

# Factors Influencing Participation in National Health Screening Program among Korean Older Adults by Cognitive Function Level

Han, Song Yi<sup>1</sup> · Ko, Young<sup>2</sup>

<sup>1</sup>Assistant Professor, Department of Nursing Science, Sunmoon University, Asan

<sup>2</sup>Associate Professor, College of Nursing, Gachon University, Incheon, Korea

**Purpose:** The aim of this study was to identify the participation rate of the National Health Screening Program (NHSP) and its influencing factors by cognitive function level in Korean older adults. **Methods:** This study was a secondary analysis using data from the survey of the Korean Longitudinal Study of Aging in 2016. The data were analyzed using  $\chi^2$  test and multiple logistic regression. **Results:** The participation rates of the NHSP in the mild cognitive impairment group (79.6%) and the suspected dementia group (58.0%) were lower than the normal cognitive function group (88.1%). The factors influencing NHSP varied by cognitive function level. Especially, in the suspected dementia group, higher participation rates of the NHSP were associated with living in rural areas, enrollment in private health insurance, no depressive symptoms, participation in social activities, and no living with children. Depression and participation in social activities influenced participation in NHSP in all groups. **Conclusion:** This study suggests that interventions differentiated by cognitive function level are important for increasing the participation in the health screening.

**Key Words:** Aged; Mass screening; Cognition

## INTRODUCTION

### 1. Background

As the elderly population is rapidly growing across the world, interest in the life in old age is increasing. To improve the quality of life of the older adults, extending the health expectancy of the older adults has become an important element of health policies [1]. The prevalence rates of chronic diseases are increasing as population aging progresses, and the growth of the elderly population naturally leads to an increase in the medical expenditures of older adults [1,2]. In fact, 89.5% of the elderly population in Korea are reported to have chronic diseases, and 51.0% are estimated to have three or more chronic diseases [3]. The medical expenditures for older adults are also reported to account for 40% of the total medical expenditures, so there is a need to take measures for this problem [4]. Therefore, preventive medicine services to prevent chronic diseases and reduce age-associated declines in

physical, mental, and cognitive functions are becoming increasingly important [1,2]. Many countries have already recognized the need for health screening as a preventive health policy and have implemented national health screening programs [5-8]. Korea introduced the National Health Screening Program (NHSP) in 1980 and is currently implementing it for the entire population across the lifespan. This program contributes to health maintenance, health promotion, and disease prevention, and at the same time helps to minimize economic losses caused by medical expenditures [9]. Actually, the NHSP has greatly contributed to the detection of chronic diseases and improvement of the treatment rates of chronic diseases [10]. Therefore, for older adults, health screening will play an important role in helping them to have a healthy old age. However, while the screening rate of the NHSP in the entire population is about 82%, the screening rate in the elderly population is relatively low with about 61%, so it is required to take measures to increase the screening rate in the elderly population.

**Corresponding author: Ko Young**

College of Nursing, Gachon University, 191 Hambakmoei-ro, Yeonsu-gu, Incheon 21936, Korea.

Tel: +82-32-820-4205, Fax: +82-32-820-4201, E-mail: camassia@naver.com

Received: Aug 20, 2019 / Revised: Nov 7, 2019 / Accepted: Nov 7, 2019

This is an open access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0/>), which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

As the elderly population increases, the number of older adults with cognitive decline is increasing. As of 2018, the prevalence of dementia and that of mild cognitive impairment in older adults are 10.2% and 22.6%, respectively [11]. The number of older adults with dementia is estimated to increase more and more rapidly [11]. In addition to demographic characteristics, the presence of chronic diseases such as hypertension, diabetes, and hyperlipidemia has been reported to be a risk factor for mild cognitive impairment [12]. In a previous study comparing the prevalence rates of chronic diseases between older adults with cognitive impairment and those with normal cognitive function, the prevalence of chronic diseases was found to be higher in older adults with cognitive impairment [13]. These findings demonstrate that management of chronic diseases is important for prevention of dementia. Therefore, health screening is necessary for early detection and management of chronic diseases in older adults with cognitive impairment. However, there has been a lack of research on the screening rate of the NHSP among older adults with cognitive decline and the influencing factors for it.

As social interest in health screening has been increasing, several studies on factors influencing the participation rate of the health screening have been conducted [14-17]. According to previous studies, participation in health screening is influenced by various factors, including gender, age, marital status, education level, income level, health behavior, health status, social networks, and enrollment status of private health insurance [14-17]. However, so far, most of the studies on the participation rate of the NHSP have been conducted among the total middle-aged population or the elderly population [14,15,18]. In addition, the characteristics of the participation rate by the cognitive functional level of older adults have not been identified. Therefore, this study aimed to investigate the participation rate of the NHSP by cognitive function level in older adults and the factors affecting the participation rate.

## 2. Purpose

The purpose of this study was to identify the participation rate of the NHSP according to cognitive functional levels of older adults and to identify the factors influencing the participation rate.

# METHODS

## 1. Study Design

This study is a secondary analysis research using the

data from the 6<sup>th</sup> Korean Longitudinal Study of Aging (KLoSA) conducted in 2016.

