How public and private health insurance coverage mitigates catastrophic health expenditures in South Korea

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How public and private health insurance coverage mitigates catastrophic health expenditures in South Korea

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Abstract

Background: Korea has instituted a private health insurance (PHI) scheme that covers the remaining expenses uncovered by the National Health Insurance (NHI). No study has yet estimated the extent to which PHI coverage lowers the economic burden of household access to health care. The current study intends to evaluate the design of Korea's PHI system in terms of coverage using a catastrophic health expenditure (CHE) indicator and compare it with NHI.

Methods: This study determined the difference between the number of households subscribed to PHI and the number of households that paid benefits. Also, it compared the effects of reduced CHE through NHI benefits with those of PHI. Furthermore, it compared PHI benefit rates by income class. Finally, it analyzed the benefit contribution of NHI and PHI to CHE reduction through a two-part model with hierarchical regression.

Results: Results indicated that of the 5,644 households studied, 3,769 subscribed to PHI, but only 246 households received benefits. The NHI reduced CHE incidence by 15.17%, whereas PHI only reduced CHE by 1.22%. The NHI scheme indicated reduced inequality as it provided more benefits to the low-income class, whereas the PHI paid more to the high-income class. The NHI coverage has protected households from CHE and improved equality to some extent; however, PHI coverage has had little effect on relieving CHE and has deteriorated equality.

Conclusions: Korean private insurance companies, which are mostly subsidiaries of for-profit conglomerates, only pay for pre-contracted diseases, therefore, most patients do not receive benefits. Thus, Korea's private insurance system needs to improve to provide benefits to patients more generously and alleviate the financial burden of medical use.

Key words: Private health insurance; National health insurance, Insurance coverage, Korea, Catastrophic health expenditure

1. Background

Since the early 2000s, it has become a major trend that the health care systems of developed nations move to a mixed version of public and private insurance systems [1,2,3]. This is because compulsory social insurance for essential packages of health care services alone cannot satisfy all medical needs and it is not easy for households to bear the burden of high medical costs for remaining non-essential health care services. Therefore, many countries with public health care systems have introduced supplementary private insurance, topping up any remaining services with co-payments [4].

Korea has introduced a national health insurance (NHI) scheme that includes compulsory coverage of 97% of the population, except for medical aid recipients [5]. However, the benefit coverage of NHI is rather low, meaning the proportion of out-of-pocket (OOP) payments, including copayments for insured services and full payments for uncovered services, is around 32.2% of current health expenditures. This metric is relatively higher than in Japan (13%), Germany (12.6%), the UK (15.9%), and France (10.2%) [6]. If OOP payments increase too high, it can lead to catastrophic consequences for households and the economy [7]. The World Health Organization (WHO) [8] defines that if the ratio of OOP expenses to a household's ability to pay exceeds a specific threshold it is considered "catastrophic health expenditures (CHE)" and this has been adopted as a measure of fairness in financial contribution indicators [8,9]. In this regard, many studies on CHE have been conducted in Korea for more than a decade, and almost all studies have criticized the financial functioning of the Korean NHI, which protects households from high OOP [10-12].

Therefore, many Koreans have additionally purchased private health insurance (PHI) products, a supplementary scheme covering uninsured services not covered by public insurance.

Although there is some variation depending on research data, it has been reported that about 65~80% of households have PHI [10,13,14]. PHI premiums averaged $184.9 per household with PHI per month, which is 2.1 times higher than NHI premiums ($89.9 per month) [14]. Logically, it would be reasonable for households insured with PHI to receive more benefits than NHI, or to at least be able to significantly reduce OOP expenses with benefits from PHI.

Previous studies have argued that poorly designed PHI systems increase issues, such as inequality, insuring only young and healthy people, and causing cost escalation [4,15]. Such studies have also suggested that well-designed PHI systems can help households avoid the financial shock of large OOP expenditures when accessing health care. However, studies analyzing the extent to which PHI relieves households' economic burden are rare. Previous studies related to PHI have mainly focused on the effects of PHI subscriptions and the increase in health care use, including adverse selections and moral hazard issues [10,16-18] as well as care-seeking behavior [19,20]. Most studies have shown that private insurance increases health care use [21-23]. However, these studies have limitations because they analyzed the effects of PHI subscriptions on medical usage without any consideration of benefit rates. Additionally, unlike NHI, PHI does not pay benefits for diseases that are not covered by the contract. Only a small percentage of the insured eventually receive benefits. To establish the hypothesis that PHI increases medical service or health care use, it must first be established that PHI benefits significantly reduce the financial burden on consumers. However, in the current research, there has been no indication of the level of PHI coverage in Korea.

