processes

MDPI

Article

Catastrophic Health Expenditures and Its Inequality in Households with Cancer Patients: A Panel Study

Munjae Lee [1] and Kichan Yoon [2,*]

[1] Department of Medical Device Management and Research, SAIHST, Sungkyunkwan University, Seoul 06351, Korea; emunjae@skku.edu
[2] Research Center, Social Security Information Service, Seoul 04554, Korea
* Correspondence: ykichan@ssis.or.kr

Received: 28 November 2018; Accepted: 10 January 2019; Published: 14 January 2019

Abstract: This study aims to examine the determinants of catastrophic health expenditure in households with cancer patients by conducting a panel analysis of three-year data. Data are adopted from surveys administered by Korea Health Panel for 2012–2014. We conducted correspondence and conditional transition probability analyses to examine households that incurred catastrophic health expenditure, followed by a panel logit analysis. The analyses reveal three notable results. First, the occurrence of catastrophic health expenditure differs by age group, that is, the probability of incurring catastrophic health expenditure increases with age. Second, this probability is higher in households with National Health Insurance than those receiving medical care benefits. Finally, households without private health insurance report a higher occurrence rate. The findings suggest that elderly people with cancer have greater medical coverage and healthcare needs. Private health insurance contributes toward protecting households from catastrophic health expenditure. Therefore, future research is needed on catastrophic health expenditure with focus on varying age groups, healthcare coverage type, and private health insurance.

Keywords: catastrophic health expenditure; cancer patient households; panel logit analysis; healthcare spending; Korea Health Panel

1. Introduction

In Korea, the death rate attributable to cancer accounts for 28.6% (2014) of total mortality and this rate increased from 23.8% in 2000 and 25.8% in 2002 to 27.0% in 2005. By 2013, the number of cancer patients grew by 94.2% (225,343) compared to that reported in 2002 (116,034). This implies a constantly widening demand for medical services by cancer patients. In addition, out-of-pocket payments for cancer patients have decreased and this has contributed to the overall improvement of medical services. However, in reality, out-of-pocket payments remain high considering the high rate of covered charges and thus, are a burden to both households and the nation. To address this issue, the Korean government is implementing a detailed policy that expands coverage to four major diseases with higher health expenditure burden: cancer, heart disease, cerebrovascular disease, and rare intractable disease.

Catastrophic health expenditure (CHE) is an index denoting health expenditures in the context of household affordability. In other words, it refers to health expenditures exceeding a certain threshold of household income or family expenditures. However, catastrophic health expenditure is a relative concept, that is, it depends on a household's affordability, and is not an absolute value of health expenditure [1]. More specifically, it includes not only significant financial burdens on household finances due to high medical expenses but also those caused by a smaller amount. That is, even if medical expenses are high, they cannot be defined as catastrophic health expenditure if there is no

financial burden. In general, catastrophic health expenditure is analyzed per household and calculated using total income or consumption expenditure, which is a household's payment capacity, as the denominator and health expenditure as the numerator [2,3].

However, with researchers using different approaches to set payment capacity and a threshold to calculate catastrophic health expenditure, the literature lacks a unified threshold that determines the occurrence of catastrophic health expenditure. For instance, Xu et al. defined a household's payment capacity as income excluding minimum living expenses, thus applying a 40% threshold [4–6]. Wagstaf and van Doorslaer, on the other hand, applied various thresholds, such as 10, 15, and 25%, and defined a household's payment capacity as household income excluding food expenditure [7,8]. Payment capacity has even been described as total household income including food expenditures; in this case, a lower threshold is applied given the possibility of underestimating catastrophic health expenditure because of a large denominator [9,10]. According to the World Health Organization (WHO), catastrophic health expenditure is incurred if health expenditure accounts for at least 40% of payment capacity and this definition may vary by each country's healthcare policy [11].

Therefore, to the effect of payment capacity and threshold, studies on catastrophic health expenditures must select suitable methods on the basis of data characteristics [12]. Given the rapid increase in healthcare utilization and expenditures by cancer patients, numerous studies have explored catastrophic health expenditure; however, most of them focus on low-income households [13,14]. Moreover, there is insufficient research on catastrophic health expenditures incurred by cancer patients, who are highly likely to suffer considerable expenditure burdens [15,16].

A key limitation of previous studies is their analyses of cross-sectional data from a specific viewpoint. This constrains researchers in identifying absolute effects on the determinants of catastrophic health expenditure. Compared to time-series and cross-sectional data, a panel data model provides more useful information. Therefore, this study examines the determinants of catastrophic health expenditure by households with cancer patients by conducting a panel analysis of three-year data.

