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The Economic and Health Effects of Long-term Care Insurance: New Evidence from Korea

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Abstract: With a rapidly aging global population, Long Term Care Insurance (LTCI) for older people is a pressing policy issue. While long-term care services are designed to assist people with limited functional ability, the breadth of coverage considerably varies from country to country. There is a debate on the costs of such programs and the adequacy of benefits. Understanding the impacts of LTCI programs is central to informing LTCI policies as few countries have embraced them. In 2008, the Korean government initiated a national public contributory LTCI program to help older people lead more independent and secure lives and support family caregivers. We use the Korean Welfare Panel Study (KOWEPS) and a difference-in-differences model combined with propensity score matching to assess the effect of the program on self-rated health, healthcare utilization, household expenditures, and savings. While older adults in beneficiary households tend to have better self-rated health and receive fewer regular health check-ups, those with inpatient visits tend to stay longer in the hospital compared to those in non-beneficiary households. We find that LTCI beneficiary households have lower savings and higher out-of-pocket healthcare expenses compared to non-beneficiary households. Overall, results suggest a positive effect of LTCI on self-rated health but detrimental effects on household out-of-pocket healthcare expenses and savings for those with less comprehensive health insurance coverage, the near-poor, and older singles. LTCI requires further research and policy attention in Korea and beyond.

Keywords: Long term care, expenditures, saving, health, health insurance, older population, Korea

JEL Codes: I13, I38

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1. Introduction

In old age, people may experience health deterioration, functional declines, or chronic diseases and demand more care. Changes in family structure and the death of spouses, relatives, and friends often make it difficult for older people to find help. Long-term care is paid care for people who need any form of support. It is not intended to solve medical problems but to help cope with functional limitations or chronic health conditions and maintain a good quality of life (OECD, 2020). As older people may experience economic challenges while utilizing long-term care services, many countries publicly finance long-term care services through government funding or compulsory insurance schemes (OECD, 2020).

In 2008, Korea implemented a public Long-Term Care Insurance (LTCI) program to provide better access to quality long-term care services at low prices and contribute to the economic wellbeing of older people by alleviating the financial burden of long-term care and healthcare services. This paper studies the health and economic effects of LTCI on beneficiary households who have received long-term care benefits for at least one year during the post-intervention period using the 2006-2019 Korean Welfare Panel Study (KOWEPS).

The KOWEPS dataset has rich information on the economic and health situations of individuals, including on LTCI beneficiary status. KOWEPS makes it possible to identify LTCI beneficiary status at the household level but it makes it impossible to distinguish between LTCI beneficiaries and other individuals within the household. Given that more than 95% of LTCI beneficiaries are older adults aged 65 and above (MOHW, 2019), we select households living with at least one older adult as our study sample. We measure the impact of LTCI on household economic outcomes (expenditures and savings), and individual health outcomes (healthcare utilization and self-rated health) for older adults aged 65 and above. Households who report receiving LTCI benefits at least one year during the post-intervention period are the treatment group. We compare them with non-beneficiary households who have never received the LTCI benefits during the same period.

This study uses a difference-in-differences (DID) model combined with propensity score matching (PSM). The DID model allows us to compare the differences in outcomes of the beneficiary and non-beneficiary households before and after the intervention while controlling for heterogeneous biases and time-specific unobservable factors (Stuart et al. 2014). PSM makes it possible to identify non-beneficiary households whose observed attributes are similar to those of beneficiary households and thus aims to address potential selection biases that may rise due to the LTCI application process. We use an event study specification to assess the validity of the parallel pre-trend assumption. We stratify the results by family structure and gender, income level, and health insurance type.

The findings of the study suggest that beneficiary households are likely to save less but spend more on healthcare services compared to non-beneficiary households. Beneficiary households tend to receive fewer health check-ups while those with inpatient visits stay longer in the hospital. Longer days of hospitalization might have contributed to the beneficiaries' higher level of out-of-pocket healthcare expenditures and lower level of savings. Older people in beneficiary households tend to maintain better self-rated health than those in non-beneficiary households. These results hold among the non-poor, national health insurance users, and single families.

This paper is structured as follows. Section 2 provides some background on LTCI in Korea and reviews the international literature on the effects of LTCI. Sections 3 and 4 describe hypotheses, data, measures, and empirical strategies. Section 5 presents results and conducts robustness checks. Section 6 concludes the paper and provides future research directions.

2. Background

2.1. Long-Term Care in Korea

The share of the population aged 65 and above has rapidly increased in Korea from 7.2% in 2000 to 15.7% in 2020 (KOSIS, 2022a). Approximately, 25.3% of older people experience difficulties in activities of daily living (ADL) or instrumental activities of daily living (IADL). The ADL/IADL prevalence rate is as high as 32% among people aged 85 and older (Jung et al., 2017). In the past, women were recognized as informal caregivers to their spouses, children, parents, and parents-in-law but social and economic changes including higher educational attainment have led women to participate more in the labor force. Along with an aging population, women's higher labor force participation rates have contributed to the increase in the demand for formal long-term care services (Chon, 2012; Kim et al., 2013).

Despite a growing demand for long-term care services, older adults with disabilities and functional limitations often could not use care services due to financial reasons (Sunwoo, 2004) as there is a high poverty rate among the older population[3] (Statistics Korea, 2018). It was even more difficult for older people living in rural areas to receive adequate care services due to a limited number of long-term care providers and facilities (Jung et al., 2014; Sunwoo, 2004). Recognizing older people's unmet needs in terms of long-term care services, the Korean government launched the LTCI program in 2008. New home care and institutional facilities were built especially in remote areas. They were owned by either the government or the private sector. As a result, the number of institutional facilities increased from 815 to 1,271 and home care providers also increased from 1,045 to 3,291 from 2006 to 2008 (Lee, 2009). In 2020, there were about 3,595 institutional facilities and 4,821 home care providers (MOHW, 2020a).

Korea has universal health and long-term care coverage. Every Korean citizen has health insurance coverage either through the National Health Insurance (NHI) or Medical Aid Program and is automatically enrolled in the LTCI program. Individuals who are insured through the Medical Aid program do not need to pay a monthly premium for LTCI but those who are insured through the NHI program pay a monthly premium for LTCI that stands at 6.55% of their NHI premium[4]. Older adults aged 65 and above who experience some functional limitations and need some assistance and individuals who have age-related diseases, even if they are under 65 years of age, can receive long-term care benefits as long as they pass the eligibility assessment. The eligibility test evaluates an applicant's physical and mental status to determine the level of care needed. During the assessment, a physician examines an applicant's ADL limitations, cognitive function, behavioral problems, nursing care needs, and musculoskeletal conditions using the government-certified disability index. Beneficiaries need to be re-evaluated for continued eligibility every two to four years given potential changes in their disability

[3] The elderly poverty rate was 43.7 % in 2018 (Statistics Korea, 2018)

[4] The NHI premium is computed based on individual income. From 2010 to 2017, the monthly premium of LTCI had remained at 6.55%. Since 2018, its rate has gradually increased: 7.38% in 2018, 8.51% in 2019, 10.25% in 2020, 11.52% in 2021 and 12.27% in 2022.

and health status. Depending on the reassessment results, beneficiaries may retain or lose their eligibility for long-term care benefits.

LTCI provides two types of in-kind benefits: home care and institutional care. Home care includes home visits, bathing, home-visit nursing, day/night care, and short-term care[5]. Institutional care is for older adults who are admitted to care facilities. Designated long-term care facilities or registered home-care facilities can take care of older adults who need day, night, or short-term care services while only designated long-term care facilities can provide services to older people who utilize institutional care. During the home visit, service providers help beneficiaries with ADL[6], errands, and chores[7] and check their physical and psychological conditions. Designated long-term care service providers and registered home-care providers offer comparable care services. There is a copay for NHI-insured recipients: a 15% copay for home care and a 20% copay for institutional care. There are two types of Medical Aid beneficiaries: Type I and Type II. Individuals who are enrolled in the Medical Aid program as Type I[8] may receive long-term care services for free. Individuals who are classified as Type II[9] can utilize long-term care services by paying a 7.5% copay for home care and a 10% copay for institutional care (MOHW, 2020b; NHIS, 2020).

The number of LTCI beneficiaries has steadily increased over a decade from 214,000 individuals in 2009 to 671,000 individuals in 2018. The share of beneficiaries in the older population has doubled from 4.2% to 8.8% (NHIS, 2018). LTCI coverage with 8.8% of the older population aged 65 and above seems in line with ADL and IADL prevalence rates: 16.6% of older people aged 65 and above have at least one IADL limitation and 8.7% of them have at least one IADL limitation and one ADL limitation (Jung et al, 2017). In 2019, the average age of LTCI beneficiaries was 81.8, and 72.8% of them were women[10]. Beneficiaries had on average 3.4 chronic conditions, and 39.5% of beneficiaries were living with adult children or grandchildren (MOHW, 2019).

2.2. Literature review on Long-Term Care Insurance

Long-term care services may replace or complement informal help provided by family caregivers. A large literature has investigated the impact of LTCI on family caregivers, in particular, in terms of labor force participation decisions and wellbeing. For Germany, LTCI benefits in cash are found to reduce family caregivers' labor supply (Geyer & Korfhage, 2015) while the provision of formal care services reduces the burden of care and improves the health of caregivers (Schmitz & Westphal, 2015). Several studies in

[5] Family caregivers may request special cash benefits if they live in areas where long-term care facilities are not available or if they have a family member who cannot receive long-term care services at designated facilities but only from family caregivers due to certain physical or mental disabilities.

[6] Washing, toothbrushing, showering, bathing, toileting, caring for nails and hair, dressing, eating, transferring, etc.

[7] Accompanying beneficiaries on visits to public offices, hospitals, banks, or grocery markets, preparing meals, cleaning houses, and laundering.

[8] Medical Aid Type I beneficiaries are those who have no ability to work. It includes individuals who are under age 18 or 65 and over, who have moderate disabilities, who need treatment or nursing for at least 3 month, and pregnant women among individuals whose income is below 40% of the standard median income.

[9] Medical Aid Type II beneficiaries are those who have an ability to work among those whose income is below 40% of the standard median income. The copayment costs for Medical Aid Type II beneficiaries may deter them from utilizing long-term care services. It would be informative to separate Medical Aid beneficiary by their types and measure the impact of LTCI as their responses to the long-term care insurance could be different. However, KOWEPS only report whether a household is enrolled in the Medical Aid program, not their types. It makes us incapable to separately assess the impact of LTCI on Type I and Type II beneficiaries.

[10] In 2018, Korea had 700 males per 1,000 females in the older population aged 65 and above. Its male-to-female ratio declines from 40 to 60 among older adults aged 65-69 to 29 to 72 among older adults aged 80 and above (KOSIS, 2022b). While there are more females than males in the older population, older females are more likely to experience income poverty. In 2019, the proportion of older females whose incomes are below 40% of the standard median income was 56.3% while it is 47.2% for older males (Lee et al., 2020).

Japan suggest that family caregivers are at risk of physical and mental health problems (Arai & Zarit, 2011), and LTCI benefits in kind may alleviate the risk of health deterioration by reducing time spent on informal care and helping caregivers better manage their wellbeing (Kan & Kajitani, 2014; Kuroda, 2016; Sugawara & Nakamura. 2014; Suzuki et al., 2008; Umegaki et al., 2014). In China, Fu et al. (2017) find a positive effect of LTCI on family caregivers' labor force participation.

Similar results have been found in Korea. Several studies suggest that LTCI improves family caregivers' psychological well-being and family relationships (Kim & Ahn, 2012; Kim & Park, 2014; Kwon et al., 2011; Yang & Choi, 2013). LTCI is also found to have a positive effect on the number of workdays, work hours, and labor incomes of family members (Kwon & Ko, 2015; Lee, 2015; Lee, 2015).

