a problem for a small group of low-income people in a society. Income mobility and poverty persistence are closely related to each other, even in growing economies and matured welfare states(Muffels, Fouarge et al. 2000). Furthermore, considering the intertwined relationship between health and poverty, examining the difference between the types of poverty in health care would give insights into developing more strategic approaches to reduction of poverty through health care policies and to integrating health policies and social policies. Since social policies and health policies have not differentiated between the types of poverty and considered the time dimension of poverty status, it can neither target interventions at the persistent poor nor evaluate how interventions work for them(Smith and Middleton 2007).

The higher share of the persistent poor in Korea would suggest the need of strategies to promote education and develop labor policies for redistribution

in the society as well as the need of offering stable and sufficient money transfers for an adequate standard of living. Moreover, the persistent poor were more likely to be older, single, those with the fewer number of family members, living in rural areas, low income levels, elementary school education levels, unemployed, and have more chronic diseases. Policies catered to the characteristics of the most disadvantaged should also be highlighted. The recurrent poor would be associated with movements between poverty and near-poverty; this would imply the need of developing policies that are effective to keep them out of poverty should be needed with following-up trajectories over time.

As for the effects of the MA status change on health care use, health expenditure, and unmet need, the continuous MA had more outpatient visits, less medical check-ups, more emergency visits, more inpatient care, less health expenditure, and more unmet need. The new MA group who can have relatively high benefit coverage of services by reduction of co-payment compared to the continuous health insurance beneficiaries had more outpatient visits and stayed longer at a hospital, and spent less outpatient OOP. It is likely that the new MA had more health care use, but the intensity of care may not be high; the new MA might also be able to use health care without incurring heavy burden of out-of-pocket payments. The new HI group who may have relatively low benefit coverage level decreased their inpatient care use and spent less outpatient OOP, which may also affect the result of the higher level of unmet need. The new HI group who might face financial barriers to care might have reduced their outpatient health expenditure, which was supported by their higher unmet need for the economic reason; it would be unintended effects of the MA's administrative policies that do not consider the beneficiaries' health needs.

As seen in the case of the new HI group, many of which can be those in near poverty, disruption of the Medical Aid status itself can have negative effects

on health care use and unmet need. Therefore, polices that can reduce negative effects of disruption of the Medical Aid status should be needed for those in near poverty based on their health needs. Recently, the MA program (or the National Basic Livelihood Security System) was revised in July 2015; the poverty line was eased and changed to various median income levels depending on types of benefits (in case of the Medical Aid, less than 40% of the MIL) from the minimum costs of living(Ministry of Health and Welfare of the Republic of Korea 2015). This allows the beneficiaries to keep some benefits even their income levels are increased. Further research should be needed whether the revision of the MA program affects health care use and health expenditure patterns among the poor.

The study was the first exploratory study to examine the effect of catastrophic health expenditure on the first poverty spell length and the total poverty duration, and on exit from poverty with a discrete time event analysis, using data from the Korean Welfare Panel Study (KOWEPS) 2008-2016. With regard to the analysis of the first poverty spell length, households with occurrence of CHE (except CHE at the threshold of 20%) were likely to stay longer in their first poverty spell. One can say that households with occurrence of CHE would be at risk of lengthening their first poverty spell, even after controlling other predictors of poverty duration, such as working status of household head and the number of family members with employment.

As for the subgroup analyses, for both households without severe diseases and the poor without MA, occurrence of CHE at the thresholds of 30% (and 40% for the poor without MA) was positively associated with the first poverty spell length. With the larger effect sizes than those for the general poor, the subgroups were more vulnerable to CHE hits that may make their first poverty spell longer. Health policies for financial protection related to CHE should be in place for these groups. Variables related to the labor

market were more critical than the general poor. Notably, for the poor without MA, the number of family members with employment and especially, working status of household head at the respective year had a significant effect on the first poverty spell length. These results would suggest that the poor without MA, i.e. the near-poor, would be the most vulnerable to the labor market and have less human resources in household, with having less social protection from the Government.

Households with occurrence of CHE at the threshold of 30% were likely to stay longer in the total poverty duration, with smaller effect sizes of CHE compared to those at the first poverty spell. This would suggest that effects of CHE were more critical for the first poverty spell. It is likely that the poor with multiple poverty spells might forgo health services when needed, because they may have much limited household budget or resources available that they cannot afford to pay for health services, and/or they may change their health seeking behaviors due to their high income volatility and their poverty experiences. Further research should be needed to explore this issue once data are accumulated in the future.

In terms of the subgroup analyses for the total poverty duration, the effect of CHE at the threshold of 30% was positively associated with the total poverty duration for households without severe diseases with a larger effect size, but it turned out to be not statistically significant for the poor without MA. The NHI has expanded benefit coverage and lowered co-insurance for severe diseases over the years; the result in this study showed that households without severe diseases might have suffered financial hardship due to health services, leading to longer total poverty duration. Therefore, the ceiling on OOP policy would be critical to provide financial protection from catastrophic health expenditure due to any illness for patients (particularly patients without severe diseases). Along with the importance of the number of family members with employment for the total poverty duration, the current

human resources in household related to the labor market were critical to reduction of the total poverty duration, particularly for the poor without MA through working status of household head.

As seen in this study, variables that proxy to loss of income, such as working status of household head, the number of family members with employment, changed types of working position of household head, etc., were critical to reduce poverty duration. Recently, some studies have emphasized the importance of introducing 'accident and sickness benefits'(Kwon 2018). Kwon (2018) examined effects of health shocks on employment and income and showed that acute hospital admissions had negative effects on the employment probability and earnings; compared to the short negative effect of out-of-pocket payments, the negative effects of changes in employment and earnings remained up to three years after the health shock. However, introduction of such accident and sickness benefits can be difficult, because it should be aligned with other social benefits, such as unemployment compensation, disability allowance, pension, etc., and needs complicated upstream economic and labor policies.

With regard to the analysis for exiting from poverty at the poverty line of less than 40% of MIL, households facing CHE were less likely to exit from poverty to near-poverty at the thresholds of 20-30%; however, effects of CHE were not associated with exiting from poverty to non-poverty. Considering the majority of types of exit from poverty were exit to near-poverty (about 70%), this result would raise concerns that occurrences of CHE may pose a big threat to their already limited household budget. Combined loss of income due to ill health, financial burden due to health care use may force the poor to be stuck at poverty. Furthermore, the same CHE estimate of 20-30% would mean differently to the poor who have more limited sources and abilities to live in a society, compared to the non-poor.

It is likely that households with more resources and capacity use more health care services and spend more health expenditure, while the worse-off forgo health care use, thus leading to not experiencing CHE; this may raise more serious concerns and call for developing policies to deal with the issue. From the results of the study, it seemed that compared to people exiting to near-poverty, people exiting to non-poverty possess more favorable characteristics, including better education levels and working position, which shows the heterogeneity among the poor. It should also be noted that those who exit from poverty to near-poverty may be more vulnerable to reentering into poverty compared to those with exit to non-poverty; particularly, facing CHE would be more detrimental to exit from poverty for them. Health policies (particularly for financial hardship due to health expenditure) and social policies that can keep the people out of poverty should be called for.

As seen in this study, the choice of thresholds of CHE can be more important for analyses with the poor than the general population; the threshold of 20% may be too low to capture properly financial hardship of the poor, because many poor people experience CHE at the thresholds of 10-20%; the threshold of 40% may be too high for the poor, given their already very limited budget and their high unmet need for health services. CHE itself has some limitations to represent financial hardship due to health services among the poor; moreover, the measurement of CHE captures only financial hardship for those seeking health services, but it fails to indicate for those not seeking health services (unmet need).

Catastrophic health expenditures do not be automatically solved with increasing income levels(World Health Organization 2005). The national health financing systems have to make sure that all people can access to services when needed, and they do not suffer from financial hardship due to health care use by reducing OOP. The key approach to this should be to develop prepayment systems by extending benefit packages and reducing co-

payments. In particular, the elderly and the other disadvantaged groups comprise a large proportion of the poor; this would imply that developing the labor market policies to reduce poverty can be limited on its own. Unlike dealing with other economic consequences of ill health events, such as loss of income, that needs complicated upper-stream policies (economic and labor markets policies) with many different interest groups, therefore, reduction of incidence of CHE by expanding coverage of the national health insurance may be one of feasible ways of reducing poverty and improving well-being of the people in a society, along with other sectors' policies for poverty reduction.

Korea has strived to reduce OOP for the poor and developed pro-poor policies along with expanding benefit coverages. As one of those polices, there are ceilings on (cumulative) OOP for the insured services for 6 months. Since 2014, criteria of ceilings were categorized into seven levels, depending on income levels. In August 2018, the Government revised the ceiling levels on OOP; for those who are under the 5th income deciles (from the 1st to 3rd ceiling category; the poorer), the ceilings are the same as before, but for those who are above the 6th income deciles, levels of ceilings are set at 10% of the average income among the health insurance beneficiaries within each ceiling category (from the 4th to 7th ceiling category)(Ministry of Health and Welfare of the Republic of Korea 2018). This will improve the equity in health care expenditure in general. However, since the ceiling policy only covers the insured services, more effective policies that can reduce financial burden of the poor and protect the poor from poverty persistence due to catastrophic health expenditure should be needed.

In July 2018, the financial support program for catastrophic health expenditure for any illness was officially introduced and provided for low income groups in South Korea; for those under less than 100% of the median income level if a share of OOP in annual income exceeds more than 15%,

those under less than 50% of the median income level if OOP exceeds 2,000,000 KRW (about 1,800 USD), and those with MA and the near poor if OOP exceeds 1,000,000 KRW (about 900 USD), then 50% of the OOP will be returned to the patient up to 20,000,000 KRW (about 18,000 USD) per year(Ministry of Health and Welfare & Statistics of the Republic of Korea 2018). This policy will have positive impacts on financial protection from catastrophic health expenditure due to health care use among the poor; monitoring and evaluating the effect of the policy should be called for.

This study was the first attempt to provide evidence of effects of poverty statues on health care utilization, health expenditure, and unmet needs, and to analyze effects of catastrophic health expenditure on poverty persistence among the poor considering duration of poverty. This study contributed to better understanding of what the economic consequences of out-of-pocket payments due to health care use were among the poor, which should be understood from a perspective of social security or poverty reduction. The Moon Jae-in Government in Korea has promoted inclusive growth, redistribution, and poverty reduction in order to deal with income inequalities in the Korean society. Particularly, the voices for strengthening social safety nets for the poorest income quintile and the elderly in poverty have been raised from experts and civil societies. In this context, this study may be used to a starting point to evaluating social policies and policies for poverty reduction.

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Appendix

Table A1. General characteristics of poverty types

	Poverty line: Median disposable income					
	<50%			<40%		
	Transient poor	Recurrent poor	Persistent poor	Transient poor	Recurrent poor	Persistent poor
	N (%); Mean (SD)			N (%); Mean (SD)		
Total no. of individuals	3,130 (100)	2,036 (100)	3,547 (100)	2,711 (100)	1,523 (100)	1,985 (100)
Medical Aid status						
Medical Aid	170 (5.44)	248 (12.21)	894 (25.2)	273 (10.08)	289 (18.99)	580 (29.22)
NHI	2,956 (94.56)	1,783 (87.79)	2,653 (74.8)	2,435 (89.92)	1,233 (81.01)	1,405 (70.78)
Demographic factors						
Male	1,477 (47.19)	883 (43.37)	1,391 (39.22)	1,230 (45.37)	617 (40.51)	759 (38.24)
Female	1,653 (52.81)	1,153 (56.63)	2,156 (60.78)	1,481 (54.63)	906 (59.49)	1,226 (61.76)
Age (Years)	55.7 (17.5)	62.2 (16.35)	68.7 (14.67)	59.12 (17.05)	65.35 (15.72)	71.01 (13.52)
20-44	868 (27.73)	331 (16.26)	321 (9.05)	577 (21.28)	196 (12.87)	128 (6.45)
45-64	1,078 (34.44)	543 (26.67)	532 (15)	858 (31.65)	313 (20.55)	225 (11.34)
65-74	740 (23.64)	707 (34.72)	1,212 (34.17)	795 (29.32)	526 (34.54)	644 (32.44)
75+	444 (14.19)	455 (22.35)	1,482 (41.78)	481 (17.74)	488 (32.04)	988 (49.77)
Marital status						
Married	2,042 (65.24)	1,291 (63.41)	2,013 (56.75)	1,745 (64.37)	930 (61.06)	1,039 (52.34)
Widowed/divorced/separated	579 (18.50)	532 (26.13)	1,246 (35.13)	600 (22.13)	455 (29.88)	802 (40.4)
Single	509 (16.26)	213 (10.46)	288 (8.12)	366 (13.5)	138 (9.06)	144 (7.25)
No. of family members						
Living alone	275 (8.79)	324 (15.91)	1,006 (28.36)	345 (12.73)	313 (20.55)	699 (35.21)
Two	1,127 (36.01)	971 (47.69)	1,852 (52.21)	1,202 (44.34)	763 (50.1)	997 (50.23)
Three+	1,724 (55.08)	741 (36.39)	689 (19.42)	1,163 (42.9)	447 (29.35)	289 (14.56)
Residential region						
Seoul	366 (11.69)	204 (10.02)	261 (7.36)	331 (12.21)	106 (6.96)	133 (6.7)
Metropolitan cities	852 (27.22)	481 (23.62)	922 (25.99)	680 (25.08)	372 (24.43)	506 (25.49)
Others	1,908 (60.96)	1,351 (66.36)	2,364 (66.65)	1,699 (62.67)	1,045 (68.61)	1,346 (67.81)
Socio-economic factors						
Total household disposable income per equivalent adult (KRW)	14,400,000 (7,867,824)	10,300,000 (5,877,198)	7,039,188 (3,447,364)	12,300,000 (8,129,230)	8,403,396 (5,081,829)	6,156,592 (3,312,854)
Education attainment						

	Poverty line: Median disposable income					
	<50%			<40%		
	Transient poor	Recurrent poor	Persistent poor	Transient poor	Recurrent poor	Persistent poor
	N (%); Mean (SD)			N (%); Mean (SD)		
Elementary school	1,102 (35.21)	907 (44.55)	2,251 (63.46)	1,137 (41.94)	814 (53.45)	1,370 (69.02)
High school	1,333 (42.59)	857 (42.09)	1,008 (28.42)	1,057 (38.99)	545 (35.78)	494 (24.89)
College and more	695 (22.2)	272 (13.36)	288 (8.12)	517 (19.07)	164 (10.77)	121 (6.1)
Economic activity status						
No working	1,383 (44.19)	1,124 (55.21)	2,580 (72.74)	1,355 (49.98)	969 (63.62)	1,571 (79.14)
Working	1,747 (55.81)	912 (44.79)	967 (27.26)	1,356 (50.02)	554 (36.38)	414 (20.86)
Private insurance						
Yes	1,739 (55.56)	806 (39.69)	850 (23.96)	1,333 (49.17)	467 (30.66)	339 (17.08)
No	1,391 (44.44)	1,230 (60.41)	2,697 (76.04)	1,378 (50.83)	1,056 (69.34)	1,646 (82.92)
Health need factors						
Self-assessed health						
Good	951 (30.38)	597 (29.32)	861 (24.27)	837 (30.87)	431 (28.3)	428 (21.56)
Fair	1,234 (39.42)	686 (33.69)	1,157 (32.62)	956 (35.26)	478 (31.39)	653 (32.9)
Bad	580 (18.53)	530 (26.03)	1,209 (34.09)	621 (22.91)	466 (30.6)	722 (36.37)
Having activity limitation due to diseases/injuries	240 (7.67)	264 (12.97)	661 (18.64)	272 (10.03)	206 (13.53)	431 (21.71)
No. of chronic diseases	2.4 (2.47)	3.1 (2.71)	3.9 (2.8)	2.7 (2.58)	3.6 (2.84)	4.1 (2.81)
0	912 (29.14)	389 (19.11)	380 (10.71)	648 (23.9)	222 (14.58)	179 (9.02)
1	557 (17.8)	328 (16.11)	409 (11.53)	448 (16.53)	199 (13.07)	204 (10.28)
2	441 (14.09)	285 (14)	461 (13)	413 (15.23)	198 (13)	241 (12.14)
3+	1,220 (38.98)	1,034 (50.79)	2,297 (64.76)	1,202 (44.34)	904 (59.36)	1,361 (68.56)
Having cancer	88 (2.81)	60 (2.95)	125 (3.52)	75 (2.77)	61 (4.01)	73 (3.68)
Having a cardiac disease	139 (4.44)	135 (6.63)	313 (8.82)	155 (5.72)	137 (9)	186 (9.37)
Having a cerebro-vascular disease	198 (6.33)	179 (8.79)	305 (8.6)	201 (7.41)	134 (8.8)	179 (9.02)
Having hypertension	941 (30.06)	765 (37.57)	1,726 (48.66)	914 (33.71)	666 (43.73)	1,017 (51.23)
Having diabetes	354 (11.31)	317 (15.57)	678 (19.11)	363 (13.39)	298 (19.57)	386 (19.45)
Being mentally disabled	24 (0.77)	29 (1.42)	73 (2.06)	25 (0.92)	26 (1.71)	44 (2.22)
Being physically disabled	304 (9.71)	277 (13.61)	633 (17.85)	336 (12.39)	255 (16.74)	372 (18.74)

Note: SD stands for standard deviation.

