J Korean Med Sci. 2023 Oct 9;38(39):e309
https://doi.org/10.3346/jkms.2023.38.e309
eISSN 1598-6357·pISSN 1011-8934

JKMS

Original Article
Medicine General & Policy

Check for updates

Impact of Coinsurance Reduction Policy on Healthcare Utilization Among Children Under 15

Minah Park,[1,2] **Eun-Cheol Park**,[1,3] **Hongin Noh**,[4] **and Sung-In Jang**[1,3]

[1]Institute of Health Services Research, Yonsei University, Seoul, Korea
[2]Department of Preventive Medicine, Eulji University College of Medicine, Daejeon, Korea
[3]Department of Preventive Medicine, Yonsei University College of Medicine, Seoul, Korea
[4]Department of Human Systems Medicine, Seoul National University College of Medicine, Seoul, Korea

OPEN ACCESS

Received: Feb 6, 2023
Accepted: Jun 7, 2023
Published online: Sep 19, 2023

Address for Correspondence:
Sung-In Jang, MD, PhD
Department of Preventive Medicine & Institute of Health Services Research, Yonsei University College of Medicine, 50 Yonsei-ro, Seodaemun-gu, Seoul 03722, Korea.
Email: JANGSI@yuhs.ac

ORCID iDs
Minah Park
https://orcid.org/0000-0002-7685-987X
Eun-Cheol Park
https://orcid.org/0000-0002-2306-5398
Hongin Noh
https://orcid.org/0000-0002-0089-0301
Sung-In Jang
https://orcid.org/0000-0002-0760-2878

Disclosure
The authors have no potential conflicts of interest to disclose.
The content for this manuscript has been derived from Minah Park's thesis paper.

ABSTRACT

Background: On October 1, 2017, a new coinsurance reduction policy for children under 15 was introduced to minimize the lack of inpatient medical services for economic reasons and secure children's access to medical care.
Methods: This study analyzes the effect of this coinsurance reduction policy on healthcare utilization using data from the National Health Insurance Service-National Sample Cohort between 2015 and 2019. Groups were classified by 3 case groups and a control group according to age. The dependent variables were inpatient cost, admission, length of hospitalization, outpatient cost and visit, and total cost. The difference-in-differences method was used to examine changes in healthcare utilization among the case and control groups after policy implementation.
Results: Children of the age group 1–5 exhibited an increase in inpatient services and a decrease in outpatient services. There was a 16.17% increase in inpatient cost, 8.55% increase in inpatient admission, 10.67% increase in inpatient length of hospitalization, −9.14% decline in outpatient cost, and −6.79% decline in outpatient visits. Regarding children in the age groups of 6–10 and 11–15, the effect of the policy was inconclusive.
Conclusion: The reduction in coinsurance rate policy in hospitalization among children has increased inpatient services and reduced outpatient services for 1–5-year-olds—a substitute effect was observed in this group. There is need for further research to examine the long-term effects of the coinsurance reduction policy.

Keywords: Coinsurance Reduction Policy; Children; Health Insurance Coverage; Healthcare Utilization

INTRODUCTION

The South Korean health insurance system aims to improve public health and social security by increasing access to medical services and guaranteeing opportunities for use by providing risk distribution, income redistribution, equitable cost burden, and appropriate insurance

Author Contributions
Conceptualization: Park M. Formal analysis: Park M. Writing - original draft: Park M. Writing - review & editing: Park M. Supervision: Park EC, Noh H, Jang SI.

benefits.[1] Universal health insurance was enabled in 1989,[2] after which there has been a continuous debate regarding the increase in coverage level. Particularly, owing to the low birth rates, various medical coverage policies have been implemented for children to reduce the burden of medical expenses.

