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Impact of coinsurance policy change on medical care utilization among mild disease patients

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**Impact of coinsurance policy change
on medical care utilization
among mild disease patients**

A Dissertation

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and the Graduate School of Yonsei University

in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

Jin-Hyeong Kim

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Jin-Hyeong Kim

Abstract

Background: The Korean healthcare system is composed of costly and inefficient structures that fail to adequately divide the functions and roles of medical care organizations. To resolve this matter, in November 2011 the government reformed the cost-sharing policy for the management of outpatients visiting general or tertiary hospitals with comparatively mild diseases.

Purpose: This study aims to examine the impact of the changes in coinsurance on medical utilization for 52 mild diseases compared with 65 mild diseases to which the policy did not apply.

Methods: The present study used health insurance claim data collected from 2007 to 2013. To examine the effect of policy, we compared 52 mild diseases to which the policy applied and 65 mild diseases to which the policy did not apply to determine the proportion and number of claims and the medical and drug costs. This study adjusted for factors that affect medical utilization and then segmented regression analysis was performed.

Results: The analysis comparing the 65 mild diseases found that the percentage and the number of claims of clinics after the policy intervention increased, and that of general and tertiary hospitals decreased. Total medical expenses increased in all medical institutions overall, and the increase was greater in hospitals and general and tertiary hospitals than in clinics. The drug cost decreased in all medical institutions overall, and



the decrease was greater in general and tertiary hospitals than in clinics and hospitals. Analysis of detail groups by income level did not find a difference in accordance with the policy intervention.

Conclusion: It was found that policy intervention had an impact on healthcare utilization of medical institutions. In the future, much research will be needed in terms of patient medical results and quality management of medical services caused by changes in the medical institutions chosen by patients with mild cases.

I. Introduction

The healthcare system is a comprehensive system to provide medical services such as prevention, care, and rehabilitation services to the people of a nation. The healthcare system constantly influences levels of health through the health services it provides. The configuration of the health system is inevitably influenced by its fundamental objectives and values. Major components consist of health resources, the organization of resources, and delivery of health care in this model of a health system, and economic support and management are provided to support these major components, each of which is directly or indirectly related to the others. Medical institutions are required to fulfill their appropriate roles in order to meet the demand for health by providing quality medical services through these health systems. Thus, improving the strategies of the health care delivery system involves localizing healthcare services and ensuring that medical institutions and their staff and patient transport systems play an appropriate role.¹

Medical organizations are classified by bed size and function as clinics, hospitals, general hospitals, and tertiary hospitals. Clinics are for outpatients, hospitals for inpatients, and tertiary hospitals for severe patients. Patients need a written request that records the doctor's diagnosis in a clinic, hospital, or general hospital to use a tertiary hospital. If a patient has such a written request, he or she can receive the appropriate medical care benefit.^{2,3} However, patients have the right to visit any healthcare facility from a primary clinic to a general or tertiary hospital as their first contact point.⁴ Despite

regulations, the healthcare system is not adequately shared, as patients prefer tertiary hospitals regardless of disease severity, which has caused an inefficient use of healthcare resources and increases unnecessary economic costs.⁵ Lee et al. (2014) showed that approximately 85% of hospital outpatient utilizations are unnecessary and that a significant amount of money is wasted on unnecessary healthcare services.⁵

These procedures induce mild-disease patients to visit the proper medical organizations and thereby strengthen their role in the healthcare system.^{2, 3} The government enacted a policy for the healthcare system in 2009. The Healthcare Function Reestablishment Task Force team of the Ministry collected opinions from hospitals and related organizations. The task force team announced a Healthcare Organization Function Reestablishment Plan under these processes in 2011.

The government increased all out-of-pocket medical expenses from 50% to 60% for unnecessary outpatient visits to general hospitals in 2009. On October 2011, legislators enacted another law that increased the medication coinsurance rate in general hospitals from 30% to 40% and in tertiary hospitals from 30% to 50% for patients with 52 mild diseases. The primary clinic copayment rate remained the same at 30%. By increasing the medication coinsurance, the Korean Government has made efforts to encourage patients with minor or simple diseases to use local primary clinics instead of general or tertiary hospitals. These containment policies were steps toward increasing the fiscal sustainability of national health insurance and the efficiency of the healthcare delivery system.



This changed medication coinsurance policy has been implemented for 52 mild diseases. Therefore, to analyze the impact of this change in the medication coinsurance rate in general and on healthcare utilization of tertiary hospitals in particular, the data were compared of prescription drug costs for the 52 covered mild diseases and 65 similar uncovered mild diseases.

II. Objectives

This study aims to examine the impact of the change in coinsurance on prescription drug costs for patients with mild diseases. Thus, this study compared 52 mild diseases covered under the changed medication coinsurance rate and 65 other mild diseases. To analyze the differences in healthcare organization utilization between patients with the 52 covered mild diseases and 65 uncovered mild diseases, this study compared medical organization proportions, numbers, medical costs, and medication costs by hospital type. The detailed objectives of this study were as follows:

First, this study observes trends in healthcare utilization according to policy implementation by outpatients with mild diseases.

Second, this study examines the effect of changed coinsurance on the healthcare utilization of outpatients with mild diseases.

This research examines the impact of the changed coinsurance on prescription drug costs and provides evidence for the improvement of the healthcare system.

III. Study background

1. Policy of cost-sharing for outpatient drug prescriptions

The healthcare delivery system in Korea is organized into three tiers: primary, secondary, and tertiary care. The National Health Insurance (NHI) service flow is designed to progress from primary to secondary to tertiary hospitals. The healthcare delivery system process was introduced to utilize medical resources efficiently, establish the roles of medical institutions, and help curb national medical expenses and stabilize insurance financing. Clinics are primary care, hospitals and general hospitals are secondary care, and tertiary hospitals are tertiary care. Within this system, patients can choose any medical organization with some financial incentive.⁶

The government enacted a policy for the healthcare system in 2009. The Healthcare Function Reestablishment Task Force Team of the Ministry collected opinions from hospitals and related organizations. The task force team announced the Healthcare Organization Function Reestablishment Plan as a result of this process in 2011. A new policy was promulgated increasing prescription drug coverage in general and tertiary hospitals for patient with 52 mild diseases on October, 2011.⁷⁻⁹

The new policy applied differential coverage of prescription drug costs for general or tertiary hospital patients with 52 mild diseases. It aims to transfer patients with mild diseases from general or tertiary hospitals to clinics or hospitals.

In South Korea, the coinsurance policy on prescription drugs applies 1,500 won for less than 10,000 won and 30% of the cost over 10,000 won until July 2007. This policy led to the problem of mild patients using tertiary hospitals and receiving the deductibles instead of severe patients.

For this reason, copayment for less than 10,000 won in clinic outpatients and pharmacies was abolished and a new coinsurance system was introduced after August 2007. Regardless of medical costs, under this new coinsurance policy 30% of total medical expenses were paid in the case of outpatients and 20% in the case of inpatients. However, in the case of patients aged 65 and over, a copayment system for costs under 10,000 won was retained, and for patients under 6 years of age 70% of the costs of adults are shared regardless of the type of healthcare organization and medical cost.

This policy caused the problem that patients with mild diseases visit general or tertiary hospitals. The government implemented the new coinsurance on prescription drug coverage to improve the situation after October 2011. Coinsurance on the prescription drug costs of patients with 52 mild diseases paid from 30% to 40% of the cost in general hospitals, 50% in tertiary hospitals, and 30% for clinic or hospital outpatients, as before. These regulations did not apply to inpatients or patients without separation of dispensing and prescription. Medicaid patients were also excluded.

If Medicaid outpatients with 52 mild diseases visit a general or tertiary hospital, they would have to pay 3% coinsurance instead of a 500-won copayment since November, 2015. However, if 3% of the total medical expenses were less than 5,000,000 won, the

500-won copayment was applied as before. In addition, if the clinical departments were different, for the 52 mild diseases 3% of prescription drug cost was covered and 500 won per prescription was charged for the other diseases.^{7, 10}

2. Previous studies of coinsurance policy change on prescription drug coverage

Several previous studies analyzed the impact of cost sharing on South Korean healthcare utilization.

Hypertension patients were more effective both in general and tertiary hospitals than on acute diseases patients.¹¹ Furthermore, another study suggested that cost sharing among diabetes patients had little effect on controlling health care utilization.¹² Many studies suggested that the number of outpatient visits at general or tertiary hospitals decreased after the policy began.¹³⁻¹⁵ However, another study suggested that patients who used only tertiary or general hospitals partly moved to hospitals and clinics.¹⁶ Finally, another study suggested that increasing the coinsurance rate for prescription drugs would have negative effects on the health delivery system because of significant increases in visit days and decreases in prescription days.¹⁷ The results of studies regarding the effect of increasing the coinsurance rate of prescription drug costs are inconsistent.

