

The Relationship between Unmet Healthcare Needs Due to Financial Reasons and the Experience of Catastrophic Health Expenditures

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Purpose: The purpose of this study is to investigate the association between unmet healthcare needs due to financial reasons and catastrophic health expenditures. **Methods:** This study used secondary data from the 2014~2015 Korean Health Panel survey. The subjects of this study were 21,495 people aged 20 or older, and of them, there were 16,227 people aged 20 to 64 and 5,268 people aged 65 or older, which were surveyed between 2014 and 2015. The association between unmet healthcare needs due to financial reasons and catastrophic health expenditures was analyzed through logistic regression. **Results:** In 2015, 1.7% of people aged 20~64 years and 7.9% of those aged 65 or older experienced unmet healthcare needs due to financial reasons. In the 20~64 age group, people who repeatedly experienced catastrophic health expenditures (=10%, =20%) were less likely to experience unmet healthcare needs due to financial reasons than those who did not experience catastrophic health expenditures for two years (OR=0.50, OR=0.41). However, in the 65-or-older group, people who repeatedly experienced catastrophic health expenditures (=20%) were more likely to experience unmet healthcare needs due to financial reasons than those who did not experience catastrophic health expenditures for two years (OR=1.68). **Conclusion:** A greater percentage of the elderly repeatedly faced both catastrophic health expenditures and unmet healthcare needs due to financial reasons compared to the non-elderly.

Key Words: Health expenditures; Health services needs; Employment

INTRODUCTION

Korea's health insurance system allows all citizens to use medical services regardless of income or ability to pay, but even if there is a need for medical services, it cannot be used due to financial burden. In 2012, 16.2% of Korean adults aged 19 or older experienced unmet healthcare needs during the previous year. In other words, they had healthcare needs but could not utilize healthcare services [1]. The most common reason for unmet healthcare needs is "financial reasons" [2]. The rate of unmet healthcare needs due to the burden of treatment costs is 4.5% in Korea [3], more than double that of the mean rate in the European Union (2.2%) [4].

In Korea, the percentage of healthcare costs paid out-of-pocket averages about 36.8%, about 1.8 times higher than the Organization for Economic Cooperation and Development (OECD) average of 20.3% [5]. In addition, about 3.48% of total household expenditures were spent on healthcare, and 26.8% of households spent at least 3 million KRW on health services (including out-of-pocket costs and non-covered services) for a household member over a six-month period [6]. As demonstrated here, the high out-of-pocket costs for healthcare seem to lead to high rates of unmet healthcare needs [7].

In previous studies, education level, type of health insurance, chronic disease, job type, private health insurance, self-reported health, type of healthcare expenditure,

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household income, employment status, stress from financial difficulties, stress from family conflict, and depression have all been associated with unmet healthcare needs due to financial reason [1,3,8]. Particularly, catastrophic health expenditures experience is associated with unmet healthcare needs due to financial reasons [3].

The definition and criteria of catastrophic health expenditures vary. The World Health Organization define catastrophic health expenditure as a household's health expenditure that exceeds 40% of the household's capacity to pay [9]. Previous studies performed international comparisons of catastrophic health expenditures by defining them as out-of-pocket spending that exceeds 40% of a household's capacity to pay [10-12]. In a study comparing catastrophic health expenditures in 59 countries, a catastrophic health expenditure is a health expenditure that exceeds 40% of the household's capacity to pay, excluding food expenses, and the rate of catastrophic health expenditures was 1.73% in Korea. This is similar to the rate in Mexico (1.54%), lower than that in Brazil (10.27%) and Vietnam (10.45%), but higher than that of European countries such as the United Kingdom (0.04%) and Sweden (0.18%) [10]. In addition, the rate of catastrophic health expenditures in Korea increased to 2.9% in 2006 [11], and the rate of catastrophic health expenditures in the economically active population aged 20~64 was 2.5% in 2012 and 2.1% in 2013 [12]. Most domestic studies that systematically examined the literature on catastrophic health expenditures defined out-of-pocket spending (total household income) excluding food expenses as the household's capacity to pay [11,12]. Although each study defined a household's capacity to pay in the same way, if the exceeding criteria differed, the rates of catastrophic health expenditure were different across studies [13]. Previous studies that used the household's capacity to pay excluding food expenses classified the exceeding criteria as 10%, 20%, 30%, and 40% [10,14,15]. In a previous study that examined the association between catastrophic health expenditures and unmet healthcare needs due to financial reasons, catastrophic health expenditures were defined as out-of-pocket healthcare spending that exceeds 10% of a household's capacity to pay [3]. In addition, these studies did not consider the Charlson Comorbidity Index (CCI), an index for chronic disease and disease severity, as a factor that impacts unmet healthcare needs [16].

In addition, an increase in healthcare service use occurs as people get older, resulting in increased healthcare expenditure [17]. On the other hand, the elderly population has less income due to their decreased economic activity and exhibits a significant drop in private health insurance

purchases [18]. Therefore, the elderly is more likely to experience unmet healthcare needs due to the increase in their use of healthcare services and the higher financial burden of medical expenses.

Therefore, in this study, we classify healthcare spending as $\geq 10\%$, $\geq 20\%$, $\geq 30\%$, and $\geq 40\%$ of income and also consider income levels and the CCI, which reflects disease severity. Moreover, because the reasons for unmet healthcare needs differ across age groups, we classify subjects as elderly or non-elderly to identify the factors that affect unmet healthcare needs due to financial reasons within these groups.