On August 9, 2017, a new policy regarding the extension of health insurance benefit coverage was announced.[3] It encompassed significantly easing the burden of medical expenses for low-income families and essential medical expenses for economically and socially vulnerable groups such as the elderly, children, and women. Particularly, the policy to ease the burden of hospitalization expenses on children was implemented to secure children's medical accessibility by minimizing situations of children receiving compulsory education not receiving proper inpatient care for economic reasons. It also aimed to improve the environment for future generations and child-rearing by preventing households from slipping into poverty owing to excessive medical expenses.[4] On October 1, 2017, the coinsurance rate for children under the age of 15 was officially reduced from 10–20% to 5%[5] under the amendments to subordinate statutes "Enforcement Decree of the National Health Insurance Act" and "Enforcement Decree of the Medical Care Assistance Act."

Similar policies were established in 2006 that exempted hospitalization copayment for children under the age of six.[6] However, many related studies have shown a clear increase in medical use and costs owing to the exemption policy. Additionally, controversies regarding moral hazard and fiscal soundness issues were raised in the process; ultimately, the hospitalization coinsurance rate increased from 0% to 10% in 2008.[7]

Since the introduction of the current coinsurance reduction policy in 2017, there has been little research on changes in health utilization and medical costs. It is relevant to review the effects and concerns of the aftermath of policy effects to ensure that this policy does not take the same route as the exemption policy. Therefore, this study explores the effect of the coinsurance reduction policy on hospitalization utilization among children under 15.

METHODS

Study population

The dataset used in this study was obtained from the National Health Insurance Service-National Sample Cohort (NHIS-NSC) for the years 2015 to 2019. The NHIS-NSC data include approximately 2.2% of the total South Korean population enrolled in the NHIS, the single universal insurer in Korea.[8] As the data were collected for research purposes, they contain personal records for medical information related to insurance claim.[9] This database has been widely used in many research areas in medicine and public health.[8]

The population was divided into four groups based on age, which was determined according to the year in which individuals were born, to analyze the effect of the coinsurance reduction policy. Case group 1 included children who were 1–5 years old, whose coinsurance rate was 10% before the reduction policy. Case groups 2 and 3 included those between 6–10 and 11–15 years of age, respectively. Although the coinsurance rate was the same for children in the age group of 6–15, these children were divided into two groups owing to the difference in healthcare utilization between late childhood and adolescence.[10] The control group included those who were 17 as their coinsurance rate did not undergo any change after the policy.

The following individuals were excluded from the study: medical aid subjects owing to different coinsurance rates; babies who were born in the year which the study took place, owing to the exemption policy for newborns; individuals who were 16 in the year which the study took place, based on their year of birth; those who died in the study period; and participants with missing income information.

Variables

Regarding the dependent variable, healthcare utilization changes were examined using six dependent variables. The inpatient services included the costs, number of admissions, and length of hospitalization. Regarding outpatient services, costs and outpatient visits were included. The total cost encompasses the inpatient and outpatient cost. This study included an interaction term between the case and policy variables for the variable of interest.

The coinsurance rate of children aged 1–5, who comprised case group 1, changed from 10% to 5%. The coinsurance rate of children aged 6–10, defined as case group 2, decreased from 20% to 5%. The coinsurance rate of children aged 11–15, who comprised case group 3, decreased from 20% to 5%. Those aged 17 made up the control group, as their coinsurance rate remained at 20%. As the policy was implemented on October 1, 2017, pre-policy intervention had been defined from January 1, 2015, to December 31, 2016. The post-policy intervention ranged from January 1, 2018, to December 31, 2019. Thus, the year 2017 was excluded.

The independent variables in this study were categorized according to sociodemographic (sex), socioeconomic (income, region), and health conditions (disability, complex chronic conditions [CCC]) were controlled for the covariates. To obtain an accurate picture of medically complex children, we used the classification of CCC. CCC is defined as "any medical condition that can be reasonably expected to last at least 12 months (unless death intervenes) and to involve either several different organ systems or one system severely enough to require specialty pediatric care and probably a certain period of hospitalization in a tertiary care center."[11] The Korean version of the CCC was modified from International Classification of Diseases-10 codes to Korean Standard Classification of Diseases codes[12] for this study.