## 2. Participants

The KLoSA has been conducted by the Korea Employment Information Service every two years since 2006. This survey is conducted among people aged 45 or older nationwide in 15 administrative regions of Korea, including 7 special/metropolitan cities (Seoul, Busan, Daegu, Incheon, Gwangju, Daejeon, and Ulsan) and 8 provinces (Gyeonggi, Gangwon, Chungbuk, Chungnam, Jeonbuk, Jeonnam, Gyeongbuk, and Gyeongnam), excluding Jeju Province among 9 provinces of Korea. The data is publicly available and can be downloaded at the homepage of the Korea Employment Information Service. This study was conducted using the data of 4,581 people aged 65 or over from the 6<sup>th</sup> KLoSA conducted in 2016. Among the 4,581 older adults, 250 people with missing data for the analysis variables were excluded, and a total of 4,331 people were included in the final analysis. The participants consisted of 622 older adults with suspected dementia, 1,025 older adults with mild cognitive impairment, and 2,684 older adults with normal cognitive function.

This study was conducted after receiving an exemption determination from the IRB of the university where the researcher belongs (IRB no. 1044396-201609-HR-069-01).

## 3. Measures

### 1) General characteristics

The general characteristics of participants included gender, age, education level, presence of the spouse, presence of religion, residential area, subjective economic status, enrollment status of private health insurance, smoking status, drinking status, participation in social activity, and co-residence with children. Regarding age, older adults were divided into young-old adults (aged 65-74 years) and old-old adults (aged 75 years or over). The education level was reclassified into 'elementary school graduation or lower' and 'middle school graduation or higher.' The presence of the spouse was examined using the question about marital status, and if the participant's marital status was married, it was classified as 'married.' If the participant's marital status was separated, divorced, widowed, spouse missing, or unmarried, it was classified as 'unmarried/separated.' Subjective economic status was assessed using the question about satisfaction with one's economic status. Subjective economic status was classified as 'low' if the score for satisfaction with one's economic

status was 0~30 points, as 'medium' if the score was 40~60 points, and as 'high' if the score was 70~100 points. Participation in social activity was examined using the question "Is there any social group or meeting you participate among the activities listed below?", and it was classified as 'participation in social activities' or 'no participation in social activities' according to whether or not the respondent participates in one or more social activities among religious meetings, social gatherings (rotating savings and credit associations, senior centers, etc.), leisure/culture/sports-related organizations, alumni associations/hometown community associations/clan meetings, volunteer groups, and political party organizations/civil society organizations/interest groups. Co-residence with children was classified into 'living with children' and 'no living with children', using the question asking about whether the respondents currently live with their children in the same household.

## 2) Health status

Health status was assessed in terms of depression, subjective health status, and the number of chronic diseases. Depression was measured using the Korean version of the Center for Epidemiological Studies-Depression Scale (CES-D-10). The total scores for depression were calculated by adding the scores of 10 dichotomous items, scored 0 or 1 point, and if the total score was 4 points or higher, it was considered to indicate the presence of depression [19, 20]. In this study, the reliability coefficient of the depression assessment tool was .841. Subjective health status was reclassified as follows: it was categorized as 'good' if the participant's health status was self-assessed as 'very good' or 'good' in response to the question asking about how individuals would rate their overall health status, and classified as 'fair' if health status was self-rated as 'fair', and classified as 'poor' if health status was self-rated as 'poor' or 'very poor.' The number of chronic diseases was reclassified into 'none', 'one', and 'two or more' by counting the number of diagnosed diseases among 10 listed chronic diseases, such as hypertension, diabetes, cancer (malignant tumor), chronic lung disease, hepatic disease, cardiovascular disease, cerebrovascular disease, psychiatric disease, arthritis and rheumatic disease, and urinary system disease.

## 3) Cognitive function

Cognitive function was measured using the total scores of the Korean Mini-Mental State Examination (K-MMSE) [21]. The maximum total score of the K-MMSE is 30 points. A score of 17 or less points was classified as 'suspected dementia', a score of 18 to 23 points was classified as 'mild

cognitive impairment' and a score of 24 or higher points was considered to indicate 'normal cognitive function' [21]. The value for reliability was .801 in this study.

## 4) Participation in NHSP

The participation or non-participation in the NHSP was examined using the participants' responses (Yes or No) to the dichotomous question "Have you ever received primary health screening freely provided by the National Health Insurance Service and the Medical Aid Program in the past two years?"

## 4. Data Analysis

Collected data was analyzed using SPSS/WIN 23. The general characteristics of participants were analyzed using descriptive statistics such as the frequency, percentage, mean, and standard deviation.  $\chi^2$  test was used to analyze differences in the participation rate of the NHSP according to general characteristics between the groups of older adults with suspected dementia, older adults with mild cognitive impairment, and older adults with normal cognitive function. Logistic regression analysis was performed to identify the factors influencing the participation rate of the NHSP, and odds ratios and 95% confidence intervals were estimated.

# RESULTS

## 1. General Characteristics of Participants

The general characteristics of participants are shown in Table 1. The number of female participants was higher than that of male participants, with 2,502 females (57.8%) and 1,829 males (42.2%), and the mean age of participants was  $75.55 \pm 7.16$  years. In terms of cognitive function levels, the participants consisted of 622 older adults with suspected dementia (14.4%), 1,025 older adults with mild cognitive impairment (23.7%), and 2,684 older adults with normal cognitive function (62.0%). Among the participants, 3,541 people (81.8%) were found to have received health screening provided by the NHSP.