Another body of literature has explored the impact of LTCI on beneficiaries' healthcare utilization and out-of-pocket healthcare expenditures (out-of-pocket expenses thereafter). Results vary across countries. In England, Forder (2009) finds that older people tend to spend less on hospital care as they spend more on home care services. In China, Lua et al. (2020) find that LTCI reduces patients' out-of-pocket expenses. In the U.S., Dong et al. (2019) show a positive effect of LTCI on asset accumulation but no effect on out-of-pocket expenses. In Japan, Iwamoto et al. (2010) find that LTCI alleviates the economic burden of long-term care for households with disabilities. Ariizumi (2008) argues that LTCI lowers out-of-pocket expenses for low-income families, raises them for middle-income families, and has no impact on high-income families in Japan.

There are very few studies on the economic impact of LTCI in Korea and they have mixed results. Using administrative claims data on services and costs paid by the Korean National Health Insurance Corporation (KNHIC), several studies have investigated the effect of LTCI on total healthcare spending (Han, 2019; Lee & Kwak, 2016; Lee & Moon, 2015). Using the same claims data, one study (Choi et al 2018) examines the impact of LTCI on out-of-pocket expenses paid by individual patients for insured medical services and finds a reduction in its expenses among LTCI beneficiaries. Choi et al. (2018) also explore the impact of LTCI on healthcare utilization and find that LTCI users are likely to stay fewer days in the hospital and have fewer inpatient visits and more outpatient visits. One limitation of studies using administrative claims data is that they do not capture uninsured services and may thus miss out on some out-of-pocket expenses. The claims data have no information on other household economic outcomes such as expenses on housing that may be affected by medical out-of-pocket expenses.

Lee and Kim (2019) use survey data, the Korea Welfare Panel Study, and a DID model to examine the impact of LTCI on household consumption and expenses. They find that LTCI increases out-of-pocket expenses, which include costs for both insured and uninsured medical services, while it does not affect other household expenditures such as expenses for rent, heat, utilities, education, and entertainment. Lee and Kim (2019) do not consider the impact of LTCI on healthcare utilization and health outcomes.

Overall, in Korea and beyond, a limited number of studies have explored the impact of LTCI on economic and health outcomes, and the results on healthcare utilization and out-of-pocket expenses have been mixed. This paper contributes to this literature by assessing the impact of Korea's LTCI on beneficiary households in terms of health status, healthcare utilization, household expenditures, and savings using the

Korea Welfare Panel Study and a difference-in-differences model combined with propensity score matching.

3. Hypotheses Data, and Measurements

3.1. Hypotheses

Since 2008, increasing shares of older people have applied for LTCI, become beneficiaries, and utilized care services. In 2018, 13.3% of the older population aged 65 and above applied for the LTCI program. After the assessment, 66.5% of them, which is equivalent to 8.8% of the older population, became eligible for long-term care services, and 77.5% of eligible beneficiaries utilized home care or institutional care services through LTCI (NHIS, 2018)[11]. These increases in the participation and utilization rates may reflect the unmet demand for long-term care services in the past.

As care providers regularly check beneficiaries' health status, encourage beneficiaries to take care of their health, and advise them to receive appropriate healthcare services, LTCI is expected to improve the health of beneficiaries. The expected impact of LTCI on healthcare utilization, out-of-pocket expenses, and other economic outcomes is ambiguous. LTCI may reduce the number of regular health check-ups received from healthcare providers, reduce the use of healthcare services, and lower out-of-pocket expenses if care services prevent health problems. At the same time, as care providers can identify healthcare needs and accompany beneficiaries to medical facilities, LTCI may boost the demand for healthcare services and healthcare utilization. If LTCI beneficiaries use more healthcare services or use healthcare services with large copays, this may make beneficiary households have larger medical out-of-pocket expenses, spend less on other items (e.g., housing), and save less. Overall, we expect to find better health among LTCI beneficiary households compared to non-beneficiary households while the expected effect of LTCI on economic outcomes is unclear.

3.2. Data

We use the Korea Welfare Panel Study (KOWEPS), a nationally representative longitudinal study of households in Korea. Since 2006, KOWEPS has annually collected a wide range of information including demographics, health, pubic benefit receipt (e.g., LTCI, disability pension), household expenditures, income, savings, and district of residence[12]. The panel data with rich information on economic and health conditions measured at the individual and household levels allow the study to identify the LTCI beneficiaries at the household level and compare the differences between the consumption, savings, healthcare utilization, and health status of LTCI beneficiaries and non-beneficiaries before and after the intervention. To examine the economic and health effects of LTCI, we select 3,711 households living with at least one older adult as our sample. These selected households are the ones who have been surveyed at least once before and once after the intervention.

[11] According to the 2014 Report on the National Survey of Senior Citizens, 6.9% of older people have at least one ADL limitation and 11.3% of older people have at least one IADL limitation (Jung et al, 2014).

[12] KOWEPS uses a two-stage sampling method to select the panel households. In the first stage, household income data of residents living in 517 administrative districts are sampled from the Korean Census Data. In the second stage, the sample is stratified into general and low-income households whose income is below 60% of the standard median income.

One caveat is that KOWEPS identifies LTCI recipients only at the household level. Although people aged below 65 may receive long-term care benefits if they are eligible, the majority of recipients are older adults aged 65 and above (MOHW, 2019)[13]. Thus, we keep households that live with at least one older adult aged 65 or above as our sample to assess the impact of LTCI on household expenditures and savings. When we examine the health effect of LTCI, we keep only older people aged 65 and above because self-rated health and healthcare utilization are reported at the individual level. It should be noted that those older adults in LTCI beneficiary households may or may not be the recipients of long-term care benefits. As KOWEPS does not collect data from individuals in long-term care facilities, the study focuses on LTCI beneficiaries who stay at home and utilize either home care services and/or day, night, and short-term care services in institutions for the analysis[14].

Tables A.1 and A.2 provide the baseline descriptive statistics for households and household heads. In 2006, the heads of households who would be included in the non-beneficiary group were more likely to be young, widowed, healthy, and stay in the labor market compared to those who would be included in the treatment group after the intervention. In terms of household characteristics, households that would become LTCI recipients after 2008 tended to be poor and covered by the Medical Aid program. LTCI beneficiary households were more likely to live with older adults and household members with disabilities. Their annual frequencies of healthcare utilization for outpatient care, inpatient care, and hospitalization were higher than those of non-beneficiary households.

Table 1 reports the descriptive statistics for the heads of households in the treatment and control groups. The average age of household heads in the treatment group is approximately two years older than that of the control group. The heads of households in the treatment group tend to be married, not in the labor force, and less educated compared to those in the control group. As expected, heads in the treatment group have poorer health than those in the control group. Table 2 reports the descriptive statistics for households in the control and treatment groups. The average household size of the treatment group is slightly smaller than that of the control group. LTCI beneficiary households are less likely to live with children or grandchildren and more likely to be poor and covered by the Medical Aid program. The shares of prime-age adults and children are lower among LTCI beneficiary households compared to non-beneficiary households while the shares of older adults and persons with disabilities are higher. Non-beneficiary households have higher levels of savings, assets, and household expenditures on all items except healthcare expenditure. Beneficiary households tend to visit outpatient and inpatient care more frequently while they receive fewer regular health check-ups compared to non-beneficiary households. We do not observe any significant difference in terms of the likelihood of experiencing various types of economic insecurity between the groups.

3.3. Measures

Measures of economic status

As LTCI beneficiaries can use long-term care services at low costs, households who used to spend a considerable amount of their budget on care services in the past may reallocate financial resources to

[13] In 2019, 96.3% were LTCI beneficiaries were older adults aged 65 or above (MOHW, 2019).

[14] In our sample, there were 48 households who receive LTCI and have a member using institutional care services. Given this small sample size and since the economic implications of institutional care services may be different from those of homecare services, this paper excludes these 48 households receiving institutional care services and focuses on LTCI recipients receiving home care services only.

reduce hunger, poverty, and other economic hardship and save more. On the other hand, households who needed some assistance but could not utilize long-term care services in the past due to high costs and lack of care providers in their region may spend more on both long-term care and healthcare and save less.

KOWEPS contains information on household savings and monthly spending on food, living, education, healthcare, entertainment, telecommunication and transportation, housewares, clothing and shoes, and others (measured in 10,000 Korean Won[15]). We use household savings and four categories of household expenditures as measures of economic outcomes: necessity (food and living), education, healthcare, and non-necessity (clothing, shoes, telecommunication, transportation, entertainment, housewares, and others)[16]. To check the robustness of the results, we use several economic insecurity questions. These questions ask each household whether they have experienced any difficulty in having multiple meals per day or a sufficient amount of food and in paying rent, utilities, public education, and medical bills during the past year.

Health status and healthcare utilization

While long-term care services may not resolve older people's medical problems, their self-rated health and demand for healthcare may change. Diversified home care services including monitoring daily health status and assisting with medication may limit the use of outpatient care. Home nursing care providers may detect diseases at an early stage and help beneficiaries to receive appropriate treatments. Non-emergency medical transportation services may help beneficiaries improve access to healthcare. KOWEPS collects information on self-rated health and healthcare utilization at the individual level. To assess the impact of LTCI on healthcare utilization, we include the number of outpatient and inpatient visits, the days of hospitalization[17], and the number of regular health check-ups for older adults aged 65 and above. We use the self-rated health of older adults as a measure of health outcomes[18].

Control variables

Control variables are at the household head and household levels. We include demographic and labor force characteristics of heads of households as control variables. They include gender, marital status, educational attainment, and employment status. As adult children (grandchildren) living with older parents (grandparents) may influence LTCI purchasing decisions, we add a binary variable indicating whether a head of household lives with adult children or grandchildren aged 18 or above if the age of head is 65 or above. At the household level, we include household size, household assets, shares of children and household members with disabilities, and a binary variable indicating the poverty status of a household.

4. Empirical strategy

4.1. Specification

[15] One USD is equivalent to approximately 1,100 KRW.
[16] We drop household saving measured in 2006 due to inconsistency in the questionnaire. Food and healthcare expenditures were not measured in 2007. Education, and non-necessary spendings were not measured in 2006 and 2007.
[17] Days of hospitalization are for people who visited for inpatient care.
[18] Self-rated health is the only measure of health outcomes available in KOWEPS.

We are interested in the impact of LTCI on outcomes for its beneficiaries, that is the average treatment effect on the treated (ATT). We apply a difference-in-differences approach (Heckman et al., 1997; Rosenbaum & Rubin, 1983, 1985) to measure the effect of LTCI on household and individual outcomes.

Effects on household outcomes are identified as follows:

$$y_{ht} = \alpha + \beta LTCI_h * Post_t + \gamma LTCI_h + \delta Post_t + \rho X_{ht} + \varepsilon_{ht} \quad (1)$$

where y_{ht} is an economic outcome of household h at time t. α is the constant term. β is the coefficient of interest that estimates the average treatment effect on the economic outcomes of the treated LTCI-beneficiary households. $LTCI_h$ is an indicator variable for whether a household has received the LTCI benefits for at least one year during the post-intervention period[19]. $Post_t$ is a binary variable taking a value of 1 for 2009 or later. X_{ht} includes household control variables. ε_{ht} is household-specific errors.

To examine the effect of LTCI on individual health and healthcare utilization outcomes, we keep older adults aged 65 and above in the sample and compare their self-rated health and healthcare utilization before and after the intervention at the individual level. For the estimation, we use the following equation:

$$y_{it} = \theta + \mu LTCI_i * Post_t + \tau LTCI_i + \sigma Post_t + \varphi X_{it} + \omega_{it} \quad (2)$$

where y_{it} is health status or healthcare utilization of older adult i at time t. θ is the constant. μ estimates the average treatment effect on health status and healthcare utilization of older adults in the treated beneficiary households. X_{it} includes individual control variables. ω_{it} is an individual-specific error term.

4.2. Pre-trends

The parallel time trends assumption is one of the key underlying assumptions of DID. It can be violated if there are time-varying household or individual unobservable confounders that may affect the probability of being treated or outcome variables. The control and treatment groups should follow the same time trend in the absence of treatment to justify the parallel trends assumption.