Statistical analysis

A descriptive analysis was performed to examine the general characteristics of the three case groups and the control group before (2015–2016) and after (2018–2019) policy implementation. The *t*-test and analysis of variance were used to determine the means and standard deviations of the dependent variables. To investigate the effect of the coinsurance reduction policy under the age of 15, the difference-in-differences (DID) method was used to ascertain any changes in healthcare utilization among the case groups (1–5 years, 6–10 years, 11–15 years) in the before (2015–2016) and after (2018–2019) intervention periods relative to the changes in the control group (17 years old). DID was used to evaluate policy effects in the healthcare service area.[13] This study employed the DID model in which different individuals were examined before and after an event (in our case, the coinsurance reduction policy). To investigate healthcare expenditure (inpatient, outpatient, and total medical costs), we used a generalized linear model with a log link and gamma distribution with a DSCALE option using a GENMOD procedure in all units of analysis.[14] To investigate healthcare utilization (inpatient admission, inpatient length of hospitalization, outpatient visit), we used a generalized linear model with a log link, negative binomial distribution with a DSCALE option using a GENMOD procedure in all units of analysis. The results are presented as percentage points with 95% confidence intervals. All analyses were performed using SAS

Enterprise Guide (version 7.1; SAS Institute, Cary, NC, USA). A *P* value < 0.05 was considered statistically significant.

Ethics statement

This study protocol was reviewed and approved by the Institutional Review Board (IRB) of Yonsei University's Health System (IRB number: 4-2021-1714), and adheres to the tenets of the Declaration of Helsinki. As NHIS-NSC data did not contain any identifying information, additional approval was not required.

RESULTS

Table 1 presents the general characteristics of the study population before and after the implementation of the policy. Case group 1 (1–5 years old) included 88,390 participants before (2015–2016) and 76,614 subjects after (2018–2019) policy intervention. Case group 2 (6–10 years old) included 90,992 subjects before (2015–2016) and 89,768 subjects after (2018–2019) policy intervention. Case group 3 (11–15 years old) included 100,633 subjects before (2015–2016) and 91,404 subjects after (2018–2019) policy intervention. The control group (17 years old) included 24,661 subjects before (2015–2016) and 20,482 subjects after the (2018–2019) policy intervention.

Table 2 presents the results of the changes in healthcare utilization in the study population according to the application of the coinsurance reduction policy. Case group 1 exhibited

Table 1. General characteristics of the study population by before and after the policy

