scientific reports

Check for updates

OPEN Association between the utilization of senior centers and participation in health check-ups

Ah Jung Ko^{1,2}, Jinhyun Kim^{2,3,4}, Eun-Cheol Park^{2,3} & Min Jin Ha⁵

The global older adult population is increasing. Early detection and intervention through health check-ups are crucial for successful aging, as they play a significant role in identifying and addressing diseases. This study explored the relationship between the utilization of senior centers and the promotion of health check-ups. It utilized data from 10,097 individuals aged 65 years and above, sourced from the 2020 Elderly Survey in South Korea. The primary variable of interest was classified into two groups: those who utilized senior centers and those who did not. Subgroups were further categorized based on the frequency of usage and the presence of family members among senior centers users. Logistic regression analyses were conducted to assess the association between the utilization of senior centers and participation in health check-ups. Both men and women utilizing senior centers demonstrated a higher likelihood of participating in health check-ups compared with those who did not use senior centers. Participants visiting senior centers in a week exhibited a progressively higher likelihood of engaging in health check-ups compared with those who visited such senior centers zero times a week. Senior centers can serve as effective intervention methods to enhance health check-ups among older adults. Furthermore, this can contribute to fostering successful aging among older adults.

Keywords Health check-ups, Senior center, Older adults, Social interaction, Health behavior

The utilization of health check-ups among older adults contributes to the early detection of diseases, thereby reducing mortality rates and enhancing quality of life¹. Timely intervention resulting from early disease detection can slow the progression illnesses and decrease medical expenditures for treatment². As aging advances, individuals become more susceptible to diseases, necessitating active management of both physical and mental aspects^{3,4}. The global aging population and increased life expectancy have contributed to a rising incidence of chronic non-communicable diseases (NCDs) and multimorbidity⁵. These chronic NCDs often diminish the quality of life of older adults and can serve as a leading cause of death⁶. Through health check-ups, older adults become aware of their existing diseases and risk factors early on, enabling the postponement of diseases and providing an opportunity to receive treatment^{6,7}. Thus, regular health check-ups prove to be an effective method for disease prevention and maintaining health in successful aging⁸. Health check-ups offer the advantage of gaining insight into one's own health status, thereby increasing the likelihood of adopting healthy behaviors⁹. In other studies, it has been noted that older adults who undergo annual health check-ups have a higher probability of survival¹⁰. Research indicates that regular health check-ups contribute to early detection and the extension of lifespan by identifying health risk factors such as total cholesterol and body mass index^{11,12}. Particularly, chronic conditions like hypertension and diabetes necessitate consistent monitoring¹³.

Andersen's healthcare utilization model posits that healthcare utilization is influenced by four factors beyond environmental, demographic characteristics, and health behaviors, extending to health outcomes¹⁴. The value attributed to health, alongside other motivational factors, demographic characteristics, collectively influences the inclination to engage in health check-up behaviors¹⁵. Among older adults, harboring negative health beliefs, lacking encouragement for health from their surroundings, or facing economic hardship is associated with a decreased likelihood of participating in health check-ups¹⁶. Health literacy plays a crucial role in promoting

¹Department of Health Policy & Management, Graduate School of Public Health, Yonsei University, Seoul, Republic of Korea. ²Institute of Health Services Research, Yonsei University, Seoul, Republic of Korea. ³Department of Preventive Medicine, Yonsei University College of Medicine, Seoul, Republic of Korea. ⁴Department of Psychiatry, Yonsei University Hospital, Seoul, Republic of Korea. ⁵Department of Health Informatics and Biostatistics, Graduate School of Public Health, Yonsei University, 50 Yonsei-ro, Seodaemun-gu, Seoul 03722, Republic of Korea. [⊠]email: mjha@yuhs.ac

engagement in health check-ups¹⁷. However, older adults often exhibit lower health literacy than younger individuals, posing challenges in acquiring health knowledge¹⁷. For instance, the prevalence of depression among older adults is notably high¹⁸. In South Korea the incidence of depression among older adults ranges from 13.87 to 18.36%, with a tendency to increase with age¹⁹. Older adults experiencing geriatric depression are less likely to adopt health-promoting behaviors compared with those not experiencing it²⁰. Furthermore, the post-retirement experience of anxiety contributes to this mentally vulnerable state, hindering the utilization of health checkups among older adults^{21,22}. On the other hand, social support serves as motivating factors for older adults to engage in healthy behaviors²³. Through participation in social activities, older adults can naturally engage in healthy behaviors, and those with social connections tend to place a higher value on health compared to those without^{24,25}. Participation in senior centers is part of social interaction. The characteristics of older adults utilizing senior centers include being female, having higher income, and having good accessibility to senior centers. Additionally, older age is associated with higher attendance rates at senior centers^{26,27}.

According to previous research, individuals from larger families and those with high social engagement and extensive connections within their local community, are more inclined to participate in health check-ups. This underscores the positive influence of interactions among family members and neighbors on health behaviors⁸. Another study highlighted that individuals who perceive a lack of support from society are more likely to forgo health check-ups^{22,28-30}. Earlier research has indicated that social relationships were identified as factors associated with participation in health check-ups for both men and women^{31,32}. However, there is a scarcity of studies focusing on whether social activities within peer groups affect participation in health check-ups. Based on the author's findings, there is no existing research on the association between the use of community centers by the elderly and health screenings. As part of older adult community participation, senior centers serve as communal spaces where older adults can engage in various activities with their peers. Within these centers, individuals receive education on health and digital-related topics, share meals, and exchange cultural experiences. This study aims to explore the association between engaging in social activities within senior centers and participation in health check-ups.

