Research Square

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The Impact of Expanded Insurance Coverage of Dental Prosthetic Services on Dental Care Utilization Among Older Adults in South Korea: Based on the Korean Health Panel Survey.

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Abstract

Background: In Korea, the National Health Insurance Service (NHIS) began its coverage of dentures and dental implants for older people in 2012 and 2014, respectively. This study aimed to investigate the impact of these policies on dental care utilization among people aged 65 years or older according to their sociodemographic characteristics.

Methods: Data was collected from the Korea Health Panel (KHP; years 2012 and 2015). The statistical significance of the relationships between sociodemographic characteristics and use of outpatient dental care, denture, and dental implant were analyzed.

Results: Results showed an increase of 5.7%, 1.4%, and 2.8% for use of outpatient dental care, denture, and dental implant, respectively, over the course of three years. Including dentures increased its use by 2.5–3.7 times among people aged 70 years or older. Including dental implants alleviated the disparities among age groups and duration of education, except among uneducated people; however, it caused inequity according to household income.

Conclusions: Thus, some Korean older adults remain neglected from the benefits of the expanded NHIS; the NHIS should aim for the provision of universal health coverage, and older adults' access to dental care should be enhanced by the implementation of policies to promote oral health care utilization, Dental prosthetic services, Older adults, Insurance coverage

Background

With the rapid extension of the human lifespan in the late 20th century, interest in older people's health and quality of life (QOL) are mounting. Diminished masticatory abilities as a result of tooth loss among older people may have an impact on physical functions other than those related to their oral health [1]; recently, multiple tooth loss among older people has been associated with reduced QOL [2–4], cognitive impairment (e.g., dementia) [5–7], and has been attracting more attention.

Multiple tooth loss in older people is a cumulative result of dental caries and periodontal diseases that occurred throughout their lives [8–9]. To restore oral functions hindered by multiple tooth loss, costly dental prosthetic services, such as dentures and dental implants, are needed. Therefore, to prevent multiple tooth loss, the importance of lifelong prevention and management of oral diseases should be emphasized [10–11].

Dental prosthetic services (including dentures) are considered as the minimal measures needed to improve oral functions and QOL in older adults with multiple tooth loss. However, utilizing dental prosthetic services is often difficult owing to their cost, and taking into account that multiple tooth loss more frequently affects the socially disadvantaged older people [12], the rationale behind this difficulty becomes clear. To resolve such socioeconomic issues, government-led dental care projects or even the expansion of the national health insurance coverage may be considered.

In Korea, the percentage of older adults (≥ 65 years) in the general population was 7.2% in 2000 and 14.3% in 2018, and there is a projection that Korea will become a super-aged society by 2026, with this percentage exceeding 20%; further, the relative poverty rate of Korean older adults (46%) is ranked in the top among OECD (Organisation for Economic Co-operation and Development) countries, and it is about four times higher than the OECD average of 12.5% [13]. Hence, faced with such a fast aging rate and a serious elderly poverty issue, the Korean government has been actively producing countermeasures, such as enacting the Framework Act on Low Birthrate in an Aging Society and installing the Presidential Committee on Aging Society and Population Policy in 2005 [14].

The percentage of edentulous patients among Korean older adults was 9.2% in 2015, which was a 0.9% rise from the previous year [15]. Further, 42.9% of Korean older adults in 2017 were reported to have some sort of masticatory discomfort [16]. As shown here, despite the gravity of the problems related to multiple tooth loss among Korean older people, they frequently fail to receive essential dental care owing to financial and policy reasons. The rate of those with unmet dental care needs among older adults aged 65 years or older in 2017 was 15.0% [17], and 72.0% of these owed to financial difficulties [18]. Thus, a consensus was reached in Korea toward the need to cover dental prosthetic services under the national health insurance for older adults having multiple tooth loss. Subsequently, the presidential candidate who pledged to expand the national health insurance coverage for dentures for older adults was elected in 1997, and, in 2012, the presidential candidate who pledged to expand the national health insurance coverage for dental implants for older adults was also elected. Then, the national health insurance began to cover dentures and dental implants for older adults in July 2012 and July 2014, respectively.