2. Materials and Methods

2.1. Study Participants

This study adopts raw data by the Korea Health Panel, which comprises the National Health Insurance Service and Korea Institute for Health and Social Affairs. For the purpose of this study, we use data for 2012–2014 and households with cancer patients, not individual household members, as the unit of research. Since a balanced panel was formed including households with cancer patients that responded to all Korea Health Panel for years 2012–2014 (seventh–ninth survey data), any change to the sample is likely to have insignificant effects on this study's results. A total of 1380 households with members who have cancer and availed of emergency, outpatient, and inpatient services were considered subjects of this study.

2.2. Catastrophic Health Expenditure

This study defines payment capacity, the denominator of catastrophic health expenditure, as total family expenditure excluding food expenditure, which is the most widely used index. We use as the numerator a household's annual household health expenditure, which includes all emergency, outpatient, and hospitalization services. To calculate the occurrence of catastrophic health expenditures, this study adopts the threshold approach for the distribution of medical expenses issued by the WHO and methodology of catastrophic health expenditure. Catastrophic health expenditure occurs if the proportion of medical expenses compared to payment capacity exceeds the defined level. However, studies compare characteristics using multiple standards for thresholds and thus, there is no consensus regarding the threshold for catastrophic health expenditure. Therefore, this study sets the thresholds of 10, 20, and 40% to define the occurrence of catastrophic health expenditure.

2.3. Independent Variables

Independent variables are categorized into demographic characteristics as well as medical security and factors of chronic diseases. Demographic characteristics include a householder's gender, age, education level, employment type, and income. Age is classified into 30s or below, 40s, 50s, 60s, and 70s or above. Education levels are elementary school graduate or lower, high school graduate or lower, and two-year college or higher. Employment type is divided into economic and non-economic activities and the latter comprises unpaid workers and unemployed persons. For households' income level, current income is substituted using its natural logarithm. For type of medical security, health insurance includes households with National Health Insurance, which are further divided into workplace subscribers and local subscribers. Medical care includes types 1 and 2. Factors of chronic diseases are classified into number of householders with chronic illness within the family. Table 1 presents the variables and handling methods employed in the analysis.

Table 1. Variable selection and handling method.

Variable	Handling Method
Dependent variable	
Catastrophic health expenditure	0 = no, 1 = yes
Independent variable	
Gender	0 = male, 1 = female
Age	1 = 30 s, 2 = 40 s, 3 = 50 s, 4 = 60 s, 5 = ≥70 s
Spouse	0 = no, 1 = yes
Education level	1 = ≤elementary school, 2 = ≤high school,3 = ≥college
Employment	0 = no, 1 = yes
No. of family members	Continuous variable
Income level	Log (ordinary income)
Healthcare coverage type	0 = National Health Insurance, 1 = medical assistance
Private health insurance application	0 = no, 1 = yes
Family member with chronic disease	0 = no, 1 = yes

2.4. Statistical Analysis

First, we conduct a frequency analysis to examine the general characteristics of households with cancer patients by year and occurrence of catastrophic health expenditure. Second, we perform a cross-tabulation analysis to investigate the annual incidence of catastrophic health expenditures. Third, we analyze the conditional transition probability to determine the probability of catastrophic health expenditure re-occurring in the next year for households that incurred expenditures in the current year. Furthermore, we conduct a panel logit analysis to identify the determinants of catastrophic health expenditure in households with cancer patients. The panel logit analysis is performed when the dependent variables are two parameters and the error term *ui* in the equation shows heterogeneity, which changes as per the panel entities. However, we assume that it has a persistent feature that does not change with time in a single panel entity and the error term e_{it} follows logistic distribution. The random effects model assumes that u_{it} follows the probability distribution and it can be generally applied under this assumption when survey data are collected using a probability sample. Fourth, we perform a panel analysis to examine the factors affecting overall health expenditures in households incurring catastrophic health expenditures at the threshold level of 20%. Stata SE ver. 13.0 program (Stata Corp., College Station, TX, USA) was used for all analyses.