## 2. Differences in the Participation Rate of the NHSP according to Cognitive Function Levels

The differences in the participation rate of the NHSP according to cognitive function levels are shown in Table 1. In older adults with suspected dementia, there were significant differences in the participation rate of NHSP ac-

**Table 1.** Differences of Health Screening Program Participation by Cognitive Function

(N=4,331)

Variables	Categories	Total n (%)	Suspected dementia group (n=622)			Mild cognitive impairment group (n=1,025)			Normal cognitive function group (n=2,684)		
			Health screening		$\chi^2$ (p)	Health screening		$\chi^2$ (p)	Health screening		$\chi^2$ (p)
			Yes (n=361, 58.0%)	No (n=261, 42.0%)		Yes (n=816, 79.6%)	No (n=209, 20.4%)		Yes (n=2,364, 88.1%)	No (n=320, 11.9%)	
Gender	Male	1,829 (42.2)	82 (22.7)	62 (23.8)	0.09 (.762)	256 (31.4)	75 (35.9)	1.55 (.213)	1,216 (51.4)	138 (43.1)	7.79 (.005)
	Female	2,502 (57.8)	279 (77.3)	199 (76.2)		560 (68.6)	134 (64.1)		1,148 (48.6)	182 (56.9)	
Age (year)	≤ 65~74	2,054 (47.4)	67 (18.6)	30 (11.5)	5.75 (.017)	314 (38.5)	55 (26.3)	10.69 (.001)	1,447 (61.2)	141 (44.1)	34.30 ( $< .001$ )
	≥ 75	2,277 (52.6)	294 (81.4)	231 (88.5)		502 (61.5)	154 (73.7)		917 (38.8)	179 (55.9)	
Educational level	Elementary school	2,449 (56.5)	304 (84.2)	221 (84.7)	0.03 (.875)	599 (73.4)	144 (68.9)	1.70 (.193)	1,014 (42.9)	167 (52.2)	9.88 (.002)
	≥ Middle school	1,882 (43.5)	57 (15.8)	40 (15.3)		217 (26.6)	65 (31.1)		1,350 (57.1)	153 (47.8)	
Marital status	Married	2,958 (68.3)	161 (44.6)	107 (41.0)	0.80 (.371)	505 (61.9)	113 (54.1)	4.25 (.039)	1,850 (78.3)	222 (69.4)	12.63 ( $< .001$ )
	Unmarried/separated	1,373 (31.7)	200 (55.4)	154 (59.0)		311 (38.1)	96 (45.9)		514 (21.7)	98 (30.6)	
Religion	No	2,467 (57.0)	223 (61.8)	175 (67.0)	1.83 (.176)	439 (53.8)	120 (57.4)	0.88 (.349)	1,315 (55.6)	195 (60.9)	
	Yes	1,864 (43.0)	138 (38.2)	86 (33.0)		377 (46.2)	89 (42.6)		1,049 (44.4)	125 (39.1)	
Region	Metropolitan	1,759 (40.6)	120 (33.2)	97 (37.2)	22.49 ( $< .001$ )	295 (36.2)	80 (38.3)	6.48 (.039)	1,005 (42.5)	162 (50.6)	8.86 (.012)
	Small and medium-sized cities	1,304 (30.1)	86 (23.9)	97 (37.2)		215 (26.3)	69 (33.0)		757 (32.0)	80 (25.0)	
	Rural	1,268 (29.3)	155 (42.9)	67 (25.6)		306 (37.5)	60 (28.7)		602 (25.5)	78 (24.4)	
Subjective economic status <sup>†</sup>	Bad (0~30)	854 (19.7)	129 (35.8)	117 (44.8)	7.03 (.030)	190 (23.3)	69 (33.2)	11.38 (.003)	280 (11.8)	69 (21.6)	65.04 ( $< .001$ )
	Fair (40~60)	2,095 (48.4)	168 (46.7)	114 (43.7)		450 (55.1)	110 (52.9)		1,068 (45.2)	185 (57.8)	
	Good (70~100)	1,380 (31.9)	63 (17.5)	30 (11.5)		176 (21.6)	29 (13.9)		1,016 (43.0)	66 (20.6)	
Private health insurance <sup>†</sup>	Yes	734 (17.0)	21 (5.8)	4 (1.5)	7.21 (.007)	74 (9.1)	8 (3.8)	6.21 (.013)	584 (24.7)	43 (13.4)	20.33 ( $< .001$ )
	No	3,595 (83.0)	340 (94.2)	257 (98.5)		742 (90.9)	201 (96.2)		1,778 (75.3)	277 (86.6)	
Smoking	Current	365 (8.4)	17 (4.7)	12 (4.6)	0.01 (.948)	61 (7.5)	16 (7.7)	0.01 (.930)	222 (9.4)	37 (11.6)	1.53 (.217)
	No	3,966 (91.6)	344 (95.3)	249 (95.4)		755 (92.5)	193 (92.3)		2,142 (90.6)	283 (88.4)	
Drinking <sup>†</sup>	Current	1,147 (26.5)	38 (10.5)	17 (6.5)	3.07 (.082)	174 (21.3)	45 (21.5)	0.26 (.878)	792 (33.5)	81 (25.3)	8.61 (.003)
	No	3,183 (73.5)	323 (89.5)	244 (93.5)		641 (78.7)	164 (78.5)		1,572 (66.5)	239 (74.7)	
Depression	No	2,494 (57.6)	145 (40.2)	58 (22.2)	22.19 ( $< .001$ )	418 (51.2)	64 (30.6)	28.35 ( $< .001$ )	1,654 (70.0)	155 (48.4)	59.45 ( $< .001$ )
	Yes	1,837 (42.4)	216 (58.0)	203 (42.0)		398 (48.8)	145 (69.4)		710 (30.0)	165 (51.6)	
Subjective health status	Bad	1,586 (36.6)	238 (65.9)	202 (77.4)	12.37 (.002)	377 (46.2)	125 (59.8)	12.40 (.002)	513 (21.7)	131 (40.9)	58.13 ( $< .001$ )
	Fair	1,972 (45.6)	95 (26.3)	52 (19.9)		351 (43.0)	66 (31.6)		1,271 (53.8)	137 (42.8)	
	Good	773 (17.8)	28 (7.8)	7 (2.7)		88 (10.8)	18 (8.6)		580 (24.5)	52 (16.3)	
Number of chronic disease	None	895 (20.7)	50 (13.9)	27 (10.3)	10.92 (.004)	133 (16.3)	38 (18.2)	3.30 (.192)	583 (24.7)	64 (20.0)	5.40 (.067)
	One	1,286 (29.7)	100 (27.7)	48 (18.4)		243 (29.8)	49 (23.4)		750 (31.7)	96 (30.0)	
	≥ Two	2,150 (49.6)	211 (58.4)	186 (71.3)		440 (53.9)	122 (58.4)		1,031 (43.6)	160 (50.0)	
Social activity participation	Yes	3,000 (69.3)	162 (44.9)	74 (28.4)	17.56 ( $< .001$ )	506 (62.0)	98 (46.9)	15.72 ( $< .001$ )	1,939 (82.0)	221 (69.1)	30.13 ( $< .001$ )
	No	1,331 (30.7)	199 (55.1)	187 (71.6)		310 (38.0)	111 (53.1)		425 (18.0)	99 (30.9)	
Living with children	No	3,158 (72.9)	235 (65.1)	137 (52.5)	10.01 (.002)	618 (75.7)	148 (70.8)	2.14 (.144)	1,794 (75.9)	226 (70.6)	4.20 (.041)
	Yes	1,173 (27.1)	126 (34.9)	124 (47.5)		198 (24.3)	61 (29.2)		570 (24.1)	94 (29.4)	