Health insurance coverage of dentures was initiated for people aged 75 years or older in July 2012 with an out-of-pocket (OOP) percentage of 30%; the eligibility was expanded to people aged 70 years or older in July 2015 and to people aged 65 years or older in July 2016 [19]. Health insurance coverage of dental implants was initiated for people aged 75 years or older in July 2014 for two dentures in a lifetime with an OOP percentage of 50%; the eligibility was expanded to people aged 70 years or older in July 2015 and to people aged 65 years or older in July 2016 [20], and the OOP percentage was reduced from 50–30% in July 2018 [21].

No other country around the world provides a national health insurance coverage of dentures and dental implants for older people as Korea currently does. Considering that dental prosthetic services are costly, unlike the internationally recommended preventive dental care services, prompt assessment of this measure undertaken by the Korean government is needed from various angles. Therefore, in this study, among the data from the Korea Medical Panel Survey were included data from 2012, when the government introduced coverage of dental prosthesis services for the elderly, and data from 2015, three years after its introduction, as a part of this assessment pertaining to the insurance coverage of dentures and dental implants in Korea, this study aimed to investigate its impact in the dental care utilization of Korean older people according to their sociodemographic characteristics.

Methods

Study participants

This study utilized secondary data from the Korea Health Panel (KHP). The KHP was developed in 2008 to collect information about Koreans' medical utilization patterns, medical expenditures, and analyze the factors that affect these in a comprehensive and in-depth form [22]. We collected raw data from the KHP from the years 2012 (the time at which the national insurance coverage of dental prosthetic services began) and 2015 (three years after beginning this coverage). To collect the data from the KHP website, we followed the delineated process within the website and conducted an analysis on people aged 65 years or older. A stratified two-stage cluster sampling with probability proportional to size was used, where the sample enumeration district clusters are extracted in the first stage and the sample households are selected from the clustered districts in stage 2, and the members of the sample households were surveyed. In 2008, 24,616 people from 7,866 households were surveyed, and the original sample retention rates in the 2012 and 2015 data were 70.5% and 59.0%, respectively.

In this study, we selected the annual use of outpatient dental care, denture use, and dental implant use as the dependent variables; for the sociodemographic characteristics, we included sex, age group, marital status, duration of education, household income, type of health insurance, and level of disability. Age groups were divided into 65–69 years, 70–74 years, 75–79 years, and ≥ 80 years, and marital status was divided into married and not married (comprising separated, widowed, missing, divorced, never married). Duration of education was divided into 0, 0–6, 6–12, and > 12 years, and household income was divided into 1st quintile (lowest) to 5th quintile (highest). Type of health insurance was classified into health insurance and medical aid.

Statistical analysis

Statistical analyses were conducted using the STATA 13.0 (Copyright Stata Corp LP, USA). The statistical significance in the relationships between sociodemographic characteristics and use of outpatient dental care, denture, and dental implant by year was analyzed with complex sample chi-square tests. Further, the association between dental care utilization and sociodemographic characteristics was analyzed by year using a complex sample multiple logistic regression model to compute odds ratio and 95% confidence levels. Cross-sectional weights for the population were applied in all analyses.

Results

As a result of expanding coverage of dental prostheses for older people, outpatient dental care utilization, denture use, and dental implant use all increased in 2015 compared to the use in 2012, when it was only 5.7%, 1.4%, and 2.8%, respectively and the changes in the annual dental care utilization according to sociodemographic characteristics are shown in Table 1.

Overall, outpatient dental care utilization was higher among men, younger age groups, married people, people with higher duration of education and household income, and health insurance. In 2012, only age group and duration of education were statistically significant; however, in 2015, outpatient dental care utilization significantly increased with sociodemographic characteristics.

In 2012, denture use did not significantly differ according to any of the sociodemographic characteristics; however, in 2015, denture use significantly increased among people aged 70 years or older and unmarried ($P < 0.001$). Still in 2015, although there was no statistical significance, the trend toward an increased denture use was strengthened among women, among people with lesser duration of education and household income, and receiving medical aid.

Overall, and similar to outpatient dental care utilization, dental implant use was higher among men, among younger age groups, married people, among people with higher duration of education and household income, and with health insurance. In 2012, it was significant with age group, duration of education, and household income; in 2015, there were significant differences according to sex in addition to the previous variables, but no statistical significance with marital status and type of health insurance.