3. Results

3.1. Sample Characteristics

In this section, we present the general characteristics of households with cancer patients by year (Table 2). The analysis subjects include 1380 households with cancer patients that responded to all surveys for years 2012–2014 (seventh–ninth survey data). Of these, 85.0% are male householders and 15.0% are female. In addition, 76.1% of householders were married in 2012, although this rate gradually decreased to 74.1% by 2014. As for education level, 40.9% were college graduates, 21.7% were elementary school graduates or lower, and 37.4% were high school graduates or lower. In terms of employment status, the rate of householders engaged in economic activities gradually decreased from 60.0% in 2012 to 58.9% in 2014. On the other hand, the rate of householders who were economically inactive (e.g., unemployed workers) increased from 40.0% in 2012 to 41.1% in 2014. The number of family members decreased from 2.36 in 2012 to 2.29 in 2014 and income level (substituted by its natural logarithm) increased from $ 28.99 thousand in 2012 to $ 31.15 thousand in 2014. As for type of medical security, the rate of households with National Health Insurance increased from 73.0% in 2012 to 74.3% 2014 and approximately 6% benefited from medical assistance. Households without private health insurance increased from 53% in 2012 to 54.6% in 2014, whereas those with insurance decreased from 47.0% to 45.4%. About 89.6% of households had two members with a chronic disease and 10.4% had one such member (10.4%).

Table 2. General characteristics of households with cancer patients.

Variable		Year		
		2012	2013	2014
Gender	Male	391 (85.0)	391 (85.0)	391 (85.0)
	Female	69 (15.0)	69 (15.0)	69 (15.0)
Age	≤30	87 (18.9)	87 (18.9)	87 (18.9)
	40	124 (27.0)	124 (27.0)	124 (27.0)
	50	97 (21.1)	95 (20.7)	92 (20.0)
	60	83 (18.0)	84 (18.3)	86 (18.7)
	≥70	69 (15.0)	70 (15.2)	71 (15.4)
Spouse	No	110 (23.9)	115 (25.0)	119 (25.9)
	Yes	350 (76.1)	345 (75.0)	341 (74.1)
Education level	≤Elementary	105 (22.8)	102 (22.2)	100 (21.7)
	≤High school	175 (38.0)	174 (37.8)	172 (37.4)
	≥College	180 (39.1)	184 (40.0)	188 (40.9)
Employment	Employed	276 (60.0)	274 (59.6)	271 (58.9)
	Unemployed	184 (40.0)	186 (40.4)	189 (41.1)
No. of family members		2.36	2.32	2.29
Income level	Log (ordinary income)	28,990	30,230	31,150
Healthcare coverage type	National Health Insurance	396 (86.0)	392 (86.9)	393 (87.1)
	Medical assistance	64 (14.0)	58 (13.1)	57 (12.9)
Private health insurance application	No	244 (53.0)	250 (54.3)	251 (54.6)
	Yes	216 (47.0)	210 (45.7)	209 (45.4)
No. of family member with a chronic disease	1	53 (11.5)	51 (11.1)	48 (10.4)
	≥2	407 (88.5)	409 (88.9)	412 (89.6)
Total		460	460	460

3.2. Trend of Catastrophic Health Expenditure Occurring in Cancer Households

Table 3 presents the trend for the occurrence of catastrophic health expenditures by threshold level in cancer households. On average, the rate of occurrence is 37.2% at the 10% threshold level. The number of households incurring catastrophic health expenditure occurrence shows an increasing trend at the 10% threshold level: 35.0%, 36.9%, and 40.0% in 2012, 2013, and 2014, respectively. Compared to 2012, the rate of occurrence increased for all threshold levels in 2014. A higher threshold level indicates a lower incidence of catastrophic health expenditure and approximately 5% households reported the occurrence of catastrophic health expenditure at the 40% threshold level.

Table 3. Trend of catastrophic health expenditure occurring in cancer households.

	10%	20%	40%	Total
2012	161 (35.0)	123 (26.9)	23 (5.0)	460 (100.0)
2013	169 (36.9)	123 (26.8)	20 (4.4)	460 (100.0)
2014	184 (40.0)	126 (27.4)	22 (4.9)	460 (100.0)
Total	514 (37.2)	372 (26.9)	65 (4.7)	1380 (100.0)

3.3. Transition Probability Analysis of Catastrophic Health Expenditure in Cancer Households

Table 4 presents the results of the transition probability analysis on the occurrence of catastrophic health expenditure as per the current status of cancer householders. We find a 76.1% possibility that households without catastrophic health expenditure in the current year will have no such expenditure in the next year. However, there is an approximately 24% chance that the possibility of incurring catastrophic health expenditure will be at least 10% in the next year. In addition, the analysis reports a 55% possibility that households with at least 40% health expenditure compared to the current solvency will be at the 10% threshold level in the following year.