<sup>†</sup>Missing value excluded.

cording to age ( $\chi^2=5.75, p=.017$ ), residential area ( $\chi^2=22.49, p<.001$ ), subjective economic status ( $\chi^2=7.03, p=.030$ ), enrollment status of private health insurance ( $\chi^2=7.21, p=.007$ ), depression ( $\chi^2=22.19, p<.001$ ), subjective health status ( $\chi^2=12.37, p<.001$ ), number of chronic diseases ( $\chi^2=10.92, p=.004$ ), participation in social activity ( $\chi^2=17.56, p<.001$ ), and living with children ( $\chi^2=10.01, p=.002$ ).

In older adults with mild cognitive impairment, there were differences in the participation rate of NHSP ac-

cording to age ( $\chi^2=10.69, p=.001$ ), presence of the spouse ( $\chi^2=4.25, p=.039$ ), residential area ( $\chi^2=6.48, p=.039$ ), subjective economic status ( $\chi^2=11.38, p=.003$ ), enrollment in private health insurance ( $\chi^2=6.21, p=.013$ ), depression level ( $\chi^2=28.35, p<.001$ ), subjective health status ( $\chi^2=12.40, p=.002$ ), and participation in social activity ( $\chi^2=15.72, p<.001$ ). In older adults with normal cognitive function, there were differences in the screening rate of NHSP depending on all the characteristics other than smoking status.

### 3. Factors Influencing the Participation Rate of the NHSP

Logistic regression analysis was performed to identify the factors influencing the participation rate of the NHSP in older adults. The results are shown in Table 2.

In the suspected dementia group, residential area, enrollment in private health insurance, depression, number of chronic diseases, participation in social activity, and

living with children were found to have a significant effect on the participation rate of the NHSP. As for residential area, older adults living in rural area were 1.53 times more likely to receive national health screening than those living in metropolitan cities (95% Confidence Interval [95% CI]=1.00~2.33). Regarding enrollment in private health insurance, older adults with private health insurance were 3.51 times more likely to participate in NHSP than those without private health insurance (95% CI=1.06~11.60).

**Table 2.** Influencing Factors on Participation of National Health Screening Program

(N=4,331)

