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Impacts of Copayment Change on Health Behaviours for Older People: Evidence from a Japanese Health Policy Reform

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Impacts of Copayment Change on Health Behaviours for Older People: Evidence from a Japanese Health Policy Reform*

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Abstract

This study investigates the effects of increased copayment on health behaviours among older people in Japan. Utilizing data from the Comprehensive Survey of Living Conditions (CSLC), our analysis focuses on the impacts on positive and negative health behaviours including having regular meals, balanced diet, regular sleep, doing exercise, smoking, and drinking alcohol. While augmented cost sharing is associated with increased positive health behaviours, its impact on negative behaviours is complex, with smoking rates declining but alcohol consumption showing a mild upward trend, particularly among highly educated individuals and males. Notably, higher educated individuals exhibit a greater propensity towards positive health behaviours. This research contributes to understanding the complex interplay between health insurance coverage and health behaviours among older adults, providing insights for policymakers aiming to promote healthy aging and mitigate adverse health outcomes resulting from policy reforms.

Keywords: Copayment, Health Insurance, Health Behaviours, Older Adults, Japan

JEL Classification: I12, I15, I18

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1. Introduction

Rising health expenditures due to an aging population pose fundamental policy challenges to governments. In countries with low fertility rates and high life expectancies, reforms for sustainable healthcare schemes are expected to increase the cost sharing of older adults. However, the effects of a larger cost share on older adults' health behaviours remain elusive. The increased cost share may reduce the direct costs by inhibiting the moral hazard of healthcare services. On the other hand, it may prevent older adults from using the services and change their health behaviours. This study examines heterogeneous effects of a larger cost share on health behaviours, using the case of the Japanese health insurance reform which increased the cost share for the people aged 70-74 years.

Japan is experiencing profound demographic shifts characterized by an increasingly aging population. In 2000, the Japanese government introduced the long-term care insurance (LTCI), covering both home and institutional care for the aging population based on disability levels. Due to rapid aging and declining birth rates, demand for LTCI grew significantly, with users increasing three-fold from 1.49 to 4.74 million between 2000 and 2018 (Nakatani, 2019). Due to the increasing demand, service expenses surged from 3.6 to 10 trillion yen between 2000 and 2016, and the individual insurance premium for older people also exhibited a rise from 2911 to 5514 yen per capita. (Cabinet Office Japan, 2018). In 2022, Japan's population aged 65 and older who comprise 30% of the total population (The World Bank, 2024), marking it as one of the most aged societies in the world. The aging population presents a significant societal challenge, particularly in countries with low fertility rates and high life expectancies like Japan. With the proportion of population aged 65 and above being projected to reach 38.5% by 2065, the health needs of older adults become increasingly complex. This demographic shift emphasizes the importance of understanding and addressing the health

behaviours of older individuals to maintain their well-being and alleviate the burden on healthcare systems (Cabinet Office Japan, 2021).

Health behaviours, such as physical activity, diet, and preventive health measures, play a crucial role in promoting health and preventing chronic diseases among older adults. However, the impact of health insurance coverage on these behaviours remains a topic of debate. Grossman's demand for health model provides a theoretical framework for understanding how changes in copayments of health insurance might affect health behaviours (Grossman, 1972). According to the Grossman model of health demand, individuals make rational decisions about their health investment, considering factors including health capital, time, and resources. If copayments of health insurance increase, individuals might have less disposable income available for healthcare spending, potentially leading to reduced utilization of healthcare services and a shift towards lower-cost alternatives by increasing healthy behaviours and reducing risky health behaviours, in order to maintain their health status at the desired level. These responses might be particularly pronounced among older individuals, as both their time costs and incomes are considerably lower compared to younger people.

Many studies have investigated the effect of health insurance copayments on health behaviours and the findings present a mixed picture. While some research suggests a potential for moral hazard, wherein larger insurance coverage may diminish preventive measures and encourage risky health behaviour, other studies explore that health insurance can enhance individuals' involvement with healthcare services and foster healthier behaviours.

For instance, Dave & Kaestner (2009) utilize the potentially independent changes in health insurance status stemming from acquiring Medicare coverage upon reaching age 65 in the US. Their findings suggest that acquiring health insurance leads to a decrease in the probability of engaging in vigorous physical exercise and an increase in cigarette consumption among elderly men. Though there is no

evidence of an ex-ante moral hazard effect for females. Courtemanche et al. (2019) analyzed the data about the Affordable Care Act (ACA) – which substantially increased insurance coverage and found that the ACA increased utilization of some preventive care, but also increased risky drinking. On the other hand, Breen et al. (2001) reveal that health insurance and access to regular healthcare promote cancer screening. Freeman et al. (2008) conduct a systematic review of studies in the US and find that loss of insurance correlates with decreased utilization of preventive measures, while expansion of health insurance coverage leads to higher likelihood and frequency of physician visits, and an increase in preventive cancer screening for mothers.

