

Original Article

# Health Conditions Sensitive to Retirement and Job Loss Among Korean Middle-aged and Older Adults

Susan Park<sup>1,2</sup>, Sung-II Cho<sup>1</sup>, Soong-Nang Jang<sup>3</sup>

<sup>1</sup>Graduate School of Public Health, Seoul National University; <sup>2</sup>Nursing Science Research Institute, Chung-Ang University;

<sup>3</sup>Department of Nursing, Red Cross College of Nursing, Chung-Ang University, Seoul, Korea

**Objectives:** This study was conducted to examine the association between health condition and leaving the labor market among middle-aged and older adults in South Korea.

**Methods:** Data was obtained from individuals aged 45 years and older participating in the 2006 and 2008 Korean Longitudinal Study of Ageing. We used various health measures including chronic diseases, comorbidities, traffic accident injuries, disability of instrumental activities of daily living, depressive symptoms, and self-rated health. The odds ratios of job loss, and retirement, versus employment were calculated using multinomial logistic regression by each health measure.

**Results:** In our cross-sectional and longitudinal analysis, health problems related to physical disabilities had the greatest effect on leaving the worksite. A shift in health condition from good to poor in a short period was a predictor of increased risk of unemployment but a persistent pattern of health problems was not associated with unemployment. Women with health problems showed a high probability of retirement, whereas among men, health problems instantly the possibility of both job loss and retirement.

**Conclusions:** Health problems of middle aged and older workers were crucial risk factors for retirement and involuntarily job loss. Especially functional defect and recent health problems strongly and instantly affected employment status.

**Key words:** Chronic disease, Disability, Depression, Wounds and injuries, Retirement, Job loss  
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## INTRODUCTION

Occupational health involves a consideration of the two-way relationship between work and health [1]. Working environment influences workers' health, and in turn, health condition affects working productivity and labor force participation. Therefore, occupational health professionals have to pay attention to risk management of the relationship between work and health, and health and work. However, most studies from a public health perspective have focused on only a one-sided relationship—considering only the influence of working environment on health [2-4]. Health status has been considered a factor for employment status based on the social selection hypothesis in previous epidemiological studies [5,6]. Economic research, mostly focused on work ability issues, has suggested that chronic disease and disability are determinants of participation in the labor force, labor supply, salary level, and work hours [7,8].

Although increasing empirical evidence from the last

decade supports a link between health and leaving the labor force, less is known about the plausible association in Korean society, in which early retirement and job loss exploded after the South Korea's economic crisis in the late of 1990s. Research on Korean cases has relevance because it may capture the vicious cycle of poor health, unemployment, and poverty, especially among the middle-aged or older population in a rapidly aging society. It has been noted in some studies that age discrimination in the workplace has become more common since the national economic crisis leading to an increase in early retirement and involuntarily job loss in Korea [9]. However, older Koreans face considerable financial distress if they do not continue to work in their old age. Specifically, Korea is distinguished by the high employment rates among adults aged 60 or older: 55% for 60 to 64 years old and 30% for 65 years old and over in 2006. These rates are higher than the mean labor force participation rates for men and women in this age group in Organization for Economic Cooperation and Development countries [10]. Although they may plan to work in a "bridge" job after temporary job loss or

retirement due to health issues, they may realize that they cannot find employment appropriate to their health status. Such unmet needs may negatively affect health among both the employed older population and the unemployed, including both those dealing with job loss and retired people [10].

Middle-aged and older individuals are transitioning not only in terms of health but also in terms of social roles. Thus, it would be valuable to identify how changes in health status influence changes in employment status, as the relationship between health and social role may be reinforced in this age group. Additionally, identifying the differences in each health outcome is a crucial task to gain a clear understanding of the pathways to employment.

The objective of this study was to determine which health problems are predictive of workers' leaving the labor market among middle-aged and older Koreans. We aimed to encompass various health outcomes including a change of health status in a short period. Consequently, this study provided information for the occupational health program to manage the risk of workers in poor health.

## METHODS

### I. Data

We used baseline (2006) and second wave (2008) data obtained from the Korean Longitudinal Study of Ageing, which was designed to produce a nationally representative sample [10]. In the baseline survey, 10 254 individuals aged 45 or over participated, and the second wave data included 8688 repeat participants (follow-up losses, 1379; deaths, 187). We used all of the data from the two waves except cases with incomplete information (n=124).