Variables	Categories	Suspected dementia group (n=622)		Mild cognitive impairment group (n=1,025)		Normal cognitive function group (n=2,684)	
		OR (95% CI)	p	OR (95% CI)	p	OR (95% CI)	p
Gender	Female (ref.)						
	Male	0.89 (0.49~1.63)	.707	1.23 (0.73~2.09)	.441	1.59 (1.10~2.31)	.015
Age (year)	65~74						
	≥75 (ref.)	1.33 (0.77~2.29)	.305	1.62 (1.10~2.40)	.015	1.69 (1.29~2.21)	<.001
Educational level	≤Elementary school (ref.)						
	≥Middle school	1.02 (0.60~1.75)	.937	0.71 (0.48~1.04)	.074	0.93 (0.70~1.22)	.588
Marital status	Married						
	Unmarried/separated (ref.)	1.15 (0.76~1.74)	.507	1.26 (0.87~1.81)	.226	0.97 (0.72~1.30)	.825
Religion	No (ref.)						
	Yes	1.17 (0.80~1.70)	.424	1.10 (0.79~1.53)	.581	1.17 (0.91~1.51)	.229
Region	Metropolitan (ref.)						
	Small and medium-sized cities	0.69 (0.45~1.07)	.094	0.89 (0.60~1.32)	.552	1.41 (1.05~1.90)	.021
	Rural	1.53 (1.00~2.33)	.049	1.34 (0.90~1.99)	.151	1.17 (0.86~1.60)	.323
Subjective economic status <sup>†</sup>	Bad (0~30) (ref.)						
	Fair (40~60)	1.11 (0.76~1.63)	.601	1.17 (0.80~1.69)	.424	1.04 (0.75~1.44)	.807
	Good (70~100)	1.13 (0.64~2.00)	.683	1.41 (0.83~2.42)	.207	2.12 (1.42~3.17)	<.001
Private health insurance	Yes						
	No (ref.)	3.51 (1.06~11.60)	.040	1.85 (0.83~4.16)	.131	1.46 (1.02~2.09)	.040
Smoking	Current (ref.)						
	No	0.77 (0.44~1.33)	.349	0.61 (0.38~1.00)	.051	0.74 (0.52~1.05)	.336
Drinking <sup>†</sup>	Current (ref.)						
	No	0.56 (0.29~1.08)	.083	1.10 (0.71~1.69)	.672	0.88 (0.65~1.19)	.395
Depression	No						
	Yes (ref.)	2.07 (1.40~3.06)	<.001	1.94 (1.37~2.76)	<.001	1.79 (1.38~2.31)	<.001
Subjective health status	Bad (ref.)						
	Fair	1.15 (0.74~1.79)	.534	1.36 (0.93~1.99)	.109	1.56 (1.16~2.10)	.003
	Good	1.96 (0.76~5.09)	.165	1.07 (0.57~2.00)	.829	1.51 (1.02~2.25)	.040
Number of chronic disease	None						
	One	1.25 (0.71~2.22)	.440	0.70 (0.47~1.11)	.133	0.88 (0.62~1.23)	.442
	≥Two (ref.)	1.64 (1.07~2.52)	.024	1.11 (0.75~1.64)	.591	0.93 (0.70~1.24)	.633
Social activity participation	Yes						
	No (ref.)	1.64 (1.11~2.42)	.013	1.55 (1.11~2.16)	.010	1.35 (1.01~1.79)	.040
Living with children	No						
	Yes (ref.)	1.80 (0.26~2.59)	.001	1.19 (0.82~1.71)	.358	1.22 (0.93~1.61)	.151

OR=odds ratio; CI=confidence interval; ref.=reference; <sup>†</sup> Missing value excluded.



Regarding depression, older adults without depression were 2.07 times more likely to receive health screening than those with depression (95% CI=1.40~3.06). As to the number of chronic diseases, older adults with one chronic disease were 1.64 times more likely to attend the NHSP than those with two or more chronic diseases (95% CI=1.07~2.52). Regarding social activity participation, older adults participating in social activities were 1.64 times more likely to participate in the NHSP than those who do not participate in social activity (95% CI=1.11~2.42). As for co-residence with children, older adults who do not live with children were 1.80 times more likely to participate in the NHSP than those living with children in the same household (95% CI=1.26~2.59).

In the mild cognitive impairment group, age, depression, and social activity participation were found to be significant influencing factors. Young-old adults (aged 65~74 years) were 1.62 times more likely to participate in the NHSP compared to old-old adults (aged 75 years and over) (95% CI=1.10~2.40). Also, older adults without depression were 1.94 times more likely to get health screening than those without depression (95% CI=1.37~2.76). In addition, older adults participating in social activities were 1.55 times more likely to receive health screening than those without social activity participation (95% CI=1.11~2.16).

In normal cognitive function group, the participation rate of the NHSP was significantly different according to gender, age, residential area, subjective economic status, enrollment status of private health insurance, depression, subjective health status, and social activity participation. Regarding gender, older men were 1.59 times more likely to receive health screening than older women (95% CI=1.10~2.31). In terms of age, young-old adults (aged 65~74 years) were 1.69 times more likely to receive health screening than old-old adults (aged 75 and over) (95% CI=1.29~2.21). Regarding residential area, older adults living in small and medium-sized cities were 1.41 times more likely to get health screening than those living in metropolitan cities (95% CI=1.05~1.90). As for subjective economic status, older adults with high subjective economic status were 2.12 times more likely to get health screening than those with low subjective economic status (95% CI=1.42~3.17). Participants with private health insurance were 1.46 times more likely to receive health screening than those without it (95% CI=1.02~2.09). Older adults without depression were 1.79 times more likely to receive health screening than those with depression (95% CI=1.38~2.31). In addition, older adults with fair subjective health status were 1.79 times more likely to receive health screening

than those with poor subjective health status (95% CI=1.16~2.10), and older adults with good subjective health status were 1.51 times more likely to receive health screening than those with poor subjective health status (95% CI=1.02~2.25). Finally, older adults participating in social activities were 1.35 times more likely to get health screening than those with no social activities (95% CI=1.01~1.79).

## DISCUSSION

The elderly population with physical illnesses and cognitive problems is increasing as a result of rapid population aging. Therefore, early detection and prevention of diseases and self-care of older adults are becoming increasingly more important. Accordingly, the 4<sup>th</sup> Health Plan 2020 (2016~2020) of Korea has presented strategies for health promotion across the life span [22]. In particular, the government is implementing prevention-oriented projects including the NHSP as one of the measures for health promotion for older adults. To this end, the government aims to increase the participation rate in the NHSP of older adults to 85% [22]. Therefore, this study attempted to examine the participation rate of the NHSP in the elderly population and factors influencing the screening rate, using the KLoSA data in order to present the basic data for practice and policies for improving the participation rate in the NHSP among elderly population. For this purpose, the participants were divided into three groups according to cognitive function levels: older adults with suspected dementia, those with mild cognitive impairment, and those with normal cognitive function.