Furthermore, previous studies analyzed only the incidence of CHE when estimating the economic burden of households due to medical expenses. However, this method had limitations; first, it was calculated only by using OOP relative to household income, so the level of health

insurance coverage could not be found. Second, as the unit of CHE incidence is the number of households, it was difficult to measure the economic burden and insurance coverage level adequately. Recently, Jung and Lee [24] developed methods by recalculating the incidence and intensity of CHE to estimate the effectiveness of insurance in covering CHE.

Therefore, this study applied the methods of Jung and Lee [24] and intended to evaluate the design of Korea's PHI system in terms of coverage by estimating the PHI benefit rates and how greatly the benefits mitigate CHE. Through this, we will compare the effects of Korea's NHI and PHI in reducing CHE and suggest directions for enhancing the coverage and role of PHI.

2. Methods

2.1. Study design

First, we investigated whether there was a difference between the number of households subscribed to PHI and the number of households that paid benefits. We expected paid households to be a small sample. Next, we compared the effects of reduced CHE through NHI benefits with those of PHI. Third, we compared PHI benefit rates by income class. It may be that the higher the income class, the higher the likelihood of the benefit rate. Next, this study aimed to analyze the benefit contributions of NHI and PHI to CHE reduction through a two-part model with hierarchical regression. The expected result was that the contribution of NHI to the mitigation effect of CHE may be substantial and would offset the sociodemographic differences. In contrast, the contribution of PHI would be insignificant.

2.2. Measuring CHE and the effectiveness of insurance coverage

Traditionally, CHE is calculated as the ratio of OOP expenses to income level in household

units [7,25]. If the ratio of OOP expenses/income is greater than or equal to a threshold Z, it is called "catastrophic." This can be expressed as:

$$E_i = 1, \text{If } \frac{\text{OOP}}{\text{`Income}} \geq \text{Z};\ E_i = 0, \text{If } \frac{\text{OOP}}{\text{Income}} < \text{Z}) \ (1).$$

Wagstaff and van Doorslaer [7] suggested three approaches: incidence, positive gap, and mean positive gap. First, the incidence of CHE (H_{cat}) is the proportion of CHE-occurring households to the total number of households (N). This is calculated as:

$$H_{cat} = \frac{1}{N}\sum_{i=1}^{N} E1_i \ (2).$$

Second, the positive gap of CHE (G_{cat}) indicates the height of the shares of OOP expenses of income based on the total population. The height of OOP expenses shares ($O1_i$) is calculated as $\frac{\text{OOP}}{\text{Income}} - \text{Z}$. The G_{cat} is:

$$\frac{1}{N}\sum_{i=1}^{N} O1_i \ (3).$$

However, the positive gap approach is a limited approach for estimating the economic burden of households with CHE as it is based on the total population, including households with no health care use. Therefore, Wagstaff and van Doorslear [7] suggested another approach, called the mean positive gap (MG_{cat}). This is calculated as

$$\sum_{i=1}^{N} O1_i \,/\, \sum_{i=1}^{N} E1_i. \ (4)$$

Recently, Jung and Lee [24] developed methods to estimate the effectiveness of insurance in covering CHE. This method uses the difference between the total health care payments (THP; OOP expenses + NHI benefit payments) and OOP expenses to estimate the extent to which health insurance benefit payments reduce CHE.