Methods

Data and study population

This study utilized data from the 2020 Elderly Survey conducted by the Ministry of Health and Welfare and the Korea Institute for Health and Social Affairs³³. The Korean Elderly Survey investigates the living conditions and welfare needs of individuals aged 65 years and above in South Korea³⁴. The sampling design employs a two-stage stratified sampling, with the first stage stratifying by survey districts and the second stage by surveyed households³⁵. The survey is conducted through in-home interviews³³. Participants provide informed consent before the survey commences. Additionally, the survey data are publicly accessible, eliminating the need for ethical approval³⁴. The survey was conducted from September 14 to November 20, 2020. The survey was conducted on 10,097 people (4035 men and 6062 women) over the age of 65 living in 17 districts. This study was conducted during the COVID-19 period in 2020. The COVID-19 period has distinct characteristics such as reduced social activities, which may introduce other potential impacts on the research results.

Variables

The dependent variable, participation in health check-ups, was categorized according to responses to two questions: "Have you undergone any health check-ups, excluding dementia screenings, in the past two years?" and "Have you undergone dementia screenings in the past two years?" Participants responding "yes" to both questions were categorized as having participated in health check-ups, whereas those participating in only one of the health check-ups or not participating in both were classified as non-participants. Health check-ups refer to general health check-ups and other health check-ups conducted by government agencies³⁶. General health check-ups aim to identify manageable conditions such as hypertension, diabetes, depression, and hepatitis through early detection³⁷. Dementia screenings are conducted targeting individuals aged 60 and above to detect cognitive impairment early. Screenings can be scheduled at public health centers or designated hospitals affiliated with the government at the individual's preferred time³⁸.

The primary variable of interest in this study, the utilization of senior centers, was assessed by asking individuals whether they had utilized senior centers in the past year. Senior centers include local centers, elderly welfare centers, social welfare centers, women's support centers, senior citizen classrooms, public leisure, and cultural facilities. These centers refer to facilities operated by both public and private entities targeting the elderly. Various programs such as education, hobbies, social activities, and meal services are conducted in these centers. Participants' responses were recorded as "yes" or "no." Additionally, participants who reported utilizing senior centers were classified into three subgroups based on the frequency of utilization (more than five times a week, 3–4 times a week, 1–2 times a week) and family composition (living with family, living alone).

We considered sociodemographic, physical, and mental health–related factors as potential confounding variables and controlled for them. Sociodemographic factors comprised sex, education level (\leq middle school, high school, \geq college), income (low, middle, high), Job status (yes, no), and family interaction (low, middle, high). Family interaction was categorized based on the frequency of meeting family members, such as children and relatives, into high, middle, and low categories. The family interaction variable was classified as high if there was frequency of meeting on a weekly basis, moderate if it occurred every 1–3 months, and low if it occurred on a yearly basis. Physical and mental health-related factors encompassed nutritional status (low, middle, high), alcohol status (yes, no), smoking status (yes, no), physical function (yes, no), physical activity (yes, no), subjective health status (low, middle, high), and depression (normal, moderate, severe). The subjective health status was assessed by asking participants how they perceived their own health status. Responses were categorized as very

healthy, healthy (high), average (moderate), poor, or very poor (low). Nutritional status was assessed utilizing the tool developed by the nutrition screening initiative, while depression was measured utilizing a shortened version of the geriatric depression scale. Physical function (yes, no) was evaluated utilizing activities of daily living (ADL) and instrumental ADL.

Statistical Analysis

To compare differences in participants' general characteristics, chi-square tests were conducted, and the results were presented in frequencies and percentages. To explore the association between the utilization of senior centers and participation in health check-ups, logistic regression analysis was performed. Furthermore, the frequency of senior center utilization (five times or more per week, 3–4 times, 1–2 times, zero times) and the family composition of senior center users (living with family, living alone) were each subdivided into subgroups. The logistic regression analysis, indicated with a 95% confidence interval (CI) and odds ratio (OR), was conducted utilizing SAS version 9.4. Statistical significance for all analyses was set at a p-value of less than 0.05.

Results

Table 1 presents the differences in the general characteristics of the population stratified by gender. The participation rate in health check-ups was 39.4% (N = 1590) for male participants and 42.2% (N = 2561) for female participants, indicating that women were more inclined to participate in health check-ups than men. The likelihood of participation increased with age, lower nutritional status, non-alcohol consumption, physical impairment, lack of physical activity, and self-perceived poor health.

Table 2 presents the outcomes of the logistic regression analysis examining the correlation between the utilization of senior centers and participation in health check-ups. Among individuals utilizing senior centers, men and women were 1.69 and 1.23 times more likely to participate in health check-ups, respectively, compared with individuals who did not use utilize senior centers (men: adjusted OR: 1.69; 95% confidence interval, 1.46–1.97 p-value: <0.0001; women: aOR, 1.23; 95% CI 1.10–1.39, p-value: 0.0002). Additionally, individuals with good physical function had lower odds of undergoing health check-up compared to those with poor physical function. (men: aOR: 0.70; 95% CI 0.53–0.94, p-value: 0.0169; women: aOR, 0.71; 95% CI 0.58–0.89, p-value: 0.0023).

Table 3 presents the subgroup analysis of health check-up participation according to the utilization of senior centers. Among women with severe depression, those utilizing senior centers were 1.59 times more likely to participate in health check-ups compared with those who did not utilize these centers (aOR, 1.59; 95% CI 1.03–2.46, p-value: <0.0001).