Table A2. Factors associated with poverty type

	Poverty line: Median disposable income					
	<50%			<40%		
	Transient poor	Recurrent poor	Persistent poor	Transient poor	Recurrent poor	Persistent poor
	Odds ratio (95% CI)			Odds ratio (95% CI)		
Medical Aid (ref: No)	0.49(0.38-0.63)***	0.88(0.68-1.14)	2.93(2.33-3.68)***	0.85(0.67-1.08)	1.30(1.02-1.66)**	2.43(1.93-3.05)***
Female (ref: Male)	0.90(0.80-1.00)*	1.01(0.87-1.17)	0.94(0.80-1.10)	0.93(0.82-1.06)	1.06(0.89-1.26)	0.86(0.69-1.06)
Age (ref: 20-44 years old)						
45-64	1.18(1.00-1.39)**	1.36(1.09-1.70)**	1.08(0.79-1.47)	1.37(1.13-1.65)**	.20(0.88-1.62)	1.17(0.75-1.81)
65-74	0.98(0.78-1.24)	1.77(1.34-2.33)***	1.53(1.10-2.14)**	1.26(0.99-1.61)*	1.63(1.14-2.32)**	2.03(1.28-3.22)**
75+	0.68(0.51-0.89)**	1.07(0.78-1.48)	2.01(1.41-2.86)***	0.79(0.60-1.06)	1.39(0.94-2.07)	2.85(1.77-4.60)***
Marital status (ref: Married)						
Widowed/divorced/separated	1.49(1.24-1.78)***	1.44(1.17-1.76)**	0.94(0.74-1.18)	1.36(1.12-1.64)**	1.20(0.95-1.53)	0.96(0.72-1.28)
Single	1.54(1.28-1.84)***	1.28(1.01-1.63)**	1.43(1.04-1.96)**	1.37(1.11-1.68)**	1.28(0.92-1.79)	2.09(1.37-3.19)**
No. of family members (ref: Three+)						
Living alone	0.52(0.40-0.67)***	0.89(0.66-1.18)	2.49(1.92-3.24)***	0.82(0.63-1.07)	0.97(0.71-1.32)	3.10(2.25-4.26)***
Two	1.02(0.89-1.17)	1.41(1.20-1.66)***	2.03(1.69-2.43)***	1.44(1.24-1.66)***	1.35(1.11-1.64)**	2.05(1.63-2.59)***
Residential region (ref: Others)						
Seoul	1.05(0.90-1.22)	0.89(0.72-1.10)	0.61(0.47-0.79)***	1.17(0.99-1.39)*	0.62(0.47-0.83)**	0.57(0.41-0.78)**
Metropolitan cities	0.97(0.86-1.09)	0.81(0.70-0.94)**	0.94(0.81-1.10)	0.90(0.79-1.03)	0.86(0.73-1.02)*	0.96(0.8-1.15)
ln(Total household disposable income per equivalent adult)	0.35(0.32-0.39)***	0.25(0.22-0.28)***	0.04(0.035-0.05)***	0.27(0.24-0.30)***	0.18(0.15-0.21)***	0.06(0.04-0.07)***
Education attainment (ref: College and more)						
Elementary school	1.73(1.41-2.13)***	1.34(1.04-1.73)**	1.73(1.29-2.32)***	1.43(1.13-1.79)**	1.40(1.02-1.93)**	2.27(1.50-3.42)***
High school	1.39(1.20-1.61)***	1.56(1.27-1.90)***	1.18(0.90-1.55)	1.15(0.96-1.37)	1.44(1.09-1.90)**	1.47(0.99-2.18)*
No working (ref: Working)	0.83(0.74-0.92)**	0.90(0.79-1.04)	1.55(1.35-1.79)***	0.88(0.78-0.99)**	1.001(0.85-1.18)	1.79(1.47-2.17)***
Having a private insurance	0.90(0.79-1.02)*	0.68(0.58-0.79)***	0.60(0.51-0.71)***	0.90(0.78-1.03)	0.64(0.53-0.77)***	0.47(0.38-0.60)***
Self-assessed health (ref: Good)						
Fair	1.17(1.06-1.29)**	0.91(0.80-1.02)	0.9997(0.87-1.14)	0.97(0.87-1.08)	0.84(0.73-0.98)**	1.14(0.97-1.35)
Bad	1.07(0.93-1.23)	0.998(0.85-1.18)	1.07(0.91-1.25)	1.04(0.89-1.20)	0.97(0.81-1.16)	1.09(0.90-1.33)
Having activity limitation due to diseases/injuries (ref: No)	0.87(0.71-1.06)	1.05(0.84-1.31)	1.07(0.89-1.28)	0.91(0.74-1.12)	0.76(0.60-0.97)**	1.26(1.03-1.54)**
No. of chronic diseases	1.01(0.98-1.04)	1.01(0.98-1.05)	1.05(1.01-1.09)**	1.003(0.97-1.04)	1.04(0.997-1.08)*	1.03(0.99-1.08)
Having cancer (ref: No)	1.14(0.86-1.51)	0.96(0.70-1.33)	1.13(0.80-1.59)	0.99(0.72-1.37)	1.30(0.91-1.85)	1.15(0.76-1.73)
Having a cardiac disease (ref: No)	0.91(0.71-1.17)	1.002(0.75-1.34)	0.97(0.75-1.24)	1.02(0.80-1.32)	1.16(0.87-1.56)	0.90(0.68-1.20)
Having a cerebro-vascular disease (ref: No)	1.18(0.94-1.47)	1.28(1.002-1.64)**	0.77(0.61-0.97)**	1.21(0.96-1.51)	1.02(0.77-1.35)	0.82(0.62-1.07)
Having hypertension (ref: No)	1.07(0.93-1.23)	0.87(0.74-1.03)*	0.91(0.77-1.06)	0.95(0.82-1.11)	0.88(0.73-1.06)	0.87(0.72-1.06)

	Poverty line: Median disposable income					
	<50%			<40%		
	Transient poor	Recurrent poor	Persistent poor	Transient poor	Recurrent poor	Persistent poor
	Odds ratio (95% CI)			Odds ratio (95% CI)		
Having diabetes (ref: No)	0.94(0.78-1.14)	1.04(0.84-1.28)	0.93(0.76-1.14)	0.98(0.81-1.19)	1.20(0.96-1.50)	0.89(0.70-1.12)
Being mentally disabled (ref: No)	0.99(0.53-1.86)	1.44(0.77-2.69)	1.81(1.05-3.11)**	0.91(0.48-1.71)	1.68(0.92-3.08)*	1.36(0.69-2.68)
Being physically disabled (ref: No)	1.02(0.84-1.23)	0.95(0.77-1.17)	0.84(0.68-1.04)	1.04(0.85-1.28)	1.09(0.87-1.37)	0.82(0.64-1.04)

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

Note: CI stands for confidence intervals.

Table A3. General characteristics of the Medical Aid status change type

	New Medical Aid	New health insurance	Continuous Medical Aid
	N (%); Mean (SD)		
Total no. of individuals	77 (100)	153 (100)	1,508 (100)
Demographic factors			
Male	33 (42.86)	66 (43.14)	630 (41.78)
Female	44 (57.14)	87 (56.86)	878 (58.22)
Age (Years)	61.77 (17.88)	52.53 (22.11)	61.37 (18.74)
20-44	14 (18.18)	51 (33.33)	279 (18.5)
45-64	26 (33.77)	42 (27.45)	432 (28.65)
65-74	16 (20.78)	26 (16.99)	330 (21.88)
75+	21 (27.27)	34 (22.22)	467 (30.97)
Marital status			
Married	34 (44.16)	65 (42.48)	637 (42.24)
Widowed/divorced/separated	34 (44.16)	40 (26.14)	611 (40.52)
Single	9 (11.69)	48 (31.37)	260 (17.24)
No. of family members			
Living alone	14 (18.18)	13 (8.5)	392 (25.99)
Two	22 (28.57)	45 (29.41)	510 (33.82)
Three+	41 (53.25)	95 (62.09)	604 (40.05)
Residential region			
Seoul	9 (11.69)	14 (9.15)	193 (12.8)
Metropolitan cities	27 (35.06)	37 (24.18)	391 (25.93)
Others	41 (53.25)	102 (66.67)	922 (61.14)
Socio-economic factors			
Total household disposable income per equivalent adult (KRW)	11,700,000 (9,451,992)	14,100,000 (9,002,090)	8,667,377 (5,582,213)
Education attainment			
Elementary school	35 (45.45)	59 (38.56)	759 (50.33)
High school	36 (46.75)	57 (37.25)	554 (36.74)
College and more	6 (7.79)	37 (24.18)	195 (12.93)
Economic activity status			
No working	52 (67.53)	84 (54.9)	1,186 (78.65)
Working	25 (32.47)	57 (37.25)	322 (21.35)
Private insurance			
Yes	33 (42.86)	57 (37.25)	366 (24.27)
No	44 (57.14)	96 (62.75)	1,142 (75.73)
Health need factors			

	New Medical Aid	New health insurance	Continuous Medical Aid
	N (%); Mean (SD)		
Self-assessed health			
Good	15 (19.48)	37 (24.18)	228 (15.12)
Fair	23 (29.87)	35 (22.88)	419 (27.79)
Bad	26 (33.77)	50 (32.68)	615 (40.78)
Having activity limitation due to diseases/injuries	18 (23.38)	24 (15.69)	358 (23.74)
No. of chronic diseases	2.99 (2.38)	3.03 (3.21)	4.08 (3.08)
0	11 (14.29)	42 (27.45)	190 (12.6)
1	11 (14.29)	28 (18.3)	174 (11.54)
2	16 (20.78)	17 (11.11)	149 (9.88)
3+	39 (50.65)	66 (43.14)	995 (65.98)
Having cancer	4 (5.19)	2 (1.31)	67 (4.44)
Having a cardiac disease	2 (2.6)	5 (3.27)	151 (10.01)
Having a cerebro-vascular disease	4 (5.19)	12 (7.84)	187 (12.4)
Having hypertension	32 (41.56)	43 (28.1)	653 (43.3)
Having diabetes	19 (24.68)	29 (18.95)	292 (19.36)
Being mentally disabled	4 (5.19)	3 (1.96)	90 (5.97)
Being physically disabled	21 (27.27)	29 (18.95)	473 (31.37)

Note: SD stands for standard deviation.

Table A4. Factors associated with the Medical Aid status change types

	New Medical Aid	New health insurance	Continuous Medical Aid
	Odds ratio (95% CI)		
Female (ref: Male)	0.82(0.44-1.53)	1.14(0.78-1.67)	0.81(0.63-1.03)*
Age (ref: 20-44 years old)			
45-64	1.11(0.44-2.81)	1.39(0.87-2.22)	1.10(0.72-1.69)
65-74	0.93(0.30-2.94)	1.09(0.54-2.19)	0.39(0.23-0.66)***
75+	1.04(0.28-3.81)	1.29(0.66-2.51)	0.42(0.25-0.73)**
Marital status (ref: Married)			
Widowed/divorced/separated	3.70(1.92-7.11)***	2.33(1.35-4.01)**	2.50(1.83-3.42)***
Single	1.57(0.56-4.42)	6.45(4.04-10.31)***	2.50(1.62-3.84)***
No. of family members (ref: Three+)			
Living alone	0.36(0.15-0.85)**	0.21(0.09-0.45)***	0.66(0.46-0.95)**
Two	0.59(0.32-1.06)*	0.59(0.36-0.95)**	0.71(0.54-0.95)**
Residential region (ref: Others)			
Seoul	1.36(0.63-2.89)	0.74(0.42-1.32)	1.48(1.09-2.02)**
Metropolitan cities	1.66(0.97-2.84)*	0.78(0.52-1.18)	1.08(0.84-1.37)
ln(Total household disposable income per equivalent adult)	0.38(0.29-0.51)***	0.43(0.33-0.57)***	0.17(0.14-0.21)***
Education attainment (ref: College and more)			
Elementary school	3.62(1.26-10.38)**	1.74(0.91-3.34)*	1.72(1.12-2.62)**
High school	3.86(1.60-9.36)**	1.56(0.96-2.55)*	1.58(1.12-2.24)**
No working (ref: Working)	1.44(0.75-2.78)	0.71(0.50-1.02)*	1.99(1.61-2.47)***
Having a private insurance	0.996(0.54-1.85)	0.53(0.35-0.81)**	0.42(0.32-0.54)***
Self-assessed health (ref: Good)			
Fair	1.07(0.61-1.87)	0.76(0.50-1.16)	1.18(0.97-1.45)
Bad	1.62(0.71-3.28)	1.53(0.97-2.42)*	1.78(1.41-2.26)***
Having activity limitation due to diseases/injuries (ref: No)	1.38(0.67-2.86)	1.14(0.62-2.10)	0.95(0.74-1.21)
No. of chronic diseases	0.93(0.81-1.06)	1.17(1.04-1.30)	1.19(1.14-1.25)***
Having cancer (ref: No)	2.64(0.91-7.70)*	0.45(0.11-1.87)	1.35(0.88-2.07)
Having a cardiac disease (ref: No)	0.36(0.08-1.58)	0.45(0.16-1.24)	0.97(0.67-1.40)
Having a cerebro-vascular disease (ref: No)	0.52(0.18-1.54)	0.90(0.43-1.86)	1.13(0.79-1.61)
Having hypertension (ref: No)	1.15(0.59-2.23)	0.56(0.37-0.85)**	0.82(0.63-1.07)
Having diabetes (ref: No)	2.07(1.04-4.12)**	1.65(1.02-2.67)**	0.90(0.65-1.23)
Being mentally disabled (ref: No)	4.07(1.11-14.96)**	0.80(0.20-3.12)	8.003(4.30-14.91)***
Being physically disabled (ref: No)	2.34(1.16-4.73)**	1.62(0.91-2.90)	3.26(2.51-4.22)***

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

Note: CI stands for confidence intervals.

Table A5. Effect of poverty status change on health care utilization among the poor (including the persistent non-poor)

	No. of outpatient visits		Having medical check-ups		Having an emergency visit		No. of hospitalization		No. of length of hospital stays	
	Poverty line: Median disposable income									
	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%
	Exp(β) (95% CI)		Odds ratio (95% CI)		Odds ratio (95% CI)		Exp(β) (95% CI)		Exp(β) (95% CI)	
Poverty status (ref: Persistent non-poor)										
Transient poor	1.01(0.95-1.08)	0.999(0.94-1.06)	0.96(0.85-1.08)	0.98(0.88-1.10)	1.11(0.94-1.31)	0.95(0.80-1.12)	1.06(0.90-1.25)	0.98(0.83-1.15)	1.06(0.81-1.39)	1.09(0.85-1.40)
Recurrent poor	1.03(0.95-1.12)	1.03(0.95-1.11)	1.11(0.95-1.30)	1.08(0.94-1.24)	0.97(0.76-1.23)	1.17(0.96-1.43)	0.92(0.74-1.16)	1.07(0.88-1.31)	0.73(0.55-0.97)**	0.87(0.67-1.13)
Persistent poor	0.97(0.89-1.07)	0.998(0.93-1.07)	1.03(0.87-1.21)	1.08(0.94-1.24)	0.90(0.72-1.13)	0.86(0.70-1.06)	0.84(0.66-1.06)	0.89(0.71-1.11)	0.91(0.65-1.28)	0.84(0.63-1.13)
Medical Aid (ref: No)	1.25(1.13-1.38)***	1.25(0.13-1.38)***	0.76(0.63-0.93)**	0.75(0.62-0.92)**	1.40(1.14-1.74)**	1.42(1.15-1.76)**	1.42(1.14-1.77)**	1.40(1.12-1.76)**	1.92(1.39-2.65)***	1.93(1.39-2.67)***
Female (ref: Male)	1.31(1.26-1.37)***	1.31(1.26-1.37)***	1.25(1.17-1.34)***	1.25(1.17-1.34)***	0.77(0.70-0.86)***	0.77(0.70-0.86)***	0.76(0.67-0.85)***	0.76(0.67-0.85)***	0.67(0.57-0.78)***	0.67(0.57-0.78)***
Age (ref: 20-44 years old)										
45-64	1.22(1.16-1.28)***	1.22(1.16-1.28)***	1.63(1.50-1.78)***	1.63(1.49-1.78)***	0.78(0.68-0.89)***	0.78(0.68-0.89)***	1.01(0.86-1.19)	1.01(0.86-1.19)	1.28(1.03-1.59)**	1.28(1.03-1.59)**
65-74	1.60(1.49-1.71)***	1.59(1.48-1.71)***	2.01(1.78-2.27)***	2.00(1.77-2.26)***	0.74(0.61-0.89)**	0.74(0.61-0.89)**	1.18(0.95-1.46)	1.18(0.95-1.46)	1.44(1.08-1.92)**	1.45(1.08-1.93)**
75+	1.55(1.42-1.70)***	1.55(1.42-1.70)***	1.42(1.21-1.67)***	1.42(1.21-1.66)***	1.07(0.86-1.34)	1.07(0.86-1.34)	1.46(1.14-1.86)**	1.45(1.14-1.85)**	2.75(1.89-3.99)***	2.76(1.90-4.02)***
Marital status (ref: Married)										
Widowed/divorced/separated	0.83(0.77-0.89)***	0.83(0.77-0.89)***	0.60(0.52-0.68)***	0.60(0.52-0.68)***	1.05(0.88-1.24)	1.04(0.88-1.24)	1.01(0.84-1.21)	1.01(0.84-1.22)	1.94(1.48-2.55)***	1.94(1.48-2.55)***
Single	0.55(0.52-0.59)***	0.55(0.52-0.59)***	0.24(0.21-0.28)***	0.24(0.21-0.28)***	0.63(0.53-0.75)***	0.63(0.53-0.75)***	0.46(0.37-0.57)***	0.46(0.37-0.57)***	0.60(00.45-0.79)***	0.60(0.45-0.79)***
No. of family members (ref: Three+)										
Living alone	1.22(1.12-1.34)***	1.22(1.12-1.34)***	2.37(2.01-2.79)***	2.35(2-2.76)***	1.06(0.85-1.33)	1.07(0.85-1.34)	1.06(0.86-1.31)	1.05(0.85-1.30)	0.55(0.40-0.75)***	0.56(0.41-0.76)***
Two	1.15(1.09-1.20)***	1.14(1.09-1.20)***	1.36(1.26-1.47)***	1.35(1.25-1.46)***	1.14(1.01-1.29)**	1.14(1.01-1.29)**	1.26(1.10-1.44)**	1.27(1.11-1.45)**	0.92(0.76-1.11)	0.93(0.76-1.13)
Residential region (ref: Others)										
Seoul	0.98(0.93-1.03)	0.98(0.93-1.03)	1.07(0.98-1.17)	1.07(0.98-1.17)	0.71(0.61-0.82)***	0.71(0.61-0.82)***	0.70(0.56-0.89)**	0.71(0.56-0.89)**	0.72(0.49-1.05)*	0.72(0.50-1.05)*
Metropolitan cities	0.96(0.92-0.999)**	0.96(0.92-0.999)**	1.05(0.98-1.12)	1.05(0.98-1.12)	0.85(0.76-0.94)**	0.85(0.76-0.94)**	0.84(0.75-0.95)**	0.84(0.75-0.95)**	0.88(0.75-1.03)	0.88(0.75-1.03)
ln(Total household disposable income per equivalent adult)	1.08(1.05-1.12)***	1.08(1.05-1.12)***	1.37(1.29-1.46)***	1.39(1.30-1.48)***	1.18(1.07-1.30)**	1.17(1.05-1.29)**	1.20(1.06-1.34)**	1.20(1.07-1.35)**	1.14(0.99-1.31)*	1.13(0.97-1.31)
Education attainment (ref: College and more)										
Elementary school	1.27(1.19-1.36)***	1.27(1.19-1.36)***	0.85(0.76-0.95)**	0.85(0.76-0.95)**	1.35(1.13-1.60)**	1.36(1.14-1.62)**	1.52(1.25-1.84)***	1.52(1.26-1.85)***	2.40(1.85-3.11)***	2.41(1.85-3.12)***
High school	1.13(1.08-1.19)***	1.13(1.08-1.19)***	0.93(0.86-1.01)*	0.93(0.86-1.01)*	1.29(1.14-1.46)***	1.29(1.14-1.46)***	1.35(1.15-1.58)***	1.35(1.16-1.58)***	1.70(1.38-2.10)***	1.71(1.38-2.11)***
No working (ref: Working)	1.05(1.01-1.09)**	1.05(1.01-1.09)**	0.83(0.77-0.89)***	0.83(0.77-0.89)***	1.11(1-1.24)*	1.11(1.001-1.24)**	1.53(1.36-1.73)***	1.53(1.35-1.73)***	1.90(1.60-2.27)***	1.91(1.59-2.28)***
Having a private insurance	1.10(1.05-1.15)***	1.10(1.05-1.15)***	1.44(1.33-1.56)***	1.44(1.34-1.56)***	1.07(0.95-1.19)	1.07(0.95-1.20)	1.10(0.96-1.26)	1.10(0.96-1.26)	1.19(0.997-1.43)*	1.20(1.001-1.43)**
Self-assessed health (ref: Good)										
Fair	1.25(1.21-1.29)***	1.25(1.21-1.29)***	1.15(1.08-1.22)***	1.15(1.08-1.23)***	0.91(0.83-1.01)*	0.91(0.83-1.01)*	0.91(0.81-1.01)*	0.91(0.82-1.01)*	0.77(0.66-0.89)***	0.76(0.66-0.89)***
Bad	1.59(1.51-1.68)***	1.59(1.51-1.68)***	1.07(0.97-1.17)	1.06(0.97-1.17)	1.50(1.31-1.72)***	1.51(1.32-1.73)***	1.69(1.42-2.01)***	1.69(1.42-2.01)***	1.73(1.35-2.23)***	1.72(1.34-2.21)***
Having activity limitation due to	1.31(1.21-1.43)***	1.31(1.20-1.43)***	0.86(0.75-0.99)**	0.86(0.74-0.99)**	1.76(1.49-2.09)***	1.76(1.49-2.09)***	2.22(1.83-2.68)***	2.21(1.83-2.68)***	3.07(2.37-3.99)***	3.16(2.42-4.12)***