The analysis results revealed various factors influencing the participation rate in the NHSP according to the cognitive function levels in the elderly population. First, age was a significant influencing factor for the participation rate in the NHSP among older adults with mild cognitive impairment and normal cognitive function. This is consistent with the results of previous studies which showed a lower health screening rate in the old-old population [5,14,15]. Rapid population aging has led to a rise in the number of older adults with mild cognitive impairment along with an increase in the old-old population.[3] To increase the participation rate of the NHSP in the old-old population, it is necessary to provide support for them to allow them to receive health screening easily in the community where they live. Especially, it is necessary to encourage older adults to participate in the NHSP through face-to-face counseling and to strengthen measures such as transport services or mobility assistance for health screening.

Gender was found to affect the participation rate of the

NHSP only in the group of normal cognitive function group. In agreement with previous studies conducted in Korea, it was found that the participation rate of the NHSP was lower in older women than older men [14,15]. This result is not consistent with the results of studies conducted in other countries. Several researchers reported a higher rate of health screening among older women [6,8,23]. In Korea, older women have more health problems due to their lower socioeconomic status than older men, and they play a greater role as caregivers, such as providing care for the family and the spouse, even in old age compared to older men [24]. These factors are reported to contribute to large gender disparities in health between older men and women [24]. In addition, it has been reported that there exist great differences in life expectancy between older men and women, and that the ratio of older women to older men increases with increasing age [3]. These differences between older men and women may account for the fact that the participation rate of the NHSP was found to be lower among older women than older men in Korea in contrast with the results of studies in other countries. However, in order to prepare and take appropriate measures, further research is needed to identify the reasons why older women showed a lower participation rate of the NHSP than older men in Korea.

In this study, the status of enrollment in private health insurance was found to have a significant effect on the participation rate of the NHSP in the suspected dementia group and normal cognitive function group, and this result is consistent with findings of previous studies [15,25]. Economic status has been reported to be an important factor influencing the participation rate of the NHSP [5], and the enrollment rate in private health insurance has been found to be higher among older adults with higher economic status [26]. These findings of previous studies seem to show that since older adults with higher economic status have more interest in health care, they are more likely to enroll in private health insurance plans [15]. The results of this study also showed that higher subjective economic status is associated with higher participation rates in the NHSP in the normal cognitive function group and this finding indicates that economic status is linked to enrollment in private medical insurance. In particular, economic status was found to be the most influential factor for participation in the NHSP in the normal cognitive function group. These results show the need to create social environments which can help to improve economically vulnerable older adults' awareness of self-management of their health and encourage them to receive health screening regardless of their economic status.

On the other hand, depression and social activity participation were found to be important factors influencing the participation rate of the NHSP in all the groups of older adults regardless of the cognitive function level. Consistent with previous studies [16,17], the participation rate of the NHSP in older adults was found to be positively influenced by participation in social activities rather than the relationship with the family such as the presence of the spouse or co-residence with children [16,17]. A possible explanation of these results is that independent older adults with a high level of social engagement and social activity participation tend to perform health promoting behaviors more actively. In addition, unlike in the past, co-residence with their children was found to have little influence on the participation rate of the NHSP. In particular, it is remarkable that living with children in the same household was found to be associated with lower participation rates of NHSP among older adults with suspected dementia. This finding is similar to the results of previous studies which reported that preventive health behaviors such as participation in the flu vaccination program or the cancer screening program were found to be lower among older adults living with children in the same household [27,28]. Therefore, it is necessary to strengthen the social support system for older adults within the local community rather than the family support system in order to increase the participation rate of the NHSP and thereby lead old adults to do self-care and prevent diseases. Older adults with mild cognitive impairment as well as older adults with normal cognitive function may need additional support for NHSP. In particular, the participation rate of the NHSP has been reported to be higher when promotional activities are carried out face-to-face with subjects [6]. Therefore, it would be effective to conduct promotion and other activities for health screening through institutions such as senior welfare centers and senior citizen centers which older adults generally use. In addition, for older adults with a low level of social activity participation, home visiting healthcare service personnel should directly provide them with information on the NHSP and encourage them to receive health screenings. In addition, there is also a need to strengthen the support for older adults with physical decline through a mobile health screening program.

In the present study, older adults with depression showed a lower participation rate of the NHSP, and depression was identified as a major influencing factor in all the groups of older adults divided according to cognitive function levels. According to statistical data, 21.1% of the elderly population have depressive symptoms and the

percentage of people with depressive symptoms increases with age [3]. Depression has been reported to have negative effects on physical health and lead to a decline in social activities in older adults, so there is a need to implement active interventions to prevent and manage depression [29].

In this study, the participation rate of the NHSP was significantly lower in older adults with mild cognitive impairment and those with suspected dementia than those with normal cognitive function. As the elderly population increases, the percentage of older adults with cognitive decline is increasing [11]. The prevalence of chronic diseases has been found to be higher among older adults with mild cognitive impairment or among those with dementia than among those with normal cognitive function [13,30]. These findings highlight the necessity of increasing the participation rate of the NHSP as one of the measures for disease prevention and management. Therefore, if customized interventions are offered based on the findings on the influencing factors for the participation in the NHSP in older adults with cognitive function decline such as older adults with mild cognitive impairment and those with suspected dementia, they are expected to increase the participation rate of the NHSP and ultimately contribute to the improvement of the level of health status in older adults.