Given the mixed evidence and the importance of understanding the relationship between health insurance coverage and health behaviours among older individuals, this study aims to examine the effects of health insurance coverage on health behaviour in Japan. By analyzing how insurance coverage influences health behaviours, including having regular meals, balanced diet, regular sleep, doing exercise, smoking, and drinking alcohol among older adults, this research contributes to our understanding of the complex interplay between health policy and individual behaviours in promoting healthy aging.

The rest of this paper is structured as follows. Section 2 provides a description of the Japanese health insurance system. Section 3 discusses the data and methodology used in the analysis. Section 4 presents the results of the paper. Section 5 discusses key issues related to the analysis and concludes.

2. Institutional Background

The Japanese health insurance scheme stands as a cornerstone of the nation's healthcare landscape, extending its mandatory coverage to both Japanese citizens and non-citizens who establish residency in Japan for more than three months. The coverage includes more than 5,000 medical procedures, dental care, and drugs and the system operates under a meticulously structured national fee schedule

that uniformly governs medical fees and drug prices across the board. Comprised of two principal categories, namely the Employees' Since its establishment in 1961, this scheme has undergone significant evolution. Over the years, disparities between the two insurance types have been systematically narrowed and eventually eliminated altogether by 2003, in alignment with the principles of egalitarian health policies.

Under this scheme, patients are endowed with the freedom to select healthcare facilities without navigating through gatekeepers or referral systems, affording them autonomy in healthcare decision-making. For each visit to hospitals, patients typically bear 30% of the medical expenses, except for pre-school children and elderly people. The insurers pay the rest of the expenses until the upper limits (also known as the maximum out-of-pocket). Above these limits, the insurers cover the entire cost. The elderly becomes eligible for lower copayment rates and limits after they turn 70 years old.

Enacted in 1982, the Health Insurance Act initially imposed a small token of copayment on individuals aged 70 and above. Subsequently, responding to demographic shifts of the aging population and escalating healthcare expenditures, the Act was revised in 2001 and 2002, which introduced a 10% copayment rate for the people aged over 70 years without the income of average workers and a 20% copayment rate for those with the income. In June 2006, the Act underwent further revision to introduce a new insurance scheme, in which the people aged 70 to 74 years copay 20%, those aged 75 years and older copay 10%, and those aged 70 years and older with the income copay 30%.

This transformation was not without its challenges - the new scheme was originally planned to be fully implemented until April 2008. The 30% copayment rate for those aged over 70 years with the income was first planned to introduce in October 2006. However, it encountered strong opposition from the public, particularly with the new insurance for those aged over 75 years, which was titled

“Late Elders’ Health Insurance.” This title evoked the greatest outrage from the targeted seniors, as it was considered as lacking in respect.

In response to public outcry, Prime Minister Yasuo Fukuda intervened, directing the Ministry of Health, Labour and Welfare to rebrand the scheme as "Longevity Health Insurance" to assuage discontent. Further measures included freezing copayment rates for individuals aged 70 to 74 and undertaking meticulous reviews of the scheme's implementation. Subsequent revisions, coupled with enhancements to primary and terminal care systems, culminated in the phased implementation of increased copayment rates, transitioning from 10% to 20% for individuals aged 70 to 74 by April 2014.

3. Data and Methodology

3.1 Data

This study utilizes the data sourced from the Comprehensive Survey of Living Conditions (CSLC) conducted by the Ministry of Health and Welfare (MLHW) in Japan every three years since 1986. To examine the impact of the copayment increase in 2014 on the people aged 70 to 74 years, this study employed the CSLC data covering the household demographic characteristics and health statuses in the years 2013 and 2016.

The survey randomly sampled 295,367 households in 2013 and 289,70 households in 2016 from more than 5,400 stratified regions across Japan. The questionnaires were distributed to these households in early June each year, in which individual members of each household were asked to complete. The responses were collected through door-to-door visits, with the response rates of 79.4% in 2013 and 77.5% in 2016.

Access to CSLC data for academic inquiry is granted by the MHLW upon review and approval of the research objectives, data handling procedures, and intended publication methods. This study secured authorization to utilize anonymized data, wherein identifiable particulars such as geographical location and precise age were redacted to safeguard participant privacy. The dataset conveniently provides age categorization in 5-year increments, enabling focused analysis on the 70-74 age bracket across both the 2013 and 2016 survey periods.

3.2 Empirical Method

As elaborated in previous sections, the co-payment structure for medical services in Japan exhibits variability based on age categories. Notably, distinct co-payment rates apply to individuals depend on their ages. In 2014, revisions were introduced concerning the percentage of medical expenses covered, presenting an opportune scenario for leveraging natural experiments to analyze the causal influence of coinsurance on health outcomes stemming from these policy differentials. Table 1 summarized the change in the health insurance copayment in Japan during 2014 to 2017 that is utilized as the exogenous policy change in our analysis.