	No. of outpatient visits		Having medical check-ups		Having an emergency visit		No. of hospitalization		No. of length of hospital stays	
	Poverty line: Median disposable income									
	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%
	Exp(β) (95% CI)		Odds ratio (95% CI)		Odds ratio (95% CI)		Exp(β) (95% CI)		Exp(β) (95% CI)	
diseases/injuries (ref: No)										
No. of chronic diseases	1.22(1.21-1.23)***	1.22(1.21-1.23)***	1.07(1.06-1.09)***	1.07(1.06-1.09)***	1.10(1.07-1.13)***	1.10(1.07-1.13)***	1.08(1.06-1.11)***	1.08(1.06-1.11)***	1.10(1.06-1.14)***	1.10(1.06-1.14)***
Having cancer (ref: No)	1.02(0.93-1.11)	1.02(0.93-1.11)	1.18(1.004-1.39)**	1.18(1.005-1.39)**	1.30(1.03-1.65)**	1.31(1.03-1.66)**	2.06(1.60-2.66)***	2.06(1.60-2.65)***	1.67(1.21-2.31)**	1.63(1.18-2.25)**
Having a cardiac disease (ref: No)	0.91(0.83-0.99)**	0.91(0.83-0.996)**	0.80(0.68-0.94)**	0.80(0.68-0.94)**	1.38(113-1.68)**	1.38(1.13-1.68)**	1.16(0.94-1.43)	1.16(0.95-1.43)	1.05(0.77-1.43)	1.04(0.76-1.42)
Having a cerebro-vascular disease (ref: No)	0.83(0.77-0.90)**	0.83(0.77-0.90)***	0.91(0.80-1.05)	0.91(0.80-1.05)	1.25(1.04-1.50)**	1.25(1.04-1.50)**	1.05(0.86-1.29)	1.06(0.86-1.30)	0.99(0.76-1.30)	0.99(0.76-1.30)
Having hypertension (ref: No)	1.20(1.15-1.26)***	1.20(1.15-1.26)***	1.002(0.92-1.09)	1.003(0.92-1.09)	0.99(0.87-1.13)	0.99(0.87-1.13)	1.08(0.93-1.27)	1.09(0.93-1.27)	1.13(0.88-1.46)	1.13(0.87-1.45)
Having diabetes (ref: No)	1.02(0.96-1.08)	1.02(0.96-1.08)	0.85(0.76-0.95)**	0.85(0.76-0.95)**	1.01(0.86-1.18)	1.01(0.86-1.18)	1.07(0.92-1.25)	1.07(0.92-1.26)	1.14(0.90-1.45)	1.14(0.89-1.45)
Being mentally disabled (ref: No)	1.29(1.01-1.64)**	1.29(1.01-1.64)**	0.58(0.27-1.28)	0.58(0.26-1.28)	0.37(0.16-0.89)**	0.37(0.16-0.89)**	0.98(0.45-2.13)	0.98(0.46-2.12)	8.013.39-18.91)***	8.09(3.42-19.18)***
Being physically disabled (ref: No)	1.15(1.06-1.24)**	1.15(1.06-1.24)**	0.88(0.77-0.99)**	0.88(0.77-0.99)**	1.23(1.04-1.46)**	1.23(1.04-1.46)**	1.29(1.09-1.52)**	1.29(1.09-1.52)**	1.70(1.34-2.15)***	1.70(1.34-2.16)***
Year dummy (ref: 2011)										
2012	1.08(1.05-1.11)***	1.08(1.05-1.11)***	1.08(1.01-1.16)**	1.08(1.01-1.16)**	1.07(0.97-1.18)	1.08(0.97-1.19)	1.13(1.01-1.27)**	1.14(1.01-1.28)**	1.22(105-1.42)**	1.22(1.05-1.42)**
2013	1.08(1.05-1.11)***	1.08(1.05-1.11)***	1.06(0.99-1.12)*	1.06(0.99-1.12)*	1.02(0.93-1.14)	1.03(0.93-1.14)	1.01(0.90-1.15)	1.02(0.90-1.15)	1.003(0.85-1.18)	1.004(0.85-1.18)

*p<0.1, **p<0.05, ***p<0.01

Note: Exp(β) means exponentiated coefficients; CI stands for confidence intervals; SE, standard errors.

Table A6. Effect of poverty status change on health expenditure and unmet need among the poor (including the persistent non-poor)

	ln(Total health expenditure)		ln(Outpatient health expenditure)		ln(Inpatient health expenditure)		Unmet need (All reasons)		Unmet need (Economic reason)	
	Poverty line: Median disposable income									
	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%
	Exp(β) (95% CI)		Exp(β) (95% CI)		Exp(β) (95% CI)		Odds ratio (95% CI)		Odds ratio (95% CI)	
Poverty status (ref: Persistent non-poor)										
Transient poor	0.98(0.96-1.01)	0.99(0.97-1.02)	0.998(0.99-1.01)	0.999(0.99-1.01)	0.998(0.97-1.03)	1.004(0.97-1.04)	1.11(0.97-1.26)	1.07(0.95-1.21)	1.62(1.25-2.09)***	1.23(0.96-1.57)*
Recurrent poor	0.96(0.93-0.997)**	0.98(0.95-1.01)	0.998(0.98-1.01)	0.99(0.98-1.01)	1.01(0.97-1.05)	0.99(0.95-1.04)	1.05(0.88-1.25)	1.09(0.93-1.28)	1.50(1.06-2.12)**	1.77(1.29-2.42)***
Persistent poor	0.95(0.91-0.98)**	0.97(0.94-0.996)**	0.98(0.96-0.996)**	0.99(0.97-0.998)**	0.98(0.93-1.03)	0.99(0.95-1.03)	1.46(1.23-1.74)***	1.37(1.18-1.60)***	1.24(0.89-1.74)	1.36(0.999-1.85)*
Medical Aid (ref: No)	0.88(0.85-0.92)***	0.88(0.85-0.92)***	0.80(0.78-0.83)***	0.80(0.78-0.83)***	0.89(0.94-0.95)***	0.89(0.84-0.95)***	1.14(0.96-1.36)	1.14(0.95-1.35)	1.35(0.97-1.88)*	1.36(0.98-1.90)*
Female (ref: Male)	1.17(1.15-1.20)***	1.17(1.15-1.20)***	1.03(1.02-1.03)***	1.03(1.02-1.03)***	1.02(0.99-1.04)	1.02(0.99-1.04)	1.15(1.06-1.24)***	1.15(1.06-1.24)**	0.86(0.73-1.02)*	0.86(0.73-1.02)*
Age (ref: 20-44 years old)										
45-64	1.05(1.02-1.07)***	1.05(1.02-1.07)***	1.02(1.01-1.03)***	1.02(1.01-1.03)***	0.998(0.97-1.03)	0.998(0.97-1.03)	1.05(0.95-1.17)	1.05(0.95-1.17)	1.49(1.20-1.87)***	1.50(1.20-1.87)***
65-74	1.11(1.08-1.14)***	1.11(1.08-1.14)***	1.01(0.999-1.02)*	1.01(0.999-1.02)*	1.02(0.98-1.06)	1.02(0.98-1.06)	0.75(0.65-0.88)***	0.75(0.64-0.88)***	1.61(1.17-2.22)**	1.60(1.16-2.21)**
75+	1.12(1.09-1.16)***	1.12(1.08-1.16)***	0.98(0.97-0.996)**	0.98(0.97-0.996)**	1.003(0.95-1.06)	1.003(0.95-1.06)	0.69(0.57-0.83)***	0.70(0.58-0.83)***	0.95(0.64-1.39)	0.95(0.65-1.38)
Marital status (ref: Married)										
Widowed/divorced/separated	0.87(0.85-0.90)***	0.88(0.85-0.90)***	0.99(0.98-1.01)	0.99(0.98-1.01)	0.94(0.90-0.98)**	0.94(0.90-0.98)**	1.13(0.99-1.29)*	1.12(0.98-1.28)*	1.73(1.33-2.26)***	1.72(1.31-2.25)***
Single	0.67(0.65-0.70)***	0.67(0.65-0.70)***	0.98(0.97-0.99)***	0.98(0.97-0.99)***	0.95(0.90-1.01)*	0.95(0.90-1.01)*	0.87(0.77-0.99)**	0.87(0.77-0.99)**	1.23(0.93-1.63)	1.22(0.92-1.62)
No. of family members (ref: Three+)										
Living alone	1.14(1.10-1.18)***	1.13(1.09-1.18)***	1.01(0.99-1.02)	1.005(0.99-1.02)	1.09(1.04-1.15)**	1.09(1.04-1.15)**	0.97(0.81-1.15)	0.98(0.82-1.16)	0.41(0.28-0.60)***	0.41(0.28-0.60)***
Two	1.06(1.04-1.08)***	1.06(1.04-1.08)***	1.02(1.01-1.02)***	1.02(1.01-1.02)***	1.04(1.01-1.07)**	1.04(1.01-1.07)**	0.95(0.87-1.05)	0.95(0.86-1.05)	0.71(0.58-0.87)**	0.71(0.58-0.87)**
Residential region (ref: Others)										
Seoul	0.99(0.97-1.01)	0.99(0.97-1.01)	1.003(0.99-1.01)	1.003(0.99-1.01)	0.99(0.95-1.02)	0.99(0.95-1.02)	1.03(0.93-1.14)	1.03(0.92-1.15)	1.44(1.14-1.82)**	1.42(1.12-1.79)**
Metropolitan cities	0.99(0.97-1.01)	0.99(0.97-1.01)	1.0003(0.99-1.01)	1.0002(0.99-1.01)	0.98(0.96-1.01)	0.98(0.96-1.01)	1.14(1.05-1.23)**	1.13(1.05-1.23)**	1.55(1.31-1.84)***	1.54(1.30-1.82)***
ln(Total household disposable income per equivalent adult)	1.07(1.05-1.09)***	1.07(1.06-1.09)***	1.02(1.01-1.02)***	1.02(1.01-1.02)***	1.02(0.997-1.04)*	1.02(0.996-1.04)	0.80(0.74-0.86)***	0.81(0.75-0.87)***	0.36(0.31-0.42)***	0.37(0.31-0.44)***
Education attainment (ref: College and more)										
Elementary school	1.01(0.99-1.04)	1.01(0.99-1.04)	1.002(0.99-1.01)	1.002(0.99-1.01)	0.96(0.93-0.997)**	0.96(0.93-0.997)**	1.31(1.14-1.49)***	1.30(1.14-1.49)***	1.49(1.12-1.98)**	1.48(1.12-1.97)**
High school	1.01(0.99-1.03)	1.01(0.99-1.03)	1.01(0.9999-1.01)*	1.007(1-1.01)*	0.98(0.95-1.004)*	0.98(0.95-1.004)*	1(0.91-1.10)	0.999(0.91-1.10)	1.57(1.28-1.94)***	1.55(1.26-1.92)***
No working (ref: Working)	1.03(1.01-1.04)**	1.03(1.01-1.04)**	1.02(1.01-1.02)***	1.02(1.01-1.02)***	1.02(0.998-1.04)*	1.02(0.998-1.04)*	0.74(0.68-0.80)***	0.74(0.68-0.80)***	1.59(1.28-1.94)***	1.59(1.34-1.88)***
Having a private insurance	1.12(1.10-1.15)***	1.12(1.10-1.15)***	1.01(1.01-1.02)***	1.01(1.01-1.02)***	1.02(0.99-1.04)	1.02(0.99-1.04)	1.06(0.97-1.16)	1.07(0.98-1.17)	0.83(0.69-0.9996)**	0.84(0.70-1.01)*
Self-assessed health (ref: Good)										
Fair	1.10(1.08-1.11)***	1.10(1.08-1.11)***	1.02(1.02-1.03)***	1.02(1.02-1.03)***	1.03(1.002-1.05)**	1.03(1.002-1.05)**	1.78(1.65-1.92)***	1.78(1.66-1.92)***	1.14(0.97-1.35)	1.14(0.97-1.35)
Bad	1.13(1.11-1.14)***	1.13(1.11-1.14)***	1.05(1.04-1.06)***	1.05(1.04-1.06)***	1.06(1.03-1.08)***	1.06(1.03-1.08)***	2.84(2.55-3.16)***	2.84(2.55-3.16)***	1.65(1.35-2.02)***	1.65(1.35-2.02)***

	ln(Total health expenditure)		ln(Outpatient health expenditure)		ln(Inpatient health expenditure)		Unmet need (All reasons)		Unmet need (Economic reason)	
	Poverty line: Median disposable income									
	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%
	Exp(β) (95% CI)		Exp(β) (95% CI)		Exp(β) (95% CI)		Odds ratio (95% CI)		Odds ratio (95% CI)	
Having activity limitation due to diseases/injuries (ref: No)	1.06(1.04-1.09)***	1.06(1.04-1.09)***	1.01(0.998-1.02)	1.01(0.998-1.02)	1.04(1.01-1.07)**	1.04(1.01-1.07)**	2.06(1.80-2.36)***	2.06(1.80-2.36)***	0.90(0.70-1.16)	0.89(0.69-1.14)
No. of chronic diseases	1.05(1.05-1.06)***	1.05(1.05-1.06)***	1.02(1.021-1.024)	1.02(1.021-1.024)***	1.01(1.002-1.01)**	1.01(1.002-1.01)**	0.96(0.93-0.98)***	0.95(0.93-0.98)***	1.06(1.01-1.11)**	1.06(1.01-1.11)**
Having cancer (ref: No)	1.07(1.04-1.09)***	1.07(1.04-1.09)***	1.03(1.02-1.04)***	1.03(1.02-1.04)***	1.07(1.04-1.10)***	1.07(1.04-1.10)***	0.85(0.68-1.07)	0.85(0.68-1.07)	0.94(0.50-1.78)	0.94(0.50-1.76)
Having a cardiac disease (ref: No)	0.999(0.98-1.03)	0.998(0.98-1.02)	1.02(1.01-1.03)***	1.02(1.01-1.03)***	1.003(0.97-1.04)	1.003(0.97-1.04)	1.03(0.85-1.25)	1.03(0.85-1.25)	1.32(0.91-1.92)	1.33(0.91-1.93)
Having a cerebro-vascular disease (ref: No)	1.01(0.98-1.03)	1.01(0.98-1.03)	1.004(0.994-1.01)	1.004(0.99-1.01)	0.99(0.95-1.02)	0.99(0.95-1.02)	0.91(0.76-1.09)	0.91(0.76-1.09)	1.25(0.90-1.75)	1.25(0.90-1.75)
Having hypertension (ref: No)	1.08(1.07-1.10)***	1.08(1.07-1.10)***	1.03(1.02-1.04)***	1.03(1.02-1.04)***	1.01(0.99-104)	1.01(0.99-1.03)	0.85(0.77-0.94)**	0.85(0.77-0.94)**	1.09(0.88-1.34)	1.08(0.88-1.33)
Having diabetes (ref: No)	1.03(1.02-1.05)***	1.03(1.02-1.05)***	1.02(1.02-1.03)***	1.02(1.02-1.03)***	1.01(0.98-1.04)	1.01(0.98-1.04)	0.90(0.79-1.03)	0.90(0.79-1.03)	0.86(0.65-1.13)	0.87(0.66-1.16)
Being mentally disabled (ref: No)	1.13(0.98-1.30)	1.13(0.98-1.30)	0.86(0.79-0.93)***	0.86(0.79-0.93)***	0.59(0.35-0.99)**	0.59(0.35-0.997)**	0.68(0.42-1.08)	0.67(0.42-1.07)*	0.92(0.33-2.57)	0.86(0.32-2.32)
Being physically disabled (ref: No)	1.06(1.04-1.09)***	1.06(1.04-1.09)***	0.999(0.99-1.01)	0.999(0.987-1.01)	0.999(0.97-1.03)	0.999(0.97-1.03)	1.06(0.92-1.23)	1.06(0.92-1.23)	0.86(0.65-1.15)	0.86(0.65-1.14)
Year dummy (ref: 2011)										
2012	1.03(1.01-1.04)***	1.03(1.01-1.04)***	1.01(1.01-1.02)***	1.01(1.01-1.02)***	1.02(1-1.04)*	1.021-1.04)*	1.07(0.998-1.15)*	1.07(0.996-1.15)*	1.18(1.01-1.38)**	1.17(0.999-1.37)*
2013	1.03(1.02-1.04)***	1.03(1.02-1.04)***	1.01(1.01-1.02)***	1.01(1.01-1.02)***	1.01(0.99-1.03)	1.01(0.99-1.03)	1.20(1.11-1.29)***	1.20(1.11-1.29)***	0.96(0.81-1.13)	0.96(0.81-1.13)

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

Note: Exp(β) means exponentiated coefficients; CI stands for confidence intervals; SE, standard errors. Health expenditure only covers out-of-pocket payments.