Additionally, subgroup analyses stratified by senior center utilization frequency and user's family composition were conducted. As exhibited in Table 4, both sexes display a progressively increasing likelihood of participating in health check-ups as the frequency of utilizing senior centers per week rises. Male and female participants who utilized senior centers 1–2 times per week had 1.55-fold (95% CI 1.28–1.90) and 1.29-fold (95% CI 1.11–1.50,) higher odds, respectively, of participating in health check-ups compared with those who did not utilize these senior centers. Male and female participants utilizing the senior center 3–4 times had 1.64-fold (95% CI 1.34–2.02,) and 1.29-fold (95% CI 1.11–1.50 higher odds, respectively, and those using them five times or more had 2.47-fold (95% CI 1.97–3.12) and 1.84-fold (95% CI 1.59–2.15) higher odds, respectively, compared with those not utilizing senior centers.

The analysis was conducted by classifying individuals who use the senior citizen center based on whether they live with their families. Compared to those who do not use the senior citizen center, it was found that elderly individuals living alone are more likely to receive health check-ups when utilizing the senior citizen center (men: aOR, 2.11; 95% CI 1.63–2.73; women: aOR, 1.52; 95% CI 1.34–1.73). All p-values for the subgroup analysis were < 0.0001.

Discussion

This study identified an association between the utilization of senior centers and participation in health checkups. Individuals utilizing senior centers exhibited a higher inclination of participating in health check-ups compared with those who did not utilize these facilities. This finding, controlling for family interaction, suggests that interactions among peers excluding family members, might influence participation in health check-ups among older adults. Moreover, there was a progressive increase in the likelihood of participating in health check-ups as the frequency of utilizing senior centers increased. Among users of senior centers, individuals living alone exhibited a higher likelihood of participating in health check-ups. This underscores the potential association between social relationships and participation in health check-ups.

It well-established that social relationships play various positive roles in the lives of older adults, encompassing health and more³⁹. Previous studies have emphasized the significant role of social networks in promoting various health-related behaviors and facilitating health check-ups^{40,41}. Other research has demonstrated that older adults with close family relationships and active engagement in social activities are more likely to undergo regular health check-ups^{42,43}. The greater the social support from family, friends, and others, the stronger the association with participation in health check-ups⁴⁴. Furthermore, it has been noted that this association extends not only to health check-ups but also to preventive health behaviors such as vaccinations²³. Previous studies have indicated the association between social support and participation in health check-ups for both men and women³¹. This association was also found to be significant for both genders in the current study. Additionally, it demonstrated that participants engaging in social activities, such as utilizing senior centers, were more likely to participate in health check-ups than those who did not. However, unlike previous studies, this research focused on interactions with peers through the utilization of senior centers, controlling for interactions with family and relatives. Moreover, the analysis of the relationship between usage frequency and participation in health