Table 1

Changes in the annual dental care utilization according to sociodemographic characteristics after expanded coverage of dental prostheses for older pe

Classification	N		Outpatient dental care utilization						Denture use						Dental implant use					
	2012 year	2015 year	2012 year			2015 year			2012 year			2015 year			2012 year			2015 year		
Wt%(N)		Wt%(N)				Wt%(N)			Wt%(N)			Wt%(N)			Wt%(N)					
Total	2,983	4,044	24.7	(736)		30.4	(1,209)		3.5	(112)		4.9	(201)		2.3	(65)		5.1	(1	
Gender																				
Male	1,290	1,720	25.5	(329)	NS	33.1	(559)	**	3.6	(48)	NS	4.5	(81)	NS	2.4	(28)	NS	6.4	(1	
Female	1,693	2,324	24.1	(407)		28.5	(650)		3.5	(64)		5.2	(123)		2.2	(37)		4.2	(9	
Age Group																				
65 ~ 69 years	909	1,367	29.1	(271)	***	33.4	(444)	***	3.7	(36)	NS	2.1	(30)	***	3.8	(35)	***	7.1	(9	
70 ~ 74 years	990	962	25.7	(251)		35.5	(336)		3.1	(31)		5.4	(55)		2.3	(21)		5.1	(4	
75 ~ 79 years	650	928	24.6	(156)		28.7	(264)		4.4	(30)		7.9	(74)		1.4	(8)		4.2	(3	
≥ 80 years	434	787	13.0	(58)		21.6	(165)		3.1	(15)		6.2	(45)		0.2	(1)		2.8	(1	
Marital status																				
Married	2,024	2,697	25.7	(520)	NS	32.2	(858)	**	3.3	(70)	NS	4.0	(115)	**	2.4	(46)	NS	5.7	(1	
Unmarried	959	1,347	22.6	(216)		27.3	(351)		4.0	(42)		6.6	(89)		2.0	(19)		4.2	(5	
Duration of education																				
0 years	494	591	16.2	(78)	***	18.5	(110)	***	2.4	(12)	NS	6.2	(33)	NS	1.1	(5)	**	1.3	(9	
≤ 0 ~ 6 years	1,303	1,657	23.1	(305)		28.5	(460)		3.6	(50)		5.2	(91)		2.2	(27)		4.9	(7	
≤ 6 ~ 12 years	961	1,464	29.5	(284)		34.9	(510)		4.4	(44)		4.6	(69)		2.1	(21)		5.7	(8	
> 12 years	225	332	31.7	(69)		39.8	(129)		2.7	(6)		3.0	(11)		6.1	(12)		6.7	(3	
Household income																				
1st quintile	1,168	1,703	23.5	(274)	NS	28.1	(465)	***	4.4	(55)	NS	6.3	(102)	NS	1.3	(13)	*	3.1	(5	
2th quintile	776	1,084	24.2	(184)		27.9	(312)		3.5	(28)		4.3	(53)		2.9	(22)		4.5	(5	
3th quintile	534	566	25.1	(136)		34.8	(195)		2.7	(15)		4.3	(23)		2.5	(12)		6.1	(3	
4th quintile	311	414	25.5	(80)		32.3	(128)		2.2	(7)		4.0	(14)		2.4	(9)		7.5	(3	
5th quintile	200	277	30.0	(61)		39.3	(109)		3.2	(7)		3.3	(12)		4.6	(9)		10.4	(3	
Type of health insurance																				
Health insurance	2,668	3,654	24.6	(654)	NS	30.7	(1,110)	*	3.2	(92)	NS	4.8	(185)	NS	2.4	(63)	NS	5.3	(1	
Medical aid	265	260	22.3	(62)		22.8	(54		5.3	(16)		6.2	(13)		0.4	(1)		1.5	(2	

$^{NS}P>0.05$, $^{*}P < 0.05$, $^{**}P < 0.01$, $^{***}P < 0.001$

Table 2. Changes in the associations between the annual dental care utilization and sociodemographic characteristics after expanded coverage of dental prostheses for older people

After coverage expansion, more sociodemographic characteristics significantly differed in outpatient dental utilization and denture use; meanwhile, although dental implant use was clearly associated with household income, it had weaker associations with other characteristics (Table 2).

In 2012, outpatient dental care utilization significantly differed: between the 65–69 and the ≥ 80 years group and between the > 12 and ≤ 6 years of education; in 2015, it differed: between the 65–69 and the 70–74 years group and between the 5th (highest) and the 2nd (low) quintile income group.