Table A7. Effect of poverty status change on health care utilization among the poor (two-part model)

	Having any outpatient visits		No. of outpatient visits		Having medical check-ups		Having an emergency visit		Having any hospitalization		No. of hospitalization		Having any length of hospital stays		No. of length of hospital stays	
	Poverty line: Median disposable income															
	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%
	Odds ratio (95% CI)		β (SE)		Odds ratio (95% CI)		Odds ratio (95% CI)		Odds ratio (95% CI)		β (SE)		Odds ratio (95% CI)		β (SE)	
Poverty status (ref: Transient poor)																
Recurrent poor	0.77(0.59-1.01)*	0.75(0.61-0.93)**	1.06(1.42)	1.62(1.23)	1.12(0.94-1.32)	1(0.86-1.16)	0.82(0.63-1.06)	1.15(0.93-1.43)	0.92(0.75-1.13)	0.996(0.84-1.18)	-0.25(0.23)	0.06(0.19)	0.94(0.77-1.15)	0.995(0.84-1.18)	-6.99(7.95)	0.54(8.38)
Persistent poor	0.74(0.52-1.04)*	0.86(0.66-1.12)	-0.87(1.75)	1.05(1.27)	1.04(0.86-1.25)	0.99(0.85-1.15)	0.76(0.59-0.99)**	0.86(0.68-1.08)	0.86(0.69-1.06)	0.84(0.70-1.01)*	-0.42(0.21)**	-0.16(0.18)	0.87(0.70-1.08)	0.84(0.70-1.01)*	-5.56(8.04)	-10.26(9.42)
Medical Aid (ref: No)	1.75(1.19-2.56)**	1.61(1.13-2.28)**	4.30(2.37)*	3.88(2.16)*	0.70(0.55-0.89)**	0.72(0.58-0.89)**	1.26(0.98-1.62)*	1.38(1.09-1.74)**	1.34(1.07-1.69)**	1.40(1.13-1.75)**	0.02(0.24)	0.01(0.21)	1.35(1.07-1.70)**	1.41(1.14-1.76)**	12.44(7.56)	21.61(12.05)*
Female (ref: Male)	2.36(1.90-2.93)***	2.49(2.06-3.02)***	-0.42(1.27)	-0.67(1.17)	1.14(0.98-1.32)*	1.17(1.03-1.34)**	0.67(0.55-0.82)***	0.69(0.58-0.83)***	0.87(0.73-1.03)	0.86(0.74-0.996)**	-0.20(0.19)	-0.28(0.15)*	0.87(0.74-1.04)	0.86(0.74-1.003)*	-4.57(6.74)	-8.04(6.24)
Age (ref: 20-44 years old)																
45-64	0.81(0.61-1.06)	0.91(0.73-1.15)	-0.10(1.26)	0.11(1.04)	2.69(2.11-3.41)***	2.39(1.94-2.95)***	0.59(0.42-0.81)**	0.69(0.52-0.92)**	0.60(0.46-0.77)***	0.65(0.52-0.82)***	0.17(0.32)	0.12(0.24)	0.60(0.46-0.77)***	0.65(0.52-0.82)***	19.52(8.27)**	15.01(6.42)**
65-74	2.21(1.36-3.57)**	2.14(1.37-3.33)**	3.91(1.95)**	3.26(1.76)*	3.11(2.33-4.14)***	2.81(2.20-3.60)***	0.44(0.30-0.65)***	0.58(0.41-0.81)**	0.62(0.45-0.84)**	0.67(0.51-0.89)**	0.09(0.26)	-0.03(0.22)	0.62(0.46-0.85)**	0.68(0.52-0.90)**	-0.57(13.36)	1.49(9.81)
75+	1.56(0.96-2.55)*	1.39(0.90-2.16)	3.50(2.33)	2.19(2.16)	2.26(1.64-3.12)***	1.90(1.44-2.52)***	0.81(0.54-1.19)	0.93(0.65-1.32)	0.86(0.61-1.20)	0.96(0.71-1.29)	0.12(0.29)	-0.03(0.24)	0.87(0.62-1.22)	0.97(0.72-1.31)	6.46(14.16)	13.61(11.14)
Marital status (ref: Married)																
Widowed/divorced/separated	0.45(0.31-0.64)***	0.41(0.29-0.57)***	-1.79(1.88)	-0.63(1.72)	0.67(0.53-0.83)***	0.66(0.55-0.80)***	0.85(0.62-1.18)	0.96(0.73-1.26)	0.72(0.55-0.94)**	0.72(0.57-0.90)**	0.72(0.51)	0.57(0.45)	0.70(0.54-0.92)**	0.70(0.55-0.87)**	23.81(9.89)**	27.26(9.75)**
Single	0.26(0.20-0.34)***	0.29(0.23-0.36)***	-2.92(1.12)**	-3.26(0.97)**	0.60(0.45-0.81)**	0.47(0.36-0.62)***	0.43(0.29-0.65)***	0.43(0.30-0.61)***	0.30(0.21-0.44)***	0.30(0.22-0.42)***	0.09(0.23)	-0.07(0.20)	0.30(0.21-0.42)***	0.29(0.21-0.41)***	-7.25(11.68)	-6.01(10.63)
No. of family members (ref: Three+)																
Living alone	2.07(1.40-3.06)***	2.14(1.47-3.12)***	1.67(2.10)	0.91(1.98)	1.97(1.53-2.53)***	2.11(1.70-2.63)***	1.21(0.84-1.73)	1.12(0.81-1.54)	1.56(1.15-2.11)**	1.57(1.21-2.04)**	-0.19(0.25)	-0.10(0.21)	1.61(1.19-2.18)**	1.62(1.25-2.11)***	-12.44(12.96)	-20.93(12.17)*
Two	1.55(1.22-1.96)***	1.53(1.23-1.90)***	1.05(1.48)	1.07(1.26)	1.41(1.19-1.67)***	1.47(1.27-1.69)***	1.05(0.82-1.34)	1.04(0.85-1.29)	1.31(1.08-1.60)**	1.26(1.06-1.50)**	0.56(0.38)	0.56(0.33)*	1.31(1.08-1.60)**	1.27(1.07-1.51)**	-0.68(7.53)	-1.81(7.40)
Residential region (ref: Others)																
Seoul	0.85(0.64-1.13)	0.88(0.69-1.14)	-3.83(1.34)**	-3.75(1.21)**	1.27(1.03-1.56)**	1.22(1.02-1.46)**	0.54(0.39-0.75)***	0.52(0.39-0.70)***	0.71(0.55-0.90)**	0.61(0.49-0.76)***	-0.57(0.19)**	-0.51(0.17)**	0.71(0.56-0.91)**	0.61(0.49-0.77)***	-12.34(5.20)**	-15.36(5.17)**
Metropolitan cities	0.86(0.68-1.08)	0.83(0.68-1.01)*	-2.43(1.39)*	-2.56(1.17)**	1.23(1.06-1.42)**	1.20(1.06-1.37)**	0.74(0.60-0.91)**	0.73(0.61-0.87)**	0.77(0.65-0.92)**	0.74(0.64-0.87)***	-0.34(0.14)**	-0.31(0.12)**	0.76(0.64-0.90)**	0.73(0.63-0.85)***	2.83(5.57)	-3.79(5.31)
ln(Total household disposable income per equivalent adult)	1.16(0.98-1.36)*	1.14(0.98-1.32)*	1.18(0.68)*	1.21(0.67)*	1.19(1.06-1.34)**	1.18(1.06-1.32)**	1.17(0.98-1.40)*	1.18(0.99-1.41)*	1.22(1.07-1.39)**	1.24(1.09-1.41)**	0.11(0.29)	0.09(0.25)	1.22(1.07-1.40)**	1.24(1.09-1.41)**	-2.53(11.28)	-0.13(10.76)
Education attainment (ref: College and more)																
Elementary school	0.94(0.64-1.39)	0.92(0.66-1.30)	4.99(1.89)**	5.10(1.63)**	0.90(0.71-1.15)	0.91(0.74-1.12)	1.69(1.18-2.42)**	.145(1.06-1.99)**	1.47(1.11-1.96)**	1.51(1.17-1.95)**	0.27(0.21)	0.22(0.15)	1.43(1.07-1.90)**	1.47(1.14-1.90)**	16.07(7.95)**	20.27(7.85)**
High school	0.91(0.72-1.15)	0.92(0.75-1.13)	0.47(1.30)	0.89(1.02)	0.90(0.73-1.11)	0.97(0.81-1.16)	1.59(1.17-2.16)**	1.36(1.04-1.79)**	1.11(0.88-1.41)	1.12(0.90-1.38)	0.63(0.26)**	0.57(0.20)**	1.10(0.87-1.40)	1.10(0.89-1.36)	13.15(5.77)**	13.67(5.22)**
No working (ref: Working)	0.80(0.65-0.97)**	0.79(0.66-0.94)**	2.09(1.04)**	1.54(0.92)*	0.72(0.62-0.83)***	0.76(0.67-0.86)***	1.25(1.02-1.53)**	1.14(0.95-1.36)	1.42(1.21-1.68)***	1.38(1.20-1.60)***	0.48(0.21)**	0.45(0.18)**	1.41(1.19-1.66)***	1.37(1.19-1.58)***	12.16(3.68)**	14.09(3.80)***
Having a private insurance	1.70(1.37-2.12)***	1.66(1.38-2)***	1.30(1.18)	0.80(1.01)	1.55(1.33-1.80)***	1.50(1.32-1.70)***	1.08(0.88-1.32)	1.04(0.87-1.24)	1.28(1.07-1.53)**	1.21(1.04-1.41)**	0.15(0.21)	0.06(0.17)	1.30(1.09-1.56)**	1.22(1.05-1.43)**	3.23(5.99)	3.40(5.31)

	Having any outpatient visits		No. of outpatient visits		Having medical check-ups		Having an emergency visit		Having any hospitalization		No. of hospitalization		Having any length of hospital stays		No. of length of hospital stays	
	Poverty line: Median disposable income															
	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%
	Odds ratio (95% CI)		β (SE)		Odds ratio (95% CI)		Odds ratio (95% CI)		Odds ratio (95% CI)		β (SE)		Odds ratio (95% CI)		β (SE)	
Self-assessed health (ref: Good)																
Fair	1.47(1.22-1.77)***	1.46(1.24-1.72)***	1.71(0.87)*	2(0.77)**	1.17(1.01-1.36)**	1.16(1.02-1.32)**	0.80(0.65-0.99)**	0.80(0.67-0.97)**	0.93(0.79-1.10)	0.89(0.77-1.03)	-0.48(0.16)**	-0.37(0.14)**	0.95(0.80-1.12)	0.90(0.78-1.05)	-26.14(5.40)***	-29.98(5.66)***
Bad	2.47(1.67-3.65)***	2.37(1.70-3.30)***	8.86(1.65)***	9.25(1.39)***	0.97(0.81-1.17)	1.04(0.88-1.22)	1.46(1.16-1.85)**	1.45(1.18-1.79)***	1.48(1.21-1.79)***	1.44(1.21-1.71)***	-0.11(0.24)	-0.002(0.21)	1.52(1.25-1.84)***	1.47(1.24-1.74)***	-13.97(7.10)*	-24.43(8.33)**
Having activity limitation due to diseases/injuries (ref: No)	0.94(0.48-1.86)	1.11(0.63-1.97)	9.17(2.60)***	8.17(2.29)***	0.89(0.71-1.10)	0.85(0.70-1.03)*	1.52(1.19-1.95)**	1.64(1.32-2.05)***	1.71(1.39-2.10)***	1.73(1.44-2.08)***	0.81(0.33)**	0.68(0.26)**	1.71(1.39-2.09)***	1.73(1.44-2.08)***	26.04(8.02)**	26.97(7.41)***
No. of chronic diseases	1.89(1.64-2.18)***	1.89(1.67-2.15)***	5.11(0.35)***	4.83(0.32)***	1.07(1.03-1.10)***	1.08(1.04-1.11)***	1.14(1.09-1.19)***	1.12(1.07-1.16)***	1.11(1.07-1.15)***	1.10(1.06-1.13)***	-0.01(0.07)	0.01(0.05)	1.11(1.07-1.15)***	1.10(1.06-1.14)***	-1.71(1.45)	-1.47(1.23)
Having cancer (ref: No)	1.97(0.57-6.74)	2.26(0.74-6.84)	-8.78(2.50)***	-7.38(2.17)**	0.99(0.69-1.43)	0.85(0.62-1.18)	1.71(1.12-2.60)**	1.56(1.07-2.29)**	2.14(1.53-2.98)***	1.92(1.44-2.56)***	1.27(0.99)	1.23(0.88)	2.15(1.54-3)***	1.93(1.45-2.58)***	6.39(10.14)	5.03(8.91)
Having a cardiac disease (ref: No)	1.80(0.42-7.71)	1.64(0.49-5.45)	-3.57(2.78)	-1.51(2.77)	0.88(0.68-1.15)	0.82(0.64-1.04)	1.21(0.90-1.64)	1.28(0.97-1.68)*	1.38(1.08-1.76)**	1.46(1.16-1.83)**	0.25(0.60)	0.19(0.46)	1.39(1.09-1.78)**	1.48(1.18-1.85)**	-14.98(8.34)*	-9.52(8.85)
Having a cerebro-vascular disease (ref: No)	4.91(1.16-20.82)**	2.45(0.99-6.03)*	-7.05(2.34)**	-6.79(2.26)**	0.98(0.77-1.24)	0.94(0.76-1.17)	1.16(0.86-1.56)	1.19(0.91-1.55)	1.23(0.96-1.59)	1.13(0.89-1.44)	-0.34(0.27)	-0.31(0.22)	1.21(0.94-1.57)	1.12(0.88-1.42)	1.33(7.28)	-3.10(6.91)
Having hypertension (ref: No)	2.78(1.72-4.50)***	3.19(2.08-4.89)***	1.13(1.53)	1.36(1.35)	0.93(0.79-1.09)	0.95(0.83-1.09)	0.97(0.79-1.21)	0.96(0.79-1.16)	0.99(0.83-1.18)	1.02(0.88-1.19)	0.38(0.25)	0.27(0.22)	0.98(0.82-1.17)	1.02(0.87-1.19)	5.72(4.99)	8.45(6.13)
Having diabetes (ref: No)	1.30(0.60-2.83)	0.99(0.52-1.90)	-2.52(2.09)	-1.34(1.85)	0.89(0.73-1.09)	0.87(0.73-1.04)	1.10(0.86-1.41)	1.03(0.82-1.29)	1.26(1.02-1.55)**	1.23(1.02-1.47)**	0.13(0.22)	0.08(0.19)	1.24(1.01-1.53)**	1.21(1.005-1.46)**	18.45(7.46)**	9.49(7.17)
Being mentally disabled (ref: No)	1.72(0.72-4.10)	1.22(0.53-2.80)	-10.82(3.68)***	-7.16(3.77)*	0.66(0.22-1.97)	0.63(0.27-1.48)	0.69(0.27-1.80)	0.55(0.22-1.40)	1.19(0.45-3.13)	1.16(0.48-2.83)	-0.20(0.47)	-0.21(0.39)	1.14(0.44-2.94)	1.13(0.47-2.73)	93.96(44.92)**	111.84(37.77)**
Being physically disabled (ref: No)	1.08(0.66-1.78)	1.16(0.74-1.81)	1.39(2.43)	1.92(2.18)	1.01(0.83-1.24)	0.97(0.81-1.16)	1.15(0.89-1.49)	1.12(0.88-1.41)	1.23(0.99-1.54)*	1.22(0.997-1.48)*	0.33(0.36)	0.32(0.30)	1.20(0.96-1.49)	1.19(0.98-1.45)*	13.13(8.45)	16.59(8.63)*
Year dummy (ref: 2011)																
2012	1(0.85-1.18)	1.01(0.88-1.17)	-0.66(0.71)	-0.43(0.58)	1.05(0.91-1.22)	1.02(0.90-1.16)	1.13(0.94-1.36)	1.19(1.01-1.40)**	1.18(1.02-1.37)**	1.21(1.06-1.38)**	0.03(0.15)	0.04(0.13)	1.19(1.03-1.39)**	1.22(1.07-1.39)**	-2.67(3.73)	1.83(3.67)
2013	1.02(0.84-1.24)	1.11(0.94-1.30)	-0.81(0.80)	-0.25(0.67)	1.11(0.97-1.28)	1.07(0.95-1.21)	0.89(0.72-1.09)	0.96(0.80-1.15)	1.11(0.95-1.31)	1.10(0.95-1.26)	-0.10(0.14)	-0.10(0.12)	1.13(0.96-1.32)	1.11(0.96-1.27)	3.93(5.46)	8.94(5.83)

*p<0.1, **p<0.05, ***p<0.01

Note: CI stands for confidence intervals; SE, standard errors. For the two-part model, the first part that examines the effect of having any health care utilization used multivariate logistic regressions, and the second part that examines the number of health care utilization used ordinary least squares regressions.