First, it calculates the same way as in equations 1–4, except substituting OOP with THP.

$$E2_i = 1, \text{If } \frac{\text{TMP}}{\text{`Income}} \geq \text{Z};\ E2_i = 0, \text{If } \frac{\text{TMP}}{\text{Income}} < \text{Z}) \ (5)$$

$$K_{cat} = \frac{1}{N}\sum_{i=1}^{N} E2_i, \quad (6)$$

$$J_{cat} = \frac{1}{N}\sum_{i=1}^{N} O2_i \ \left(O2_i = \frac{THP}{\text{Income}} - \text{Z}\right), \quad (7)$$

$$MJ_{cat} = \sum_{i=1}^{N} O2_i \,/\, \sum_{i=1}^{N} E2_i. \quad (8)$$

Subsequently, the effectiveness of NHI coverage in reducing the incidence of CHE (SH_{cat}) was calculated by $K_{cat} - H_{cat}$, and the positive gap of CHE (TS_{cat}) was calculated by $J_{cat} - G_{cat}$. The mean positive gap of TS_{cat}, MTS_{cat} is $(\sum_{i=1}^{N} O2_i - \sum_{i=1}^{N} O1_i)/\sum_{i=1}^{N} E2_i$ (for a more detailed explanation, refer to Jung and Lee [24]).

To estimate the effectiveness of PHI coverage in reducing CHE, we used private healthcare payments (PHP; OOP expenses + PHI benefit payments). PHI benefit payments are a part of OOP expenses reimbursed by PHI. The definition of PHI benefit payments we used is the indemnity PHI products only because WHO [26] does not count flat-rate insurance as a component of the health care system.

$$E3_i = 1, \text{If } \frac{\text{PHP}}{\text{`Income}} \geq \text{Z};\ E3_i = 0, \text{If } \frac{\text{PHP}}{\text{Income}} < \text{Z} \quad (9)$$

$$P_{cat} = \frac{1}{N}\sum_{i=1}^{N} E3_i, \quad (10)$$

$$Sil_{cat} = \frac{1}{N}\sum_{i=1}^{N} O3_i \ \left(O3_i = \frac{THP}{\text{Income}} - \text{Z}\right), \quad (11)$$

$$MSil_{cat} = \sum_{i=1}^{N} O3_i \,/\, \sum_{i=1}^{N} E3_i. \quad (12)$$

Likewise, the effectiveness of PHI coverage in reducing the incidence of CHE (SP_{cat}) was calculated using $P_{cat} - H_{cat}$, and the positive gap of CHE (TP_{cat}) was calculated using $Sil_{cat} - G_{cat}$. The mean positive gap of TS_{cat}, MTP_{cat} was computed as $(\sum_{i=1}^{N} O3_i - \sum_{i=1}^{N} O1_i)/\sum_{i=1}^{N} E3_i$.

2.3. Data source and study population

The present research used 2017 data from the Korea Health Panel Study (KHPS), conducted by the National Health Insurance Services and the Korea Institute for Health and Social Affairs. The KHPS is a representative, publicly open data source to analyze health care use and expenditures. First, KHPS employs two-stage stratified random cluster sampling based on the Population and Housing Census, which covers the entire Korean population. Second, the data include various variables, such as individuals' socio-economic characteristics, health behavior, and other related aspects of health care use, including NHI benefits, statutory payments, PHI benefits, hospital visits, length of stay, payment for uncovered services, and disease code. In addition, the KHPS uses health insurance data and receipt checks at the National Health Insurance Services to prevent loss of information and recall bias errors. The number of household samples from the 2017 KHPS data was 6,392. We excluded 748 households that were surveyed for OOP expenses but not for THPs. These cases may include health care use outside of the formal institutional health system, such as an alternative therapy. This study was approved by the Institutional Review Board of Yonsei University (approval number: 1041849-202108-SB-127-01).

2.4. Statistical analysis

In descriptive statistics, the characteristics of all study subjects were shown using frequency and mean tests. All study subjects were NHI subscribers because NHI subscription is compulsory for all citizens in Korea. To understand the PHI subscription and benefit rates, we separately presented households with PHI and households receiving benefits from PHI, checking whether the benefit rates differed according to the characteristics of the subjects through a chi-square test. We graphed the level at which health insurance benefits reduced CHE and the level at which PHI reduced CHE.

When the dependent variable does not show a normal distribution and the lower bound, usually 0, occupies a larger portion of the sample, the two-part model is an alternative method that overcomes the limitations of non-normality by dividing a single regression equation into two parts and analyzing it [27]. The first part is a logit or probit model that analyzes the effects of factors, such as the use of health care services. The second part is an ordinary least squares regression model, which estimates the effects of factors on the amount of health care use in those who entered the health care system. The two-part model assumes that the determinants of health care use decisions and the amount of health care services are different. This model assumes that health care use decisions are mainly determined by predisposition factors, such as gender, marital status, and health status, and the amount is determined by economic factors, such as health insurance type or income level.

