# Population Aging and the Fiscal Policy on Healthcare for Seniors

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# I

# Introduction

The South Korean population is aging at an accelerated rate. According to Statistics Korea's demographic projections, South Korea will join the ranks of aged societies with 14 percent of its population consisting of seniors. By 2026, it will have become a super-aged society with seniors making up at least 20 percent of its population. Increasing life expectancy and the growing older population are projected to considerably increase the expenditure on healthcare for seniors. Indeed, such expenditures have been rising quickly in recent years. The amount paid out in National Health Insurance (NHI) benefits on account of seniors more than doubled between 2008 and 2015, from KRW 8.1 trillion to KRW 16.9 trillion. As of 2015, 12 percent of NHI beneficiaries were seniors aged 65 and older. This relatively small segment of the population, however, accounted for 38 percent of all NHI expenditures. Assuming that the proportion of seniors in the Korean population will increase to 20 percent in the next decade, spending on elderly healthcare will multiply, adding a greater burden on public resources. As seniors already account for the largest share of medical expenditures in Korea, population aging will undoubtedly exert greater pressure.

Medical expenditures for seniors are sizable and growing as they tend to have chronic lifestyle diseases, such as diabetes and hypertension; require longer, more frequent hospital stays; need a variety of medications; and require life-extending interventions. The deterioration of physical functions also renders many seniors unable to perform many daily tasks, giving rise to the need for care and assisted living services. Population aging and growing life expectancy, in other words, are precursors of inevitable rises in the demand for, and costs

of, medical treatment, care services, and services provided by Long-Term Care Insurance for Seniors (LTCIS). LTCIS benefits paid out tenfold more in 2015 than in 2008 - from KRW 0.4 trillion to KRW 4 trillion. The number of assisted living facilities providing long-term care also multiplied from 8,138 to 18,002, and the number of LTCIS-eligible seniors from 270,000 to 680,000 over the same years. As of 2016, 7.7 percent of all seniors aged 65 and older were eligible for LTCIS benefits and services. While the amount of fiscal spending on care services for seniors remains small relative to the amount of medical spending, it is not too hard to imagine that the former will increase significantly in the coming years.

In order to fend off this impending fiscal crisis, while expanding the range of care and health services demanded by seniors, it is critical to reform and streamline the cost management system for senior health and long-term care. In this study, we identify and analyze institutional factors, on the part of both medical service providers and users, that encourage excess medical spending with unnecessary medical services and treatments, and emphasize the need to overhaul the fiscal policy structure as the first step toward strengthening the sustainability of healthcare for seniors. Our focus is on examining the necessity and moral hazard of frequent outpatient services, long-term hospitalization, and medications sought out by—or provided for—seniors and delineating the improvements and changes that are to be made. The token co-payments required of elderly patients is tied to the significantly higher levels of medical spending associated with them in comparison to NHI-eligible patients of other age groups and also serve to foster various moral hazards, including preference for long-term hospitalization. There is also growing support for integrating the assisted living facilities under LTCIS with those under NHI so as to reduce inefficiencies. In this study, we identify the fiscal risks associated with increases in medical spending for seniors, and examine possible measures for enhancing the efficiency of NHI, Medicare, and LTCIS toward improving the sustainability and quality of healthcare for the older members of society.

# Fiscal Policy and Spending on Healthcare for Seniors Today

## 1 Fiscal Policy and Spending on Healthcare for Seniors

The main fiscal policy programs on healthcare for seniors include medical support, such as NHI and Medicare, and care and assisted living services provided under LTCIS. As of 2015, fiscal spending on medical treatments and care services for all Koreans amounted to KRW 53.8 trillion, including KRW 44 trillion paid out by NHI, KRW 5.9 trillion spent on Medicare, and KRW 4 trillion for services under LTCIS. Of these, KRW 16.9 trillion of NHI spending, KRW 2.7 trillion of Medicare spending, and KRW 3.8 trillion of LTCIS spending (KRW 23.4 trillion together or 43.4 percent of the total fiscal spending) went to seniors aged 65 and older - a proportion that has been rising rapidly, from 33.9 percent in 2008 to 43.4 percent in 2015. Over these years, NHI spending on the elderly more than doubled, LTCIS spending multiplied tenfold, and Medicare spending on the elderly grew by 150 percent.

The cost of per-capita medical benefits for seniors is considerably higher than for the general population - KRW 2.72 million for the former compared to KRW 870,000 for the latter, as of 2015. This figure rises to KRW 5.409 million (as of 2015) for seniors eligible for Medicare in addition to NHI benefits. Only three percent or so of the entire national population is eligible for Medicare, and seniors aged 65 and older make up approximately 7.5 percent of the whole population. Yet the cost of medical benefits per capita among Medicare-eligible seniors is much

higher than for members of the general public who are also eligible for NHI.

In the meantime, seniors aged 65 and older make up 32.1 percent of all persons eligible for Medicare. The rapid population aging, coupled with the alarmingly high poverty rate among seniors, will thus accelerate increases in medical spending for seniors. Choi (2015) projected that the proportion of seniors in the Medicare-eligible population would grow from 30 percent in 2012 to 55.8 percent by 2035, while the proportion of medical spending for seniors would also rise from 44 percent in 2012 to 65 percent by 2035.[1] If persons eligible for Medicare incur greater medical costs because they are in poorer states of health than non-eligible persons, that is another problem to be addressed by health and economics experts. If the problem, however, derives from institutional settings, we need to make institutional changes.

⟨Table II-1⟩ **Fiscal Spending on Healthcare for Seniors**

(Units: KRW 1 trillion, percentage)

| | NHI | | Medicare | | LTCIS | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Subtotal | For seniors aged 65+ | Subtotal | For seniors aged 65+ | Subtotal | For seniors aged 65+ | Subtotal | For seniors aged 65+ |
| 2008 | 25.6 | 8.1 (31.6%) | 4.4 | 1.8 (41.1%) | 0.4 | 0.4 (95.4%) | 30.4 | 10.3 (33.9%) |
| 2009 | 28.9 | 9.4 (32.5%) | 4.6 | 1.9 (41.6%) | 1.7 | 1.6 (93.8%) | 35.3 | 13 (36.7%) |
| 2010 | 32.5 | 10.8 (33.4%) | 4.9 | 2.1 (42.2%) | 2.4 | 2.2 (93.4%) | 39.8 | 15.1 (38.1%) |
| 2011 | 34.6 | 11.8 (34.2%) | 5.1 | 2.2 (42.8%) | 2.6 | 2.4 (93.4%) | 42.2 | 16.4 (38.8%) |
| 2012 | 35.7 | 12.6 (35.3%) | 5.1 | 2.2 (43.6%) | 2.7 | 2.5 (93.7%) | 43.5 | 17.4 (39.9%) |
| 2013 | 38.1 | 13.8 (36.3%) | 5.2 | 2.3 (44.6%) | 3.1 | 2.9 (94.2%) | 46.4 | 19.1 (41.1%) |
| 2014 | 41.2 | 15.3 (37%) | 5.6 | 2.5 (45.1%) | 3.5 | 3.3 (95.2%) | 50.3 | 21.1 (42%) |
| 2015 | 44.0 | 16.9 (38.4%) | 5.9 | 2.7 (45.6%) | 4.0 | 3.8 (95.5%) | 53.8 | 23.4 (43.4%) |

Sources: NHIS, *NHI Statistics*, each year, National Statistics Portal (http://kosis.kr/, accessed February 13, 2017); *Medical Benefits Statistics*, each year, NHIS website (http://www.nhis.or.kr/retrieveHomeMain.xx, accessed February 13, 2017); *LTCIS Statistics*, each year, NHIS website (http://www.nhis.or.kr/retrieveHomeMain.xx, accessed February 13, 2017).

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1) Choi, Seongeun, "Population Aging and Medical Spending for Seniors: Current Status and Projections," *Fiscal Policy Commentaries*, 2015, No. 17.

〈Table II-2〉 **Number of Beneficiaries Per Program**

(Units: 1,000 persons, percentage)

| Year | Total population | Aged 65+ | NHI | | Medicare | | LTCIS | |
|---|---|---|---|---|---|---|---|---|
| | | | Overall | Overall | Overall | 65+ | Overall | 65+ |
| 2008 | 49,055 | 4,989 (9.6%) | 48,160 | 4,600 (9.6%) | 1,841 | 487 (26.4%) | 265.4 | 249.5 (94.0%) |
| 2009 | 49,308 | 5,177 (9.9%) | 48,614 | 4,826 (9.9%) | 1,677 | 460 (27.4%) | 322.3 | 299.7 (93.0%) |
| 2010 | 49,554 | 5,366 (10.2%) | 48,907 | 4,979 (10.2%) | 1,674 | 470 (28.1%) | 337.6 | 314.7 (93.2%) |
| 2011 | 49,937 | 5,515 (10.5%) | 49,299 | 5,184 (10.5%) | 1,609 | 460 (28.6%) | 478.4 | 446.0 (93.2%) |
| 2012 | 50,200 | 5,767 (11%) | 49,662 | 5,468 (11.0%) | 1,507 | 454 (30.1%) | 495.4 | 462.7 (93.4%) |
| 2013 | 50,429 | 6,023 (11.5%) | 49,990 | 5,740 (11.5%) | 1,459 | 453 (31.1%) | 535.3 | 502.5 (93.9%) |
| 2014 | 50,747 | 6,277 (11.9%) | 50,316 | 6,005 (11.9%) | 1,441 | 458 (31.8%) | 585.4 | 551.7 (94.2%) |
| 2015 | 51,015 | 6,541 (12.3%) | 50,490 | 6,223 (12.3%) | 1,544 | 496 (32.1%) | 630.8 | 596.0 (94.5%) |

Note: The sum of populations eligible for the three programs may exceed the total population (due to overlapping eligibility, etc.).
Sources: NHIS, *Yearbooks of NHI Statistics*, each year, NHIS website (http://www.nhis.or.kr/retrieveHomeMain. xx, accessed February 13, 2017); Statistics Korea, "National Statistics Portal" (http://kosis.kr/statHtml /statHtml.do?orgId=101%tblId=DT_1BPA003&conn_path=I2, accessed February 7, 2017).

〈Table II-3〉 **Benefits Per Capita Per Program**

(Units: KRW 1 trillion, 10,000 persons, KRW 10,000)

| | NHI | | | Medicare | | | LTCIS | |
|---|---|---|---|---|---|---|---|---|
| | Overall | 65 to 79 | 80+ | Overall | 65 to 79 | 80+ | Overall | 65 to 79 |
| 2008 | 53.2 | 176.1 | 202.9 | 236.7 | 368.4 | 376.1 | 199 | 203.3 |
| 2009 | 59.5 | 194.7 | 230.6 | 277 | 419.7 | 433.3 | 672 | 680.1 |
| 2010 | 66.4 | 217.7 | 267.2 | 290.6 | 437 | 468.8 | 888.7 | 894.7 |
| 2011 | 70.1 | 227.8 | 289.9 | 314 | 470.1 | 517.5 | 797.8 | 805.4 |
| 2012 | 71.9 | 230.3 | 305.8 | 339.2 | 490.6 | 551.7 | 795.2 | 802.3 |
| 2013 | 76.2 | 240.9 | 330 | 357.9 | 513.5 | 587.9 | 814.5 | 820.6 |
| 2014 | 81.9 | 254.2 | 355.8 | 385.6 | 547.4 | 629.7 | 823.9 | 834.6 |
| 2015 | 87.1 | 271.5 | 383.5 | 381.6 | 540.9 | 630.5 | 851.2 | 861.5 |

Note: The LTCIS-eligible population consists of seniors recognized by the government as eligible for LTCIS services and benefits.
Sources: NHIS, *NHI Statistics*, each year, National Statistics Portal (http://kosis.kr/, accessed February 13, 2017); *Medical Benefits Statistics*, each year, NHIS website (http://www.nhis.or.kr/retrieveHomeMain. xx, accessed February 13, 2017); *LTCIS Statistics*, each year, NHIS website (http://www.nhis.or.kr/ retrieveHomeMain.xx, accessed February 13, 2017).

LTCIS, introduced in 2008, saw its expenditures increase astonishingly from KRW 0.55 trillion in 2008 to KRW 4 trillion by 2015. As of 2015, the average per-capita cost for LTCIS-eligible seniors was KRW 8.51 million, while the figure was slightly higher, at KRW 8.62 million, for all seniors aged 65 and older. The cost of LTCIS services per capita, in other words, easily overwhelms the costs of NHI and Medicare benefits per capita.