Characteristics	Case group 1 (1–5 years old)			Case group 2 (6–10 years old)			Case group 3 (11–15 years old)			Control group (17 years old)		
	Before	After	*P* value	Before	After	*P* value	Before	After	*P* value	Before	After	*P* value
Total	88,390 (100.00)	76,614 (100.0)		90,992 (100.00)	89,768 (100.0)		100,633 (100.0)	91,404 (100.0)		24,661 (100.0)	20,482 (100.0)	
Gender			0.808			0.064			0.051			0.947
Male	45,293 (51.24)	39,213 (51.2)		46,982 (51.63)	46,222 (51.5)		52,493 (52.2)	47,273 (51.7)		12,932 (52.4)	10,747 (52.5)	
Female	43,097 (48.76)	37,401 (48.8)		44,010 (48.37)	43,546 (48.5)		48,140 (47.8)	44,131 (48.3)		11,729 (47.6)	9,735 (47.5)	
Income			< 0.001			< 0.001			< 0.001			< 0.001
Low	16,694 (18.89)	14,518 (18.9)		18,519 (20.35)	18,455 (20.6)		23,810 (23.7)	20,886 (22.9)		6,618 (26.8)	5,275 (25.8)	
Middle	32,590 (36.87)	26,385 (34.4)		26,320 (28.93)	24,153 (26.9)		25,052 (24.9)	21,646 (23.7)		5,966 (24.2)	4,737 (23.1)	
High	39,106 (44.24)	35,711 (46.6)		46,153 (50.72)	47,160 (52.5)		51,771 (51.4)	48,872 (53.5)		12,077 (49.0)	10,470 (51.1)	
Region			< 0.001			< 0.001			< 0.001			0.012
Urban	37,709 (42.66)	31,583 (41.2)		38,074 (41.84)	36,569 (40.7)		42,873 (42.6)	37,863 (41.4)		10,705 (43.4)	8,652 (42.2)	
Rural	50,681 (57.34)	45,031 (58.8)		52,918 (58.16)	53,199 (59.3)		57,760 (57.4)	53,541 (58.6)		13,956 (56.6)	11,830 (57.8)	
Disability			< 0.001			< 0.001			0.072			0.498
Yes	245 (0.28)	362 (0.5)		716 (0.79)	866 (1.0)		874 (0.9)	865 (0.9)		269 (1.1)	210 (1.0)	
No	88,145 (99.72)	76,252 (99.5)		90,276 (99.21)	88,902 (99.0)		99,759 (99.1)	90,539 (99.1)		24,392 (98.9)	20,272 (99.0)	
CCC			< 0.001			< 0.001			< 0.001			< 0.001
Yes	6,842 (7.74)	4,272 (5.6)		12,629 (13.88)	9,124 (10.2)		18,333 (18.2)	14,423 (15.8)		5,309 (21.5)	3,823 (18.7)	
No	81,548 (92.26)	72,342 (94.4)		78,363 (86.12)	80,644 (89.8)		82,300 (81.8)	76,981 (84.2)		19,352 (78.5)	16,659 (81.3)	

Values are presented as number (%).
CCC = complex chronic conditions.

Table 2. Changes in healthcare utilizations in the study population according to application of coinsurance reduction policy

Variables	Case			Control			Adjusted change, DID estimates, %	*P* value
	Before	After	Unadjusted change, %	Before	After	Unadjusted change, %		
Inpatient cost, ₩				103,375 ± 1,234,581	122,514 ± 1,225,558	15.6		
Case group 1	225,155 ± 1,492,054	323,349 ± 2,725,348	30.4				16.17 (5.95, 27.38)	0.001
Case group 2	93,695 ± 782,011	128,232 ± 2,663,758	26.9				−1.36 (−10.22, 8.37)	0.775
Case group 3	74,491 ± 821,777	107,870 ± 2,187,810	30.9				7.36 (−2.28, 17.95)	0.139
Inpatient admission				0.08 ± 0.42	0.09 ± 0.46	11.1		
Case group 1	0.36 ± 2.27	0.44 ± 2.56	18.2				8.55 (2.80, 14.60)	0.003
Case group 2	0.12 ± 1.06	0.13 ± 1.36	7.7				−1.20 (−5.64, 3.45)	0.606
Case group 3	0.07 ± 0.67	0.08 ± 0.82	12.5				0.59 (−3.67, 5.03)	0.790
Inpatient length of stay				0.49 ± 4.14	0.48 ± 4.52	−2.1		
Case group 1	1.53 ± 6.34	1.63 ± 6.73	6.1				10.67 (4.94, 16.71)	< 0.001
Case group 2	0.53 ± 3.66	0.52 ± 3.93	−1.9				−0.26 (−5.57, 5.36)	0.926
Case group 3	0.39 ± 3.21	0.39 ± 4.12	0.0				3.17 (−2.46, 9.13)	0.275
Outpatient cost, ₩				169,580 ± 285,720	214,168 ± 446,892	20.8		
Case group 1	457,241 ± 482,492	527,691 ± 537,384	13.4				−9.14 (−11.37, −6.84)	< 0.001
Case group 2	291,093 ± 2,571,886	326,672 ± 554,650	10.9				−9.41 (−12.01, −6.72)	< 0.001
Case group 3	194,585 ± 1,341,636	267,354 ± 3,849,528	27.2				5.59 (2.04, 9.28)	0.001
Outpatient visit				7.10 ± 8.20	7.80 ± 9.09	9.0		
Case group 1	28.58 ± 19.03	29.35 ± 19.61	2.6				−6.79 (−8.44, −3.01)	< 0.001
Case group 2	13.81 ± 12.01	13.95 ± 12.37	1.0				−7.88 (−9.66, −6.07)	< 0.001
Case group 3	8.11 ± 8.78	8.65 ± 8.91	6.2				−3.06 (−5.07, −1.01)	0.003
Total cost, ₩				272,955 ± 1,330,674	336,682 ± 1,389,375	18.9		
Case group 1	682,396 ± 1,664,483	851,040 ± 2,876,345	19.8				−1.64 (−4.15, 0.95)	0.213
Case group 2	384,788 ± 2,877,109	454,904 ± 2,800,114	15.4				−6.56 (−9.50, −3.52)	< 0.001
Case group 3	269,076 ± 1,616,124	375,223 ± 4,627,959	28.3				6.73 (2.84, 10.76)	< 0.001

