

## RESEARCH ARTICLE

# Changes in Economic Status of Households Associated with Catastrophic Health Expenditures for Cancer in South Korea

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## Abstract

**Background:** Cancer imposes significant economic challenges for individuals, families, and society. Households of cancer patients often experience income loss due to change in job status and/or excessive medical expenses. Thus, we examined whether changes in economic status for such households is affected by catastrophic health expenditures. **Materials and Methods:** We used the Korea Health Panel Survey (KHPS) Panel 1<sup>st</sup>-4<sup>th</sup> (2008-2011 subjects) data and extracted records from 211 out of 5,332 households in the database for this study. To identify factors associated with catastrophic health expenditures and, in particular, to examine the relationship between change in economic status and catastrophic health expenditures, we conducted a generalized linear model analysis. **Results:** Among 211 households with cancer patients, 84 (39.8%) experienced catastrophic health expenditures, while 127 (40.2%) did not show evidence of catastrophic medical costs. If a change in economic status results from a change in job status for head of household (job loss), these households are more likely to incur catastrophic health expenditure than households who have not experienced a change in job status (odds ratios (ORs)=2.17, 2.63, respectively). A comparison between households with a newly-diagnosed patient versus households with patients having lived with cancer for one or two years, showed the longer patients had cancer, the more likely their households incurred catastrophic medical costs (OR=1.78, 1.36, respectively). **Conclusions:** Change in economic status of households in which the cancer patient was the head of household was associated with a greater likelihood that the household would incur catastrophic health costs. It is imperative that the Korean government connect health and labor policies in order to develop economic programs to assist households with cancer patients.

**Keywords:** Job status - cancer - household - catastrophic health expenditure - Korea

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## Introduction

Cancer imposes a significant burden on individuals, families, and society (Cho et al., 2013). Cancer is a major cause of morbidity and mortality worldwide, with 14.1 million new cases diagnosed and 8.2 million deaths in 2012 (World Health Organization, 2013). According to the National Statistics Office in South Korea, cancer accounts for 27.6% of total deaths in Korea with an average mortality rate of 146.5 per 100,000 people in 2012 (National Cancer Institute, 2014).

The cost for diagnosis and treatment of cancer leads to great socioeconomic burden. Importantly, the incidence and survival rate of cancer have increased as a result of early detection and innovative advances in technology and treatment (Kang et al., 2012). Unfortunately, these advances have increased the burden on families as well as patients because of intensive treatments and new, costly chemotherapy in the long-term struggle against

the disease (Park et al., 2013). The Korean government invested tremendous resources between 2005 and 2009 in order to decrease out-of-pocket costs to 5% of total costs incurred by cancer patients and their families. However, households having a family member with cancer still have experienced significant economic burden due to non-insured or partially insured medical costs.

Excessive medical expenses and change in job status often result in income loss for households of cancer-afflicted patients (Chirikos et al., 2002). A study in Korea of persons employed when diagnosed with cancer showed that 26% lost their jobs within the first year following diagnosis (Park et al., 2008). Even without actual job loss, decreases in wages resulting from reduced work hours due to treatment can adversely affect household income, an effect that will not be shown in data related solely to whether people are employed or not. A recent telephone interview study of 453 Canadian breast cancer patients who worked during cancer treatment showed a

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27% average reduction in earned wages in the first year following a cancer diagnosis (Lauzier et al., 2008). In addition, family members may have to reduce paid work to accommodate treatment schedules, emotional needs, and other demands, such as providing support and care for the family member receiving treatment (Longo et al., 2006). Family caregivers of terminal cancer patients suffer job loss and severe work-related difficulties, probably due to caregiving itself and to fatigue (Kim et al., 2013). Taken together, high medical expenses as well as change in job status for the cancer patient as well as family members may result in catastrophic health expenditures for the household.