In 2012, denture use did not significantly differ according to any of the sociodemographic characteristics; however, in 2015, it did significantly differ between the 65–69 years group and all age groups older than 70 years.

In 2012, dental implant use significantly differed between the 65–69 and the ≥ 75 years groups and between > 12 and ≤ 12 years of education; in 2015, it differed: between the 5th (highest) and the 3rd (middle) quintile income groups and between > 12 and 0 years of education, while the significant difference between age groups disappeared.

Table 2
Changes in the associations between the annual dental care utilization and sociodemographic characteristics after expanded coverage of dental prostheses for older people

Classification	Outpatient dental care utilization		Denture use		Dental implant use	
	2012 year	2015 year	2012 year	2015 year	2012 year	2015 year
	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)	Odds Ratio (95% CI)
Gender						
Male	Ref. 1.000	Ref. 1.000	Ref. 1.000	Ref. 1.000	Ref. 1.000	Ref. 1.000
Female	1.147(0.932–1.412)^{NS}	1.040(0.870–1.243)^{NS}	1.021(0.636–1.638)^{NS}	0.966(0.632–1.474)^{NS}	1.124(0.632–1.999)^{NS}	0.832(0.583–1.187)^{NS}
Age Group						
65 ~ 69 years	Ref. 1.000	Ref. 1.000	Ref. 1.000	Ref. 1.000	Ref. 1.000	Ref. 1.000
70 ~ 74 years	0.891(0.717–1.106)^{NS}	1.250(1.023–1.528)*	0.760(0.454–1.274)^{NS}	2.544(1.440–4.494)**	0.656(0.365–1.181)^{NS}	0.916(0.609–1.377)^{NS}
75 ~ 79 years	0.842(0.655–1.083)^{NS}	0.963(0.775–1.195)^{NS}	0.996(0.588–1.687)^{NS}	3.690(2.101–6.483)***	0.355(0.148–0.849)*	0.817(0.500-1.333)^{NS}
≥ 80 years	0.389(0.272–0.555)***	0.666(0.514–0.865)**	0.556(0.263–1.173)^{NS}	2.735(1.452–5.151)**	0.062(0.008–0.490)**	0.556(0.283–1.095)^{NS}
Marital status						
Married	Ref. 1.000	Ref. 1.000	Ref. 1.000	Ref. 1.000	Ref. 1.000	Ref. 1.000
Unmarried	1.138(0.911–1.422)^{NS}	1.089(0.894–1.327)^{NS}	1.495(0.930–2.402)^{NS}	1.548(0.953–2.516)^{NS}	1.491(0.809–2.771)^{NS}	1.206(0.787–1.849)^{NS}
Duration of education						
0 years	Ref. 1.000	Ref. 1.000	Ref. 1.000	Ref. 1.000	Ref. 1.000	Ref. 1.000
≤ 0 ~ 6 years	0.848(0.604–1.191)^{NS}	0.821(0.614–1.097)^{NS}	1.699(0.630–4.582)^{NS}	1.254(0.598–2.629)^{NS}	0.315(0.148–0.671)**	0.693(0.427–1.122)^{NS}
≤ 6 ~ 12 years	0.606(0.427–0.860)**	0.643(0.474–0.871)***	1.258(0.455–3.481)^{NS}	1.100(0.514–2.352)^{NS}	0.362(0.163–0.806)*	0.739(0.445–1.228)^{NS}
> 12 years	0.427(0.278–0.657)***	0.397(0.269–0.585)***	0.712(0.216–2.352)^{NS}	1.055(0.445–2.497)^{NS}	0.260(0.078–0.865)*	0.219(0.088–0.540)**
Household income						
1st quintile	Ref. 1.000	Ref. 1.000	Ref. 1.000	Ref. 1.000	Ref. 1.000	Ref. 1.000
2th quintile	0.826(0.546–1.250)^{NS}	0.753(0.524–1.802)	0.737(0.231–2.350)^{NS}	0.876(0.339–2.263)^{NS}	0.548(0.207–1.451)^{NS}	0.623(0.346–1.121)^{NS}
3th quintile	0.830(0.567–1.215)^{NS}	0.846(0.603–1.186)	0.930(0.346–2.496)^{NS}	0.928(0.415–2.072)^{NS}	0.634(0.246–1.636)^{NS}	0.547(0.314–0.955)*
4th quintile	0.822(0.569–1.188)^{NS}	0.611(0.446–0.837)**	1.138(0.447–2.897)^{NS}	1.240(0.598–2.569)^{NS}	0.839(0.364–1.931)^{NS}	0.442(0.263–0.743)**
5th quintile	0.874(0.610–1.253)^{NS}	0.752(0.553–1.023)	1.513(0.620–3.689)^{NS}	1.305(0.658–2.589)^{NS}	0.407(0.160–1.035)^{NS}	0.374(0.204–0.685)**
Type of health insurance						
Health insurance	Ref. 1.000	Ref. 1.000	Ref. 1.000	Ref. 1.000	Ref. 1.000	Ref. 1.000
Medical aid	1.027(0.739–1.426)^{NS}	0.785(0.544–1.133)^{NS}	1.436(0.808–2.551)^{NS}	0.948(0.488–1.842)^{NS}	0.291(0.040–2.084)^{NS}	0.424(0.086–2.085)^{NS}