Table 1. Health Insurance copayment in Japan (2014 – 2017)

<table>
<tr><td rowspan="2">Period</td><td colspan="2">October 2006 – March 2014</td><td colspan="2">April 2014– August 2017</td></tr>
<tr><td>Low Income</td><td>High Income</td><td>Low Income</td><td>High Income</td></tr>
<tr><td>Age 75 and above</td><td rowspan="2">10%</td><td rowspan="2">30%</td><td>10%</td><td rowspan="2">30%</td></tr>
<tr><td>Age 70 to 74</td><td>20%</td></tr>
<tr><td>Age 69 and below</td><td colspan="2">30%</td><td colspan="2">30%</td></tr>
</table>

Note: High income refers to the taxable income that is more than average taxable income of the active workforce (which is 1,450,000 yen per year in 2012).

The table illustrates how copayment rates vary according to age groups and income levels. Individuals aged 69 and below, regardless of income level, faced a consistent copayment rate of 30% throughout both periods, from October 2006 to March 2014 and from April 2014 to August 2017. Same rate was

applied to those aged 70 and above if they fell into the high-income category. For those with low income and aged 70 and above, there was a copayment rate of 10% from October2006 to March 2014. However, after the policy change in April 2014, the copayment rate for individuals aged 70 to74 with low income was raised 20%.

The change in the proportion of the copayment for the people aged 70 to 74 with low income facilitates the utilization of the difference-in-differences method. However, though we intend to incorporate solely low-income individuals into our sample, there is no explicit income information provided in the survey data. As a result, in order to approximate low-income status, we opted to exclude observations of individuals engaged in full-time jobs, defined as those working five days or more per week. This exclusion criterion serves to diminish the inclusion of high-income individuals in our analysis, thereby facilitating a more precise evaluation of the policy's effects on the target demographic.

Hence, our analysis pivots on the following main regression model for estimation:

$$y_{it} = \alpha + \beta_1 aged70_{it} + \beta_2 2016_t + \delta(aged70 * 2016)_{it} + \boldsymbol{Z}_{it}\boldsymbol{\rho} + u_{it}$$

where $aged70$ is the age indicator which is equal to one for individuals aged between 70 and 74, and equal to zero for individuals aged between 65 and 69. The variable 2016 is the year dummy for the survey conducted in 2016. $\boldsymbol{Z}$ denotes other control variables including gender, marital status and education level of the individuals.

The dependent variable, y_{it}, represent individual i's health behaviours, encompassing both the negative health behaviours of smoking and alcohol consumption; and the positive health behaviours of having regular meals, maintaining a balanced diet, doing exercise, and having enough sleep. Moreover, to evaluate the influence of health insurance on overall health outcomes, we incorporate

the individual's health status and healthcare utilization as dependent variables. Details of the definitions of the dependent and independent variables can be found in Appendix A.

4. Results

4.1 Summary Statistics

Table 2 presents the summary statistics for the variables included in our estimation. The sample comprises 19,322 individuals who worked fewer than five days a week. Specifically, there were 9,742 individuals in 2013 and 9,580 individuals in 2016.

Table 2. Summary statistics

Year		**2013**			**2016**	
Variable	**Obs.**	**Mean**	**Std. dev.**	**Obs.**	**Mean**	**Std. dev.**
Smoker	9,583	0.127	0.333	9,106	0.134	0.341
No. of cig.	9,583	1.670	5.154	9,106	1.766	5.263
Drinker	9,579	0.380	0.485	9,075	0.383	0.486
Amt. of alcohol	9,579	85.97	149.18	9,075	89.29	152.83
Regular meals	9,742	0.758	0.428	9,298	0.732	0.443
Balanced diet	9,742	0.506	0.500	9,298	0.504	0.500
Do exercise	9,742	0.542	0.498	9,298	0.539	0.499
Regular sleep	9,742	0.486	0.500	9,298	0.451	0.498
Health	9,602	3.206	0.959	9,157	3.203	0.934
Good Health	9,602	0.288	0.453	9,157	0.284	0.451
Being in hospital	9,941	0.020	0.140	9,458	0.017	0.129
Aged70	9,742	0.509	0.500	9,580	0.456	0.498
Male	9,742	0.431	0.495	9,580	0.426	0.495
Education levels						
Primary or below	9,742	0.248	0.432	9,580	0.169	0.375
High school	9,742	0.463	0.499	9,580	0.467	0.499
Vocational training	9,742	0.036	0.186	9,580	0.048	0.214
University	9,742	0.099	0.298	9,580	0.118	0.322
Post-graduated	9,742	0.006	0.075	9,580	0.007	0.086
Education Missing	9,742	0.149	0.356	9,580	0.191	0.393

Among the risky health behaviours, the prevalence of smoking and alcohol consumption of older adults in Japan shows a slight increase from 2013 to 2016. On the other hand, the proportion of older

adults reporting having regular meals, balanced diets, regular sleep and engaging in exercise are similar in 2016 compared to 2013. Consider the health condition, the self-reported health status among older adults shows minimal change between 2013 and 2016, as indicated by comparable mean values for the self-assessment of health. Similarly, the proportion of individuals reporting "Good Health" remains relatively stable over the same period. However, there is a slight decrease in the percentage of individuals being hospitalized in 2016, suggesting either potential improvements in health outcomes or changes in healthcare utilization patterns among this demographic group.