The demand among seniors aged 80 and older for elderly care services is already high and growing, especially as more and more women continue to work and extended families are no longer the norm, phenomena that increasingly shift care for the elderly and weak from the private to the public sphere. Welfare states in Europe boast extensive public systems of care for the elderly, but their governments are struggling to find ways to lessen the fiscal burden all the same. Although South Korea's fiscal spending on LTCIS was only 0.8 percent of the country's GDP as of 2014, below the Organization for Economic Cooperation and Development (OECD) average of 1.4 percent, the share is still significant, as most seniors in higher-share countries, such as the Netherlands (4.3 percent), the Nordic countries, and Japan (2.1 percent) live in assisted living facilities.

## 2 Characteristics of the Rising Cost of Healthcare for Seniors

### A. Increase in Costs by Service Type

NHI spending on seniors has been growing much faster than the average NHI spending for all eligible persons. From 2008 to 2015, overall NHI spending grew an annual average of 8 percent, while NHI spending on seniors aged 65 and older grew an annual average of 11.1 percent. The spending on seniors aged 80 and older grew even more quickly at 18.6 percent a year.

NHI spending on seniors also involves more hospitalization costs than outpatient costs. In 2015, NHI spending for all eligible persons was evenly divided between outpatient services (39 percent) and hospitalization (39.4 percent). However, NHI spending on seniors aged 65 and older was 47.7 percent hospitalization (KRW 8.07 trillion) and only 30.7 percent outpatient services

(KRW 5.18 trillion). The disparity grows even wider among seniors aged 80 and older, with hospitalization accounting for 64 percent (KRW 2.98 trillion) and outpatient services making up 20 percent (KRW 0.92 trillion). Hospitalization of seniors aged 65 and older accounted for 47 percent of all hospitalization costs.

Not only does hospitalization make up the largest portion of NHI spending on seniors, but the costs have been rising more steeply than for other medical services and benefits. Overall hospitalization costs grew 10.2 percent a year from 2008 to 2015, hovering above the annual average rate of increase, at eight percent, in the costs of all medical services and benefits covered by NHI. In the meantime, the cost of hospitalizing seniors aged 65 and older rose 13.1 percent a year, and 20.4 percent for seniors aged 80 and older.

Of Medicare-eligible persons, those in Grade 1 are not responsible for copayments for hospitalization. This institutional incentive has radically increased the rate of all eligible persons, including seniors, in long-term hospital care. As a consequence, the proportion of total Medicare spending taken up by hospitalization costs, which amounted to 54.4 percent in 2015, was significantly greater than the proportion it took of overall NHI spending (39.4 percent). (Outpatient and medication costs made up 29.3 percent and 16.3 percent, respectively, of Medicare spending that year. Moreover, Medicare-eligible persons pay significantly less in copayments for medication.) Medicare spending for hospitalization grew 6.2 percent a year from 2008 to 2015, well above the annual average rate of growth, 4.4 percent, in overall Medicare spending. While all these trends are suggestive of the existence of moral hazards among Medicare-eligible patients seeking hospitalization, 55.6 percent of the Medicare spending for seniors aged 65 and older is spent on hospitalization, roughly on par with the portion of Medicare spending on persons of all ages for hospitalization. However, for seniors aged 80 and older, this number jumps to 65.8 percent.

### B. Increasing Number of Patients in Long-Term Hospital Care

The hospitalization cost of seniors remains high because the conditions for which they are hospitalized are aging-related illnesses that require long-term medical intervention. According to a recent study from the Korea Institute for Health and Welfare Policy (KIHAW, 2017), patients remaining in hospital for 270 to 365 days made up approximately two percent of all hospitalized patients in 2015. However, among senior hospitalized patients aged 65 and older, seven percent remained in hospital for 270 to 365 days. This proportion rose to 11 percent among seniors aged 75 and older. The number of patients in long-term hospital care (270 days or more) grew an average of 23 percent a year from 2005 to 2015. Yet the number of senior patients in long-term hospital care grew more steeply, at 31 percent a year. While it is natural that seniors are more likely to need hospital care than younger age groups, the dramatic growth in long-term hospitalization is also indicative of the inefficiency of hospitalization management. Persons needing long-term hospital care take up beds needed for patients with acute symptoms or diseases, calling our attention to the strong need to redefine the functions of assisted living facilities, including hospice care.

### C. Increasing Number of Hospitalization Days

The total medical spending on seniors, including the cost of hospitalization, has been on a rise also because more and more medical services are available to them. From 2008 to 2015, the total number of hospital visits and hospitalization days for all NHI-eligible persons grew 2.6 percent a year on average. The number of hospitalization days, in particular, grew seven percent a year on average. In the meantime, the number of hospital visits and hospitalization days for seniors aged 65 to 79 and those aged 80 and older grew at annual rates of 6 percent and 13 percent, respectively. The number of hospitalization days for these two groups of senior patients, in particular, grew by 11 percent and 17 percent a year, respectively.

While the total number of hospital visits and hospitalization days for Medicare-eligible persons dropped somewhat during the same period, their

number of hospitalization days grew 2.4 percent a year on average. This is particularly the case because Medicare-eligible persons have no copayment responsibilities for hospitalization. In the meantime, the total number of hospital visits and hospitalization days for seniors aged 65 to 79 and for those aged 80 and older grew 1.1 percent and 5.3 percent a year, respectively, with much of the growth owing to increases in the number of hospitalization days. The increasing number of days for which senior Medicare-eligible patients remain hospitalized accounts significantly for the rise in overall Medicare spending.

The total number of hospital visits and hospitalization days may be increasing for two reasons: (1) a higher total number of persons seeking medical services and (2) a higher number of hospital visits and hospitalization days per patient. Our examination of statistics from 2015 reveals that, whereas the latter increased, the former decreased, in comparison to the preceding year. In other words, the total number of hospital visits and hospitalization days has been on the rise in Korea not necessarily because more people are ill, but because more hospital services are sought out by existing patients. As of 2015, the total number of hospital visits and hospitalization days per patient was 21, while the number of hospitalization days per patient was 20. The number of hospitalization days per patient reached 165 among senior patients in rehabilitation hospitals, which was significantly higher than the number of hospitalization days per patient at higher hospitals.

## D. Medical Costs by Type of Care Facility

Medical costs are highest at the clinic level, followed by higher-level general hospitals and standard general hospitals. The fact that medical costs are higher at clinics, which mostly treat outpatients, indicates the need to control outpatient costs. The medical costs associated with rehabilitation hospitals is lower, but has also seen a rapid rise. Much of the medical costs incurred at rehabilitation hospitals are related to hospitalization. The number of rehabilitation hospitals has been growing, too, from 690 (0.9 percent of all medical institutions) in 2008 to 1,372 (1.6 percent of all medical institutions) in 2015. While this increase in rehabilitation hospitals with poor service quality was a worrisome phenomenon

at first, introduction of LTCIS has also helped to enhance the efficiency of the geriatric care market, leading to the closure of small, unsustainable facilities. As there is ongoing debate on the need to improve the medical services offered at rehabilitation hospitals and redefine their function in relation to assisted living facilities, it will be necessary to reform rehabilitation hospital management in the future.

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# Identifying Outliers in Seniors' Use of Medical Services

## 1 Regression Modeling

### A. Exploration of Outliers

Significant medical costs may be incurred at different turns in a person's lifecycle due to acute or chronic illness or injuries sustained in unforeseen events. There are also stretches of time in one's life where no medical costs are incurred. These outliers have been regarded as unnecessary obstacles that interfere with the stability of analysis models and therefore in need of removal. Outliers, however, may provide important information that must be taken into account. Data mining technology is used to detect patterns in these outliers, which are key to detecting fraud in financial and medical claims and also intrusions in cyberspace (Park et al., 2013). Big data analysis modeling is in vogue in medical research today, with the intent of identifying outliers in medical records and health insurance billing data (Lee et al., 2009). Diverse data mining techniques are also being used in the United States and Europe to detect outliers in the use of medical services (OECD, 2017).[2]

We set up a regression analysis model, designed to explain variations in the amounts of NHI benefits claimed and the number of hospital visits made

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2) The Health Insurance Review and Assessment Service (HIRA) is also using medical big data to detect outliers in the use of medical services and fraudulent claims ("Detecting Fraud in the Healthcare System: The Power of Medical Big Data," *The Jeonja Shinmun*, May 24, 2017, accessed October 21, 2017).

by patients via patients' socioeconomic and clinical characteristics. Information that is not observable from NHI billing data, such as patient preferences, may exert significant influence on the use of medical services. Anthony et al. (2009) demonstrated that, even after observable data, such as those on patients' gender, age and health status, were controlled for, patients who preferred being seen by doctors for coughs and chest paints were indeed more likely than other patients to seek outpatient services and also to consult multiple specialists rather than a single primary care practitioner. Tak et al. (2013) revealed that the willingness to participate actively in doctors' decision-making regarding treatment was influenced by patients' education and possession of private health insurance, and that patients' active involvement in decision-making was in proportion to the length of hospitalization and the cost of treatment.

We ought not, however, to overlook the impact of medical service providers on increasing patient demand for more medical services. Roemer's Law, that, in an insured population, a hospital bed built is a filled bed, has been proven repeatedly and empirically. Delamater et al. (2013), for instance, affirmed the positive correlation between the number of available hospital beds and the hospitalization rate through an inter-regional comparison. Cutler et al. (2013) also demonstrated that the personal convictions of medical service providers regarding certain methods of treatment explained the differences in the use of medical services from region to region more than individual patient preferences, confirming the effect of medical service provider behavior on the societal use of medical services.

As a matter of fact, a variety of factors, such as the level of competition on the given region's healthcare market (Henke et al., 2013) and the spillover effect on medical techniques among medical service providers (Chandra and Staiger, 2007), could affect patients' use of medical services. We do not even have to refer to these existing studies in order to imagine, quite reasonably, that a wide range of data concerning the idiosyncrasies of patients and medical practitioners that are unobservable from official health insurance billing data exerts complex effects as well.

We may be able to identify this unobserved data by tracking the dummy variables for individuals ($u_1$) in a fixed-effect model on panel data ($y_{i,t} = X_{i,t}\beta + u_i + \epsilon_{i,t}$). If the values of dummy variables concerning specific

individuals are particularly high, we may infer that the idiosyncratic factors discussed so far, in addition to the controlled variables, may be increasing the given individual's use of medical services. In order to confirm this inference, however, we must track the differences in the dummy variables concerning all individuals in our panel data analysis. Where the sample size is prohibitively large or where the sample period of the given panel data is too short, however, it is realistically impossible to track these differences reliably or efficiently.

In this chapter, therefore, we estimate the fixed effect of our model using within-patient variations, and use the difference (i.e., residual) between the model's estimates and actual observations ($\hat{e}_{i,t} = y_{i,t} - \hat{y}_{i,t}$) to identify the overall trajectory or direction in which the fixed-effect dummy variables move. Estimating fixed effects using within-patient variations enables us to obtain the estimate, $\hat{\sigma}$, without having to directly measure $u_1$ and free from the disruptive effect thereof. The residual here, ($\hat{e}_{i,t} = X_{i,t}(\beta - \hat{\beta}) + u_i + \epsilon_{i,t}$), provides both the information we need ($u_1$) and the error term ($\epsilon_{i,t}$) we do not need.

Unless the sample period of the given panel data spans a sufficiently long period of time, such as a few decades, we should not expect that the sum of the residuals concerning individuals, $\sum_{t=0}^{T} \hat{e}_{i,t} = \sum_{t=0}^{T}(u_i + \epsilon_{i,t})$, would make $\sum_{t=0}^{T} \epsilon_{i,t}$ equal zero. It is therefore impossible to identify the $u_1$ per individual. The error term concerning each individual, however, is randomly given. With respect to individuals that produce large residuals, whether positive or negative, that depart significantly from the given range over a relatively long span of time[3], it would be natural to assume that their $u_1$ would be biased in the same direction. In other words, the random effect of error terms may indicate excessive overuse or underuse of medical services at certain points in time, but the continued and repeated patterns observed in certain patients' use of medical services over long stretches of time may suggest that individuals' $u_1$ consistently lead them to overuse or underuse medical services.

To determine the threshold for determining how widely given residuals depart

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3) In our following analysis based on the NHI cohort database, we apply this method to the units of the sample that are observed in at least 10 of the 12 years making up our sample period, i.e., 2002 to 2013.

from the range of predictions estimable from our given model, we use studentized residuals.[4] The studentized residual of each individual is known to follow the *t*-distribution, thus allowing us to decide that the use of medical services by individuals that falls outside the range of studentized residuals, i.e., [—2, 2], constitutes an outlier. In other words, this method requires us to determine whether the studentized residuals generated by individuals each year continue to depart from the given range over the years. By examining whether these biases are correlated to patients' age, we may confirm how patients' age affects the distribution of outliers in individual patients' use of medical services.