### II. Measures

Baseline employment status was classified into three categories: employment, job loss, and retirement. Those outside of the labor force were excluded. Among those who had worked before, people not currently working but seeking a job were classified as having lost a job. People who were retired and had no interest in working were categorized as retired. Follow-up employment status focused on the change in employment status from baseline among employed workers. Follow-up employment status was categorized into continuing employment, transition to job loss, and retirement from

employment since baseline.

We used various health measures including chronic diseases, comorbidities, traffic accident injuries, instrumental activities of daily living (IADL) disability, depressive symptoms, and self-rated health. The number of chronic diseases was categorized into three groups (0, 1, and 2 or more). Depressive symptoms were defined as a score above 4 on the Center for Epidemiological Studies-Depression 10 scale [11]. Self-rated poor health was defined as the answers of poor and very poor.

We classified recent changes in chronic diseases, traffic accident injuries, and disabilities into three time frames for assessment: 1) none, 2) before baseline, and 3) during the follow-up period. Changes in self-rated health and depression were categorized into four groups: 1) continuously good, 2) from poor to good, 3) from good to poor, and 4) continuously poor. Covariates included age, marital status, education level, type of health insurance, tertile of household equivalent income, and type of employment contract.

### III. Analysis

We calculated a weighted percentage of each employment status according to socio-economic status and health problems at baseline. We then presented the absolute percentage (non-weighted) of follow-up employment status among the baseline employed. We did not apply the sample weights for longitudinal analysis because we used only an employed subsample derived from the whole data set.

For the cross-sectional analysis, we used multinomial logistic regression to calculate the odds ratios (ORs), adjusting for covariates based on likelihood estimates of job loss, and retirement, versus employment at baseline. Each category of health problem was analyzed with a separate multinomial logit model. To compare the effects of short and long-term health problems, we simultaneously analyzed the baseline health problems and the recent health problems during the follow-up interval. The ORs of transition to job loss and retirement versus staying employed were calculated with adjustments for baseline covariates.

The analysis of specific types of chronic diseases was excluded because of low frequency. Men and women were separately analyzed due to different distribution and transition patterns in employment status. Multinomial analysis was performed with SAS version 9.2 (SAS Inc., Cary, NC, USA) using PROC SURVEY-LOGISTIC for cross-sectional analysis and PROC CATMOD for longitudinal analysis.

