

Association between private health insurance and medical use by linking subjective health and chronic diseases

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Abstract

This empirical study identifies the negative aspects of private health insurance (PHI) by analyzing the association between subjective health conditions, 2 weeks of outpatient care, chronic diseases, and hospitalizations for 1 year. We used frequency analysis, χ^2 testing, an analysis of variance, and logistic and multiple logistic regression models to analyze the association between PHI and subjective health conditions, outpatient care, chronic disease status, and hospitalization. The PHI group had good subjective health but had more outpatient care for 2 weeks. There were few chronic diseases in the private insurance group, and there was no significant difference in hospitalizations for 1 year. Hospitalization may occur when essential medical care is required, regardless of health insurance type. This study confirmed that as the PHI lowers the burden of personal medical expenses, the PHI can lead to an increase in the medical resource expenditures on the outpatient medical service and higher public health costs. The government should work to redefine the role of private and national health insurance. Also, the effectiveness of PHI should be reevaluated so that it does not lead to indiscriminate use of medical services by minimizing the burden of private insurance.

Abbreviations: CI = confidence interval, KNHNES = Korea National Health and Nutrition Examination Survey, NHI = national health insurance, PHI = private health insurance, OECD = Organization for Economic Cooperation and Development, OPD= Outpatient Department.

Keywords: hospitalization, outpatient care, private health insurance, subjective health condition

1. Introduction

Korea has been building a system to improve the medical accessibility of all citizens since the introduction of the National Health Insurance (NHI) system in July 1989.^[1] The demand for medical services has been increasing due to an aging population, increasing chronic illnesses, higher incomes, and medical technology advancements. However, the national health system has a high personal burden rate of 37.3% and faces a 17.7% higher burden rate than the Organization for Economic Cooperation and Development average of 19.6%. The public experiences a nonwage burden of about 16.6%, and the nonwage burden for local clinics increased from 11.5% in 2008 to 22.8% as of 2018. A drastic increase in total health spending is predictable due to the rapidly aging Korean population and associated epidemiological changes that require

more chronic care. The NHI program considered the potential contribution of private health insurance (PHI) in financing the ongoing issues of public financing and limited benefit availability.^[2–5] According to the “2019 Health Insurance System National Recognition Survey,” a survey of 2000 health insurance subscribers, 94.9% (or 1898) of households had PHI. The majority of people are subscribing to PHI to ease the financial burden of medical expenses, and the size of the PHI market is expanding.^[1]

The NHI has greatly expanded access to medical services and universal medical care, but there are problems with the scope of wages and the coverage.^[6] Under such a system, PHI takes the form of supplementary schemes providing faster access, better quality services, and increased consumer choices, based on income and ability to pay.^[7] In particular, countries with universal coverage perceive private insurance

JY-M and JH-K contributed equally to this work.

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The National Health and Nutrition Survey is a public open database and cannot be obtained.

Data are owned by and are available from the database of the Korea National Health and Nutrition Examination Surveys (KNHNES) <https://knhanes.kdca.go.kr/knhanes/main.do>. KNHNES allows all of these data freely for any researcher who promises to follow the research ethics.

The Ethics Committee of the Korea Centers for Disease Control and Prevention approved the survey. Written informed consent was obtained from each student's parent before participation.

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as a complementary resource to assist public funding.^[8–12] The expansion of private insurance may provide various benefits to the public insurer and the general population.^[13] But others believe that PHI will contribute to a rapid increase in health expenditures, fragment the health system, and aggravate social inequity by increasing the gap in health care utilization among different socioeconomic groups. Some assert that the role of NHI should be further extended by raising contributions, extending benefit packages, and reducing out-of-pocket payment at the point of service.^[14]

According to prior research, PHI subscriptions significantly increase the number of outpatient visits and hospitalizations.^[15] The 2001 Korean Labor and Income Panel showed that the probability of using outpatient and inpatient care was high for PHI purchasers over the age of 15 years.^{16,17} Insured people often increase the demand for health care services due to a reduction in cost sharing. If this effect is strong, PHI will lead to higher health care utilization rates and spending.^[18]