Catastrophic health expenditures are one index used to measure the burden of medical costs upon households at the national level; it estimates the proportion of households that spend a certain amount of income or subsistence expenditures on health costs (Xu et al., 2003). However, there is no consensus for what threshold delineates the true burden experienced by these households because a wide range of threshold criteria has been used in other studies. Catastrophic health expenditures have been defined as when direct health expenses exceed 5% to more than 20% of household income (Wyszewianski, 1986), as medical costs in excess of 10%-40% of the ability of a household to pay (Wagstaff and van Doorslaer, 2003), or when direct health care spending exceeds 40% of a household's other expenses, excluding subsistence needs (Xu et al., 2006). For the purpose of this study, we defined catastrophic health expenditure as medical expenses in excess of 10% of disposal income.

Time after cancer diagnosis plays a role in the financial burden in households as well; other studies have provided evidence that both direct and indirect factors contribute to patient costs (Houts et al., 1984; Stommel et al., 1993; Guidry et al., 1998; Longo et al., 2006). However, there are very few studies that have investigated the impact of direct or indirect medical expenses and change in economic status on the household and their relationship to catastrophic health expenditure. Because the head of household has the prime responsibility for the household's livelihood and influences the economic decisions of the household (Aguiar, 2005), a change in economic status of the head of household with cancer may impact catastrophic medical costs incurred by the household. Thus, we examined whether a change in economic status of the head of household with cancer contributes to catastrophic health expenditures for the household.

## Materials and Methods

Data from the Korea Health Panel Survey (KHPS) Panel 1<sup>st</sup>-4<sup>th</sup> (2008-2011 subjects) co-produced by the Korea Institute for Health and Social Affairs along with the National Health Insurance Service was obtained for this study. The survey consisted of (1) demographic and socio-economic characteristics of individuals, (2) income, and (3) health care utilization and expenditures (Korea Institute for Health Social Affairs, 2009).

The methodology alleviated the problems of recall bias

by using housekeeping books or receipts for healthcare spending. This research included data from the 1<sup>st</sup> (7866 households), 2<sup>nd</sup> (6798 households), 3<sup>rd</sup> (6433 households), and 4<sup>th</sup> (6042 households) for 4 years research periods. We excluded households that were dropped or added during the 1<sup>st</sup> to 4<sup>th</sup> research periods and we finally settled on querying 5,332 households. Of these households, we extracted 211 households who had a family member with cancer for this study. The data we used did not include survey information about post-cancer diagnosis period and we considered this an important factor as well. Therefore, we estimated the post-diagnosis period by for incidence of cancer in individuals showing up in the 1<sup>st</sup> to 3<sup>rd</sup> data set and analyzed the 3<sup>rd</sup> to 4<sup>th</sup> data set with the information.

The main independent variable for this study is the change in economic status for the head of household. We stratified the households based on four categories with respect to job status (employed no change, employed-then-unemployed, unemployed-then-employed, or unemployed-no change).

In this study we used several covariates to control for demographic and socioeconomic characteristics and health status. Demographic characteristics included gender, age, marital status, and socioeconomic factors including education and the type of health insurance, such as National Health Insurance, and Medical Aid (tax-financed program for the poor). Income level was measured by summing the total family income, including the income from employment, assets, pensions, financial support from the government, and other sources. Household income was adjusted by taking the square root of the number of members of the household. As a proxy for health status, we used head of household self-rated health to control for the participant's health condition and health behavior, which can affect health care utilization. In addition, we stratified groups according to time elapsed (one, two and three years) after cancer diagnosis because the economic burden likely is greater the longer a patient has survived after diagnosis.

The dependent variable used was catastrophic health expenditure and we compared between households with and without catastrophic health expenditure. We considered the individual out-of-pocket health care expenditure as catastrophic if the annual medical expenses were more than 10% of the total yearly household income. Our analysis used a high threshold value because the criterion of catastrophic health expenditure is indicative of the burden of medical expense on the household; cancer is a severe disease that imposes additional burdens because of other factors (Kim, 2002).

The frequency with which catastrophic health expenditure occurred overall and after stratifying by household demographic and socioeconomic status was determined by performing a chi-square test. To identify factors associated with catastrophic health expenditure and, in particular, to examine the relationship between change in economic status and catastrophic health expenditure, we conducted a generalized linear model analysis. We used the SAS 9.2 statistical package (Cary, NC, USA) for analysis.