Table A8. Effect of poverty status change on health care utilization among the poor (two-part model, including the persistent non-poor)

	Having any outpatient visits		No. of outpatient visits		Having medical check-ups		Having an emergency visit		Having any hospitalization		No. of hospitalization		Having any length of hospital stays		No. of length of hospital stays	
	Poverty line: Median disposable income															
	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%
	Odds ratio (95% CI)		β (SE)		Odds ratio (95% CI)		Odds ratio (95% CI)		Odds ratio (95% CI)		β (SE)		Odds ratio (95% CI)		β (SE)	
Poverty status (ref: Persistent non-poor)																
Transient poor	0.93(0.78-1.10)	0.99(0.86-1.15)	1.35(0.88)	-0.01(0.67)	0.96(0.85-1.08)	0.98(0.88-1.10)	1.11(0.94-1.31)	0.95(0.80-1.12)	1.03(0.90-1.19)	1.03(0.90-1.17)	-0.01(0.15)	-0.18(0.13)	1.02(0.89-1.18)	1.03(0.90-1.18)	-3.13(6.67)	-0.83(6.35)
Recurrent poor	0.89(0.69-1.15)	0.89(0.72-1.10)	2.45(1.35)*	1.96(1.25)	1.11(0.95-1.30)	1.08(0.94-1.24)	0.97(0.76-1.23)	1.17(0.96-1.43)	0.97(0.81-1.18)	1.06(0.90-1.25)	-0.06(0.22)	0.06(0.20)	0.99(0.82-1.20)	1.07(0.90-1.26)	-11.74(8.94)	0.81(8.89)
Persistent poor	0.85(0.61-1.17)	1.03(0.80-1.32)	0.62(1.55)	1.08(1.16)	1.03(0.87-1.21)	1.08(0.94-1.24)	0.90(0.72-1.13)	0.86(0.70-1.06)	0.89(0.73-1.07)	0.89(0.75-1.06)	-0.25(0.19)	-0.18(0.19)	0.90(0.74-1.09)	0.90(0.76-1.07)	-11.07(8.71)	-10.60(7.96)
Medical Aid (ref: No)	1.27(0.89-1.82)	1.22(0.85-1.76)	4(1.88)**	3.94(1.91)**	0.76(0.63-0.93)**	0.75(0.62-0.92)**	1.40(1.14-1.74)**	1.42(1.15-1.76)**	1.46(1.19-1.79)***	1.47(1.20-1.81)***	0.07(0.16)	0.05(0.17)	1.44(1.18-1.76)***	1.45(1.19-1.77)***	23.07(11.09)**	22.87(10.94)**
Female (ref: Male)	2.29(2.10-2.50)***	2.29(2.10-2.51)***	0.85(0.47)*	0.85(0.47)*	1.25(1.17-1.34)***	1.25(1.17-1.34)***	0.77(0.70-0.86)***	0.77(0.70-0.86)***	0.81(0.74-0.89)***	0.81(0.74-0.89)***	-0.19(0.09)**	-0.20(0.09)**	0.82(0.75-0.89)***	0.82(0.75-0.89)***	-5.15(3.11)*	-5.33(3.10)*
Age (ref: 20-44 years old)																
45-64	1.03(0.93-1.16)	1.03(0.92-1.15)	0.28(0.37)	0.29(0.37)	1.63(1.50-1.78)***	1.63(1.49-1.78)***	0.78(0.68-0.89)***	0.78(0.68-0.89)***	0.84(0.75-0.94)**	0.84(0.75-0.94)**	0.22(0.11)**	0.22(0.11)**	0.84(0.75-0.94)**	0.84(0.75-0.94)**	6.55(2.78)**	6.51(2.83)**
65-74	1.95(1.52-2.51)***	1.94(1.51-2.49)***	4.80(0.85)***	4.78(0.85)***	2.01(1.78-2.27)***	2.00(1.77-2.26)***	0.74(0.61-0.89)**	0.74(0.61-0.89)**	0.93(0.79-1.09)	0.93(0.79-1.09)	0.21(0.18)	0.21(0.18)	0.93(0.79-1.09)	0.93(0.79-1.09)	0.74(5.04)	0.73(5)
75+	1.07(0.79-1.46)	1.04(0.77-1.42)	4.20(1.29)**	4.16(1.30)**	1.42(1.21-1.67)***	1.42(1.21-1.66)***	1.07(0.86-1.34)	1.07(0.86-1.34)	1.29(1.06-1.56)**	1.29(1.06-1.56)**	0.17(0.19)	0.16(0.19)	1.28(1.06-1.55)**	1.28(1.06-1.55)**	17.06(6.52)**	17.16(6.49)**
Marital status (ref: Married)																
Widowed/divorced/separated	0.36(0.29-0.44)***	0.36(0.30-0.44)***	-0.96(1.07)	-0.95(1.07)	0.60(0.52-0.68)***	0.60(0.52-0.68)***	1.05(0.88-1.24)	1.04(0.88-1.24)	0.98(0.84-1.14)	0.98(0.84-1.14)	0.17(0.25)	0.17(0.25)	0.94(0.81-1.09)	0.94(0.81-1.09)	27.78(7.02)**	27.70(7.02)**
Single	0.30(0.27-0.34)***	0.30(0.27-0.34)***	-1.33(0.39)**	-1.32(0.39)**	0.24(0.21-0.28)***	0.24(0.21-0.28)***	0.63(0.53-0.75)***	0.63(0.53-0.75)***	0.43(0.36-0.51)***	0.43(0.36-0.50)***	-0.05(0.09)	-0.05(0.09)	0.42(0.36-0.50)***	0.42(0.36-0.50)***	-0.95(3.52)	-0.92(3.51)
No. of family members (ref: Three+)																
Living alone	2.54(1.95-3.29)***	2.49(1.92-3.23)***	2.18(1.36)	2.12(1.35)	2.37(2.01-2.79)***	2.35(2-2.76)***	1.06(0.85-1.33)	1.07(0.85-1.34)	1.12(0.93-1.36)	1.12(0.93-1.36)	-0.07(0.16)	-0.08(0.16)	1.17(0.97-1.41)	1.17(0.97-1.42)*	-27.19(7.87)**	-27.05(7.92)**
Two	1.42(1.24-1.62)***	1.41(1.23-1.61)***	1.17(0.59)**	1.16(0.58)**	1.36(1.26-1.47)***	1.35(1.25-1.46)***	1.14(1.01-1.29)**	1.14(1.01-1.29)**	1.22(1.10-1.35)***	1.22(1.10-1.35)***	0.29(0.15)*	0.29(0.15)*	1.22(1.10-1.36)***	1.23(1.11-1.36)***	-6.20(3.80)	-6.02(3.78)
Residential region (ref: Others)																
Seoul	0.99(0.88-1.12)	099(0.88-1.12)	-1.19(0.50)**	-1.19(0.50)**	1.07(0.98-1.17)	1.07(0.98-1.17)	0.71(0.61-0.82)***	0.71(0.61-0.82)***	0.71(0.62-0.80)***	0.71(0.62-0.80)***	-0.20(0.18)	-0.20(0.18)	0.71(0.63-0.81)***	0.71(0.63-0.81)***	-3.81(6.28)	-3.76(6.25)
Metropolitan cities	0.96(0.88-1.06)	0.96(0.88-1.06)	-1.06(0.47)**	-1.06(0.47)**	1.05(0.98-1.12)	1.05(0.98-1.12)	0.85(0.76-0.94)**	0.85(0.76-0.94)**	0.88(0.80-0.96)**	0.88(0.80-0.96)**	-0.16(0.08)**	-0.16(0.08)*	0.87(0.80-0.95)**	0.87(0.80-0.95)**	-3.18(2.88)	-3.09(2.86)
ln(Total household disposable income per equivalent adult)	1.28(1.18-1.39)***	1.31(1.20-1.42)***	0.73(0.34)**	0.70(0.35)**	1.37(1.29-1.46)***	1.39(1.30-1.48)***	1.18(1.07-1.30)**	1.17(1.05-1.29)**	1.23(1.14-1.33)***	1.23(1.13-1.34)***	0.05(0.10)	0.04(0.10)	1.23(1.14-1.33)***	1.23(1.13-1.34)***	-1.57(5.26)	-1.01(5.80)
Education attainment (ref:																

	Having any outpatient visits		No. of outpatient visits		Having medical check-ups		Having an emergency visit		Having any hospitalization		No. of hospitalization		Having any length of hospital stays		No. of length of hospital stays	
	Poverty line: Median disposable income															
	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%	<40%	<50%
	Odds ratio (95% CI)		β (SE)		Odds ratio (95% CI)		Odds ratio (95% CI)		Odds ratio (95% CI)		β (SE)		Odds ratio (95% CI)		β (SE)	
College and more)																
Elementary school	1.06(0.86-1.31)	1.06(0.86-1.31)	4.59(0.79)***	4.60(0.80)***	0.85(0.76-0.95)**	0.85(0.76-0.95)**	1.35(1.13-1.60)**	1.36(1.14-1.62)**	1.59(1.38-1.84)***	1.59(1.38-1.84)***	-0.02(0.14)	-0.01(0.14)	1.56(1.35-1.80)***	1.56(1.35-1.80)***	16.16(4.81)**	16.28(4.64)***
High school	0.996(0.90-1.10)	0.999(0.91-1.10)	1.35(0.35)***	1.35(0.35)***	0.93(0.86-1.01)*	0.93(0.86-1.01)*	1.29(1.14-1.46)***	1.29(1.14-1.46)***	1.21(1.09-1.35)***	1.21(1.09-1.35)***	0.19(0.10)*	0.19(0.10)*	1.20(1.08-1.34)**	1.20(1.08-1.34)**	9.27(2.43)***	9.32(2.43)***
No working (ref: Working)	1.1(1.002-1.20)**	1.09(0.998-1.20)*	0.66(0.41)	0.65(0.41)	0.83(0.77-0.89)***	0.83(0.77-0.89)***	1.11(1-1.24)*	1.11(1.001-1.24)**	1.32(1.21-1.45)***	1.32(1.21-1.45)***	0.42(0.10)***	0.41(0.10)***	1.31(1.20-1.43)***	1.31(1.20-1.43)***	12.95(2.49)***	12.99(2.51)***
Having a private insurance	1.69(1.53-1.87)***	1.70(1.54-1.88)***	0.12(0.54)	0.13(0.54)	1.44(1.33-1.56)***	1.44(1.34-1.56)***	1.07(0.95-1.19)	1.07(0.95-1.20)	1.16(1.04-1.28)**	1.16(1.05-1.28)***	-0.02(0.11)	-0.02(0.11)	1.17(1.06-1.30)**	1.18(1.06-1.30)**	-0.77(3.45)	-0.51(3.40)
Self-assessed health (ref: Good)																
Fair	1.52(1.41-1.65)***	1.52(1.41-1.65)***	1.94(0.30)***	1.93(0.30)***	1.15(1.08-1.22)***	1.15(1.08-1.23)***	0.91(0.83-1.01)*	0.91(0.83-1.01)*	1(0.92-1.09)	0.999(0.92-1.09)	-0.22(0.07)**	-0.22(0.07)**	1.01(0.93-1.10)	1.01(0.93-1.10)	-21.31(2.78)***	-21.27(2.76)***
Bad	2.54(2.08-3.10)***	2.53(2.07-3.09)***	9.25(0.75)***	9.24(0.75)***	1.07(0.97-1.17)	1.06(0.97-1.17)	1.50(1.31-1.72)***	1.51(1.32-1.73)***	1.65(1.47-1.85)***	1.65(1.47-1.85)***	0.26(0.15)*	0.26(0.15)*	1.68(1.49-1.88)***	1.68(1.49-1.88)***	-15.52(5.06)**	-15.56(5.07)**
Having activity limitation due to diseases/injuries (ref: No)	1.68(1.13-2.51)**	1.68(1.13-2.50)**	8.43(1.59)***	8.37(1.59)***	0.86(0.75-0.99)**	0.86(0.74-0.99)**	1.76(1.49-2.09)***	1.76(1.49-2.09)***	1.84(1.58-2.13)***	1.83(1.58-2.12)***	0.92(0.21)***	0.91(0.21)***	1.85(1.59-2.14)***	1.85(1.59-2.14)***	16.86(5.29)**	17.03(5.33)**
No. of chronic diseases	2.05(1.90-2.21)***	2.05(1.90-2.21)***	4.39(0.17)***	4.39(0.17)***	1.07(1.06-1.09)***	1.07(1.06-1.09)***	1.10(1.07-1.13)***	1.10(1.07-1.13)***	1.10(1.08-1.13)***	1.10(1.08-1.13)***	-0004(0.03)	-0.004(0.03)	1.10(1.08-1.13)***	1.10(1.08-1.13)***	-0.99(0.74)	-1.01(0.74)
Having cancer (ref: No)	2.04(1.13-3.69)**	2.04(1.13-3.70)**	-4.04(1.05)***	-4.02(1.05)***	1.18(1.004-1.39)**	1.18(1.005-1.39)**	1.30(1.03-1.65)**	1.31(1.03-1.66)**	1.79(1.482.15)***	1.79(1.48-2.15)***	0.87(0.43)**	0.87(0.43)**	1.80(1.50-2.17)***	1.80(1.50-2.17)***	2.72(4.68)	2.66(4.69)
Having a cardiac disease (ref: No)	1.25(0.50-3.13)	1.26(0.50-3.16)	-1.33(1.62)	-1.30(1.62)	0.80(0.68-0.94)**	0.80(0.68-0.94)**	1.38(113-1.68)**	1.38(1.13-1.68)**	1.36(1.15-1.61)***	1.36(1.15-1.61)***	0.06(0.29)	0.06(0.28)	1.38(1.16-1.63)***	1.38(1.17-1.63)***	-6.59(6.28)	-6.64(6.28)
Having a cerebro-vascular disease (ref: No)	0.73(0.48-1.10)	0.73(0.49-1.11)	-5.67(1.36)***	-5.66(1.35)***	0.91(0.80-1.05)	0.91(0.80-1.05)	1.25(1.04-1.50)**	1.25(1.04-1.50)**	1.23(1.04-1.46)**	1.23(1.04-1.46)**	-0.30(0.15)**	-0.30(0.15)**	1.23(1.04-1.46)**	1.23(1.03-1.46)**	-0.66(5.40)	-0.63(5.40)
Having hypertension (ref: No)	2.95(2.23-3.90)***	2.96(2.23-3.92)***	1.79(0.69)**	1.79(0.69)**	1.002(0.92-1.09)	1.003(0.92-1.09)	0.99(0.87-1.13)	0.99(0.87-1.13)	0.97(0.88-1.08)	0.97(0.88-1.08)	0.27(0.15)*	0.27(0.15)*	0.98(0.88-1.08)	0.98(0.88-1.08)	7.94(4.60)*	8.07(4.64)*
Having diabetes (ref: No)	1.29(0.81-2.06)	1.29(0.81-2.06)	-0.72(1.04)	-0.70(1.04)	0.85(0.76-0.95)**	0.85(0.76-0.95)**	1.01(0.86-1.18)	1.01(0.86-1.18)	1.11(0.98-1.27)	1.11(0.98-1.27)	0.05(0.15)	0.05(0.15)	1.10(0.97-1.25)	1.10(0.97-1.25)	9.75(5.68)*	9.59(5.64)*
Being mentally disabled (ref: No)	1.62(0.89-2.96)	1.61(0.88-2.94)	-6.80(2.37)**	-6.80(2.36)**	0.58(0.27-1.28)	0.58(0.26-1.28)	0.37(0.16-0.89)**	0.37(0.16-0.89)**	0.98(0.46-2.09)	0.98(0.46-2.09)	-0.25(0.28)	-0.25(0.28)	0.95(0.45-2.04)	0.95(0.45-2.03)	124.44(34.22)***	125(34.20)***
Being physically disabled (ref: No)	1.08(0.80-1.44)	1.08(0.81-1.45)	1.96(1.36)	2(1.36)	0.88(0.77-0.99)**	0.88(0.77-0.99)**	1.23(1.04-1.46)**	1.23(1.04-1.46)**	1.34(116-1.55)***	1.34(1.16-1.55)***	0.22(0.20)	0.22(0.20)	1.31(1.14-1.51)***	1.31(1.14-1.51)***	13.95(5.99)**	13.61(5.94)**
Year dummy (ref: 2011)																
2012	1.11(1.04-1.18)**	1.11(1.04-1.18)**	0.58(0.24)**	0.57(0.24)**	1.08(1.01-1.16)**	1.08(1.01-1.16)**	1.07(0.97-1.18)	1.08(0.97-1.19)	1.12(1.04-1.22)**	1.13(1.04-1.22)**	0.03(0.09)	0.03(0.09)	1.14(1.05-1.24)**	1.14(1.06-1.24)**	2.81(2.38)	2.93(2.41)
2013	1.16(1.08-1.25)***	1.16(1.08-1.25)***	0.34(0.26)	0.33(0.25)	1.06(0.99-1.12)*	1.06(0.99-1.12)*	1.02(0.93-1.14)	1.03(0.93-1.14)	1.06(0.98-1.16)	1.07(0.98-1.16)	-0.12(0.09)	-0.12(0.09)	1.08(0.993-1.18)*	1.08(0.996-1.18)*	3.95(3.17)	4.21(3.29)

*p<0.1, **p<0.05, ***p<0.01

Note: CI stands for confidence intervals; SE, standard errors. For the two-part model, the first part that examines the effect of having any health care utilization used multivariate logistic regressions, and the second part that examines the number of health care utilization used ordinary least squares regressions.

Table A9. Effect of the Medical Aid status change on health care utilization (excluding the continuous health insurance)

	No. of outpatient visits	Having medical check-ups	Having an emergency visit	No. of hospitalization	No. of length of hospital stays
	Exp(β) (95% CI)	Odds ratio (95% CI)	Odds ratio (95% CI)	Exp(β) (95% CI)	Exp(β) (95% CI)
Medical Aid status (ref: Continuous Medical Aid)					
New Medical Aid	1.13(0.88-1.45)	1.08(0.52-2.24)	1.11(0.55-2.27)	1.01(053-1.90)	1.26(0.51-3.09)
New health insurance	0.98(0.80-1.20)	1.40(0.83-2.33)	0.80(0.44-1.44)	0.67(0.39-1.16)	0.49(0.25-0.95)**
Female (ref: Male)	1.09(0.93-1.28)	1.14(0.79-1.63)	0.72(0.49-1.04)*	0.69(0.50-0.94)**	0.70(0.46-1.05)*
Age (ref: 20-44 years old)					
45-64	1.58(1.29-1.94)***	5.03(2.82-8.96)***	0.58(0.33-1.02)*	0.77(0.48-1.24)	1.33(0.71-2.52)
65-74	1.78(1.36-2.32)***	4.48(2.16-9.32)***	0.70(0.35-1.39)	0.71(0.39-1.26)	0.67(0.31-1.45)
75+	1.26(0.95-1.67)	3.08(1.41-6.72)**	1.21(0.58-2.52)	1.06(0.59-1.91)	1.76(0.83-3.77)
Marital status (ref: Married)					
Widowed/divorced/separated	0.80(0.67-0.95)**	0.72(0.48-1.07)	0.98(0.62-1.53)	0.91(0.66-1.25)	1.15(0.70-1.88)
Single	0.59(0.46-0.76)***	0.79(0.45-1.40)	0.56(0.29-1.07)*	0.46(0.26-0.82)**	0.25(0.13-0.46)***
No. of family members (ref: Three+)					
Living alone	1.25(1.04-1.52)**	2.74(1.68-4.47)***	0.62(0.36-1.07)*	1.23(0.84-1.78)	0.73(0.43-1.23)
Two	1.20(1.02-1.41)**	1.62(1.11-2.36)**	0.60(0.39-0.94)**	1.13(0.81-1.57)	1.12(0.71-1.76)
Residential region (ref: Others)					
Seoul	0.85(0.71-1.02)*	1.40(0.91-2.15)	0.76(0.44-1.33)	0.86(0.57-1.29)	0.61(0.38-0.99)**
Metropolitan cities	0.91(0.77-1.06)	1.17(0.81-1.69)	0.82(0.56-1.19)	0.98(0.71-1.36)	1.09(0.71-1.68)
ln(Total household disposable income per equivalent adult)	0.90(0.81-1.01)*	1.01(0.78-1.31)	1.14(0.86-1.50)	1.24(1.001-1.53)**	1.13(0.85-1.50)
Education attainment (ref: College and more)					
Elementary school	1.42(1.09-1.84)**	0.95(0.52-1.75)	1.38(0.70-2.72)	2.19(1.24-3.85)**	3.53(1.76-7.08)***
High school	1.33(1.10-1.62)**	0.97(0.58-1.62)	1.92(1.09-3.39)**	2.25(1.42-3.60)**	2.84(1.55-5.21)**
No working (ref: Working)	1.13(0.99-1.29)*	0.54(0.37-0.78)**	0.91(0.63-1.31)	1.66(1.20-2.30)**	2.40(1.52-3.77)***
Having a private insurance	1.17(1.002-1.36)**	1.45(1.03-2.05)**	1.25(0.86-1.81)	1.27(0.92-1.74)	1.69(1.06-2.70)**
Self-assessed health (ref: Good)					
Fair	1.30(1.13-1.51)***	0.76(0.53-1.09)	0.90(0.59-1.38)	0.48(0.35-0.66)***	0.23(0.14-0.36)***
Bad	1.79(1.49-2.16)***	0.72(0.47-1.11)	1.78(1.16-2.72)**	0.85(0.62-1.17)	0.60(0.39-0.92)**

	No. of outpatient visits	Having medical check-ups	Having an emergency visit	No. of hospitalization	No. of length of hospital stays
	Exp(β) (95% CI)	**Odds ratio (95% CI)**	**Odds ratio (95% CI)**	**Exp(β) (95% CI)**	**Exp(β) (95% CI)**
Having activity limitation due to diseases/injuries (ref: No)	1.23(1.04-1.46)**	0.89(0.58-1.35)	1.31(0.89-1.93)	1.32(1.01-1.73)**	1.65(1.13-2.41)**
No. of chronic diseases	1.16(1.12-1.20)***	0.996(0.93-1.07)	1.21(1.12-1.31)***	1.13(1.06-1.19)***	1.18(1.08-1.28)****
Having cancer (ref: No)	0.98(0.75-1.28)	1.17(0.54-2.54)	2.88(1.56-5.30)**	1.74(1.15-2.63)**	1.49(0.79-2.79)
Having a cardiac disease (ref: No)	0.84(0.66-1.07)	1.32(0.77-2.25)	0.91(0.54-1.53)	0.88(0.60-1.30)	0.75(0.43-1.28)
Having a cerebro-vascular disease (ref: No)	0.84(0.68-1.05)	0.62(0.39-1.003)*	1.34(0.82-2.19)	1.53(1.002-2.34)**	1.58(0.95-2.61)*
Having hypertension (ref: No)	1.10(0.92-1.31)	1.40(0.96-2.05)*	1.04(0.70-1.55)	0.99(0.73-1.34)	0.93(0.60-1.44)
Having diabetes (ref: No)	0.96(0.79-1.17)	1.33(0.86-2.08)	0.75(0.49-1.15)	1.04(0.76-1.41)	0.86(0.54-1.38)
Being mentally disabled (ref: No)	0.96(0.66-1.42)	0.57(0.20-1.63)	0.70(0.24-2.03)	0.54(0.20-1.49)	1.70(0.56-5.18)
Being physically disabled (ref: No)	1.01(0.84-1.21)	0.85(0.59-1.23)	1.24(0.83-1.85)	1.54(1.14-2.08)**	2.20(1.45-3.32)***
Year dummy (ref: 2011)					
2012	1.05(0.95-1.16)	1.21(0.84-1.72)	0.88(0.62-1.23)	0.87(0.68-1.12)	1.15(0.84-1.57)
2013	1.03(0.92-115)	0.92(0.65-1.30)	0.93(0.65-1.32)	0.82(0.63-1.06)	1.08(0.77-1.53)

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

Note: Exp(β) means exponentiated coefficients; CI stands for confidence intervals; SE, standard errors.