France operates supplemental PHI similar to Korea's and the NHI system.^[19] From a policy perspective, the net increase in total health care spending associated with the expanded PHI financing casts doubt on deleting private insurance providing a more enhanced stake in health care financing.^[13] In the United States, an empirical study on Medigap, a form of supplemental insurance for Medicare,^[20–23] found that subscribed patients use more medical services than nonsubscribed patients and spend more on medical care.^[22] Reports indicate that Medigap increases Medicare's medical spending.^[23]

An analysis of Medigap data shows that the better a person's subjective health, the lower their use of medical care.^[22] Private insurance subscriptions can minimize medical use by psychologically making the subscriber feel healthier.

Chronic disease is a long-term, persistent disease, often with gradual onset, that has a complex, multifactorial causality. These conditions can result in significant impairments in quality of life and activities and premature mortality.^[24] Therefore, chronic diseases require long-term treatment, which is a significant economic burden, unlike other diseases. People with chronic diseases are more likely to obtain PHI as a way to reduce medical expenses. Insurance generally increases the utilization of allied health services by people with chronic diseases.^[25] However, a prior study suggests that the proportion of people with chronic disease with PHI is lower than that of people without PHI.^[26]

Research suggests that PHI positively impacts outpatient expenditure.^[27–30] No studies have identified an increase in medical service usage by linking PHI subscribers' subjective health and chronic disease status to outpatient care and hospitalization rates.

The purpose of this study is to identify the negative aspects of PHI by analyzing the subjective health conditions of subscribers, the rate of outpatient care for 2 weeks, chronic diseases, and the rate of hospitalization for 1 year. This study revealed that the use of medical care by PHI subscribers is not always necessary but based on their desires. The role of public and private insurance must be redefined.

2. Methods

2.1. Research data and subjects

The purpose of this study is to empirically analyze the relationship between outpatient use of private insurance and subjective health conditions or chronic diseases. This is the second analysis using data from the 2016 and 2017 Korea National Health and Nutrition Examination Survey (KNHNES) that was organized and conducted by the Ministry of Health and Welfare. The KNHNES is a nationwide survey conducted every 3 years based on Article 16 of the National Health Promotion Act, which was enacted in 1995. In the first year, 8150 people from 3513 households participated, and 8127 people from 3580 households

participated in the second year. The subjects in the study were extracted from the total census data of the population housing as the basic extraction frame by a 2-stage stratification collection method consisting of survey districts and households as primary and secondary extraction units.

There were 11,283 study participants, excluding nonresponders and those missing variables for PHI status, gender, age, marital status, alcohol history, smoking history, income (individual), occupation, health insurance type, unfulfilled necessary medical care, subjective health condition, outpatient for 2 weeks, hospitalization for 1 year, diagnosis of hypertension, abnormal lipidemia, or diabetes. Data were integrated from the 2016 to 2017 Annual National Nutrition Health Survey.

2.2. Independent variables

2.2.1. PHI status. PHI was investigated by a self-survey by answering "Yes," "No," and "Don't know" to the question: "Does OOO have a PHI policy that subsidizes medical expenses such as cancer insurance, cardiovascular disease insurance, and accident insurance, sold by insurance companies?" In this study, those who answered "Don't know" were excluded from the analysis.

2.3. Dependent variables

2.3.1. Subjective health condition. Subjective health condition was investigated by a self-survey with the choices "very good," "good," "normal," "bad," and "very bad" for the question "How do you usually feel about your health?" In this study, "very good" and "good" were grouped into "good," and "bad" and "very bad" are grouped into "bad." Answers were reclassified as "good," "normal," and "bad."

2.3.2. Outpatient care for 2 weeks. Outpatient services for 2 weeks were investigated by a self-survey with "yes" and "no" choices to the question "Have you been hospitalized for the last two weeks or received treatment at a hospital (including dentistry), a health center, or an oriental clinic?"