The pre-trend testing is one way of assessing the validity of the parallel trends assumption underlying DID. To check the general trends before and after the implementation of LTCI, we follow the specification suggested by Clarke and Schythe (2020) and Schmidheiny and Siegloch (2019):

$$y_{ht} = \alpha + \sum_{j=2}^{J} \lambda_j (Lag\ j)_{ht} + \sum_{k=1}^{K} \eta_k (Lead\ k)_{ht} + X'_{ht} \Psi + \gamma_h + \delta_t + \varepsilon_{ht} \quad (3)$$

where γ_h and δ_t are the household and year fixed effects. λ_j and η_k are event study coefficients that measure the deviations from the common trends that beneficiary households experience in the years leading up to and following the implementation of LTCI. Particularly, λ_j is the coefficient that outlines the differential pre-event trends in outcomes that are associated with the group of households who would

[19] The treatment group is further stratified based on the duration of benefits: 1) households who have received the LTCI benefits on a continuous basis; 2) households who have received the LTCI benefits for at least one year in the past but stopped receiving the benefits at some point.

become eligible and receive the LTCI benefits after the implementation. A similar specification is applied for the individual-level event study analysis:

$$y_{it} = \theta + \sum_{j=2}^{J} \nu_j (Lag\ j)_{it} + \sum_{k=1}^{K} \chi_k (Lead\ k)_{it} + X'_{it}\Phi + \tau_i + \sigma_t + \omega_{it} \quad (4)$$

where τ_i and σ_t are the individual and year fixed effects. ν_j and χ_k are event study coefficients that outline the deviations from the common trends that older adults in beneficiary households experience in the years leading up to and following the implementation of LTCI.

Although we cannot check the pre-event trends for education and non-necessary spending since KOWEPS did not collect relevant information in 2006 and 2007, as shown in Figures 1 and 2, the overall results of the test imply a parallel trend in food expenditures, healthcare expenditures, healthcare utilization, and self-rated health before the intervention. It should be noted that failing to reject the null hypothesis, that the outcomes before the treatment exhibit parallel trends, should not be interpreted as confirming its validity. Roth (2019) claims that the pre-trend tests are often underpowered and failing to reject the parallel trends assumption may disguise possible bias from non-parallel trends. Furthermore, several scholars argue that the parallel trends assumption may often be implausible, especially in a health policy setting, as some unobserved confounders may have a time-varying effect on health outcomes (O'Neill et al., 2016; Ryan et al., 2015).

For cases in which the parallel trends assumption is violated, Ryan et al. (2019) suggest using propensity score matching (PSM) with DID to estimate the causal effects of intervention because the matched DID performs better even with non-parallel trends while addressing potential selection biases. The DID method with PSM has been used in the literature on the impact of the LTCI (Choi et al., 2018; Fu et al., 2017). We derive propensity scores to choose control households that have attributes similar to treatment households at baseline (i.e., before 2009) (Heckman et al., 1997; Smith & Todd, 2005). We match the groups using pre-2009 variables, that include the covariates used in Equations (1) and (2) and two additional variables (net wealth and self-rated health status) because many scholars suggest including factors that are related to the probability of being treated or the outcomes (Brookhart et al., 2006; Ho et al., 2007; Imbens, 2004). Those who stay within the 0.06 bandwidth of kernel propensity scores are selected as a control group (Heckman et al., 1997).

The balance test that compares the means of covariates in the initial wave shows no statistically significant difference at the 5% level between the matched control and treatment groups (Appendix Table A.3 and A.4). The results give us more assurance that the matched treatment and control groups are similar and more likely to follow the same trend in the absence of treatment. However, we should note that there could still be unobserved differences between the groups that the DID with PSM has not fully addressed. In this light, the results of this study should be interpreted with caution.

Another important aspect we should consider is the anticipation effect. After the announcement of the LTCI program but before its implementation, people might have changed their expense and saving behaviors and demand for healthcare in anticipation of the new program. KOWEPS collects the survey at the beginning of every year. As LTCI was announced in April 2007 and implemented in July 2008, there is approximately a one-year gap between announcement and implementation. We check whether

households have changed their behaviors during that period using Figures 1 and 2 which are generated based on the event study specification. We find no evidence of any significant change in the expenses, savings, and healthcare utilization patterns of households in anticipation of LTCI.

4.3. Stratification

LTCI may have heterogeneous effects depending on the duration of benefits, family composition and gender, income level, and type of health insurance. Although LTCI became available nationally in 2008, it took time for some to access the program due to low awareness and a limited supply of care facilities and services in some regions. While some people started receiving the benefits right after the implementation and continued, others occasionally came in and out of the program. We define households who have never utilized long-term care services through LTCI as a control group and households who have utilized long-term care services through LTCI for at least one year during the post-intervention period as a treatment group. As households' responses to LTCI may vary depending on whether they have continuously used the long-term care services or not, we stratify the households in the treatment group into two subgroups: 1) households who have received the LTCI benefits for at least one year but stopped at some point and 2) households who have received the LTCI benefits for at least one year and never left the program after the entry.

We use different post-intervention periods to consider the potential heterogeneity of the impact of LTCI over time. With the short post-intervention period (2009-2011), the treatment group includes households who received the LTCI benefits from 2009 to 2010 or 2011 and did not leave the program during that period. With the long post-intervention period (2009-2019), the control group includes households who did not receive the LTCI benefits from 2009 to 2019.

In addition to the duration of benefits, each household's family composition and gender, income level, and type of healthcare insurance may influence LTCI's impact on household spending, saving, and healthcare utilization. First, the level of household income and assets may vary by gender, particularly in older single families, due to the education and employment gaps between older men and women. Singles and couples may have more power when they make decisions on household expenditures compared to older members of multigenerational families. To verify whether family composition and gender affect the allocation of household budgets and the utilization of healthcare services after the use of LTCI, we stratify the sample by gender and into three family composition groups: singles, older couples, and multigenerational families.

Second, poor families may be less flexible in terms of reallocating household budgets from one item to another compared to non-poor families. As households may present different consumption, saving, and healthcare utilization patterns depending on their income level, we separate the sample into two groups: poor and non-poor.

Third, Medical Aid beneficiaries pay lower copay costs for long-term care and medical services than NHI beneficiaries. We, therefore, stratify the sample by health insurance type to consider the different effects that LTCI may have on NHI-insured and Medical Aid-insured individuals.

5. Results

5.1. Empirical results

Table 3 shows the results of the DID estimation with the short post-intervention period. During the period of 2009-2010, LTCI beneficiary households tend to spend 11.4% more on healthcare services than non-beneficiary households. Older adults in beneficiary households are 8.8% more likely to report better health and tend to stay 2.72 days longer in the hospital when they visit for inpatient care. During the period of 2009-2011, we find similar results. LTCI beneficiary households tend to spend 14.8% more on healthcare services compared to non-beneficiary households. Older adults in beneficiary households are 11.9% more likely to maintain good health and stay 2.68 days longer in the hospital compared to older adults in non-beneficiary households.

In Table 4, we expand our study period from the short post-intervention period (2009-2011) to the long post-intervention period (2009-2019). Similar to the results in Table 3, LTCI beneficiary households are likely to spend 20.9% more on healthcare services compared to non-beneficiary households. Whether they have used long-term care services occasionally or continuously, their spending on healthcare services is statistically higher than that of non-beneficiary households although the magnitude of the increase varies from 17.4% for occasional beneficiary households to 28.4% for continuous beneficiary households. While LTCI beneficiary households spend more on healthcare services, they experience a decrease in savings. LTCI beneficiary households save 26% less than non-beneficiary households. Particularly, households who have continuously utilized long-term care services save 39.7% less than non-beneficiary households.

Regarding self-rated health, older adults in LTCI beneficiary households are 19.7% more likely to rate their health status as good or very good compared to older adults in non-beneficiary households. The positive health effect of LTCI is stronger among those who have continuously utilized long-term care services. Older adults in continuous beneficiary households are 25.1% more likely to indicate that they are healthy whereas older adults in occasional beneficiary households are 15.6% more likely to rate their health as good compared to older adults in non-beneficiary households.

As for healthcare utilization, we find no statistically significant difference in the number of outpatient and inpatient visits between LTCI beneficiary and non-beneficiary households. Older adults in occasional beneficiary households are the only group that shows a decrease in the number of outpatient visits and an increase in the number of inpatient visits. No statistically significant differences in the number of outpatient and inpatient visits are found among older adults in continuous beneficiary households. Although there is no statistically significant difference in terms of the number of inpatient visits between the groups, older adults in LTCI beneficiary households with inpatient visits tend to stay 3.69 days longer in the hospital. Older adults in both occasional and continuous beneficiary households show an increase in the days of hospitalization: 5.25 days for older adults in occasional beneficiary households and 2.13 days for older adults in continuous beneficiary households. Older adults in LTCI beneficiary households are less likely to receive regular health check-ups than those in non-LTCI beneficiary households. Similar results hold whether they have received the LTCI benefits occasionally or continuously.

5.2. Subgroup analysis

People may be impacted by LTCI differently depending on their demographic and socioeconomic conditions. We, therefore, stratify the sample and measure the impact of LTCI on relevant subgroups using DID with PSM[20].

By family structure and gender

In Tables 5, 6, and 7, we stratify households into three family composition groups: older singles, older couples, and multigenerational families. In each table, we separate results for men and women. Starting with the effect of LTCI on household expenditures and savings measured at the household level, Table 5's results indicate that older singles, who could be identified as LTCI recipients, tend to spend more on healthcare. This effect is evident predominantly among women, whether they have received LTCI benefits occasionally or continuously. While occasional female beneficiaries show an increase in household savings, continuous female beneficiaries show a decrease in savings along with an increase in healthcare spending which is consistent with the main results. Table 6 has results for older couples with an LTCI recipient and their spouse, or both persons on LTCI. Beneficiary couples tend to spend more on healthcare services and save less compared to non-beneficiary couples. These results mainly hold among continuous beneficiary households. Table 7 covers multigenerational families with at least one older adult and shows a result that is distinct from the results with older singles and couples. Multigenerational families show increases in all household outcomes including healthcare and savings. Its effect is the most apparent among households who have continuously received the LTCI benefits.

At the individual level, in Table 5, we find that older single male and female beneficiaries are likely to stay longer in the hospital than older single non-beneficiaries. Older single female beneficiaries tend to maintain better self-rated health, although this effect is only marginally significant. As for older couples in Table 6, both older men and women in the beneficiary households are more likely to rate their health as good or very good compared to those in non-beneficiary households. Among older couples in the occasionally beneficiary households, older women are likely to have fewer outpatient visits while older men are likely to stay longer in the hospital. Multigenerational families in Table 7 show that older men and women in beneficiary households are likely to have better health than those in non-beneficiary households. Interestingly, we find an increase in the number of inpatient visits and the days of hospitalization only among older female adults in multigenerational beneficiary households.

By income level

The impact of LTCI on health and economic outcomes may differ by income level. Table 8 separates the sample into poor and non-poor households. Poor households are families whose annual incomes are below 60% of the standard median income. Panel A shows that poor beneficiary households tend to spend more on necessary items and healthcare services compared to poor non-beneficiary households. While poor occasional beneficiary households have higher healthcare expenditures, poor continuous beneficiary households have higher necessary spending. Interestingly, poor beneficiary households experience only a marginal reduction in savings compared to poor non-beneficiary households. Poor occasional beneficiary households do not experience a decrease in savings despite an increase in healthcare expenditures. In contrast, poor continuous beneficiary households show a significant reduction in savings while they do

[20] For each subgroup analysis, we perform the balance test. The results confirmed no statistically significance difference between the control and treatment groups

not experience a significant change in healthcare expenditures. Older adults in poor beneficiary households show an improvement in self-rated health and an increase in the days of hospitalization.

Among non-poor households in Panel B, analogous to the main results, we find an increase in healthcare expenditures and a decrease in household savings. Contrary to the results we find among poor households, non-poor continuous beneficiary households spend more on healthcare while non-poor occasional beneficiary households save less compared to non-poor non-beneficiary households. As for self-rated health, older adults in occasional beneficiary households show the greatest improvement in self-rated health among non-poor beneficiary households. Regarding healthcare utilization, older adults in occasional beneficiary households show significant increases in the number of inpatient visits and the days of hospitalization while the number of outpatient visits falls. The number of regular health check-ups is the only aspect that older adults in continuous beneficiary households show a statistically significant change for (a reduction).