Lee et al. (2017) used health insurance claim data collected from 2010 to 2013. The study population was defined as those aged 20–64 years who had visited medical care

organizations for the treatment of 52 diseases both before and after the program began. To examine the effect of the cost-sharing policy on outpatient healthcare service utilization, a segmented regression analysis was performed. After the policy to increase the coinsurance rate on prescription drug costs was implemented, the number of outpatient visits at general or tertiary hospitals decreased. However, the number increased at hospitals and clinics. Eventually, the number of outpatient visits to hospitals and clinics began to decrease after policy initiation. Outpatient medical costs decreased for all type of medical care organizations, and this decreasing trend continued with time.¹³

Choi et al. (2016) analyzed the national health insurance service data from 2010 to 2013. The policy on differentiated prescription drug coverage was effective both in general hospitals and in tertiary hospitals. The claims for health insurance coverage of outpatient medical expenditures in all general hospitals and advanced general hospitals, which were made for a year (from October 2010 to September 2011) before the policy and for two years (from October 2011 to September 2013) after the policy, were analyzed. The policy on differentiated prescription drug coverage was effective both in general hospitals and in tertiary hospitals. The number of medical claims and patients were decreased, and it was slightly more effective in advanced general hospitals. It was most effective on hypertension both in general hospitals and in tertiary hospitals and was more effective on chronic diseases than on acute ones.¹¹

Byeon (2014) analyzed the national health insurance service data from 2008 to 2012 using interrupted time series analysis. Immediately after policy change, outpatient visits

decreased among tertiary hospital. However, it was not significant among clinic and hospital. Visits and medical cost of all type of hospital decreased over time.¹⁴

Kim et al. (2013) evaluated the changes resulted from tertiary or general hospital drug coverage rise policy on healthcare service utilization. The data used 5-year claim data (2007.3. ~ 2012. 3.) from health insurance review and assessment service. Study population was most common 10 high ranking of the main disease targeting visiting patient from age of 6 to 64. The visit duration and medical expense statistically declined right after the policy implementation in both the tertiary and general hospital. Meanwhile, administration day was statistically meaningful only for the decrease right after the policy implementation. General hospital changes are not statistically meaningful. And the drug cost was statistically, meaningfully decreased after the increase in drug coverage. Tertiary or general hospital outpatient drug coverage policy showed partially short-term effect is assured.¹⁵

Park et al. (2017) analyzed the effects of differential coinsurance policy on prescription drug coverage of outpatients by types of medical institutions using a sample cohort database of the National Health Insurance Service. About 16% of patients who used only tertiary or general hospital due to 52 ambulatory care sensitive conditions before policy implementation moved to hospitals and clinics. However, about 57% of them still use tertiary or general hospital. The factors influencing the utilization of hospitals and clinics after the implementation of the policy were gender, age, and income

level. The policy is effective to reduce the medical use of outpatient mental patients in tertiary or general hospital, but the effect is not significant.¹⁶

Song et al. (2016) analyzed the National Health Insurance Service Cohort Database from 2011 to 2010 with difference in difference (DID) method comparing applied group of policy with non-applied group of policy. The effect of policy was significantly increased in visit days, significantly decreased in prescription days among supplied of prescription drug. Increasing coinsurance rate in prescription drug for outpatients would have negative effects on healthcare delivery system.¹⁷

Um et al. (2016) analyzed the Korea health panel data from 2010 to 2012. This study participant was selected among diabetic patients over 18 who have visit from 2010 to 2012 at least once a year. The changed policy did not lead diabetic outpatients from tertiary hospital to clinics as expected. The goal to lead diabetic outpatients from tertiary care hospital to hospital and clinics seemed hard to be reached only with drug cost system.¹²

Park et al. (2015) used the Korea Welfare Panel Study (KOWEPS) during 2010 ~ 2012 year. Study population was defined as outpatients due to diabetes, hypertension, allergic rhinitis and asthma. To analysis of changed policy, they conducted analysis of difference in difference (DID) method. In the results by experience of hospitalization, using outpatient care of patient who had not experience of hospitalization for general or tertiary hospital had decreased by study period. However, patient who had experience of

hospitalization for general or tertiary hospital had statistically significant increased by study period.¹⁶

It was difficult to find studies in other countries of policies to increase prescription drugs to improve the healthcare delivery system or to reestablish the functions of healthcare organizations. There were, however, similar studies of cost sharing for prescription drugs.

In Taiwan, national health insurance (NHI) has resulted in accelerating outpatient care utilization and costs because patients free to access different tiers of medical facilities. To deter nonessential visits and encourage initial contact in primary care (physician clinics), a differential co-payment was introduced on 15th July 2005. Chen et al. (2009) analyzed regional weekly outpatient medical claims (January 2004 to July 2006) by a segmented time-series analysis. The overall number of outpatient visits significantly decreased after policy implementation due to a reduction in the number of patients using outpatient facilities, but total costs of care remained unchanged. The policy had its greatest impact on the number of visits to regional and local community hospitals but had no influence on those to the medical centers. Medical utilization in physician clinics decreased due to an audit of reimbursement declarations. Overall, the policy failed to encourage referrals from primary care to higher tiers because there was no obvious shifting of medical utilization and costs reversely.¹⁸

Other study examined the effects of outpatient prescription drug copayment program in the elderly. Under its new National Health Insurance program, Taiwan implemented a

prescription drug cost-sharing program August 1, 1999. Liu et al. (2003) analyzed data of 240,000 patients aged 65 and over representing 1,600,000 outpatient prescriptions were drawn from 21 hospitals using a stratified random sampling method. The initial effects of the policy change did not reverse the trend of drug cost increases. Instead, there was a significant increase in total prescription drug costs in the cost-sharing group.¹⁹

In Quebec, the policy of a prescription coinsurance and deductible cost-sharing policy for elderly persons and welfare recipients was implemented in 1996. Tamblyn et al. (2001) analyzed the impact of introducing prescription drug cost-sharing on use of essential and less essential drugs among elderly persons and welfare recipients and rates of emergency department visits and serious adverse events associated with reductions in drug use before and after policy implementation. Reduction in using essential drugs and a high rate of serious adverse events and emergency department visits associated with cost-sharing for prescription drugs in elderly persons and welfare recipients.²⁰

IV. Study Methods

1. Study design

This study utilized the national sample cohort data released by the National Health Insurance Service from 2007 to 2013, which consists of patient characteristics, healthcare utilization, and hospital characteristics. The cohort data included approximately 100 million people sampled by sex, age, employment status, income, and individual medical costs. Our study population was defined as outpatients aged 20–64 years who had visited medical care organizations more than once, both before and after the policy change, and we excluded subjects who visited medical care organizations more than once due to malignant neoplasm or who had died between 2007 and 2013. Mild diseases were classified into two types, the 52 mild diseases to which the changed policy of coinsurance prescription drug coverage applied and 65 mild diseases to which this policy did not apply. The entire population consistently used healthcare services during 2007 to 2013. Their coinsurance on prescription drug coverage was 30% before the policy change and increased to 40–50% after the policy change.

The requirement for informed consent from patients was waived as patient information was anonymized prior to the study analysis. The present study was approved by the Institutional Review Board, Yonsei University Graduate School of Public Health(Y-2017-0096).