2.3.3. Hospitalization for 1 year. Hospitalization for 1 year was surveyed with a self-survey of "yes" or "no" to the question "Have you been hospitalized for the last year?"

2.3.4. Chronic disease status. The number of chronic diseases was investigated by a self-survey of "yes" or "no" to the question of whether or not the subject had hypertension, abnormal lipidemia, or diabetes, which were one of the 3 major chronic diseases with high medical use rate in Korea.^[31] In this study, only "yes" responses were extracted from each question and reclassified as "none," "1," or "2 or 3."

2.4. Control variables

2.4.1. Social demographic variable. Social demographic variables used in the study include gender, age, marital status, income (individual), and occupation. Gender was classified as "male" or "female," and age was classified as "19 to 29," "30 to 39," "40 to 49," "50 to 59," "60 to 69," and "≥70 years of age." Marital status was classified as "married" or "unmarried," and income was classified as "low," "low-intermediate," "high-intermediate," and "high." Finally, occupations were classified into 3 categories: "white collar," "blue collar," and "unemployed" (housewife, student, etc).

2.4.2. Health-related characteristics variables. Smoking history, alcohol history, health insurance type, and unfulfilled necessary medical care were the health characteristics used. Smoking history was classified as "<5 packs (100 cigarettes),"

Table 1
General characteristics of subjects included for analysis.

	Total		Subjective health condition (good)			OPD utilization (yes)			Chronic disease			Hospitalization (yes)			
	N	%*	n	%*	P value	n	%*	P value	n	Means	Standard deviation	P value	n	%*	P value
Private health insurance status					<.0001			<.0001				.0004			.5493
Yes	8688	81.7	2613	31.1		2545	27.8		8688	1.328	37.862		1024	11.7	
No	2595	18.3	508	21.2		1019	34.7		2595	1.742	42.310		344	12.2	
Gender					<.0001			<.0001				.3194			<.0001
Male	4904	49.5	1535	32.7		1393	25.7		4904	1.409	42.487		522	10.0	
Female	6379	50.5	1586	26.0		2171	32.3		6379	1.398	38.025		846	13.6	
Age					<.0001			<.0001				<.0001			.0005
19–29	1217	16.5	465	38.8		279	23.0		1217	1.029	13.924		126	10.8	
30–39	1879	18.6	606	31.7		462	24.4		1879	1.062	17.370		235	11.8	
40–49	2128	21.0	658	30.2		495	22.5		2128	1.230	32.959		193	9.3	
50–59	2174	20.4	567	26.6		684	30.9		2174	1.554	44.302		276	13.5	
60–69	1976	12.9	451	24.3		749	37.1		1976	1.879	40.384		266	12.6	
70	1909	10.6	374	19.8		895	46.4		1909	2.057	36.222		272	14.0	
Marital status					<.0001			<.0001				.1043			.0011
Yes	9550	78.1	2517	27.5		3162	30.9		9550	1.492	40.837		1212	12.5	
No	1733	21.9	604	35.7		402	22.8		1733	1.088	25.002		156	9.2	
Alcohol history					<.0001			<.0001				.1064			.0003
No	1314	9.3	282	25.3		519	37.1		1314	1.716	42.180		206	15.5	
Yes	9969	90.7	2839	29.7		3045	28.3		9969	1.371	39.250		1162	11.4	
Smoking history					.0006			.0509				.0199			.2262
<5 packs	228	2.4	90	41.6		61	26.0		228	1.194	33.362		21	9.3	
>5 packs	4223	40.7	1116	27.6		1272	27.8		4223	1.435	42.450		498	11.3	
Never smoked	6832	56.9	1915	30.0		2231	30.1		6832	1.390	38.553		849	12.3	
Income (individual)					<.0001			.1366				.0240			.2999
Low	2737	24.6	591	24.2		873	29.3		2737	1.430	41.418		371	12.8	
Low-intermediate	2817	24.6	727	27.4		915	29.4		2817	1.384	39.258		335	10.8	
High-intermediate	2827	25.1	823	30.3		838	27.2		2827	1.397	39.719		333	11.7	
High	2902	25.7	980	35.1		938	30.4		2902	1.403	39.696		329	11.8	
Occupation					<.0001			<.0001				.0037			<.0001
White collar	4190	41.4	1403	33.5		1083	25.3		4190	1.252	34.767		397	9.3	
Blue collar	2631	23.2	666	27.0		820	27.8		2631	1.484	41.846		298	11.2	
Unemployed (housewife, student, etc)	4462	35.4	1052	25.9		1661	34.3		4462	1.527	41.753		673	15.1	
Health insurance type					<.0001			<.0001				<.0001			.0200
National health insurance (regional)	3299	28.8	871	29.2		1025	29.1		3299	1.470	41.525		410	12.3	
National health insurance (work)	7568	68.2	2202	30.0		2325	28.3		7568	1.357	38.527		881	11.4	
Medical benefits	416	3.0	48	14.0		214	47.6		416	1.828	45.067		77	17.0	
Unfulfilled necessary medical care					<.0001			<.0001				<.0001			<.0001
Yes	1053	9.2	139	13.6		365	32.2		1053	1.436	41.049		132	11.8	
No	9727	85.4	2795	30.2		3141	29.9		9727	1.415	40.259		1211	12.3	
Never required medical attention	503	5.5	187	42.2		58	11.1		503	1.172	28.834		25	4.0	
Subjective health condition								<.0001				<.0001			<.0001
Good	3121	29.3				763	22.8		3121	1.238	32.543		271	8.7	
Normal	5916	52.8				1772	27.8		5916	1.389	39.310		651	11.1	
Bad	2246	17.9				1029	43.1		2246	1.717	45.499		446	18.8	
Outpatient for 2 wk					<.0001							<.0001			<.0001
Yes	3564	29.1	763	23.0					3564	1.581	43.173		574	15.7	
No	7719	70.9	2358	31.9					7719	1.331	37.648		794	10.2	
Chronic disease status (hypertension, diabetes, and dyslipidemia)					<.0001			<.0001							<.0001