4.2 Main Results

Tables 3 presents the results obtained from estimating the DID model for the average treatment effects of health insurance copayment on negative health behaviours.

Table 3. Main results for negative health behaviours

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Smoking		***No. of cigarette***		***Drinking***		***Amount of alcohol***	
Aged70	-0.033***	-0.042**	-0.644***	-0.770**	-0.044***	-0.048***	-19.389***	-21.571**
	(0.000)	(0.001)	(0.000)	(0.028)	(0.000)	(0.000)	(0.000)	(0.439)
2016	0.010***	0.012***	0.097***	0.137***	0.004***	0.000	2.360***	1.959*
	(0.000)	(0.000)	(0.000)	(0.005)	(0.000)	(0.001)	(0.000)	(0.209)
*Aged70*2016*	-0.009***	-0.006*	-0.081***	-0.052*	-0.007***	-0.003***	-0.278***	1.050*
	(0.000)	(0.000)	(0.000)	(0.007)	(0.000)	(0.000)	(0.000)	(0.136)
Male		0.185*		2.729		0.399***		125.497*
		(0.024)		(0.555)		(0.005)		(10.714)
Constant	0.143***	0.095**	1.997***	1.214**	0.402***	0.199**	95.833***	38.779*
	(0.000)	(0.007)	(0.000)	(0.139)	(0.000)	(0.002)	(0.000)	(3.153)
Education level	No	Yes	No	Yes	No	Yes	No	Yes
Observations	18689	18689	18689	18689	18654	18654	18654	18654
R-sq	0.003	0.076	0.004	0.070	0.002	0.181	0.004	0.180

Notes: Standard errors clustered within age groups are in parentheses. ***, **, * denote significance at 1%, 5%, and 10%, respectively.

In general, the coefficient estimates of the 2016 year dummy are positive and statistically significant. The results show that there is an overall increase in both cigarette and alcohol consumption over time across both age groups.

Regarding smoking behaviour, our findings reveal that individuals aged between 70 and 74 exhibit a lower probability of smoking compared to those aged 65 to 69, as indicated by a negative coefficient of -0.033. Furthermore, the DID estimate $\hat{\delta}$ from the full model is -0.006, which reveals a decrease in smoking prevalence caused by the raise of copayment.

Similarly, individuals aged 70 to 74 display reduced alcohol consumption compared to their counterparts aged 65 to 69, as evidenced by negative coefficients of -0.048 for the probability of drinking alcohol and -21.571 for amount. The increase in copayment reduces the probability of drinking alcohol by 0.3%. However, the amount of alcohol consumption increased slightly by 1.05 ml after the copayment increased.

Moving to the positive health behaviours, Table 4 presents the estimated effects of the increase in health insurance copayment.

Table 4. Main results for positive health behaviours

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Regular meals		***Balanced diet***		***Do exercise***		***Regular sleep***	
Aged70	0.037***	0.043***	0.000***	0.022***	0.014***	0.028**	0.017***	0.020*
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.002)
2016	-0.036***	-0.038***	-0.015***	-0.027**	-0.010***	-0.019**	-0.043***	-0.045**
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.002)
*Aged70*2016*	0.025***	0.025***	0.029***	0.029***	0.018***	0.018***	0.019***	0.020***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Male		-0.036		-0.097		0.016		0.057
		(0.015)		(0.026)		(0.004)		(0.011)
Constant	0.739***	0.717***	0.506***	0.423***	0.535***	0.433***	0.478***	0.424**
	(0.000)	(0.009)	(0.000)	(0.005)	(0.000)	(0.005)	(0.000)	(0.011)
Education level	No	Yes	No	Yes	No	Yes	No	Yes
Observations	19040	19040	19040	19040	19040	19040	19040	19040
R-sq	0.004	0.009	0.000	0.036	0.001	0.017	0.002	0.008

Notes: Standard errors clustered within age groups are in parentheses. ***, **, * denote significance at 1%, 5%, and 10%, respectively.

The results indicate significant impacts of health insurance copayment on positive health behaviours. The estimation results from the full model indicate that the raise in copayment increases the probabilities of having regular meals, maintaining a balanced diet, and doing exercise by 2.5%, 2.9%, 1.8% and 2% respectively.