Table 4. Results for transition probability analysis of catastrophic health expenditure in cancer households.

	t + 1			
	<10	10–40	>40	Total
<10	76.1	18.3	5.6	100.0
10–40	38.3	52.4	9.3	100.0
>40	24.1	53.1	22.8	100.0

Table 5 lists the result for the transition probability analysis on the occurrence of catastrophic health expenditure by household characteristics. There is about a 20% possibility that households without catastrophic health expenditures may incur such expenditures in the following year when the householder is male; however, this probability increases to 30% for a female householder. Those in the older age groups are more vulnerable to the occurrence of catastrophic health expenditures. Furthermore, householders with a spouse are less likely to incur catastrophic health expenditures in the following year, even though they did not suffer such expenses in the current year. However, the recurrence probability in the following year is higher at the 40% threshold level. As for education level, if a householder is an elementary school graduate or lower and did incur catastrophic health expenditure in the current year, there is about a 32% probability of such expenditures occurring in the following year and this rate decreases with an increase in education level. In the case of an economically active householder, the probability of catastrophic health expenditures is lower than the probability for economically inactive households.

Table 5. Transition probability analysis of catastrophic health expenditure of households with cancer patients.

Variable		t (%)	t + 1			
			<10	**10–40**	**>40**	**Total**
Gender	Male	<10	80.72	17.31	1.97	100.00
		10–40	42.35	49.01	8.64	100.00
		≥40	18.00	56.40	25.60	100.00
	Female	<10	70.48	26.80	2.72	100.00
		10–40	35.51	54.27	10.22	100.00
		≥40	29.41	44.39	26.20	100.00
Age	≤30	<10	92.33	7.11	0.56	100.00
		10–40	68.44	31.26	0.3	100.00
		≥40	65.53	31.25	3.22	100.00
	40	<10	83.50	16.23	0.27	100.00
		10–40	66.16	30.11	3.73	100.00
		≥40	28.22	63.12	8.66	100.00
	50	<10	71.45	27.25	1.3	100.00
		10–40	42.23	53.12	4.65	100.00
		≥40	26.11	52.75	21.14	100.00
	60	<10	62.11	36.45	1.44	100.00
		10–40	25.66	59.12	15.22	100.00
		≥40	18.68	51.64	29.68	100.00
	≥70	<10	54.56	34.18	11.26	100.00
		10–40	25.69	56.22	18.09	100.00
		≥40	16.44	49.35	34.21	100.00
Spouse	No	<10	72.24	23.11	4.65	100.00
		10–40	38.51	52.30	9.19	100.00
		≥40	27.52	45.11	27.37	100.00
	Yes	<10	81.22	16.55	2.23	100.00
		10–40	41.35	53.11	5.54	100.00
		≥40	17.22	59.12	23.66	100.00
Educational Level	Elementary school	<10	67.33	24.31	8.36	100.00
		10–40	34.21	56.21	9.58	100.00
		≥40	25.18	48.15	26.67	100.00
	High school	<10	82.01	17.99	0	100.00
		10–40	46.22	47.45	6.33	100.00
		≥40	23.11	59.18	17.71	100.00
	College	<10	89.11	13.12	−2.23	100.00
		10–40	54.23	36.45	9.32	100.00
		≥40	14.11	47.13	38.76	100.00

Table 5. *Cont.*

Variable		t (%)	t + 1			
			<10	**10–40**	**>40**	**Total**
Employment	Employed	<10	81.23	16.11	2.66	100.00
		10–40	45.21	48.42	6.37	100.00
		≥40	26.22	56.12	17.66	100.00
	Unemployed	<10	65.35	24.06	10.59	100.00
		10–40	34.25	57.13	8.62	100.00
		≥40	18.85	52.11	29.04	100.00
Healthcare coverage type	National Health Insurance	<10	76.22	21.36	2.42	100.00
		10–40	26.48	54.14	19.38	100.00
		≥40	21.25	53.11	25.64	100.00
	Medical assistance	<10	81.35	8.94	9.71	100.00
		10–40	56.24	27.48	16.28	100.00
		≥40	0	0	100	100.00
Private health insurance	No	<10	67.67	26.17	6.16	100.00
		10–40	34.22	53.11	12.67	100.00
		≥40	16.52	50.12	33.36	100.00
	Yes	<10	82.34	14.65	3.01	100.00
		10–40	51.55	43.68	4.77	100.00
		≥40	21.33	68.11	10.56	100.00

Finally, households with National Health Insurance report a 23% probability of incurring catastrophic health expenditures in the following year and not in the current year, which is higher than the probabilities for the beneficiaries of medical care (17%). In addition, there is an 18% probability of incurring catastrophic health expenditure in the following year, even though there is no expenditure in the present year, among households with private health insurance; on the other hand, the probability for those without private insurance is 32%.