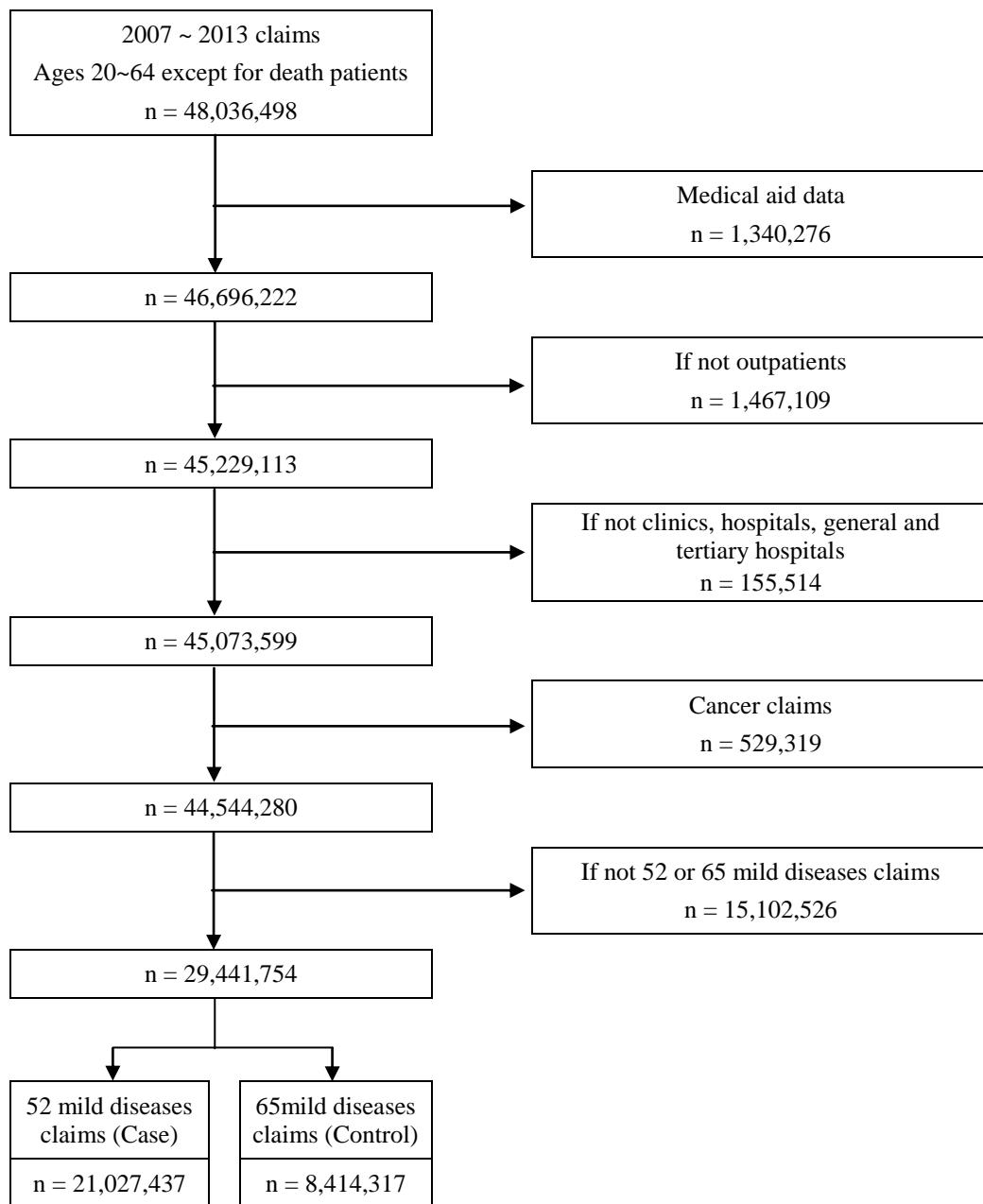


Figure 1. Flowchart of selective process of study population



2. Variables

The dependent variables of this study measured the average and proportion of medical care utilization (Table 1). All variables were calculated in units of person-month. The number of outpatient visits, medical costs and prescription days per person-month were analyzed by medical care organization (tertiary hospital, general hospital, hospital and clinic). Medical costs indicated the total costs of visiting physicians.

For the analysis of the relationship between the policy and healthcare utilization, we adjusted for individual characteristics. Age (20 ~ 29, 30 ~ 39, 40 ~ 49, 50~ 59, 60 ~ 64), sex (men, women), income level (low, middle, high), region (urban, rural), disability, CCI (0, 1, 2≤), four seasons were included as individual level covariates. Income level was estimated using the average monthly health insurance premium. CCI was the summation of weighted scores assigned many major health conditions according to a validated method. In this study, CCI was yearly calculated using Quan's methods. Seasons were included to adjust for seasonal variations.²¹⁻²³ Study period was divided time by policy intervention.



Table 1. Dependent variables in the study

Variables	Definition
The proportion of visits in type of medical organization	$\frac{\text{Monthly the number of claims in clinics (hospitals, general hospitals, tertiary hospitals)}}{\text{Monthly the number of claims in all type of hospital}} \times 100$
The number of claims	Monthly the numbers of claims in clinics (hospitals, general hospitals, tertiary hospitals)
The average medical cost	$\frac{\text{Monthly medical cost in clinics (hospitals, general hospitals, tertiary hospitals)}}{\text{Monthly the number of claims in clinics (hospitals, general hospitals, tertiary hospitals)}} \times 100$
The average drug cost	$\frac{\text{Monthly drug cost in clinics (hospitals, general hospitals, tertiary hospitals)}}{\text{Monthly the number of claims in clinics (hospitals, general hospitals, tertiary hospitals)}} \times 100$

3. Statistical Methods

We examined Chi-square test to evaluate differences according to policy intervention for each categorical factor. We used segmented regression analysis of interrupted time series analysis to evaluate policy effects.

$$\begin{aligned}
 Y_t = & \beta_0 + \beta_1 time_t + \beta_2 policy\ intervention_t + \beta_3 time\ after\ policy\ intervention_t \\
 & + \beta_4 Case + \beta_5 time_t \times Case + \beta_6 policy\ intervention_t \times Case \\
 & + \beta_7 time\ after\ policy\ intervention_t \times Case + Z_1 \cdots + Z_p + e_t
 \end{aligned}$$

Y was dependent variables. t was time period (month). $time$ was a continuous variable started in January 2007. $policy\ intervention$ was a binary variable (0 before, 1 after). $time\ after\ policy\ intervention$ was a continuous variable started in October 2011. $Case$ was a binary variable (0 controls, 1 cases). Z_p was independent variables. e_t was a error term.

For the segmented regression analysis, the generalized estimation equation (GEE) was used. PROC GEMMOD was performed for the GEE with link identity, normal distribution and AR(1). All statistical analyses were performed using SAS statistical software version 9.4. All calculated p values were considered statistically significant at $p < 0.05$.



V. Results

1. General and healthcare utilization characteristics

Table 2 shows the general characteristics of the medical claims for the 52 covered and 65 uncovered mild diseases. The claims for the 52 covered mild diseases were 71.4% ($n = 21,027,437$) of the total, while the claims for the 65 uncovered mild diseases made up 28.6% ($n = 8,414,317$). The variables of both groups were similar.

Table 2. General characteristics of the study population

Variables	Case (n = 21,027,437)	Control (n = 8,414,317)	p-value
Age			<0.0001
20~29	2,836,010	13.5	1,566,027
30~39	4,295,267	20.4	1,750,118
40~49	5,562,921	26.5	1,950,918
50~59	5,799,189	27.6	2,078,689
60~64	2,534,050	12.1	1,068,565
Sex			<0.0001
Male	8,394,696	39.9	3,160,720
Female	12,632,741	60.1	5,253,597
Income level			<0.0001
Low (0~20%)	4,695,005	22.3	1,941,191
Middle (21~80%)	10,823,701	51.5	4,400,127
High (81~100%)	5,508,731	26.2	2,072,999
Region			<0.0001
Urban	10,274,990	48.9	4,096,099
Rural	10,752,447	51.1	4,318,218
Disability			<0.0001
Yes	923,134	4.4	389,148
No	20,104,303	95.6	8,025,169
Charlson comorbidity index			<0.0001
0	2,713,620	12.9	1,333,400
1	5,098,619	24.3	2,151,771
2	4,906,239	23.3	1,912,189
3 ≤	8,308,959	39.5	3,016,957
Season			<0.0001
Spring	5,319,388	25.3	2,052,352
Summer	5,038,395	24.0	2,285,990
Fall	5,228,637	24.9	2,035,475
Winter	5,441,017	25.9	2,040,500
Year			<0.0001
2007	2,354,283	11.2	967,791
2008	2,757,862	13.1	1,077,167
2009	2,928,113	13.9	1,131,020
2010	3,046,555	14.5	1,176,199
2011	3,170,744	15.1	1,247,222
2012	3,364,704	16.0	1,377,175
2013	3,405,176	16.2	1,437,743
Total	21,027,437	71.4	8,414,317
			28.6

Note: p-value for case and control difference

Table 3 presents the characteristics of the healthcare utilization of the study population. The proportions of cases of the 52 covered mild diseases who visited the respective institutions was 88.9% for clinics, 5.0% for hospitals, 2.4% for general hospitals, and 3.7% for tertiary hospitals, while the respective proportions of cases of the control group were 83.6% in clinics, 8.1% in hospitals, 2.9% in general hospitals, and 5.4% in tertiary hospitals. The average number of visits among the covered cases was 222,443 to clinics, 12,621 to hospitals, 6,089 to general hospitals, and 9,174 to tertiary hospitals, while the average number of visits among the control cases was 83,389 to clinics, 8,301 to hospitals, 2,957 to general hospitals, and 5,522 to tertiary hospitals. The average total medical cost of each visit for the covered cases was 14,004 won in clinics, 26,486 won in hospitals, 31,858 won in general hospitals, and 42,536 won in tertiary hospitals, while that for the control cases was 16,375 won in clinics, 36,066 won in hospitals, 42,609 won in general hospitals, and 52,960 won in tertiary hospitals. The average drug cost for the covered cases was 14,041 won in clinics, 26,777 won in hospitals, 44,951 won in general hospitals, and 75,024 won in tertiary hospitals, while that for the control cases was 8,895 won in clinics, 17,639 won in hospitals, 28,947 won in general hospitals, and 48,035 won in tertiary hospitals.