Besides that, there remains the question of whether the increase in copayment would ultimately impact health outcomes. Table 5 presents the estimated results concerning different measures of health status among older individuals..

Table 5. Main results for health outcomes and hospital admission

	(1)	(2)	(3)	(4)	(5)	(6)
	Health status		***Good Health***		***Hospitalized***	
Aged70	-0.096***	-0.077***	-0.022***	-0.013**	0.014***	0.013***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
2016	-0.020***	-0.034***	-0.007***	-0.014***	-0.000***	-0.000
	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
*Aged70*2016*	0.027***	0.027***	0.006***	0.006*	-0.005***	-0.005**
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Male		-0.011		-0.001		0.005
		(0.003)		(0.002)		(0.001)
Constant	3.254***	3.138***	0.299***	0.242**	0.013***	0.012*
	(0.000)	(0.011)	(0.000)	(0.005)	(0.000)	(0.001)
Education level	No	Yes	No	Yes	No	Yes
Observations	18759	18759	18759	18759	19399	19399
R-sq	0.002	0.010	0.000	0.010	0.002	0.003

Notes: Standard errors clustered within age groups are in parentheses. ***, **, * denote significance at 1%, 5%, and 10%, respectively.

The copayment appears to positively influence an individual's health condition, as evidenced by its significant impacts on *Health status* and *Good Health*, with average treatment effects of 0.027 and 0.006 respectively; and it's negative effect on *Hospitalized*, with an average treatment effect of -0.005. When considering these findings alongside those from Tables 3 and 4, it suggests that the rise in

copayment encourages the adoption of healthier behaviours, discourages risky health behaviours, and ultimately contributes to improved health outcomes.

4.3 Robustness Check

Given the limitations of the accessible data from the CSLC surveys, we conducted a robustness check to ensure the reliability of our findings. As mentioned earlier, our primary focus is on individuals aged 70 to 74 with low income, as they are directly impacted by the policy change. However, since the survey data lacks specific income information, we employed a criterion based on employment status to approximate low-income individuals, excluding those who work full time, defined as working five days or more per week. Due to the absence of specific income information in the survey data, we tried to refine our sample to include only individuals most likely affected by the policy change. Thus, we excluded individuals who had any form of employment, regardless of the number of working days. Consequently, the sample size decreased from 19,322 to 16,059 observations. This robustness check strengthens the credibility of our results and provides additional confidence in the conclusions drawn regarding the relationship between health insurance policies and health behaviour among older individuals in Japan.

As shown in Tables 6, 7, and 8, the results obtained from the robustness check, which involved estimating the same models using a sample excluding working individuals, demonstrate consistency with our main findings. Despite the exclusion of individuals with any form of employment, the estimated models yielded results that align closely with those from our main analysis. This consistency across both sets of results lends further support to the robustness and reliability of our findings.

Table 6. Results for smoking and drinking excluding working individuals

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Smoking		***No. of cigarette***		***Drinking***		***Amount of alcohol***	
Aged70	-0.028***	-0.040**	-0.562***	-0.729**	-0.036***	-0.045***	-16.276***	-20.310**
	(0.000)	(0.001)	(0.000)	(0.031)	(0.000)	(0.000)	(0.000)	(0.572)
2016	0.009***	0.011***	0.073***	0.103***	0.002***	-0.004*	1.432***	0.388
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.147)
*Aged70*2016*	-0.010***	-0.007*	-0.062***	-0.012	-0.008***	-0.001	0.836***	2.987*
	(0.000)	(0.001)	(0.000)	(0.012)	(0.000)	(0.000)	(0.000)	(0.244)
Male		0.188*		2.675		0.392***		122.872*
		(0.027)		(0.541)		(0.004)		(10.783)
Constant	0.134***	0.092*	1.834***	1.183*	0.378***	0.192**	88.365***	37.633*
	(0.000)	(0.010)	(0.000)	(0.149)	(0.000)	(0.004)	(0.000)	(3.228)
Education level	No	Yes	No	Yes	No	Yes	No	Yes
Observations	15996	15996	15996	15996	15965	15965	15965	15965
R-sq	0.003	0.081	0.004	0.072	0.002	0.175	0.003	0.177

Notes: Standard errors clustered within age groups are in parentheses. ***, **, * denote significance at 1%, 5%, and 10%, respectively.