3.4. Determinants of Catastrophic Health Expenditure Occurrence

Prior to the analysis, we conducted a correlation analysis of the independent variables to examine for multicollinearity among them. We find no coefficient that is 0.7 or higher, indicating the lack of multicollinearity among variables. Furthermore, we performed a panel logit analysis on 1380 households with cancer patients to highlight the factors determining the occurrence of catastrophic health expenditure at the 10, 20, and 40% threshold levels (Table 6). First, the probability of catastrophic health expenditures is 1.4 times higher in households with female householders than male households at the 10% threshold level ($p < 0.001$). At the 20% threshold level or higher, there is no significant difference in probability by gender of householder. We also find a significant difference in probability at all threshold levels with an increase in age ($p < 0.05$). In particular, at the 40% threshold level, the probability gradually increased by age group from 2.16 times for 30 s or below to 2.95 times for 70 s or above. Households with spouses showed a higher probability at all threshold levels compared to those without spouses. Further, with an increase in threshold, the probability for households with spouses increased 1.97 times, 2.11 times, 2.52 times, and 2.94 times. As for education level, elementary school graduates or lower showed a lower probability at all threshold levels. As for households with higher income, the probability decreased 0.84 and 0.88 times at the 10% and 40% threshold levels. In terms of medical security, households receiving medical care reported a lower probability at all

threshold levels than those with National Health Insurance. Households with private health insurance had a lower probability at all threshold levels than those without insurance. Finally, the number of household members with a chronic disease had a significant effect: those with a greater number of members with chronic diseases showed an increased probability of 2.18, 1.91, and 1.74 times for the three threshold levels.

Table 6. Determinants of catastrophic health expenditure of households with cancer patients.

Variable (Reference Group)		10%		20%		40%	
		Coef (SE)	OR	Coef (SE)	OR	Coef (SE)	OR
Gender (male)	Female	−0.23*** (0.10)	0.42	−0.04 (0.19)	0.23	−0.27 (021)	0.31
Age	≤30	0.13 (0.10)	1.08	0.05 (0.19)	1.06	0.67* (0.41)	2.16
	40	0.45*** (0.13)	1.67	0.31** (0.19)	1.34	0.89*** (0.40)	2.64
	50	0.71*** (0.12)	1.89	0.52 (0.16)	1.78	0.91*** (0.38)	2.91
	60	0.80*** (0.14)	2.12	0.71* (0.18)	1.98	1.01*** (0.38)	2.93
	≥70	0.89*** (0.11)	2.23	0.76*** (0.13)	1.88	1.11*** (0.41)	2.95
Spouse (no)	Yes	0.57*** (0.11)	1.97	0.76*** (0.15)	2.11	1.09*** (0.22)	2.52
Education level (≤elementary school)	≤High school	−0.15** (0.07)	0.81	−0.38*** (0.08)	0.75	−0.58*** (0.13)	0.59
	≥College	−0.28*** (0.18)	0.69	−0.56*** (0.14)	0.63	−0.61*** (0.24)	0.48
Employment status (employed)	Not employed	0.42 (0.06)	1.51	0.56 (0.07)	1.58	0.67 (0.16)	0.35
No. of family member		−0.42 (0.04)	0.68	−0.69 (0.05)	0.42	−1.12 (0.13)	0.87
Income (log)		−0.31*** (0.09)	0.84	−0.02 (0.08)	1.21	−0.57*** (0.11)	0.88
Healthcare coverage type (National Health Insurance)	Medical assistance	−1.97*** (0.08)	0.19	−1.64*** (0.17)	0.25	−1.33*** (0.23)	0.29
	Etc.		0.53		0.72		1.21
Private health insurance (no)	Yes	−0.43*** (0.07)	0.77	−0.42*** (0.03)	0.69	−0.78*** (0.15)	0.46
No. of household members with chronic disease		0.69*** (0.04)	2.18	0.63*** (0.05)	1.91	0.42*** (0.14)	1.35
Log likelihood		−5875.64		−4311.58		−1984.64	
Wald chi-square		1687.11***		995.24***		485.44***	

Notes: The Hausman test of fixed and random effects is rejected at the 1% significance level with probability > chi^2 = 0.012. "Coef (SE)" denotes coefficient (standard error) and "OR" is odds ratio. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