Male	Male					Female				
Check-1	Check-ups Non		eckups		Check-ups		Non-c	heckups		
N	(%)	N	(%)	p-value	N	(%)	N	(%)	p-value	
1590	(39.4)	2445	(60.6)	-	2561	(42.2)	3501	(57.8)	-	
		1		1			1			
604	(49.3)	621	(50.7)		1244	(47.4)	1380	(52.6)		
986		1824		< 0.0001	1317	(38.3)	2121	(61.7)	< 0.000	
1			[· ·			[· ·			1	
458	(31.6)	993	(68.4)	< 0.0001	676	(32.7)	1394	(67.3)	< 0.0001	
819	-	1061			1203		1397			
313	(44.5)	391	(55.5)		682		710			
	. ,									
917	(42.3)	1249	(57.7)		2123	(44.7)	2628	(55.3)	< 0.0001	
				0.0002	_					
					-					
	(*)		()			(0,0,7)		(*****)		
737	(37.9)	1207	(62.1)		805	(43.7)	1036	(56.3)	0.1235	
-				0.0612			-	-		
	(10.0)	1200	(37.2)	1	1,50	(11.0)	2 105	(30.1)		
731	(387)	1156	(61.3)		883	(41.5)	1246	(58.5)		
-				0.0953				-	0.6293	
-						. ,				
370	(37.7)	021	(02.3)		1034	(42.9)	1404	(37.1)		
	(20.1)	202	((1.0)	1	455	((1))	600	(55.5)		
				0.0852					0.2287	
343	(42.8)	459	(57.2)		482	(43.0)	640	(57.0)		
	1	1		1			1	1		
-				_			-		< 0.0001	
	(24.0)			< 0.0001	_					
3580	(24.0)	11,349	(76.0)		355	(53.0)	315	(47.0)		
								·		
704	(42.1)	970	(57.9)	0.0037	2080	(44.0)	2645	(56.0)	< 0.0001	
886	(37.5)	1475	(62.5)		481	(36.0)	856	(64.0)		
1235	(40.3)	1831	(59.7)	0.0430	2488	(42.0)	3439	(58.0)	0.0049	
355	(36.6)	614	(63.4)	0.0150	73	(54.1)	62	(45.9)		
149	(46.9)	169	(53.1)	0.0046	300	(52.0)	277	(48.0)	< 0.0001	
1441	(38.8)	2276	(61.2)		2261	(41.2)	3224	(58.8)		
926	(41.5)	1307	(58.5)	0.0028	1382	(45.9)	1627	(54.1)	- < 0.0001	
	(2(2))	1138	(63.2)		1179	(38.6)	1874	(61.4)		
664	(36.8)	1150					1			
664 status	(36.8)	1150								
	(36.8)	1402	(61.8)		1088	(40.7)	1582	(59.3)		
status	1	I		0.2335	1088 840	(40.7) (42.8)	1582 1122	(59.3) (57.2)	0.0365	
status 868	(38.2)	1402	(61.8)	0.2335				-	0.0365	
status 868 470	(38.2) (40.6)	1402 688	(61.8) (59.4)	0.2335	840	(42.8)	1122	(57.2)	0.0365	
status 868 470 225	(38.2) (40.6) (41.4)	1402 688 318	(61.8) (59.4) (58.6)	0.2335	840 592	(42.8) (45.0)	1122 725	(57.2) (55.0)	0.0365	
status 868 470	(38.2) (40.6)	1402 688	(61.8) (59.4)	0.2335	840	(42.8)	1122	(57.2)	0.0365	
	N 1590 604 986 458 819 313 917 538 135 737 853 731 483 376 242 979 343 10,319 3579 3580 704 886 1235 355 149	1590 (39.4) 604 (49.3) 986 (35.1) 458 (31.6) 819 (43.6) 313 (44.5) 917 (42.3) 538 (36.4) 135 (34.5) 737 (37.9) 853 (40.8) 731 (38.7) 483 (42.0) 376 (37.7) 242 (38.1) 979 (38.6) 343 (42.8) 10,319 (16.2) 3579 (24.0) 3580 (24.0) 3580 (24.0) 3580 (24.0) 355 (36.6) 1235 (40.3) 355 (36.6)	N (%) N 1590 (39.4) 2445 604 (49.3) 621 986 (35.1) 1824 458 (31.6) 993 819 (43.6) 1061 313 (44.5) 391 917 (42.3) 1249 538 (36.4) 940 135 (34.5) 256 737 (37.9) 1207 853 (40.8) 1238 731 (38.7) 1156 483 (42.0) 668 376 (37.7) 621 242 (38.1) 393 979 (38.6) 1557 343 (42.8) 459 10,319 (16.2) 53,439 3579 (24.0) 11,348 3580 (24.0) 11,349 704 (42.1) 970 886 (37.5) 1475 704 (42.1) 970 <td>N (%) N (%) 1590 (39.4) 2445 (60.6) 604 (49.3) 621 (50.7) 986 (35.1) 1824 (64.9) 458 (31.6) 993 (68.4) 819 (43.6) 1061 (56.4) 313 (44.5) 391 (55.5) 917 (42.3) 1249 (57.7) 538 (36.4) 940 (63.6) 135 (34.5) 256 (65.5) 737 (37.9) 1207 (62.1) 853 (40.8) 1238 (59.2) 731 (38.7) 1156 (61.3) 483 (42.0) 668 (58.0) 376 (37.7) 621 (62.3) 242 (38.1) 393 (61.9) 979 (38.6) 1557 (61.4) 343 (42.8) 459 (57.2) 10,319 (16.2) 53,439</td> <td>N (%) N (%) p-value 1590 (39.4) 2445 (60.6) $$</td> <td>N $(%)$ N $(%)$ p-value N 1590 (39.4) 2445 (60.6) 2561 604 (49.3) 621 (50.7) <0.0001 1244 986 (35.1) 1824 (64.9) <0.0001 1244 986 (35.1) 1824 (64.9) <0.0001 1203 458 (31.6) 993 (68.4) <0.0001 1203 313 (44.5) 391 (55.5) <0.0001 390 135 (34.5) 256 (65.5) 0.0002 390 135 (34.5) 256 (65.5) 0.0012 885 737 (37.9) 1207 (62.1) 0.0612 883 483 (42.0) 668 (58.0) 0.0953 624 376 (37.7) 621 (61.3) 0.0953 624 376 (38.6) 1557 (61.4) <td< td=""><td>$\begin{array}{ c c c c c c c c c c c c c c c c c c c$</td><td>N (%) N (%) p-value N (%) N 1590 (39.4) 2445 (60.6) 2561 (42.2) 3501 604 (49.3) 621 (50.7) 20.0001 1244 (47.4) 1380 986 (35.1) 1824 (64.9) <0.0001 1244 (47.4) 1380 458 (31.6) 993 (68.4) <0.0001 1203 (46.3) 1397 313 (43.6) 1061 (56.4) <0.0001 1203 (46.3) 1397 313 (44.5) 391 (55.5) 0.0002 390 (32.8) 800 135 (36.4) 940 (63.6) 0.0002 390 (32.8) 800 135 (34.5) 256 (65.5) 0.0612 805 (43.7) 1036 853 (40.8) 1238 (59.2) 0.0612 805 (43.7) 1036 853 (40.8)</td><td>$\begin{array}{ c c c c c c c c c c c c c c c c c c c$</td></td<></td>	N (%) N (%) 1590 (39.4) 2445 (60.6) 604 (49.3) 621 (50.7) 986 (35.1) 1824 (64.9) 458 (31.6) 993 (68.4) 819 (43.6) 1061 (56.4) 313 (44.5) 391 (55.5) 917 (42.3) 1249 (57.7) 538 (36.4) 940 (63.6) 135 (34.5) 256 (65.5) 737 (37.9) 1207 (62.1) 853 (40.8) 1238 (59.2) 731 (38.7) 1156 (61.3) 483 (42.0) 668 (58.0) 376 (37.7) 621 (62.3) 242 (38.1) 393 (61.9) 979 (38.6) 1557 (61.4) 343 (42.8) 459 (57.2) 10,319 (16.2) 53,439	N (%) N (%) p-value 1590 (39.4) 2445 (60.6) $$	N $(%)$ N $(%)$ p-value N 1590 (39.4) 2445 (60.6) 2561 604 (49.3) 621 (50.7) <0.0001 1244 986 (35.1) 1824 (64.9) <0.0001 1244 986 (35.1) 1824 (64.9) <0.0001 1203 458 (31.6) 993 (68.4) <0.0001 1203 313 (44.5) 391 (55.5) <0.0001 390 135 (34.5) 256 (65.5) 0.0002 390 135 (34.5) 256 (65.5) 0.0012 885 737 (37.9) 1207 (62.1) 0.0612 883 483 (42.0) 668 (58.0) 0.0953 624 376 (37.7) 621 (61.3) 0.0953 624 376 (38.6) 1557 (61.4) <td< td=""><td>$\begin{array}{ c c c c c c c c c c c c c c c c c c c$</td><td>N (%) N (%) p-value N (%) N 1590 (39.4) 2445 (60.6) 2561 (42.2) 3501 604 (49.3) 621 (50.7) 20.0001 1244 (47.4) 1380 986 (35.1) 1824 (64.9) <0.0001 1244 (47.4) 1380 458 (31.6) 993 (68.4) <0.0001 1203 (46.3) 1397 313 (43.6) 1061 (56.4) <0.0001 1203 (46.3) 1397 313 (44.5) 391 (55.5) 0.0002 390 (32.8) 800 135 (36.4) 940 (63.6) 0.0002 390 (32.8) 800 135 (34.5) 256 (65.5) 0.0612 805 (43.7) 1036 853 (40.8) 1238 (59.2) 0.0612 805 (43.7) 1036 853 (40.8)</td><td>$\begin{array}{ c c c c c c c c c c c c c c c c c c c$</td></td<>	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	N (%) N (%) p-value N (%) N 1590 (39.4) 2445 (60.6) 2561 (42.2) 3501 604 (49.3) 621 (50.7) 20.0001 1244 (47.4) 1380 986 (35.1) 1824 (64.9) <0.0001 1244 (47.4) 1380 458 (31.6) 993 (68.4) <0.0001 1203 (46.3) 1397 313 (43.6) 1061 (56.4) <0.0001 1203 (46.3) 1397 313 (44.5) 391 (55.5) 0.0002 390 (32.8) 800 135 (36.4) 940 (63.6) 0.0002 390 (32.8) 800 135 (34.5) 256 (65.5) 0.0612 805 (43.7) 1036 853 (40.8) 1238 (59.2) 0.0612 805 (43.7) 1036 853 (40.8)	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	