Table 3. Healthcare utilization characteristics of the study population

Variables	Case (n = 21,027,437)		Control (n = 8,414,317)		p-value
The proportion (%), SD					
Clinics	88.9	±1.3	83.6	±4.0	<0.0001
Hospital	5.0	±1.1	8.1	±2.3	<0.0001
General hospital	2.4	±0.2	2.9	±0.6	<0.0001
Tertiary hospital	3.7	±0.5	5.4	±1.1	<0.0001
The number of claims (mean, SD)					
Clinics	222,443	±34,144	83,389	±10,292	<0.0001
Hospital	12,621	±4,101	8,301	±3,489	<0.0001
General hospital	6,089	±1,002	2,957	±951	<0.0001
Tertiary hospital	9,174	±937	5,522	±1,853	<0.0001
The average medical cost (mean, SD)					
Clinics	14,004	±1,317	16,375	±1,996	<0.0001
Hospital	26,486	±3,714	36,066	±7,372	<0.0001
General hospital	31,858	±2,682	42,309	±5,706	<0.0001
Tertiary hospital	42,536	±3,869	52,960	±7,826	<0.0001
The average drug cost (mean, SD)					
Clinics	14,041	±1,613	8,895	±998	<0.0001
Hospital	26,777	±4,188	17,639	±3,002	<0.0001
General hospital	44,981	±8,449	28,947	±3,596	<0.0001
Tertiary hospital	75,024	±11,771	48,035	±6,242	<0.0001

Note: p-value for case and control difference

Table 4 presents proportion of visits by time period. In clinics, medical claims for the 52 covered diseases made up 89.9% of the total, 89.1% before intervention and 87.8% after intervention, while those for the 65 uncovered diseases made up 86.9% of the total, 85.5% before intervention and 78.3% after intervention. In hospitals, medical claims for the 52 covered diseases made up 4.0%, 4.5% before intervention and 6.4% after intervention, while those for the 65 uncovered diseases made up 6.3%, 6.8% before intervention and 11.2% after intervention. In general hospitals, medical claims for the 52 covered diseases made up 2.3% of the total, 2.5% before intervention and 2.5% after intervention, while those for the 65 uncovered diseases made up 2.4% of the total, 2.7% before intervention and 3.6% after intervention. In tertiary hospitals, medical claims for the 52 covered diseases made up 3.8% of the total, 3.9% before intervention and 3.3% after intervention, while those for the 65 uncovered diseases made up 4.4% of the total, 5.0% before intervention and 6.9% after intervention.

Table 4. The average proportion according to hospital type (% ± SD)

	Before intervention		After intervention		p-value
	2007.1. ~ 2009. 6.	2009.7. ~ 2011.9.	2011.10.~ 2013.12.		
Clinic					
Case	89.9	1.2	89.1	0.6	87.8
Control	86.9	1.7	85.5	0.7	78.3
Hospital					
Case	4.0	0.4	4.5	0.2	6.4
Control	6.3	0.8	6.8	0.3	11.2
General hospital					
Case	2.3	0.3	2.5	0.1	2.5
Control	2.4	0.3	2.7	0.3	3.6
Tertiary hospital					
Case	3.8	0.5	3.9	0.3	3.3
Control	4.4	0.6	5.0	0.3	6.9

Note: p-value for total duration (2007.1.~2013.12.)

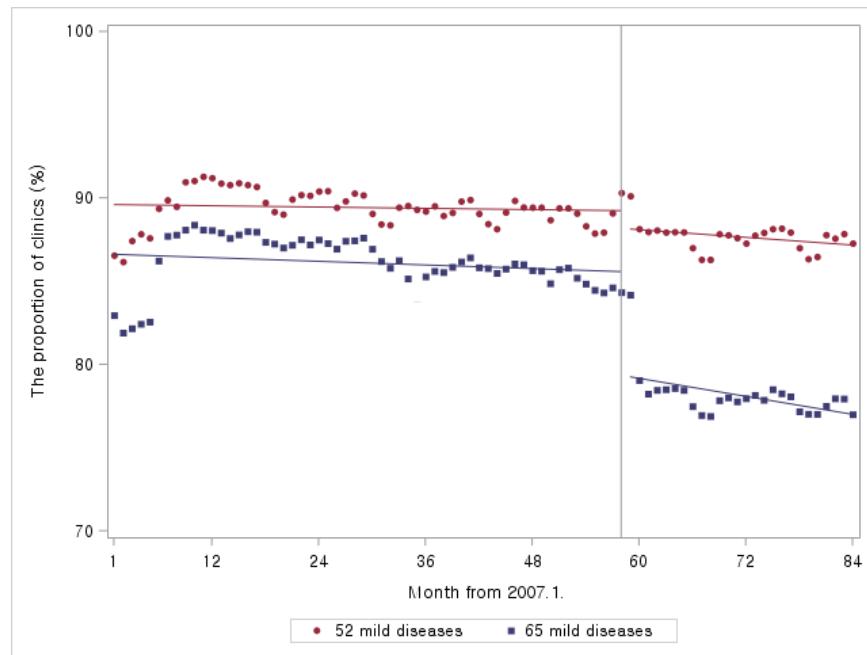


Figure 2. The trend of average proportion in clinics by mild diseases

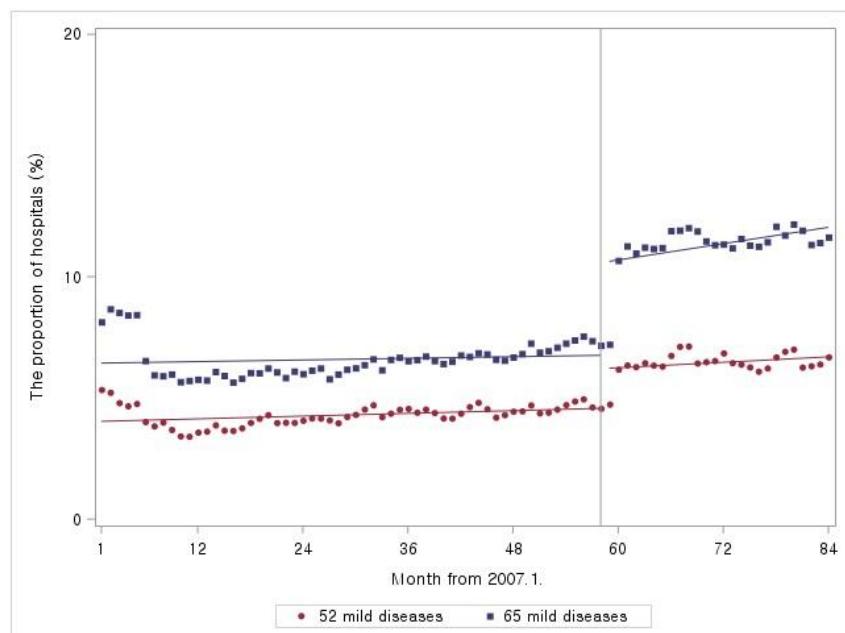


Figure 3. The trend of average proportion in hospitals by mild diseases

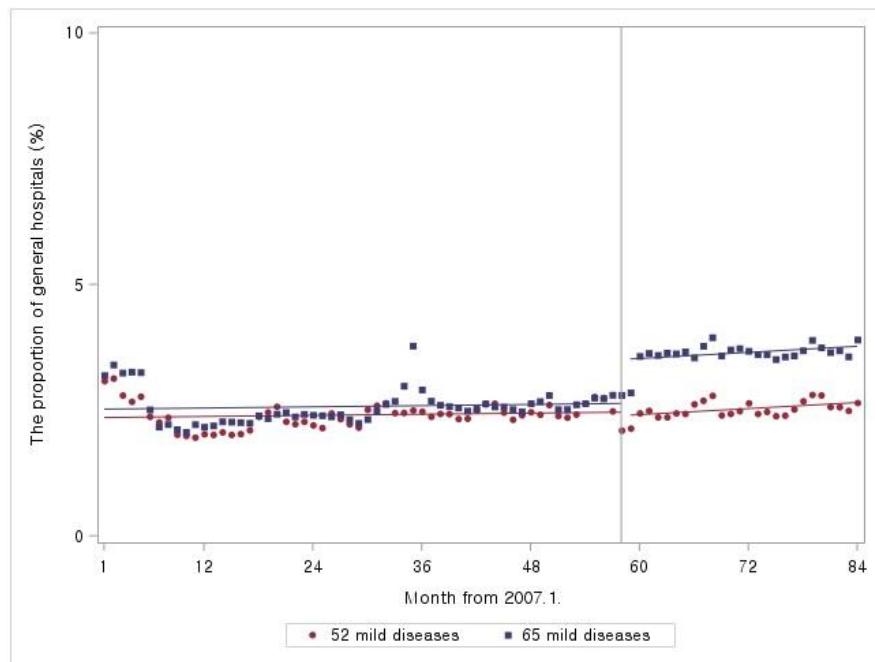


Figure 4. The trend of average proportion in general hospitals by mild diseases

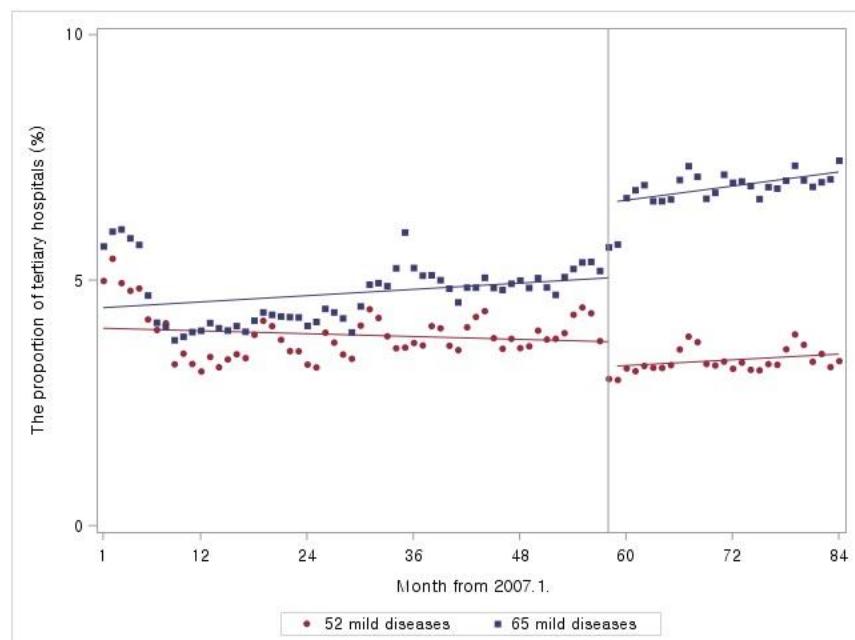


Figure 5. The trend of average proportion in tertiary hospitals by mild diseases

Table 5 presents average number of visits by time period. In clinics, the average numbers of medical claims for the 52 covered and 65 control mild diseases were 230,223 and 85,463 before intervention and 248,967 and 91,350 after intervention, respectively; in hospitals, 11,603 and 6,805 before intervention and 18,080 and 13,121 after intervention, respectively; in general hospitals, 6,405 and 2,688 before intervention and 7,082 and 4,229 after intervention, respectively; and in tertiary hospitals, 10,050 and 5,042 before intervention and 9,463 and 8,026 after intervention, respectively.