METHODS

1. Study design

This study is a descriptive research study to investigate the relationship between the experience of catastrophic health expenditures and the experience of unmet healthcare needs due to financial reasons using nationwide Korea Health Panel (KHP) data.

2. Participants

Data from the 2014~2015 annual KHP (version 1.4) conducted by the Korea Institute for Health and Social Affairs (KIHASA) and National Health Insurance Service (NHIS) were used for this study.

The subjects of this study were 21,495 people aged 20 or older, 16,227 people aged 20 to 64 and 5,268 people aged 65 or older, which were surveyed between 2014 and 2015.

The data were obtained from the KHP conducted by the KIHASA and NHIS. Permission to use the data set was granted by the KIHASA after reviewing the proposal for this study. This study obtained approval from the institutional review boards of the U1 University (Approval no. U1IRB2019-14).

3. Measures

The dependent variable of this study is an experience of unmet healthcare needs due to financial reasons in 2015. Participants were considered to have experienced unmet healthcare needs due to financial reasons if they answered "financial reasons (the cost was too high)" to the question "What is the most important reason that you could not seek treatment or test at a hospital or clinic during the last year?".

The independent variables were sex, age, education level, employment status, income level, type of private in-

insurance, self-reported health status, CCI, and experience of a catastrophic health expenditure. Employment status were classified regular workers, non-regular workers, self-employed, and not economically active. Regarding income level, total annual household income was divided by the square root of the number of household members and was presented in quintiles. The first quintile includes the bottom 20%, while the fifth quintile includes the top 20%. Types of private health insurance were classified as no private health insurance or fixed-benefit, indemnity, or mixed (fixed-benefit and indemnity) insurance. Self-reported health was measured based on the responses ("very good"=1, "very bad"=5) to the question "How do you rate your current health?". The CCI was developed by a tool for predicting one-year mortality in breast cancer patients, and it is a validated tool for comorbidity adjustment [19,20]. Using the diagnosis codes in the KHP data, a weighted score of 1~6 was added depending on disease severity, and total scores were classified as 0, 1, 2, and ≥ 3 [19,21]. Therefore, in the present study, we used the diagnosis codes reported in the questionnaire and weighted 15 disease groups with scores of 1~6 to compute the CCI. For the 20~64 age group, the CCI was classified as 0, 1, 2, and ≥ 3 , and for the 65-or-older group, the CCI was classified as 3, 4, and ≥ 5 . Catastrophic health expenditure measures healthcare spending against a household's capacity to pay. A household's capacity to pay is represented by their total household income minus food expenses. Total household income is the sum of total earned income and income from assets within the household, and food expenses are the costs for food excluding costs for dining out. Healthcare expenditure is the direct healthcare costs for emergency medical service, inpatient medical service, outpatient medical service, and prescription drugs (emergency, inpatient, and outpatient prescriptions) [22].

In this study, 2014 and 2015 catastrophic health expenditures were classified as $\geq 40\%$, $\geq 30\%$, $\geq 20\%$, and $\geq 10\%$ of a household's capacity to pay, and as 0 for no catastrophic health expenditures over the two years, 1 for one catastrophic health expenditure, and 2 for two catastrophic health expenditures.

4. Data Analysis

In present study, the distribution of unmet healthcare needs due to financial and others reasons and catastrophic healthcare expenditures were analyzed through frequency test. The difference in unmet healthcare needs due to financial and other reasons in the 20~64 age group and the 65-or-older group were analyzed through chi-squared test

and one-way ANOVA (Scheffé test).

The focus of this study is to compare those who have experienced unmet healthcare needs due to financial reasons with those who have not. Thus, when using logistic regression analysis, we excluded those who experienced unmet healthcare needs due to other reasons. And, the associations between catastrophic health expenditures and the experience of unmet healthcare needs due to financial reasons in the 20~64 age group and the 65-or-older group were analyzed through logistic regression. For the 65-or-older group, no regular workers had experienced unmet healthcare needs due to financial reasons, so we excluded employment status from the analysis.

RESULTS

1. Distribution of Unmet Healthcare Needs due to Financial Reasons and Catastrophic Health Expenditures by Type and Group

In 2015, 13.3% of the subjects had unmet healthcare needs: 11.8% in the 20~64 age group and 17.8% in the 65-or-older group. In 2015, 3.2% of the subjects had unmet healthcare needs due to financial reasons: 1.7% in the 20~64 age group and 7.9% in the 65-or-older group.

In 2014, the rate of catastrophic health expenditures $\geq 10\%$, $\geq 20\%$, $\geq 30\%$, and $\geq 40\%$ were 16.4%, 6.4%, 3.2%, and 1.7%, respectively, in the 20~64 age group, and 41.7%, 21.4%, 13.4%, and 9.2%, respectively, in the 65-or-older group. In 2015, the rate of catastrophic health expenditures $\geq 10\%$, $\geq 20\%$, $\geq 30\%$, and $\geq 40\%$ were 17.1%, 6.7%, 3.1%, and 1.9%, respectively, in the 20~64 age group, and 45.7%, 25.7%, 15.8%, and 11.1%, respectively, in the 65-or-older group.