Table 7. Results for positive health behaviour excluding working individuals

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Regular meals		***Balanced diet***		***Do exercise***		***Regular sleep***	
Aged70	0.033***	0.040***	-0.005***	0.018*	0.013***	0.026**	0.015***	0.018
	(0.000)	(0.001)	(0.000)	(0.002)	(0.000)	(0.001)	(0.000)	(0.003)
2016	-0.029***	-0.031**	-0.014***	-0.026**	-0.009***	-0.018**	-0.041***	-0.044**
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.002)
*Aged70*2016*	0.024***	0.023***	0.029***	0.027**	0.019***	0.019**	0.022***	0.023**
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
Male		-0.040		-0.099		0.023		0.053
		(0.017)		(0.034)		(0.007)		(0.021)
Constant	0.744***	0.723***	0.511***	0.427***	0.535***	0.437***	0.477***	0.428**
	(0.000)	(0.008)	(0.000)	(0.006)	(0.000)	(0.017)	(0.000)	(0.010)
Education level	No	Yes	No	Yes	No	Yes	No	Yes
Observations	16306	16306	16306	16306	16306	16306	16306	16306
R-sq	0.003	0.009	0.000	0.036	0.001	0.017	0.002	0.008

Notes: Standard errors clustered within age groups are in parentheses. ***, **, * denote significance at 1%, 5%, and 10%, respectively.

Table 8. Results for health outcomes and hospital admission excluding working individuals

	(1)	(2)	(3)	(4)	(5)	(6)
	Health status		***Good Health***		***Hospitalized***	
Aged70	-0.093***	-0.073**	-0.020***	-0.011**	0.015***	0.014***
	(0.000)	(0.002)	(0.000)	(0.001)	(0.000)	(0.000)
2016	-0.032***	-0.045***	-0.013***	-0.019**	0.002***	0.002**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
*Aged70*2016*	0.033***	0.033***	0.006***	0.006*	-0.007***	-0.006**
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Male		-0.034		-0.009		0.006*
		(0.018)		(0.007)		(0.001)
Constant	3.235***	3.129***	0.293***	0.240***	0.013***	0.013*
	(0.000)	(0.007)	(0.000)	(0.003)	(0.000)	(0.001)
Education level	No	Yes	No	Yes	No	Yes
Observations	16059	16059	16059	16059	16636	16636
R-sq	0.002	0.009	0.000	0.009	0.002	0.003

Notes: Standard errors clustered within age groups are in parentheses. ***, **, * denote significance at 1%, 5%, and 10%, respectively.

4.4 Heterogeneous Effects of Copayment

In order to explore the heterogeneous effects of the increase in copayment among individuals with varying socio-demographic characteristics, we conducted two subsample analyses. First, we examined the impact among different education levels, disaggregating the sample based on educational attainment to observe how the policy change affected individuals with varying levels of education. Second, we explored the gender-based differences by separating the sample by gender to distinguish any disparities in the effects of the copayment increase between males and females.

4.4.1 High versus low education levels

Examining the heterogeneous effects among individuals with low and high education levels is essential within the framework of the Grossman Health Demand model. According to the Grossman model, education serves as a determinant of health capital accumulation, influencing both the demand for healthcare and health outcomes. Individuals with higher education levels typically possess greater

health literacy and are more adept at navigating healthcare systems, potentially altering their response to policy changes compared to those with lower education levels. By analyzing the heterogenous effects of the copayment increase based on education levels, we gain insights into how human capital, as represented by education, interacts with health policy changes to shape health behaviour and outcomes. This analysis offers valuable insights into the differential impact of policies across socioeconomic strata, aiding in the formulation of targeted interventions to address disparities and enhance overall health equity.

We conducted the subsample analysis by categorizing individuals into low versus high education groups. The low group is defined by high school education or lower, while the high group consists of individuals with education levels above high school. Tables 9 and 10 show the results obtained from this subsample analysis.

Table 9. Results for smoking and drinking with different education levels

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Education	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**
	Smoking		***No. of cigarette***		***Drinking***		***Amount of alcohol***	
Aged70	-0.038***	-0.037**	-0.661**	-0.841**	-0.057***	-0.039***	-21.962***	-21.976***
	(0.001)	(0.001)	(0.012)	(0.027)	(0.001)	(0.000)	(0.287)	(0.257)
2016	0.011***	0.010*	0.134***	0.054	0.006***	-0.007**	3.305***	-0.138
	(0.000)	(0.001)	(0.000)	(0.019)	(0.000)	(0.000)	(0.003)	(0.170)
*Aged70*2016*	-0.003*	-0.013***	-0.013	-0.093**	-0.005**	-0.002***	-0.785	4.556***
	(0.000)	(0.000)	(0.009)	(0.002)	(0.000)	(0.000)	(0.234)	(0.004)
Male	0.187*	0.164	2.803	2.377	0.407**	0.404**	125.353*	129.774**
	(0.022)	(0.029)	(0.494)	(0.662)	(0.011)	(0.010)	(12.255)	(6.822)
Constant	0.069*	0.067	0.851	0.955	0.220**	0.256**	40.976*	45.537**
	(0.008)	(0.015)	(0.189)	(0.337)	(0.004)	(0.005)	(4.685)	(3.468)
Observations	12692	5997	12692	5997	12672	5982	12672	5982
R-sq	0.078	0.059	0.074	0.055	0.176	0.166	0.179	0.169

Notes: Standard errors clustered within age groups are in parentheses. ***, **, * denote significance at 1%, 5%, and 10%, respectively.