Table 5. The average number of medical claims according to hospital type (% ± SD)

	Before intervention		After intervention		p-value
	2007.1. ~ 2009. 6.	2009.7. ~ 2011.9.	2011.10. ~ 2013.12.		
Clinic					
Case	200,022	31,456	230,223	20,734	248,967
Control	76,317	10,050	85,463	4,152	91,350
Hospital					
Case	8,898	1,034	11,603	847	18,080
Control	5,419	230	6,805	540	13,121
General hospital					
Case	5,017	458	6,405	429	7,082
Control	2,089	102	2,688	307	4,229
Tertiary hospital					
Case	8,222	487	10,050	485	9,463
Control	3,763	197	5,042	398	8,026

Note: p-value for total duration (2007.1.~2013.12.)

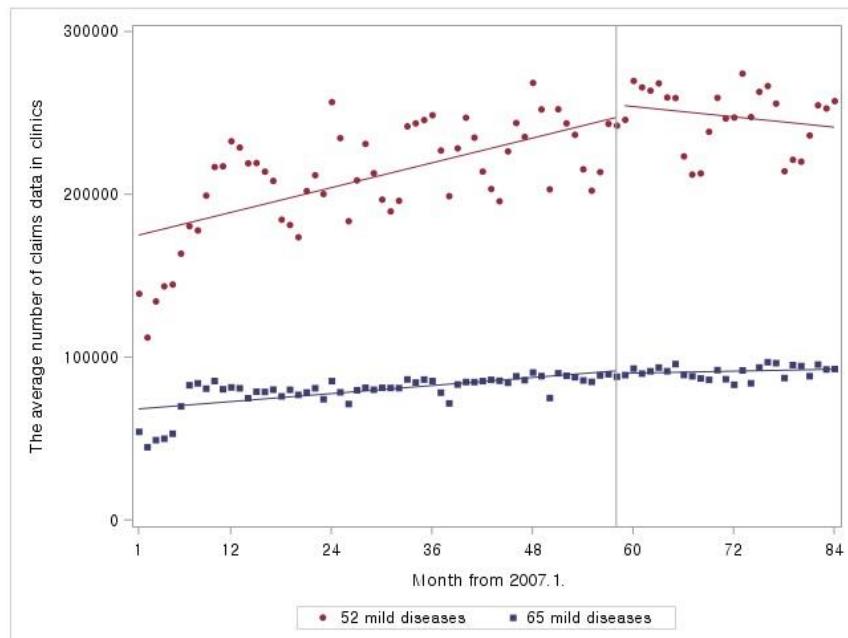


Figure 6. The trend of average number of claims in clinics by mild diseases

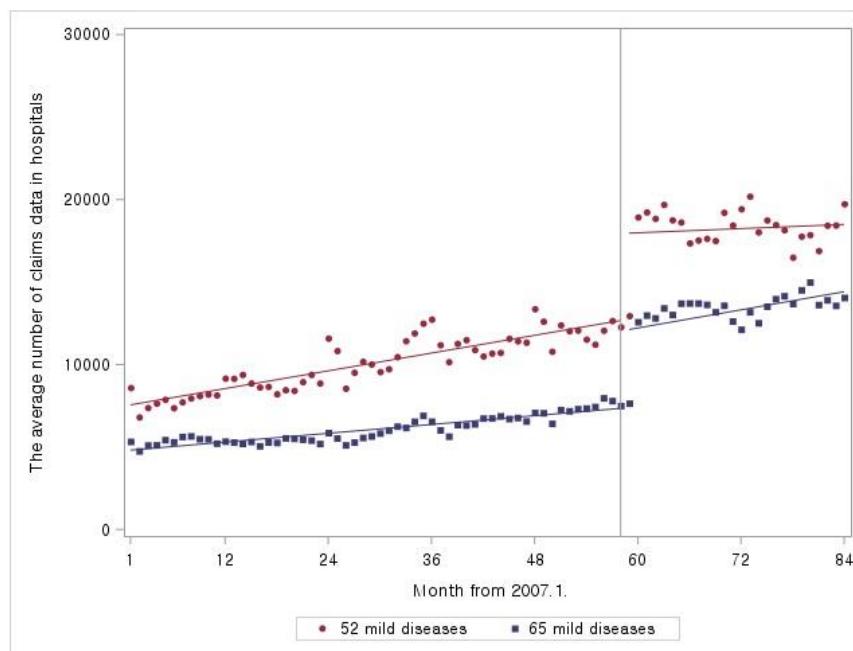


Figure 7. The trend of average number of claims in hospitals by mild diseases

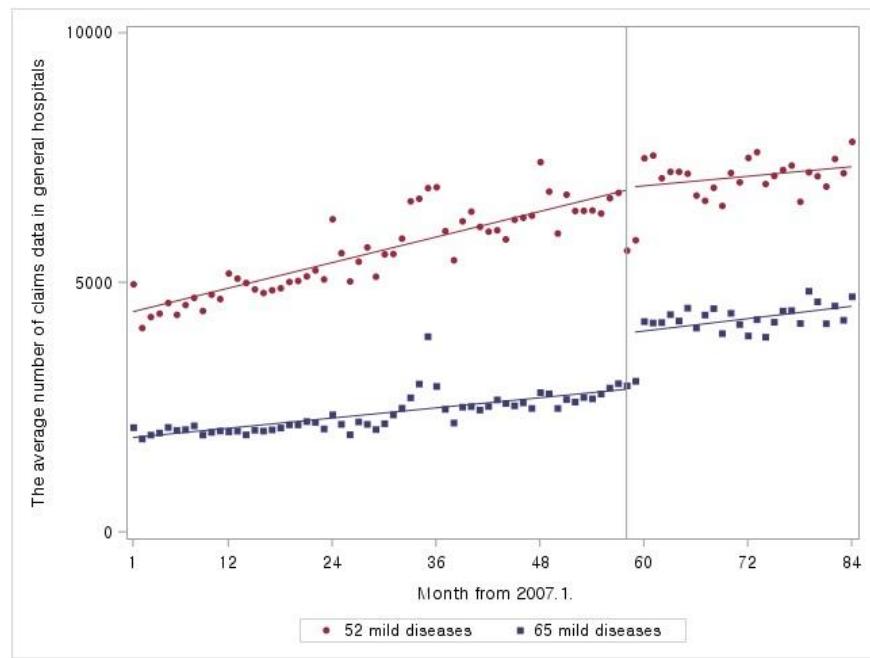


Figure 8. The trend of average number of claims in general hospitals by mild diseases

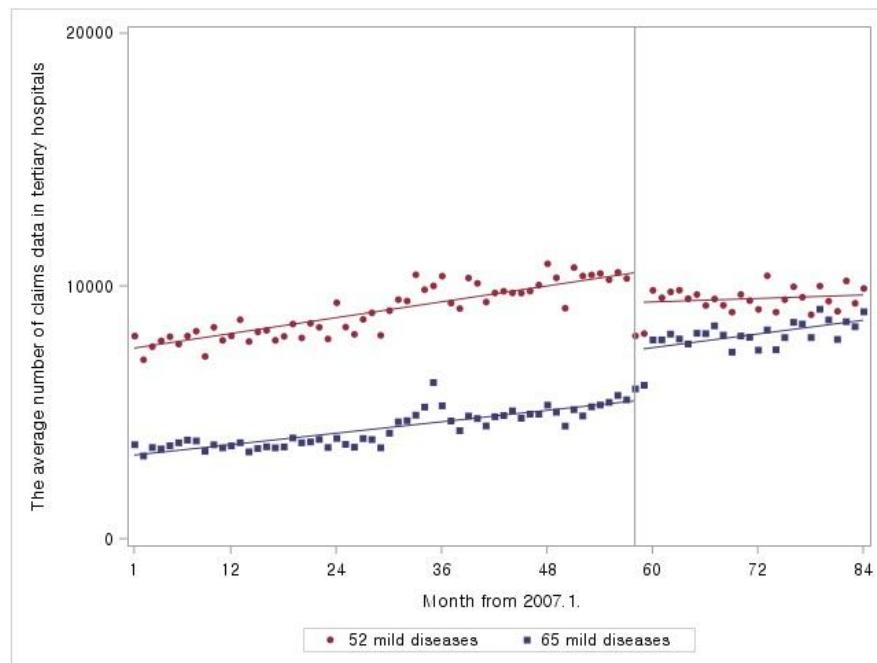


Figure 9. The trend of average number of claims in tertiary hospitals by mild diseases

Table 6 presents the average medical costs of claims. In clinics, the average medical cost of claims for the 52 covered and 65 control mild diseases were 14,147 won (13,643 won before intervention and 13,855 won after intervention) and 16,329 won (15,957 won before intervention and 16,376 won after intervention), respectively; in hospitals, 28,551 won (29,000 won before intervention and 21,529 won after intervention) and 38,919 won (42,638 won before intervention and 26,376 won after intervention), respectively; in general hospitals, 33,702 won (33,050 won before intervention and 28,437 won after intervention) and 44,009 won (47,653 won before intervention and 35,127 won after intervention), respectively; and in tertiary hospitals, 45,477 won (44,419 won before intervention and 37,331 won after intervention) and 59,034 won (56,788 won before intervention and 42,422 won after intervention), respectively.