The percentages of subjects who experienced more than one catastrophic health expenditure $\geq 10\%$, $\geq 20\%$, $\geq 30\%$, and $\geq 40\%$ in 2014~2015 were 4.6%, 1.4%, 0.6%, and 0.3%, respectively, in the 20~64 age group, and 24.2%, 9.7%, 4.9%, and 2.7%, respectively, in the 65-or-older group. In addition, percentages of subjects who had only one catastrophic health expenditure $\geq 10\%$, $\geq 20\%$, $\geq 30\%$, and $\geq 40\%$ in 2014~2015 were 18.9%, 8.2%, 4.2%, and 2.6%, respectively, in the 20~64 age group, and 32.8%, 24.4%, 17.4%, and 13.5%, respectively, in the 65-or-older group (Table 1).

2. Differences in the Rate of Unmet Healthcare Needs due to Financial Reasons

In the 20~64 age group, more women than men had un-

Table 1. Distribution of Unmet Healthcare Needs due to Financial Reasons and Catastrophic Healthcare Expenditures

Variables	Categories	Total (N=21,495)	20~64 years (n=16,227)	65 years or older (n=5,268)
		n (%)	n (%)	n (%)
Unmet healthcare needs	Met	17,951 (86.7)	13,671 (88.2)	4,280 (82.2)
	Unmet	2,761 (13.3)	1,834 (11.8)	927 (17.8)
Reasons for unmet healthcare needs	Met	18,716 (87.1)	14,379 (88.7)	4,337 (82.4)
	Financial	693 (3.2)	277 (1.7)	416 (7.9)
	Others	2,068 (9.6)	1,557 (9.6)	511 (9.7)
CHE (2014)	≥40%	627 (3.9)	202 (1.7)	425 (9.2)
	≥30%	990 (6.1)	372 (3.2)	618 (13.4)
	≥20%	1,733 (10.9)	746 (6.4)	987 (21.4)
	≥10%	3,819 (23.6)	1,900 (16.4)	1,919 (41.7)
CHE (2015)	≥40%	758 (4.6)	225 (1.9)	533 (11.1)
	≥30%	1,122 (6.8)	364 (3.1)	758 (15.8)
	≥20%	2,017 (12.2)	785 (6.7)	1,232 (25.7)
	≥10%	4,200 (25.4)	2,009 (17.1)	2,191 (45.7)
CHE ≥10%	0	12,804 (67.6)	10,628 (76.5)	2,176 (43.0)
	1	4,281 (22.6)	2,621 (18.9)	1,660 (32.8)
	2	1,869 (9.9)	644 (4.6)	1,225 (24.2)
CHE ≥20%	0	15,894 (83.9)	12,561 (90.4)	3,333 (65.9)
	1	2,370 (12.5)	1,133 (8.2)	1,237 (24.4)
	2	690 (3.6)	199 (1.4)	491 (9.7)
CHE ≥30%	0	17,166 (90.6)	13,234 (95.3)	3,932 (77.7)
	1	1,464 (7.7)	582 (4.2)	882 (17.4)
	2	324 (1.7)	77 (0.6)	247 (4.9)
CHE ≥40%	0	17,742 (93.6)	13,502 (97.2)	4,240 (83.8)
	1	1,039 (5.5)	355 (2.6)	684 (13.5)
	2	173 (0.9)	36 (0.3)	137 (2.7)

CHE=catastrophic health expenditures; 2014 and 2015 catastrophic health expenditures were classified as 0 for no catastrophic health expenditures over the two years, 1 for one catastrophic health expenditure, and 2 for two catastrophic health expenditures.

Missing data: Total, unmet healthcare needs (783); reasons for unmet healthcare needs (18); CHE (2014) ≥10% (5,291), CHE (2014) ≥20%, ≥30%, ≥40% (5,279); CHE (2015) ≥10%, ≥20%, ≥30%, ≥40% (4,958); CHE ≥10%, CHE ≥20%, CHE ≥30%, CHE ≥40% (2,541). For ages 20~64, unmet healthcare needs (722); reasons for unmet healthcare needs (14); CHE (2014) ≥10%, ≥20%, ≥30% (4,622), CHE (2014) ≥40% (4,629), CHE (2015) ≥10%, ≥20%, ≥30%, ≥40% (4,488); CHE ≥10%, CHE ≥20%, CHE ≥30%, CHE ≥40% (2,334). For those over 65, unmet healthcare needs (61); reasons for unmet healthcare needs (4); CHE (2014) ≥10%, ≥20%, ≥30% (657), CHE (2014) ≥40% (667), CHE (2015) ≥10%, ≥20%, ≥30%, ≥40% (470); CHE ≥10%, CHE ≥20%, CHE ≥30%, CHE ≥40% (207).

met healthcare needs due to financial reasons ($p < .001$), and the rate of unmet healthcare needs due to financial reasons increased as education and income levels decreased ($p < .001$). Non-regular workers and not economically active had the highest rate of unmet healthcare needs due to financial reasons, followed by individuals who were self-employed workers, and regular workers ($p < .001$). Individuals without private health insurance had the highest rate of unmet healthcare needs due to financial reasons, followed by individuals with mixed, fixed-benefit, and indemnity insurance ($p < .001$). The rate of unmet healthcare needs due to financial reasons increased with

poorer self-reported health ($p < .001$), higher CCI score ($p < .001$), more experiences of catastrophic health expenditures ≥10% and ≥20% ($p < .001$). Individuals who had only one catastrophic health expenditure had the highest rate of unmet healthcare needs due to financial reasons, followed by individuals who experienced two catastrophic health expenditure, and individuals who experience no catastrophic health expenditure (≥30%) ($p = .026$) (Table 2).