^{NS}P>0.05, *P < 0.05, **P < 0.01, ***P < 0.001

Discussion

The importance of lifelong prevention and management of dental caries and periodontal diseases to address the problem of multiple tooth loss in older people has been highlighted, so the Korean government initiated the expansion of the national health insurance coverage to provide dental prosthetic services for older people, mainly because there was a social consensus among the Korean population regarding its rapid aging society and the serious problem of poverty among the Korean elderly. However, such expansion had not been attempted elsewhere in the world because dental prosthetic services are costly, so this provision may incur in financial burden. Thus, we aimed to review the usefulness of this policy by investigating its effects on dental care utilization according to sociodemographic characteristics of the Korean older people.

First, implementing health insurance coverage of dentures and dental implants for older people in Korea increased the utilization of the said services as well as annual outpatient dental care (Table 1). However, over the three years we analyzed (during which insurance coverage was expanded), the increase in the rates for outpatient dental utilization, denture use, and dental implant use were only 5.7%, 1.4%, and 2.8%, respectively; this suggests that the policy has enhanced the access to dental care for a particular populational group as opposed to promoting universal health coverage. This may have been inevitable, as there were clear limitations in improving access to dental care by expanding coverage to dental prosthetic services. In 2015, the percentage of Korean older people who needed dentures was 22.7% [23], while it was around 31.5% from 2007 to 2009 [24]. Further, such low increase may also be attributable to the high coverage cost per dental implant and denture (1.3 million South Korean Won, or 1,126 United States of America dollars [USD], for dentures) [25], which incurred in various restrictions for the insurance benefit to be accessed, such as age limit, high OOP cost, and a limited number of covered dental implants. In fact, the rapid escalation of the values spent by the government on the national health insurance owing to the dental care coverage expansion (31.05 million USD in 2012 ; 128.55 million USD in 2015) confirms that there are practical limitations for this expansion owing to financial burden [26]. Therefore, we suggest that the government should take a high-risk approach by focusing on mitigating sociodemographic disparities in access to such services as opposed to promoting universal health coverage.

Next, logistic regression models revealed varying changes regarding access to dental care according to sociodemographic characteristics following the studied expansion (Table 2); it indeed alleviated inequalities in access among social characteristics (such as duration of education, household income, and type of health insurance), but not to a statistically significant extent. One of the main changes was that it increased dental care utilization by 2.5–3.7 times among people aged 70 years or older compared to people aged 65–69 years. A study on Brazilian adults also found that the need for a complete denture increased with age and that it was closely related to an individual's socioeconomic position [27]. Further, expanded dental implant coverage mitigated gaps among different age groups and people with differing duration of education—except for uneducated people; still, it also induced a clear stepwise pattern of inequality according to household income. The reason for these differences may be that, although denture provision is perceived as an essential service that is utilized by people aged 70 years or older upon need, high-income individuals are more likely to utilize dental implants owing to the different perceptions of OOP cost between low- and high-income individuals. Therefore, this shows that there is a need for a complete review of the policy, mainly because it seems that the dental implant coverage actually worsened access inequality, contradicting its original intent, which was to alleviate sociodemographic inequalities in access to the service through breaking down financial barriers (by lowering eligible age and OOP rate).