Table 6. The average medical cost according to hospital type (% ± SD)

	Before intervention		After intervention		p-value
	2007.1. ~ 2009. 6.	2009.7. ~ 2011.9.	2011.10. ~ 2013.12.		
Clinic					
Case	14,147	1,827	13,643	293	13,855
Control	16,329	2,833	15,957	257	275
					<0.0001
Hospital					
Case	28,551	1,016	29,000	1,126	21,529
Control	38,919	1,971	42,638	747	2,077
					<0.0001
General hospital					
Case	33,702	1,215	33,050	1,226	28,437
Control	44,009	2,051	47,653	2,445	1,384
					<0.0001
Tertiary hospital					
Case	45,477	1,130	44,419	915	37,331
Control	59,034	2,079	56,788	3,499	1,908
					<0.0001
All hospitals					
Case	16,345	1,876	16,021	449	15,482
Control	20,220	2,760	20,691	461	351
					<0.0001
					445

Note: p-value for total duration (2007.1.~2013.12.)

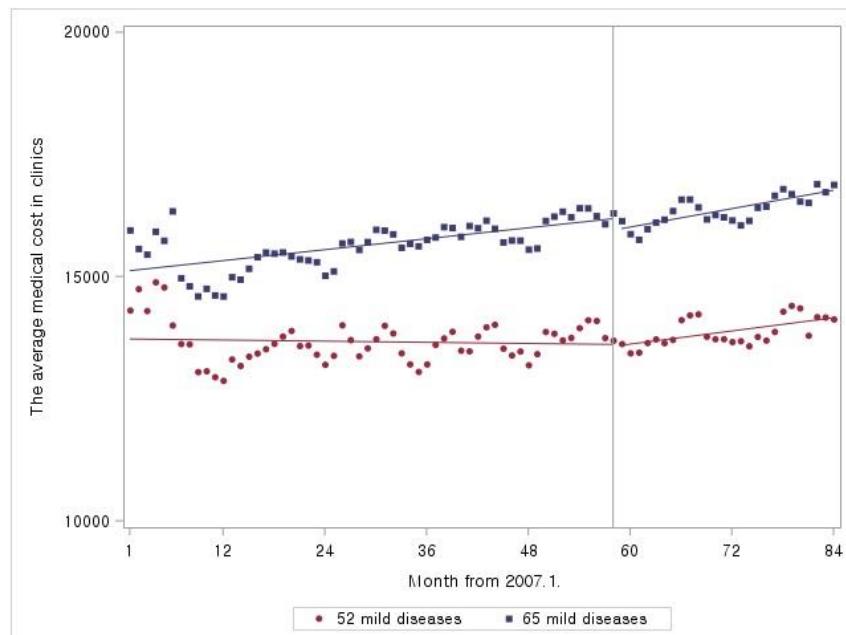


Figure 10. The trend of average medical cost in clinics by mild diseases

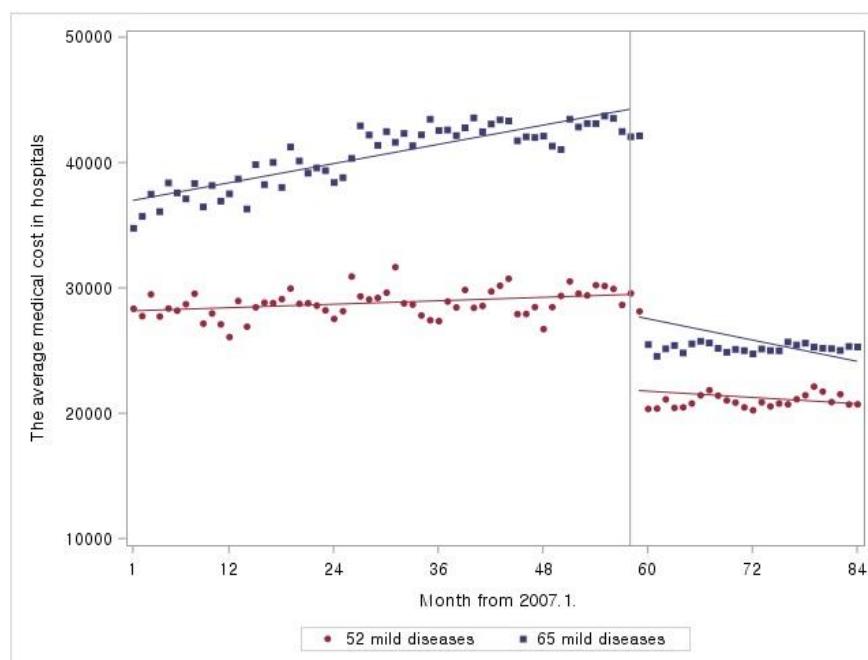


Figure 11. The trend of average medical cost in hospitals by mild diseases

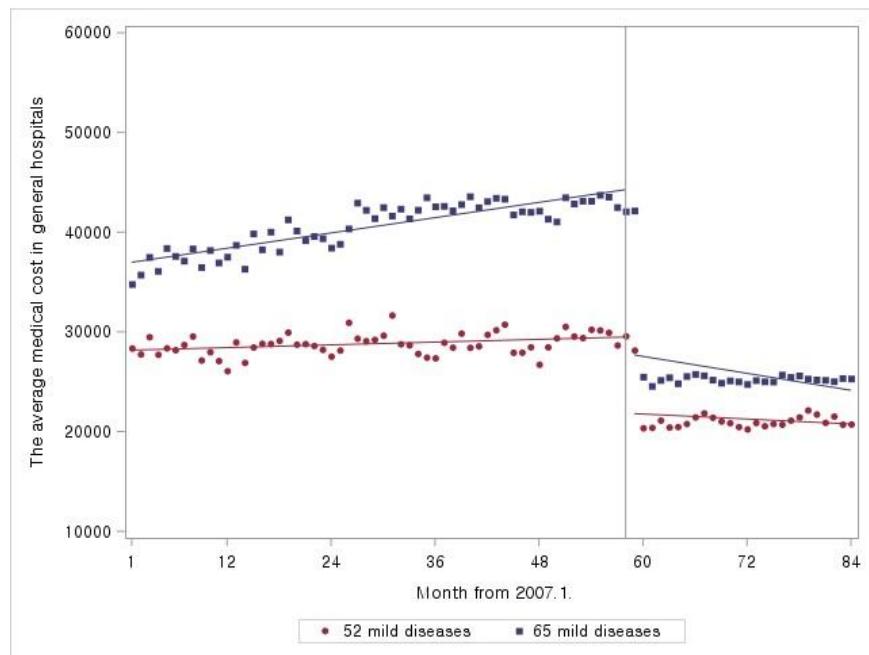


Figure 12. The trend of average medical cost in general hospitals by mild diseases

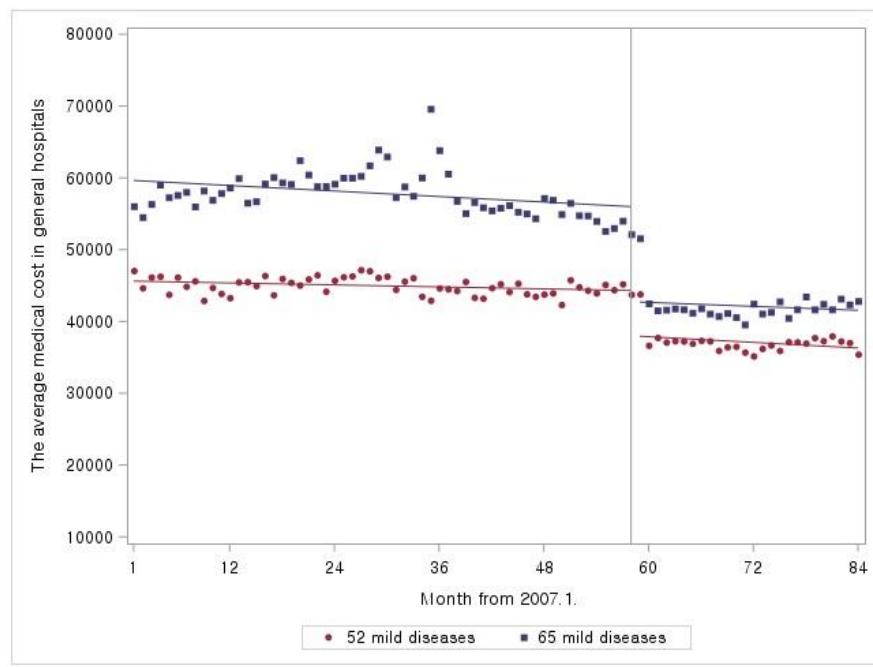


Figure 13. The trend of average medical cost in tertiary hospitals by mild diseases