Values are presented as mean ± standard deviation or % (95% CI).
DID = difference-in-differences.

(1–5 years old) an increase in inpatient cost, inpatient admission, and inpatient length of hospitalization (16.17% for inpatient cost, 8.55% for inpatient admission, and 10.67% for inpatient length of hospitalization). Both outpatient costs and visits and total costs (−9.14% for outpatient costs, −6.79% for outpatient visits) decreased. The results were statistically significant except for the total cost. In case group 2 (6–10 years old), the decrease in outpatient utilization (−9.14% for outpatient cost, −6.79% for outpatient visits) and total cost (−6.56%) were significant. Inpatient utilization differed statistically insignificantly. In case group 3 (11–15 years old), the decrease in outpatient utilization (−9.14% for outpatient cost, −6.79% for outpatient visits) and increase in total cost (6.73%) were significant. Inpatient utilization differed statistically insignificantly.

Table 3 presents the results of the subgroup analyses according to the participants' income. In the low-income group, inpatient costs and admissions significantly increased in case group 1 (inpatient cost: 45.15%, *P* value ≤ 0.001; inpatient admission: 17.02%, *P* value = 0.003). In case group 3, inpatient cost and length of hospitalization increased significantly (inpatient cost: 30.54%, *P* value = 0.005; inpatient length of hospitalization: 12.14%, *P* value = 0.045). In case group 2, although there was an increase in inpatient costs and inpatient admissions, it was statistically insignificant.

DISCUSSION

This study investigated the effect of a coinsurance reduction policy on healthcare utilization among children under 15. According to the study results, regarding individuals aged 1–5,