## Results

The general characteristics of households with cancer patients are shown in Table 1. Among 211 households with cancer patients, 84 (39.8%) experienced catastrophic health expenditure, while 127 (60.2%) did not. At the level of the head of household, there was no significant difference in the proportion of males or females ( $p=0.18$ ) experiencing catastrophic health expenditure. Senior citizens represented a higher proportion of individuals experiencing catastrophic health expense than younger people. A lower level of education of the head of household was associated with a higher frequency of catastrophic health expense. There was no significant difference in catastrophic health expense associated with marital status ( $p=0.11$ ). However, there was significant difference in the proportion of economic status experiencing catastrophic health expenditure.

At the household level, there was no significant difference between groups stratified according to time post-cancer diagnosis in the proportion of those experiencing catastrophic health expenditure ( $p=0.60$ ).

The lower income groups were associated with an overall higher frequency of catastrophic health expenditure compared to those without catastrophic medical cost. Households including senior citizens were associated with a higher frequency of catastrophic health expense.

There were no significant differences in the proportion of catastrophic health expenditure for health insurance type and self-rated health ( $p=0.21, 0.70$ , respectively). Finally, there was significant difference in the proportion of number of family members experiencing catastrophic health expenditure.

Table 2 presents the results from generalized linear model analysis conducted to identify factors associated with catastrophic health expenditure in households in Korea. The female heads of household were more likely to experience catastrophic health expenditure than male heads of household (Odds ratio (OR)=1.02, 95% CI: 1.01-1.04). Compared with heads of household less than 49 years-old, those 50-64 years old were 1.3 times more likely to experience catastrophic health expenditure. Heads of household living with a spouse had a higher risk of catastrophic medical cost than those who were divorced or separated. Households where the head of household experienced a change in job status from employed to unemployed, and households where the head of household was unemployed with no change, were more likely to incur catastrophic health expenditure compared to households who did not experience a change in economic status (OR=2.17, 2.63, respectively). Compared with the households with newly-diagnosed cancer patients, the households with a cancer patient one or two years post-diagnosis were more likely to experience catastrophic

**Table 1. General Characteristics**

Variables	Catastrophic health expenditure					* p value	
	Total	With Cata	%	Without Cata	%		
Level of head of household							
Gender							
	Male	177	74	88.1	103	81.1	0.1762
	Female	34	10	11.9	24	18.9	
Age							
	≤49	100	22	11.9	78	29.2	<.0001
	50-64	142	41	22.2	101	37.8	
	≥65	180	98	53	82	30.7	
Education level							
	Below elementary school	56	27	32.1	29	22.8	0.0297
	Middle school	39	17	20.2	22	17.3	
	High school	63	28	33.3	35	27.6	
	Above university	53	12	14.3	41	32.3	
Marital status							
	Married	168	71	84.5	97	76.4	0.1059
	Divorced or separated	39	11	13.1	28	22	
Economic status							
	Employed -> employed	127	39	46.4	88	69.3	0.001
	Employed -> unemployed	16	10	11.9	6	4.7	
	Unemployed -> employed	7	1	1.2	6	4.7	
	Unemployed -> unemployed	61	34	40.5	27	21.3	
Level of head of household Post-cancer diagnosis period							
	Onset	94	41	48.8	53	41.7	0.598
	1 year	35	13	15.5	22	17.3	
	2 years	82	30	35.7	52	40.9	
Income							
	High	76	10	11.9	66	52	<.0001
	Middle	63	26	31	37	29.1	
	Low	72	48	57.1	24	18.9	
Health insurance type							
	Health insurance	192	79	94	113	89	0.2078
	Medical aid	19	5	6	14	11	
Number of family members							
	1	22	7	8.3	15	11.8	0.0036
	2	79	44	52.4	35	27.6	
	3	43	14	16.7	29	22.8	
	4	67	19	22.6	48	37.8	
Senior citizens in household							
	None	108	31	36.9	77	60.6	0.0007
	>1 person	103	53	63.1	50	39.4	
Self-rated health							
	Good	97	40	47.6	57	44.9	0.6962
	Bad	114	44	52.4	70	55.1	
Total		211	84	100	127	100	