This method has the advantage of allowing us to use individualized means, reflective of individual patients' observed socioeconomic and clinical characteristics, as the yardstick by which whether individuals' uses of medical services are outliers or not. This approach differs from studies like Phelps and Parente (1990) and Shin (2007), which measure the over- or underuse of medical services using the average medical costs of all regions. Analysis based on post-regression residuals, as attempted here, also provides an alternative for researchers trying to analyze dummy variables concerning individuals with panel data of insufficient time spans.

## B. Hierarchical Condition Categories Model (HCCM)

In order to control the influence of individuals' particular medical conditions on their use of medical services, we resort to the concept of hierarchical condition categories (HCCs), which the U.S. Centers for Medicare and Medicaid (CMS) use to determine the capitation fees of persons in Medicare Part C. Medicare, which in the United States refers to public health insurance for seniors aged 65 and older, pays for seniors' medical expenses based on the 2.9 percent of seniors' earned income collected as taxes. The Balanced Budget Act (BBA) of 1997 has since enabled individuals to receive Medicare benefits via private

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4) The studentized residuals are those obtained by standardizing residuals using $\frac{y_i - \hat{y}_i}{\hat{\sigma}\sqrt{1 - h_{ii}}}$. Here, $h_{ii}$ represents the *i*-th diagonal element of $H = X(X^T X)^{-1} X^2$, and $\hat{\sigma}$ represents the estimated root mean square error.
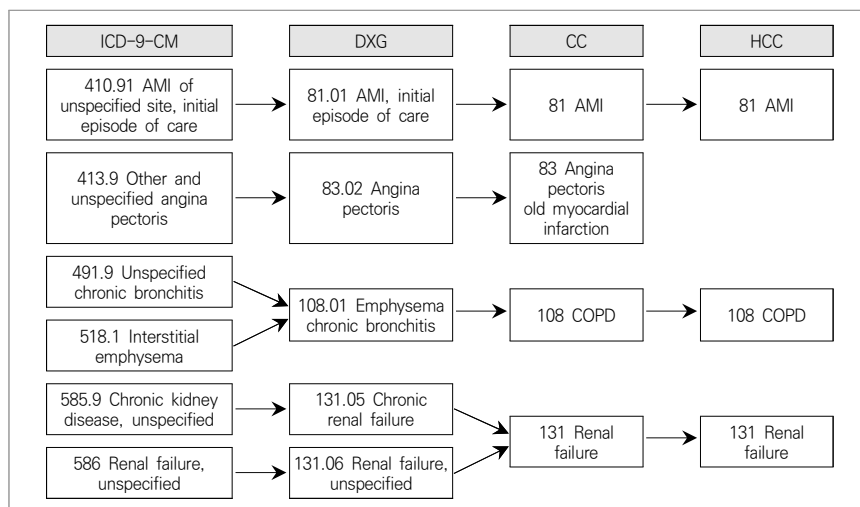
insurance providers. These private insurance providers pay for seniors' medical expenses, and the federal government reimburses the providers at fixed per-capita rates. The HCC model is used to calculate how much the federal government should reimburse private insurance providers for Medicare costs. The CMS employ regression analysis of the clinical and personal factors of senior patients obtained from the previous year's medical billing data to estimate the portion of the total cost attributable to each factor. The CMS then use these estimates to project the extent to which individual seniors would use medical services in the current year and determine the amount of the Medicare cost per capita in Part C to be reimbursed.

The HCC model provides a simple regression formula, but we resort to this model in analyzing seniors' medical costs for a number of reasons. First, this model simulates the hierarchical positions of various medical conditions and how they would affect medical spending on the basis of medical experts' advice. Consider Pope et al. (2011)'s example (Figure III-5). Medical conditions that are clinically similar and generate similar levels of medical costs are grouped together into a condition category (CC). Unspecified chronic bronchitis and interstitial emphysema, for example, are medical conditions that could be grouped together into a single category - chronic obstructive pulmonary diseases (COPDs) or Category No. 108. If a patient suffers from multiple conditions belonging to a number of similar CCs, we may assume that the greatest portion of the cost would be concentrated on treating that patient for the most serious condition he has and therefore take into account the medical cost of the CC to which that condition belongs. For example, a patient may have been diagnosed with both acute myocardial infarction and angina pectoris. In such a case, treatment for the patient's acute myocardial infarction in CC No. 81 would form the main source of the medical cost. By systematizing a vast array of medical conditions in this hierarchical and categorized manner, we can begin to generate useful information with which we can adjust the clinical risks of seniors. The HCCs, furthermore, lead us to categorize medical conditions in terms of cost and are therefore capable of explaining medical spending with greater reliability than the more popularly used measures of public health research, such as the Charleson Comorbidity Index and the Elixhauser Comorbidity Index.

The CMS regularly update their HCC models. In this chapter, we refer to

Version 22, which consists of 79 HCCs (Appendix Table 1).

[Figure III-1] HCCs: An Example



Source: Pope et al., 2011, p. 14.

## C. Data

We base our analysis on the NHI billing database cohorts, which provide billing information on a million or so patients from 2002 to 2013. The morbidity codes provided by medical service providers after patients' respective visits to medical institutions are used to develop the HCCs. We also utilized additional data on patients' gender, income (deciles),[5] age (20 to 34, 35 to 44, 45 to 54, 55 to 64, 65 to 69, 70 to 74, 75 to 79, 80 to 84, and 85 and older),[6] types of NHI membership (workplace-main, workplace-dependent, region-main, and region-dependent), death, disability (no disability, mild disability, severe

5) As Medicare-eligible persons' use of medical services differs from that of other groups, Medicare beneficiaries were excluded from our sample.

6) Minors aged 19 and under were excluded from our sample because their patterns of medical service use differ from those of other age groups.

disability), and the municipalities of residence as explanatory variables. The six dependent variables of our analysis are (1) total annual care costs confirmed by the HIRA, (2) total annual hospitalization costs confirmed by the HIRA, (3) total annual outpatient costs confirmed by the HIRA, (4) total number of visits to medical institutions, (5) total number of times patients were hospitalized, and (5) total number of times outpatient services were provided.[7]

**2** **Descriptive Statistics and Results of Analysis**

The analyzed period spans the years 2002 through 2013. Table III-1 provides a summary of descriptive statistics, from the three years of 2002, 2008, and 2013, used in our analysis. The table shows that the proportion of seniors aged 65 and older in the sample population grew steadily, from 9.88 percent in 2002 to 15.23 percent in 2013.

While the use of medical services increased across all age groups over the years, seniors aged 85 and older claimed the greatest shares of medical spending as of 2009. Seniors in this age group, in particular, were hospitalized 1.6 times a year, incurring hospitalization costs amounting to KRW 2.9 million per capita, as of 2013, and thus emerged as the most frequent users of hospitalization services. In contrast, this age group's use of outpatient services was comparatively less frequent than seniors aged 65 to 84, suggesting that costly hospitalization services effectively replaced outpatient services for those aged 85 and older. These findings indicate the need to develop an active health management and intervention system for seniors in their 80s as well as the need to expand care facility infrastructure capable of serving the terminally ill [Figures III-1] and [Figures III-2].

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7) Costs confirmed by the HIRA refer to the total amounts of benefits paid by the NHI in excess of patients' copayments with the HIRA's approval.

⟨Table III-1⟩ **Descriptive Statistics**

(Unit: percentage)

| | 2002 | 2008 | 2013 |
|---|---|---|---|
| N | 724,769 | 734,997 | 778,005 |
| Gender | | | |
| Male | 49.43 | 49.63 | 49.66 |
| Female | 50.57 | 50.37 | 50.34 |
| Age | | | |
| 20 to 34 | 36.72 | 29.71 | 26.84 |
| 35 to 44 | 24.85 | 23.74 | 21.15 |
| 45 to 54 | 17.07 | 21.38 | 21.70 |
| 55 to 64 | 11.49 | 12.14 | 15.08 |
| 65 to 69 | 4.14 | 5.05 | 4.88 |
| 70 to 74 | 2.65 | 3.67 | 4.43 |
| 75 to 79 | 1.63 | 2.22 | 3.06 |
| 80 to 84 | 0.92 | 1.22 | 1.70 |
| 85+ | 0.54 | 0.87 | 1.16 |
| 65+ | 9.88 | 13.03 | 15.23 |
| Income deciles | | | |
| 1 | 6.93 | 7.20 | 7.17 |
| 2 | 7.11 | 7.30 | 7.50 |
| 3 | 7.93 | 7.97 | 7.87 |
| 4 | 8.84 | 8.66 | 8.38 |
| 5 | 9.58 | 9.46 | 9.09 |
| 6 | 10.38 | 10.14 | 9.99 |
| 7 | 11.16 | 10.81 | 10.69 |
| 8 | 11.91 | 11.62 | 11.74 |
| 9 | 12.62 | 12.87 | 13.08 |
| 10 | 13.54 | 13.98 | 14.49 |
| Disability | | | |
| No disability | 97.13 | 95.02 | 94.65 |
| Mild disability | 0.76 | 1.01 | 0.98 |
| Severe disability | 2.11 | 3.97 | 4.37 |
| NHI membership type | | | |
| Region–main | 24.55 | 19.91 | 16.84 |
| Region–dependent | 25.31 | 18.02 | 14.55 |
| Workplace–main | 23.42 | 30.58 | 35.84 |
| Workplace–dependent | 26.72 | 31.49 | 32.77 |

Note: Medicare beneficiaries and minors aged 19 and under were excluded from the sample.

[Figure III-2] **Use of Medical Services by Age: Medical Costs**



Prior to the residual analysis described above, we had to set up a random effect model regarding the entire sample and identified the determinants for use of medical services.[8] Table III-5 lists the results of analysis based on such a regression model, involving the aggregate amount of medical benefits approved by the HIRA as the dependent variable. Our analysis reaffirms the conclusion of existing literature that women in general tend to incur greater medical costs than men (Bertakis et al. 2000; Alemayehu and Warner 2004). As expected, the more advanced the age, the greater the medical cost. The amount of outpatient

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8) We first set up a linear probability model to determine how all the variables of unchanging characteristics (e.g., sex, disability, etc.) are correlated to levels of medical spending. To identify outliers, we applied a fixed-effect model and calculated residuals.

spending decreases, but the cost of hospitalization increases far more dramatically in older seniors aged 80 or above. This confirms the substitutional relationship of hospitalization and outpatient services, as already suggested by the descriptive statistics of our sample. Low-income households tend to spend less on medical care than high-income households, as do the top-earning households (Deciles 9 and 10). The same pattern is observed in terms of the number of times senior patients have been hospitalized (to be discussed in detail later), suggesting that the top-earning households have relatively less demand for medical care than middle and upper-middle class households.

[Figure III-3] **Use of Medical Services by Age: Number of hospital visits**

⟨Table III-2⟩ **Results of Regression Analysis on HIRA-Approved Benefits Per Capita**

| Dependent variable (annual, per capita) | Total HIRA-approved benefits | Hospitalization benefits | Outpatient benefits |
|---|---|---|---|
| Gender (Female = 1) | 87,322.4 *** (2,110.4) | 24,477.9 *** (1,627.6) | 61,385.4 *** (1,314.5) |
| Age (Base = 20 to 34) | | | |
| 35 to 44 | 16,108.8 *** (1,362.9) | −14,003.3 *** (1,054.5) | 34,228.6 *** (798.4) |
| 45 to 54 | 66,916.7 *** (1,964.7) | −17,298.6 *** (1,506.3) | 92,711.5 *** (1,148.9) |
| 55 to 64 | 128,191.2 *** (3,193.1) | −35,104.0 *** (2,530.1) | 183,529.4 *** (1,765.9) |
| 65 to 69 | 235891.4 *** (5,683.0) | −21,084.4 *** (4,752.5) | 299,651.7 *** (2,802.4) |
| 70 to 74 | 337,304.3 *** (7,365.3) | 27,951.8 *** (6,331.7) | 371,151.9 *** (3,357.3) |
| 75 to 79 | 477,330.5 *** (10,973.4) | 157,599.2 *** (9,862.0) | 397,347.5 *** (4,384.7) |
| 80 to 84 | 644,237.3 *** (17,207.9) | 373,876.0 *** (16,227.4) | 348,448.6 *** (5,405.2) |
| 85+ | 918,990.0 *** (28,107.4) | 705,771.0 *** (26,647.2) | 260,522.3 *** (6,978.0) |
| Income (Base = Decile 1) | | | |
| Decile 2 | 2,908.7 (3,431.3) | −692.4 (3,057.6) | 2,189.9 (1,379.4) |
| Decile 3 | 4,991.9 (3,490.4) | −136.3 (3,104.9) | 3,208.3 * (1,421.8) |
| Decile 4 | 17,978.9 *** (3,692.8) | 8,899.9 ** (3,300.1) | 7,031.4 *** (1,411.8) |
| Decile 5 | 26,513.2 *** (3,477.4) | 12,638.2 *** (3,091.0) | 11,289.8 *** (1,413.6) |
| Decile 6 | 36,714.6 *** (3,558.2) | 16,736.8 *** (3,143.1) | 16,969.4 *** (1,475.8) |
| Decile 7 | 37,483.4 *** (3,660.4) | 15,018.6 *** (3,248.8) | 19,130.6 *** (1,450.8) |
| Decile 8 | 41,374.3 *** (3,617.4) | 12,317.9 *** (3,146.8) | 25,045.9 *** (1,559.0) |