Table 7 shows the average drug costs of claims. In clinics, the average drug cost of claims for the 52 covered and 65 control mild diseases was 13,682 won (14,355 won before intervention and 13,843 won after intervention) and 8,995 won (9,249 won before intervention and 8,337 won after intervention), respectively; in hospitals, 28,277 won (29,734 won before intervention and 14,655 won after intervention) and 17,940 won (20,396 won before intervention and 14,655 won after intervention), respectively; in general hospitals, 50,954 won (49,522 won before intervention and 33,740 won after intervention) and 30,840 won (30,397 won before intervention and 25,392 won after intervention), respectively; and in tertiary hospitals, 83,329 won (81,276 won before intervention and 59,755 won after intervention) and 50,544 won (51,880 won before intervention and 41,663 won after intervention), respectively.

Table 7. The average drug cost according to hospital type (% ± SD)

	After intervention				Before intervention		p-value
	2007.1. ~ 2009. 6.	2009.7. ~ 2011.9.	2011.10. ~ 2013.12.				
Clinic							
Case	13,682	2,306	14,355	965	13,843	836	<0.0001
Control	8,995	1,402	9,249	247	8,337	563	<0.0001
Hospital							
Case	28,277	3,419	29,734	1,516	22,108	2,316	<0.0001
Control	17,940	2,041	20,396	1,344	14,655	2,167	<0.0001
General hospital							
Case	50,954	3,553	49,522	1,825	33,740	3,964	<0.0001
Control	30,840	2,552	30,397	2,500	25,392	2,838	<0.0001
Tertiary hospital							
Case	83,329	5,740	81,276	1,455	59,755	6,281	<0.0001
Control	50,544	4,379	51,880	4,108	41,663	4,476	<0.0001
All hospitals							
Case	17,344	2,583	18,074	1,165	1,5840	984	<0.0001
Control	11,299	1,485	12,041	486	11,091	776	<0.0001

Note: p-value for total duration (2007.1.~2013.12.)