\* p values from Pearson's Chi-square test

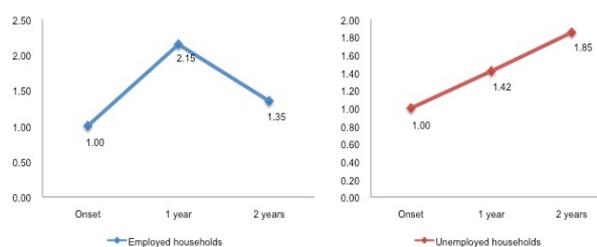
**Table 2. Factors Associated with Catastrophic Health Expenditure**

Variables		Catastrophic health expenditure	
		Adjusted OR*	95% CI
Level of head of household			
Gender	Male	1.00	
	Female	1.02	(1.01-1.04)
Age	≤49	1.00	
	50-64	1.29	(1.27-1.31)
	≥65	0.92	(0.89-0.95)
Education level	Above university	1.00	
	High school	2.21	(2.18-2.24)
	Middle school	1.68	(1.65-1.70)
	Below elementary school	1.95	(1.91-1.98)
Marital status	Married	1.00	
	Divorced or separated	40.00	(0.39-0.41)
Economic status	Employed -> employed	1.00	
	Employed -> unemployed	2.17	(2.13-2.21)
	Unemployed -> employed	0.90	(0.88-0.92)
	Unemployed -> unemployed	2.63	(2.59-2.66)
Level of head of household Post-cancer diagnosis period			
	Onset	1.00	
	1 year	1.78	(1.75-1.80)
	2 years	1.36	(1.35-1.38)
Income	High	1.00	
	Middle	2.27	(2.24-2.30)
	Low	9.78	(9.65-9.91)
Health insurance type	Health insurance	1.00	
	Medical aid	0.81	(0.80-0.82)
Number of family members	1	1.00	
	2	1.72	(1.70-1.75)
	3	1.55	(1.53-1.58)
	4	1.48	(1.45-1.52)
Senior citizens in household	None	1.00	
	>1 person	1.35	(1.32-1.38)
Self-rated health	Good	1.00	
	Bad	1.08	(1.07-1.09)

\*Adjusted odds ratio from generalized linear model analysis with all the variables in Table 1

medical costs (OR=1.78, 1.36, respectively). There was a clear association between catastrophic health expenditure and household income. Households with low or middle income were more likely to engage in problem drinking than those with higher income (OR=2.27, 9.78, respectively). Households receiving medical aid had a lower risk of catastrophic medical costs than those with health insurance (OR=0.81, 95% CI: 0.80-0.82). Households living with senior citizens had a higher risk of catastrophic health expenditure than those without (OR=1.35, 95% CI: 1.32-1.38). The households engaged in unhealthy practices (such as excessive drinking) had a higher risk of incurring catastrophic medical cost than healthy households (OR=1.08, 95% CI: 1.07-1.09). Compared with the households of individuals living alone, the households having two to four family members were more likely to incur catastrophic medical cost (OR=1.72, 1.55, 1.48 respectively).

Figure 1 shows the association between time post-cancer diagnosis and catastrophic health expenditure according to economic status. We stratified the households into households where the head of household maintained employment and those where the head of household was unemployed. The households with employment at 1 year after cancer diagnosis were more likely to incur catastrophic health expenditure than those at 2 years post-cancer diagnosis. The unemployed households, however,



**Figure 1. Association with Post-Cancer Diagnosis Period and Catastrophic Health Expenditure by Economic Status**

were more likely to incur catastrophic health expenditure immediately after cancer diagnosis.

