Observational Study

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, \( \chi^2 \) 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.\textsuperscript{[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.\textsuperscript{[2–3]} 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.\textsuperscript{[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.\textsuperscript{[4]} 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.\textsuperscript{[5]} In particular, countries with universal coverage perceive private insurance as a necessity.
as a complementary resource to assist public funding.\textsuperscript{[10–12]} The expansion of private insurance may provide various benefits to the public insurer and the general population.\textsuperscript{[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.\textsuperscript{[14]}

According to prior research, PHI subscriptions significantly increase the number of outpatient visits and hospitalizations.\textsuperscript{[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.\textsuperscript{[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.\textsuperscript{[18]}

France operates supplemental PHI similar to Korea’s and the NHI system.\textsuperscript{[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.\textsuperscript{[20]} In the United States, an empirical study on Medigap, a form of supplemental insurance for Medicare,\textsuperscript{[20–23]} found that subscribed patients use more medical services than nonsubscribed patients and spend more on medical care.\textsuperscript{[22]}

Reports indicate that Medigap increases Medicare’s medical spending.\textsuperscript{[23]}

An analysis of Medigap data shows that the better a person’s subjective health, the lower their use of medical care.\textsuperscript{[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.\textsuperscript{[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.\textsuperscript{[24]} However, a prior study suggests that the proportion of people with chronic disease with PHI is lower than that of people without PHI.\textsuperscript{[24]}