(Continued)

Table 1
(Continued)

	Total		Subjective health condition (good)			OPD utilization (yes)			Chronic disease				Hospitalization (yes)		
	N	%*	n	%*	P value	n	%*	P value	n	Means	Standard deviation	P value	n	%*	P value
None	7378	71.3	2423	33.7		1894	24.3						791	10.6	
1	2241	17.0	468	21.3		914	38.5						313	13.8	
2 or 3	1664	11.7	230	14.4		756	44.3						264	16.1	
Hospitalization for 1 yr					<.0001			<.0001				.0030			
Yes	1368	11.8	271	21.7		574	38.7		1368	1.517	43.225				
No	9915	88.2	2850	30.3		2990	27.8		9915	1.388	39.482				
Total	11,283	100.0	3121		29.310	3564		29.076	11,283	1.4		33.353	1368		11.804

OPD = outpatient department.
*Weighted percentage.

>5 packs (100 cigarettes),” “never smoked,” and “unhidden (teenagers, children).” Alcohol history was classified as “never drunk,” “yes,” “non-applicable (infant),” and “don’t know,” but “don’t know” was excluded from the analysis. Unfulfilled necessary medical care was classified as “yes,” “no,” “never required medical attention,” and “don’t know,” but the last category was excluded, and “no” and “never required medical attention” were reclassified as “no.”