In the 65-or-older group, more women than men had unmet healthcare needs due to financial reasons ($p < .001$). Non-regular workers had the highest rate of unmet healthcare needs due to financial reasons, followed by indivi-

Table 2. Difference in Unmet Healthcare Needs due to Financial and Others Reasons for 20~64 Years Old Population (N=16,227)

Variables	Categories	Met ^a	Unmet		Total	<i>p</i> Scheffé
		n (%) or M±SD	Financial ^b n (%) or M±SD	Others ^c n (%) or M±SD	n	
Gender	Male	6,959 (90.1)	104 (1.3)	660 (8.5)	7,723	< .001
	Female	7,420 (87.4)	173 (2.0)	897 (10.6)	8,490	
Age (year)		41.23±13.99	49.13±12.70	44.39±12.40	16,213	< .001 a < b, c
Education level	Graduate more	7,912 (90.9)	75 (0.9)	717 (8.2)	8,704	< .001
	High school	4,346 (88.2)	87 (1.8)	494 (10.0)	4,927	
	Middle school	1,192 (85.3)	45 (3.2)	160 (11.5)	1,397	
	Less than primary school	929 (78.4)	70 (5.9)	186 (15.7)	1,185	
Employment status	Regular worker	3,612 (89.8)	14 (0.3)	397 (9.9)	4,023	< .001
	Non-regular worker	3,034 (86.0)	79 (2.2)	413 (11.7)	3,526	
	Self-employ	2,194 (84.6)	49 (1.9)	350 (13.5)	2,593	
	Not economically active	5,539 (91.2)	135 (2.2)	397 (6.5)	6,071	
Income quintile	5	5,051 (91.8)	11 (0.2)	442 (8.0)	5,504	< .001
	4	3,811 (89.1)	33 (0.8)	434 (10.1)	4,278	
	3	3,023 (87.1)	63 (1.8)	383 (11.0)	3,469	
	2	1,922 (85.9)	91 (4.1)	225 (10.1)	2,238	
	1	572 (79.0)	79 (10.9)	73 (10.1)	724	
Private health insurance	No private health insurance	258 (81.9)	10 (3.2)	47 (14.9)	315	< .001
	Fixed benefic type	9,746 (89.1)	158 (1.4)	1,029 (9.4)	10,933	
	Indemnity type	1,016 (90.5)	13 (1.2)	94 (8.4)	1,123	
	Mixed type	2,787 (87.8)	59 (1.9)	329 (10.4)	3,175	
Self-reported health status		2.48±0.74	3.18±0.80	2.75±0.73	15,234	< .001 a < b, c
CCI score	0	6,411 (91.6)	55 (0.8)	535 (7.6)	7,001	< .001
	1	2,953 (87.2)	48 (1.4)	384 (11.3)	3,385	
	2	2,932 (85.2)	91 (2.6)	419 (12.2)	3,442	
	3 or more	2,083 (87.3)	83 (3.5)	219 (9.2)	2,385	
CHE ≥ 10%	0	9,425 (88.8)	162 (1.5)	1,031 (9.7)	10,618	< .001
	1	2,308 (88.1)	68 (2.6)	244 (9.3)	2,620	
	2	568 (88.3)	24 (3.7)	51 (7.9)	643	
CHE ≥ 20%	0	11,160 (88.9)	211 (1.7)	1,180 (9.4)	12,551	< .001
	1	965 (85.2)	36 (3.2)	131 (11.6)	1,132	
	2	176 (88.9)	7 (3.5)	15 (7.6)	198	
CHE ≥ 30%	0	11,735 (88.7)	232 (1.8)	1,256 (9.5)	13,223	.026
	1	498 (85.6)	20 (3.4)	64 (11.0)	582	
	2	68 (89.5)	2 (2.6)	6 (7.9)	76	
CHE ≥ 40%	0	11,963 (88.7)	240 (1.8)	1,288 (9.5)	13,491	.097
	1	306 (86.2)	13 (3.7)	36 (10.1)	355	
	2	32 (91.4)	1 (2.9)	2 (5.7)	35	

CCI=Charlson comorbidity index; CHE=catastrophic health expenditures; 2014 and 2015 catastrophic health expenditures were classified as 0 for no catastrophic health expenditures over the two years, 1 for one catastrophic health expenditure, and 2 for two catastrophic health expenditures. Missing data: Gender, age, education level, Employment status, Income Quintile, CCI score (14); Self-reported health status (993); Private health insurance (681); CHE ≥ 10%, CHE ≥ 20%, CHE ≥ 30%, CHE ≥ 40% (2,346).