Table 10. Results for positive health behaviour with different education levels

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Education	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**
	Regular meals		***Balanced diet***		***Do exercise***		***Regular sleep***	
Aged70	0.035***	0.045**	0.011**	-0.011*	0.016***	0.015**	0.026***	-0.009
	(0.000)	(0.002)	(0.001)	(0.002)	(0.000)	(0.000)	(0.000)	(0.001)
2016	-0.028***	-0.049**	-0.021***	-0.019**	-0.006***	-0.027***	-0.035***	-0.061***
	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)
*Aged70*2016*	0.015***	0.039***	0.020**	0.050***	0.014***	0.025***	0.014***	0.036***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Male	-0.042*	-0.004	-0.096	-0.045	0.011	0.064	0.056***	0.074
	(0.004)	(0.044)	(0.023)	(0.043)	(0.006)	(0.012)	(0.001)	(0.039)
Constant	0.755***	0.742**	0.520**	0.577**	0.511***	0.546***	0.443***	0.470**
	(0.001)	(0.022)	(0.009)	(0.022)	(0.002)	(0.006)	(0.000)	(0.020)
Observations	12872	6168	12872	6168	12872	6168	12872	6168
R-sq	0.005	0.008	0.009	0.003	0.001	0.006	0.005	0.008

Notes: Standard errors clustered within age groups are in parentheses. ***, **, * denote significance at 1%, 5%, and 10%, respectively.

The results indicate that the positive effects of the increase in copayment on fostering positive health behaviours were more prominent among individuals with higher education levels. Those with higher education exhibited greater responsiveness to the policy change, demonstrating more significant improvements in health behaviours compared to their less-educated counterparts.

Similarly, while the increase in copayment was associated with a reduction in smoking across the board, this effect was higher among those with higher education levels. This suggests that individuals with higher education may be more inclined to respond to financial incentives, such as higher copayments, by adopting healthier lifestyle choices such as quitting smoking.

However, our analysis also reveals a different finding among individuals with higher education levels - the increase in copayment was associated with an increase in the amount of alcohol consumed. This unexpected result suggests that the relationship between copayment increases and health behaviours is complex and multifaceted.

4.4.2 Females versus males

Examining the heterogeneous effects among males and females is crucial for understanding the differential impact of health policy changes on gender-specific health behaviours. Research has shown that men and women often have distinct health-related preferences, risks, and responses to policy interventions. The following Tables 11 and 12 show the impacts of copayment on health behaviours for older females and males respectively.

Table 11. Results for smoking and drinking between females and males

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Gender	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**
	Smoking		***No. of cigarette***		***Drinking***		***Amount of alcohol***	
Aged70	-0.022**	-0.067***	-0.308**	-1.357***	-0.046***	-0.050***	-12.317**	-33.824***
	(0.001)	(0.000)	(0.020)	(0.015)	(0.000)	(0.000)	(0.234)	(0.129)
2016	0.010*	0.015**	0.095*	0.185**	0.007**	-0.010*	3.587***	-0.276
	(0.001)	(0.001)	(0.014)	(0.007)	(0.000)	(0.001)	(0.046)	(0.337)
*Aged70*2016*	-0.001**	-0.014**	0.042**	-0.193***	-0.002**	-0.004*	-0.632	3.090***
	(0.000)	(0.000)	(0.002)	(0.002)	(0.000)	(0.000)	(0.128)	(0.021)
Constant	0.077*	0.304**	0.818	4.474***	0.197**	0.601***	35.949**	167.384***
	(0.010)	(0.008)	(0.140)	(0.030)	(0.006)	(0.000)	(1.288)	(1.358)
Education level	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10668	8021	10668	8021	10653	8001	10653	8001
R-sq	0.005	0.013	0.004	0.015	0.009	0.008	0.007	0.009

Notes: Standard errors clustered within age groups are in parentheses. ***, **, * denote significance at 1%, 5%, and 10%, respectively.