We employed a two-part model to determine the factors of the incidence and positive gap of CHE (Model 1). Furthermore, to estimate and compare the effectiveness of NHI and PHI coverage, we applied hierarchical regression analysis to the two-part model. Model 2 adds NHI coverage ($O2_i - O1_i$) to CHE in Model 1. Model 3 adds PHI coverage ($O3_i - O1_i$) to the CHE in Model 2.

Model 1

Part 1: $\log\left(\frac{P}{1-P}\right)_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \epsilon_i$

Part 2: $\log(Y|y > 0)_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \epsilon_i$

P: $E2_i$ (threshold: 10%), Y: $O2_i$ (threshold: 10%), X_{1i}: predisposing factors (gender, age, educational level, marital status, job type of household head) X_{2i}: needs factors (with or without disabled, number of chronic diseases, and the experience of health care use of four

major diseases (cancers, cerebrovascular diseases, cardiac diseases, rare diseases), X_{3i}: enabling factors (income adjusted by household equalization index ($number\ of\ adults + 0.5 \times number\ of\ children$)$^{0.56}$ [8], with or without PHI, type of NHI), ϵ_i: error term.

We used the incidence of CHE based on THP and $E2_i$ as the dependent variable for the logistic regression in the two-part model and used the positive gap of CHE based on THP, $O2_i$ for the linear regression in the two-part model. In the case of $O2_i$, we applied a logarithmic transformation. The four major diseases that the NHI of Korea has increased the coverage rate as a special plan due to high mortality and medical expenses. In Model 2, we added NHI coverage on CHE ($O2_i - O1_i$) to Model 1, and in Model 3, added PHI coverage on CHE ($O3_i - O1_i$) to Model 2. We used the statistical software program Stata/SE version 14.0 (Stata Corp., Texas, USA) for all analyses.

3. Results

3.1 General characteristics of the samples

As a result of examining general characteristics, 3,769 out of 5,644 households had PHI, and 246 households had received PHI benefits. We computed the Pearson chi^2 tests and a t-test between paid benefits and other characteristics in households with PHI (Table 1).

3.2 NHI benefits, OOP payments, and PHI benefits by income quintile

According to income class, there were differences in NHI and PHI benefits and the tendency was also different. First, in terms of NHI benefits, the average benefit of the poor and the near-poor was the highest, and the average benefit decreased as the income group increased. Second, there were few beneficiary households in the lower class in terms of PHI benefits, and

the number of beneficiary households increased as the income class increased. In addition, the higher the income group, the higher the average benefit. Lastly, as for OOP expenses, the average payment among the poor was slightly lower than that of other groups, however, the other groups showed similar results (Table 2).

3.3 The level of protecting households with coverage of NHI and PHI from CHE

In the OOP-based CHE results that were calculated according to the traditional CHE calculation method, when the threshold was 10%, H_{cat} and G_{cat} were the highest at 19.26% and 2.76%, respectively, as the threshold increased to 20% and 40%, respectively. In contrast, MG_{cat} increased as the threshold increased. The results of the THP-based CHE suggested by Jung and Lee [24] and the PHP-based CHE added in this study were higher than the OOP-based CHE, but there was a difference in the level. The results of NHI and PHI coverage on CHE are presented in the right tab. First, NHI reduced the incidence of CHE (SH_{cat}) by 15.17% at a threshold of 10% and reduced the proportion of health care expenses to income of households with CHE (MTS_{cat}) by 33.46% (23.46% + threshold 10%). In contrast, PHI reduced the incidence of CHE ($S\mathrm{P}_{cat}$) by 1.22% at a threshold of 10% and reduced the proportion of health care expenses to income of households with CHE ($MT\mathrm{P}_{cat}$) by 11.39% (1.39 + threshold 10%) (Table 3).

Figure 1 is a composite graph that visually shows the extent to which each NHI and PHI reduces CHE for each household. A smooth curve lying under the bars represents the ratio of OOP expenses to income level in households in the order of highest to lowest. The heights of the blue and red bars represent the drop rates of CHE, which are covered by NHI and PHI, respectively. The reason bars fluctuate is that they are all based on the ratio of OOP expenses to income. This means that someone may receive fewer NHI benefits, even if they pay higher

OOP expenses. As can be observed, compared to NHI coverage, PHI coverage was relatively infrequent and low in height. In addition, NHI coverage increased as the ratio of OOP expenses to income increased, whereas PHI coverage was irregular (Figure 1).