Table 3. Results of the subgroup analyses according to subjects' income

Variables	Income					
	Low		Middle		High	
	% (95% CI)	*P* value	% (95% CI)	*P* value	% (95% CI)	*P* value
Inpatient cost						
Case group 1	45.15 (20.38, 75.03)	< 0.001	7.44 (−10.34, 28.76)	0.436	7.89 (−5.48, 23.15)	0.261
Case group 2	11.53 (−7.72, 34.77)	0.258	−7.13 (−23.24, 12.36)	0.446	−4.60 (−16.45, 8.92)	0.485
Case group 3	30.54 (8.36, 57.27)	0.005	2.94 (−15.17, 24.92)	0.769	0.53 (−11.92, 14.74)	0.937
Inpatient admission						
Case group 1	17.02 (5.19, 30.19)	0.003	4.40 (−6.47, 16.53)	0.442	6.18 (−1.69, 14.67)	0.126
Case group 2	0.92 (−7.96, 10.66)	0.844	−3.08 (−11.64, 6.31)	0.507	−2.14 (−8.3, 4.43)	0.514
Case group 3	7.34 (−1.57, 17.05)	0.108	−2.22 (−10.45, 6.76)	0.615	−1.23 (−7.05, 4.95)	0.688
Inpatient length of stay						
Case group 1	9.22 (−1.95, 21.66)	0.109	12.08 (0.87, 24.53)	0.033	11.52 (3.36, 20.32)	0.004
Case group 2	−7.96 (−17.69, 2.94)	0.146	6.97 (−4.26, 19.51)	0.233	0.38 (−7.01, 8.37)	0.922
Case group 3	12.14 (0.22, 25.47)	0.045	1.10 (−10, 13.56)	0.854	1.42 (−6.22, 9.68)	0.724
Outpatient cost						
Case group 1	−10.66 (−15.79, −5.23)	< 0.001	−9.29 (−13.36, −5.03)	< 0.001	−8.34 (−11.45, −5.13)	< 0.001
Case group 2	−15.67 (−21.05, −9.91)	< 0.001	−6.11 (−11.41, −0.5)	0.033	−7.37 (−10.91, −3.71)	<0.001
Case group 3	0.50 (−6.4, 7.91)	0.889	17.07 (8.81, 25.95)	< 0.001	1.22 (−3.34, 5.98)	0.607
Outpatient visits						
Case group 1	−8.68 (−12.25, −4.96)	< 0.001	−6.69 (−9.83, −3.42)	< 0.001	−6.34 (−8.65, −3.96)	< 0.001
Case group 2	−7.36 (−11.14, −3.42)	<0.001	−8.67 (−12.21, −4.99)	< 0.001	−7.88 (−10.31, −5.39)	< 0.001
Case group 3	−3.59 (−7.62, 0.62)	0.093	−3.19 (−7.33, 1.13)	0.145	−2.93 (−5.66, −0.11)	0.041
Total medical cost						
Case group 1	6.66 (−0.21, 14)	0.057	−3.97 (−9.03, 1.38)	0.143	−4.79 (−8.49, −0.96)	0.014
Case group 2	−6.97 (−13.40, −0.05)	0.048	−6.64 (−12.46, −0.42)	0.036	−6.73 (−10.64, −2.65)	0.001
Case group 3	10.82 (2.59, 19.7)	0.009	12.96 (4.38, 22.24)	0.002	0.61 (−4.29, 5.76)	0.811

CI = confidence interval.

there was a significant increase in inpatient costs, admissions, and length of hospitalization, while there was a significant decrease in outpatient costs and visits.

This study is consistent with similar research. In Vietnam,[15] there was a policy change that allowed children under 6 to have free access to health services in public facilities. Compared with non-beneficiaries, the 4–5 years-old group had better health-related outcomes. In Sweden,[16] there was a policy reform in 2002 that abolished copayments for those under 20. The results showed that the number of doctor visits increased by 5–10%.

Regarding those aged 1–5, there seems to be a substitution effect between inpatient and outpatient services owing to the reduction in coinsurance policy. This effect can be noted in similar policies that reduced the coinsurance rate. Lee[17] observed the effect of the reduction policy among stomach cancer patients and suggested that patients who could not get hospitalized owing to medical expenses used inpatient services owing to the reduction in the coinsurance rate. Consequently, outpatient services decreased, thus showing a substitute effect. Nevertheless, this study argues that it is not necessary to note the substitute effect as a moral hazard issue. Particularly, low-income families experience a state where their medical needs are not met,[18] and the reduction of the coinsurance allows them to obtain the medical care they need. However, this study analyzes the study population, which includes those who did not use inpatient services. If there is a significant increase in the population, the substitute effects should be interpreted with caution.