〈Table III-2〉 **continued**

| Dependent variable (annual, per capita) | Total HIRA–approved benefits | Hospitalization benefits | Outpatient benefits |
|---|---|---|---|
| Decile 9 | 38,789.7 *** (3,769.6) | 7,745.5 * (3,292.1) | 26,259.1 *** (1,616.6) |
| Decile 10 | 36,098.9 *** (4,009.6) | 2,730.1 (3,503.6) | 26,575.4 *** (1,708.9) |
| Disability (Base = no disability) | | | |
| Mild disability | 3,236,579.8 *** (66,176.8) | 1,200,901.5 *** (41,512.4) | 2,313,043.5 *** (60,030.6) |
| Severe disability | 344,036.9 *** (11,260.0) | 203,881.9 *** (9,357.9) | 141,402.6 *** (5,184.0) |
| Living or deceased (Base = living) | | | |
| Deceased | 758,521.7 *** (37,555.2) | 1,208,873.6 *** (36,188.8) | −424,567.9 *** (9,794.5) |
| NHI membership type (Base = region–main) | | | |
| Region–dependent | −12,310.2 *** (2,846.0) | −64.9 (2,406.8) | −14,693.5 *** (1,295.7) |
| Workplace–main | 642.1 (2,209.1) | −24,212.4 *** (1,781.1) | 23,430.2 *** (1,115.3) |
| Workplace–dependent | 48,581.2 *** (2,832.3) | 24,422.9 *** (2,368.4) | 21,770.1 *** (1,326.9) |
| Constant | 9,047.9 (14,842.0) | 2,370.3 (13,471.0) | 301.3 (5,573.9) |

Notes: 1) The regression analysis assumes a linear probability model and also includes the variables of municipality dummies and HCCs. Person–clustered robust standard errors were used.
2) The asterisks, ***, **, and *, respectively represent statistical significance at the levels of 0.1 percent, one percent, and five percent.

<Table III-2> shows the results of our regression analysis, with the number of hospitalization visits per capita as dependent variables. The pattern here is similar to the one noted in the case of medical cost per capita. However, although the number of times hospitalization services were provided increased with age, the number of times outpatient services were provided continued to increase to age 80 or so, after which it began to decline. In other words, hospitalization tends to replace outpatient services for senior patients aged 80 and older. The

fact that the numbers of hospitalization visits remain low among people in lower income deciles suggests that medical care in Korea still remains relatively inaccessible to the poor. However, people in the top two income deciles sought hospitalization less than people in the middle-to-upper income deciles.

⟨Table III-3⟩ **Results of Regression Analysis on the Number of Hospital Visits Per Capita**

| Dependent variable (annual, per capita) | Number of hospital visits | Number of times hospitalization was provided | Number of times outpatient services were provided |
|---|---|---|---|
| Gender (Female = 1) | 3.436 *** (0.020) | 0.034 *** (0.001) | 3.375 *** (0.019 |
| Age (Base = 20 to 34) | | | |
| 35 to 44 | 1.206 *** (0.012) | −0.018 *** (0.001) | 1.188 *** (0.012) |
| 45 to 54 | 3.496 *** (0.017) | −0.007 *** (0.001) | 3.375 *** (0.017) |
| 55 to 64 | 7.119 *** (0.028) | −0.007 *** (0.001) | 6.762 *** (0.027) |
| 65 to 69 | 12.93 *** (0.052) | 0.001 (0.002) | 11.950 *** (0.051) |
| 70 to 74 | 17.99 *** (0.074) | 0.041 *** (0.003) | 16.430 *** (0.072) |
| 75 to 79 | 21.35 *** (0.102) | 0.144 *** (0.005) | 19.350 *** (0.099) |
| 80 to 84 | 21.34 *** (0.133) | 0.331 *** (0.009) | 19.120 *** (0.129) |
| 85+ | 18.71 *** (0.169) | 0.614 *** (0.015) | 16.460 *** (0.165) |
| Income (Base = Decile 1) | | | |
| Decile 2 | 0.0382 (0.026) | −0.001 (0.002) | 0.048 (0.025) |
| Decile 3 | 0.0361 (0.026) | −0.001 (0.002) | 0.042 (0.026) |
| Decile 4 | 0.190 *** (0.026) | 0.006 *** (0.002) | 0.185 *** (0.026) |
| Decile 5 | 0.381 *** (0.026) | 0.011 *** (0.002) | 0.372 *** (.02546) |

〈Table III-3〉 **continued**

| Dependent variable (annual, per capita) | Number of hospital visits | Number of times hospitalization was provided | Number of times outpatient services were provided |
|---|---|---|---|
| Decile 6 | 0.615 *** (0.026) | 0.016 *** (0.002) | 0.595 *** (0.026) |
| Decile 7 | 0.749 *** (0.026) | 0.015 *** (0.002) | 0.731 *** (0.026) |
| Decile 8 | 0.912 *** (0.027) | 0.014 *** (0.002) | 0.891 *** (0.027) |
| Decile 9 | 0.979 *** (0.028) | 0.009 *** (0.002) | 0.965 *** (0.028) |
| Decile 10 | 0.982 *** (0.030) | 0.001 (0.002) | 0.997 *** (0.030) |
| Disability (Base = no disability) | | | |
| Mild disability | 5.617 *** (0.250) | 0.680 *** (0.022) | 4.733 *** (0.249) |
| Severe disability | 5.223 *** (0.091) | 0.127 *** (0.005) | 4.836 *** (0.090) |
| Living or deceased (Base = living) | | | |
| Deceased | −11.05 *** (0.084) | 0.458 *** (0.013) | −10.720 *** (0.081) |
| NHI membership type (Base = region-main) | | | |
| Region-dependent | −0.636 *** (0.021) | −0.006 *** (0.001) | −0.617 *** (0.021) |
| Workplace-main | 1.294 *** (0.018) | −0.015 *** (0.001) | 1.314 *** (0.017) |
| Workplace-dependent | 0.855 *** (0.022) | 0.018 *** (0.001) | 0.796 *** (0.021) |
| Constant | 0.287 ** (0.101) | 0.018 ** (0.007) | 0.252 ** (0.097) |

Notes: 1) The regression analysis assumes a linear probability model and also includes the variables of municipality dummies and HCCs. Person-clustered robust standard errors were used.
2) The asterisks, ***, **, and *, respectively represent statistical significance at the levels of 0.1 percent, one percent, and five percent.

The outliers we identified using residual information and the technique described earlier are presented in Figures III-4 and III-5 and Tables III-3 and III-4. Figures III-4 and III-5 present the proportions of individuals with residuals outside the [–2, 2], divided between the underusing and overusing groups. The proportion of individuals with overuse outliers, in terms of the total medical cost and the total hospitalization cost grows dramatically among seniors aged 65 and older. In other words, the proportion of individuals that incur extremely greater medical and hospitalization costs is greater among seniors than in other age groups. The same pattern, however, was not observed with respect to the outpatient service cost and the total number of times hospitalization and outpatient services were provided. In sum, excessive use of medical services by seniors tends to increase the total medical and hospitalization costs.

Outliers of underuse are further indicative of the polarized pattern that characterize seniors' use of medical services. The proportion of individuals extremely underusing medical services also increases with age. In other words, the proportion of individuals who extremely underuse medical services is noticeably higher among seniors than in other age groups, indicating the significant presence of seniors who are denied proper medical care.

If residuals depart from the [–2, 2] range only sporadically throughout the sample period, we cannot use them as evidence of underuse or overuse.[9] However, if these range-departing residuals are repeatedly observed throughout a relatively long sample period, we may interpret them as indicative of abnormal patterns in the use of medical services. To confirm this, we divided the sample population into four groups in terms of the proportion of individual members with residuals that depart from the [–2, 2] range, i.e., zero to 25 percent, 25 to 50 percent, 50 to 75 percent, and 75 to 100 percent.[10] While there is no absolute threshold that determines overuse or underuse of medical

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9) Although the disease-related variables had already been controlled, catastrophic medical situations not reflected on NHI billing data or unusually and extremely healthy situations could have caused residuals to depart from the estimates resulting from the regression model.

10) The authors divided the sample population into these proportions arbitrarily, and the results of our analysis based on the division of these proportions into 10 deciles are similarly arbitrary.

services, it would not be too far-fetched to regard residuals that depart at least 50 percent from the fitted line, in either direction, during the sample period as indicative of abnormal use of medical services. To examine how these proportions are correlated to age, we also divided the sample population into age groups, beginning with the year 2002, and present the results in <Tables III-5> and <Tables III-6>.

[Figure III-4] **Proportions of Overuse Outliers by Age**



[Figure III-5] **Proportions of Underuse Outliers by Age**

Our analysis of outliers shows that seniors aged 65 or above show greater proportions of outliers than younger people in terms of the mean amount of medical benefits per capita, the mean hospitalization cost per capita, and the mean number of times each patient was hospitalized. The proportions of outliers among seniors and non-seniors, in the 50-percent to 75-percent range, were 0.47 to 0.96 percent and 0.05 to 0.29 percent, respectively, for the mean amount of medical benefits; 0.37 to 1.01 percent and 0.02 to 0.17 percent, respectively, for the mean hospitalization cost per capita; and 0.62 to 1.42 percent and 0.04 to 0.30 percent, respectively, for the mean number of times each patient was hospitalized. Our analysis confirms that seniors are more likely to be outliers of overuse when it comes to NHI-covered medical care, with the outlier patterns particularly prominent in terms of hospitalization service. As this analysis is based on residuals resulting from a regression model in which all age and disease-related variables were controlled, the age-related patterns it shows are particularly significant. As patients grow older, they are more likely to overuse medical services than younger patients with the same medical conditions.[11]

The proportion of individuals with underuse outliers in the 50-to-100-percent range increases steadily with age, particularly when measured in terms of the number of hospital visits (especially in terms of the number of times outpatient services were provided). In other words, seniors are more likely than younger age groups to underuse medical services to an extreme extent. This strongly suggests that seniors are polarized between those who grossly overuse medical services and those who grossly underuse them. That deviation in the use of medical service is greater among seniors than in other age groups corresponds to the conclusion of Jeong (2010), which demonstrated, through regression analysis, that the variations in the distribution of medical costs grew wider in proportion to age.

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11) As this analysis is based on residuals resulting from a regression model in which all age and disease-related variables were controlled, the age-related patterns it shows are particularly significant. As patients grow older, they are more likely to overuse medical services than younger patients with the same medical conditions.

〈Table III-4〉 **Results of the Outlier Analysis (All Medical Services)**

| Age | 20–34 | 35–44 | 45–54 | 55–64 | 65–69 | 70–74 | 75–79 | 80–84 | 85+ |
|---|---|---|---|---|---|---|---|---|---|
| Mean medical cost per capita | | | | | | | | | |
| Proportion of overuse outliers (%) | | | | | | | | | |
| 0–25 | 99.68 | 99.37 | 98.71 | 97.68 | 96.52 | 95.45 | 94.22 | 94.37 | 94.96 |
| 25–50 | 0.25 | 0.50 | 1.02 | 1.89 | 2.91 | 3.58 | 4.72 | 4.58 | 3.94 |
| 50–75 | 0.05 | 0.09 | 0.18 | 0.29 | 0.47 | 0.82 | 0.96 | 0.83 | 0.94 |
| 75–100 | 0.02 | 0.04 | 0.10 | 0.14 | 0.10 | 0.16 | 0.10 | 0.22 | 0.16 |
| Proportion of underuse outliers (%) | | | | | | | | | |
| 0–25 | 99.54 | 99.27 | 98.32 | 96.37 | 93.85 | 89.95 | 82.39 | 78.22 | 82.05 |
| 25–50 | 0.11 | 0.31 | 0.75 | 1.73 | 3.60 | 6.61 | 13.06 | 14.93 | 12.13 |
| 50–75 | 0.05 | 0.11 | 0.30 | 0.66 | 1.01 | 1.67 | 2.76 | 4.76 | 3.62 |
| 75–100 | 0.30 | 0.31 | 0.64 | 1.23 | 1.54 | 1.77 | 1.79 | 2.10 | 2.20 |

| Age | 20–34 | 35–44 | 45–54 | 55–64 | 65–69 | 70–74 | 75–79 | 80–84 | 85+ |
|---|---|---|---|---|---|---|---|---|---|
| Mean number of hospital visits per capita | | | | | | | | | |
| Proportion of overuse outliers (%) | | | | | | | | | |
| 0–25 | 94.31 | 92.75 | 89.28 | 86.50 | 87.97 | 91.15 | 94.77 | 96.99 | 98.43 |
| 25–50 | 4.46 | 5.40 | 7.52 | 9.09 | 8.27 | 6.35 | 4.00 | 2.49 | 1.26 |
| 50–75 | 1.06 | 1.52 | 2.63 | 3.85 | 3.49 | 2.45 | 1.15 | 0.52 | 0.31 |
| 75–100 | 0.18 | 0.33 | 0.57 | 0.56 | 0.27 | 0.04 | 0.08 | 0.00 | 0.00 |
| Proportion of underuse outliers (%) | | | | | | | | | |
| 0–25 | 100.00 | 99.98 | 99.47 | 73.27 | 29.54 | 10.87 | 2.48 | 0.83 | 0.47 |
| 25–50 | 0.00 | 0.01 | 0.42 | 16.74 | 21.54 | 14.38 | 6.91 | 3.19 | 1.57 |
| 50–75 | 0.00 | 0.00 | 0.09 | 7.35 | 21.40 | 19.67 | 14.14 | 8.86 | 3.31 |
| 75–100 | 0.00 | 0.00 | 0.02 | 2.63 | 27.51 | 55.09 | 76.48 | 87.12 | 94.65 |

Note: Our analysis here concerns only the units of the sample population that repeated in at least 10 of
the 12 years, 2002 through 2013, subject to our analysis, and that were divided into age groups
according to their ages in 2002. The number of years in which the studentized residuals of these
units departed from the [−2, 2] range in either a positive or negative direction were added up so that
the units were divided into the four groups in terms of the proportions of overuse and underuse outliers.