This study has some limitations which need to be pointed out. First of all, this study regarded the participation rate of primary health screening provided freely by the National Health Insurance Service and the Medical Aid Program as the participation rate of the NHSP. Therefore, because individuals who participate in primary health screening do not always receive secondary health check-ups and undergo subsequent treatment, care should be taken in interpreting the results of this study. Second, the results of this study showed that participation in social activities is an influencing factor for participation in the NHSP. However, the level of the quality of social activity participation was not taken into consideration, so this weakness of the study should be addressed in future studies.

## CONCLUSION

These days, greater emphasis is placed on the importance of preventive healthcare policies in improving the health status of the growing elderly population. Therefore, it is necessary to enhance the early detection and prevention of diseases by improving the participation rate of the NHSP among the elderly population. This study analyzed the data from the KLoSA to investigate the partic-

ipation rate of the NHSP according to the cognitive function levels among older adults and identify the factors influencing the participation rate. As a result, it was found that the participation rate of the NHSP in the elderly population did not reach the goal set in the 4<sup>th</sup> Health Plan (2016~2020) and that the participation rate of the NHSP was lower among older adults with mild cognitive impairment and those with suspected dementia than those with normal cognitive function. People with cognitive impairment have difficulty in managing their own health or getting health screenings. Therefore, it is necessary to develop policies to increase the screening rate among older adults with cognitive impairment. In particular, there is a need to provide social support for older adults with limitations of physical activity due to a decline in physical function, including those with mild cognitive impairment or dementia and those living in long-term care facilities so that these groups of older adults can also receive health screenings.

The results of this study revealed various factors affecting the participation rate of the NHSP according to the cognitive function levels. In older adults with suspected dementia and normal older adults, female gender, low subjective economic status, and non-enrollment of private health insurance were associated with lower participation rates. In the entire group of participants, older adults with depression and those with limited social activity participation showed lower health screening rates. In addition, in old adults with dementia or suspected dementia, the participation rate was lower among older adults living in small and medium-sized cities and rural areas than in metropolitan cities. Therefore, differentiated approaches according to the cognitive function levels of older adults are required. In order to develop specific policies, follow-up studies should be conducted to investigate the negative effects of non-participation in the NHSP on health outcomes among older adults and to identify the reasons for not receiving health screenings in older adults with dementia or mild cognitive impairment.

## REFERENCES

1. Oh YH. Health status and policy for the elderly [Internet]. Sejong: Korea Institute for Health and Social Affairs. 2013 [cited 2018 December 01]. Available from: <http://repository.kihasa.re.kr/handle/201002/10981>
2. Prince MJ, Wu F, Guo Y, Gutierrez Robledo LM, O'Donnell M, Sullivan R, et al. The burden of disease in older people and implications for health policy and practice. *The Lancet*. 2015;385: 549-562. [https://doi.org/10.1016/S0140-6736\(14\)61347-7](https://doi.org/10.1016/S0140-6736(14)61347-7)