By health insurance type

LTCI may interact with the type of health insurance a person has, which may affect their demand for healthcare services, healthcare expenditures, and health status. In Table A.5, Panel A focuses on households that are covered by the Medical Aid program. There is no statistically significant difference in terms of household expenditures and savings between the beneficiary and non-beneficiary households. Older adults in LTCI beneficiary households tend to maintain better health while their healthcare utilization is not statistically different from those in non-beneficiary households. On the other hand, Panel B indicates that, among the NHI-insured households, LTCI beneficiary households tend to spend more on healthcare services and save less compared to non-beneficiary households. It is more evident among continuous beneficiary households than occasional beneficiary households.

5.3. Robustness check

To check the robustness of the results, we use economic insecurity questions that ask whether a household has ever experienced difficulty in paying for food, living (rent or utilities), education, and healthcare services over the past year in Table 9.[21]. Aligned with the increase in healthcare expenditures found in Tables 3 and 4, LTCI beneficiary households are 1.6% more likely to experience difficulty in paying for healthcare services than non-beneficiary households. Furthermore, LTCI beneficiary households respond that they are 0.9% more likely to experience difficulty in paying for rent and utilities compared to non-beneficiary households. When the sample is disaggregated by family structure, income level, and health insurance type for the robustness checks (Tables A.6, A.7, and A.8), the results are similar to the findings of subgroup analyses reported earlier (Tables 5, 6, 7, 8, and A.5). For instance, older single and couple beneficiaries are more likely to experience difficulty in paying for healthcare services (Table A.6). While NHI-insured beneficiary households report that they are more likely to experience difficulty in paying for healthcare services, Medical Aid beneficiaries do not report such difficulty (Table A.8). Non-poor beneficiary households are the only group that reports a higher likelihood of experiencing a lack of available financial resources for food while their likelihood of experiencing difficulty in paying for healthcare services is not different from that of non-poor non-beneficiary households (Table A.7).

[21] Note that the proportions of households who experience difficulty in paying for food, living, education and healthcare services are small, ranging from 1 to 4 percent.

There are other Korean panel data such as the Korean Longitudinal Study of Ageing (KLoSA) and the Korea Health Panel Survey (KHPS). We considered these panel datasets as an alternative to check the consistency of the results but they presented limitations and thus we did not use these datasets for the robustness check[22].

6. Discussion and conclusion

LTCI is intended to provide care services to older people who need assistance with daily activities at affordable prices. As they utilize care services at low costs, beneficiary households may become more flexible in the allocation of financial resources and experience an improvement in the quality of life. This study examines the health and economic effects of LTCI on beneficiary households who have received the benefits for at least one year during the post-intervention period using the 2006-2019 Korean longitudinal data and a DID approach with PSM. By taking advantage of a unique setting and a panel dataset collected before and after the rollout of LTCI in Korea, this paper contributes to the literature on the economic and health effects of LTCI.

This study finds that older adults in LTCI beneficiary households with inpatient care visits tend to stay longer in the hospital than those in non-beneficiary households while the number of inpatient visits is not statistically different between the groups. This result may suggest that home nursing care services provide sufficient health check-ups and treatments that could have been done through outpatient visits otherwise. Care services may reduce not only the number of regular health check-ups but also the number of outpatient visits as we find in this study predominantly among occasional beneficiary households. In addition, service providers may detect health problems that require hospital care. By identifying health needs and accompanying visits to healthcare facilities, LTCI beneficiaries might have improved access to healthcare and increased the length of stay.

These findings are different from the results of Choi et al. (2018) which find a decrease in the days of hospitalization and the number of inpatient visits and an increase in the number of outpatient visits using the NHI claims dataset. We should note that the NHI claims data collects information on each patient's out-of-pocket expenses only for insured medical services whilst KOWEPS has information on each household's out-of-pocket expenses for both insured and uninsured medical services.

One aspect that has not been explored in the existing literature is the effect of LTCI on beneficiaries' self-rated health. LTCI services, or the health care services they facilitate, may help improve health. This study finds that older adults in LTCI beneficiary households are more likely to report better health compared to those in the control group. Similar to the finding of Schmitz and Westphal (2015), better health of older adults in LTCI beneficiaries may suggest not only a positive effect of LTCI on beneficiaries' health but also a potential spillover effect on family caregivers' health by helping them replace informal care with formal care and better manage their physical and mental health.

[22] KLoSA collects data every two years starting after the LTCI rollout in 2008. As it asks whether an individual uses long term care services at the moment, if respondents used long-term care services in the previous year but do not currently, they may not be considered as beneficiaries. The shares of older individuals who are either eligible for the LTCI program or received in-kind LTCI benefits were approximately 1% in the 2018 wave of KLoSA, lower than the national rate of 8.8% (NHIS, 2018). KHPS has rich information about healthcare utilizations and costs but does not contain household expenditure information.

As for the effect of LTCI on household expenditures, we find that LTCI beneficiary households spend more on healthcare services than non-beneficiary households. Despite the decrease in the number of regular health check-ups, the longer days in the hospital appear to contribute to the increase in out-of-pocket expenses. A higher likelihood of experiencing difficulty in paying for healthcare that we find in the robustness check suggests that beneficiary households may face a bigger economic burden of medical services.

Similar to the study of Lee and Kim (2019) that examines the economic effect of LTCI on household expenditures using the 2008 and 2016 KOWEPS datasets and a DID model, we find no effect of LTCI on essential, education, and non-essential items. Similar to Ariizumi (2008), we find a larger increase in out-of-pocket expenses among NHI-insured households. Medical Aid-insured households, who are eligible to utilize medical care and long-term care services at no or low costs, do not experience a decline in household savings or an increase in medical out-of-pocket expenses. On the other hand, NHI-insured households, who utilize medical care and long-term care services at regular rates, appear to use their savings to cope with increased out-of-pocket expenses. The long-term care utilization does not create an extra economic burden on Medical Aid-insured families but on NHI-insured families, particularly those who are near-poor but ineligible for the Medical Aid program. These results may imply the need for public support for near-poor households who are covered by NHI but may have limited access to long-term care and healthcare services due to financial difficulties.

Lower savings of LTCI beneficiary households compared to non-beneficiary households may suggest that they use household savings to cope with medical out-of-pocket expenses. The reduction in household savings of LTCI beneficiaries that this study finds is different from the findings of Iwamoto et al. (2010) and Dong et al. (2019) that show a positive effect of LTCI on asset accumulation and mitigating the economic burden of beneficiary households in Japan and the United States. These results may imply that LTCI beneficiaries in Korea suffer from the economic burden of long-term care expenses and healthcare expenditures due to the burdensome copays of long-term care or healthcare services and the limited coverage of care services. To alleviate the economic burden of long-term care and healthcare services, the reduction of copays or the expansion of coverage for home nursing care services can be considered. Through the expansion of its coverage, beneficiaries may receive improved preventive care services which may help reduce days of hospitalization and medical out-of-pocket expenses.

When we disaggregate households by family structure, due to considerable overlap between the samples of older singles and poor households, older singles show the LTCI effects that are similar to those of the poor households: increases in medical of-of-pocket expenses and longer days of hospitalization among those with inpatient visits. Older couples show results analogous to the main results in terms of household expenditures and savings while no changes in their healthcare utilization are different from the main results. Older adults in multigenerational families show distinct results from the ones with older singles and older couples. They spend more on all household items including necessary items, education, healthcare, and non-necessary items while their savings also increase at a marginal level. The overall results that differ by demographic and socioeconomic characteristics suggest that LTCI may have heterogeneous effects depending on age, gender, economic status, health insurance type, and family composition. The effects on disadvantaged groups such as older singles and near-poor households who have limited financial resources and less comprehensive health insurance coverage should be considered further in research and policy.

This study has several limitations. First, KOWEPS does not identify LTCI beneficiaries at the individual level. Because it is not feasible to estimate the impact of LTCI on each beneficiary's economic and health outcome using KOWEPS, this study measures the economic impact of LTCI on household expenditures and savings at the household level and self-rated health and healthcare utilization at the individual level by limiting the sample to households living with at least one older adult. Second, there is no information on private long-term care insurance. People who used to be enrolled in private long-term care might have changed their behaviors after the intervention. Identifying privately insured households or individuals[23] would provide us with a clearer picture of the LTCI impact but KOWEPS does not contain information on private long-term care. Third, this study suffers from a small sample size of the LTCI beneficiary population. Only 6.88% of the total sample in KOWEPS are LTCI beneficiary households. This small sample size might have affected our result, in particular, for the subgroup analysis. Fourth, LTCI beneficiaries must take the assessment test to determine the level of care needed. Its level differentiates the maximum amount of benefit that each beneficiary can claim. The economic impact of LTCI may differ by the level of care needed and the maximum amount of benefit, however, KOWEPS does not collect such information. It makes the study unable to separately assess the effect of LTCI based on the level of care needed and the total amount of benefit claimed. Lastly, the number of care facilities, type of care services, and cost and quality of services may vary by region. Such regional variation might have affected our results but it has not been considered due to data limitations. The inclusion of information on long-term care facilities at the regional level can be considered to address regional variations that may influence the accessibility and long-term care purchasing decisions.

Despite these limitations, this paper provides important findings that suggest a positive effect of LTCI on self-rated health but detrimental effects on household out-of-pocket healthcare expenditures and savings for persons with limited financial resources and less comprehensive health insurance coverage. Given such results and a rapidly aging global population, LTCI and its effects need to receive more research and policy attention in Korea and beyond.

[23] Only 4.8% of older adults aged 60 and above have private nursing insurance (Kang & Kim, 2019). Private nursing insurance is mostly for persons with dementia and takes the form of a one-time payment after diagnosis.