**Table 1.** Employment status according to socio-economic position at baseline survey

	Men				Women			
	n <sup>1</sup>	Employed	Job loss	Retired	n	Employed	Job loss	Retired
Total	3318	69.9 (0.8)	8.2 (0.5)	21.9 (0.7)	2097	58.5 (1.1)	10.9 (0.7)	30.6 (1.0)
Age (y)								
45 - 54	1140	90.0 (1.0)	6.6 (0.8)	3.3 (0.6)	941	70.4 (1.6)	14.3 (1.2)	15.2 (1.2)
55 - 64	1005	68.2 (1.5)	10.9 (1.0)	21.0 (1.4)	582	55.3 (2.2)	9.0 (1.3)	35.8 (2.1)
≥ 65	1173	34.5 (1.5)	6.4 (0.7)	59.1 (1.5)	574	35.1 (2.1)	5.9 (1.0)	59.0 (2.2)
Marital status								
With a living partner	3075	71.7 (0.9)	7.1 (0.5)	21.2 (0.7)	1497	63.7 (1.3)	10.1 (0.8)	26.2 (1.2)
Without a living partner	243	47.5 (3.6)	21.8 (3.0)	30.7 (3.1)	600	43.8 (2.2)	13.3 (1.5)	42.9 (2.1)
Education								
No formal education	222	45.9 (3.7)	7.3 (2.2)	46.9 (3.6)	487	42.3 (2.4)	8.6 (1.4)	49.1 (2.4)
Elementary/middle school	1256	65.9 (1.4)	10.2 (1.0)	23.9 (1.2)	968	61.0 (1.7)	9.7 (1.0)	29.3 (1.5)
More than high school	1840	74.5 (1.1)	7.0 (0.6)	18.5 (0.9)	642	64.6 (2.0)	14.1 (1.5)	21.3 (1.7)
Health insurance								
Public health insurance	3157	71.8 (0.8)	7.4 (0.5)	20.8 (0.7)	1957	59.9 (1.2)	10.7 (0.8)	29.4 (1.1)
Medicare	161	32.0 (4.1)	23.8 (3.9)	44.2 (4.3)	140	36.8 (4.4)	14.0 (3.3)	49.2 (4.5)
Equivalent household income								
1T	985	50.6 (1.8)	12.6 (1.2)	36.8 (1.6)	672	45.8 (2.1)	11.4 (1.3)	42.8 (2.0)
2T	1070	69.8 (1.5)	9.1 (1.0)	21.1 (1.3)	729	61.0 (1.9)	11.2 (1.3)	27.9 (1.7)
3T	1263	82.3 (1.1)	4.6 (0.6)	13.1 (0.9)	696	66.7 (1.9)	10.3 (1.2)	23.0 (1.6)
No. of chronic diseases								
0	1971	79.0 (0.9)	7.1 (0.6)	13.9 (0.8)	1132	67.2 (1.5)	12.7 (1.1)	20.1 (1.2)
1	887	60.1 (1.8)	8.4 (1.0)	31.5 (1.6)	604	52.0 (2.1)	9.7 (1.3)	38.3 (2.1)
2+	460	44.2 (2.7)	12.8 (1.8)	43.0 (2.6)	361	38.8 (2.8)	6.7 (1.6)	54.4 (2.8)
Self-rated health								
Good	2649	77.1 (0.8)	7.1 (0.5)	15.8 (0.7)	1384	65.5 (1.3)	11.9 (0.9)	22.7 (1.2)
Poor	669	37.7 (2.1)	13.1 (1.5)	49.2 (2.1)	713	43.6 (2.0)	8.9 (1.2)	47.6 (2.0)
Depression <sup>2</sup>								
No	2569	74.7 (0.9)	7.0 (0.6)	18.3 (0.8)	1338	65.6 (1.4)	9.2 (0.9)	25.3 (1.2)
Yes	749	51.5 (2.0)	12.7 (1.4)	35.8 (1.9)	759	45.1 (1.9)	14.2 (1.4)	40.7 (1.9)
Traffic accident injury								
No	2935	70.1 (0.9)	7.9 (0.6)	22.0 (0.8)	1882	59.0 (1.2)	11.0 (0.8)	30.0 (1.1)
Yes	383	69.1 (2.5)	10.0 (1.7)	20.8 (2.1)	215	53.2 (3.6)	10.2 (2.3)	36.5 (3.4)
IADL disability								
No	2846	72.4 (0.9)	8.2 (0.6)	19.4 (0.7)	1931	59.8 (1.2)	11.5 (0.8)	28.7 (1.1)
Yes	472	54.5 (2.5)	7.6 (1.4)	37.9 (2.4)	166	38.7 (4.0)	2.2 (1.2)	59.1 (4.1)
Employment contract								
Self-employed	2305	100 (0.0)			1548	100 (0.0)		
Nonstandard employed	256	100 (0.0)			239	100 (0.0)		
Standard employed	756	100 (0.0)			310	100 (0.0)		

Data are presented as weighted % (SE).

IADL, instrumental activity of daily living; T, tertile.

<sup>1</sup> Non-weighted sample frequency.

<sup>2</sup> Depression was categorized by a score of more than 4 on the Center for Epidemiological Studies Depression Scale-10 item.

## RESULTS

About half of the women had worked regularly, whereas over 90% of the men had work experience (data not shown). Approximately 50% of the total sample suffered from one or more chronic diseases. Both genders showed a high proportion of employment in the following categories: having a living partner, high education level, public health insurance, and high household income (Table 1).

Approximately 6% of workers had been newly diagnosed with a chronic disease within the past 2 years

and traffic accident injuries and IADL disability were higher in men than in women. During the follow-up interval, 4.3% (8.5%) and 5.4% (10.1%) of employed men (women) lost their job and retired, respectively (Table 2).