3.4 Coverage effects of NHI and private insurance on CHE

Model 1 is a typical factor analysis model for CHE (Table 4). Only the dependent variable CHE is based on THP and not the OOP expenses because this analysis aimed to compare the magnitude impact of coverage of NHI and PHI. The results of the incidence of CHE, logistic regression revealed that educational level, marital status, the household heads' job type, household income level, type of NHI, whether four major diseases were present, and the number of chronic diseases affected CHE.

Model 2 is a model that added NHI coverage ($O2_i - O1_i$), which is the drop rate of CHE and the NHI coverage (Table 4). NHI coverage had an effect of 16.743 odds ratio in the logistic regression and a coefficient of 0.936 in the linear regression. After computed NHI coverage ($O2_i - O1_i$), many social variables became insignificant except for household income level, type of NHI, the presence of four major diseases, and the number of chronic diseases. Moreover, there were significant changes among the variables. Compared to Model 1, the difference between income groups (odds, coefficient) was significantly reduced, and the positive gap for Medical Aid recipients was changed to a statistically significant decrease (coefficient: -0.188, $p < 0.001$). In addition, the effect of the four major diseases on the positive gap of CHE becomes insignificant.

Discussion

This study evaluated the coverage of PHI for Korean consumer households by applying a modified CHE calculation method and compared it with the nation's NHI coverage. A total of 3,769 households, out of 5,644 subscribers of PHI, were analyzed and only 246 households received benefits. The NHI revealed the effects of reduced health care inequality when more benefits are provided to lower-income households, whereas the PHI paid more for higher-income households. This can be interpreted as an indication of the income-regressive aspect of PHI. In particular, the contribution of PHI to CHE reduction was too low compared to that of NHI in terms of incidence and positive gap indicators. The number and height of the bar graph in Figure 1 show that the number of beneficiaries and the benefits of PHI, which represents the effects of reduced CHE, was quite small compared to that of NHI.

The findings from the two-part model with hierarchical analyses in Table 4 are as follows. Model 2 is a model in which NHI coverage ($O2_i - O1_i$) is added to Model 1. NHI coverage had the most influence among all variables in incidence and the positive gap of CHE. When the NHI coverage ($O2_i - O1_i$) was added to Model 2, it offset the effects of other variables, which were significant in Model 1. Educational level, marital status, and job type were significant among the incidence of CHE in Model 1 but not in Model 2. This indicates that NHI effectively reduces the differences in health care expenses according to socioeconomic status. This interpretation can be validated by acknowledging how Korea operates a fee-for-service system, which pays the amount of health insurance benefits as much as the amount of health care use. In Model 2, the odds ratio and coefficient values of income decreased overall compared to those in Model 1 (Table 4). This can be interpreted as the maximum out-of-pocket expenses policy, which differentiates the burden of health care expenses according to income level, which has an effect to some extent. However, the maximum out-of-pocket expenses

policy in Korea is applied only to the health care services covered by the NHI, excluding uncovered services, so it seems that the difference in influence by income level may not be completely offset.

Additionally, in the positive gap analysis, Medical Aid was not significant in Model 1 but decreased significantly in Model 2, and the presence of four major diseases was significantly higher in Model 1 but not significant in Model 2 (Table 4). Medical aid recipients in Korea pay only one or two dollars OOP, so their health care expenses are very low compared to those covered by NHI. Therefore, the results of the positive gap, which appeared significantly negative (-), reflect reality more accurately. Second, Korea is implementing a policy (expansion coverage plan for four major diseases) to lower the ratio of statutory OOP expenses to the total health care expenses to 5% for four specific diseases (cancers, cerebrovascular diseases, cardiac diseases, rare diseases) that have high mortality and a high probability of causing high health care expenses [28-30]. Most Korean studies have concluded that the expansion coverage policy for these four major diseases is ineffective when analyzing CHE. However, we consider these results to be biased because the incidence rates do not change significantly. Studies analyzing the policy effects on the four major diseases using OOP expenses or NHI benefits as a dependent variable tended to report that there was a policy effect [28,31] however, studies that used CHE incidence as a dependent variable tended to report no effect at all [32,33]. In this regard, Jung and Lee [24] confirmed that the positive gap (intensity) can be viewed more accurately than the incidence approach when looking at policy effects. Overall, the fact that four major diseases did not appear significantly in Model 2 can be understood as lowering the medical cost burdens by NHI.