〈Table III-5〉 **Results of the Outlier Analysis (Hospitalization)**

| Age | 20–34 | 35–44 | 45–54 | 55–64 | 65–69 | 70–74 | 75–79 | 80–84 | 85+ |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Mean hospitalization cost per capita | | | | | |
| | | | | Proportion of overuse outliers (%) | | | | | |
| 0–25 | 99.83 | 99.62 | 99.21 | 98.40 | 96.94 | 95.53 | 94.00 | 93.67 | 94.33 |
| 25–50 | 0.14 | 0.34 | 0.68 | 1.40 | 2.63 | 3.57 | 4.92 | 5.24 | 4.57 |
| 50–75 | 0.02 | 0.03 | 0.09 | 0.17 | 0.37 | 0.77 | 1.01 | 0.87 | 0.94 |
| 75–100 | 0.01 | 0.01 | 0.03 | 0.03 | 0.06 | 0.13 | 0.07 | 0.22 | 0.16 |
| | | | | Proportion of underuse outliers (%) | | | | | |
| 0–25 | 99.80 | 99.52 | 98.64 | 96.70 | 94.91 | 92.43 | 88.27 | 87.65 | 89.92 |
| 25–50 | 0.13 | 0.32 | 0.87 | 1.90 | 2.81 | 4.60 | 8.37 | 8.42 | 7.09 |
| 50–75 | 0.05 | 0.11 | 0.35 | 0.93 | 1.25 | 1.58 | 1.86 | 2.53 | 1.42 |
| 75–100 | 0.02 | 0.04 | 0.14 | 0.47 | 1.03 | 1.39 | 1.50 | 1.40 | 1.57 |

| Age | 20–34 | 35–44 | 45–54 | 55–64 | 65–69 | 70–74 | 75–79 | 80–84 | 85+ |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Mean number of times for which hospitalization was provided per capita | | | | | |
| | | | | Proportion of overuse outliers (%) | | | | | |
| 0–25 | 99.44 | 99.03 | 98.35 | 97.37 | 95.36 | 93.82 | 92.86 | 92.80 | 94.02 |
| 25–50 | 0.51 | 0.84 | 1.42 | 2.27 | 3.95 | 4.99 | 5.70 | 5.89 | 4.41 |
| 50–75 | 0.04 | 0.11 | 0.19 | 0.30 | 0.62 | 1.07 | 1.25 | 1.05 | 1.42 |
| 75–100 | 0.01 | 0.02 | 0.04 | 0.06 | 0.08 | 0.13 | 0.20 | 0.26 | 0.16 |
| | | | | Proportion of underuse outliers (%) | | | | | |
| 0–25 | 99.86 | 99.67 | 99.05 | 97.39 | 95.17 | 91.20 | 74.75 | 62.68 | 65.67 |
| 25–50 | 0.09 | 0.24 | 0.65 | 1.73 | 2.97 | 6.01 | 20.32 | 23.40 | 20.16 |
| 50–75 | 0.03 | 0.07 | 0.23 | 0.67 | 1.29 | 1.64 | 3.57 | 12.13 | 10.08 |
| 75–100 | 0.01 | 0.03 | 0.07 | 0.22 | 0.57 | 1.15 | 1.36 | 1.79 | 4.09 |

Note: Our analysis here concerns only the units of the sample population that repeated in at least 10 of the 12 years, 2002 through 2013, subject to our analysis, and that were divided into age groups according to their ages in 2002. The number of years in which the studentized residuals of these units departed from the [−2, 2] range in either a positive or negative direction were added up so that the units were divided into the four groups in terms of the proportions of overuse and underuse outliers.

⟨Table III-6⟩ **Results of the Outlier Analysis (Outpatient Services)**

| Age | 20–34 | 35–44 | 45–54 | 55–64 | 65–69 | 70–74 | 75–79 | 80–84 | 85+ |
|---|---|---|---|---|---|---|---|---|---|
| Mean outpatient cost per capita | | | | | | | | | |
| Proportion of overuse outliers (%) | | | | | | | | | |
| 0–25 | 99.32 | 98.77 | 97.71 | 96.12 | 96.01 | 96.46 | 97.66 | 98.52 | 99.53 |
| 25–50 | 0.51 | 0.96 | 1.71 | 2.87 | 0.95 | 0.63 | 1.71 | 0.87 | 0.31 |
| 50–75 | 0.12 | 0.19 | 0.39 | 0.76 | 0.80 | 0.75 | 0.45 | 0.57 | 0.16 |
| 75–100 | 0.05 | 0.08 | 0.19 | 0.25 | 0.24 | 0.16 | 0.18 | 0.04 | 0.00 |
| Proportion of underuse outliers (%) | | | | | | | | | |
| 0–25 | 99.59 | 99.46 | 98.77 | 97.33 | 95.74 | 94.20 | 94.40 | 94.33 | 97.17 |
| 25–50 | 0.07 | 0.15 | 0.36 | 0.85 | 1.71 | 2.61 | 2.57 | 3.10 | 1.10 |
| 50–75 | 0.04 | 0.07 | 0.22 | 0.52 | 0.85 | 1.26 | 1.36 | 1.22 | 0.47 |
| 75–100 | 0.31 | 0.32 | 0.65 | 1.31 | 1.70 | 1.93 | 1.66 | 1.35 | 1.26 |

| Age | 20–34 | 35–44 | 45–54 | 55–64 | 65–69 | 70–74 | 75–79 | 80–84 | 85+ |
|---|---|---|---|---|---|---|---|---|---|
| Mean number of times for which outpatient services were provided per capita | | | | | | | | | |
| Proportion of overuse outliers (%) | | | | | | | | | |
| 0–25 | 94.04 | 92.59 | 89.22 | 86.84 | 88.75 | 91.58 | 94.9 | 97.16 | 98.27 |
| 25–50 | 4.65 | 5.50 | 7.53 | 8.89 | 7.74 | 5.97 | 3.85 | 2.36 | 1.57 |
| 50–75 | 1.12 | 1.56 | 2.68 | 3.73 | 3.29 | 2.41 | 1.18 | 0.48 | 0.16 |
| 75–100 | 0.19 | 0.35 | 0.58 | 0.55 | 0.23 | 0.03 | 0.05 | 0.00 | 0.00 |
| Proportion of underuse outliers (%) | | | | | | | | | |
| 0–25 | 100.00 | 99.98 | 99.46 | 72.34 | 28.37 | 10.15 | 2.64 | 0.79 | 0.31 |
| 25–50 | 0.00 | 0.01 | 0.43 | 16.79 | 20.61 | 13.88 | 6.38 | 3.14 | 1.57 |
| 50–75 | 0.00 | 0.00 | 0.10 | 8.00 | 21.05 | 19.13 | 13.36 | 8.25 | 3.62 |
| 75–100 | 0.00 | 0.00 | 0.02 | 2.87 | 29.97 | 56.84 | 77.62 | 87.82 | 94.49 |

Note: Our analysis here concerns only the units of the sample population that repeated in at least 10 of the 12 years, 2002 through 2013, subject to our analysis, and that were divided into age groups according to their ages in 2002. The number of years in which the studentized residuals of these units departed from the [–2, 2] range in either a positive or negative direction were added up so that the units were divided into the four groups in terms of the proportions of overuse and underuse outliers.
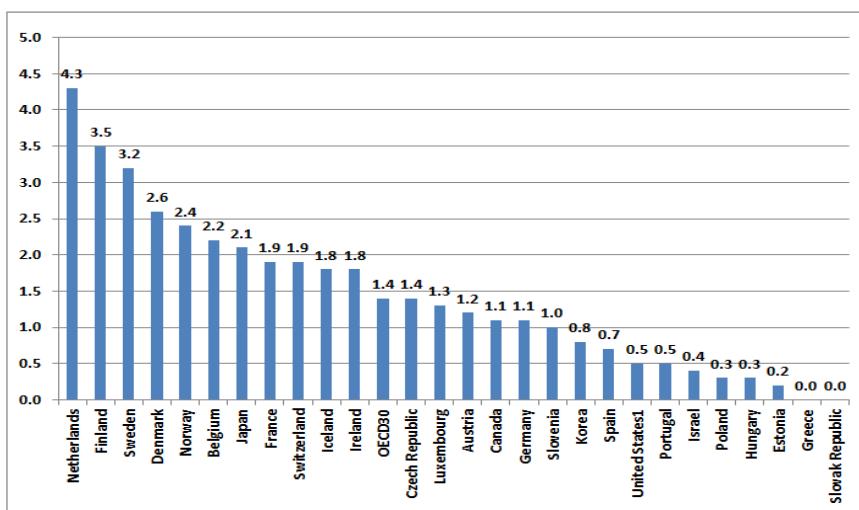
# IV

## LTCIS and Policy Tasks

**1** LTCIS in Korea Today and International Comparison

On top of the rising cost of public healthcare, another major fiscal expense associated with population aging is care services for the elderly. Long-term hospitalization, life-prolonging treatment, and care for the terminally ill are three major sources of the rising medical costs for seniors. The cost of care for the terminally ill tends to rise in proportion to income, and therefore makes up greater proportions of medical costs for seniors in developed countries than in developing ones. Elderly care services are in strong demand especially among seniors aged 80 and older. The increasing participation of women in the economy and the breakdown of extended families make it increasingly difficult for families to provide the unofficial care that their elderly members need, thereby raising societal demand for public care services. European states boast well-structured public long-term care services for seniors. Yet the governments of these countries, too, are struggling to find ways to reduce the associated fiscal burden.