Table 3 shows a cross-sectional and longitudinal association between health problems and employment status after adjusting for age, marital status, education, health insurance, household equivalent income, and employment contract. In the results of the cross-sectional analysis, job loss and retirement were related to most of the health problems among men, whereas women's

**Table 2.** Employment status of baseline employed subjects according to health problems within a follow-up

	Men				Women			
	Baseline employed	2-year follow-up			Baseline employed	2-year follow-up		
		Employed	Job loss	Retired		Employed	Job loss	Retired
Total (n)	2116	1912 (90.4)	90 (4.3)	114 (5.4)	1184	963 (81.3)	101 (8.5)	120 (10.1)
Health problems at baseline								
Comorbidity								
0	1463	1347 (92.1)	56 (3.8)	60 (4.1)	750	635 (84.7)	54 (7.2)	61 (8.1)
1	475	419 (88.2)	25 (5.3)	31 (6.5)	305	235 (77.1)	33 (10.8)	37 (12.1)
2+	178	146 (82.0)	9 (5.1)	23 (12.9)	129	93 (72.1)	14 (10.9)	22 (17.1)
Self-rated poor health	225	187 (83.1)	11 (4.9)	27 (12.0)	293	229 (78.2)	26 (8.9)	38 (13.0)
Depression	354	308 (87.0)	17 (4.8)	29 (8.2)	331	259 (78.3)	32 (9.7)	40 (12.1)
Traffic accident injury	242	218 (90.1)	10 (4.1)	14 (5.8)	108	84 (77.8)	14 (13.0)	10 (9.3)
IADL disability	218	194 (89.0)	9 (4.1)	15 (6.9)	59	48 (81.4)	6 (10.2)	5 (8.5)
Health problems during f/u interval								
Comorbidity								
0	1334	1242 (93.1)	47 (3.5)	45 (3.4)	674	580 (86.1)	45 (6.7)	49 (7.3)
1	539	475 (88.1)	29 (5.4)	35 (6.5)	334	259 (77.5)	38 (11.4)	37 (11.1)
2+	243	195 (80.3)	14 (5.8)	34 (14.0)	176	124 (70.5)	18 (10.2)	34 (19.3)
Self-rated poor health	397	311 (78.3)	26 (6.6)	60 (15.1)	394	295 (74.9)	38 (9.6)	61 (15.5)
Depression	815	708 (86.9)	46 (5.6)	61 (7.5)	601	462 (76.9)	63 (10.5)	76 (12.7)
Traffic accident injury	277	241 (87.0)	17 (6.1)	19 (6.9)	121	93 (76.9)	16 (13.2)	12 (9.9)
IADL disability	328	272 (82.9)	22 (6.7)	34 (10.4)	76	55 (72.4)	7 (9.2)	14 (18.4)
Diagnosis of chronic disease								
None	1334	1242 (93.1)	47 (3.5)	45 (3.4)	674	580 (86.1)	45 (6.7)	49 (7.3)
Before baseline	653	565 (86.5)	34 (5.2)	54 (8.3)	434	328 (75.6)	47 (10.8)	59 (13.6)
During f/u interval	129	105 (81.4)	9 (7.0)	15 (11.6)	76	55 (72.4)	9 (11.8)	12 (15.8)
Change of self-rated health								
Continuously good	1719	1601 (93.1)	64 (3.7)	54 (3.1)	790	668 (84.6)	63 (8.0)	59 (7.5)
From poor to good	127	113 (89.0)	4 (3.2)	10 (7.9)	140	121 (86.4)	9 (6.4)	10 (7.1)
From good to poor	172	124 (72.1)	15 (8.7)	33 (19.2)	101	66 (65.4)	12 (11.9)	23 (22.8)
Continuously poor	98	74 (75.5)	7 (7.1)	17 (17.4)	153	108 (70.6)	17 (11.1)	28 (18.3)
Change of depression								
Continuously normal	1301	1204 (92.5)	44 (3.4)	53 (4.1)	583	501 (85.9)	38 (6.5)	44 (7.6)
From depression to normal	133	120 (90.2)	3 (2.3)	10 (7.5)	116	90 (77.6)	11 (9.5)	15 (12.9)
From normal to depression	461	400 (86.8)	29 (6.3)	32 (6.9)	270	203 (75.2)	31 (11.5)	36 (13.3)
Continuous depression	221	188 (85.1)	14 (6.3)	19 (8.6)	215	169 (78.6)	21 (9.8)	25 (11.6)
Traffic accident injury								
None	1839	1671 (90.9)	73 (4.0)	95 (5.2)	1063	870 (81.8)	85 (8.0)	108 (10.2)
Before baseline	242	218 (90.1)	10 (4.1)	14 (5.8)	108	84 (77.8)	14 (13.0)	10 (9.3)
During f/u interval	35	23 (65.7)	7 (20.0)	5 (14.3)	13	9 (69.2)	2 (15.4)	2 (15.4)
IADL disability								
None	1788	1640 (91.7)	68 (3.8)	80 (4.5)	1108	908 (82.0)	94 (8.5)	106 (9.6)
Before baseline	218	194 (89.0)	9 (4.1)	15 (6.9)	59	48 (81.4)	6 (10.2)	5 (8.5)
During f/u interval	110	78 (70.9)	13 (11.8)	19 (17.3)	17	7 (41.2)	1 (5.9)	9 (52.9)

Data are presented as n (%).