Table 3. Difference in Unmet Healthcare Needs due to Financial and Others Reasons for Population Over Age 65 (N=5,268)

Variables	Categories	Met ^a	Unmet		Total n	p Scheffé
		n (%) or M±SD	Financial ^b n (%) or M±SD	Others ^c n (%) or M±SD		
Gender	Male	1,533 (84.8)	136 (7.5)	139 (7.7)	1,808	.001
	Female	2,804 (81.1)	280 (8.1)	372 (10.8)	3,456	
Age (year)		73.72±6.63	74.31±6.06	75.14±7.45	5,264	< .001 a < c
Education level	Graduate more	355 (91.0)	13 (3.3)	22 (5.6)	390	< .001
	High school	798 (88.3)	47 (5.2)	59 (6.5)	904	
	Middle school	842 (86.3)	69 (7.1)	65 (6.7)	976	
	Less than primary school	2,342 (78.2)	287 (9.6)	365 (12.2)	2,994	
Employment status	Regular worker	59 (95.2)	- (0.0)	3 (4.8)	62	.004
	Non-regular worker	495 (83.8)	55 (9.3)	41 (6.9)	591	
	Self-employ	819 (83.4)	61 (6.2)	102 (10.4)	982	
	Not economically active	2,964 (81.7)	300 (8.3)	365 (10.1)	3,629	
Income quintile	5	468 (91.1)	18 (3.5)	28 (5.4)	514	< .001
	4	612 (91.2)	16 (2.4)	43 (6.4)	671	
	3	778 (85.7)	41 (4.5)	89 (9.8)	908	
	2	1,179 (83.8)	93 (6.6)	135 (9.6)	1,407	
	1	1,300 (73.7)	248 (14.1)	216 (12.2)	1,764	
Private health insurance	No private health insurance	87 (79.8)	10 (9.2)	12 (11.0)	109	.176
	Fixed benefic type	2,405 (85.6)	175 (6.2)	229 (8.2)	2,809	
	Indemnity type	153 (82.3)	12 (6.5)	21 (11.3)	186	
	Mixed type	321 (88.4)	22 (6.1)	20 (5.5)	363	
Self-reported health status		3.00±0.79	3.53±0.80	3.43±0.87	5,070	< .001 a < b, c
CCI score	3	1,084 (85.0)	90 (7.1)	102 (8.0)	1,276	< .001
	4	2,046 (83.9)	172 (7.1)	220 (9.0)	2,438	
	5 or more	1,207 (77.9)	154 (9.9)	189 (12.2)	1,550	
CHE ≥ 10%	0	1,883 (86.5)	121 (5.6)	172 (7.9)	2,176	< .001
	1	1,350 (81.4)	146 (8.8)	163 (9.8)	1,659	
	2	938 (76.8)	137 (11.2)	147 (12.0)	1,222	
CHE ≥ 20%	0	2,837 (85.1)	210 (6.3)	285 (8.6)	3,332	< .001
	1	986 (79.7)	127 (10.3)	124 (10.0)	1,237	
	2	348 (71.3)	67 (13.7)	73 (15.0)	488	
CHE ≥ 30%	0	3,299 (83.9)	277 (7.0)	355 (9.0)	3,931	< .001
	1	689 (78.3)	96 (10.9)	95 (10.8)	880	
	2	183 (74.4)	31 (12.6)	32 (13.0)	246	
CHE ≥ 40%	0	3,533 (83.4)	317 (7.5)	387 (9.1)	4,237	.001
	1	528 (77.2)	72 (10.5)	84 (12.3)	684	
	2	110 (80.9)	15 (11.0)	11 (8.1)	136	

CCI=Charlson comorbidity Index; CHE=catastrophic health expenditures; 2014 and 2015 catastrophic health expenditures were classified as 0 for no catastrophic health expenditures over the two years, 1 for one catastrophic health expenditure, and 2 for two catastrophic health expenditures.

Missing data: Gender, age, education level, Employment status, Income Quintile, CCI score (4); Private health insurance (1,801); Self-reported health status (198); CHE ≥ 10%, CHE ≥ 20%, CHE ≥ 30%, CHE ≥ 40% (221).

duals who were not economically active, and self-employed workers ($p=.004$). The rate of unmet healthcare needs due to financial reasons increased with decreasing education levels and income levels ($p<.001$), poorer self-reported health ($p<.001$) and with higher CCI score ($p<.001$). Finally, the rate of unmet healthcare needs due to financial reasons increased with more experiences of catastrophic health expenditures $\geq 10\%$, $\geq 20\%$, $\geq 30\%$ ($p<.001$), and $\geq 40\%$ ($p=.001$) (Table 3).

3. Factors Affecting the Rate of Unmet Healthcare Needs due to Financial Reasons

In the 20~64 age group, factors that affected the rate of unmet healthcare needs due to financial reasons were employment status, income level, type of private health insurance, self-reported health, CCI score, catastrophic health expenditure $\geq 10\%$, $\geq 20\%$. Regarding catastrophic health expenditures $\geq 10\%$ and $\geq 20\%$, those who experienced two catastrophic health expenditures over two years were 0.50 and 0.41 times less likely to experience unmet healthcare needs due to financial reasons than those who did not experience catastrophic health expenditures (Table 4).

In the 65-or-older group, factors affected the rate of unmet healthcare needs due to financial reasons were income level, self-reported health, and catastrophic health expenditure $\geq 20\%$. Regarding catastrophic health expenditures $\geq 20\%$, those who experienced two catastrophic health expenditures over two years were 1.68 times more likely to experience unmet healthcare needs due to financial reasons than those who did not experience catastrophic health expenditures (Table 5).

DISCUSSION

In the present study, the rate of people with unmet healthcare needs due to financial reasons among who those have unmet healthcare needs was greater than the mean rate in the European Union in 2014 (5.9%) [23].

Also, the rate of catastrophic health expenditures greater than 40% was 4.6% in 2015, higher than that of any other country. According to OECD Health Working Papers, the rate of people experiencing catastrophic health expenditures greater than 40% in South Korea was the highest in 2013 (3.7%), which was higher than 2.0% in the United States, 1.6% in Ireland, 0.5% in Hungary, and 0.1% in Finland [24].