Research suggests that PHI positively impacts outpatient expenditure.\textsuperscript{[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 lipemia, 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 OO0 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 lipemia, or diabetes, which were one of the 3 major chronic diseases with high medical use rate in Korea.\textsuperscript{[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 %* Pvalue                        | n %* Pvalue          | n Means         | n %* Pvalue                   |
|                             |                |                                    |                      | Standard deviation |                                      |
|                             |                |                                    |                      | Pvalue           |                                      |
|                             |                |                                    |                      |                 |                                      |
| Private health insurance status |                |                                    |                      |                 |                                      |
| Yes                         | 8688 81.7      | 2613 31.1 P<.0001                  | 2545 27.8            | 8688 1.328      | 2595 1.742                   |
| No                          | 2595 18.3      | 508 21.2 34.7                     | 1019 34.7            | 2595 1.742      | 42.310 344                   |
| Gender                      |                |                                    |                      |                 |                                      |
| Male                        | 4904 49.5      | 1535 32.7 P<.0001                 | 1393 25.7            | 4904 1.409      | 2179 1.398                   |
| Female                      | 6379 50.5      | 1586 32.6                           | 2171 32.3            | 6379 1.389      | 36.025 486                   |
| Age                         |                |                                    |                      |                 |                                      |
| 19–29                       | 1217 16.5      | 465 38.8                           | 279 23.0             | 1217 1.029      | 2174 1.554                   |
| 30–39                       | 1879 18.6      | 606 31.7                           | 462 24.4             | 1879 1.062      | 2174 1.554                   |
| 40–49                       | 2128 21.0      | 658 30.2                           | 495 22.5             | 2128 1.230      | 2174 1.554                   |
| 50–59                       | 2174 20.4      | 567 26.6                           | 684 30.9             | 2174 1.554      | 2174 1.554                   |
| 60–69                       | 1976 12.9      | 451 24.3                           | 749 37.1             | 1976 1.879      | 2109 2.057                   |
| 70                          | 1909 10.6      | 374 21.9                           | 895 46.4             | 1909 2.057      | 2109 2.057                   |
| Marital status              |                |                                    |                      |                 |                                      |
| Yes                         | 9550 78.1      | 2517 27.5 P<.0001                 | 2517 27.5            | 9550 1.492      | 2517 1.088                   |
| No                          | 1733 21.9      | 604 35.7                           | 402 22.8             | 1733 1.088      | 604 22.8                     |
| Alcohol history             |                |                                    |                      |                 |                                      |
| No                          | 1314 9.3       | 282 25.3                           | 519 37.1             | 1314 1.314      | 282 25.3                     |
| Yes                         | 9969 90.7      | 2839 29.7                           | 3045 28.8            | 9969 1.399      | 2839 29.7                     |
| Smoking history             |                |                                    |                      |                 |                                      |
| <5 packs                    | 228 2.4        | 90 41.6                            | 61 26.0              | 228 1.194      | 90 41.6                      |
| >5 packs                    | 4223 40.7      | 1116 27.6                           | 1272 27.8            | 4223 1.425      | 1116 27.6                     |
| Never smoked                | 6832 56.9      | 1915 30.0                           | 2231 30.1            | 6832 1.383      | 1915 30.0                     |
| Income (individual)         |                |                                    |                      |                 |                                      |
| Low                         | 2737 24.6      | 591 24.2                           | 873 29.3             | 2737 1.430      | 591 24.2                      |
| Low-intermediate            | 2817 24.6      | 727 27.4                           | 915 29.4             | 2817 1.384      | 727 27.4                      |
| High-intermediate           | 2827 25.1      | 823 30.3                           | 838 27.2             | 2827 1.397      | 823 30.3                      |
| High                        | 2902 25.7      | 980 35.1                           | 938 30.4             | 2902 1.403      | 980 35.1                      |
| Occupation                  |                |                                    |                      |                 |                                      |
| White collar                | 4190 41.4      | 1403 33.5                           | 1083 25.3            | 4190 1.252      | 1403 33.5                     |
| Blue collar                 | 2631 23.2      | 666 27.0                           | 820 27.8             | 2631 1.484      | 666 27.0                      |
| Unemployed                  | 4462 35.4      | 1052 25.9                           | 1661 34.3            | 4462 1.527      | 1052 25.9                     |
| Health insurance type       |                |                                    |                      |                 |                                      |
| National health insurance   | 3299 28.8      | 871 29.2                           | 1025 29.1            | 3299 1.470      | 871 29.2                      |
| (regional)                  |                |                                    |                      |                 |                                      |
| National health insurance   | 7568 68.2      | 2202 30.0                           | 2325 28.3            | 7568 1.357      | 2202 30.0                     |
| (work)                      |                |                                    |                      |                 |                                      |
| Medical benefits            | 416 3.0        | 48 14.0                            | 214 47.6             | 416 1.828      | 48 14.0                       |
| Unfulfilled necessary       |                |                                    |                      |                 |                                      |
| medical care                |                |                                    |                      |                 |                                      |
| Yes                         | 1053 9.2       | 139 13.6                           | 365 32.2             | 1053 1.436      | 139 13.6                      |
| No                          | 9727 85.4      | 2795 30.2                           | 3141 29.9            | 9727 1.415      | 2795 30.2                     |
| Never required medical      | 503 5.5        | 167 42.2                           | 58 11.1              | 503 1.172      | 167 42.2                      |
| attention                   |                |                                    |                      |                 |                                      |
| Subjective health condition |                |                                    |                      |                 |                                      |
| Good                        | 3121 29.3      | 763 22.8                           | 3121 23.8            | 3121 1.238      | 763 22.8                      |
| Normal                      | 5916 52.8      | 1772 27.8                           | 5916 1.389           | 5916 1.389      | 1772 27.8                      |
| Bad                         | 2246 17.9      | 1029 43.1                           | 2246 1.717           | 2246 1.717      | 1029 43.1                      |
| Outpatient for 2 wk         |                |                                    |                      |                 |                                      |
| Yes                         | 3564 29.1      | 763 23.0                           | 3564 1.581           | 3564 1.581      | 763 23.0                      |
| No                          | 7719 70.9      | 2358 31.9                           | 7719 1.331           | 7719 1.331      | 2358 31.9                      |
| Chronic disease status      |                |                                    |                      |                 |                                      |
| (hypertension, diabetes, and dyslipidemia) |            |                                    |                      |                 |                                      |

(Continued)
As shown in Table 1, PHI subscribers were 1.298× (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 1.240× (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 1.198× (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 KNHINES (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 1

(Continued)

| Variable               | Total | Subjective health condition (good) | OPD utilization (yes) | Chronic disease | Hospitalization (yes) |
|------------------------|-------|-----------------------------------|-----------------------|-----------------|-----------------------|
|                        | N     | %*                               | 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 y*                   |       |                                  |                       |                |                       |      |           |                |         |       |          |              |
| 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                  | 29.3           | 3564                  | 29.076 | 11,283  | 1.4     | 33.533 | 1368  | 11.804     |              |

OPD = outpatient department.

*Weighted percentage.
outpatient medical expenses, and overall medical expenses. 