IADL, instrumental activity of daily living; f/u, follow-up.

health problems were mainly related to retirement. Cerebrovascular disease in men, liver disease in women, and multiple morbidities in both genders were associated with a higher risk of retirement. In the results of longitudinal association, analyses showed that higher comorbidity, self-rated poor health, and depression at baseline increased the likelihood of retirement among men. However, baseline health problems were not related to follow-up employment status among women. Interestingly, a new occurrence of a chronic disease, a traffic accident injury, and IADL disability affected job loss and retirement, and these associations were much

higher than the association between ongoing health problems and employment status. Additionally, traffic accident injuries and IADL disabilities were more likely to increase the risk of job loss and retirement than was chronic disease. Finally, a change in self-rated health from good to poor and newly emerging depression had a much greater impact on the risk for employment transition than did consistently poor health status. Comparing the effect size of all measured health problems, physical health problems accompanied by functional limitations constituted the best predictor of employment transition.

**Table 3.** Cross-sectional and longitudinal associations between health problems and employment status within a 2-year follow-up

	Men		Women	
	Job loss	Retired	Job loss	Retired
<b>Cross-sectional analysis (2006)</b>				
n / N	947 / 3318	254 / 3318	701 / 2097	212 / 2097
Diagnosis of chronic disease				
Hypertension	1.46 (1.05, 2.04)	1.45 (1.14, 1.85)	0.80 (0.52, 1.24)	1.42 (1.09, 1.84)
Diabetes	1.48 (0.98, 2.24)	1.56 (1.13, 2.16)	1.19 (0.65, 2.19)	1.30 (0.88, 1.92)
Cancer	1.04 (0.31, 3.44)	2.10 (0.99, 4.45)	1.14 (0.39, 3.39)	2.81 (1.40, 5.64)
Lung disease	2.39 (1.05, 5.46)	1.38 (0.73, 2.63)	0.52 (0.06, 4.51)	1.70 (0.72, 4.00)
Liver disease	1.05 (0.48, 2.32)	1.11 (0.49, 2.52)	1.04 (0.10, 11.45)	6.60 (1.81, 24.07)
Cardiovascular disease	1.01 (0.42, 2.45)	1.53 (0.91, 2.56)	1.49 (0.59, 3.73)	1.46 (0.86, 2.47)
Cerebrovascular disease	2.41 (0.96, 6.09)	7.49 (3.69, 15.24)	2.34 (0.69, 7.96)	2.70 (1.09, 6.69)
Arthritis	1.41 (0.85, 2.34)	1.00 (0.65, 1.54)	0.81 (0.51, 1.28)	1.26 (0.97, 1.64)
Comorbidity				
0	1.00	1.00	1.00	1.00
1	1.29 (0.91, 1.81)	2.00 (1.57, 2.55)	1.01 (0.70, 1.44)	1.69 (1.30, 2.20)
2+	2.29 (1.47, 3.57)	3.08 (2.26, 4.19)	0.91 (0.51, 1.61)	2.60 (1.91, 3.55)
Self-rated poor health				
Depression	2.39 (1.64, 3.50)	4.26 (3.22, 5.65)	1.13 (0.76, 1.69)	1.85 (1.45, 2.36)
Traffic accident injury	1.81 (1.28, 2.57)	2.11 (1.61, 2.76)	2.26 (1.62, 3.15)	1.54 (1.21, 1.95)
IADL disability	1.04 (0.68, 1.59)	0.87 (0.62, 1.22)	0.95 (0.56, 1.61)	1.17 (0.81, 1.68)
IADL disability	1.17 (0.74, 1.85)	2.26 (1.69, 3.01)	0.27 (0.08, 0.90)	1.59 (1.09, 2.32)