The changes between Model 1 to Model 2 were dramatic, but this was not so in Model 3, which added PHI coverage ($O3_i - O1_i$). Although, there are four significant results. First, all

the regression coefficients for income in Model 3 were larger than those in Model 2, which means increasing inequality. In addition, the odds ratio of the four major diseases decreased from Model 2 to Model 3. This decrease can be interpreted that the PHI coverage effect for these diseases exists because they are the main products of PHI. In addition, the odds ratio of the number of chronic diseases was higher in Model 3 than in Model 2. This can be interpreted as a result of PHI not accepting a high-risk group that may have many chronic diseases. Finally, the most important result was that PHI did not significantly contribute to the reduction of CHE. The reason for the low coverage of PHI seems to be that insurance products tend to pay benefits that are limited to specific diseases and treatments (including magnetic resonance imaging, ultrasound, and nursing care costs) that have been contracted in advance, which is the positive list approach.

According to the results of this study, most households were subscribed to PHI and paid almost twice the PHI premiums than that of NHI; however, the level of PHI coverage was rather low. Given that PHI in Korea is a part of the wider health insurance system, it cannot avoid the responsibility of protecting households. Therefore, it is necessary to enhance PHI coverage and indemnity insurance. However, the funding pool of PHI in Korea is insufficient because almost all entities are established based on for-profit conglomerates and are operated separately as subsidiaries, unlike other countries, such as Germany and France. Given that for-profit companies evaluate their annual returns, they tend to not pay insurance benefits. Several factors of these tendencies are that PHI in Korea is managed by the Ministry of Economy and Finance rather than the Ministry of Health and Welfare. Therefore, this study proposes the introduction of non-profit private health insurance, such as is observed in France. For example, in France, over 90% of citizens are covered by complementary health insurance, from either a “mutuelle” (mutual benefit organization) or PHI, covering health care services, such as dental

services, glasses, and contact lenses [34]. France's complementary and voluntary scheme has historically been dominated by non-profit entities [35]. The market share of for-profit insurance companies has recently increased to 47%, and non-profit firms have started to pursue a profit in France [35]. Therefore, a new approach for PHI is necessary to re-establish the protective role by expanding the benefits and solving funding problems simultaneously.

However, whether to have PHI is up to personal choice, so it may not be appropriate to inquire about inequality or benefit levels. However, to help make rational decisions, it is also necessary to determine the level of coverage of PHI. To date, the level of practical PHI coverage has been filled with knowledge gaps, and this study provides basic data that aimed to fill that gap for the first time. Most studies claim that PHI increases health care use when only considering enrollment status [10,21-23,36], therefore, the paid benefit level has not been included in the analysis. As a result of estimating the level of PHI coverage in this study, the coverage was insignificant and the use of health care services were not problematic. In addition, it is difficult to assume if this would affect the NHI fund.

This study presents several limitations. First, although PHI is based on individual subscriptions, the CHE is calculated at the household level, therefore, the PHI effect was also calculated at the household level. Second, the level of coverage of PHI was somewhat underestimated due to fixed-rate insurance, savings insurance, and other types of products, which were not included in the WHO's standards for medical insurance, was excluded. Third, this study did not conduct a longitudinal analysis. The reason for this was that the PHI enrollment rate did not change, and the analysis mainly focused on the comparisons of NHI and PHI coverage.

Conclusion

Private insurance companies in Korea are mostly subsidiaries of for-profit conglomerates who tend not to pay insurance benefits. They use a positive list system covering only a few specific diseases that make it difficult for the insured to receive benefits. The results of this study show that PHI just barely protects households from CHE. Private insurance has limited medical benefits due to concerns about saving functions or subsidies in the event of death. For private insurance to play the role of medical coverage subsidizing NHI, it is necessary to improve the benefit coverage of indemnity insurance by introducing non-profit private health insurance and the negative list approach. Whatever method is used, the Korean private insurance system needs to improve its benefit rates to reduce the burden of medical expenses on the insured.