2.5. Analytical approach and statistics

Frequency analysis, a χ^2 test, and an analysis of variance were conducted to determine the subjective health condition, outpatient care, hospitalization, chronic disease and social demographic variables, and the composition and level of health-related activities according to whether or not a person subscribed to PHI. Logistic regression and multiple logistic regression analysis were used to identify differences in subjective health conditions, outpatient care, hospitalization, and relevance to chronic diseases depending on whether a person has PHI. Also, we added the dependent variables, subjective health level, chronic disease, outpatient care, and hospitalization as control variables for each correlation analysis model between PHI and medical use for continuous of care. by analyzing PHI and health status while medical use variables are controlled, it is possible to confirm the health status of pure survey subjects.^[30]

For all analyses, the criterion for statistical significance was $P \leq 0.05$, 2 tailed. All analyses were conducted using the SAS statistical software package, version 9.4 (SAS Institute Inc, Cary, NC).

3. Results

3.1. General characteristics of the study subjects

As shown in Table 1, 11,283 people were surveyed, with 29.3% (n = 3121) of them reporting good subjective health and 29.1% (n = 3564) of them having been outpatients for 2 weeks. In addition, 1664 people were diagnosed with 2 or 3 conditions (hypertension, abnormal lipidemia, and diabetes), and 11.8% (n = 1368) were hospitalized for 1 year. Of the 8688 people who have PHI, 31.1% (n = 2613) reported good subjective health, and 27.8% (n = 2545) were outpatients for 2 weeks. Among PHI subscribers, 955 people were diagnosed with 2 or 3 conditions (high blood pressure, abnormal lipidemia, and diabetes), and 11.7% (n = 1024) were hospitalized for 1 year.

According to demographic characteristics, of 4904 males (49.5%) and 6379 females (50.5%), women were perceived to be in better subjective health condition than men (men = 1535; women = 1586), and outpatient use was high for 2 weeks (men

= 1393; women = 2171 people). The average number of chronic diseases among men was higher than that of women (men = 1.409 disease; women = 1.398 disease), and hospitalization was higher for 1 year (men = 522; women = 846).

3.2. The relationship between subjective health conditions and outpatients for 2 weeks with PHI

As shown in Table 2, PHI subscribers were 1.298x (95% confidence interval [CI], 1.141–1.476; * $P < .0001$) more likely to report “good” subjective health conditions than those who do not have it. Also, PHI subscribers were 1.240x (95% CI, 1.056–1.457; * $P = .0089$) more likely to use outpatient department use in 2 weeks than those who did not. At this time, influencing factors like gender, age, marital status, alcohol history, smoking history, income (individual), occupation, health insurance type, unfulfilled necessary medical care, number of chronic diseases, and hospitalization for 1 year were calibrated.

3.3. The relationship between chronic diseases and hospitalizations in 1 year with PHI

As shown in Table 3, an analysis of the relationship between chronic diseases and hospitalization for 1 year shows that there are 0.054 fewer (95% CI, -0.087 to -0.021; * $P = .0019$) chronic diseases in people with PHI compared to those who do not have PHI. Those who subscribed to PHI had 1.198x (95% CI, 0.981–1.463; $P = .0768$) more hospitalizations in 1 year than those who did not, but this was not statistically significant. Factors such as gender, age, marital status, alcohol history, smoking history, income (individual), occupation, health insurance type, unfulfilled necessary medical care, subjective health condition, and outpatient care for 2 weeks were calibrated.

4. Discussion

In this study, the association between private insurance subscriptions and medical use was analyzed using data from the KNHNES (2016–2017) organized and conducted by the Ministry of Health and Welfare. There were 11,283 respondents, excluding nonresponders and missing values by variable, used after adjusting for gender, age, marital status, drinking and smoking history, income (individual), occupation, health insurance type, and unfulfilled necessary medical care.

First, the PHI group had good subjective health but had more outpatient care for 2 weeks. In this study, the PHI group used more hospital outpatient services, which was in line with a prior study that found that indemnity and fixed benefit insurance increased outpatient service use, hospitalization,

Table 2
Association between private health insurance and subjective health condition.