A decade has elapsed since LTCIS was first introduced in Korea in 2008, and the fiscal spending on LTCIS services has been rising steeply ever since, amounting to 0.8 percent of Korea's GDP in 2014, although this figure was lower than the OECD average of 1.4 percent at the time. Nevertheless, Korea's spending on long-term care for the elderly, as a percentage of national GDP, is not insignificant in comparison to other OECD member states, with the exception of the Netherlands (4.3 percent), the Nordic countries, and Japan (2.1

percent) where the majority of seniors live in assisted living and care facilities. In the majority of European states, the public sector is responsible for long-term care of the elderly, with individual seniors or their families paying for less than 30 percent of the total cost in copayments (except in the United Kingdom, Switzerland and Estonia). These states pay for public long-term care services from either general tax expenditure accounts or social insurance funds. The governments of countries that finance public long-term care services with general tax revenue mostly limit their services to seniors in low-income groups or differentiate the amount of services provided by beneficiary income level. Social insurances for long-term senior care services, on the other hand, tend to minimize the role of doctors and care service providers, reduce society's medical costs, and prevent increases in the burden on the public health insurance system. Nevertheless, the separation of the healthcare system and the long-term care system for the elderly may engender inefficiencies.
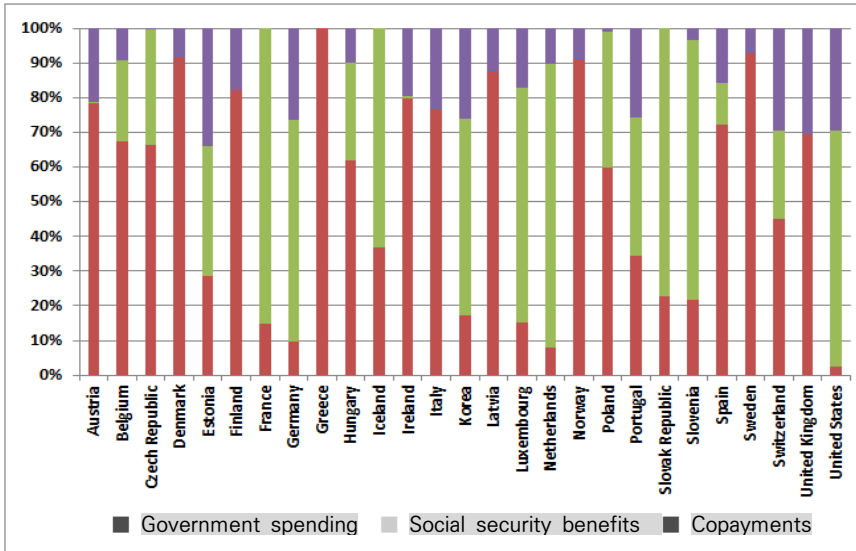
[Figure IV-1] **OECD Member States' Public Spending on Long-Term Care for Seniors as Percentages of Their GDP (2014)**



Note: Long-term care spending includes spending on both healthcare and social services.
Source: OECD Health Statistics 2017, http://stats.oecd.org/index.aspx?DataSetCode=HEALTH_STAT (accessed October 20, 2017).

[Figure IV-2] **Financial Resources for Long-Term Care for Seniors in OECD Member States (2015)**



Note: The different colors represent the respective proportions of different sources of finance for long-term care spending.
Source: OECD Health Statistics 2017, http://stats.oecd.org/index.aspx?DataSetCode=HEALTH_STAT (accessed October 20, 2017).

## 2 Effects of LTCIS

Population aging and the changing family dynamics increasingly shift long-term care for seniors from the private sphere to the public. When state facilities provide long-term care services for the elderly, it has the effect of alleviating the burden on women, enabling them to participate more actively in the labor market, and increasing jobs in the services sector. In their analysis of the Input-Output Tables of 2008 in Korea, Park et al. (2011) estimated that LTCIS increased the number of jobs available in the long-term care service and other related sectors from 20,916 in 2008 to 83,606 in 2009, to 103,760

in 2010, and further to 165,061 in 2011. Introduction of LTCIS is also estimated to have increased the gross output by KRW 0.91 trillion in 2008, KRW 3.8 trillion in 2009, KRW 4.8 trillion in 2010, and KRW 7.6 trillion in 2011. The value added by the production process is also estimated to have increased from KRW 0.83 trillion in 2008 to KRW 3.4 trillion in 2009, to KRW 4.34 trillion in 2010, and to KRW 6.9 trillion in 2011.

There is a significant body of studies from around the world that empirically prove that introduction of a public system of long-term care services for seniors has indeed lightened the burden of care on women and thereby increased their participation in the economy in countries with relatively well-established systems of long-term care insurance. Geyer et al. (2015), for example, argued that the German state's decision to switch the source of financing for public long-term elderly care services from the account for public assistance to that for social insurance in 1995, with the intent of increasing seniors' use of at-home services, significantly reduced the amount of labor supply from women. The authors set up a structural model of analysis and demonstrated that the government's provision of long-term elderly care services in kind slightly increased the total amount of labor supply from all family members, while cash support for long-term elderly care services reduced labor supply from all family members more significantly. When the state's support for long-term elderly care was provided in both kind and cash, the labor-reducing effect of cash support overwhelmed the labor-increasing effect of in-kind support. Sugawara et al. (2014) also demonstrated that introduction of long-term care insurance for seniors in Japan increased women's participation in the labor market. Ansah et al. (2016) projected that the domestic labor supply would drop 0.34 percent by 2030 due to women leaving the labor market in order to care for elderly family members. Yet the authors used their simulation model, assuming improvements in the public long-term care service system, to predict that such improvements would reduce the percentage of women leaving the labor market. Public long-term care insurances not only increase the jobs available to women, but also positively affect women's decision to have children and ultimately increase the birth rate society-wide. Korn et al. (2012), for example, argued that public support for long-term elderly care in European states not only increased women's participation in the labor market, but also raised birth rates.

As LTCIS is still quite new in Korea, there is little empirical research on whether its introduction has indeed increased women's presence in the workforce. While there are a number of studies that partially examine whether LTCIS, by alleviating the burden of care on younger family members, has made any difference to family members' social, cultural, and economic activities, no consensus is found in these studies. Lee and Won (2012), for example, concluded that the effect of LTCIS on increasing opportunities for economic participation of younger family members was insignificant. Kim (2013), on the other hand, cited the results of an opinion poll affirming its positive effect, reducing family members' need to care for their own elderly family members, on improving family relations and economic (employment) prospects of family members, concluding that its introduction has replaced family care with more productive activities.

We are tempted to think that LTCIS has increased the satisfaction of family members ─mostly women─ who are most burdened with having to care for their elderly. Choi (2015), however, concluded that it failed to improve the satisfaction of seniors with the quality of care they receive and quality of life for the whole family. Sunwoo et al. (2016) also found that LTCIS-eligible seniors with limitations to their physical functions still suffer a rather low quality of life, and that no significant difference in quality of life existed between LTCIS-ineligible and LTCIS-eligible seniors. These findings may well be attributed to the fact that still a relatively narrow subset of seniors is eligible to receive LTCIS services, with the process of determining eligibility still too rigorous despite attempts to relax the criteria.

Programs like LTCIS may affect not only women's participation in the labor market and seniors' overall satisfaction with quality of life, but also the societal cost of medical care. Such programs may improve overall senior health and reduce their demand for medical care, thereby leading to decreases in public spending on healthcare for seniors. In societies like Korea, however, where nursing homes for seniors associated with LTCIS and rehabilitation hospitals associated with NHI exist side by side without centralized management, LTCIS is unlikely to reduce public spending on healthcare for seniors as the types of care these facilities provide overlap. Although the rate of increase in NHI spending on healthcare for seniors aged 65 and older has somewhat slowed

since LTCIS was introduced, LTCIS spending has been rising steeply instead. The pace of growth in NHI spending on seniors has slowed because of the decreasing cost of rehabilitation hospital care, mainly thanks to an increase in the number of nursing homes and other such assisted living facilities catering to seniors. LTCIS may still, in theory, reduce public spending on healthcare for seniors by improving senior health. Yet the empirical studies conducted in Korea do not support this theoretical potential.

Empirical studies in Korea on whether LTCIS has increased or decreased medical spending on seniors generally support the latter conclusion. However, these studies also show that much of this spending, on seniors typically covered by NHI, has been transferred to LTCIS with an increasing number of seniors now admitted into assisted living facilities instead of long-term hospitalization. In other words, LTCIS has reduced medical spending only on the surface, not by improving senior health and reducing fiscal waste, but simply by moving the source of public spending from NHI to LTCIS, which is why the majority of these studies cite the decreases in hospitalization costs. Han et al. (2013), for example, concluded that the mean annual medical cost per capita among seniors eligible for LTCIS services was 61.85 percent lower than the cost per capita among non-eligible seniors, and found that introduction of LTCIS had decreased hospitalization costs by 91.63 percent and outpatient costs by 13.93 percent (although the cost of medications grew by 31.85 percent). The authors added that the total medical cost for seniors aged 85 and older fell by an especially great margin of 80.2 percent, compared to seniors aged 65 to 74. Lee et al. (2015) found that, whereas the total annual medical cost per capita among LTCIS-eligible seniors increased by KRW 1.5 million, the total annual medical cost per capita among non-eligible seniors grew by KRW 14.76 million, concluding that LTCIS effectively lowered seniors' medical costs by KRW 13.26 million per capita. They also noted that LTCIS-eligible seniors paid KRW 13.55 million less per capita than non-eligible seniors for hospitalization, while LTCIS-eligible seniors paid KRW 50,000 more and KRW 240,000 more per capita for outpatient services and medications, respectively, than their non-eligible counterparts.

Notwithstanding the ambiguity over the cost-cutting effect of LTCIS, there have been attempts to determine whether it has made a difference to seniors'

wellbeing, by reducing the mortality rate, for example. Lee et al. (2011) found that this indeed was the case. There was a significant difference in the mortality rates of seniors, with those eligible for LTCIS—particularly those staying at assisted living facilities—showing improvements in all functions. In order for the health-improving effect of LTCIS to translate into a cost-cutting effect, however, its relation to NHI must be redefined. At present, assisted living facilities (under LTCIS) and rehabilitation hospitals (under NHI) provide overlapping services, making it nearly impossible to streamline fiscal spending on overall healthcare. In the following section, we examine the effect of LTCIS on households' medical spending using welfare panel data from 2015 and discuss the problems of overlapping services offered by rehabilitation hospitals and assisted living facilities.

### 3  Effect of LTCIS on Household Medical Spending

In this section, we analyze the Welfare Panel Survey data from 2015 to determine how LTCIS benefits affected household medical spending. This survey showed that 4.8 percent of households with seniors aged 65 and older were receiving LTCIS services. This does not depart too far from the actual proportion of seniors, 6.7 percent, who were recognized by the government as eligible for LTCIS benefits as of 2015. Of the surveyed seniors, 29.4 percent lived by themselves. Households with seniors aged 65 and older reported income lower and medical spending higher than the all-households averages.

⟨Table IV-1⟩ **Descriptive Statistics on All Households and Households with Seniors (65+)**

| Variable | | All households | Households with seniors aged 65+ | | |
|---|---|---|---|---|---|
| | | | All | LTCIS– ineligible | LTCIS– eligible |
| Household head age (years old) | | 53.788 (0.238) | 64.080 (0.453) | 63.873 (0.469) | 68.198 (1.307) |
| Household head gender (Male = 1) | | 0.787 (0.006) | 0.684 (0.010) | 0.688 (0.010) | 0.617 (0.054) |
| Households with heads aged 65+ | | 0.230 (0.006) | 0.655 (0.013) | 0.656 (0.014) | 0.618 (0.058) |
| Number of household members | | 2.810 (0.023) | 2.303 (0.036) | 2.296 (0.037) | 2.428 (0.150) |
| Single–person households (Single–person household = 1) | | 0.197 (0.006) | 0.294 (0.010) | 0.298 (0.010) | 0.229 (0.043) |
| LTCIS eligibility (Eligible = 1) | | 0.019 (0.002) | 0.048 (0.005) | 0.000 ( – ) | 1.000 ( – ) |
| Household head employment (Employed = 1) | | 0.736 (0.007) | 0.496 (0.012) | 0.507 (0.013) | 0.276 (0.049) |
| Disposable household income (in KRW 10,000) | | 4,928.455 (207.861) | 3,822.007 (570.270) | 3,866.213 (598.646) | 2,941.632 (296.495) |
| Mean monthly household medical spending (in KRW 10,000) | | 16.890 (0.515) | 18.811 (0.835) | 1,418.670 (66.492) | 530.932 (115.085) |
| Household head employment status | Full–time | 0.362 (0.009) | 0.167 (0.012) | 0.174 (0.012) | 0.027 (0.012) |
| | Temporary | 0.129 (0.006) | 0.098 (0.008) | 0.098 (0.009) | 0.098 (0.035) |
| | Daily | 0.053 (0.004) | 0.042 (0.005) | 0.043 (0.005) | 0.019 (0.011) |
| | Public sector | 0.011 (0.001) | 0.020 (0.002) | 0.021 (0.003) | 0.000 ( – ) |
| | Employer | 0.035 (0.003) | 0.014 (0.003) | 0.015 (0.003) | 0.005 (0.005) |
| | Self–employed | 0.144 (0.006) | 0.154 (0.008) | 0.155 (0.008) | 0.127 (0.036) |
| | Unpaid family work | 0.002 (0.001) | 0.002 (0.001) | 0.002 (0.001) | 0.000 ( – ) |
| | Unemployed | 0.016 (0.002) | 0.012 (0.003) | 0.013 (0.004) | 0.007 (0.007) |
| | Economically inactive | 0.248 (0.007) | 0.492 (0.012) | 0.480 (0.012) | 0.717 (0.050) |

〈Table IV-1〉 **continued**

| Variable | | All households | Households with seniors aged 65+ | | |
|---|---|---|---|---|---|
| | | | All | LTCIS–ineligible | LTCIS–eligible |
| Household head education | No schooling | 0.041 (0.002) | 0.108 (0.005) | 0.108 (0.005) | 0.107 (0.022) |
| | Elementary school | 0.128 (0.005) | 0.241 (0.009) | 0.243 (0.009) | 0.204 (0.041) |
| | Middle school | 0.105 (0.005) | 0.135 (0.007) | 0.133 (0.007) | 0.172 (0.036) |
| | High school | 0.327 (0.008) | 0.262 (0.011) | 0.260 (0.012) | 0.309 (0.059) |
| | College diploma /bachelor's degree | 0.352 (0.009) | 0.223 (0.012) | 0.226 (0.013) | 0.162 (0.050) |
| | Postgraduate degree | 0.046 (0.004) | 0.030 (0.005) | 0.029 (0.005) | 0.046 (0.029) |
| N | | 6,723 | 3,853 | 3,684 | 169 |

Notes: 1) Figures outside parentheses indicate mean values, while those in parentheses are standard deviations.
2) All variables reference household heads, except those that specifically pertain to their spouses.
3) The amounts of disposable, current, and personal income are annual amounts.
4) "Unemployed" includes both unemployed (but actively job–seeking) and economically inactive persons.
Source: 11th Korean Welfare Panel Survey.