4. Discussion

With the constantly increasing number of cancer patients, the burden of out-of-pocket payments for both individuals and households is growing in Korea. To protect households from excessive health expenditures, the Korean government is implementing various health and medical policies. Accounting for this social and policy trend, this study conducted a panel analysis on the effects of demographic characteristics on the occurrence of catastrophic health expenditures in households with cancer patients. More specifically, we first performed a transition probability analysis to determine the occurrence probability for the following year when no catastrophic health expenditure occurred in the current year. The results revealed that, in general, households that incurred catastrophic health expenditures once were more likely to experience a recurrence in the following year. Furthermore, householders who were male and among older age groups showed a higher possibility of incurring catastrophic health expenditures, whereas this possibility was lower for householders with high

education levels and those economically active. The probability was also higher for households with National Health Insurance than those receiving medical care benefits, which suggests that the level of medical security for those with National Health Insurance is insufficient compared to that of households with medical care benefits. Households with private health insurance have a less than half probability of incurring catastrophic health expenditures than those without insurance.

Next, we conducted a panel logit analysis to examine the factors determining the occurrence of catastrophic health expenditure by threshold level and found that the results were consistent with those of the transition probability analysis. However, while the determinants were generally similar between both analyses, they varied by threshold. More specifically, female householders reported a relatively lower probability than male householders [17,18]. Furthermore, the probability was higher among older age groups, indicating that the vulnerability to incurring catastrophic health expenditures increases with age. Householders with spouses showed a higher probability than those without [19–21]. According to the Andersen behavioral model, marital status is a predisposing factor that affects the use of medical services: the likelihood of using medical services decreases in the absence of a spouse owing to limited information or time constraints [22,23]. Higher education levels result in a low incidence of catastrophic health expenditure, which is consistent with the results of previous studies [13,24,25]. In addition, the incidence is low for households with high income and this is in line with the findings of most previous studies [25–28].

The higher probability of catastrophic health expenditure in households receiving medical care benefits suggests that these households have relatively low medical security, which is consistent with existing findings. Sohn et al. proved that this probability is almost four times higher in the group with health insurance than that with medical care; this is because the former have relatively weak security, whereas the government covers most of the health expenditures for the latter. Those with private health insurance report a lower probability than those without private insurance, suggesting that private health insurance complements National Health Insurance [15,20,29–31]. Private health insurance is expanding into various forms and can be considered a positive intervention to prevent unexpected risks. However, it is necessary to reconsider its role if it is due to the poor performance in the public sector [32].

The factors determining the occurrence of catastrophic health expenditure can be referenced in creating healthcare policies for households with cancer patients. The results of our study offer the following implications. First, it is necessary to promote policies that offer insurance premium support for subscribers of National Health Insurance and increase benefits for the near-poverty group. Many subscribers of National Health Insurance belong to poverty and near-poverty groups who do not receive benefits from the National Basic Livelihood Security System (NBLSS) because they fail to meet the requirements for persons under duty to support and the standard of property. To elaborate, they have the same income levels and living standards as those of the NBLSS' recipients; however, they do not qualify for various benefits because they are not eligible beneficiaries. In addition, many of them are in the dead zone of health insurance because of failure to pay their premiums in time. This reiterates the importance of insurance premiums support for low-income groups so that they are guaranteed minimum medical services.

Furthermore, there is a need to expand the scope of special cases in health insurance so that they are exempted from out-of-pocket payments for medical services and improve medical security for low-income groups. It is noteworthy that the incidence of catastrophic health expenditures is low among households with private health insurance [33]. In other words, private health insurance seems to be achieving its original goal of protecting households from excessive health expenditures. Since a majority of insurance holders are households with sound financial capabilities or relatively high income, the incidence of catastrophic health expenditure is likely to be lower. Therefore, it is necessary to discuss the role of private health insurance as complementary in expanding the role of National Health Insurance. Third, to guarantee accessibility to health services among the poor strata with high catastrophic health expenditures and significantly unmet medical needs compared to income, it is

necessary to ease or discontinue legal out-of-pocket payments for medical care. The beneficiaries of type-2 medical care incur 10% of the legal out-of-pocket payment for hospitalization and $1.3 to 15% for outpatient services. By contrast, the use of services under private health insurance is strictly limited, which emphasizes the need to increase accessibility. Furthermore, type-2 beneficiaries are defined as conditional beneficiaries who are able to work and categorized as the absolute poverty group under the National Basic Living Security Act; however, a majority of individuals in need of medical services are patients who cannot work because of their illness. In addition to the lack of proper treatment owing to loss of income, they face difficulties such as legal out-of-pocket payments that restrict their use of medical services. A possible solution is lowering the level of legal out-of-pocket payments for type-2 beneficiaries to that of type-1 beneficiaries. Furthermore, the burden of medical expenditures continues to grow with numerous cases ineligible for benefits. This warrants improvements in the system such that out-of-pocket payments for the use of medical services are reduced.