	Subjective health condition (good)			OPD utilization (yes)		
	OR	95% CI	P value	OR	95% CI	P value
Private health insurance status						
Yes	1.298	1.141–1.476	<.0001	1.240	1.056–1.457	.0089
No	1.000			1.000		
Gender						
Male	1.702	1.518–1.909	<.0001	0.749	0.649–0.864	<.0001
Female	1.000			1.000		
Age						
19–29	1.631	1.273–2.089	.0001	0.560	0.413–0.760	.0002
30–39	1.150	0.943–1.401	.1671	0.536	0.439–0.656	<.0001
40–49	1.123	0.937–1.346	.2100	0.446	0.365–0.544	<.0001
50–59	1.098	0.922–1.307	.2943	0.595	0.487–0.727	<.0001
60–69	1.098	0.932–1.294	.2619	0.714	0.607–0.839	<.0001
70	1.000			1.000		
Marital status						
Yes	1.275	1.083–1.500	.0036	1.077	0.895–1.297	.4303
No	1.000			1.000		
Alcohol history						
No	1.035	0.885–1.211	.6625	0.999	0.852–1.174	.9935
Yes	1.000			1.000		
Smoking history						
<5 packs of cigarettes	1.133	0.838–1.532	.4169	1.167	0.806–1.69	.4117
>5 packs of cigarettes	0.631	0.557–0.714	<.0001	1.114	0.964–1.287	.1428
Never smoked	1.000			1.000		
Income (individual)						
Low	0.621	0.544–0.709	<.0001	0.874	0.753–1.014	.0761
Low-intermediate	0.723	0.638–0.820	<.0001	0.952	0.829–1.092	.4783
High-intermediate	0.748	0.659–0.849	<.0001	0.841	0.733–0.964	.0134
High	1.000			1.000		
Occupation						
White collar	1.248	1.116–1.396	.0001	0.950	0.842–1.071	.3987
Blue collar	1.157	1.016–1.317	.0283	0.928	0.808–1.067	.2931
Unemployed (housewife, student, etc)	1.000			1.000		
Health insurance type						
National health insurance (regional)	1.893	1.453–2.466	<.0001	0.553	0.419–0.73	<.0001
National health insurance (work)	1.758	1.352–2.287	<.0001	0.572	0.432–0.759	.0001
Medical benefits	1.000			1.000		
Unfulfilled necessary medical care						
Yes	0.268	0.212–0.339	<.0001	2.545	1.750–3.703	<.0001
No	0.723	0.592–0.883	.0016	2.697	1.949–3.731	<.0001
Never required medical attention	1.000			1.000		
Subjective health condition						
Good				0.534	0.456–0.626	<.0001
Normal				0.631	0.559–0.711	<.0001
Bad				1.000		
Outpatient for 2 wk						
Yes	0.682	0.616–0.755	<.0001			
No	1.000					
Chronic disease status (hypertension, diabetes, and dyslipidemia)						
None	2.611	2.257–3.019	<.0001	0.623	0.534–0.728	<.0001
1	1.541	1.323–1.794	<.0001	0.921	0.789–1.075	.2984
2 or 3	1.000			1.000		
Hospitalization for 1 yr						
Yes	0.633	0.552–0.726	<.0001	1.373	1.196–1.576	<.0001
No	1.000			1.000		

CI = confidence interval, OPD = outpatient department, OR = odds ratio.

*Adjusted for socioeconomic factors and health status and risk factors.

outpatient medical expenses, and overall medical expenses.^[32] While a US study that analyzed medical use based on Medicare subscriptions found that higher subjective health results in less medical use,^[22] this study found that higher subjective health results in higher medical use. According to the 2020 Ministry of Health and Welfare, in Korea, medical access is high due to the compulsory subscription to the NHI, and as a result, even with a high level of personal health, medical use is higher than in other countries for personal health satisfaction due to low copayment rates.^[31,33] In addition, in the case of the group that

even subscribed to private insurance, it was found that medical use was higher because even “noninsurance items,” which were not included in the health insurance fee system, could be covered.^[34,35] According to a previous study in Korea, it was found that the PHI group received treatment for additional health satisfaction rather than being diagnosed to receive essential medical care compared to the non-PHI group.^[36]

Second, the number of chronic diseases was lower in the private insurance group, and there was no significant difference in hospitalization use for 1 year. This translates into the use of

Table 3
Association between private health insurance and objective health condition.