## Discussion

In this study, the change in economic status of the head of household with cancer was hypothesized to be associated with catastrophic health expenditure for the household. In addition, we stratified households where the head of household was employed and where the head of household was unemployed and examined whether the households were affected by a change in job status of the head of household according to post-cancer diagnosis period, respectively.

We found that the households in which there was a job loss were 2.17 times more likely to incur catastrophic health expenditure than households without job loss. Our results suggest that a cancer diagnosis brings the likelihood of unemployment and income changes for cancer patients. That is, this finding suggests that many newly diagnosed cancer patients may be at risk for financial difficulties, a potentially important issue for families.

In addition, previous studies showed that 20% of caregivers provided fulltime or constant care (Bukki et al., 2013); 5-20% of caregivers had quit their jobs or declined advancement as a result of caregiving (Dybicz et al., 2011; Fairfield et al., 2012; Pantilat et al., 2012). Fatigability was another major reason for unemployment among cancer survivors in previous studies (Phipps et al., 2011; Flannelly et al., 2012). Thus, a health crisis may result in a loss or a reduction in productivity of household members (Wagstaff, 2007).

This study also discovered factors significantly associated with catastrophic health expenditure: female head of household, low education level, old age, married, low household income, living with senior citizens, bad self-rated health, health insurance type and early post-cancer diagnosis stage. These findings are in agreement with previous studies (Su et al., 2006; Kang, 2009; Song and Shin, 2010; Kavosi et al., 2012). Furthermore, Korea has a national health care system that is not connected to employment status, unlike countries such as the United States, where work decisions may be influenced by employment-connected health insurance. Korea has a divided health insurance and medical aid policy with regard to national health insurance. The government assists poor people through its medical aid policy; therefore, the incidence of catastrophic health expenditure for medical aid beneficiaries is low because the government contributes

to low out-of-pocket obligations for poor people (Choi, 2012). However, medical aid beneficiaries comprise only 3% of the total population in Korea. Thus, for the general population, unemployment of the head of household is not compensated for by health insurance if devastating diseases such as cancer occur in a household. Medical costs related to cancer are high in the early stage (the first year) after cancer diagnosis (Statistics Korea, 2014). However, households in which the head of household is unemployed are more likely to incur catastrophic health expenditure over time. Therefore, income indemnity insurance or emergency relief assistance policies need to be considered in the long-term to protect people at risk for high medical expenditures due to severe illnesses such as cancer, although support focused on medical expenditures themselves also is important.

In conclusion, we were able to prove that the change in economic status of the head of household with cancer was associated with catastrophic health expenditure for the household. In addition, we found that catastrophic health expenditure in the household was impacted by the length of time post-cancer diagnosis. The Korean government needs to take a comprehensive approach to health and labor policies in order to develop programs to effectively assist households with managing the economic impact of cancer.