Table 1. General characteristics of the study population by gender.

check-ups indicated a correlation between increased social activity and a higher likelihood of participating in health check-ups.

	Male			Female			
Variables	aOR	95% CI	aOR	95% CI			
Senior center	aon	J JJ /0 CI	aon	J 570 CI			
Not use (ref)	1.00		1.00				
Use	1.69	(1.46-1.97)	1.00	(1.10-1.39)			
Age	1.07	(1.40-1.57)	1.25	(1.10-1.57)			
65-69 (ref)	1.00		1.00				
70–79	1.55	(1.32-1.82)	1.64	(1.43-1.89)			
≥80	1.55	(1.32-1.82)	1.89	(1.43-1.89)			
Education	1.51	(1.21-1.90)	1.09	(1.38-2.20)			
≤ Middle school (ref)	1.00		1.00				
	0.89	(0.77, 1.04)		(0.62, 0.96)			
High school	-	(0.77-1.04)	0.73	(0.63-0.86)			
≥ College	0.73	(0.57–0.94)	0.88	(0.60–1.31)			
Job status	1.00	1	1.00				
No (ref)	1.00	(0.00.1.10)	1.00	(1.15.1.45)			
Yes	1.02	(0.88–1.19)	1.29	(1.15–1.47)			
Income	1	1	1	1			
Low (ref)	1.00		1.00				
Middle	1.44	(1.20-1.74)	1.23	(1.08-1.41)			
High	1.26	(1.05–1.53)	1.09	(0.95–1.26)			
Family interaction		1		1			
Low (ref)	1.00		1.00				
Middle	0.86	(0.69–1.08)	1.21	(1.02-1.45)			
High	0.89	(0.75–1.06)	1.11	(0.96–1.28)			
Nutrition status		1		1			
High (ref)	1.00		1.00				
Middle	1.41	(1.18–1.69)	1.35	(1.18–1.56)			
Low	2.60	(1.95-3.47)	1.69	(1.40-2.05)			
Alcohol status		1		1			
No (ref)	1.00		1.00				
Yes	0.90	(0.78–1.04)	0.77	(0.67–0.88)			
Smoking status							
No (ref)	1.00		1.00				
Yes	0.91	(0.78-1.08)	1.67	(1.17-2.39)			
Physical function							
Poor (ref)	1.00		1.00				
Good	0.70	(0.53-0.94)	0.71	(0.58-0.89)			
Physical activity							
No (ref)	1.00		1.00				
Yes	1.25	(1.09-1.44)	1.5	(1.35-1.68)			
Self-reported health stat	tus	1		4			
High (ref)	1.00		1.00				
Middle	0.93	(0.80-1.10)	0.93	(0.82-1.06)			
Low	0.88	(0.70-1.12)	0.83	(0.71-0.98)			
Depression		1	1	1			
Normal (ref)	1.00		1.00				
Moderate	0.69	(0.57-0.86)	0.83	(0.72-0.97)			
Severe	0.74	(0.53-1.05)	1.09	(0.87-1.38)			
	0.7 1	(0.00 1.00)	1.37	(0.0, 1.00)			

Table 2. Results of logistic regression analysis investigating the association between senior center utilization and participation in health check-up. Significant values are given in bold. *aOR* adjusted odds ratio, *CI* confidence interval.