List of abbreviations

National Health Insurance (NHI)

Out-of-Pocket (OOP)

World Health Organization (WHO)

Catastrophic Health Expenditures (CHE)

Private Health Insurance (PHI)

Private Healthcare Payments (PHP)

Korea Health Panel Study (KHPS)

Declarations

Ethical approval and consent to participate: Approval of IRB exemption for this study was granted by the Yonsei University Institutional Review Board (approval number: 1041849-202108-SB-127-01) given the retrospective nature of the study. We used publicly available and reliable data from Korea Health Panel Study which were provided through the de-identified samples.

Consent for publication: There is consent for publication

Available of data and materials: The data that support the findings of this study are available from Korea Health Panel Survey (https://www.khp.re.kr:444/eng/main.do) but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available for the authors upon reasonable request and with permission of the National Health Insurance Services and the Korea Institute for Health and Social Affairs.

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References

[1] Besley, T.; Gouveia, M., Alternative systems of health care provision. *Economic policy* 1994, *9* (19), 199-258.

[2] Petretto, A., Optimal social health insurance with supplementary private insurance. *Journal of Health Economics* 1999, *18* (6), 727-745.

[3] Zweifel, P.; Breyer, F., The indiviudal as the producer of his health. *Health economics New York: Oxford University Press* 1997, 52-89.

[4] Sekhri, N.; Savedoff, W., Private health insurance: implications for developing countries. *Bulletin of the World Health Organization* 2005, *83*, 127-134.

[5] Kim, E.; Kwon, S., The effect of catastrophic health expenditure on exit from poverty among the poor in South Korea. *The International Journal of Health Planning and Management* 2021, *36* (2), 482-497.

[6] OECD, *Health expenditure and financing https://stats.oecd.org/index.aspx?ThemeTreeId=9*

[7] Wagstaff, A.; Doorslaer, E. v., Catastrophe and impoverishment in paying for health care: with applications to Vietnam 1993–1998. *Health economics* 2003, *12* (11), 921-933.

[8] World Health Organization, *The world health report 2000: health systems: improving performance*. World Health Organization: 2000.

[9] Kawabata, K.; Xu, K.; Carrin, G., Preventing impoverishment through protection against catastrophic health expenditure. SciELO Public Health: 2002.

[10] Jeon, B.; Kwon, S., Effect of private health insurance on health care utilization in a universal public insurance system: a case of South Korea. *Health policy* 2013, *113* (1-2), 69-76.

[11] Choi, J.-W.; Choi, J.-W.; Kim, J.-H.; Yoo, K.-B.; Park, E.-C., Association between chronic disease and catastrophic health expenditure in Korea. *BMC health services research* 2015, *15* (1), 1-8.

[12] Sohn, M.; Jung, M., Effects of public and private health insurance on medical service utilization in the National Health Insurance System: National panel study in the Republic of Korea. *BMC health services research* 2016, *16* (1), 1-11.

[13] You, C.-H.; Kang, S.-W.; Choi, J.-H.; Kwon, Y.-D., Effect of Private Health Insurance on Medical Care Utilization: Six Year Unbalanced Panel Data Model. *The Korean Journal of Health Service Management* 2017, *11* (3), 51-64.

[14] Moon, S.-w., Kang, T. E., Oh, H., Seo, N., Jang, S. H., Jung, D.-i., Kim, S. S., Kim, C. H., Lee, H.-j., & Park, J. *A report on the Korea health panel survey of 2017*; 2019.

[15] Zigora, T., Current issues, prospects, and programs in health insurance in Zimbabwe: sustainable health care financing in southern Africa. *Washington, DC: The World Bank* 1996, 117-23.

[16] Mitchell, J. M., Utilization trends for advanced imaging procedures: evidence from individuals with private insurance coverage in California. *Medical care* 2008, 460-466.

[17] Kratzer, J.; Cheng, L.; Allin, S.; Law, M. R., The impact of private insurance coverage on prescription drug use in Ontario, Canada. *Healthcare Policy* 2015, *10* (4), 62.

[18] Sommers, B. D.; Blendon, R. J.; Orav, E. J.; Epstein, A. M., Changes in utilization and health among low-income adults after Medicaid expansion or expanded private insurance. *JAMA internal medicine* 2016, *176* (10), 1501-1509.