<b>Longitudinal analysis (2006-2008)</b>				
n / N	114 / 2116	90 / 2116	114 / 2116	90 / 2116
Health problems at baseline				
Comorbidity				
0	1.00	1.00	1.00	1.00
1	1.31 (0.79, 2.16)	1.22 (0.76, 1.95)	1.37 (0.84, 2.22)	1.17 (0.74, 1.86)
2+	1.44 (0.68, 3.04)	2.18 (1.26, 3.78)	1.37 (0.70, 2.67)	1.52 (0.85, 2.73)
Self-rated poor health				
Depression	1.18 (0.60, 2.35)	2.54 (1.53, 4.24)	0.77 (0.46, 1.30)	0.99 (0.63, 1.57)
Traffic accident injury	1.09 (0.62, 1.93)	1.67 (1.04, 2.70)	1.01 (0.63, 1.63)	1.03 (0.67, 1.60)
IADL disability	0.92 (0.46, 1.85)	1.05 (0.57, 1.92)	1.61 (0.86, 2.99)	0.86 (0.43, 1.74)
IADL disability	0.88 (0.42, 1.80)	1.17 (0.65, 2.13)	0.98 (0.39, 2.46)	0.65 (0.25, 1.73)
Health problems during f/u interval				
Diagnosis of chronic disease				
None	1.00	1.00	1.00	1.00
Before baseline	1.46 (0.91, 2.34)	1.81 (1.17, 2.78)	1.52 (0.95, 2.42)	1.44 (0.92, 2.24)
During f/u interval	2.04 (0.95, 4.39)	3.49 (1.78, 6.87)	2.08 (0.95, 4.54)	2.13 (1.04, 4.37)
Change of self-rated health				
Continuously good	1.00	1.00	1.00	1.00
From poor to good	0.85 (0.30, 2.44)	2.49 (1.18, 5.26)	0.58 (0.27, 1.25)	0.69 (0.33, 1.42)
From good to poor	2.86 (1.53, 5.34)	6.35 (3.75, 10.74)	1.83 (0.92, 3.66)	3.46 (1.94, 6.17)
Continuously poor	2.35 (0.97, 5.68)	6.77 (3.41, 13.46)	1.17 (0.61, 2.24)	2.05 (1.17, 3.58)
Change of depression				
Continuously normal	1.00	1.00	1.00	1.00
From depression to normal	0.75 (0.23, 2.50)	1.80 (0.85, 3.83)	1.36 (0.66, 2.80)	1.56 (0.81, 2.98)
From normal to depression	1.80 (1.09, 2.97)	1.66 (1.02, 2.69)	1.84 (1.10, 3.08)	1.73 (1.06, 2.82)
Continuous depression	1.66 (0.86, 3.22)	2.12 (1.17, 3.86)	1.26 (0.68, 2.32)	1.15 (0.65, 2.03)
Traffic accident injury				
None	1.00	1.00	1.00	1.00
Before baseline	1.01 (0.50, 2.02)	1.10 (0.60, 2.02)	1.63 (0.88, 3.05)	0.87 (0.43, 1.76)
During f/u interval	8.83 (3.45, 22.63)	4.79 (1.63, 14.06)	3.22 (0.67, 15.60)	2.26 (0.46, 11.23)
IADL disability				
None	1.00	1.00	1.00	1.00
Before baseline	1.02 (0.49, 2.11)	1.39 (0.76, 2.54)	0.99 (0.39, 2.47)	0.75 (0.28, 1.98)
During f/u interval	4.60 (2.35, 8.99)	4.58 (2.48, 8.47)	1.19 (0.14, 9.98)	8.89 (3.10, 25.50)

The reference category was employed status.

IADL, instrumental activity of daily living; f/u, follow-up.

Adjusted for age group, marital status, education level, type of health insurance, tertile of household equivalent income, and type of employment contract at baseline survey.

## DISCUSSION

Health problems related to a physical disability had the greatest effect on workers' leaving the workplace in the older Korean population. A shift in health condition from good to poor in a short period was more strongly associated with an increase in the risk of unemployment than was a pattern of continuing health problems. Women with health problems showed only a high probability of retirement, whereas among men, health problems increased the possibility of job loss and retirement.