Regarding those aged 6–10 and 11–15, inpatient utilization showed inconclusive results. It is attributable to factors other than costs that may be considered for hospitalization. Children in Korea are obliged to attend elementary school to middle school[19]; attendance is critical because it determines grade retention.[20] Additionally, absence from school is associated with various risk factors for child development,[21] including academic outcomes.[22] This fact can also be noted in a report from the United Kingdom by the Office for Standards in Education, Children's Services and Skill, which found that a persistent coronavirus disease 2019 related absence results in students lagging behind in school.[23] Additionally, children of this age group can be more negatively affected by hospitalization. As school-aged children are affected by the external environment, both physical difficulties and disruption of emotional balance during hospitalization are significantly negatively affected.[24] Teenagers are also known to have worse adaptation to hospitalization than younger children.[25]

This study has various limitations. First, the control group used in the study may have been inappropriate. Owing to the difference in healthcare utilization behavior in the groups aged 1–5, 6–10, 11–15, and 17,[26] those aged 17 may not have been the appropriate control group. However, as the policy change was implemented among children under 15, those aged 17 were the closest in age to the case groups. Second, owing to data limitations, specific diseases could not be analyzed, and their severity could not be determined. For example, influenza is a known cause of hospitalization across age.[27] However, because of the masking policy, it was not possible to perform this analysis. Therefore, it will be necessary to determine the severity of each disease in future studies. Third, various policies were implemented during the period from 2017 through 2019 owing to the Moon Jae-in government's plan for benefit expansion.[28] Other health policies may have affected children's healthcare utilization patterns. Fourth, other factors that could influence a child's health, such as parents' characteristics, were not considered. Future studies should consider these aspects.

This study has several strengths as well. First, it uses NHIS-NSC data. The advantage is that the database represents nationwide data. It was followed from 2002 to 2019. Therefore, underlying comorbidities are incorporated to this study, and the results may be adjusted for these important factors. Second, this study analyzes the data using the DID method. The DID method is effectively employed in the public health research field and has been developing, thereby reinforcing its credibility.

The reduction in the coinsurance rate policy in hospitalization among children under 15 showed mixed results. Regarding those aged 1–5 (case group 1), the reduction of the coinsurance rate did not fulfill its purpose as a substitute effect was noted. Regarding those aged 6–10 (case group 2) and 11–15 (case group 3), the effect of the policy was inconclusive. Every aspect of the outcomes needs to be examined as policies tend to affect policy targets and social repercussions. Further research is necessary to investigate the policy regarding long-term effects, not only among those aged 1–5, but also among those aged 6–10 and 11–15.

REFERENCES

1. Jung Y. A study on strengthening of health care protection and sustainability plan. *J Korea Contents Assoc* 2021;21(4):96-110.
2. Park EC. Strategies for improving healthcare delivery system in Korea. *HIRA Res* 2021;1(1):9-15.
   CROSSREF
3. Kim G. Current status and challenges of the government's health insurance coverage expansion plan. *Healthc Policy Forum* 2018;16(2):67-74.
4. Research Institute for Healthcare Policy (KR). *A Study on the Government's Expansion of Health Insurance Coverage*. Seoul, Korea: Research Institute for Healthcare Policy; 2018.
5. Ministry of Health and Welfare. The 1st comprehensive national health insurance plan (2019–2023). https://www.korea.kr/archive/expDocView.do?docId=38486. Updated 2019. Accessed April 2, 2022.
6. Jeon KS, Yoon SJ, Ahn HS, Shin HW, Yoon YH, Hwang SM, et al. The effect of the cost exemption policy for hospitalized children under 6 years old on the medical utilization in Korea. *J Prev Med Public Health* 2008;41(5):295-9.
   PUBMED | CROSSREF
7. Kim J. The effect of the cost exemption policy on health insurance: evidence from hospitalized children under 6 years old. *Korea Rev Appl Econ* 2017;19(2):5-39.
8. Lee J, Lee JS, Park SH, Shin SA, Kim K. Cohort profile: the National Health Insurance Service-National Sample Cohort (NHIS-NSC), South Korea. *Int J Epidemiol* 2017;46(2):e15.
   PUBMED | CROSSREF
9. Moon JY, Lee J, Park YH, Park EC, Lee SH. Incidence of keratoconus and its association with systemic comorbid conditions: a nationwide cohort study from South Korea. *J Ophthalmol* 2020;2020:3493614.
   PUBMED | CROSSREF
10. Park JE, Lee SY, Kang JH. Common disease codes in pediatric inpatients (1997-2008). *Korean J Pediatr Infect Dis* 2011;18(1):54-60.
    CROSSREF
11. Feudtner C, Christakis DA, Connell FA. Pediatric deaths attributable to complex chronic conditions: a population-based study of Washington State, 1980-1997. *Pediatrics* 2000;106(1 Pt 2):205-9.
    PUBMED | CROSSREF
12. Kim MS, Lim NG, Kim HJ, Kim C, Lee JY. Pediatric deaths attributed to complex chronic conditions over 10 years in Korea: evidence for the need to provide pediatric palliative care. *J Korean Med Sci* 2018;33(1):e1.
    PUBMED | CROSSREF
13. Wing C, Simon K, Bello-Gomez RA. Designing difference in difference studies: best practices for public health policy research. *Annu Rev Public Health* 2018;39:453-69.
    CROSSREF
14. Chen J, Vargas-Bustamante A, Novak P. Reducing young adults' health care spending through the ACA expansion of dependent coverage. *Health Serv Res* 2017;52(5):1835-57.
    PUBMED | CROSSREF