Our analysis of the effect of LTCIS on household mean monthly medical spending reveals that eligibility for LTCIS benefits in fact increases the medical spending of households with seniors aged 65 and older. This increase is in proportion to the number of household members and household income, and also in association with the presence of infants and toddlers, members diagnosed with chronic diseases, and members in generally poor health. Our finding suggests that LTCIS has yet to reduce the financial burden of medical care on households.

⟨Table IV-2⟩ **Estimates Concerning All Households**

| Variable | Coefficient | |
|---|---|---|
| LTCIS eligibility | 0.781*** | (0.125) |
| Household head age (years old) | 0.016*** | (0.002) |
| Household head gender (Male = 1) | 0.048 | (0.055) |
| Number of household members | 0.091*** | (0.025) |
| Single–person households | −0.581*** | (0.066) |
| Households with children under five years of age | 0.194*** | (0.058) |
| Households with seniors aged 65 and older | 0.078 | (0.051) |
| Ln (disposable household income) | 0.666* | (0.341) |
| Temporary worker | −0.166** | (0.065) |
| Day laborer | −0.233** | (0.092) |
| Public sector worker | −0.409*** | (0.124) |
| Employer | −0.132 | (0.102) |
| Self–employed | −0.158** | (0.062) |
| Unpaid family worker | −0.699*** | (0.270) |
| Unemployed | −0.179 | (0.136) |
| Economically inactive | −0.399*** | (0.075) |
| No schooling | −0.463*** | (0.092) |
| Elementary school | −0.286*** | (0.071) |
| Middle school | −0.259*** | (0.070) |
| High school | −0.143*** | (0.052) |
| Postgraduate degree | 0.084 | (0.099) |
| Household head being treated for chronic disease for less than 3 months | 0.484*** | (0.083) |
| Household head being treated for chronic disease for 3 to 6 months | 0.721*** | (0.091) |
| Household head being treated for chronic disease for more than 6 months | 0.449*** | (0.045) |
| Health: Good | 0.206*** | (0.063) |
| Health: Average | 0.343*** | (0.074) |
| Health: Poor | 0.572*** | (0.081) |
| Health: Very poor | 0.844*** | (0.206) |
| Disability Grade 1 | 0.111 | (0.321) |
| Disability Grade 2 | −0.176 | (0.210) |
| Disability Grade 3 | −0.049 | (0.129) |

⟨Table IV-2⟩ **continued**

| Variable | Coefficient | |
|---|---|---|
| Disability Grade 4 | −0.148 | (0.112) |
| Disability Grade 5 | 0.092 | (0.124) |
| Disability Grade 6 | −0.030 | (0.098) |
| Member(s) with unregistered disability | −0.187 | (0.140) |
| Constant | −5.662* | (3.342) |
| R−squared | 0.2345 | |
| F | 33.85*** | |
| N | 6,485 | |

Notes: 1) The asterisks, ***, **, and *, represent statistical significance at one−, five−, and 10−percent levels, respectively, in a two−tail test.
2) Figures in parentheses indicate standard errors.
3) The dependent variable is the natural logarithm of the mean monthly household medical spending.
4) "ln(disposable household income)" represents the natural logarithm of disposable household income.
5) The coefficients corresponding to the employment status of household heads represent the effect of each status variable in comparison to the effect of full−time paid work.
6) The coefficients corresponding to the education of household heads represent the effect of each variable in comparison to the effect of college/undergraduate (bachelor's degree) education.
7) The coefficients corresponding to the treatment of a household head with chronic disease represent the effect of each variable on the duration of the disease in comparison to the absence of such disease.
8) The coefficients corresponding to household heads' subjective conditions of health represent the effect of each variable on health in comparison to being very healthy.
9) The coefficients corresponding to the severity of disability in household heads represent the effect of each grade of disability in comparison to the presence of no disability.

⟨Table IV-3⟩ **Estimates Concerning Households with Seniors (65+)**

| Variable | Coefficient | |
|---|---|---|
| LTCIS eligibility | 0.640*** | (0.127) |
| Household head age (years old) | 0.014*** | (0.004) |
| Household head gender (Male = 1) | 0.037 | (0.072) |
| Number of household members | 0.146*** | (0.042) |
| Single−person households | −0.540*** | (0.091) |
| Households with children under five years of age | 0.131 | (0.106) |
| ln(disposable household income) | 0.785** | (0.377) |
| Temporary worker | −0.039 | (0.121) |
| Day laborer | −0.043 | (0.193) |

⟨Table IV-3⟩ **continued**

| Variable | Coefficient | |
|---|---|---|
| Public sector worker | −0.084 | (0.157) |
| Employer | −0.035 | (0.250) |
| Self−employed | 0.008 | (0.120) |
| Unpaid family worker | −0.111 | (0.390) |
| Unemployed | 0.158 | (0.271) |
| Economically inactive | −0.184 | (0.127) |
| No schooling | −0.452*** | (0.110) |
| Elementary school | −0.367*** | (0.093) |
| Middle school | −0.291*** | (0.094) |
| High school | −0.198** | (0.091) |
| Postgraduate degree | 0.278 | (0.258) |
| Household head being treated for chronic disease for less than 3 months | 0.204* | (0.113) |
| Household head being treated for chronic disease for 3 to 6 months | 0.523*** | (0.174) |
| Household head being treated for chronic disease for more than 6 months | 0.336*** | (0.076) |
| Health: Good | 0.472*** | (0.137) |
| Health: Average | 0.606*** | (0.140) |
| Health: Poor | 0.836*** | (0.144) |
| Health: Very poor | 1.134*** | (0.218) |
| Disability Grade 1 | 0.285 | (0.468) |
| Disability Grade 2 | 0.107 | (0.233) |
| Disability Grade 3 | −0.096 | (0.167) |
| Disability Grade 4 | −0.153 | (0.142) |
| Disability Grade 5 | −0.019 | (0.131) |
| Disability Grade 6 | 0.032 | (0.123) |
| Member(s) with unregistered disability | −0.177 | (0.164) |
| Constant | −7.043* | (3.656) |
| R−squared | 0.2491 | |
| F | 20.73*** | |
| N | 3,759 | |

Notes: 1) The asterisks, ***, **, and *, represent statistical significance at one−, five−, and 10−percent levels, respectively, in a two−tail test.
2) Figures in parentheses indicate standard errors.
3) The dependent variable is the natural logarithm of the mean monthly household medical spending.

4) "In(disposable household income)" represents the natural logarithm of disposable household income.
5) The coefficients corresponding to the employment status of household heads represent the effect of each status variable in comparison to the effect of full-time paid work.
6) The coefficients corresponding to the education of household heads represent the effect of each variable in comparison to the effect of college/undergraduate (bachelor's degree) education.
7) The coefficients corresponding to the treatment of a household head with chronic disease represent the effect of each variable on the duration of the disease in comparison to the absence of such disease.
8) The coefficients corresponding to household heads' subjective conditions of health represent the effect of each variable on health conditions in comparison to being very healthy.
9) The coefficients corresponding to the severity of disability in household heads represent the effect of each grade of disability in comparison to the presence of no disability.

**4** **Assisted Living Facilities and Rehabilitation Hospitals: Current Issues**

"Rehabilitation hospital" in Korea refers to a specific type of medical institution which, under the Medical Service Act of 1994, is accredited by the government to provide medical services for patients in need of long-term care and convalescence, including patients with geriatric conditions and chronic diseases, and in post-surgery recovery. Medical institutions capable of accommodating at least 30 patients each can easily be accredited as rehabilitation hospitals, according to facility and personnel qualifications that are looser than those applying to other types of medical institutions. The Korean government's Loan Program for the Expansion of Rehabilitation Hospitals, in effect from 2002 to 2007, encouraged the multiplication of small rehabilitation hospitals providing less than adequate care. Thanks to this program, the number of rehabilitation hospitals increased rapidly from 68 in 2003 to 591 in 2007, representing astonishing average annual growth of 72 percent. Introduction of LTCIS further fueled this increase and spontaneously forced the exit of small, struggling institutions. Yet the number of rehabilitation hospitals in Korea has continued to rise, from 690 (0.9 percent of all medical institutions) in 2008 to 1,232 in 2013, and further to 1,372 in 2015 (1.6 percent of all medical institutions).

Assisted living facilities (ALFs), too, have been multiplying rapidly thanks to the introduction of LTCIS, from 1,700 in 2008 to 5,187 by 2016. While both ALFs and group homes have been growing in number, group homes (small-scale ALFs) increased almost sevenfold between 2008 and 2016, from

321 to 2,050, respectively, representing average annual growth of 27 percent. This rapid outward growth, however, also suggests that the expanding care infrastructure fails to ensure the quality of care services provided.

⟨Table IV-4⟩ **Rehabilitation Hospitals and ALFs in Korea Today**

(Units: Number of institutions, KRW 1 trillion)

| Year | All medical institutions | | Rehabilitation hospitals | | ALFs | |
|---|---|---|---|---|---|---|
| | N | Amount | N | Amount | N | Amount |
| 2008 | 78,461 | 18.8 | 690 (0.9%) | 0.7 (3.9%) | 1,700 | 0.3 |
| 2009 | 80,270 | 21.2 | 777 (1.0%) | 1.0 (4.6%) | 2,629 | 0.7 |
| 2010 | 81,681 | 24.2 | 867 (1.1%) | 1.3 (5.4%) | 3,751 | 0.9 |
| 2011 | 82,948 | 25.8 | 988 (1.2%) | 1.6 (6.2%) | 4,061 | 1.1 |
| 2012 | 83,811 | 27.2 | 1,103 (1.3%) | 2.0 (7.2%) | 4,327 | 1.2 |
| 2013 | 84,971 | 29.5 | 1,232 (1.4%) | 2.4 (8.2%) | 4,648 | 1.4 |
| 2014 | 86,629 | 31.8 | 1,337 (1.5%) | 2.84 (9.0%) | 4,871 | 1.6 |
| 2015 | 88,163 | 34.5 | 1,372 (1.6%) | 3.2 (9.4%) | 5,085 | 1.8 |

Source: Statistics Korea, National Statistics Portal (http://kosis.kr/statHtml/statHtml.do?orgId=350&tblId=TX_ 35001_A014&conn_path=I2, accessed August 2, 2017.

ALFs for seniors mainly provide assistance with daily activities and accommodation for those whose deteriorating physical functions make daily tasks difficult on their own. Seniors officially recognized to be eligible for this level of LTCIS services can enter ALFs. These facilities are not required to have medical staff on site, and instead employ social workers, nurses, physical therapists, and caretakers. Residents need to seek medical care from hospitals or similar facilities when necessary. Rehabilitation hospitals, which have provided medical care for people in need of long-term care and recovery since 1994 under the Medical Service Act, in contrast, also admit seniors in need of non-medical care services and the terminally ill that could better benefit from hospice care. The structure of copayments under LTCIS serves to encourage the excess use of rehabilitation hospitals by seniors. On the surface, patients at rehabilitation hospitals are required to pay 20 percent of their hospitalization costs and 50 percent of their meal costs, while residents staying at ALFs are required to pay 20 percent of their long-term care costs. Rehabilitation hospitals and ALFs thus

appear to impose similar copayment burdens. However, rehabilitation hospitals are further regulated by NHI policy, with patients in lower income groups not required to make copayments in excess of a legally defined ceiling. ALFs, on the other hand, are free from any such ceiling. Some seniors therefore find it financially more sensible to stay in rehabilitation hospitals rather than ALFs.