Health problems were the important risk factors for unemployment and retirement among older workers. As this study revealed that unhealthy employees had the higher risk to lose or quit a job, it supported the social selection hypothesis in which health status affects their socio-economic status [5]. Recent studies focused on older workers provided evidence that various chronic diseases, mobility problems, poor self-rated health, and psychological distress were associated with unemployment and retirement [12-15]. Health problems were likely to have an adverse effect on work performance and productivity, and consequently weaken workers' competitiveness in the labor market [16]. In turn, decreased earning potential associated with low productivity resulted in a lower willingness to work. Furthermore, older workers with poor health are more likely to decrease the willingness to work above economic decision considering life expectancy [17].

The present study found that the onset of physical disabilities and traffic accident injuries directly affected job loss and retirement, whereas the presence of those problems at baseline had no significant effect on job loss and retirement. This result indicates the need to review working conditions carefully in terms of adaptation to physical functioning in older workers and in terms of difficulty of finding a new job with a disability. The employment rate of disabled people in Korea is only 0.95%, even though the government suggests a mandatory criterion of >2% of employees [18]. Because older Korean workers have mostly engaged in manual jobs demanding physical labor (66.2%), the onset of a disability may be a critical reason for leaving the workplace.

We considered the recent incidence of health problems and comorbidities so that we would not underestimate the association between health problems and employment status. Workers who experience a health status change are most vulnerable to remaining employed. The lack of a coping strategy to deal with the

new health problem and multiple chronic diseases could be related to this outcome. It is easy to quit a job, but difficult to re-enter the labor market, so those who leave the workforce are likely to remain retired or unemployed.

Although public assistance is available for retirees and disabled people, many basic pensions and social security systems were just launched in 2007, and pension coverage is still very low. For example, only 28% of all elderly people in South Korea are covered by a basic old-age pension [19]. Furthermore, the proportion of out-of-pocket expenses for medical services is relatively high (almost 50% of total payments) compared with the situation in Hong Kong and Taiwan, which among Asian countries have a gross domestic product level similar to that of South Korea [20]. In other words, if older workers quit their job due to a health problem, they are likely to suffer from both decreased income and increased health payments.

Women were more likely than men to retire when health problems appeared. The association between health and employment status showed a gender difference. Men's health problems were related with both job loss and retirement, whereas women's health problems were associated only with retirement. There were two possible explanations, which were the gender disparity of the work environment and the traditional working role.

The Korean labor market based on a patriarchal economy has involved mainly men, so in this study the employed proportion of the women was less than half that of the men. Furthermore, employed women are embedded in relatively poor working conditions including wage and job positions in Korea. According to 2010 statistics of the National Statistical Office, the proportion of non-standard work was 27% and 41% among men and women, respectively. Furthermore, the average wage of women reached only 66% of that of men [19]. Discrimination against women in work environment would force them into retirement.

In addition, the traditional work role of women, which was focused on childrearing and family care, could affect employment status. A previous study using a British household panel survey from 1991 to 1998 showed that women had a higher transition rate from employment to non-employment (including unemployment, retirement, family care, etc.) and an especially higher non-employment rate for family care than did men [21]. Also, social norms related to work roles prompted a gender difference in the psychological reaction to job loss. Men tended to understand their job

loss as social failure, while women tended to think of their job loss as a chance to spend more time with family, because basically the men's self-identity was derived from a breadwinner role and the women's consisted of various roles (wife, mother, daughter, and friend) above the work role [22]. Therefore when employment status was changed due to health problems, women were more likely to give up their willingness to work than men because they could pursue the other role over the work role.

There are several limitations to this study. The problem of endogeneity with respect to the relationship between self-reported health status and employment status should be considered [23]. For example, people who lost or retired from their job may justify their non-participation by claiming their poor health. A reverse causation between health and labor may have occurred in the relation between the health outcome of the cross-sectional and follow-up period and employment status.

Recent health problems are critical in workers' retirement and involuntarily job loss in Korean society. This finding has two important implications for improving the work participation of older workers. First, occupational health professionals should pay attention to self-management education for chronic disease patients, especially newly diagnosed patients. Self-management education allows workers having health problems to continue their work while managing their disease. Second, health promotion policies for older workers, such as flexible working time and healthcare support, should be high priorities for improving labor participation by middle-age and older adults. If workers could manage their time for health care in the early stage of their health problem, more workers with various health issues could work longer.

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## CONFLICT OF INTEREST

The authors have no conflicts of interest with the material presented in this paper.

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