Among the elderly, the rate of unmet healthcare needs was 17.8% and that of unmet healthcare needs due to financial reasons was 7.9%. On the other hand, the rate of

unmet healthcare needs among the non-elderly was 11.8% and that of unmet healthcare needs due to financial reasons was 1.7%. The rate of unmet healthcare needs among the elderly is 6.0% higher than that among the non-elderly, presumably due to the 6.2% difference in the rates of unmet healthcare needs due to financial reasons.

As shown here, the elderly experienced more unmet healthcare needs due to financial reasons than non-elderly. There was minimal association between socioeconomic factors, namely income and education level, and unmet healthcare needs due to financial reasons. Education level had no association with unmet healthcare needs due to financial reasons at all. Regarding income, only the 1st quintile (bottom 20%) among the elderly was associated with unmet healthcare needs due to financial reasons. Among the non-elderly, all income quintiles were associated with unmet healthcare needs due to financial reasons, and in particular, the bottom 20% is more likely to experience unmet healthcare needs due to financial reasons than the top 20%.

According to data from the 2013 National Health Statistics, the incidence of unmet healthcare needs due to financial reasons was 4.2 times higher among the lowest income group (5.0%) than in the highest income group (1.2%) [25]. Further, this aligns with a previous finding concerning adults aged 65 or older, in which those with a low average monthly households income were found to be more likely to experience unmet healthcare needs due to financial reasons [26].

Employment status, an indicator of economic activity that impacts income, was significantly associated with unmet healthcare needs due to financial reasons among the non-elderly. In the present study, the incidence of unmet healthcare needs due to financial reasons was higher among non-regular workers, the self-employed, and individuals who were not economically active compared to regular workers. This is similar to a previous finding, and in the existing studies, wage workers are less likely to experience unmet healthcare needs due to financial reasons than unemployed [3]. In a prior study on the economically active population aged 20~64, the incidence of unmet healthcare needs due to financial reasons was higher among non-regular workers, such as temporary workers and day laborers, than among regular workers [12].

The association of unmet healthcare needs due to financial reasons with self-reported health status and CCI score is weaker in the elderly than in the non-elderly. In the present study, the incidence of unmet healthcare needs due to financial reasons was about 2.5 times higher among those with poorer self-reported health status in the non-

Table 4. Factors affecting Unmet Healthcare Needs due to Financial Reasons of 20~64 Years Old Population (N=16,227)

Variables	Categories	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Gender	Male (ref.)				
	Female	1.17 (0.85~1.61)	1.17 (0.84~1.61)	1.16 (0.84~1.60)	1.15 (0.84~1.59)
Age (year)		0.98 (0.96~1.01)	0.98 (0.96~1.01)	0.98 (0.96~1.01)	0.98 (0.96~1.01)
Education level	Graduate more (ref.)				
	High school	0.79 (0.52~1.21)	0.79 (0.52~1.22)	0.79 (0.52~1.21)	0.78 (0.51~1.20)
	Middle school	0.87 (0.51~1.47)	0.86 (0.51~1.46)	0.84 (0.50~1.43)	0.84 (0.49~1.42)
	Less than primary school	1.26 (0.74~2.16)	1.27 (0.74~2.17)	1.25 (0.73~2.14)	1.24 (0.73~2.13)
Employment status	Regular worker (ref.)				
	Non-regular worker	2.93 (1.50~5.73)	2.91 (1.49~5.70)	2.93 (1.50~5.74)	2.93 (1.50~5.73)
	Self-employ	2.97 (1.49~5.94)	2.98 (1.49~5.95)	3.00 (1.50~6.00)	2.98 (1.49~5.95)
	Not economically active	2.54 (1.32~4.87)	2.56 (1.33~4.91)	2.61 (1.36~5.01)	2.57 (1.34~4.94)
Income quintile	5 (ref.)				
	4	2.74 (1.35~5.54)	2.67 (1.32~5.39)	2.67 (1.32~5.40)	2.67 (1.32~5.39)
	3	6.28 (3.25~12.16)	6.01 (3.11~11.61)	5.95 (3.08~11.50)	5.93 (3.07~11.45)
	2	10.12 (5.24~19.54)	9.68 (5.03~18.65)	9.49 (4.93~18.26)	9.31 (4.84~17.94)
	1	32.90 (16.39~66.02)	30.66 (15.38~61.14)	31.18 (15.64~62.18)	29.35 (14.76~58.34)
Private health insurance	No private health insurance (ref.)				
	Fixed benefic type	0.45 (0.22~0.94)	0.45 (0.22~0.94)	0.46 (0.22~0.96)	0.45 (0.21~0.93)
	Indemnity type	0.42 (0.17~1.08)	0.42 (0.16~1.06)	0.42 (0.17~1.08)	0.40 (0.16~1.01)
	Mixed type	0.66 (0.30~1.43)	0.66 (0.30~1.43)	0.68 (0.31~1.47)	0.65 (0.30~1.42)
Self-reported health status		2.57 (2.11~3.12)	2.55 (2.10~3.09)	2.50 (2.06~3.03)	2.47 (2.04~3.00)
CCI score	0 (ref.)				
	1	1.60 (0.86~2.98)	1.64 (0.88~3.04)	1.64 (0.88~3.06)	1.67 (0.90~3.10)
	2	3.03 (1.39~6.58)	3.09 (1.42~6.72)	3.01 (1.39~6.54)	3.07 (1.42~6.66)
	3 or more	2.42 (1.00~5.87)	2.40 (0.99~5.82)	2.34 (0.97~5.66)	2.37 (0.98~5.72)
CHE ≥ 10%	0 (ref.)				
	1	0.76 (0.54~1.06)			
	2	0.50 (0.29~0.85)			
CHE ≥ 20%	0 (ref.)				
	1		0.74 (0.49~1.12)		
	2		0.41 (0.17~0.99)		
CHE ≥ 30%	0 (ref.)				
	1			0.65 (0.38~1.11)	
	2			0.17 (0.02~1.31)	
CHE ≥ 40%	0 (ref.)				
	1				0.71 (0.37~1.38)
	2				-