	Chronic disease status			Hospitalization for 1 yr (yes)		
	Estimate	95% CI	P value	OR	95% CI	P value
Private health insurance status						
Yes	-0.054	-0.087 to -0.021	.0019	1.198	0.981-1.463	.0768
No	Ref			1.000		
Gender						
Male	0.077	0.048-0.106	<.0001	0.758	0.618-0.929	.0079
Female	Ref			1.000		
Age						
19-29	-0.910	-0.969 to -0.846	<.0001	2.172	1.387-3.402	.0007
30-39	-0.872	-0.922 to -0.822	<.0001	1.618	1.188-2.205	.0024
40-49	-0.709	-0.757 to -0.661	<.0001	1.109	0.828-1.487	.4866
50-59	-0.411	-0.458 to -0.365	<.0001	1.390	1.070-1.806	.0137
60-69	-0.115	-0.162 to -0.068	<.0001	1.045	0.838-1.303	.6969
70	Ref			1.000		
Marital status						
Yes	-0.006	-0.047 to 0.034	.7660	1.686	1.207-2.354	.0023
No	Ref			1.000		
Alcohol history						
No	0.025	-0.014 to 0.065	.2042	1.242	1.010-1.528	.0402
Yes	Ref			1.000		
Smoking history						
<5 packs of cigarettes	-0.036	-0.107 to 0.035	.3248	0.972	0.570-1.656	.9152
>5 packs of cigarettes	0.004	-0.025 to 0.033	.7974	1.196	0.972-1.472	.0905
Never smoked	Ref			1.000		
Income (individual)						
Low	-0.009	-0.040 to 0.023	.5979	0.963	0.771-1.202	.7374
Low-intermediate	-0.011	-0.041 to 0.019	.4759	0.852	0.691-1.050	.1331
High-intermediate	-0.001	-0.031 to 0.029	.9535	0.959	0.790-1.165	.6725
High	Ref			1.000		
Occupation						
White collar	-0.007	-0.035 to 0.020	.5910	0.639	0.535-0.762	<.0001
Blue collar	-0.015	-0.046 to 0.015	.3301	0.819	0.680-0.987	.0363
Unemployed (housewife, student, etc)	Ref			1.000		
Health insurance type						
National health insurance (regional)	-0.133	-0.200 to -0.067	<.0001	0.895	0.629-1.271	.5332
National health insurance (work)	-0.158	-0.223 to -0.092	<.0001	0.842	0.590-1.203	.3436
Medical benefits	Ref			1.000		
Unfulfilled necessary medical care						
Yes	0.061	0.003 to 0.120	.0390	2.238	1.299-3.855	.0038
No	0.103	0.056 to 0.151	<.0001	2.811	1.704-4.638	<.0001
Never required medical attention	Ref			1.000		
Subjective health condition						
Good	-0.274	-0.307 to -0.240	<.0001	0.495	0.401-0.611	<.0001
Normal	-0.176	-0.206 to -0.146	<.0001	0.609	0.515-0.721	<.0001
Bad	Ref			1.000		
Outpatient for 2 wk						
Yes	0.096	0.072-0.120	<.0001	1.372	1.195-1.575	<.0001
No	Ref			1.000		
Chronic disease status (hypertension, diabetes, and dyslipidemia)						
None				0.768	0.619-0.953	.0167
1				0.926	0.744-1.151	.4850
2 or 3				1.000		
Hospitalization for 1 yr						
Yes	0.050	0.017-0.084	.0029			
No	Ref					

CI = confidence interval, OR = odds ratio, Ref = reference.