Table 12. Results for positive health behaviour between females and males

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Gender	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**
	Regular meals		***Balanced diet***		***Do exercise***		***Regular sleep***	
Aged70	0.028**	0.063**	-0.005	0.059**	0.023**	0.034***	0.022*	0.020***
	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.000)	(0.003)	(0.000)
2016	-0.035**	-0.043**	-0.030*	-0.023**	-0.014*	-0.025***	-0.042*	-0.050***
	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.000)	(0.004)	(0.000)
*Aged70*2016*	0.025***	0.025**	0.041***	0.012***	0.016**	0.022***	-0.001	0.049***
	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)	(0.000)
Constant	0.726***	0.670**	0.426**	0.324**	0.437**	0.446***	0.427**	0.478***
	(0.007)	(0.017)	(0.019)	(0.014)	(0.008)	(0.006)	(0.024)	(0.002)
Education level	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10893	8147	10893	8147	10893	8147	10893	8147
R-sq	0.006	0.013	0.029	0.037	0.011	0.024	0.004	0.006

Notes: Standard errors clustered within age groups are in parentheses. ***, **, * denote significance at 1%, 5%, and 10%, respectively.

The regression results in Table 12 reveal gender disparities in healthy behaviours among older adults in Japan. Females demonstrate a higher likelihood of regular meals, balanced diet, and exercise compared to males. However, males exhibit a slightly higher likelihood of regular sleep.

The results in Table 11 shows different patterns of change in negative health behaviours between females and males. Particularly, females reduced both the probability of cigarette and alcohol consumption after the raise of copayment. Though the number of cigarettes taken increased for females, this effect is suspicious since smoking is quite uncommon among females in Japan. Conversely, column (8) of Table 10 shows a positive coefficient of the amount of alcohol consumed among males.

5. Discussion and Conclusions

The findings of this research shed light on the complex relationship between health insurance coverage and health behaviours among older individuals in Japan. In general, the decrease in health insurance coverage, indicated by an increase in copayment, is associated with an increment in positive health behaviours. This aligns with previous research indicating that lowering financial barriers to healthcare access might discourage individuals from engaging in preventive health measures.

However, the impact on risky health behaviours presents a more complex picture. While the consumption of cigarettes declines in response to increased copayment, the quantity demanded for alcohol increases, particularly for high educated people and males. One possible reason for this finding is that the older people in Japan may believe that moderate alcohol consumption is good for health. There is a Japanese adage "sake is the best of all medicines" where "sake" refers to alcohol (Haishi & Asabe, 2021, p.77). In Japan, some people believe that alcohol is good for health when their drinking is moderate. Moderate alcohol consumption, when incorporated into social interactions such as communication or celebration, can yield health benefits (Toyama, 2022). This could be the potential reason for why the alcohol consumption increases as people in Japan may consider it as healthy behaviour.

Furthermore, our analysis reveals heterogeneous behaviour across different socio-demographic characteristics. Individuals with higher education levels exhibit a stronger change in their behaviour for both positive and negative health behaviours in response to changes in health insurance coverage. This highlights the importance of considering socioeconomic factors when designing interventions aimed at promoting healthy behaviours among older adults.

Furthermore, gender differences are evident in the response to changes in health insurance coverage. Males experience a larger decline in smoking rates but also demonstrate a significant increase in

alcohol consumption. This highlights the need for gender-sensitive interventions to address the differential impact of health policy changes on health behaviours among older males and females.

This study contributes to the growing body of literature on the effects of health insurance coverage on health behaviours among older individuals. By examining the impact of copayment increases on both positive and risky health behaviours, as well as considering heterogeneity across socio-demographic characteristics, our findings provide valuable insights for policymakers aiming to promote healthy aging and mitigate the adverse effects of health policy changes on population health outcomes.

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Appendix A

Table A1. Definitions of the variables

Variable	Definition
Dependent variables	
Smoker	=1 if the individual reported smoking; =0 otherwise.
No. of cig.	Number of cigarettes taken per day.
Drinker	= 1 if the individual reported drinking alcohol; =0 otherwise.
Amt. of alcohol	Amount (in ml) taken per day.
Regular meals	= 1 if the individual reported having regular meals; =0 otherwise.
Balanced diet	= 1 if the individual reported having a balanced diet; =0 otherwise.
Do exercise	=1 if the individual reported doing moderate exercise or being physically active; =0 otherwise.
Regular sleep	=1 if the individual reported having enough sleep; =0 otherwise.
Health	Self-assessed health status. =5 for good; =4 for fairly good; =3 for average; =4 for not very good; =5 for bad.
Good Health	=1 if *Health*≥4; =0 otherwise.
Admitted in hospital	=1 if had been admitted in hospital in the last 12 months; =0 otherwise.
Aged70	=1 if the individual aged 70 to 74; =0 if the individual aged 65 to 69.
Male	=1 if the individual is a male; =0 otherwise.
Education levels	
Primary or below	=1 if the individual's highest education level is primary school or below; =0 otherwise.
High school	=1 if the individual's highest education level is high school; =0 otherwise.
Vocational training	=1 if the individual's highest education level is vocational training; =0 otherwise.
University	=1 if the individual's highest education level is undergraduate; =0 otherwise.
Post-graduated	=1 if the individual's highest education level is post-graduate; =0 otherwise.
Education Missing	=1 if the individual's highest education level is missing; =0 otherwise.