According to Andersen's healthcare utilization model, healthcare utilization is influenced by four elements: environmental, demographic characteristics, health behavior, and health outcomes²². From a psychological perspective, social isolation in old age is considered a potential obstacle to participation in health programs^{21,45}. Socially isolated individuals often place lower value on health compared with their non-isolated counterparts²⁴.

	Male	-		Female			
	Mate	Lice		Temate	Use		
W	Network	Use		Network		050/ 01	
Variables	Not use	aOR	95% CI	Not use	aOR	95% CI	
Age	1.00	2.20	(1 (0 2 14)	1.00	1.40	(1.20, 1.00)	
65-69	1.00	2.29	(1.68-3.14)	1.00	1.49	(1.20-1.86)	
70–79	1.00	1.65	(1.35-2.02)	1.00	1.26	(1.08–1.49)	
≥80	1.00	1.32	(0.96–1.84)	1.00	0.88	(0.70–1.12)	
Education		1				(
≤ Middle school	1.00	1.64	(1.36–1.99)	1.00	1.12	(1.00-1.28)	
High school	1.00	1.67	(1.26-2.21)	1.00	1.75	(1.32-2.35)	
≥College	1.00	1.59	(0.94-2.70)	1.00	2.50	(0.80-7.82)	
Job status	1	1	1	1		1	
Yes	1.00	2.41	(1.92-3.03)	1.00	1.43	(1.15–1.78)	
No	1.00	1.22	(1.00-1.50)	1.00	1.15	(1.01–1.33)	
Income			,				
Low	1.00	2.27	(1.78-2.91)	1.00	1.63	(1.33-2.00)	
Middle	1.00	1.40	(1.08-1.83)	1.00	1.25	(1.00-1.58)	
High	1.00	1.44	(1.07–1.94)	1.00	1.00	(0.84–1.20)	
Family interaction	<u>.</u>						
Low	1.00	2.31	(1.56-3.42)	1.00	1.84	(1.40-2.43)	
Middle	1.00	1.79	(1.49–2.17)	1.00	1.27	(1.10–1.47)	
High	1.00	1.33	(0.95-1.86)	1.00	0.90	(0.69–1.18)	
Nutrition status							
High	1.00	1.97	(1.65-2.36)	1.00	1.34	(1.17–1.55)	
Middle	1.00	1.31	(0.94-1.84)	1.00	0.99	(0.78-1.27)	
Low	1.00	1.11	(0.61-2.03)	1.00	1.37	(0.97-1.96)	
Alcohol status							
No	1.00	1.55	(1.23-1.96)	1.00	1.09	(0.97-1.25)	
Yes	1.00	1.89	(1.56-2.32)	1.00	2.10	(1.62-2.74)	
Smoking status		1			1		
No	1.00	1.63	(1.38-1.94)	1.00	1.22	(1.10-1.38)	
Yes	1.00	2.12	(1.54-2.93)	1.00	1.72	(0.62-4.76)	
Physical function					1		
No	1.00	1.71	(1.47-2.01)	1.00	1.22	(1.09-1.38)	
Yes	1.00	1.54	(0.89-2.69)	1.00	1.15	(0.76-1.74)	
Physical activity		1			1		
No	1.00	1.65	(1.36-2.02)	1.00	1.26	(1.08-1.48)	
Yes	1.00	1.79	(1.43-2.25)	1.00	1.24	(1.05-1.47)	
Self-reported health status							
High	1.00	2.10	(1.72-2.59)	1.00	1.61	(1.35-1.92)	
Middle	1.00	1.42	(1.09–1.86)	1.00	0.96	(0.79–1.18)	
Low	1.00	1.11	(0.74-1.67)	1.00	1.11	(0.88-1.41)	
Depression		1	,	1	1	,	
Normal	1.00	1.94	(1.64-2.29)	1.00	1.32	(1.16-1.51)	
Moderate	1.00	1.07	(0.70-1.66)	1.00	0.93	(0.71 - 1.23)	

Table 3. Subgroup analysis of health check-up participation according to the use of elderly facilities. *aOR* adjusted odds ratio, *CI* confidence interval.

This diminished valuation of health acts as a deterrent to engaging in health management behaviors²⁴. Socialization and social support serve as motivational factors for older adults to consistently engage in health behaviors²⁵. Previous research has highlighted that, while individuals recognize the importance of improving health through health behaviors, they might naturally engage in health-promoting activities as part of their involvement in social activities²⁵. Among older adults, self-efficacy promotes health-seeking behaviors and becomes a predictive concept for actions such as health check-ups⁴⁶. Older adults with higher self-efficacy are more likely to utilize preventive medical care and undergo health check-ups compared with those with lower self-efficacy⁴⁷. Additionally, friendship interactions among older adults exhibit a positive correlation with self-efficacy⁴⁸.

	Male		Female				
Variables	aOR	95% CI	aOR	95% CI			
Frequency of visits to senior center							
0 (ref)	1.00		1.00				
1-2	1.55	(1.28–1.90)	1.29	(1.11–1.50)			
3-4	1.64	(1.34-2.02)	1.29	(1.11-1.50)			
5-	2.47	(1.97-3.12)	1.84	(1.59–2.15)			
Senior center							
Not use (ref)	1.00		1.00				
Use							
Living with family	1.72	(1.49-2.00)	1.39	(1.23–1.58)			
Living without family	2.11	(1.63-2.73)	1.52	(1.34–1.73)			

Table 4. Results of subgroup analysis stratified by frequency of use of facilities for the elderly and family composition of users. *aOR* adjusted odds ratio, *CI* confidence interval.

.....