hospital admissions being similar to those of chronic patients, even those who do not have serious chronic diseases. The low number of chronic diseases in private insurance subscribers is believed to be caused by the “underwriting” process. When attempting to get an indemnity medical insurance policy in Korea, policyholders are required to provide information on their health status to insurance companies under the obligation of notice.^[37] However, insurance companies have a strong incentive to reject patients with chronic disease who might require a lot of medical use during an “underwriting” process.^[37] There were few people with ≥2 chronic diseases who had PHI. This is

in line with previous studies that indicate that chronic diseases have harmed PHI.^[26,33,38,39] In addition, hypertension, hyperlipidemia, and diabetes mellitus included as chronic diseases in this study are the 3 major diseases with the highest medical use rate in Korea. Because most of them seek health improvement through outpatient treatment, not through inpatient treatment, there was no significant difference in the hospitalization rate.^[40]

The absence of significant differences in hospitalization for 1 year indicates that hospitalization is used when essential medical use is required, regardless of whether the patient has PHI. The PHI did not affect hospitalization rates as it

did outpatient care because the entry barrier is low and the patient's solvency and choice can affect continuous utilization and expenditure. Hospitalization and expenditure are influenced more by physician recommendations and disease severity than by patient decisions, and it is believed that the solvency is soon reflected in the subscription of PHI.^[14] According to a previous study, groups with sufficient PHI solvency can receive high-quality medical services, while groups with insufficient PHI solvency do not receive high-quality medical services and medical services themselves.^[33] As a result, there is a problem of hindering the equity and publicity of medical care, which is the goal pursued by the Ministry of Health and Welfare in Korea.^[41]

The results of a study that outpatient treatment of the PHI subscribers is longer than that of health insurance subscribers for >2 weeks are consistent with the current financial deterioration of the NHI Service, which is the biggest problem in Korea.^[33] Therefore, this study intends to provide basic data to prevent the deterioration of insurance finances due to excessive medical treatment due to PHI.

This study has some limitations. First, the study conducted a cross-sectional analysis using data from the first year (2016) and the second year (2017) of the KNHNS, so it is not possible to identify the causal relationship between PHI and medical care utilization, health conditions. Second, PHI subscription status, outpatient care for 2 weeks, hospitalization for 1 year, and chronic disease diagnosis may have regression bias from self-examination. Third, there may be differences in behavior depending on the type of PHI (fixed benefit, indemnity, and mixed types). This study did not separate by the type of PHI. Fourth, this study analyzed the number of chronic diseases by dividing them into a single chronic disease and a combination of chronic diseases. Although measuring the number of chronic diseases is easy to classify, this method does not correct severity because all diseases are assessed equally.^[42] An analysis based on the number of chronic diseases, the combination of different chronic diseases, and their severity is necessary. Fifth, since this study used data from the 2016 and 2017 KNHNS, it does not represent the results of the latest data from the KNHNS. Sixth, to analyze the relationship between PHI and medical use, we selected 3 chronic diseases with high medical expenses and medical use rates in Korea among various chronic diseases,^[31] so there is a limitation that various chronic diseases cannot be included.

5. Conclusion

There was a significant association between the availability of private insurance and the usage of medical services in this study. One key controversy surrounding PHI in Korea is its potential impact on health care utilization.^[33,41] If a purchaser of supplementary PHI utilizes more health care services (due to decreased copayments under NHI), then PHI fiscally spills over on NHI, and there is an inequity in health care utilization between those who purchase PHI and those who do not.^[14] Therefore, the government will have to redefine the role of PHI and NHI to enhance efficiency and equity in the health care sector and to relieve financial burdens.^[1] PHI should be reassessed to minimize the reckless use of medical services through private insurance subscriptions.

Author contributions

Jeong Min Yang designed this study, performed statistical analysis and completed the manuscript.
Su Bin Lee designed this study and drafted the manuscript.
Ye Ji Kim designed this study and drafted the manuscript.
Douk Young Chon contributed to the design of the study and manuscript.

Jong Youn Moon and Jae Hyun Kim conceived, designed and directed this study

All authors read and approved the final manuscript.

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