3. Ministry of Health and Welfare. 2017 elderly survey [Internet]. Sejong: Ministry of Health and Welfare. 2017 [cited 2019 July 15]. Available from: [http://www.mohw.go.kr/react/jb/sjb030301vw.jsp?PAR\\_MENU\\_ID=03&MENU\\_ID=032901&CONT\\_SEQ=344953](http://www.mohw.go.kr/react/jb/sjb030301vw.jsp?PAR_MENU_ID=03&MENU_ID=032901&CONT_SEQ=344953)
4. National Health Insurance Service. 2018 Health Insurance Statistics [Internet]. Wonju: National Health Insurance Service. 2019 [cited 2019 July 15]. Available from: <https://www.nhis.or.kr/bbs7/boards/B0074/29670?boardKey=29&boardName=B0074>
5. Schüle S, Taylor KJ, Schrieffer D, Blettner M, Kluga SJ. Participation in preventive health check-ups among 19,351 women in Germany. *Preventive Medicine Reports*. 2017;6:23-26. <https://doi.org/10.1016/j.pmedr.2017.01.011>
6. Cook EJ, Sharp C, Randhawa G, Guppy A, Gangotra R, Cox J. Who uses NHS health checks? Investigating the impact of ethnicity and gender and method of invitation on uptake of NHS health checks. *International Journal for Equity in Health*. 2016; 15:13. <https://doi.org/10.1186/s12939-016-0303-2>
7. Yoon S, Jun DB, Park S. The effect of general health checks on healthcare utilization: Accounting for self-selection bias. *Journal of Royal Statistical Society, series A*. 2019;1-34. <https://doi.org/10.1111/rssa.12482>
8. Dryden R, Williams B, McCowan C, Themessl-Huber M. What do we know about who does and does not attend general health checks? Findings from a narrative scoping review. *BMC Public Health*. 2012;12:723. <https://doi.org/10.1186/1471-2458-12-723>
9. National Health Insurance Service. 2017 The National Health Screening Statistical Yearbook [Internet]. Wonju: National Health Insurance Service. 2017 [cited 2019 June 17]. Available from: <http://www.nhis.or.kr/menu/boardRetrieveMenuSet.xx?menuId=F3328>
10. Kang SY, Lee JA, Kim YS. Knowledge and attitude of health care providers for Korean National Health Examination. *Korean Journal of Health Promotion*. 2017;17(4):252-258. <https://doi.org/10.15384/kjhp.2017.17.4.252>
11. Central Dementia Center. 2018. 2016 National Dementia Epidemiology Survey [Internet]. Seongnam: Central Dementia Center. 2018 [cited 2019 July 23]. Available from: [https://www.nid.or.kr/notification/data\\_view.aspx?board\\_seq=76](https://www.nid.or.kr/notification/data_view.aspx?board_seq=76)
12. Ritchie K, Ancelin ML, Beaino E, Portet F, Brickman AM, Dartigues JF, et al. Retrospective identification and characterization of mild cognitive impairment from a prospective population cohort. *The American Journal of Geriatric Psychiatry*. 2010;18(8):692-700. <https://doi.org/10.1097/jgp.0b013e3181df4897>
13. Lee YK, Sung MR, Lee DY. Comorbidity and health habits of Seoul city elders with dementia. *Journal of Korean Academy of Nursing*. 2011;41(3):411-422. <https://doi.org/10.4040/jkan.2011.41.3.411>
14. Yeo JY, Jeong HS. Determinants of health screening and its effects on health behaviors. *Health Policy and Management*. 2012;22(1):49-64. <https://doi.org/10.4332/KJHPA.2012.22.1.049>
15. Jung YK. Determinants of general health check-up among older adults in Korea. *Crisisonomy*. 2018;14(1):135-148. <https://doi.org/10.14251/crisisonomy.2018.14.1.135>
16. Stafford M, von Wagner C, Perman S, Taylor J, Kuh D, Sheeringham J. Social connectedness and engagement in preventive health services: An analysis of data from a prospective cohort study. *The Lancet Public Health*. 2018;3(9):e438-e446. [https://doi.org/10.1016/S2468-2667\(18\)30141-5](https://doi.org/10.1016/S2468-2667(18)30141-5)
17. Vozikaki M, Linardakis M, Philalithis A. Preventive health services utilization in relation to social isolation in older adults. *Journal of Public Health*. 2017;25(5):545-556. <https://doi.org/10.1007/s10389-017-0815-2>
18. Park KY, An HG. Factors influencing the health examination in middle-aged men in Korea: Using data from the 6th Korea National Health and Nutrition Examination Survey (KNHANES VI-1), 2013. *Journal of the Korean Data Analysis Society*. 2016; 18(2):1035-1049.
19. Irwin M, Artin KH, Oxman MN. Screening for depression in the older adult: Criterion validity of the 10-item Center for Epidemiological Studies Depression Scale (CES-D). *Archives of Internal Medicine*. 1999;159(15):1701-1704. <https://doi.org/10.1001/archinte.159.15.1701>
20. Chung SD, Koo MJ. Factors influencing depression: A comparison among babyboomers, the pre-elderly, and the elderly. *Journal of Welfare for the Aged*. 2011;52:305-324.
21. Korea Employment Information Service. User's guide of 2019 Korean Longitudinal Study of Ageing (KLoSA). Eumseong: Korea Employment Information Service. 2019 [cited 2019 April 2]. Available from: <https://survey.keis.or.kr/klosa/klosaguide/List.jsp>
22. Ministry of Health and Welfare. The 4th Health plan 2020 ('16~'20). Sejong: Ministry of Health and Welfare. 2016 [cited 2019 June 11]. Available from: [http://www.mohw.go.kr/react/jb/sjb030301vw.jsp?PAR\\_MENU\\_ID=03&MENU\\_ID=0319&CONT\\_SEQ=330479&page=1](http://www.mohw.go.kr/react/jb/sjb030301vw.jsp?PAR_MENU_ID=03&MENU_ID=0319&CONT_SEQ=330479&page=1)
23. Gidlow C, Ellis N, Randall J, Cowap L, Smith G, Iqbal Z, et al. Method of invitation and geographical proximity as predictors of NHS Health Check uptake. *Journal of Public Health*. 2015;37(2):195-201. <https://doi.org/10.1093/pubmed/fdu092>
24. Oh S, Ko Y. Activities of daily living, depression, and self-rated health and related factors in Korean elderly: Focused on socioeconomic status and family support. *Journal of Korean Acad-*

- emy of Community Health Nursing. 2015;26(2):140-149.  
<https://doi.org/10.12799/jkachn.2015.26.2.140>
25. Sommers BD, Blendon RJ, Orav J, Epstein AM. Changes in utilization and health among low-income adults after medicaid expansion or expanded private insurance. *JAMA Internal Medicine*. 2016;176(10):1501-1509.  
<https://doi.org/10.1001/jamainternmed.2016.4419>
26. Lee YC, Im BH, Park YH. The determinants and comparison of health behavior and health service by private medical insurance on national health-nutrition survey. *Journal of the Korea Contents Association*. 2010;10(12):190-204.
27. Schmitz H, Wubker A. What determines influenza vaccination take up of elderly Europeans? *Health Economics*. 2011;20(11):1281-1297. <https://doi.org/10.1002/hec.1672>
28. Kim JG. The impact of family type on health behavior of elderly people. *Korean Journal of Gerontological Social Welfare*. 2011;51:35-55.
29. Shin SH, Jang KS, Choi O. Study of the successful aging of the elderly women in rural area. *Journal of Health Informatics and Statistics*. 2019;44(2):198-205.  
<https://doi.org/10.21032/jhis.2019.44.2.198>
30. Park M, Sung MR, Kim SK, Lee DY. Comparison of demographic characteristics, comorbidity, and health habits of older adults with mild cognitive impairment and older adults with normal cognitive function. *Journal of Korean Academy of Nursing*. 2014;44(4):351-360.  
<https://doi.org/10.4040/jkan.2014.44.4.351>