This study has several limitations. First, it is a cross-sectional study, which hinders the determination of causality between factors, making it challenging to evaluate the sequence of events leading to outcomes. Second, the reliance on self-reported survey methods might compromise the reliability of the results. Third, despite attempts to control for covariates that may influence the dependent variable, uncontrolled confounding variables might have impacted the results. Fourth, variables related to hospitalization or long-term care admission could not be controlled for, which may have influenced the results.

However, this study also possesses several strengths. First, the data utilized in the study targeted the national population, enhancing its representativeness. Second, conducting face-to-face interviews by trained professionals could enhance the reliability and validity of survey responses.

Conclusion

The results of this study suggest a potential association between the use of community centers by the elderly and participation in health screenings. With the global population aging, the efficient management of older adult health has become a critical area of interest. This study suggests the possibility that facilities where the elderly gather could be utilized for health management purposes.

Data availability

The data can be accessed through a link provided to public data. https://chs.kdca.go.kr/chs/index.do.

Received: 22 January 2024; Accepted: 13 May 2024 Published online: 21 May 2024

References

- 1. Tian, W.-H., Chen, C.-S. & Liu, T.-C. The demand for preventive care services and its relationship with inpatient services. *Health Policy* **94**(2), 164–174 (2010).
- Fragala, M. S., Shiffman, D. & Birse, C. E. Population health screenings for the prevention of chronic disease progression. Am. J. Manag. Care 25(11), 548–553 (2019).
- Halter, J. B. et al. Diabetes and cardiovascular disease in older adults: Current status and future directions. Diabetes 63(8), 2578– 2589 (2014).
- Fiest, K. M., Currie, S. R., Williams, J. V. & Wang, J. Chronic conditions and major depression in community-dwelling older adults. J. Affect. Disord. 131(1–3), 172–178 (2011).
- Ansari, S., Muhammad, T. & Dhar, M. How does multi-morbidity relate to feeling of loneliness among older adults? Evidence from a population-based survey in India. J. Popul. Ageing 16(1), 45–66 (2023).
- Sazlina, S. Health screening for older people—What are the current recommendations?. Malays. Fam. Physicians Off. J. Acad. Fam. Physicians Malays. 10(1), 2 (2015).
- 7. Chernoff, R. Nutrition and health promotion in older adults. J. Gerontol. Ser. A Biol. Sci. Med. Sci. 56, 47-53 (2001).
- Noguchi, R. & Shen, J. Factors affecting participation in health checkups: Evidence from Japanese survey data. *Health Policy* 123(4), 360–366 (2019).
- 9. Kang, C., Kawamura, A. & Noguchi, H. Benefits of knowing own health status: Effects of health check-ups on health behaviours and labour participation. *Appl. Econ. Lett.* 28(11), 926–931 (2021).
- 10. Chiou, C.-J. & Chang, H.-Y. Do the elderly benefit from annual physical examination? An example from Kaohsiung city, Taiwan. *Prev. Med.* **35**(3), 264–270 (2002).
- 11. Choi, Y. Y. & Kim, K. Y. Effects of physical examination and diet consultation on serum cholesterol and health-behavior in the Korean pilots employed in commercial airline. *Ind. Health* **51**(6), 603–611 (2013).
- Chang, K.C.-M. et al. Impact of the National Health Service Health Check on cardiovascular disease risk: A difference-in-differences matching analysis. Cmaj 188(10), E228–E238 (2016).
- Eyre, H. *et al.* Preventing cancer, cardiovascular disease, and diabetes: A common agenda for the American Cancer Society, the American Diabetes Association, and the American Heart Association. *Circulation* 109(25), 3244–3255 (2004).
- 14. Andersen RM. Revisiting the behavioral model and access to medical care: Does it matter? *J. of health and social behavior* **16**, 1–10. (1995).
- Chien, S.-Y., Chuang, M.-C. & Chen, I.-P. Why people do not attend health screenings: Factors that influence willingness to participate in health screenings for chronic diseases. *Int. J. Environ. Res. Public Health* 17(10), 3495 (2020).
- 16. Okura, M. et al. Health checkup behavior and individual health beliefs in older adults. Geriatr. Gerontol. Int. 18(2), 338-351 (2018).