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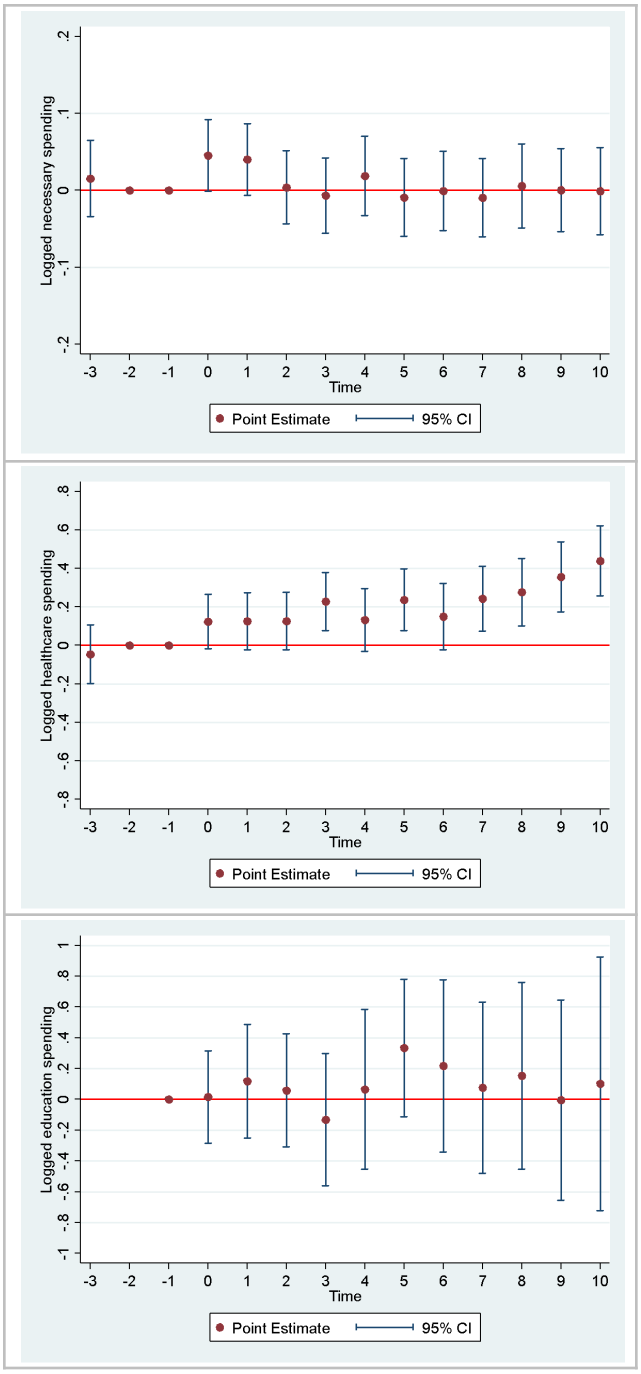
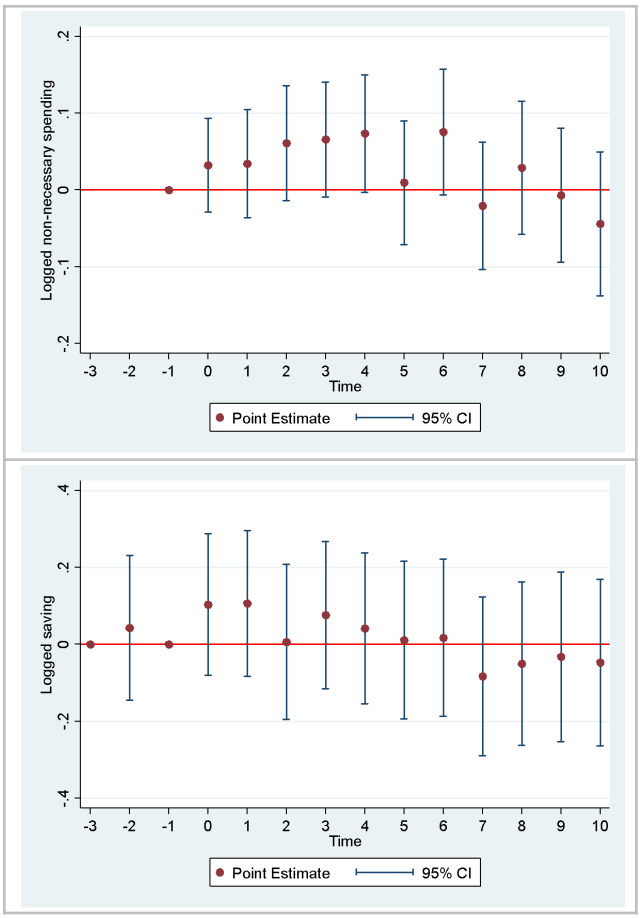
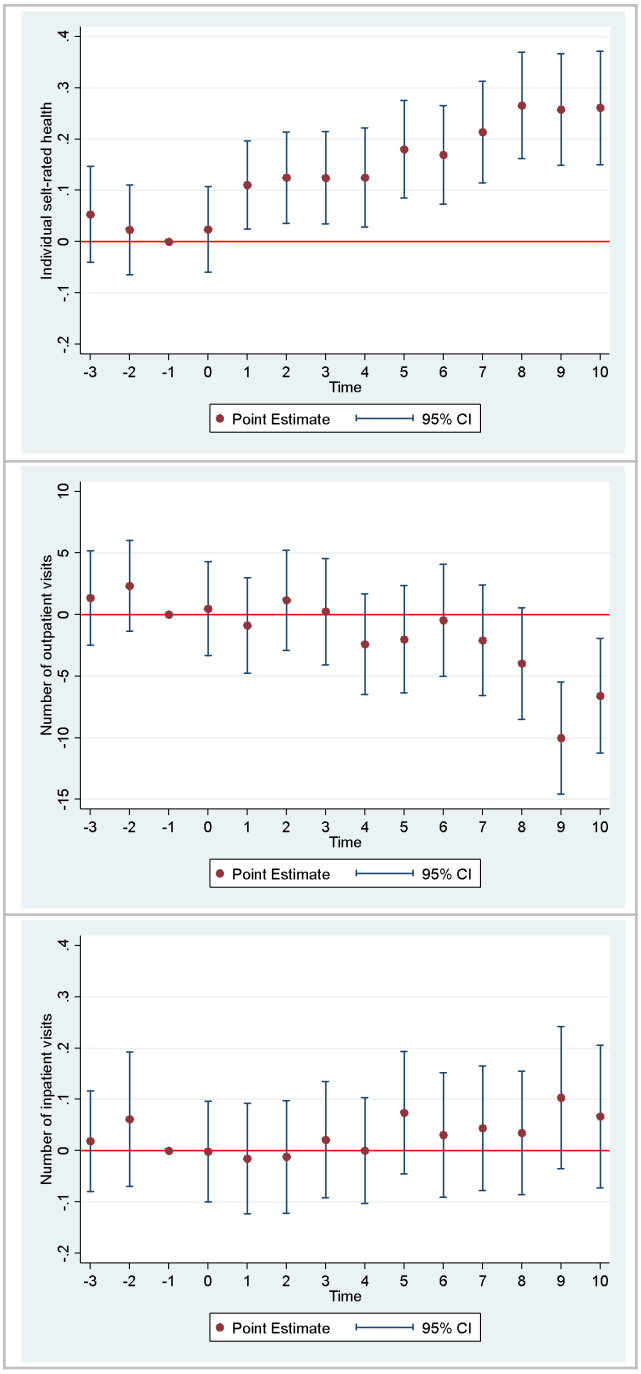
Figure 1. Pre- and post-event trends of household expenditures and savings

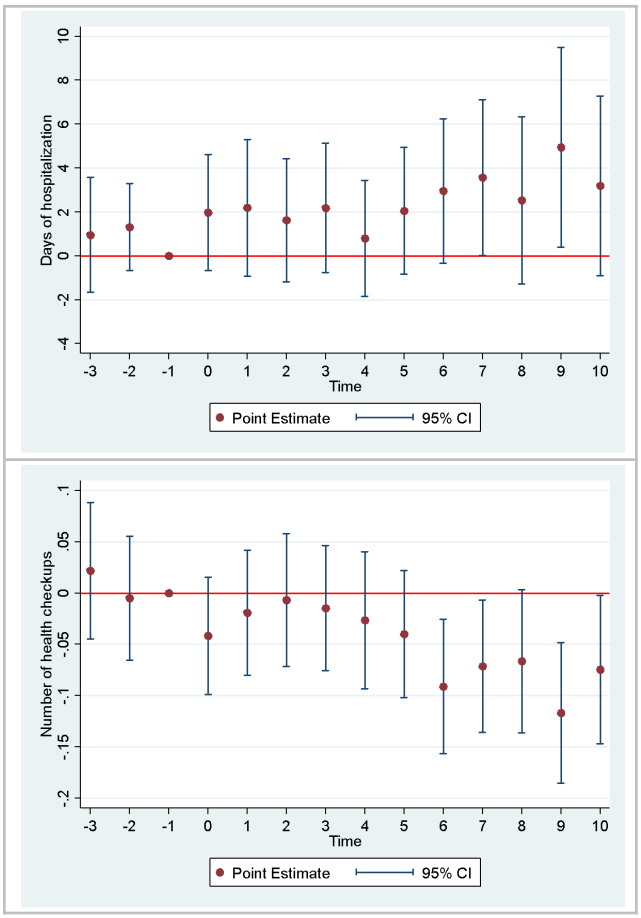




Source: Authors' calculation using KOWEPS, 2006-2019.

Figure 2. Pre- and post-event trends of healthcare utilization and self-rated health of older adults





Source: Authors' calculation using KOWEPS, 2006-2019.

Years of LTCI coverage	Control		Treatment					
	Never treated		All treated		Not continuously used		Continuously used	
	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.
Head of household characteristics								
Age	71.39	(10.60)	73.60	(11.51)	73.24	(12.45)	73.98	(10.46)
Education								
No education	0.21	(0.41)	0.27	(0.45)	0.25	(0.44)	0.30	(0.46)
Elementary school	0.36	(0.48)	0.31	(0.46)	0.30	(0.46)	0.33	(0.47)
Middle school	0.14	(0.35)	0.15	(0.36)	0.15	(0.36)	0.16	(0.36)
High school	0.19	(0.39)	0.16	(0.36)	0.17	(0.38)	0.14	(0.35)
Two-year college	0.02	(0.13)	0.02	(0.14)	0.02	(0.14)	0.02	(0.13)
Four-year college	0.07	(0.25)	0.07	(0.25)	0.08	(0.28)	0.05	(0.23)
Graduate (Master)	0.01	(0.11)	0.01	(0.10)	0.02	(0.13)	0.00	(0.04)
Graduate (PhD)	0.00	(0.04)	0.00	(0.05)	0.00	(0.07)	.	(.)
Male head	0.60	(0.49)	0.60	(0.49)	0.62	(0.49)	0.58	(0.49)
Marital status								
Married	0.52	(0.50)	0.54	(0.50)	0.55	(0.50)	0.54	(0.50)
Widowed	0.39	(0.49)	0.37	(0.48)	0.34	(0.47)	0.40	(0.49)
Divorced	0.06	(0.23)	0.06	(0.23)	0.07	(0.26)	0.04	(0.19)
Separated	0.01	(0.10)	0.01	(0.09)	0.01	(0.11)	0.00	(0.04)
Not married	0.03	(0.17)	0.02	(0.16)	0.02	(0.15)	0.03	(0.16)
Other	0.00	(0.03)	0.00	(0.04)	0.00	(0.05)	.	(.)
Employment status								
Regular employee	0.05	(0.22)	0.04	(0.20)	0.05	(0.22)	0.04	(0.18)
Temporary employee	0.06	(0.23)	0.04	(0.20)	0.05	(0.22)	0.04	(0.18)
Daily employee	0.05	(0.22)	0.02	(0.15)	0.02	(0.15)	0.02	(0.15)
Public labor	0.02	(0.14)	0.01	(0.11)	0.01	(0.09)	0.02	(0.13)
Employer	0.01	(0.09)	0.01	(0.08)	0.01	(0.10)	0.00	(0.06)
Self-employed	0.26	(0.44)	0.21	(0.41)	0.19	(0.39)	0.23	(0.42)
Non-paid employee	0.01	(0.08)	0.00	(0.05)	0.00	(0.06)	0.00	(0.03)
Unemployed	0.01	(0.10)	0.01	(0.09)	0.01	(0.10)	0.01	(0.08)
Not in the labor force	0.54	(0.50)	0.65	(0.48)	0.66	(0.47)	0.65	(0.48)
Self-rated health								
Very good	0.03	(0.17)	0.02	(0.15)	0.03	(0.16)	0.02	(0.14)
Good	0.28	(0.45)	0.20	(0.40)	0.21	(0.41)	0.19	(0.39)
Fair	0.29	(0.45)	0.22	(0.42)	0.22	(0.41)	0.23	(0.42)
Poor	0.36	(0.48)	0.45	(0.50)	0.43	(0.49)	0.48	(0.50)
Very poor	0.05	(0.22)	0.10	(0.30)	0.12	(0.32)	0.08	(0.27)
Observations	31,563		5,691		2,871		2,635	

Table 1. Descriptive statistics: characteristics of heads of households in the control and treatment groups

Source: Authors' calculation using KOWEPS, 2006-2019.