OR=odds ratio; CI=confidence intervals; ref.=reference; CCI=Charlson comorbidity Index; CHE=catastrophic health expenditures; 2014 and 2015 catastrophic health expenditures were classified as 0 for no catastrophic health expenditures over the two years, 1 for one catastrophic health expenditure, and 2 for two catastrophic health expenditures.

elderly, but only 1.9 times higher in the elderly. This result was supported by a previous study on older adults aged 65 years or older, in which the incidence of unmet healthcare needs due to financial reasons increased with poorer self-reported health [3]. Further, among the non-elderly, the incidence of unmet healthcare needs due to financial reasons was about three times higher among those with a

CCI score of 2 than among those with a CCI score of 0. We could not find previous studies on the association of unmet healthcare needs due to financial reasons with CCI score in the elderly. Further research is needed in the future to answer the reason that the association of unmet healthcare needs due to financial reasons with CCI score is not significant in the elderly.

Table 5. Factors affecting Unmet Healthcare Needs due to Financial Reasons of People Over 65 Years of Age (N=5,268)

Variables	Categories	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Gender	Male (ref.)				
	Female	0.82 (0.59~1.15)	0.82 (0.59~1.15)	0.81 (0.58~1.12)	0.81 (0.58~1.12)
Age (year)		1.00 (0.97~1.03)	1.00 (0.97~1.03)	1.00 (0.97~1.03)	1.00 (0.97~1.03)
Education level	Graduate more (ref.)				
	High school	0.98 (0.42~2.29)	1.00 (0.43~2.33)	0.97 (0.42~2.24)	0.96 (0.41~2.23)
	Middle school	1.22 (0.54~2.72)	1.24 (0.55~2.76)	1.20 (0.54~2.68)	1.21 (0.54~2.69)
	Less than primary school	1.69 (0.77~3.69)	1.70 (0.78~3.72)	1.67 (0.76~3.64)	1.67 (0.76~3.64)
Income quintile	5 (ref.)				
	4	0.47 (0.21~1.04)	0.48 (0.22~1.06)	0.48 (0.22~1.06)	0.48 (0.22~1.06)
	3	0.82 (0.43~1.58)	0.87 (0.46~1.66)	0.88 (0.46~1.68)	0.88 (0.46~1.68)
	2	1.21 (0.66~2.21)	1.28 (0.71~2.33)	1.37 (0.76~2.48)	1.37 (0.76~2.48)
	1	2.65 (1.43~4.91)	2.82 (1.55~5.15)	3.31 (1.82~6.02)	3.30 (1.83~5.94)
Private health insurance	No private health insurance (ref.)				
	Fixed benefic type	1.07 (0.50~2.30)	1.08 (0.51~2.30)	1.15 (0.54~2.44)	1.15 (0.54~2.44)
	Indemnity type	1.52 (0.57~4.00)	1.60 (0.61~4.19)	1.68 (0.64~4.38)	1.67 (0.64~4.36)
	Mixed type	1.39 (0.57~3.37)	1.43 (0.59~3.45)	1.49 (0.62~3.60)	1.48 (0.61~3.57)
Self-reported health status		1.85 (1.52~2.25)	1.86 (1.52~2.26)	1.89 (1.55~2.30)	1.89 (1.55~2.30)
CCI score	3 (ref.)				
	4	0.71 (0.47~1.07)	0.71 (0.47~1.06)	0.75 (0.50~1.12)	0.74 (0.50~1.11)
	5 or more	0.70 (0.44~1.12)	0.71 (0.45~1.12)	0.78 (0.49~1.23)	0.78 (0.50~1.24)
CHE ≥ 10%	0 (ref.)				
	1	1.25 (0.87~1.81)			
	2	1.42 (0.93~2.18)			
CHE ≥ 20%	0 (ref.)				
	1		1.06 (0.73~1.52)		
	2		1.68 (1.05~2.71)		
CHE ≥ 30%	0 (ref.)				
	1			0.92 (0.62~1.35)	
	2			0.86 (0.40~1.81)	
CHE ≥ 40%	0 (ref.)				
	1				0.91 (0.60~1.38)
	2				0.67 (0.23~1.95)

OR=odds ratio; CI=confidence intervals; ref.=reference; CCI=Charlson Comorbidity Index; CHE=catastrophic health expenditures; 2014 and 2015 catastrophic health expenditures were classified as 0 for no catastrophic health expenditures over the two years, 1 for one catastrophic health expenditure, and 2 for two catastrophic health expenditures.