⟨Table IV-5⟩ **Rehabilitation Hospitals Vs. ALFs**

| Type | Rehabilitation hospitals | ALFs |
|---|---|---|
| Effective since | January 1994 | July 2008 |
| Legal grounds | Medical Service Act, NHI Act | Seniors Welfare Act, ALTCIS |
| Fiscal source | NHI funding | LTCIS funding |
| Main function | Providing medical care for patients in need of long−term hospitalization, at a facility capable of accommodating at least 30 patients | Providing assistance with daily activities for seniors disabled by aging−related diseases, including dementia and stroke |
| Services | Therapy and nursing care for patients diagnosed with geriatric or chronic conditions, or in need of post−injury or post−surgery recovery | Assistance with physical activities (personal hygiene, bathing, etc.) and with daily activities (nursing and up−close support), daily task exercises, functional training, nursing, hobby and recreational programs, etc. |
| Eligible beneficiaries | Persons with diseases or injuries in need of long−term care and treatment, decided in consultation with doctors | Seniors in LTCIS Grade 3 and higher and who have entered LTCIS service contracts |
| Service termination | Care ends when the disease/illness that has been the cause of medical care has been sufficiently treated. | There are monthly ceilings on the financial value of LTCIS services seniors may receive in consideration of fiscal resource limits. |
| Personnel requirements | −One doctor per 40 patients<br>−One nurse per six hospitalized patients<br>−One social worker per hospital | At least one doctor or licensed traditional herbal medicine clinician per 30 patients<br>−One nurse for 10 or more residents; one per 25 residents in facilities with 30 or more residents each<br>−One social worker for 10 or more residents; one more if the number of residents exceeds 100<br>−One caretaker per 2.5 residents<br>One physical/occupational therapist for 30 or more residents; one more if the number of residents exceeds 100. |

〈Table IV-5〉 **continued**

| Type | Rehabilitation hospitals | ALFs |
|------|--------------------------|------|
| Facility requirements | − At least 30 hospital beds (with six or fewer beds per room)<br>− Medical records room, disinfection facility, cafeteria, bathrooms, lounges, etc. | ALFs: At least 10 residents.<br>Group homes: 5 to 9 residents.<br>− Beds (four or fewer per room), cafeteria/dining hall, kitchen, bathrooms, showers, etc.<br>− Facilities with 10 or more residents must provide rooms for medical care/nursing, therapy programs and physical therapy. |
| Copayments | Hospitalized patients in general: 20% of total cost and 50% of meal cost.<br>Patients better suited to ALFs or outpatient care[1]: 40% of hospitalization cost and 50% of meal cost. | 20% of cost of long−term care |
| Ceiling on copayments | Any copayments by patients in excess of annual ceilings reimbursed (at seven differential rates according to income). | None<br>(Medicare−eligible seniors pay 50% less in copayments than ineligible seniors.) |

Note: 1) Kim, Jinsu et al., *A Study on Redefining the Respective Roles of Rehabilitation Hospitals and Assisted Living Facilities: Focusing on Integrating Services*, 2013, KIHASA, p. 54.
Sources: Annex 5 ("Quorums of Medical Staff Members at Medical Institutions") to Article 38 and Annexes 3 and 4 ("Facility Requirements for Medical Institutions of Different Types" and "Dimensional Requirements for Medical Institutions") to Article 34, Enforcement Rules for the Medical Service Act, National Law Information Center (http://www.law.go.kr/법령/의료법시행규칙, accessed October 13, 2017); Annex 2 ("Facility and Personnel Requirements for Assisted Living Facilities for Seniors") to Article 22.1, Enforcement Rules for the Senior Welfare Act, National Law Information Center (http://www.law.go.kr/법령/노인복지법시행규칙/(00497,20170530), accessed October 13, 2017).

## 5 Improving the Efficiency of LTCIS

When effectively integrated with the medical care system, LTCIS services can help reduce the unnecessary use of hospital beds and resources for seniors that are otherwise reserved for patients with acute symptoms. Improving the quality of service at ALFs can also significantly reduce senior demands for medical care. Earlier studies on the integration of different healthcare programs all emphasize the need to integrate and streamline services and resources at LTCIS facilities and rehabilitation hospitals. Choi and Lee (2010), for instance, report that a sizable number of seniors remain hospitalized in rehabilitation

hospitals, despite their eligibility for LTCIS benefits, and a sizable number who remain in living facilities despite the critical need they have for medical care. This confusion stems, in part, from the supply side. ALF operators have an incentive to hold senior patients in need of medical intervention for acute symptoms in their facilities to claim greater reimbursements from the government. Rehabilitation hospitals, too, have an incentive to give patients discounts on their copayments in an effort to retain them and not lose them to LTCIS facilities. The authors propose updating the government-determined prices of medical services, subsidizing the costs of care, and reinforcing the criteria for determining eligibility for both LTCIS and NHI (rehabilitation hospitals) as possible solutions. Kim and Song (2013) find that general hospitals, higher-level general hospitals and rehabilitation hospitals are now substitutes for one another, and that the relationship between rehabilitation hospitals and LTCIS facilities remains both substitutive and competitive. Such competition originates from the overlapping categories of seniors both types of institutions serve and indicates the need to redefine and streamline these institutions' respective functions.

Song (2012) points out that the ambiguity of legal and policy requirements concerning rehabilitation hospitals in Korea leads these hospitals to function indistinctly from care facilities. According to the author, Korea is the only country in the world where rehabilitation hospitals are operated with funding from the national/public health insurance system. The OECD, indeed, defines rehabilitation hospitals as consisting of rehabilitative care beds reserved for patients in need of long-term care. In Japan, Canada, and the United States, rehabilitation hospitals provide integrative treatment and nursing for patients with severer symptoms than those of patients in Korean rehabilitation hospitals, applying clear and rigorous standards of admission. Kim et al. (2013) analyze the amounts of rehabilitation hospital and LTCIS benefits provided by the government, and find that, from 2009 to 2012, approximately 32 percent of all patients hospitalized in rehabilitation hospitals in any given year were seniors eligible for LTCIS benefits (Grades 1 to 3). The authors identify the inefficiency of resource distribution and confusion that arise from the ambiguity over the respective roles of LTCIS facilities and rehabilitation hospitals. Ga (2017) argues that the current LTCIS distinguishes between medical care and care services

in general, and therefore stands in the way of providing more holistic and effective care for seniors. Especially troubling is the fact that seniors' eligibility for LTCIS services is determined on the basis of their need for assistance with physical activities and chores only, utterly disregarding their medical needs. As a result, seniors in serious medical conditions are granted Grades 1 and 2 in eligibility status and encouraged to enter LTCIS facilities, while seniors with milder forms of disability and medical conditions are forced to seek care from rehabilitation hospitals.

The fragmentation of care providing institutions into multiple categories, such as rehabilitation hospitals and ALFs, threatens to undermine the effectiveness and efficiency of LTCIS services. It is critical for policymakers to integrate the related services and functions of these institutions and strengthen the role of primary care so that it will serve as a gatekeeper of the healthcare system for seniors. Furthermore, policymakers should establish a system for providing various integrated services for seniors in need of care, as well as introducing an instrument for assessing and improving the quality of services provided by care facilities of varying sizes, with procedures for forcing the inefficient ones out of the market. Most importantly, policymakers should reinforce the rigor of criteria for licensing care facilities and introduce evaluation-based accreditation to raise the market barrier higher for new care operators intent on entering the industry.

Korea's LTCIS is still new and faces a critical moment of transition, with population aging and changing family dynamics rapidly increasing the demand for elderly care. As the increasing number of seniors and their growing demand for care services will ultimately exert upward pressure on related fiscal spending, it is crucial to revisit the LTCIS now and make efforts to strengthen its effectiveness and efficiency.

# V

# Conclusion: Policy Suggestions for Enhancing Effective Management of the Fiscal Policy on Healthcare for Seniors

The Korean population is aging at an accelerated rate. The increased life expectancy and size of the elderly population fuels a rising demand for medical and care services, and is expected to drastically increase public spending on healthcare for the elderly. Rising fiscal spending on healthcare for seniors is a grave concern because seniors aged 65 and older account for a significant portion of overall public medical spending. For example, seniors aged 65 and older, who make up only 11.9 percent of all eligible persons, claim 36 percent of all NHI spending on medical benefits and services. NHI spending per capita among seniors aged 65 and older amounts to three times the overall average.

Seniors tend to require treatment for multiple chronic comorbidities and are also in need of care services and assistance with their deteriorating physical functions. As seniors require repeated and constant medical interventions, they are prone to needing long-term hospitalization. That seniors are far more likely than middle-aged persons to be hospitalized for the long term is an inevitable part of nature. The rapid increase in the number of long-term rehabilitation hospitals, however, has been matched with equally rapid increases in the number of seniors admitted for long-term hospital care, calling for conscious policy efforts to ensure efficiency in the overall healthcare system. Intervention for the terminally ill makes up a significant portion of healthcare spending on seniors, and there is growing demand for institutional reforms in this area of care.

In analyzing the problem of the rising cost of healthcare for seniors, we sought to identify how much of this rise was attributable to the use of necessary

services, on the one hand, and how much to moral hazard fostered by institutional settings. In our analysis, we were able to confirm the excess use, by seniors, of available medical services, but also that seniors were more likely than other age groups to underuse available medical care. Seniors' overuse of medical care was concentrated on hospitalization. That seniors are far more likely than, say, the middle-aged, to need hospitalization is also tied to the fact that much of the healthcare cost for seniors involves life-prolonging treatment for the terminally ill. The gross disparity between overusing and underusing seniors, even in comparison to other age groups, indicates that seniors on the whole are using medical services quite inefficiently. The unnecessary long-term hospitalization of seniors is a serious problem originating from the current structure of copayments, the lack of clarity on the roles and functions of LTCIS facilities, and the inefficient management of hospital beds. In order to strengthen healthcare security for seniors as well as efficiency in fiscal spending, it is critical to establish a system for effectively managing the cost of healthcare for seniors. Institutional factors, such as copayments and hospitalization management practices, should be revisited and reformed, and the respective roles of rehabilitation hospitals and care facilities redefined.

Of the institutional factors prompting these healthcare cost increases for seniors in Korea, we focused our analysis on the structure of copayments. Medicare beneficiaries show significantly higher medical costs per capita than NHI-eligible persons, and also tend to be hospitalized for the long term more than the rest, mainly because Medicare beneficiaries are not required to make any copayments for the hospitalization care they receive. We also found that the elasticity of hospitalization is less among seniors aged 65 and older than in younger age groups, while the elasticity of outpatient care for milder conditions is greater. This finding suggests that, while individuals' copayments for hospitalization should be raised overall, seniors aged 65 and older likely require hospitalization as a matter of medical necessity as well. Therefore, while seniors may continue to enjoy discounts on copayments, it is still important that they pay at least part of the cost. Considering that life-prolonging interventions and treatment for the terminally ill form the greatest source of the medical cost for seniors aged 80 and older, increases in medical spending for these older seniors are more likely the result of higher personal income than copayments.

Policymakers should therefore introduce measures to control the increases in the cost of treating terminally ill seniors at a reasonable level. Finally, hospital beds should be managed more efficiently, on the supply side, in order to rein in these rising healthcare costs for seniors.

It is also important to enhance the effectiveness of care and LTCIS services for seniors. European states, with well-established public long-term care services for seniors, have been undertaking a variety of reforms and privatization initiatives in an effort to lessen the growing fiscal burden. Systematized long-term care services significantly reduce the burden of caregiving on women and enable them to participate more actively in the labor market. The LTCIS in Korea as it is today, however, cannot bring about these anticipated benefits unless it serves a broader scope of people and provides greater benefits. Even in its current state, however, LTCIS spending is growing steeply. It is therefore critical for Korean policymakers to streamline the various elderly care and LTCIS services by merging them and redefining the respective roles of NHI-supported rehabilitation hospitals and LTCIS-supported care facilities. Moreover, policymakers should reinforce the rigor of evaluation and accreditation, strengthen the mechanisms by which facilities providing poor service are forced out of the market, and introduce more stringent criteria for licensing new facilities intent on entering the care service industry.

Strengthening medical security for seniors is high on the list of policy issues that must be addressed nationally now that the Korean population is aging so rapidly. As Korea is on the verge of becoming a super-aged society, it is of utmost importance for policymakers to reform institutional factors that foster inefficiencies in policymaking and fiscal spending, particularly in relation to healthcare for seniors. We should revisit and take into account NHI, Medicare, LTCIS, and other elderly care spending programs at the same time, and identify and remove structural and institutional factors that engender inefficiencies on both the demand and supply sides. As for the demand side, the structure of copayments for hospitalization under NHI and Medicare should be reformed, with copayments relating to relatively mild symptoms raised even for seniors. On the supply side, hospitals should be incentivized into managing their beds more efficiently and minimizing unnecessary long-term hospitalization. The management of elderly care services, including those offered under LTCIS,

should be centralized and the roles of hospices, ALFs, rehabilitation hospitals and other care institutions, redefined clearly so that resources can be spent more efficiently.

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