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Trends in influenza vaccination coverage rates in South Korea from 2005 to 2014: Effect of public health policies on vaccination behavior

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ABSTRACT

Background: Influenza is a major cause of morbidity and mortality worldwide. Annual vaccination is effective in its prevention and is recommended especially in susceptible populations such as the elderly over 65 years, children younger than 5, pregnant women, and people with chronic diseases. Overall, South Korea has a high vaccination rate owing to its National Immunization Program, although the method and extent of its coverage varies among the target subgroups. The aim of this study is to assess the trend of influenza vaccination coverage between 2005 and 2014 in South Korea to address the influence of sociodemographic and disease factors on vaccination behavior. Also, we aim to compare the vaccination coverage of target subgroups and evaluate the effect of relevant policies to provide suggestions for their improvement.

Methods: A total of 61,036 respondents from the Korea National Health and Nutrition Examination Surveys III to VI were included.

Results: The total influenza vaccination coverage increased from 38.0% in 2005 to 44.1% in 2014. Vaccination coverage was higher among the elderly aged ≥ 65 years (range, 70.0–79.8%; p-for-trend < 0.001) and children under 5 (range, 64.6–78.9%; p-for-trend < 0.001) than among pregnant women (range, 9.4–37.8%; p-for-trend = 0.122) and people with chronic diseases (range, 29.6–42.6%; p-for-trend = 0.068) from 2005 to 2014. High vaccination coverage was associated with female gender, rural residence, low education level, high income, and increasing number of chronic diseases. But the effect of high income on high vaccination coverage was absent in the elderly aged ≥ 65 years and children under 5.

Conclusion: Influenza vaccination rates have steadily increased from 2005 to 2014 in South Korea. Disparities between target groups correspond to their financial coverage under the National Immunization Program, and financial aids remove the influence of high income on higher vaccination rates. Future vaccination policies should focus on pregnant women and people with chronic diseases.

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1. Introduction

Influenza is a major cause of morbidity and mortality worldwide. Seasonal influenza affects 5–10% of adults annually [1]. In South Korea, influenza caused illnesses in 242.8 per 100,000 adults and caused hospitalizations in 57.9 per 100,000 adults in the 2013–14 season. Its total socioeconomic cost of 2013–14 season was estimated as 125 million USD (1 USD = 1100 KRW) [2]. Annual vaccination is the most effective means to prevent influenza infection. Although vaccination can benefit all age groups, it is especially important for people with a high risk of complications, such as the elderly, children, pregnant women, and people with underlying

health conditions (e.g., HIV/AIDS, asthma, and chronic heart or lung diseases) [1,3–6]. Many countries have implemented public vaccination programs for high-risk population to achieve the goal of 75% coverage set by the World Health Organization (WHO); however, suboptimal influenza vaccination rates remain prevalent [7–9].

South Korea has a comparatively high influenza vaccination coverage. In the 2011–12 season, 43.6% of the total population was vaccinated, including over 80% of the elderly aged ≥ 65 years [10]. South Korea implemented the National Immunization Program (NIP) to offer vaccination for legally designated infectious diseases, and NIP for influenza was established in 1997 targeting low-income elderly adults [11,12]. Until recently, free influenza vaccines had been provided only to the elderly adults aged ≥ 65 years: it was first operated on municipal budgets in only a few provinces, then it earned the national financial support and was

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expanded to all elderly adults aged ≥ 65 in the 2005–06 season. Children can receive most vaccinations (DTP, polio, MMR, Hib, varicella, PCV, etc) free of cost, but influenza was not included until the 2017–18 season for children aged 6 months to 5 years [13]. South Korea started the domestic production of influenza vaccine in 2009 and delegated NIP for influenza to private healthcare organizations in 2015, which led to even higher vaccination coverage [12].

In this study, we aimed to evaluate (1) the trends in vaccination rates of the target and non-target groups from 2005 to 2014, (2) vaccination rate disparities among different target subgroups, and (3) the influence of sociodemographic and disease factors on vaccination behavior. In addition, we aimed to evaluate the effect of current relevant policies and provide suggestions for their improvement.