[19] Al-Hanawi, M. K.; Mwale, M. L.; Kamninga, T. M., The effects of health insurance on health-seeking behaviour: evidence from the kingdom of Saudi Arabia. *Risk Management and Healthcare Policy* 2020, *13*, 595.

[20] Rana, R. H.; Alam, K.; Gow, J., Selection of private or public hospital care: examining the care-seeking behaviour of patients with private health insurance. *BMC health services research* 2020, *20* (1), 1-17.

[21] Ettner, S. L., Adverse selection and the purchase of Medigap insurance by the elderly. *Journal of health economics* 1997, *16* (5), 543-562.

[22] Tian, W.-H.; Tien, J. J.; Chen, C.-S.; Liu, T.-C., Private Health Insurance and Inpatient Service Utilisation among Adults and Elderly People under Taiwan's National Insurance Programme. *The Geneva Papers on Risk and Insurance-Issues and Practice* 2012, *37* (4), 655-677.

[23] Buchmueller, T. C.; Couffinhal, A.; Grignon, M.; Perronnin, M., Access to physician services: does supplemental insurance matter? Evidence from France. *Health economics* 2004, *13* (7), 669-687.

[24] Jung, H, Lee, J., Estimating the effectiveness of national health insurance in covering

catastrophic health expenditure: Evidence from South Korea. *Plos one*. 2021;16(8):e0255677.

[25] Wagstaff, A., Measuring catastrophic medical expenditures: reflections on three issues. *Health economics* 2019, *28* (6), 765-781.

[26] World Health Organization. A system of Health Accounts 2011 Edition. *OECD publishing* 2011.

[27] Yardim, M. S.; Cilingiroglu, N.; Yardim, N., Financial protection in health in Turkey: the effects of the Health Transformation Programme. *Health policy and Planning* 2014, *29* (2), 177-192.

[28] Kim Kwan Ok, S. Y. J., The effect of the policy of expanding coverage for four major diseases: focused on out-of-pocket payment. *Health and Social Welfare Review* 2017, *37* (2), 452-476.

[29] Lee, H., Effect of four major severe diseases benefit expansion policies on the health care utilization and catastrophic health expenditure. *Korean J Soc Welf* 2018, *70* (1), 89-116.

[30] Cho, H., Jung, H., & Lee, J., Effect of Four major severe Disease Benefit Expansion policy in 2013. *Korean Social Ssecurity Studies* 2020, *36* (1), 71-89.

[31] Park, J. H., & Jung, K. T., Analysis of Changes in medical use of people with severe illness after health insurance policy for 4 major diseases. *Health Services Management* 2019, *13* (3), 9-23.

[32] Choi, J.; Jeong, H., Impacts of the benefit extension policy on financial burden and catastrophic health care expenditure. *Korean J Health Econ Policy* 2012, *18* (4), 1-19.

[33] Jung H. W., & Lee, K-S., What Policy Approaches Were Effective in Reducing Catastrophic Health Expenditure? A Systematic Review of Studies from Multiple

Countries. *Appl Health Econ Health Policy*. 2022, https://doi.org/10.1007/s40258-022-00727-y..

[34] Saliba, B.; Ventelou, B., Complementary health insurance in France Who pays? Why? Who will suffer from public disengagement? *Health Policy* 2007, *81* (2-3), 166-182.

[35] Benoît, C.; Coron, G., Private health insurance in France: Between Europeanization and collectivization. *The Milbank Quarterly* 2019, *97* (4), 1108-1150.

[36] Kang, S.; You, C. H.; Kwon, Y. D.; Oh, E.-H., Effects of supplementary private health insurance on physician visits in Korea. *Journal of the Formosan Medical Association* 2009, *108* (12), 912-920.

Figure 1. The effect of national health insurance and private health insurance to protect households from catastrophic health expenditure.

The y-axis is the out-of-pocket payments as a share of the household's income. The x-axis is arranged from left to right in the order of households with the highest out-of-pocket-to-income ratio. The red and blue bar graph represents the private healthcare payment (out-of-pocket + private health insurance benefit) and the total healthcare payment (out-of-pocket + national health insurance benefit) share of the household's income. The smooth curve is out-of-pocket/income.

Figures

Figure 1

The effect of national health insurance and private health insurance to protect households from catastrophic health expenditure.

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