15. Nguyen H, Wang W. The effects of free government health insurance among small children--evidence from the free care for children under six policy in Vietnam. *Int J Health Plann Manage* 2013;28(1):3-15.
PUBMED | CROSSREF
16. Nilsson A, Paul A. Patient cost-sharing, socioeconomic status, and children's health care utilization. *J Health Econ* 2018;59:109-24.
PUBMED | CROSSREF
17. Lee YJ. A study on the influences of changes to the co-payment of cancer patients of their uses of medical services. *J Korean Public Policy* 2009;11(1):3-25.
18. Jang BN, Joo JH, Kim HJ, Park EC, Jang SI. Unmet healthcare needs status and trend of Korea in 2019. *J Health Policy Manag* 2021;31(2):225-31.
CROSSREF
19. Yoon J, Kwon S, Shim JE. Present status and issues of school nutrition programs in Korea. *Asia Pac J Clin Nutr* 2012;21(1):128-33.
PUBMED
20. Ministry of Education (KR). *Manual for Attendance*. Sejong, Korea: Ministry of Education; 2021.
21. Kim D, Um M. A longitudinal study of the ecological-systemic factors on school absenteeism in South Korean children-a panel fixed effects analysis. *Korean J Soc Welf* 2016;38(3):105-25.
CROSSREF
22. Hu N, Fardell J, Wakefield CE, Marshall GM, Bell JC, Nassar N, et al. School academic performance of children hospitalised with a chronic condition. *Arch Dis Child* 2022;107(3):289-96.
PUBMED | CROSSREF
23. Adams R. *Persistent Covid-Related Absence Leaves Pupils Lagging – Ofsted*. London, UK: The Guardian; 2021.
24. Kang MJ, Kwon IS, Jeong E. Influence of hospitalization recognition and hospital-related fear on the adjustment to hospital life by hospitalized school-aged children. *Child Health Nurs Res* 2017;23(3):375-84.
CROSSREF
25. Findlay S, Pinzon J, Goldberg E, Frappier JY. Issues of care for hospitalized youth. *Paediatr Child Health* 2008;13(1):61-8.
PUBMED | CROSSREF
26. The Korean Pediatric Society. *Nationwide Survey of Discharge Data to Monitor the Long-Term Trends of Diseases and a Preliminary Study for the Constructing General Disease Surveillance System in Korean Children and Adolescents*. Seoul, Korea: The Korean Pediatric Society; 2007.
27. Healthcare Bigdata Hub. Statistics on common diseases. http://opendata.hira.or.kr/op/opc/olapHifrqSickInfo.do. Updated 2022. Accessed May 5, 2022.
28. Kim W. Opinion on the policy of strengthening health insurance coverage. *Mon Public Finance Forum* 2021;(306):8-29.