Table 2. Descriptive statistics: characteristics of households in the control and treatment groups

Years of LTCI coverage	Control		Treatment					
	Never treated		All treated		Not continuously used		Continuously used	
	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.
Household characteristics								
Region								
Seoul	0.14	(0.34)	0.13	(0.33)	0.15	(0.36)	0.11	(0.31)
Incheon/Gyeonggi	0.19	(0.39)	0.17	(0.38)	0.18	(0.38)	0.17	(0.37)
Busan/Gyeongnam/Ulsan	0.18	(0.39)	0.15	(0.35)	0.12	(0.33)	0.17	(0.37)
Daegu/Gyeongbuk	0.15	(0.36)	0.20	(0.40)	0.16	(0.37)	0.24	(0.43)
Daejeon/Chungnam	0.08	(0.27)	0.10	(0.30)	0.11	(0.31)	0.09	(0.28)
Gawngwon/Chungbuk	0.07	(0.26)	0.07	(0.25)	0.06	(0.24)	0.08	(0.27)
Gwangju/Jeonnam/Jeonbuk/Jeju	0.19	(0.40)	0.19	(0.39)	0.22	(0.41)	0.16	(0.36)
Household size	2.04	(1.19)	2.02	(1.13)	2.08	(1.19)	1.95	(1.06)
Family structure								
Single	0.37	(0.48)	0.35	(0.48)	0.34	(0.47)	0.36	(0.48)
Couple	0.27	(0.45)	0.36	(0.48)	0.35	(0.48)	0.37	(0.48)
Multigeneration	0.36	(0.48)	0.29	(0.45)	0.31	(0.46)	0.27	(0.44)
Poor households	0.63	(0.48)	0.69	(0.46)	0.67	(0.47)	0.72	(0.45)
Health insurance type								
National Health Insurance	0.90	(0.30)	0.84	(0.37)	0.85	(0.35)	0.83	(0.38)
Medical Aid	0.10	(0.30)	0.16	(0.37)	0.15	(0.35)	0.17	(0.38)
Share of older adults	0.79	(0.29)	0.83	(0.28)	0.81	(0.29)	0.85	(0.26)
Share of prime-age adults	0.14	(0.22)	0.12	(0.20)	0.12	(0.21)	0.11	(0.20)
Share of children	0.03	(0.11)	0.02	(0.09)	0.03	(0.09)	0.02	(0.08)
Share of household members with disabilities	0.13	(0.27)	0.25	(0.35)	0.25	(0.34)	0.26	(0.36)
Self-rated health	3.10	(0.85)	3.46	(0.82)	3.46	(0.85)	3.45	(0.79)
Healthcare utilization								
Outpatient visits	28.04	(32.93)	31.20	(35.05)	29.95	(33.84)	32.48	(36.21)
Inpatient visits	0.23	(0.55)	0.37	(0.83)	0.38	(0.74)	0.35	(0.91)
Days of hospitalization	4.34	(15.67)	8.20	(22.78)	8.86	(23.50)	7.53	(22.00)
Regular check-ups	0.47	(0.47)	0.44	(0.47)	0.42	(0.48)	0.45	(0.47)
Household expenditure								
Food	45.98	(30.50)	39.27	(24.69)	41.69	(27.99)	39.86	(24.52)
Healthcare	15.61	(26.30)	19.92	(29.43)	22.83	(32.25)	20.22	(29.01)
Living	5.13	(17.90)	4.93	(15.80)	4.58	(11.71)	5.28	(18.96)
Education	4.33	(18.17)	4.32	(19.44)	5.33	(21.97)	3.34	(16.53)
Entertainment	5.02	(12.29)	4.09	(12.37)	4.46	(14.54)	3.72	(9.79)
Telecommunication and transportation	20.86	(38.15)	18.24	(34.88)	20.37	(39.11)	16.15	(30.01)
Other	32.74	(47.00)	28.25	(46.17)	30.90	(47.87)	25.65	(44.29)

Household saving	2793.46	(7366.18)	2141.74	(6266.55)	2008.01	(5163.60)	2275.73	(7202.73)
Household assets	12708.26	(43833.62)	9922.67	(26029.93)	8875.89	(19937.56)	10988.39	(30994.56)
Food insecurity	0.01	(0.07)	0.00	(0.06)	0.01	(0.07)	0.00	(0.05)
Other economic insecurity								
Rent	0.01	(0.09)	0.01	(0.10)	0.01	(0.10)	0.01	(0.09)
Utility	0.03	(0.17)	0.03	(0.16)	0.03	(0.17)	0.03	(0.16)
Public education	0.00	(0.04)	0.00	(0.05)	0.00	(0.05)	0.00	(0.04)
Heating	0.03	(0.18)	0.03	(0.17)	0.04	(0.19)	0.03	(0.16)
Healthcare	0.03	(0.16)	0.03	(0.16)	0.03	(0.16)	0.03	(0.16)
Observations	31,563		5,691		2,871		2,635	

Source: Authors' calculation using KOWEPS, 2006-2019.

Table 3. Difference-in-Differences estimation using the 2006-2011 data

Dependent variable		**Post-intervention : 2009-2010**	**Post-intervention : 2009-2011**
Logged household expenditures			
	Necessary items	0.026	0.023
		(0.021)	(0.019)
	Healthcare	0.114 **	0.148 ***
		(0.049)	(0.045)
	Education	-0.041	-0.055
		(0.149)	(0.142)
	Non-necessary items	-0.035	0.029
		(0.049)	(0.047)
Logged household saving		0.007	0.020
		(0.095)	(0.086)
Self-rated health of older adults		0.088 **	0.119 ***
		(0.035)	(0.033)
Healthcare utilization			
	Outpatient visits	-2.025	-1.150 ***
		(1.630)	(1.491)
	Inpatient visits	-0.036	-0.029
		(0.047)	(0.046)
	Days of hospitalization	2.716 **	2.682 ***
		(1.182)	(1.014)
	Regular check-ups	-0.027	-0.021
		(0.023)	(0.022)
Control variables		Yes	Yes

*statistically significant at the 0.10 level; **statistically significant at the 0.05 level; ***statistically significant at the 0.01 level.

Notes: Household expenditures refer to monthly household expenditures. Self-rated health refers to people who rate their health status as good or very good. Days of hospitalization is the mean among persons who were hospitalized. Standard errors are clustered at the household or individual level. Control variables measured for the head of household include gender, marital status, educational attainment, and employment status. Control variables measured at the household level include household size, household assets, share of children and share of household members with disabilities, a binary variable indicating the poverty status of a household, and a binary variable indicating whether a head of household lives with adult children or grandchildren aged 18 or above, if the age of head is 65 or above. Standard errors in parentheses. Source: Authors' calculation using KOWEPS, 2006-2011.

Table 4. Difference-in-Differences estimation using the 2006 -2019 data

	Post-intervention: 2009 - 2019		
Dependent variable	**All treated**	**Not continuously used**	**Continuously used**
Logged household expenditures			
Necessary items	-0.015	-0.010	-0.001
	(0.018)	(0.019)	(0.020)
Healthcare	0.209 ***	0.174	0.284 ***
	(0.044)	(0.046)	(0.049)
Education	0.161	0.035	0.268
	(0.167)	(0.181)	(0.204)
Non-necessary items	-0.038	0.003	-0.083
	(0.047)	(0.051)	(0.051)
Logged household savings	-0.260 ***	-0.096	-0.397 ***
	(0.077)	(0.081)	(0.082)
Self-rated health of older adults	0.197 ***	0.156	0.251 ***
	(0.031)	(0.040)	(0.043)
Healthcare utilization			
Outpatient visits	-2.419	-5.036	0.191
	(1.473)	(1.942)	(1.976)
Inpatient visits	0.007	0.093	-0.085
	(0.043)	(0.042)	(0.079)
Days of hospitalization	3.688 ***	5.253	2.133 *
	(0.891)	(1.276)	(1.095)
Regular check-ups	-0.048 **	-0.043	-0.063 ***
	(0.019)	(0.025)	(0.025)
Control variables	Yes	Yes	Yes

*statistically significant at the 0.10 level; **statistically significant at the 0.05 level; ***statistically significant at the 0.01 level.

Note: Notes from Table 3 apply. Standard errors are in parentheses. Source: Authors' calculation using KOWEPS, 2006-2019.

Table 5. Difference-in-Differences estimation by gender for older singles

	Post-intervention: 2009 - 2019					
	All treated		**Not continuously used**		**Continuously used**	
Dependent variable	Men	Women	Men	Women	Men	Women
Logged household expenditure						
Necessary items	0.032	0.041	-0.086	0.082 ***	-0.004	0.031
	(0.088)	(0.030)	(0.091)	(0.032)	(0.099)	(0.032)
Healthcare	0.562 *	0.425 ***	0.358	0.392 ***	0.277	0.477 ***
	(0.313)	(0.099)	(0.358)	(0.101)	(0.371)	(0.113)
Education	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)
Non-necessary items	0.152	0.126	-0.149	0.256 ***	0.034	-0.013
	(0.257)	(0.077)	(0.284)	(0.097)	(0.284)	(0.074)
Logged household saving	0.058	-0.290 **	0.433	0.338 **	0.380	-0.830 ***
	(0.414)	(0.146)	(0.446)	(0.159)	(0.493)	(0.155)
Self-rated health of older adults	0.199	0.119 *	0.204	0.138 *	0.343	0.164 *
	(0.200)	(0.064)	(0.241)	(0.083)	(0.356)	(0.090)
Healthcare utilization						
Outpatient visits	-0.465	0.045	1.473	-1.525	-1.470	1.326
	(7.054)	(3.463)	(6.466)	(5.426)	(15.781)	(3.618)
Inpatient visits	0.347 **	0.054	0.676 ***	0.064	0.000	0.068
	(0.166)	(0.057)	(0.241)	(0.093)	(0.229)	(0.066)
Days of hospitalization	8.517 **	3.605 **	11.046 **	5.528 *	3.893 *	3.366 *
	(3.287)	(1.802)	(5.529)	(3.174)	(2.221)	(1.959)
Regular check-ups	0.221	-0.043	0.247	-0.055	-0.027	-0.034
	(0.137)	(0.043)	(0.157)	(0.064)	(0.225)	(0.054)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes

*statistically significant at the 0.10 level; **statistically significant at the 0.05 level; ***statistically significant at the 0.01 level.

Note: Notes from Table 3 apply. Standard errors are in parentheses. Source: Authors' calculation using KOWEPS, 2006-2019.

Table 6. Difference-in-Differences estimation by gender for older couples

	Post-intervention: 2009 - 2019					
	All treated		**Not continuously used**		**Continuously used**	
Dependent variable	Men	Women	Men	Women	Men	Women
Logged household expenditure						
Necessary items	0.032	0.032	-0.018	-0.018	0.014	0.014
	(0.029)	(0.029)	(0.032)	(0.032)	(0.034)	(0.034)
Healthcare	0.183 **	0.183 **	0.220 **	0.220 **	0.277 ***	0.277 ***
	(0.079)	(0.079)	(0.086)	(0.086)	(0.091)	(0.091)
Education	.	.	.	.	.	.
	(.)	(.)	(.)	(.)	(.)	(.)
Non-necessary items	0.011	0.011	0.146 *	0.146 *	-0.058	-0.058
	0.067	0.067	0.08	0.08	(0.077)	(0.077)
Logged household saving	-0.333 **	-0.333 **	-0.337 **	-0.337 **	-0.589 ***	-0.589 ***
	(0.149)	(0.149)	(0.158)	(0.158)	(0.167)	(0.167)
Self-rated health of older adults	0.216 ***	0.161 ***	0.237 ***	0.126 *	0.218 **	0.192 ***
	(0.067)	(0.053)	(0.089)	(0.068)	(0.088)	(0.073)
Healthcare utilization						
Outpatient visits	-2.595	-4.284	-3.113	-7.673 **	-1.425	-1.786
	(2.597)	(2.858)	(2.471)	(3.771)	(4.473)	(3.648)
Inpatient visits	-0.113	0.004	0.159	0.069	-0.426	-0.084
	(0.138)	(0.052)	(0.097)	(0.060)	(0.293)	(0.076)
Days of hospitalization	3.245	2.225	6.512 **	3.576	-0.587	1.175
	(2.094)	(1.704)	(2.619)	(2.361)	(3.109)	(2.059)
Regular check-ups	-0.029	-0.053	-0.038	-0.057	-0.034	-0.060
	(0.037)	(0.036)	(0.046)	(0.046)	(0.045)	(0.047)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes

*statistically significant at the 0.10 level; **statistically significant at the 0.05 level; ***statistically significant at the 0.01 level.

Note: Notes from Table 3 apply. Standard errors are in parentheses. Source: Authors' calculation using KOWEPS, 2006-2019.