Table A10. Effect of the Medical Aid status change on health expenditure and unmet need (excluding the continuous health insurance)

	ln(Total health expenditure)	ln(Outpatient health expenditure)	ln(Inpatient health expenditure)	Unmet need (All reasons)	Unmet need (Economic reason)
	Exp(β) (95% CI)	Exp(β) (95% CI)	Exp(β) (95% CI)	Odds ratio (95% CI)	Odds ratio (95% CI)
Medical Aid status (ref: Continuous Medical Aid)					
New Medical Aid	1.04(0.92-1.18)	1.06(0.98-1.14)	0.93(0.67-1.29)	0.73(0.37-1.41)	0.85(0.20-3.61)
New health insurance	1.05(0.94-1.18)	1.15(1.1-1.20)***	1.13(0.93-1.37)	1.32(0.85-2.06)	2.13(0.77-5.92)
Female (ref: Male)	1.14(1.06-1.22)**	1.05(1.01-1.10)**	1.08(0.96-1.21)	1.35(0.99-1.85)*	0.55(0.32-0.96)**
Age (ref: 20-44 years old)					
45-64	1.13(1.01-1.25)**	1.01(0.95-1.07)	0.90(0.76-1.07)	1.77(1.15-2.73)**	1.86(0.84-4.10)
65-74	1.08(0.96-1.22)	0.95(0.88-1.03)	0.94(0.78-1.13)	1.10(0.65-1.86)	1.06(0.37-3.04)
75+	1.07(0.94-1.22)	0.87(0.79-0.96)**	0.98(0.80-1.21)	1.03(0.60-1.77)	0.35(0.12-1.02)*
Marital status (ref: Married)					
Widowed/divorced/separated	0.91(0.84-0.98)**	0.97(0.93-1.01)	1.03(0.89-1.18)	1.07(0.76-1.50)	1.64(0.87-3.09)
Single	0.66(0.58-0.76)***	0.89(0.83-0.96)**	1.02(0.83-1.25)	1.39(0.87-2.21)	1.34(0.56-3.20)
No. of family members (ref: Three+)					
Living alone	1.08(0.97-1.20)	1.04(0.97-1.06)	1.07(0.88-1.30)	0.92(0.59-1.43)	0.46(0.21-1.03)*
Two	1.09(1.01-1.17)**	1.02(0.97-1.06)	1.10(0.96-1.25)	0.94(0.69-1.28)	0.72(0.38-1.39)
Residential region (ref: Others)					
Seoul	1.02(0.93-1.12)	1.003(0.95-1.06)	1.09(0.97-1.22)	1.04(0.71-1.51)	1.63(0.71-3.73)
Metropolitan cities	1.01(0.94-1.09)	1.01(0.97-1.06)	0.95(0.83-1.09)	1.19(0.87-1.62)	2.74(1.49-5.05)**
ln(Total household disposable income per equivalent adult)	1.09(1.03-1.16)**	1.09(1.05-1.13)***	1.08(1.002-1.15)**	0.70(0.55-0.89)**	0.20(0.12-0.34)***
Education attainment (ref: College and more)					
Elementary school	1.03(0.91-1.17)	0.94(0.87-1.01)	0.89(0.72-1.09)	1.40(0.88-2.24)	2.43(0.92-6.46)*
High school	1.06(0.95-1.18)	0.95(0.90-1.01)	0.98(0.86-1.13)	0.99(0.65-1.49)	0.97(0.47-1.99)
No working (ref: Working)	1.05(0.98-1.12)	1.01(0.98-1.05)	1.04(0.91-1.18)	0.80(0.59-1.08)	1.78(0.97-3.26)*
Having a private insurance	1.21(1.13-1.31)***	1.04(1.01-1.08)**	1.09(0.99-1.21)*	0.98(0.72-1.32)	1.28(0.70-2.35)
Self-assessed health (ref: Good)					
Fair	1.08(1.003-1.16)**	1.04(0.99-1.10)	1.07(0.94-1.22)	1.55(1.11-2.16)**	0.95(0.49-1.81)
Bad	1.12(1.04-1.21)**	1.11(1.05-1.18)***	1.08(0.95-1.21)	2.49(1.72-3.61)***	1.16(0.64-2.08)
Having activity limitation due to diseases/injuries (ref: No)	1.06(0.98-1.13)	0.98(0.93-1.04)	1.03(0.92-1.14)	2.40(1.75-3.30)***	0.76(0.41-1.44)
No. of chronic diseases	1.04(1.03-1.05)***	1.02(1.01-1.03)***	1.01(0.99-1.03)	0.91(0.85-0.97)**	0.99(0.86-1.13)

	ln(Total health expenditure)	ln(Outpatient health expenditure)	ln(Inpatient health expenditure)	Unmet need (All reasons)	Unmet need (Economic reason)
	Exp(β) (95% CI)	**Exp(β) (95% CI)**	**Exp(β) (95% CI)**	**Odds ratio (95% CI)**	**Odds ratio (95% CI)**
Having cancer (ref: No)	1.09(0.995-1.19)*	1.06(0.99-1.13)*	1.02(0.90-1.15)	0.67(0.30-1.49)	0.27(0.06-1.19)*
Having a cardiac disease (ref: No)	1.02(0.96-1.09)	1.08(1.02-1.13)**	1.03(0.92-1.15)	1.30(0.77-2.19)	4.16(1.17-14.74)**
Having a cerebro-vascular disease (ref: No)	1.0(1.01-1.17)**	1.03(0.97-1.08)	1.06(0.93-1.22)	0.78(0.47-1.28)	2.01(0.67-5.97)
Having hypertension (ref: No)	0.99(0.93-1.07)	0.99(0.93-1.04)	1.02(0.90-1.16)	0.95(0.68-1.33)	1.49(0.80-2.80)
Having diabetes (ref: No)	1.06(0.997-1.13)*	1.06(1.01-1.10)**	1.01(0.91-1.13)	0.82(0.57-1.17)	0.61(0.28-1.31)
Being mentally disabled (ref: No)	0.76(0.60-0.96)**	0.70(0.59-0.82)***	0.41(0.13-1.35)	0.48(0.25-0.94)**	0.40(0.09-1.74)
Being physically disabled (ref: No)	1.06(0.99-1.14)*	0.97(0.92-1.01)	1.03(0.93-1.13)	0.78(0.55-1.11)	0.43(0.23-0.81)**
Year dummy (ref: 2011)					
2012	1.04(0.98-1.09)	1.03(0.99-1.07)	0.99(0.91-1.08)	1.08(0.83-1.41)	0.89(0.50-1.60)
2013	1.03(0.96-1.09)	1.02(0.98-1.07)	0.96(0.85-1.09)	1.50(1.13-1.98)**	0.59(0.34-1.04)*

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

Note: Exp(β) means exponentiated coefficients; CI stands for confidence intervals; SE, standard errors. Health expenditure only covers out-of-pocket payments.

Table A11. Effect of the Medical Aid status change on health care utilization (two-part model)

	Having any outpatient visits	No. of outpatient visits	Having medical check-ups	Having an emergency visit	Having any hospitalization	No. of hospitalization	Having any length of hospital stays	No. of length of hospital stays
	Odds ratio (95% CI)	β (SE)	Odds ratio (95% CI)	Odds ratio (95% CI)	Odds ratio (95% CI)	β (SE)	Odds ratio (95% CI)	β (SE)
Medical Aid status (ref: Continuous health insurance)								
New Medical Aid	1.18(0.52-2.70)	3.58(3.87)	0.90(0.46-1.76)	1.59(0.76-3.29)	1.32(0.68-2.56)	0.14(0.54)	1.36(0.70-2.65)	17.09(30.78)
New health insurance	1.070.65-1.76)	6.16(3.71)*	0.997(0.61-1.63)	1.18(0.66-2.09)	0.88(0.52-1.49)	0.22(0.79)	0.85(0.50-1.46)	26.16(40.11)
Continuous Medical Aid	1.27(0.89-1.83)	4.16(1.97)**	0.74(0.60-0.90)**	1.36(1.10-1.68)**	1.43(1.17-1.76)**	0.02(0.17)	1.41(1.15-1.73)**	22.08(10.80)**
Female (ref: Male)	2.30(2.10-2.51)***	0.85(0.47)*	1.25(1.17-1.34)***	0.77(0.69-0.85)***	0.81(0.73-0.88)***	-0.21(0.09)**	0.81(0.74-0.89)***	-5.46(3.13)*
Age (ref: 20-44 years old)								
45-64	1.03(0.93-1.16)	0.31(0.37)	1.63(1.50-1.78)***	0.78(0.68-0.89)***	0.84(0.75-0.94)**	0.20(0.11)*	0.84(0.75-0.94)**	6.30(2.76)**
65-74	1.97(1.53-2.53)***	4.85(0.85)***	2.01(1.78-2.27)***	0.75(0.62-0.90)**	0.93(0.79-1.09)	0.19(0.18)	0.93(0.79-1.09)	0.26(5.12)
75+	1.01(0.75-1.36)	4.22(1.29)**	1.43(1.22-1.67)***	1.06(0.85-1.32)	1.27(1.05-1.54)**	0.12(0.19)	1.27(1.05-1.54)**	16.88(6.60)**
Marital status (ref: Married)								
Widowed/divorced/separated	0.37(0.30-0.45)***	-0.995(1.07)	0.60(0.53-0.68)***	1.07(0.90-1.26)	0.98(0.85-1.14)	0.21(0.25)	0.94(0.81-1.10)	27.55(6.89)***
Single	0.30(0.27-0.34)***	-1.35(0.39)***	0.24(0.21-0.28)***	0.63(0.53-0.75)***	0.43(0.36-0.51)***	-0.05(0.09)	0.42(0.36-0.50)***	-1.27(3.50)
No. of family members (ref: Three+)								
Living alone	2.51(1.94-3.26)***	2.37(1.32)*	2.39(2.04-2.81)***	1.03(0.82-1.29)	1.10(0.91-1.33)	-0.15(0.15)	1.15(0.95-1.38)	-28.95(7.20)***
Two	1.42(1.24-1.63)***	1.30(0.59)**	1.36(1.26-1.47)***	1.14(1.01-1.28)**	1.21(1.09-1.34)***	0.27(0.15)*	1.21(1.10-1.35)***	-6.91(3.63)*
Residential region (ref: Others)								
Seoul	0.98(0.87-1.11)	-1.22(0.50)**	1.07(0.98-1.17)	0.71(0.61-0.82)***	0.62-0.80)***	-0.20(0.18)	0.71(0.63-0.81)***	-3.43(6.21)
Metropolitan cities	0.96(0.87-1.05)	-1.09(0.47)**	1.05(0.98-1.12)	0.85(0.76-0.94)**	0.88(0.80-0.96)**	-0.16(0.08)**	0.87(0.80-0.95)**	-2.39(2.90)
ln(Total household disposable income per equivalent adult)	1.32(1.22-1.42)***	0.36(0.34)	1.36(1.28-1.44)***	1.19(1.09-1.30)***	1.25(1.16-1.35)***	0.08(0.09)	1.25(1.16-1.34)***	1.32(4.34)
Education attainment (ref: College and more)								
Elementary school	1.06(0.86-1.31)	4.62(0.79)***	0.85(0.76-0.95)**	1.35(1.13-1.60)**	1.60(1.39-1.85)***	-0.01(0.14)	1.47(1.36-1.82)***	16.92(4.88)**
High school	1(0.91-1.10)	1.29(0.60-1.98)***	0.93(0.86-1.003)*	1.29(114-1.46)***	1.22(1.10-1.36)***	0.19(0.10)*	1.21(1.09-1.35)***	9.84(2.42)***
No working (ref: Working)	1.09(0.99-1.19)*	0.67(0.40)*	0.83(0.77-0.89)***	1.11(0.997-1.23)*	1.32(1.21-1.44)***	0.41(0.10)***	1.31(1.20-1.43)***	12.79(2.47)***
Having a private insurance	1.70(1.54-1.88)***	0.08(0.53)	1.44(1.33-1.56)***	1.06(0.95-1.19)	1.16(1.05-1.28)**	-0.02(0.11)	1.17(1.06-1.30)**	-0.12(3.54)

	Having any outpatient visits	No. of outpatient visits	Having medical check-ups	Having an emergency visit	Having any hospitalization	No. of hospitalization	Having any length of hospital stays	No. of length of hospital stays
	Odds ratio (95% CI)	β (SE)	Odds ratio (95% CI)	Odds ratio (95% CI)	Odds ratio (95% CI)	β (SE)	Odds ratio (95% CI)	β (SE)
Self-assessed health (ref: Good)								
Fair	1.53(1.42-1.65)***	1.93(0.30)***	1.15(1.08-1.23)***	0.92(0.83-1.01)*	1(0.92-1.09)	-0.22(0.07)**	1.01(0.93-1.10)	-21.58(2.78)***
Bad	2.57(2.10-3.14)***	9.23(0.75)***	1.07(0.97-1.17)	1.52(1.33-1.74)***	1.65(1.47-1.85)***	0.26(0.15)*	1.68(1.49-1.88)***	-16.24(5.03)**
Having activity limitation due to diseases/injuries (ref: No)	1.68(1.13-2.51)**	8.38(1.59)***	0.86(0.74-0.99)**	1.75(1.48-2.08)***	1.82(1.57-2.11)***	0.89(0.21)***	1.83(1.58-2.12)***	16.09(5.14)**
No. of chronic diseases	2.03(1.89-2.19)***	4.39(0.17)***	1.08(1.06-1.09)***	1.10(1.07-1.13)***	1.10(1.08-1.13)***	-0.003(0.03)	1.10(1.08-1.13)***	-1.15(0.67)*
Having cancer (ref: No)	2.07(1.14-3.76)**	-3.97(1.05)***	1.17(0.996-1.38)*	1.30(1.02-1.64)**	1.79(1.49-2.16)***	0.84(0.42)**	1.81(1.50-2.18)***	2.19(4.64)
Having a cardiac disease (ref: No)	1.30(0.52-3.24)	-1.26(1.62)	0.80(0.68-0.94)**	1.37(1.13-1.68)**	1.36(1.14-1.60)***	0.04(0.28)	1.37(1.16-1.62)***	-6.62(6.23)
Having a cerebro-vascular disease (ref: No)	0.63(0.41-0.97)**	-5.63(1.36)***	0.91(0.79-1.04)	1.25(1.04-1.51)**	1.25(1.14-1.60)***	-0.25(0.15)*	1.25(1.05-1.48)**	1.03(5.46)
Having hypertension (ref: No)	2.88(2.18-3.79)***	1.78(0.69)**	1.0004(0.92-1.09)	0.98(0.86-1.11)	0.97(0.87-1.07)	0.28(0.15)*	0.97(0.88-1.08)	8.60(4.70)*
Having diabetes (ref: No)	1.16(0.73-1.85)	-0.74(1.04)	0.85(0.76-0.95)**	1.02(0.87-1.19)	1.13(0.99-1.28)*	0.07(0.15)	1.12(0.98-1.27)*	10.18(5.63)*
Being mentally disabled (ref: No)	1.59(0.87-2.92)	-6.67(2.35)**	0.59(0.27-1.30)	0.38(0.16-0.90)**	0.99(0.46-2.11)	-0.28(0.27)	0.97(0.45-2.05)	122.22(34.76)***
Being physically disabled (ref: No)	1.02(0.76-1.37)	1.93(1.36)	0.87(0.77-0.99)**	1.25(1.06-1.48)**	1.37(1.19-1.58)***	0.25(0.20)	1.34(1.16-1.55)***	14.85(6.06)**
Year dummy (ref: 2011)								
2012	1.11(1.04-1.18)**	0.58(0.24)**	1.08(1.01-1.16)**	1.06(0.96-1.18)	1.12(1.03-1.21)**	0.02(0.09)	1.13(1.04-1.23)**	2.77(2.34)
2013	1.17(1.09-1.25)***	0.28(0.26)	1.06(0.995-1.13)*	1.01(0.92-1.12)	1.06(0.97-1.15)	-0.13(0.09)	1.07(0.99-1.17)*	3.5193.10)

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

Note: CI stands for confidence intervals; SE, standard errors. For the two-part model, the first part that examines the effect of having any health care utilization used multivariate logistic regressions, and the second part that examines the number of health care utilization used ordinary least squares regressions.