5. Conclusions

This study offers key insight into the factors determining the occurrence of catastrophic health expenditure in households with cancer patients. However, despite its contributions, it is not free from limitations. First, this study compiled balanced panel data including householders who responded to all panel surveys for years 2012–2014 (seventh–ninth survey data). However, studies using unbalanced panel data reflecting changes in samples may produce different results. Second, this study failed to clarify differences in the occurrence of catastrophic health expenditure in cancer households on the basis of patient condition (stage of cancer). Future research is, thus, needed to address these limitations along with follow-up studies that can mitigate these shortcomings.

Author Contributions: Conceptualization, M.L.; Formal analysis, M.L.; Methodology, M.L.; Supervision, K.Y.; Writing—original draft, M.L.; Writing—review & editing, K.Y.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Kawabata, K.; Xu, K.; Carrin, G. Preventing impoverishment through protection against catastrophic health expenditure. *Bull. World Health Organ.* **2002**, *80*, 612. [PubMed]
2. Su, T.T.; Kouyaté, B.; Flessa, S. Catastrophic household expenditure for health care in a low-income society: A study from Nouna District, Burkina Faso. *Bull. World Health Organ.* **2006**, *84*, 21–27. [CrossRef] [PubMed]
3. Karpur, A.; Bruyère, S.M. Health care expenditure among people with disabilities: Potential role of workplace health promotion and implications for rehabilitation counseling. *Rehabil. Couns. Bull.* **2012**, *56*, 7–22. [CrossRef]
4. Xu, K.; Evans, D.B.; Kawabata, K.; Zeramdini, R.; Klavus, J.; Murray, C.J. Household catastrophic health expenditure: A multicountry analysis. *Lancet* **2003**, *362*, 111–117. [CrossRef]
5. Damme, W.V.; Leemput, L.V.; Hardeman, W.; Meessen, B. Out-of-pocket health expenditure and debt in poor households: Evidence from Cambodia. *Trop. Med. Int. Health* **2004**, *9*, 273–280. [CrossRef] [PubMed]
6. Takeda, Y.; Kawachi, I.; Yamagata, Z.; Hashimoto, S.; Matsumura, Y.; Oguri, S.; Okayama, A. The impact of multiple role occupancy on health-related behaviours in Japan: Differences by gender and age. *Public Health* **2006**, *120*, 966–975. [CrossRef]
7. Van Doorslaer, E.; Wagstaff, A.; Van der Burg, H.; Christiansen, T.; De Graeve, D.; Duchesne, I.; Gerdtham, U.-G.; Gerfin, M.; Geurts, J.; Gross, L. Equity in the delivery of health care in Europe and the US. *J. Health Econ.* **2000**, *19*, 553–583. [CrossRef]
8. Ayanian, J.Z.; Weissman, J.S.; Schneider, E.C.; Ginsburg, J.A.; Zaslavsky, A.M. Unmet health needs of uninsured adults in the United States. *Jama* **2000**, *284*, 2061–2069. [CrossRef]
9. Flores, G.; Krishnakumar, J.; O'donnell, O.; Van Doorslaer, E. Coping with health-care costs: Implications for the measurement of catastrophic expenditures and poverty. *Health Econ.* **2008**, *17*, 1393–1412. [CrossRef]