Table 7. Difference-in-Differences estimation by gender for multigenerational families

	Post-intervention: 2009 - 2019					
	All treated		**Not continuously used**		**Continuously used**	
Dependent variable	Men	Women	Men	Women	Men	Women
Logged household expenditure						
Necessary items	0.088 ***	0.088 ***	0.056 *	0.056 *	0.150 ***	0.150 ***
	(0.027)	(0.027)	(0.029)	(0.029)	(0.029)	(0.029)
Healthcare	0.345 ***	0.345 ***	0.375 ***	0.375 ***	0.332 ***	0.332 ***
	(0.073)	(0.073)	(0.074)	(0.074)	(0.080)	(0.080)
Education	0.351 **	0.351 **	-0.008	-0.008	0.348 **	0.348 **
	(0.176)	(0.176)	(0.184)	(0.184)	(0.175)	(0.175)
Non-necessary items	0.219 ***	0.219 ***	0.131 *	0.131 *	0.449 ***	0.449 ***
	(0.070)	(0.070)	(0.075)	(0.075)	(0.080)	(0.080)
Logged household saving	0.260 *	0.260 *	-0.054	-0.054	0.681 ***	0.681 ***
	(0.140)	(0.140)	(0.144)	(0.144)	(0.150)	(0.150)
Self-rated health of older adults	0.429 ***	0.240 ***	0.371 **	0.224 **	0.466 ***	0.289 **
	(0.106)	(0.077)	(0.152)	(0.089)	(0.131)	(0.118)
Healthcare utilization						
Outpatient visits	0.961	-6.190	-1.930	-9.668	2.962	-0.242
	(3.361)	(4.322)	(4.666)	(5.970)	(4.142)	(4.847)
Inpatient visits	-0.130	0.150 **	-0.267	0.220 **	0.009	0.055
	(0.137)	(0.065)	(0.257)	(0.088)	(0.095)	(0.075)
Days of hospitalization	0.387	5.877 ***	-0.990	5.988 ***	2.212	5.367 **
	(2.865)	(1.821)	(5.172)	(2.127)	(2.114)	(2.499)
Regular check-ups	-0.060	-0.034	-0.019	-0.016	-0.101 *	-0.058
	(0.046)	(0.040)	(0.061)	(0.050)	(0.059)	(0.055)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes

*statistically significant at the 0.10 level; **statistically significant at the 0.05 level; ***statistically significant at the 0.01 level.

Note: Notes from Table 3 apply. Standard errors are in parentheses. Source: Authors' calculation using KOWEPS, 2006-2019.

Table 8. Difference-in-Differences estimation by income level

Dependent variable	Post-intervention: 2009 - 2019		
	All treated	**Not continuously used**	**Continuously used**
Panel A: Poor households			
Logged household expenditure			
Necessary items	0.033 *	0.017	0.047 **
	(0.019)	(0.020)	(0.021)
Healthcare	0.257 ***	0.174 ***	0.355
	(0.055)	(0.056)	(0.062)
Education	0.282	0.457	0.160
	(0.287)	(0.347)	(0.297)
Non-necessary items	0.053 *	0.101 *	0.025
	(0.047)	(0.054)	(0.051)
Logged household saving	-0.153	-0.017	-0.279 ***
	(0.093)	(0.099)	(0.101)
Self-rated health of older adults	0.161 ***	0.100 **	0.260 ***
	(0.036)	(0.044)	(0.050)
Healthcare utilization			
Outpatient visits	-1.818	-4.304 *	0.977
	(1.753)	(2.344)	(2.249)
Inpatient visits	0.008	0.065	-0.059
	(0.052)	(0.051)	(0.095)
Days of hospitalization	2.456 **	3.395 **	1.993 *
	(0.955)	(1.371)	(1.037)
Regular check-ups	-0.027	-0.039	-0.029
	(0.023)	(0.031)	(0.030)
Control variables	Yes	Yes	Yes
Panel B: Non-poor households			
Logged household expenditure			
Necessary items	-0.013	-0.053	0.045
	(0.033)	(0.036)	(0.037)
Healthcare	0.216 ***	0.134	0.294 ***
	(0.083)	0.086	(0.096)
Education	-0.073	-0.042	-0.675 **
	(0.224)	(0.244)	(0.307)
Non-necessary items	0.047	0.013	0.064
	(0.082)	(0.088)	(0.091)
Logged household saving	-0.326 **	-0.446 ***	-0.407
	(0.136)	(0.143)	(0.143)
Self-rated health of older adults	0.237 ***	0.308 ***	0.171 **
	(0.065)	(0.089)	(0.083)
Healthcare utilization			
Outpatient visits	-5.431 **	-7.737 **	-3.659
	(2.663)	(3.497)	(3.668)
Inpatient visits	0.009	0.137 **	-0.131
	(0.077)	(0.069)	(0.149)
Days of hospitalization	6.105 ***	9.323 ***	3.026
	(1.815)	(2.666)	(2.224)
Regular check-ups	-0.093 ***	-0.057	-0.142 ***
	(0.036)	(0.045)	(0.047)
Control variables	Yes	Yes	Yes

*statistically significant at the 0.10 level; **statistically significant at the 0.05 level; ***statistically significant at the 0.01 level.

Note: Notes from Table 3 apply. Standard errors are in parentheses. Source: Authors' calculation using KOWEPS, 2006-2019.

Table 9. Robustness check using economic insecurity questions for all households and by income level

Dependent variable		Post-intervention: 2009 - 2019 All treated	Not continuously used	Continuously used
Food insecurity		0.001	0.000	0.002
		(0.002)	(0.002)	(0.002)
Other economic insecurity				
	Living	0.009 ***	0.009 ***	0.011 ***
		(0.003)	(0.003)	(0.003)
	Education	-0.006 ***	-0.008 ***	-0.003 ***
		(0.001)	(0.001)	(0.001)
	Healthcare	0.016 ***	0.021 ***	0.009 **
		(0.004)	(0.004)	(0.005)
Control variables		Yes	Yes	Yes

*statistically significant at the 0.10 level; **statistically significant at the 0.05 level; ***statistically significant at the 0.01 level.

Note: Notes from Table 3 apply. Standard errors are in parentheses. Source: Authors' calculation using KOWEPS, 2006-2019.

Years of LTCI coverage	Never treated		All treated		Not continuously used		Continuously used	
	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.
Head of household characteristics								
Age	67.98	(11.04)	70.50	(10.91)	70.85	(12.14)	70.06	(9.16)
Education								
No education	0.25	(0.44)	0.30	(0.46)	0.29	(0.46)	0.31	(0.46)
Elementary school	0.36	(0.48)	0.31	(0.46)	0.27	(0.45)	0.36	(0.48)
Middle school	0.12	(0.33)	0.14	(0.35)	0.14	(0.35)	0.14	(0.34)
High school	0.18	(0.38)	0.15	(0.36)	0.18	(0.38)	0.12	(0.33)
Two-year college	0.01	(0.12)	0.02	(0.14)	0.02	(0.15)	0.02	(0.13)
Four-year college	0.06	(0.24)	0.07	(0.25)	0.08	(0.27)	0.05	(0.23)
Graduate (Master)	0.01	(0.11)	0.01	(0.08)	0.01	(0.11)	.	(.)
Graduate (PhD)	.	(.)	.	(.)	.	(.)	.	(.)
Male head	0.65	(0.48)	0.71	(0.45)	0.72	(0.45)	0.70	(0.46)
Marital status								
Married	0.57	(0.50)	0.66	(0.48)	0.65	(0.48)	0.67	(0.47)
Widowed	0.34	(0.47)	0.27	(0.45)	0.26	(0.44)	0.29	(0.45)
Divorced	0.04	(0.21)	0.04	(0.20)	0.06	(0.24)	0.02	(0.15)
Separated	0.01	(0.11)	0.01	(0.10)	0.01	(0.09)	0.01	(0.10)
Not married	0.03	(0.18)	0.02	(0.13)	0.02	(0.15)	0.01	(0.10)
Other	.	(.)	.	(.)	.	(.)	.	(.)
Employment status								
Regular employee	0.05	(0.22)	0.03	(0.17)	0.03	(0.17)	0.03	(0.16)
Temporary employee	0.06	(0.23)	0.04	(0.20)	0.03	(0.18)	0.05	(0.22)
Daily employee	0.06	(0.23)	0.02	(0.15)	.	(.)	0.03	(0.18)
Public labor	0.00	(0.05)	0.00	(0.07)			0.01	(0.10)
Employer	0.01	(0.09)	0.01	(0.08)	0.01	(0.11)	.	(.)
Self-employed	0.29	(0.45)	0.28	(0.45)	0.23	(0.42)	0.34	(0.47)
Non-paid employee	0.01	(0.09)	.	(.)	.	(.)	.	(.)
Unemployed	0.03	(0.18)	0.02	(0.14)	0.03	(0.16)	0.01	(0.10)
Not in the labor force	0.50	(0.50)	0.60	(0.49)	0.66	(0.48)	0.53	(0.50)
Self-rated health								
Very good	0.05	(0.21)	0.04	(0.20)	0.03	(0.17)	0.06	(0.24)
Good	0.26	(0.44)	0.20	(0.40)	0.22	(0.42)	0.17	(0.38)
Fair	0.15	(0.36)	0.13	(0.33)	0.10	(0.31)	0.15	(0.36)
Poor	0.38	(0.49)	0.41	(0.49)	0.37	(0.48)	0.47	(0.50)
Very poor	0.17	(0.38)	0.22	(0.42)	0.28	(0.45)	0.15	(0.36)
Observations	2,096		414		230		184	

Appendix Table A.1. Base year descriptive statistics for the heads of households in the control and treated groups

Source: Authors' calculation using KOWEPS, 2006-2019.

Appendix Table A.2. Base year descriptive statistics for the households in the control and treated groups

Years of LTCI coverage	Never treated		All treated		Not continuously used		Continuously used	
	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.
Household characteristics								
Region								
Seoul	0.13	(0.34)	0.13	(0.34)	0.15	(0.36)	0.11	(0.32)
Incheon/Gyeonggi	0.18	(0.39)	0.16	(0.37)	0.17	(0.37)	0.15	(0.36)
Busan/Gyeongnam/Ulsan	0.19	(0.39)	0.15	(0.35)	0.13	(0.34)	0.17	(0.38)
Daegu/Gyeongbuk	0.16	(0.37)	0.20	(0.40)	0.17	(0.37)	0.25	(0.43)
Daejeon/Chungnam	0.08	(0.27)	0.11	(0.31)	0.12	(0.33)	0.09	(0.28)
Gawngwon/Chungbuk	0.08	(0.26)	0.07	(0.25)	0.05	(0.22)	0.08	(0.27)
Gwangju/Jeonnam/Jeonbuk/Jeju	0.18	(0.38)	0.19	(0.39)	0.22	(0.41)	0.15	(0.35)
Household size	2.21	(1.29)	2.17	(1.17)	2.21	(1.20)	2.13	(1.14)
Family structure								
Single	0.32	(0.47)	0.26	(0.44)	0.25	(0.43)	0.27	(0.44)
Couple	0.24	(0.43)	0.41	(0.49)	0.42	(0.49)	0.39	(0.49)
Multigeneration	0.44	(0.50)	0.34	(0.47)	0.33	(0.47)	0.35	(0.48)
Poor households	0.73	(0.45)	0.76	(0.43)	0.77	(0.42)	0.76	(0.43)
Health insurance type								
National Health Insurance	0.88	(0.32)	0.83	(0.37)	0.83	(0.38)	0.84	(0.37)
Medical Aid	0.12	(0.32)	0.17	(0.37)	0.17	(0.38)	0.16	(0.37)
Share of older adults	0.74	(0.31)	0.80	(0.29)	0.80	(0.30)	0.80	(0.28)
Share of prime-age adults	0.17	(0.23)	0.13	(0.21)	0.12	(0.20)	0.14	(0.22)
Share of children	0.05	(0.13)	0.03	(0.11)	0.04	(0.12)	0.03	(0.11)
Share of household members with disabilities	0.10	(0.22)	0.17	(0.27)	0.18	(0.28)	0.16	(0.26)
Self-rated health	3.37	(1.00)	3.61	(0.94)	3.67	(0.98)	3.53	(0.88)
Healthcare utilization								
Outpatient visits	26.71	(38.82)	30.10	(35.21)	30.65	(33.86)	29.41	(36.90)
Inpatient visits	0.20	(0.58)	0.39	(1.41)	0.32	(0.61)	0.47	(2.01)
Days of hospitalization	4.00	(14.23)	5.95	(16.11)	6.66	(17.32)	5.06	(14.46)
Regular check-ups	0.30	(0.43)	0.34	(0.54)	0.32	(0.61)	0.35	(0.45)
Household expenditure								
Food	31.50	(21.35)	29.27	(19.49)	29.53	(20.12)	28.94	(18.72)
Healthcare	9.79	(24.53)	10.86	(18.19)	11.33	(18.18)	10.28	(18.24)
Living	.	(.)	.	(.)	.	(.)	.	(.)
Education	.	(.)	.	(.)	.	(.)	.	(.)
Entertainment	.	(.)	.	(.)	.	(.)	.	(.)
Telecommunication and transportation	.	(.)	.	(.)	.	(.)	.	(.)
Other	.	(.)	.	(.)	.	(.)	.	(.)
Household saving	.	(.)	.	(.)	.	(.)	.	(.)
Household assets	7239.48	(22525.71)	5982.68	(12003.31)	5486.05	(11199.71)	6603.47	(12942.28)
Food insecurity	0.02	(0.15)	0.01	(0.12)	0.02	(0.13)	0.01	(0.10)
Other economic insecurity								
Rent	0.02	(0.14)	0.02	(0.13)	0.02	(0.15)	0.01	(0.10)
Utility	0.08	(0.27)	0.06	(0.24)	0.06	(0.23)	0.07	(0.25)
Public education	0.01	(0.08)	0.02	(0.13)	0.02	(0.15)	0.01	(0.10)
Heating	0.14	(0.35)	0.12	(0.32)	0.12	(0.32)	0.11	(0.32)
Healthcare	0.09	(0.29)	0.08	(0.27)	0.07	(0.25)	0.09	(0.29)
Observations	2,096		414		230		184	