Table A12. Effect of the Medical Aid status change on health care utilization (two-part model, excluding the continuous health insurance)

	Having any outpatient visits	No. of outpatient visits	Having medical check-ups	Having an emergency visit	Having any hospitalization	No. of hospitalization	Having any length of hospital stays	No. of length of hospital stays
	Odds ratio (95% CI)	β (SE)	Odds ratio (95% CI)	Odds ratio (95% CI)	Odds ratio (95% CI)	β (SE)	Odds ratio (95% CI)	β (SE)
Medical Aid status (ref: Continuous Medical Aid)								
New Medical Aid	1.17(0.49-2.77)	2.93(3.85)	1.08(0.52-2.24)	1.11(0.55-2.27)	0.87(0.44-1.70)	0.14(0.53)	0.92(0.47-1.82)	12.28(30.82)
New health insurance	0.93(0.55-1.60)	5.62(3.68)	1.40(0.83-2.33)	0.80(0.44-1.44)	0.60(0.35-1.03)*	0.21(0.79)	0.59(0.34-1.02)*	22.43(39.78)
Female (ref: Male)	2.43(1.60-3.68)***	0.79(0.47)*	1.14(0.79-1.63)	0.72(0.49-1.04)*	0.81(0.58-1.13)	-0.21(0.09)**	0.84(0.60-1.17)	-5.93(3.25)*
Age (ref: 20-44 years old)								
45-64	1.14(0.65-2)	0.32(0.37)	5.03(2.82-8.96)***	0.58(0.33-1.02)*	0.58(0.36-0.94)**	0.20(0.11)*	0.55(0.34-0.89)**	5.90(2.78)**
65-74	4.19(1.37-12.86)**	4.60(0.85)***	4.48(2.16-9.32)***	0.70(0.35-1.39)	0.46(0.26-0.82)**	0.19(0.18)	0.46(0.26-0.83)**	-2.54(5.59)
75+	0.62(0.26-1.46)	3.98(1.29)**	3.08(1.41-6.72)**	1.21(0.58-2.52)	0.82(0.45-1.49)	0.12(0.18)	0.79(0.43-1.43)	14.59(6.67)**
Marital status (ref: Married)								
Widowed/divorced/separated	0.52(0.27-1.03)*	-0.78(1.06)	0.72(0.48-1.07)	0.98(0.62-1.53)	0.75(0.52-1.09)	0.21(0.25)	0.67(0.46-0.97)**	28.71(6.81)***
Single	0.34(0.21-0.55)***	-1.28(0.39)**	0.79(0.45-1.40)	0.56(0.29-1.07)*	0.31(0.17-0.58)***	-0.05(0.09)	0.31(0.17-0.59)***	-0.52(3.50)
No. of family members (ref: Three+)								
Living alone	2.05(0.70-6)	2.45(1.32)*	2.74(1.68-4.47)***	0.62(0.36-1.07)*	1.41(0.89-2.23)	-0.15(0.15)	1.53(0.98-2.40)*	-28.19(7.22)***
Two	1.96(1.16-3.31)**	1.25(0.59)**	1.62(1.11-2.36)**	0.60(0.39-0.94)**	1.09(0.77-1.54)	0.27(0.15)*	1.06(0.75-1.49)	-7.32(3.58)**
Residential region (ref: Others)								
Seoul	1.31(0.72-2.39)	-1.14(0.49)**	1.40(0.91-2.15)	0.76(0.44-1.33)	0.83(0.54-1.26)	-0.20(0.18)	0.85(0.56-1.30)	-2.43(6.10)
Metropolitan cities	0.88(0.56-1.39)	-1.10(0.47)**	1.17(0.81-1.69)	0.82(0.56-1.19)	1.05(0.75-1.47)	-0.16(0.08)**	1.07(0.77-1.49)	-2.02(2.90)
ln(Total household disposable income per equivalent adult)	0.73(0.55-0.99)**	0.06(0.35)	1.01(0.78-1.31)	1.14(0.86-1.50)	1.53(1.19-1.95)**	0.08(0.10)	1.47(1.15-1.88)**	-0.98(4.43)
Education attainment (ref: College and more)								
Elementary school	1.01(0.50-2.02)	4.58(0.79)***	0.95(0.52-1.75)	1.38(0.70-2.72)	2(1.16-3.45)**	-0.01(0.14)	1.87(1.08-3.26)**	16.99(4.95)**
High school	1.22(0.79-1.87)	1.26(0.35)***	0.97(0.58-1.62)	1.92(1.09-3.39)**	1.84(1.18-2.87)**	0.19(0.10)*	1.77(1.13-2.77)**	10.25(2.42)***
No working (ref: Working)	0.82(0.53-1.28)	0.76(0.40)*	0.54(0.37-0.78)**	0.91(0.63-1.31)	1.74(1.22-2.48)**	0.41(0.09)***	1.63(1.15-2.32)**	13.73(2.62)***
Having a private insurance	2.55(1.68-3.87)***	-0.07(0.53)	1.45(1.03-2.05)**	1.25(0.86-1.81)	1.31(0.94-1.84)	-0.02(0.11)	1.33(0.95-1.86)*	-1.58(3.42)
Self-assessed health (ref: Good)								
Fair	2.19(1.47-3.27)***	1.93(0.30)***	0.76(0.53-1.09)	0.90(0.59-1.38)	0.52(0.37-0.73)***	-0.22(0.07)**	0.56(0.40-0.78)**	-15.84(5.02)**

	Having any outpatient visits	No. of outpatient visits	Having medical check-ups	Having an emergency visit	Having any hospitalization	No. of hospitalization	Having any length of hospital stays	No. of length of hospital stays
	Odds ratio (95% CI)	β (SE)	Odds ratio (95% CI)	Odds ratio (95% CI)	Odds ratio (95% CI)	β (SE)	Odds ratio (95% CI)	β (SE)
Bad	3.81(1.88-7.72)***	9.36(0.75)***	0.72(0.47-1.11)	1.78(1.16-2.72)**	0.92(0.64-1.32)	0.26(0.15)*	0.996(0.70-1.42)	-21.75(2.86)***
Having activity limitation due to diseases/injuries (ref: No)	2.31(0.98-5.45)*	8.46(1.49)***	0.89(0.58-1.35)	1.31(0.89-1.93)	1.11(0.80-1.53)	0.88(0.21)***	1.15(0.83-1.59)	15.74(5.11)**
No. of chronic diseases	1.58(1.26-1.98)***	4.43(0.18)***	0.996(0.93-1.07)	1.21(1.12-1.31)***	1.14(1.06-1.22)***	-0.002(0.03)	1.14(1.07-1.22)***	-0.80(0.68)
Having cancer (ref: No)	3.35(0.38-29.80)	-3.94(1.05)***	1.17(0.54-2.54)	2.88(1.56-5.30)**	2.66(1.55-4.58)***	0.84(0.42)**	2.82(1.64-4.85)***	2.99(4.60)
Having a cardiac disease (ref: No)	1.17(0.24-5.62)	-1.23(1.62)	1.32(0.77-2.25)	0.91(0.54-1.53)	1.30(0.82-2.07)	0.04(0.28)	1.32(0.83-2.10)	-6.39(6.19)
Having a cerebro-vascular disease (ref: No)	0.68(0.15-3.02)	-5.57(1.36)***	0.62(0.39-1.003)*	1.34(0.82-2.19)	1.72(1.03-2.87)**	-0.25(0.15)*	1.71(1.02-2.86)**	1.67(533)
Having hypertension (ref: No)	2.36(1.03-5.41)**	1.72(0.69)**	1.40(0.96-2.05)*	1.04(0.70-1.55)	0.90(0.64-1.28)	0.28(0.15)*	0.93(0.66-1.32)	8.10(4.71)*
Having diabetes (ref: No)	0.51(0.18-1.47)	-0.77(1.04)	1.33(0.86-2.08)	0.75(0.49-1.15)	1.17(0.82-1.69)	0.07(0.15)	1.13(0.79-1.63)	9.88(5.66)*
Being mentally disabled (ref: No)	1.26(0.47-3.32)	-5.37(2.22)**	0.57(0.20-1.63)	0.70(0.24-2.03)	0.60(0.21-1.71)	-0.28(0.27)	0.61(0.21-1.77)	126.26(35.50)***
Being physically disabled (ref: No)	1.04(0.50-2.19)	2.33(1.34)*	0.85(0.59-1.23)	1.24(0.83-1.85)	1.68(1.20-2.35)**	0.25(0.19)	1.65(1.18-2.30)**	17.27(6.55)**
Year dummy (ref: 2011)								
2012	1.18(0.85-1.62)	0.59(0.24)**	1.21(0.84-1.72)	0.88(0.62-1.23)	1.08(0.83-1.40)	0.02(0.09)	1.16(0.89-1.52)	2.89(2.36)
2013	1.28(0.90-1.83)	0.28(0.26)	0.92(0.65-1.30)	0.93(0.65-1.32)	1(0.75-1.33)	-0.13(0.09)	1.07(0.80-1.44)	3.42(3.10)

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

Note: CI stands for confidence intervals; SE, standard errors. For the two-part model, the first part that examines the effect of having any health care utilization used multivariate logistic regressions, and the second part that examines the number of health care utilization used ordinary least squares regressions.

Table A13. Effect of catastrophic health expenditure and its interaction term with households without severe diseases on the first poverty spell length among the poor (poverty line: less than 50% of the MIL)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	CHE(THE/hcp≥20%)	CHE(THE/hcp≥20%)	CHE(THE/hcp≥30%)	CHE(THE/hcp≥30%)	CHE(THE/hcp≥40%)	CHE(THE/hcp≥40%)
	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)
Catastrophic health expenditure	0.032(0.025)	0.028(0.027)	0.067(0.029)**	0.076(0.031)**	0.064(0.039)	0.069(0.043)
Catastrophic health expenditure*HH with severe diseases		0.028(0.062)		-0.055(0.074)		-0.022(0.090)
Female (ref: Male)	0.165(0.093)*	0.164(0.093)*	0.167(0.093)*	0.166(0.093)*	0.168(0.093)*	0.168(0.093)*
Age (ref: 20-44 years old)						
45-64	0.265(0.184)	0.265(0.184)	0.267(0.184)	0.268(0.184)	0.268(0.184)	0.267(0.184)
65-74	0.989(0.347)**	0.989(0.347)**	0.987(0.346)**	0.988(0.0345)**	0.989(0.346)**	0.988(0.346)**
75+	1.732(0.343)***	1.732(0.343)***	1.730(0.343)***	1.731(0.0342)***	1.732(0.343)***	1.732(0.343)***
Marital status (ref: Married)						
Widowed/divorced/separated	0.371(0.119)**	0.372(0.118)**	0.374(0.119)**	0.375(0.119)**	0.369(0.118)**	0.370(0.118)**
Single	0.880(0.189)***	0.880(0.189)***	0.880(0.189)***	0.880(0.189)***	0.881(0.189)***	0.882(0.189)***
No. of family members (ref: Three+)						
Living alone	-0.017(0.186)	-0.016(0.186)	-0.019(0.186)	-0.018(0.186)	-0.018(0.186)	-0.018(0.186)
Two	-0.226(0.174)	-0.226(0.174)	-0.229(0.174)	-0.227(0.174)	-0.228(0.175)	-0.227(0.175)
Metropolis (ref: Rural, Sub-urban)	-0.008(0.061)	-0.009(0.061)	-0.008(0.061)	-0.008(0.061)	-0.008(0.061)	-0.008(0.061)
College and more (ref: No)	0.128(0.115)	0.129(0.114)	0.136(0.115)	0.136(0.115)	0.130(0.114)	0.130(0.114)
Working of HH head (ref: No)	-0.171(0.049)***	-0.171(0.049)***	-0.170(0.049)***	-0.170(0.049)***	-0.170(0.049)***	-0.170(0.049)***
No. of family members with employment	-0.225(0.056)***	-0.225(0.056)***	-0.225(0.056)***	-0.225(0.056)***	-0.225(0.056)***	-0.225(0.056)***
Having children under 7 in a household (ref: No)	-0.249(0.504)	-0.247(0.503)	-0.258(0.507)	-0.261(0.509)	-0.257(0.505)	-0.257(0.505)
Having a person aged 65 years old and more in a household (ref: No)	-0.339(0.0375)	-0.339(0.376)	-0.335(0.374)	-0.336(0.373)	-0.337(0.375)	-0.337(0.375)
Decreased number of family members with employment (ref: No)	-0.106(0.047)**	-0.106(0.047)**	-0.107(0.047)**	-0.106(0.047)**	-0.105(0.047)**	-0.105(0.047)**
Changed type of working position of HH head (ref: No)	0.056(0.032)*	0.056(0.032)*	0.056(0.032)*	0.055(0.032)*	0.055(0.032)*	0.055(0.032)*
No. of chronic diseases in HH	0.036(0.044)	0.036(0.044)	0.036(0.044)	0.036(0.044)	0.037(0.044)	0.037(0.044)
HH with severe diseases	-0.015(0.041)	-0.207(0.049)	-0.019(0.041)	-0.005(0.044)	-0.017(0.041)	-0.014(0.042)
Intercept	-0.536(0.240)**	-0.535(0.240)**	-0.539(0.240)**	-0.541(0.239)**	-0.535(0.239)**	-0.536(0.239)**
Wald chi2	1380.56***	1379.94***	1369.11***	1378.72***	1373.69***	1374.55***
No. of observations	8,336	8,336	8,336	8,336	8,336	8,336
No. of subjects	3,383	3,383	3,383	3,383	3,383	3,383

*p<0.1, **p<0.05, ***p<0.001.

Note: CHE stands for catastrophic health expenditure; THE, total health expenditure; hcp, household capacity to pay; SE, standard errors; HH, household.

Table A14. Effect of catastrophic health expenditure on the first poverty spell length among the poor without severe diseases (poverty line: less than 50% of the MIL)

	Model 1	Model 2	Model 3
	CHE(THE/hcp≥20%)	CHE(THE/hcp≥30%)	CHE(THE/hcp≥40%)
	β (SE)	β (SE)	β (SE)
Catastrophic health expenditure	0.021(0.028)	0.072(0.033)**	0.060(0.046)
Female (ref: Male)	0.098(0.087)	0.097(0.088)	0.099(0.087)
Age (ref: 20-44 years old)			
45-64	0.203(0.135)	0.204(0.136)	0.203(0.135)
65-74	0.900(0.326)**	0.901(0.325)**	0.899(0.326)**
75+	1.624(0.321)***	1.624(0.320)***	1.623(0.321)***
Marital status (ref: Married)			
Widowed/divorced/separated	0.355(0.115)**	0.363(0.115)**	0.357(0.114)**
Single	0.880(0.179)***	0.884(0.179)***	0.883(0.179)***
No. of family members (ref: Three+)			
Living alone	-0.089(0.140)	-0.091(0.140)	-0.090(0.140)
Two	-0.300(0.123)**	-0.301(0.123)**	-0.299(0.123)**
Metropolis (ref: Rural, Sub-urban)	-0.001(0.057)	-0.002(0.057)	-0.001(0.057)
College and more (ref: No)	0.063(0.109)	0.070(0.110)	0.064(0.109)
Working of HH head (ref: No)	-0.184(0.048)***	-0.183(0.048)***	-0.183(0.048)***
No. of family members with employment	-0.228(0.058)***	-0.226(0.058)***	-0.227(0.058)***
Having children under 7 in a household (ref: No)	-0.150(0.395)	-0.161(0.401)	-0.156(0.397)
Having a person aged 65 years old and more in a household (ref: No)	-0.448(0.327)	-0.447(0.325)	-0.446(0.326)
Decreased number of family members with employment (ref: No)	-0.121(0.051)**	-0.121(0.051)**	-0.120(0.051)**
Changed type of working position of HH head (ref: No)	0.065(0.035)*	0.065(0.035)*	0.065(0.035)*
No. of chronic diseases in HH	0.033(0.042)	0.032(0.042)	0.033(0.042)
Intercept	-0.222(0.197)	-0.229(0.198)	-0.222(0.197)
Wald chi2	1112.50***	1108.59***	1106.88***
No. of observations	7,271	7,271	7,271
No. of subjects	3,040	3,040	3,040

*p<0.1, **p<0.05, ***p<0.001.

Note: CHE stands for catastrophic health expenditure; THE, total health expenditure; hcp, household capacity to pay; SE, standard errors; HH, household.

Table A15. Effect of catastrophic health expenditure on the first poverty spell length among the poor without the Medical Aid (poverty line: less than 50% of the MIL)

	Model 1	Model 2	Model 3
	CHE(THE/hcp≥20%)	CHE(THE/hcp≥30%)	CHE(THE/hcp≥40%)
	β (SE)	β (SE)	β (SE)
Catastrophic health expenditure	0.040(0.027)	0.072(0.030)**	0.072(0.041)*
Female (ref: Male)	0.254(0.087)**	0.256(0.087)**	0.258(0.087)**
Age (ref: 20-44 years old)			
45-64	0.255(0.136)*	0.260(0.138)*	0.259(0.138)*
65-74	0.423(0.249)*	0.426(0.251)*	0.425(0.250)*
75+	1.114(0.243)***	1.116(0.245)***	1.116(0.245)***
Marital status (ref: Married)			
Widowed/divorced/separated	0.226(0.111)**	0.227(0.112)**	0.224(0.112)**
Single	0.743(0.176)***	0.744(0.177)***	0.743(0.176)***
No. of family members (ref: Three+)			
Living alone	0.014(0.191)	0.013(0.192)	0.015(0.192)
Two	-0.247(0.164)	-0.251(0.165)	-0.249(0.165)
Metropolis (ref: Rural, Sub-urban)	0.009(0.053)	0.009(0.053)	0.008(0.053)
College and more (ref: No)	-0.003(0.098)	0.004(0.098)	-0.004(0.098)
Working of HH head (ref: No)	-0.204(0.051)***	-0.203(0.051)***	-0.203(0.051)***
No. of family members with employment	-0.201(0.056)***	-0.202(0.056)***	-0.202(0.056)***
Having children under 7 in a household (ref: No)	-0.254(0.395)	-0.260(0.398)	-0.260(0.397)
Having a person aged 65 years old and more in a household (ref: No)	-0.151(0.204)	-0.149(0.205)	-0.147(0.205)
Decreased number of family members with employment (ref: No)	-0.070(0.048)	-0.071(0.048)	-0.069(0.048)
Changed type of working position of HH head (ref: No)	0.019(0.034)	0.018(0.034)	0.018(0.034)
No. of chronic diseases in HH	0.070(0.043)	0.071(0.043)*	0.073(0.043)*
Having HH head with severe diseases	-0.015(0.051)	-0.020(0.051)	-0.020(0.051)
Having HH members with severe diseases	0.078(0.092)	0.077(0.092)	0.082(0.092)
Intercept	-0.170(0.195)	-0.175(0.196)	-0.175(0.196)
Wald chi2	1012.65***	1012.37***	1011.14***
No. of observations	6,127	6,127	6,127
No. of subjects	2,834	2,834	2,834

*p<0.1, **p<0.05, ***p<0.001.

Note: CHE stands for catastrophic health expenditure; THE, total health expenditure; hcp, household capacity to pay; SE, standard errors; HH, household.