10. Cabrera-Alonso, J.; Long, M.J.; Bangalore, V.; Lescoe-Long, M. Marital status and health care expenditures among the elderly in a managed care organization. *Health Care Manag.* **2003**, *22*, 249–255. [CrossRef]
11. World Health Organization. *Improving Health System Efficiency: Mexico: Catastrophic Health Expenditure Fund*; World Health Organization: Geneva, Switzerland, 2015.
12. Wagstaff, A. Reflections on and alternatives to WHO's fairness of financial contribution index. *Health Econ.* **2002**, *11*, 103–115. [CrossRef] [PubMed]
13. Sohn, S.; Shin, Y.J.; Kim, C.Y. Factors influencing household catastrophic health expenditure of the poor. *Health Soc. Welf. Rev.* **2010**, *30*, 92–110. [CrossRef]
14. Rout, H.S. Gender and Household Health Expenditure in Odisha, India. *J. Health Manag.* **2010**, *12*, 445–460. [CrossRef]
15. Limwattananon, S.; Tangcharoensathien, V.; Prakongsai, P. Catastrophic and poverty impacts of health payments: Results from national household surveys in Thailand. *Bull. World Health Organ.* **2007**, *85*, 600–606. [CrossRef] [PubMed]
16. Gotsadze, G.; Zoidze, A.; Rukhadze, N. Household catastrophic health expenditure: Evidence from Georgia and its policy implications. *BMC Health Serv. Res.* **2009**, *9*, 69. [CrossRef]
17. Wyszewianski, L. Financially catastrophic and high-cost cases: Definitions, distinctions, and their implications for policy formulation. *Inquiry* **1986**, *23*, 382–394.
18. McLeod, L.; Bereza, B.G.; Shim, M.; Grootendorst, P. Financial burden of household out-of-pocket expenditures for prescription drugs: Cross-sectional analysis based on national survey data. *Open Med.* **2011**, *5*, e1–e9.
19. Sun, L.-Y.; Lee, E.-W.; Zahra, A.; Park, J.-H. Should non-citizens have access to publicly funded health care?: A study of public attitudes and their affecting factors. *Public Health* **2015**, *129*, 1157–1165. [CrossRef]
20. Yardim, M.S.; Cilingiroglu, N.; Yardim, N. Catastrophic health expenditure and impoverishment in Turkey. *Health Policy* **2010**, *94*, 26–33. [CrossRef]
21. Choi, J.-W.; Cho, K.-H.; Choi, Y.; Han, K.-T.; Kwon, J.-A.; Park, E.-C. Changes in economic status of households associated with catastrophic health expenditures for cancer in South Korea. *Asian Pac. J. Cancer Prev. APJCP* **2013**, *15*, 2713–2717. [CrossRef]
22. Wang, F. More Health Expenditure, Better Economic Performance? Empirical Evidence From OECD Countries. *Inquiry* **2015**, *52*. [CrossRef] [PubMed]
23. Kim, H.-K.; Lee, M. Factors associated with health services utilization between the years 2010 and 2012 in Korea: Using Andersen's Behavioral model. *Osong Public Health Res. Perspect.* **2016**, *7*, 18–25. [CrossRef] [PubMed]
24. Berki, S. A look at catastrophic medical expenses and the poor. *Health Aff.* **1986**, *5*, 138–145. [CrossRef]
25. Li, Y.; Wu, Q.; Xu, L.; Legge, D.; Hao, Y.; Gao, L.; Ning, N.; Wan, G. Factors affecting catastrophic health expenditure and impoverishment from medical expenses in China: Policy implications of universal health insurance. *Bull. World Health Organ.* **2012**, *90*, 664–671. [CrossRef] [PubMed]
26. Jiang, C.; Ma, J.; Zhang, X.; Luo, W. Measuring financial protection for health in families with chronic conditions in Rural China. *BMC Public Health* **2012**, *12*, 988. [CrossRef] [PubMed]
27. Lee, H.; Lee, T. Factors associated with incidence and recurrence of household catastrophic health expenditure in South Korea. *Korean Soc. Secur. Stud.* **2012**, *28*, 39–62.
28. 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 Serv. Res.* **2015**, *15*, 26. [CrossRef]
29. Naga, R.H.A.; Lamiraud, K. *Catastrophic Health Expenditure and Household Well-Being*; ESSEC Working paper; ESSEC Research Center: Cergy, Reance, 2011.
30. Saito, E.; Gilmour, S.; Rahman, M.M.; Gautam, G.S.; Shrestha, P.K.; Shibuya, K. Catastrophic household expenditure on health in Nepal: A cross-sectional survey. *Bull. World Health Organ.* **2014**, *92*, 760–767. [CrossRef]
31. Che, Y.; Chongsuvivatwong, V.; Li, L.; Sriplung, H.; Wang, Y.; You, J.; Ma, S.; Yan, Y.; Zhang, R.; Shen, T. Financial burden on the families of patients with hepatitis B virus-related liver diseases and the role of public health insurance in Yunnan province of China. *Public Health* **2016**, *130*, 13–20. [CrossRef]

32. Onwujekwe, O.; Uzochukwu, B. Socio-economic and geographic differentials in costs and payment strategies for primary healthcare services in Southeast Nigeria. *Health Policy* **2005**, *71*, 383–397. [CrossRef]
33. Lee, M.; Yoon, K.; Choi, M. Private health insurance and catastrophic health expenditures of households with cancer patients in South Korea. *Eur. J. Cancer Care* **2018**, *27*, e12867. [CrossRef] [PubMed]