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## References

- Aguiar M (2005). Consumption versus expenditure. *Journal of Political Economy*, **113**, 919-48.
- Bukki J, Klein J, But L, et al (2013). Methicillin-resistant staphylococcus aureus (MRSA) management in palliative care units and hospices in Germany: a nationwide survey on patient isolation policies and quality of life. *Palliat Med*, **27**, 84-90.
- Chirikos TN, Russell-Jacobs A, Cantor AB (2002). Indirect economic effects of long-term breast cancer survival. *Cancer Pract*, **10**, 248-55.
- Cho KH, Park S, Lee KS, et al (2013). A single measure of cancer burden in Korea from 1999 to 2010. *Asian Pac J Cancer Prev*, **14**, 5249-55.
- Choi JG (2012). Impacts of the benefit extension policy on financial burden and catastrophic health care expenditure. *Korean J Health Economics Policy*, **18**, 19.
- Dybiczb SB, Thompson S, Molotsky S, Stuart B (2011). Prevalence of diabetes and the burden of comorbid conditions among elderly nursing home residents. *Am J Geriatr Pharmacother*, **9**, 212-23.
- Fairfield KM, Murray KM, Wierman HR, et al (2012). Disparities in hospice care among older women dying with ovarian cancer. *Gynecol Oncol*, **125**, 14-8.
- Flannelly KJ, Emanuel LL, Handzo GF, et al (2012). A national study of chaplaincy services and end-of-life outcomes. *BMC Palliat Care*, **11**, 10.
- Guidry JJ, Aday LA, Zhang D, Winn RJ (1998). Cost considerations as potential barriers to cancer treatment. *Cancer Pract*, **6**, 182-7.
- Houts PS, Lipton A, Harvey HA, et al (1984). Nonmedical costs to patients and their families associated with outpatient chemotherapy. *Cancer*, **53**, 2388-92.
- Kang MS, Jang HS, Lee M, Park EC (2012). Sustainability of Korean national health insurance. *J Korean Med Sci*, **27**, 21-4.
- Kang TW (2009). Analysis of private health insurance on catastrophic health expenditure of household with cancer patient. Graduate School of Public Health, Seoul National University.
- Kavosi Z, Rashidian A, Pourreza A, et al (2012). Inequality in household catastrophic health care expenditure in a low-income society of Iran. *Health Policy Plan*, **27**, 613-23.
- Kim CB (2002). A Care Condition of Cancer Patients In Health Insurance. Korea National Health Insurance Service.
- Kim SY, Chang YJ, Do YR, et al (2013). Employment status and work-related difficulties among family members of terminally ill patients compared with the general population. *Asian Pac J Cancer Prev*, **14**, 373-80.
- Kim SY, Kim SG, Park JH, Park EC (2009). Costs of initial cancer care and its affecting factors. *J Prev Med Public Health*, **42**, 243-50.
- Lauzier S, Maunsell E, Drolet M, et al (2008). Wage losses in the year after breast cancer: extent and determinants among Canadian women. *J Natl Cancer Inst*, **100**, 321-32.
- Longo CJ, Fitch M, Deber RB, Williams AP (2006). Financial and family burden associated with cancer treatment in Ontario, Canada. *Support Care Cancer*, **14**, 1077-85.
- Pantilat SZ, Kerr KM, Billings JA, et al (2012). Characteristics of palliative care consultation services in California hospitals. *J Palliat Med*, **15**, 555-60.
- Park JH, Lee KS, Choi KS (2013). Burden of cancer in Korea during 2000-2020. *Cancer Epidemiol*, **37**, 353-9.
- Park JH, Park EC, Park JH, et al (2008). Job loss and re-employment of cancer patients in Korean employees: a nationwide retrospective cohort study. *J Clin Oncol*, **26**, 1302-9.
- Phipps MS, Desai RA, Wira C, Bravata DM (2011). Epidemiology and outcomes of fever burden among patients with acute ischemic stroke. *Stroke*, **42**, 3357-62.
- Song EC, Shin YJ (2010). The effect of catastrophic health expenditure on the transition to poverty and the persistence of poverty in South Korea. *J Prev Med Public Health*, **43**, 423-35 (in Korean).
- Stommel M, Given CW, Given BA (1993). The cost of cancer home care to families. *Cancer*, **71**, 1867-74.
- Su TT, Kouyate B, Flessa S (2006). Catastrophic household expenditure for health care in a low-income society: a study from nouna district, burkina Faso. *Bull World Health Organ*, **84**, 21-7.
- Wagstaff A (2007). The economic consequences of health shocks: evidence from Vietnam. *J Health Econ*, **26**, 82-100.
- Wagstaff A, van Doorslaer E (2003). Catastrophe and impoverishment in paying for health care: with applications to Vietnam 1993-1998. *Health Econ*, **12**, 921-34.
- Wyszewianski L (1986). Families with catastrophic health care expenditures. *Health Serv Res*, **21**, 617-34.
- Xu K, Evans DB, Kadama P, et al (2006). Understanding the impact of eliminating user fees: utilization and catastrophic health expenditures in Uganda. *Soc Sci Med*, **62**, 866-76.
- Xu K, Evans DB, Kawabata K, et al (2003). Household catastrophic health expenditure: a multicountry analysis. *Lancet*, **362**, 111-7.