- 17. Lee, H. Y., Kim, S., Neese, J. & Lee, M. H. Does health literacy affect the uptake of annual physical check-ups?: Results from the 2017 US health information national trends survey. *Arch. Public Health* **79**, 1–10 (2021).
- 18. Allan, C. E., Valkanova, V. & Ebmeier, K. P. Depression in older people is underdiagnosed. Pract. 258(1771), 19–22 (2014).
- Kim, Y., Kim, J., Kim, M., Song, K. & Choi, M. Association of depressive mood and frailty with mortality and health care utilization: Korean national cohort study. J. Am. Med. Dir. Assoc. 24(4), 504–510 (2023).
- Chang, C.-F. et al. The relationship between geriatric depression and health-promoting behaviors among community-dwelling seniors. J. Nurs. Res. 21(2), 75–82 (2013).
- Tomioka, K., Kurumatani, N. & Hosoi, H. Positive and negative influences of social participation on physical and mental health among community-dwelling elderly aged 65–70 years: A cross-sectional study in Japan. BMC Geriatr. 17(1), 1–13 (2017).
- 22. Du, B. & Mu, Y. The relationship between health changes and community health screening participation among older people. *Front. Public Health* **10**, 870157 (2022).
- 23. Han, S. H., Kim, K. & Burr, J. A. Social support and preventive healthcare behaviors among couples in later life. *Gerontol.* **59**(6), 1162–1170 (2019).
- 24. Hawton, A. *et al.* The impact of social isolation on the health status and health-related quality of life of older people. *Qual. Life Res.* **20**, 57–67 (2011).
- 25. Miller, A. M. & Iris, M. Health promotion attitudes and strategies in older adults. Health Educ. Behav. 29(2), 249-267 (2002).
- Jefferson, B.J., "Factors affecting participation in senior center programs". UNLV Theses, Dissertations, Professional Papers, and Capstones. 310 (1999).
- 27. Ralston, P. A. Determinants of senior center attendance and participation. J. Appl. Gerontol. 10(3), 258-273 (1991).
- Tolonen, H., Lundqvist, A., Jääskeläinen, T., Koskinen, S. & Koponen, P. Reasons for non-participation and ways to enhance participation in health examination surveys—The health 2011 survey. Eur. J. Public Health 27(5), 909–911 (2017).
- Cadzow, R. B. & Servoss, T. J. The association between perceived social support and health among patients at a free urban clinic. J. Natl. Med. Assoc. 101(3), 243–250 (2009).
- Chen, Y.-J., Lin, C.-F., Feng, J. & Chiu, H.-L. Influencing factors of participation in and satisfaction with elderly health checkups: A cross-sectional study. *Front. Public Health* 11, 1104438 (2023).
- 31. McFall, S. L. & Davila, M. Gender, social ties, and cancer screening among elderly persons. J. Aging Health 20(8), 997-1011 (2008).
- 32. Salmon, C., Parent, M. -É., Quesnel-Vallée, A. & Barnett, T. A. A scoping review of social relationships and prostate cancer screening. *Prev. Med.* 154, 106892 (2022).
- Yun, I., Kim, H., Park, E.-C. & Jang, S.-Y. Association of perceived life satisfaction with attitudes toward life-sustaining treatment among the elderly in South Korea: A cross-sectional study. BMC Palliat. Care 21(1), 1–7 (2022).
- 34. Baek, J. Y., Lee, E., Jung, H.-W. & Jang, I.-Y. Geriatrics fact sheet in Korea 2021. Ann. Geriatr. Med. Res. 25(2), 65 (2021).
- Kim, G. & Lee, M.-A. Age discrimination and suicidal ideation among Korean older adults. Am. J. Geriatr. Psychiatry 28(7), 748–754 (2020).
- Shin, H.-Y., Kang, H.-T., Lee, J. W. & Lim, H.-J. The association between socioeconomic status and adherence to health check-up in Korean adults, based on the 2010–2012 Korean National Health and Nutrition Examination Survey. *Korean J. Fam. Med.* 39(2), 114 (2018).
- Shin, D. W., Cho, J., Park, J. H. & Cho, B. National general health screening program in Korea: History, current status, and future direction. Precis. Future Med. 6(1), 9–31 (2022).
- Lee, S. J., Seo, H.-J., Lee, D. Y. & Moon, S.-H. Effects of a dementia screening program on healthcare utilization in South Korea: A difference-in-difference analysis. *Int. J. Environ. Res. Public Health* 16(20), 3837 (2019).
- Choi, Y., Lee, K. S., Shin, J., Kwon, J. A. & Park, E. C. Effects of a change in social activity on quality of life among middle-aged and elderly Koreans: Analysis of the Korean longitudinal study of aging (2006–2012). Geriatr. Gerontol. Int. 17(1), 132–141 (2017).
- Gallant MP. Social networks, social support, and health-related behavior. The Oxford handbook of health communication, behavior change, and treatment adherence, 16, 305–22. (2013).
- Suarez, L., Lloyd, L., Weiss, N., Rainbolt, T. & Pulley, L. Effect of social networks on cancer-screening behavior of older Mexica-American women. J. Natl. Cancer Inst. 86(10), 775–779 (1994).
- Jung, Y. & Choi, S. Trajectories of preventive health care utilization among older Koreans: The role of social relationships. *Health Educ. Behav.* 50(3), 382–393 (2023).
- Cao, W., Yun, Q., Chang, C. & Ji, Y. Family support and social support associated with national essential public health services utilization among older migrants in china: A gender perspective. *Int. J. Environ. Res. Public Health* 19(3), 1610 (2022).
- Dickey, S. L., Cormier, E. M., Whyte, J. IV., Graven, L. & Ralston, P. A. Demographic, social support, and community differences in predictors of African–American and white men receiving prostate cancer screening in the United States. *Public Health Nurs.* 33(6), 483–492 (2016).
- Cacioppo, J. T. & Cacioppo, S. Social relationships and health: The toxic effects of perceived social isolation. Soc. Personal. Psychol. Compass 8(2), 58–72 (2014).
- Straughan, P. T. & Seow, A. Fatalism reconceptualized: A concept to predict health screening behavior. J. Gend. C. Health 3, 85–100 (1998).
- Chen, J. Z., Hsu, H. C., Tung, H. J. & Pan, L. Y. Effects of health literacy to self-efficacy and preventive care utilization among older adults. *Geriatr. Gerontol. Int.* 13(1), 70–76 (2013).
- 48. Lee, G. R. & Shehan, C. L. Social relations and the self-esteem of older persons. Res. Aging 11(4), 427-442 (1989).

Author contributions

K.A.J. wrote the main manuscript text and prepared Table. All authors reviewed the manuscript.

Funding

This research was supported by National Research Foundation of Korea(NFR) grant funded by the Korea government(MSIT)[No. 2022R1A2C1091488].

Competing interests

The authors declare no competing interests.

Additional information

Correspondence and requests for materials should be addressed to M.J.H.

Reprints and permissions information is available at www.nature.com/reprints.

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit http://creativecommons.org/licenses/by/4.0/.

© The Author(s) 2024