2. Materials and methods

2.1. Study design and population

We retrieved data from the Korea National Health and Nutrition Examination Surveys (KNHANES) conducted by Korea Centers of

Disease Control and Prevention (KCDC). KNHANES is a nationwide survey from a sample of the civilian non-institutionalized Korean population. It includes approximately 10,000 individuals each year and contains comprehensive information on socioeconomic status, health-related behaviors, quality of life, healthcare utilization, anthropometric measures, biochemical and clinical profiles for non-communicable diseases and dietary intakes collected from three components: a health interview, a health examination, and a nutritional survey. The health interview and health examination are conducted by trained staff members. All respondents provided written informed consent. The Institutional Review Board of the Korean Centers for Disease Control (KCDC) approved the survey annually (2007-02CON-04-P, 2008-04EXP-01-C, 2009-01CON-03-2C, 2010-02CON-21, 2011-02CON-06-C, 2012-01EXP-01-2C, 2013-07CON-03-4C, 2014-12EXP-03-5C and 2015-01-02-6C) [14,15].

We collected data from KNHANES III (2005), IV (2007–09), V (2010–12) and VI (2013–15). Participants who did not answer the influenza vaccination question were excluded: Out of 100,118 respondents in the surveys, 61,036 individuals were included in this study. The response rate for KNHANES I–VI was between 70.2% and 86.5% [14].

Table 1
General characteristics and Influenza vaccination rates (n = 61,036).

		Total		Vaccinated		p-value
		n	%	n	%	
Sociodemographic factors						
Age (years, mean \pm SE)		40.7	0.1			
Age (years)	<5	2929	4.8	2140	73.1	<0.001
	5–64	47,517	77.9	14,360	30.2	
	≥ 65	10,590	17.4	8238	77.8	
Gender	Male	27,383	44.9	10,395	38.0	<0.001
	Female	33,653	55.1	14,360	42.7	
Residency area	City	48,102	78.8	18,376	38.2	<0.001
	Rural	12,934	21.2	6379	49.3	
Level of Education	≤ 9 yr	19,499	37.5	16,457	53.7	<0.001
	10–12 yr	12,679	24.4	4492	26.8	
	≥ 13 yr	19,784	38.1	3673	27.6	
House income	Lowest quartile	14,853	24.7	5822	39.2	<0.001
	Second quartile	15,153	25.2	6083	40.1	
	Third quartile	15,079	25.1	6121	40.6	
	Highest quartile	15,042	25	6323	42	
Disease factors						
Number of diseases	0	49,723	81.5	20,151	40.5	<0.001
	1	9520	15.6	3991	41.9	
	2	1546	2.5	513	33.2	
	≥ 3	247	0.4	100	40.5	
Non-target group of Influenza vaccines						
Age 5–64, no diseases, not pregnant		40,443	66.3	11,754	29.1	<0.001
Recommended groups of Influenza vaccines						
Age (years)	<5	2929	4.8	2140	73.1	<0.001
	≥ 65	10,590	17.4	8238	77.8	
Currently pregnant		264	0.4	68	25.8	
Age 5–64 with diseases		6810	11.2	2555	37.5	
Age 5–64 with diseases, n = 6810						
Disease type						
	Diabetes mellitus	1847	21.2	770	41.7	<0.001
	Heart diseases	799	9.2	352	44.1	<0.001
	Lung diseases	3050	34.9	1141	37.4	0.491
	Liver diseases	1003	11.5	290	28.9	<0.001
	Kidney disease	121	1.4	55	45.5	0.061
	Stomach cancer	119	1.4	50	42	0.282
	Liver cancer	27	0.3	11	40.7	0.71
	Breast cancer	141	1.6	49	34.8	0.529
	Colon cancer	61	0.7	29	47.5	0.096
	Cervical cancer	127	1.5	50	39.4	0.625
	Lung cancer	23	0.3	15	65.2	0.006
	Other cancers	360	4.1	147	40.8	0.153

Heart diseases: coronary heart disease, myocardial infarction, angina, stroke.

Lung diseases: pulmonary tuberculosis, bronchial asthma, chronic bronchitis, emphysema.

Liver diseases: chronic hepatitis, liver cirrhosis.

Kidney diseases: chronic renal disease.

p-values were obtained by chi-square test.

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