For this policy review, we suggest referencing the Sweden coverage system, where dental implants are covered only in essential cases: Since the launching of a dental insurance in 1974, Sweden has been offering a comprehensive and costly prosthetic care to middle-aged or older people [28], and the Dental Health Insurance Plan implemented in 2002 mentions the provision of subsidies for costly dental prostheses for people aged 65 years or older [29]; moreover, the scope of the dental implant coverage is determined by the number of lost teeth [30]. Contrastingly, the Korean health insurance covers only two dental implants for people aged 65 years or older during their whole lives. Considering that, in 2015, the average number of remaining natural teeth was 17.5 among older adults aged 65 years or older [15], the coverage of only two dental implants during Korean older people's lifetime is not consistent with their current oral health status. Therefore, the dental implant coverage policy should focus on restoring their minimal masticatory functions to ensure QOL as opposed to simply increasing the number of teeth. To this end, policies that take into consideration the oral health status and socioeconomic levels of the target population should be implemented.

Although the annual outpatient dental care utilization increased by 5.7% over three years of the expansion, the utilization rate still remained at 30.4%, highlighting that most Korean older people still struggle to utilize the national dental care coverage. Universal health coverage refers to the assurance that everyone can receive high quality essential health services without experiencing financial difficulties [31]. In 2001, the Ministry of Health and Social Care of the United Kingdom published the "National Service Framework for Older People," and it has been endeavoring to provide fair, high-quality and comprehensive healthcare and social welfare services to British older people [32]. Fisher et al. suggested including dental insurance as part of health insurance and thus expand universal health coverage to include oral health [33]. The Japanese government, which deal with an already super-aged society, implemented the Medical Aid policy for the elderly in 1973, in which all medical costs for people aged 70 years or older are paid by the government [34]; it is also planning to complete the provision of a regional care system by 2025, which aims to comprehensively provide health services, health promotion, home care, rehabilitation, and welfare to the entire Japanese older adult population [35]. Borreani et al. suggest the need for individual change and systemic change at the societal level for enhancing elderly's access to care [36]. Thus, taking into account the current situation of older adults' access to oral health care, and the fact that Korea is facing an aging society that may become similar to that of Japan, we believe that the Korean government may need to adopt Japan's healthcare delivery system to diminish health disparities among Korean older adults. Most of all, we believe that the national health insurance should mainly cover preventive care services for oral health of older adults, rather than providing dental prosthetic services; further, older adults with physical or cognitive disabilities having access to dental care need policies targeted at them, which should provide home visit services and community care.

Limitations, Strengths And Future Directions

Owing to the cross-sectional nature of this study, we were able to examine the association between dental prosthetic services and sociodemographic factors among older people, but not their causal relationships. In addition, there is the possibility of self-report biases arising from the self-reported responses. Nevertheless, this study is significant in that it investigated the impact of dental prosthetic coverage expansion on dental care utilization of older people

according to their sociodemographic characteristics, and it also reviewed the usefulness of the said policy. In the future, researchers should make longitudinal examinations to establish the causal relationships between dental prosthetic services and sociodemographic factors among Korean older people.

Conclusions

This study found that, regardless of the provided expansion in the national health insurance coverage, socially disadvantaged older people remain neglected from denture and dental implant services in Korea. Thus, the national coverage system for preventive oral care and dental prosthetic services should consider older people's sociodemographic characteristics and promote universal health coverage; further, policies should be developed and implemented toward the provision of home visit services and community care for older people with limited access to dental care.

Abbreviations

KHP
Korea Health Panel
NHIS
National Health Insurance Service
OECD
Organisation for Economic Co-operation and Development
OOP
Out-Of-Pocket
QOL
Quality Of Life

Declarations

Ethics approval and consent to participate

The collected KHP data was approved by the institutional review board at the Korea Institute for Health and Social Affairs.

Consent for publication

"Not applicable"

Availability of data and materials

The datasets generated and/or analysed during the current study are available in the [Korea Health Panel Survey] repository, [https://www.khp.re.kr:444/]

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

All authors gravely contributed to the study presented in this article. JS was involved in acquiring, analyzing, and writing the first draft of the manuscript, and SH contributed to study planning and designing, data interpretation, and revision of the final draft.

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