Type of private health insurance was associated with unmet healthcare needs due to financial reasons among the non-elderly but not in the elderly. Non-elderly who had fixed-benefit private health insurance showed a lower rate of unmet healthcare needs due to financial reasons compared to those without private health insurance. These results were in line with a previous finding that people with private health insurance had a lower rate of unmet healthcare needs due to financial reasons than those without private health insurance [3].

In the present study, 23.6% and 25.4% of participants experienced a catastrophic health expenditure ≥ 10% in 2014 and 2015, respectively. This rate was higher than those

found in previous studies, and higher than the average rate in 133 countries (11.7%), higher than the average in Asian countries (12.8%), and higher than the average in European (7.2%) and Oceanian countries (3.9%) [27]. In previous studies [27], catastrophic healthcare expenditure was calculated as the ratio of out-of-pocket health spending to total household consumption, which may be different from this study. Despite this difference, South Korea has higher out-of-pocket health spending than any OECD country [5] and an extremely low upper limit on out-of-pocket health spending [28]. Therefore, people are more likely to experience catastrophic healthcare expenditure and thus face a higher chance of experiencing unmet

healthcare needs.

In particular, the rate of catastrophic health expenditure was higher among the elderly than among the non-elderly. The rate of catastrophic health expenditures $\geq 10\%$ was about two times higher among the elderly than among the non-elderly, and the rate of catastrophic health expenditures $\geq 40\%$ was about five times higher among the elderly than among the non-elderly. Elderly people are less economically active than their young counterparts, resulting in a decreased ability to pay medical expenses. In contrast, they tend to rely more on medical services than young people, resulting in higher medical expenses. Therefore, the elderly is more likely to experience catastrophic healthcare expenditure than others. Because the private health insurance purchase rate is higher among the non-elderly, it seems that the rate of unmet healthcare needs due to financial reasons was lower among the non-elderly due to their higher private health insurance purchase rate, and so they resolve healthcare costs using their private health insurance. According to the KHP data, private health purchase rates in 2014 were highest among people in their 30s~50s (82.9~84.1%) and began to decrease among people in their 60s or older, with a 70.6% rate among those in their 60s, 31.6% among those in their 70s, and 5.6% among those 80 or older [29].

However, the association between catastrophic health expenditures and unmet healthcare needs due to financial reasons is unclear. Among the elderly, the odds ratio (OR) of experiencing unmet healthcare needs due to financial reasons was 1.06 for people with one catastrophic health expenditure ($\geq 20\%$) and 1.68 for people with two catastrophic health expenditures ($\geq 20\%$), and only the OR of 1.68 for the latter group was significant. On the other hand, among the non-elderly, the OR of experiencing unmet healthcare needs due to financial reasons was 0.76 for people with one catastrophic health expenditure ($\geq 10\%$). Only the OR of 0.50 for the latter group was significant. In a previous study, people who experienced a catastrophic health expenditure ($\geq 10\%$) only in the preceding year and those who experienced an additional catastrophic health expenditure ($\geq 10\%$) in the current year were more likely to experience unmet healthcare needs due to financial reasons [3]. However, the study in question excluded income from the independent variables and did not classify participants into different age groups, so it is not appropriate to compare their findings with ours.

In the present study, there may be two reasons for the result that facing catastrophic health expenditures lowered the rate of unmet healthcare needs due to financial reasons, both of which seem to be related to our study's

limitations. First, sufficient utilization of healthcare services for various reasons may increase one's likelihood of facing catastrophic health expenditures. Because the experience of catastrophic health expenditures and unmet healthcare needs due to financial reasons are surveyed every year, the high variability of these variables is reflected unlike for socioeconomic status, and it is unclear which of the two variables precedes the other. Second, theoretically, catastrophic health expenditures lead to a failure to adequately utilize necessary healthcare services, and thus is highly likely to result in unmet healthcare needs. In particular, people with severe disease who face catastrophic health expenditures may be more likely to experience unmet healthcare needs. However, an individual's current experience of unmet healthcare needs was measured based on a self-reported response to a question about one's failure to utilize healthcare services, despite wanting to do so, due to financial reasons in the past year. Further, most of the subjects had a mild, as opposed to severe, disease. Hence, this study is limited in its ability to empirically analyze the association between catastrophic health expenditures and unmet healthcare needs.

This study found no causal relationship between unmet healthcare needs due to financial reasons and the experience of catastrophic health expenditure $\geq 30\%$ and $\geq 40\%$ by elderly and non-elderly people. This result may be associated with the study limitation of most subjects being mildly ill rather than severely ill. Therefore, further research on the relationship between unmet healthcare needs and the experience of catastrophic health expenditure by severely ill patients is recommended.

The limitation of this study is that when using logistic regression analysis, we excluded those who experienced unmet healthcare needs due to other reasons. The association between unmet healthcare needs due to financial reasons and those who have not, which is of interest in this paper may be different in case of those who experienced unmet healthcare needs due to other reasons. This should be taken into account when interpreting the results. Thus, Further research is needed on the relevance of catastrophic health expenditures to unmet healthcare needs experience groups for other reasons.

CONCLUSION

Compared to the non-elderly, the elderly is more likely to experience unmet healthcare needs due to financial reasons and more likely to experience repeated catastrophic health expenditures. To reduce the incidence of unmet healthcare needs due to financial reasons, the non-elderly

need income security and stable jobs, while the elderly need income security, particularly for low-income individuals, and policies that support people repeatedly facing catastrophic health expenditures.

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