While a US study that analyzed medical use based on Medcap subscriptions found that higher subjective health results in less medical use, 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. 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. 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.

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 2 | Association between private health insurance and subjective health condition. |
|---------|--------------------------------------------------------------------------------|
| Subjective health condition (good) | OR  | 95% CI | P value |
| Private health insurance status | Yes | 1.298 | 1.141–1.476 | <.0001 |
| | No | 1.000 | 1.000 |
| Gender | Male | 1.702 | 1.518–1.909 | <.0001 |
| | Female | 1.000 | 1.000 |
| Age | 19–29 | 1.631 | 1.273–2.089 | .0001 |
| | 30–39 | 1.150 | 0.943–1.401 | .1671 |
| | 40–49 | 1.123 | 0.937–1.346 | .2100 |
| | 50–59 | 1.098 | 0.922–1.307 | .2943 |
| | 60–69 | 1.098 | 0.932–1.294 | .2619 |
| | 70 | 1.000 | 1.000 |
| Marital status | Yes | 1.275 | 1.083–1.500 | .0036 |
| | No | 1.000 | 1.000 |
| Alcohol history | No | 1.035 | 0.885–1.211 | .6625 |
| | Yes | 1.000 | 1.000 |
| Smoking history | <5 packs of cigarettes | 1.133 | 0.838–1.532 | .4169 |
| | >5 packs of cigarettes | 0.631 | 0.557–0.714 | <.0001 |
| | Never smoked | 1.000 | 1.000 |
| Income (individual) | Low | 0.621 | 0.544–0.709 | .0001 |
| | Low-intermediate | 0.723 | 0.638–0.820 | <.0001 |
| | High-intermediate | 0.748 | 0.659–0.849 | <.0001 |
| | High | 1.000 | 1.000 |
| Occupation | White collar | 1.248 | 1.116–1.396 | <.0001 |
| | Blue collar | 1.157 | 1.016–1.317 | .0283 |
| | Unemployed (housewife, student, etc) | 1.000 | 1.000 |
| Health insurance type | National health insurance (regional) | 1.893 | 1.453–2.466 | <.0001 |
| | National health insurance (work) | 1.758 | 1.352–2.287 | <.0001 |
| | Medical benefits | 1.000 | 1.000 |
| Unfulfilled necessary medical care | Yes | 0.268 | 0.212–0.339 | <.0001 |
| | No | 0.723 | 0.592–0.883 | <.0001 |
| Subjective health condition | Good | 0.534 | 0.456–0.626 | <.0001 |
| | Normal | 0.631 | 0.559–0.711 | <.0001 |
| | Bad | 1.000 | 1.000 |
| Outpatient for 2 wk | Yes | 0.682 | 0.616–0.755 | <.0001 |
| | No | 1.000 | 1.000 |
| Chronic disease status (hypertension, diabetes, and dyslipidemia) | None | 2.611 | 2.257–3.019 | <.0001 |
| | 1 | 1.541 | 1.323–1.794 | <.0001 |
| | 2 or 3 | 1.000 | 1.000 |
| Hospitalization for 1 yr | Yes | 0.633 | 0.552–0.726 | <.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.
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

### Table 3

| Chronic disease status | Hospitalization for 1 yr (yes) |
|------------------------|-------------------------------|
| Estimate 95% CI | OR 95% CI | Estimate 95% CI | OR 95% CI |
| 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 |
| 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 | .5725 |
| | High | Ref | 1.000 | | | | |
| Occupation | White collar | −0.007 | −0.035 to 0.020 | .5910 | 0.639 | 0.525–0.762 | <.0001 |
| | Blue collar | −0.015 | −0.046 to 0.015 | .3301 | 0.819 | 0.689–0.987 | .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 | | | | | | |
| | 1 | | | | | | |
| | 2 or 3 | | | | | | |
| | Hospitalization for 1 yr | Yes | 0.050 | 0.017–0.084 | .0029 | | | |
| | No | Ref | 1.000 | | | | |

CI = confidence interval, OR = odds ratio, Ref = reference.
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 hiding 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 KNHNES, 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.\[16\] 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 KNHNES, it does not represent the results of the latest data from the KNHNES. 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.\[10\] 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 Li Kim designed this study and drafted the manuscript.
Douk Young Chon contributed to the design of the study and manuscript.

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