Source: Authors' calculation using KOWEPS, 2006-2019.Appendix Table A.3. Balance test at the household level

	Mean control	Mean treated	Diff	|t|	Pr(|T|>|t|)
Household size	2.148	2.161	0.012	0.37	0.7125
poor household	0.747	0.751	0.004	0.36	0.7160
Household assets	6586.382	6749.496	163.114	0.37	0.7095
Living with adult children/grand children	0.141	0.139	-0.002	0.19	0.8494
Share of children	0.033	0.032	-0.001	0.38	0.7052
Share of members with disability	0.181	0.191	0.01	1.28	0.2023
Head high school graduates or higher	0.383	0.389	0.006	0.47	0.6397
Head married	0.62	0.643	0.023	1.74	0.0817*
Head male	0.68	0.7	0.02	1.58	0.1151
Head employed	0.384	0.383	-0.001	0.09	0.9273

*statistically significant at the 0.10 level; **statistically significant at the 0.05 level; ***statistically significant at the 0.01 level.

Source: Authors' calculation using KOWEPS, 2006-2019.

Appendix Table A.4. Balance test at the individual level

	Mean control	Mean treated	Diff	|t|	Pr(|T|>|t|)
Household size	2.224	2.224	-0.001	0.03	0.9770
poor household	0.721	0.725	0.004	0.47	0.6368
Household assets	8293.529	8207.342	-86.187	0.21	0.8349
Living with adult children/grand children	0.132	0.13	-0.002	0.3	0.7630
Share of children	0.028	0.027	-0.001	0.51	0.6110
Share of members with disability	0.186	0.196	0.009	1.67	0.0941*
High school graduates or higher	0.249	0.25	0.001	0.17	0.8622
Married	0.672	0.69	0.017	1.93	0.0541*
Male	0.411	0.407	-0.004	0.39	0.6964
Employed	8.025	8.037	0.012	0.37	0.7113

*statistically significant at the 0.10 level; **statistically significant at the 0.05 level; ***statistically significant at the 0.01 level.

Source: Authors' calculation using KOWEPS, 2006-2019.

Table A.5. Difference-in-Differences estimation by health insurance type

Dependent variable	All treated	Post-intervention: 2009 - 2019 Not continuously used	Continuously used
Panel A: Households with Medical Aid			
Logged household expenditure			
Necessary items	0.000	-0.022	0.088 *
	(0.045)	(0.049)	(0.052)
Healthcare	0.237	0.160	0.575 **
	(0.179)	(0.190)	(0.230)
Education	.	.	.
	(.)	(.)	(.)
Non-necessary items	0.137	0.168	0.062
	(0.099)	(0.111)	(0.114)
Logged household saving	-0.378	-0.446 **	-0.394 *
	(0.200)	(0.212)	(0.232)
Self-rated health of older adults	0.217 ***	0.099	0.330 ***
	(0.083)	(0.110)	(0.111)
Healthcare utilization			
Outpatient visits	4.242	-1.372	10.254
	(4.742)	(5.438)	(7.229)
Inpatient visits	0.049	0.195	-0.172
	(0.213)	(0.202)	(0.444)
Days of hospitalization	3.010	3.921	5.426
	(3.409)	(4.327)	(3.852)
Regular check-ups	-0.043	-0.105	0.083
	(0.072)	(0.102)	(0.067)
Control variables	Yes	Yes	Yes
Panel B: Households with NHI			
Logged household expenditure			
Necessary items	0.022	-0.053	-0.058 *
	(0.020)	(0.027)	(0.027)
Healthcare	0.261 ***	0.217 ***	0.321 ***
	(0.044)	(0.042)	(0.044)
Education	0.173	0.137	0.295 ***
	(0.184)	(0.183)	(0.166)
Non-necessary items	0.033	0.042	0.035
	(0.054)	(0.042)	(0.053)
Logged household saving	-0.172 **	-0.185	-0.189 ***
	(0.083)	(0.068)	(0.070)
Self-rated health of older adults	0.200 ***	0.171 ***	0.248 ***
	(0.034)	(0.044)	(0.047)
Healthcare utilization			
Outpatient visits	-3.206 **	-5.510 **	-0.753
	(1.594)	(2.149)	(2.123)
Inpatient visits	0.009	0.074 **	-0.062
	(0.035)	(0.037)	(0.061)
Days of hospitalization	3.382 ***	5.615 ***	1.594
	(0.900)	(1.269)	(1.204)
Regular check-ups	-0.051 ***	-0.027	-0.091 ***
	(0.019)	(0.024)	(0.027)
Control variables	Yes	Yes	Yes

*statistically significant at the 0.10 level; **statistically significant at the 0.05 level; ***statistically significant at the 0.01 level.

Note: Household expenditures refer to monthly household expenditures. Self-rated health refers to people who rate their health status as good or very good. Days of hospitalization is the mean among persons who were hospitalized. Standard errors are clustered at the household or individual level. Control variables measured for the head of household include gender, marital status, educational attainment, and employment status. Control variables measured at the household level includes household size, household assets, shares of children and household members with disabilities, a binary variable indicating the poverty status of a household, and a binary variable indicating whether a head of household lives with adult children or grandchildren aged 18 or above, if the age of head is 65 or above. Standard errors are in parentheses. Source: Authors' calculation using KOWEPS, 2006-2019.

Table A.6. Robustness check using economic insecurity questions by family structure

Dependent variable		Post-intervention: 2009 - 2019 All treated	Not continuously used	Continuously used
Panel A: Older singles				
Food insecurity		0.005	0.010 *	0.000
		(0.005)	(0.006)	(0.004)
Other economic insecurity				
	Living	0.022 ***	0.030 ***	0.015 ***
		(0.006)	(0.006)	(0.006)
	Education	.	.	.
		(.)	(.)	(.)
	Healthcare	0.032 ***	0.050 ***	0.018 *
		(0.009)	(0.010)	(0.009)
Control variables		Yes	Yes	Yes
Panel B: Older couples				
Food insecurity		-0.002	-0.006 **	0.005 **
		(0.003)	(0.003)	(0.002)
Other economic insecurity				
	Living	0.007 *	0.006 *	0.005
		(0.004)	(0.004)	(0.005)
	Education	.	.	.
		(.)	(.)	(.)
	Healthcare	0.017 **	0.010	0.022 **
		0.008	(0.007)	(0.009)
Control variables		Yes	Yes	Yes
Panel C: Multigenerational households				
Food insecurity		-0.002	-0.002	-0.004
		(0.003)	(0.003)	(0.003)
Other economic insecurity				
	Living	-0.005	-0.014 **	0.006
		(0.006)	(0.007)	(0.005)
	Education	-0.018 ***	-0.025 ***	-0.011 ***
		(0.004)	(0.004)	(0.003)
	Healthcare	0.002	0.017 **	-0.017 **
		(0.008)	(0.009)	(0.008)
Control variables		Yes	Yes	Yes

*statistically significant at the 0.10 level; **statistically significant at the 0.05 level; ***statistically significant at the 0.01 level.

Note: Notes from Table A.5 apply. Standard errors are in parentheses. Source: Authors' calculation using KOWEPS, 2006-2019.

Table A.7. Robustness check using economic insecurity questions by income level

Dependent variable		Post-intervention: 2009 - 2019 All treated	Not continuously used	Continuously used
Panel A: Poor households				
Food insecurity		0.000	0.000	0.001
		(0.003)	(0.003)	(0.003)
Other economic insecurity				
	Living	0.010 ***	0.011 **	0.010 ***
		(0.004)	(0.004)	(0.004)
	Education	-0.005 ***	-0.007 ***	-0.005 ***
		(0.001)	(0.002)	(0.001)
	Healthcare	0.021 ***	0.029 ***	0.012 *
		(0.006)	(0.006)	(0.007)
Control variables		Yes	Yes	Yes
Panel B: Non-poor households				
Food insecurity		0.003 ***	0.003 ***	0.002 *
		(0.001)	(0.001)	(0.001)
Other economic insecurity				
	Living	0.005 *	0.003	0.009 ***
		(0.003)	(0.003)	(0.003)
	Education	-0.004 **	-0.010 ***	0.002
		(0.002)	(0.003)	(0.002)
	Healthcare	0.002	0.006	0.000
		(0.004)	(0.004)	(0.004)
Control variables		Yes	Yes	Yes

*statistically significant at the 0.10 level; **statistically significant at the 0.05 level; ***statistically significant at the 0.01 level.

Note: Notes from Table A.5 apply. Standard errors are in parentheses. Source: Authors' calculation using KOWEPS, 2006-2019.

Table A.8. Robustness check using economic insecurity questions by health insurance type

Dependent variable		Post-intervention: 2009 - 2019		
		All treated	**Not continuously used**	**Continuously used**
Panel A: Households with Medical Aid				
Food insecurity		-0.003	-0.009	0.013 *
		(0.009)	(0.011)	(0.007)
Other economic insecurity				
	Living	0.025 **	0.012	0.041 ***
		(0.012)	(0.012)	(0.013)
	Education	-0.004 **	0.001	.
		(0.002)	(0.002)	(.)
	Healthcare	0.000	0.017	-0.028
		(0.015)	(0.017)	(0.017)
Control variables		Yes	Yes	Yes
Panel B: Households with NHI				
Food insecurity		0.002	0.004 **	-0.001
		(0.002)	(0.002)	(0.002)
Other economic insecurity				
	Living	0.006 **	0.008 ***	0.006 **
		(0.003)	(0.003)	(0.003)
	Education	-0.007 ***	-0.008 ***	-0.004 ***
		(0.001)	(0.001)	(0.001)
	Healthcare	0.019 ***	0.022 ***	0.016 ***
		0.004	(0.004)	(0.005)
Control variables		Yes	Yes	Yes

*statistically significant at the 0.10 level; **statistically significant at the 0.05 level; ***statistically significant at the 0.01 level.

Note: Notes from Table A.5 apply. Standard errors are in parentheses. Source: Authors' calculation using KOWEPS, 2006-2019.