Table A16. Effect of catastrophic health expenditure and its interaction term with households without severe diseases on the total poverty duration among the poor (poverty line: less than 50% of the MIL)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	CHE(THE/hcp≥20%)	CHE(THE/hcp≥20%)	CHE(THE/hcp≥30%)	CHE(THE/hcp≥30%)	CHE(THE/hcp≥40%)	CHE(THE/hcp≥40%)
	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)
Catastrophic health expenditure	0.015(0.016)	0.021(0.018)	0.033(0.019)*	0.042(0.021)**	0.032(0.026)	0.046(0.029)
Catastrophic health expenditure*HH with severe diseases		-0.037(0.040)		-0.050(0.047)		-0.066(0.058)
Female (ref: Male)	0.075(0.039)*	0.076(0.039)*	0.075(0.039)*	0.075(0.039)*	0.076(0.039)*	0.075(0.039)*
Age (ref: 20-44 years old)						
45-64	0.363(0.091)***	0.363(0.091)***	0.363(0.091)***	0.363(0.091)***	0.363(0.091)***	0.363(0.091)***
65-74	0.579(0.150)***	0.579(0.150)***	0.578(0.150)***	0.578(0.150)***	0.578(0.150)***	0.578(0.150)***
75+	1.154(0.148)***	1.154(0.148)***	1.153(0.148)***	1.153(0.148)***	1.153(0.148)***	1.153(0.148)***
Marital status (ref: Married)						
Widowed/divorced/separated	0.178(0.053)**	0.177(0.053)**	0.178(0.053)**	0.178(0.053)**	0.177(0.053)**	0.178(0.053)**
Single	0.613(0.087)***	0.613(0.087)***	0.614(0.087)***	0.614(0.086)***	0.613(0.087)***	0.613(0.087)***
No. of family members (ref: Three+)						
Living alone	0.058(0.082)	0.057(0.082)	0.057(0.082)	0.057(0.082)	0.058(0.082)	0.058(0.082)
Two	-0.168(0.067)**	-0.168(0.067)**	-0.169(0.067)**	-0.169(0.067)**	-0.168(0.066)**	-0.168(0.066)**
Metropolis (ref: Rural, Sub-urban)	0.004(0.026)	0.005(0.026)	0.004(0.026)	0.004(0.026)	0.004(0.026)	0.004(0.026)
College and more (ref: No)	0.002(0.062)	0.002(0.062)	0.004(0.062)	0.003(0.062)	0.002(0.062)	0.003(0.062)
Working of HH head (ref: No)	-0.177(0.028)***	-0.177(0.028)***	-0.176(0.028)***	-0.176(0.028)***	-0.176(0.028)***	-0.176(0.028)***
No. of family members with employment	-0.172(0.029)***	-0.172(0.029)***	-0.171(0.029)***	-0.171(0.029)***	-0.172(0.029)***	-0.172(0.029)***
Having children under 7 in a household (ref: No)	-0.116(0.195)	-0.116(0.195)	-0.118(0.195)	-0.119(0.196)	-0.118(0.195)	-0.119(0.195)
Having a person aged 65 years old and more in a household (ref: No)	0.0001(0.137)	0.0001(0.0137)	0.0002(0.137)	0.0004(0.137)	0.0007(0.137)	0.001(0.137)
Decreased number of family members with employment (ref: No)	-0.065(0.025)**	-0.065(0.025)**	-0.065(0.025)**	-0.065(0.025)**	-0.065(0.025)**	-0.064(0.025)**
Changed type of working position of HH head (ref: No)	0.036(0.020)*	0.036(0.020)*	0.035(0.020)*	0.035(0.020)*	0.036(0.020)*	0.035(0.020)*
No. of chronic diseases in HH	0.052(0.025)**	0.052(0.025)**	0.052(0.025)**	0.052(0.025)**	0.053(0.025)**	0.053(0.025)**
HH with severe diseases	0.015(0.025)	0.031(0.031)	0.014(0.025)	0.026(0.028)	0.015(0.025)	0.024(0.026)
Intercept	-0.112(0.112)	-0.113(0.112)	-0.111(0.112)	-0.113(0.112)	-0.111(0.112)	-0.112(0.112)
Wald chi2	2233.25***	2234.75***	2231.89***	2234.78***	2228.53***	2231.52***
No. of observations	11,560	11,560	11,560	11,560	11,560	11,560
No. of subjects	3,392	3,392	3,392	3,392	3,392	3,392

*p<0.1, **p<0.05, ***p<0.001.

Note: CHE stands for catastrophic health expenditure; THE, total health expenditure; hcp, household capacity to pay; SE, standard errors; HH, household.

Table A17. Effect of catastrophic health expenditure on the total poverty duration among the poor without severe diseases (poverty line: less than 50% of the MIL)

	Model 1	Model 2	Model 3
	CHE(THE/hcp≥20%)	CHE(THE/hcp≥30%)	CHE(THE/hcp≥40%)
	β (SE)	β (SE)	β (SE)
Catastrophic health expenditure	0.018(0.018)	0.037(0.021)*	0.035(0.029)
Female (ref: Male)	0.043(0.038)	0.043(0.038)	0.044(0.038)
Age (ref: 20-44 years old)			
45-64	0.378(0.080)***	0.377(0.080)***	0.377(0.080)***
65-74	0.524(0.143)***	0.523(0.143)***	0.523(0.143)***
75+	1.070(0.141)***	1.069(0.141)***	1.069(0.141)***
Marital status (ref: Married)			
Widowed/divorced/separated	0.167(0.052)**	0.167(0.052)**	0.166(0.052)**
Single	0.578(0.085)***	0.579(0.085)***	0.577(0.085)***
No. of family members (ref: Three+)			
Living alone	0.067(0.076)	0.057(0.076)	0.058(0.076)
Two	-0.154(0.062)**	-0.154(0.062)**	-0.153(0.062)**
Metropolis (ref: Rural, Sub-urban)	-0.003(0.026)	-0.003(0.025)	-0.003(0.025)
College and more (ref: No)	-0.015(0.064)	-0.014(0.064)	-0.015(0.064)
Working of HH head (ref: No)	-0.182(0.028)***	-0.182(0.028)***	-0.182(0.028)***
No. of family members with employment	-0.169(0.029)***	-0.169(0.029)***	-0.169(0.029)***
Having children under 7 in a household (ref: No)	-0.052(0.182)	-0.054(0.182)	-0.054(0.182)
Having a person aged 65 years old and more in a household (ref: No)	-0.013(0.130)	-0.013(0.129)	-0.012(0.129)
Decreased number of family members with employment (ref: No)	-0.063(0.027)**	-0.063(0.027)**	-0.063(0.027)**
Changed type of working position of HH head (ref: No)	0.030(0.021)	0.029(0.021)	0.029(0.021)
No. of chronic diseases in HH	0.053(0.024)**	0.054(0.024)**	0.054(0.024)**
Intercept	0.005(0.106)	0.005(0.106)	0.006(0.106)
Wald chi2	1814.54***	1815.30***	1810.94***
No. of observations	10,069	10,069	10,069
No. of subjects	3,138	3,138	3,138

*p<0.1, **p<0.05, ***p<0.001.

Note: CHE stands for catastrophic health expenditure; THE, total health expenditure; hcp, household capacity to pay; SE, standard errors; HH, household.

Table A18. Effect of catastrophic health expenditure on the total poverty duration among the poor without the Medical Aid (poverty line: less than 50% of the MIL)

	Model 1	Model 2	Model 3
	CHE(THE/hcp≥20%)	CHE(THE/hcp≥30%)	CHE(THE/hcp≥40%)
	β (SE)	β (SE)	β (SE)
Catastrophic health expenditure	0.004(0.017)	0.019(0.019)	0.023(0.026)
Female (ref: Male)	0.101(0.038)**	0.101(0.038)**	0.101(0.038)**
Age (ref: 20-44 years old)			
45-64	0.427(0.069)***	0.427(0.069)***	0.427(0.069)***
65-74	0.452(0.125)***	0.452(0.125)***	0.452(0.125)***
75+	0.965(0.124)***	0.965(0.124)***	0.965(0.124)***
Marital status (ref: Married)			
Widowed/divorced/separated	0.141(0.052)**	0.142(0.052)**	0.142(0.052)**
Single	0.594(0.090)***	0.595(0.090)***	0.595(0.090)***
No. of family members (ref: Three+)			
Living alone	0.098(0.082)	0.097(0.082)	0.098(0.082)
Two	-0.123(0.063)*	-0.124(0.063)**	-0.124(0.063)**
Metropolis (ref: Rural, Sub-urban)	0.015(0.025)	0.015(0.025)	0.015(0.025)
College and more (ref: No)	-0.080(0.056)	-0.079(0.056)	-0.080(0.056)
Working of HH head (ref: No)	-0.191(0.026)***	-0.190(0.026)***	-0.190(0.026)***
No. of family members with employment	-0.158(0.027)***	-0.158(0.027)***	-0.158(0.027)***
Having children under 7 in a household (ref: No)	0.022(0.154)	0.022(0.155)	0.021(0.155)
Having a person aged 65 years old and more in a household (ref: No)	0.011(0.103)	0.010(0.103)	0.011(0.103)
Decreased number of family members with employment (ref: No)	-0.049(0.025)**	-0.049(0.025)**	-0.049(0.025)*
Changed type of working position of HH head (ref: No)	0.016(0.020)	0.016(0.020)	0.016(0.020)
No. of chronic diseases in HH	0.081(0.023)***	0.081(0.023)***	0.081(0.023)***
Having HH head with severe diseases	0.011(0.029)	0.010(0.029)	0.010(0.029)
Having HH members with severe diseases	0.040(0.048)	0.038(0.048)	0.039(0.048)
Intercept	0.007(0.096)	0.007(0.096)	0.007(0.096)
Wald chi2	1915.34***	1909.63***	1907.18***
No. of observations	8,783	8,783	8,783
No. of subjects	3,014	3,014	3,014

*p<0.1, **p<0.05, ***p<0.001.

Note: CHE stands for catastrophic health expenditure; THE, total health expenditure; hcp, household capacity to pay; SE, standard errors; HH, household.

Table A19. Effect of catastrophic health expenditure and its interaction term with households without severe diseases on the total poverty duration among the poor (poverty line: less than 40% of the MIL)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	CHE(THE/hcp≥20%)	CHE(THE/hcp≥20%)	CHE(THE/hcp≥30%)	CHE(THE/hcp≥30%)	CHE(THE/hcp≥40%)	CHE(THE/hcp≥40%)
	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)	β (SE)
Catastrophic health expenditure	0.057(0.024)**	0.066(0.025)**	0.052(0.029)*	0.065(0.030)**	0.041(0.040)	0.060(0.041)
Catastrophic health expenditure*HH with severe diseases		-0.071(0.068)		-0.080(0.087)		-0.093(0.103)
Female (ref: Male)	0.119(0.053)**	0.120(0.053)**	0.119(0.053)**	0.119(0.053)**	0.120(0.053)**	0.119(0.053)**
Age (ref: 20-44 years old)						
45-64	0.299(0.128)**	0.300(0.128)**	0.300(0.128)**	0.299(0.128)**	0.300(0.128)**	0.299(0.128)**
65-74	0.608(0.251)**	0.608(0.250)**	0.603(0.248)**	0.603(0.249)**	0.600(0.248)**	0.601(0.249)**
75+	1.235(0.249)***	1.236(0.248)***	1.231(0.246)***	1.231(0.247)***	1.229(0.246)***	1.230(0.247)***
Marital status (ref: Married)						
Widowed/divorced/separated	0.165(0.081)**	0.162(0.081)**	0.161(0.081)**	0.159(0.081)**	0.159(0.081)*	0.159(0.081)**
Single	0.614(0.142)***	0.612(0.142)***	0.605(0.142)***	0.604(0.141)***	0.602(0.142)***	0.602(0.141)***
No. of family members (ref: Three+)						
Living alone	-0.033(0.106)	-0.032(0.106)	-0.027(0.105)	-0.026(0.105)	-0.026(0.105)	-0.025(0.105)
Two	-0.329)***	-0.329(0.085)***	-0.326(0.085)***	-0.326(0.085)***	-0.325(0.085)***	-0.324(0.085)***
Metropolis (ref: Rural, Sub-urban)	0.007(0.036)	-0.005(0.036)	-0.007(0.036)	-0.006(0.036)	-0.007(0.036)	-0.007(0.036)
College and more (ref: No)	0.101(0.069)	0.099(0.069)	0.102(0.069)	0.010(0.069)	0.101(0.069)	0.101(0.069)
Working of HH head (ref: No)	-0.170(0.043)***	-0.170(0.043)***	-0.172(0.043)***	-0.172(0.043)***	-0.174(0.043)***	-0.174(0.043)***
No. of family members with employment	-0.190(0.047)***	-0.191(0.047)***	-0.190(0.047)***	-0.191(0.047)***	-0.191(0.047)***	-0.192(0.047)***
Having children under 7 in a household (ref: No)	0.104(0.278)	0.105(0.278)	0.102(0.275)	0.101(0.275)	0.102(0.274)	0.100(0.275)
Having a person aged 65 years old and more in a household (ref: No)	-0.131(0.231)	-0.130(0.230)	-0.127(0.228)	-0.128(0.229)	-0.124(0.228)	-0.125(0.228)
Decreased number of family members with employment (ref: No)	-0.093(0.039)**	-0.092(0.039)**	-0.093(0.039)**	-0.092(0.039)**	-0.092(0.039)**	-0.091(0.039)**
Changed type of working position of HH head (ref: No)	0.015(0.033)	0.015(0.033)	0.015(0.033)	0.014(0.033)	0.015(0.033)	0.014(0.033)
No. of chronic diseases in HH	0.058(0.038)	0.058(0.038)	0.062(0.037)*	0.062(0.037)*	0.064(0.037)*	0.064(0.037)*
HH with severe diseases	0.006(0.040)	0.036(0.049)	0.006(0.039)	0.026(0.043)	0.008(0.040)	0.021(0.041)
Intercept	-0.269(0.159)*	-0.271(0.160)*	-0.265(0.159)*	-0.265(0.159)*	-0.264(0.159)*	-0.266(0.159)*
Wald chi2	1185.40***	1186.97***	1179.04***	1181.37***	1176.72***	1175.04***
No. of observations	6,337	6,337	6,337	6,337	6,337	6,337
No. of subjects	2,487	2,487	2,487	2,487	2,487	2,487

*p<0.1, **p<0.05, ***p<0.001.

Note: CHE stands for catastrophic health expenditure; THE, total health expenditure; hcp, household capacity to pay; SE, standard errors; HH, household.

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본 연구는 한국의 빈곤동태와 의료급여의 수급지위변화가 의료이용, 의료비와 미충족 의료에 미치는 영향에 대해 한국의료패널 2008-2014년 자료를 사용하여 2011-2013년에 대한 분석을 하였다. 또한 중위소득 50% 미만의 빈곤선 아래의 빈곤층에서, 재난적 의료비가 첫 번째 빈곤주기의 길이와 총 빈곤기간에 미치는 영향에 대해서 한국복지패널 2008-2016년 자료를 사용하여 분석하였다. 그리고, 중위소득 40% 미만의 빈곤선 아래의 빈곤층에서, 재난적 의료비가 빈곤탈출 (혹은 빈곤지속)에 미치는 영향에 대해서 한국복지패널 2008-2016년 자료를 사용하여 이산시간 사건사 분석을 통해 분석을 하였다.

본 연구는 빈곤동태가 의료이용, 의료비와 미충족 의료에 미치는 영향을 탐색한 첫 번째 시도라는 점에서 의미가 있다. 연구결과, 지속적 빈곤층(the persistent poor)은 응급실 방문과 입원횟수에 어려움이 있었고, 의료비를 낮게 지출하였고, 미충족 의료를 더 많이 보고하였다. 반복적 빈곤층(the recurrent poor)은 입원횟수가 더 적었고, 의료비를 덜 지출하였고, 가장 높은 수준의 경제적 이유로 인한 미충족 의료를 호소하였다. 건강유지와 개인의

안녕에서 질병이 발생하였을 때 적절한 때에 적절한 의료이용을 하는 것의 중요성을 생각해볼 때, 지속적 빈곤층과 반복적 빈곤층은 건강상태와 안녕이 나빠질 위험에 처해 있다고 할 수 있겠다.

또한 의료급여의 수급지위의 변화가 의료이용, 의료비, 미충족 의료에 미치는 영향을 살펴보면, 지속적 의료급여집단은 더 많은 외래이용, 더 적은 건강검진서비스 이용, 더 많은 응급의료 이용과 입원이용을 하였고, 의료비를 덜 지출하였으나 더 많은 미충족 의료를 보고하였다. 신규 의료급여 집단은 본인부담금이 낮아지면서 더 많은 급여혜택을 받게 되어 더 많은 외래이용을 하고 재원일수가 길었다. 신규 건강보험 집단은 본인부담금이 높아지면서 급여혜택이 줄어드는 상황이 되는데, 입원이용을 줄이는 양상을 보였고, 높은 미충족 의료 수준을 보고하였다.

본 연구는 재난적 의료비가 첫 번째 빈곤주기의 길이와 총 빈곤기간, 그리고 빈곤탈출에 미치는 영향을 처음으로 분석한 것에 의의를 가진다. 다른 빈곤기간에 미치는 영향요인들을 통제한 상태에서도, 재난적 의료비가 발생한 가구는 통계적으로 유의하게 첫 번째 빈곤주기(30-40%의 역치 수준)와 총 빈곤기간(30%의 역치 수준)이 길어졌다. 재난적 의료비의 총 빈곤기간에 대한 영향의 크기는 첫 번째 빈곤주기의 길이에 대한 영향보다 다소 줄어들었는데, 이는 재난적 의료비의 영향이 첫 번째 빈곤주기의 길이에서 더 중요하게 작용함을 의미한다고 할 수 있다.

재난적 의료비가 빈곤탈출에 미치는 영향은 빈곤탈출 유형별로 다르게 나타났다. 본 연구에서는 차상위 빈곤층으로 탈출과 완전 빈곤탈출로 나누어 빈곤탈출을 살펴보았다. 재난적 의료비의 발생은 통계적으로 유의하게 차상위 빈곤층으로 탈출과 부적 상관이 있었으나, 완전 빈곤탈출에서는 통계적으로 유의하지 않았다. 빈곤탈출의 대부분(70%)이 차상위 빈곤층으로의 이동임을 고려할 때, 재난적 의료비의 발생은 이미 제한적인 빈곤층의 가계예산에 위협을 주며, 가계의 소득감소와 더불어 빈곤지속의 요인임을 확인할 수 있었다.

의료이용의 접근성 향상과 의료비로 인한 재정적 위험에 대한 보호를 이루기 위한 가장 중요한 접근은 급여항목을 확대하고 본인부담금을 낮추는 선지불체계를 발전시키는 것이다. 다른 분야의 빈곤감소 정책들과 더불어, 건강보장제도를 강화하여 재난적 의료비

발생을 줄이는 것은 빈곤을 감소시키고 국민의 안녕을 향상시키는 실현가능하고 현실적인 방안들 중 하나라고 할 수 있겠다.

주제어 : 빈곤; 빈곤동태; 의료이용; 의료비; 미충족 의료; 재난적 의료비; 한국.
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