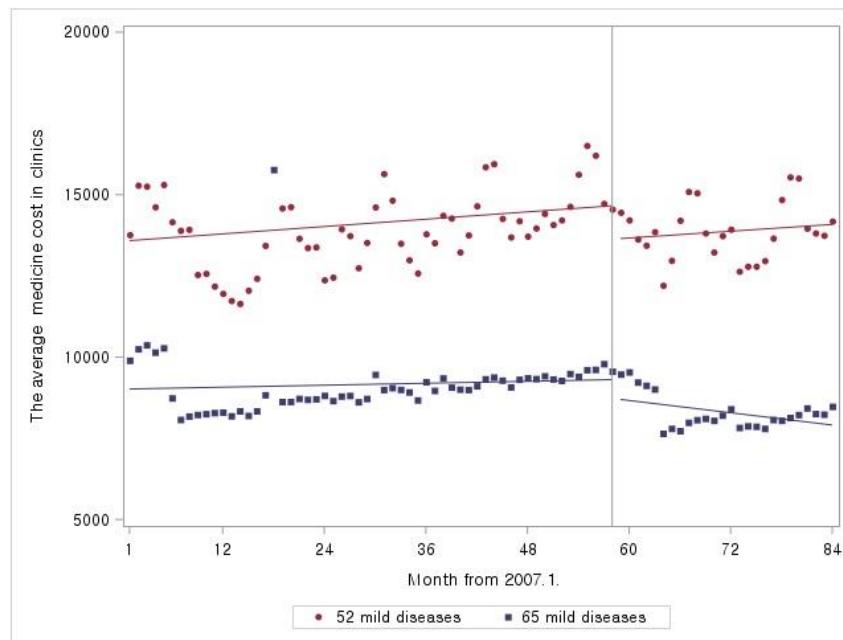


Figure 14. The trend of average drug cost in clinics by mild diseases

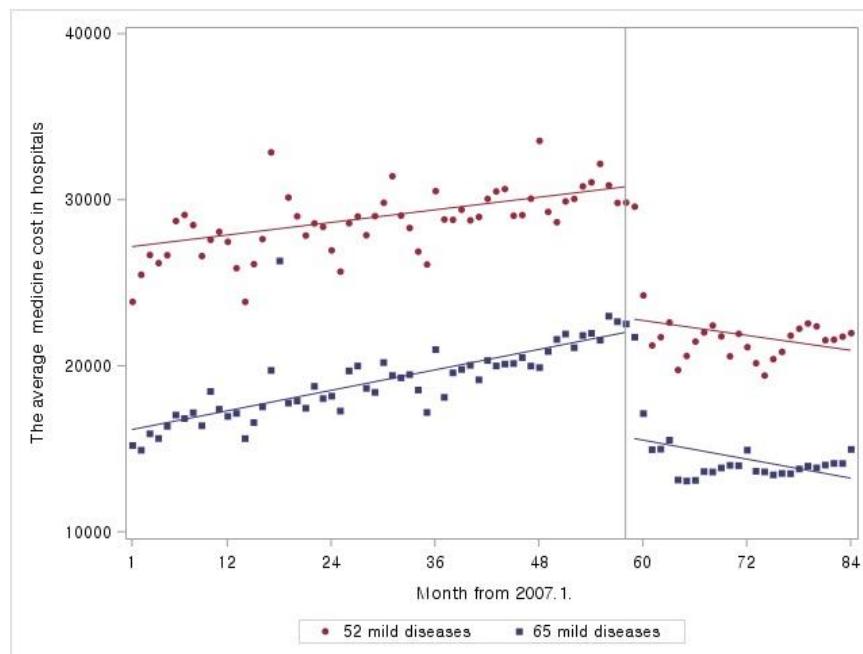


Figure 15. The trend of average drug cost in hospitals by mild diseases

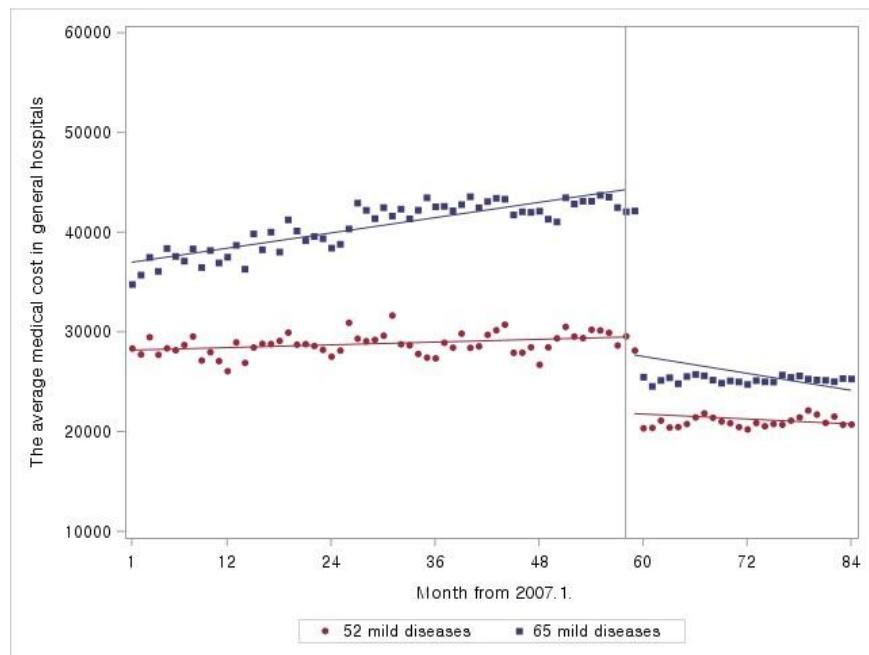


Figure 16. The trend of average drug cost in general hospitals by mild diseases

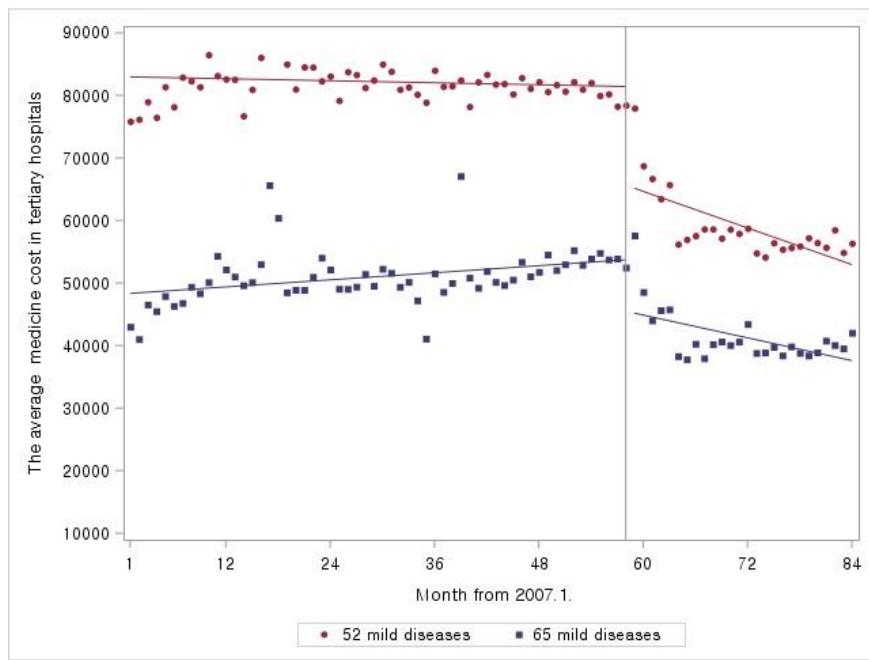


Figure 17. The trend of average drug cost in tertiary hospitals by mild diseases

2. Results of the segmented regression analysis

Table 8 and Figure 18 report the results of the segmented regression analysis of the claim data for the proportion of visits for the 65 control mild diseases. Estimates in this analysis were adjusted for age, sex, income level, region, disability, Charlson comorbidity index, and season. We also performed segmented regression on unadjusted estimation and the aggregate data by month. The results of this analysis are reported in Tables A1–A3. In clinics, the estimates of the level change and trend change of the difference between cases and controls increased during the study time period (level change 2.2389, trend change 0.0471, $p < 0.0001$). In contrast, it decreased in hospitals, general and tertiary hospitals.

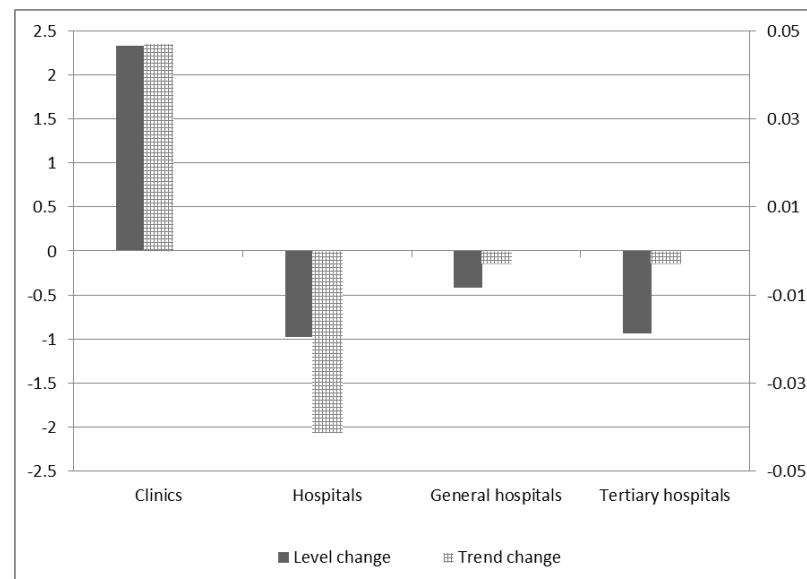


Figure 18. Results of the segmented regression analysis with control for the proportion by hospital type

Table 8. Results of the segmented regression analysis with control for the proportion by hospital type

Variables	Estimate	95% Confidence limits	p-value
Clinic			
Intercept β	90.4230	90.4193	90.4266 <.0001
Baseline trend	-0.1135	-0.1135	-0.1134 <.0001
Level change	-2.2072	-2.2094	-2.2051 <.0001
Trend change	-0.1062	-0.1064	-0.1060 <.0001
Difference between case and control	-0.5607	-0.5643	-0.5570 <.0001
Baseline trend of difference between case and control	0.0939	0.0938	0.0940 <.0001
Level change of difference between case and control	2.3289	2.3264	2.3315 <.0001
Trend change of difference between case and control	0.0471	0.0469	0.0473 <.0001
Hospital			
Intercept β	3.9958	3.9938	3.9978 <.0001
Baseline trend	0.0660	0.0660	0.0660 <.0001
Level change	1.5648	1.5636	1.5659 <.0001
Trend change	0.0610	0.0609	0.0611 <.0001
Difference between case and control	-0.8708	-0.8727	-0.8688 <.0001
Baseline trend of difference between case and control	-0.0319	-0.0319	-0.0319 <.0001
Level change of difference between case and control	-0.9732	-0.9745	-0.9718 <.0001
Trend change of difference between case and control	-0.0414	-0.0415	-0.0412 <.0001
General hospital			
Intercept β	2.0623	2.0616	2.0630 <.0001
Baseline trend	0.0145	0.0145	0.0145 <.0001
Level change	0.2292	0.2288	0.2297 <.0001
Trend change	0.0170	0.0170	0.0171 <.0001
Difference between case and control	0.4551	0.4544	0.4558 <.0001
Baseline trend of difference between case and control	-0.0147	-0.0147	-0.0147 <.0001
Level change of difference between case and control	-0.4164	-0.4169	-0.4159 <.0001
Trend change of difference between case and control	-0.0028	-0.0029	-0.0028 <.0001
Tertiary hospital			
Intercept β	3.5189	3.5177	3.5202 <.0001
Baseline trend	0.0330	0.0329	0.0330 <.0001
Level change	0.4132	0.4125	0.4140 <.0001
Trend change	0.0281	0.0280	0.0282 <.0001
Difference between case and control	0.9763	0.9751	0.9776 <.0001
Baseline trend of difference between case and control	-0.0473	-0.0474	-0.0473 <.0001
Level change of difference between case and control	-0.9394	-0.9402	-0.9385 <.0001
Trend change of difference between case and control	-0.0029	-0.0030	-0.0028 <.0001

Table 9 and Figure 19 report the results of the segmented regression analysis of the data for the average number of claims for the 65 control mild diseases. The estimates of the level change in clinics and hospitals increased 6255.5 and 134.8, respectively ($p < 0.0001$), while the estimates of the trend change reflecting the trend after intervention decreased 1413.6 in clinics and 99.8 in hospitals ($p < 0.0001$). The estimates of the level and trend changes of the difference between cases and controls decreased in general and tertiary hospitals. However, when interpreting the results, closer attention to detail is required because the average claims used in the analysis were not transformed into same units for analysis and the number of 52 mild-disease claims was greater than that of the 65 mild-diseases claims.

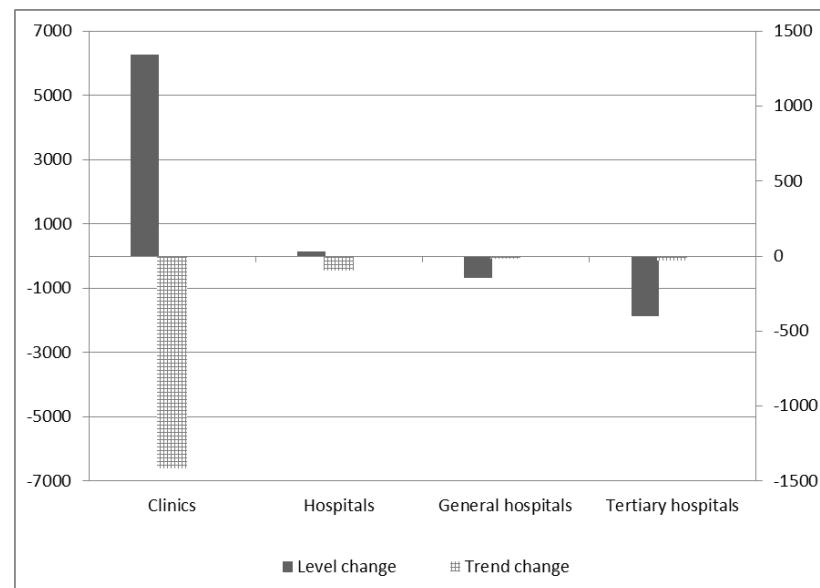


Figure 19. Results of the segmented regression analysis with control for the number of claims by hospital type

Table 9. Results of the segmented regression analysis with control for the number of claims by hospital type

Variables	Estimate	95% Confidence limits	p-value
Clinic			
Intercept β	78809.4	78756.4	78862.4 <.0001
Baseline trend	342.2	341.3	343.1 <.0001
Level change	-1008.9	-1040.5	-977.3 <.0001
Trend change	-191.3	-194.2	-188.5 <.0001
Difference between case and control	101108.4	101055.5	101161.3 <.0001
Baseline trend of difference between case and control	971.2	970.1	972.2 <.0001
Level change of difference between case and control	6255.5	6218.3	6292.6 <.0001
Trend change of difference between case and control	-1413.6	-1417.0	-1410.2 <.0001
Hospital			
Intercept β	2458.3	2454.4	2462.3 <.0001
Baseline trend	114.2	114.2	114.3 <.0001
Level change	2009.8	2007.4	2012.1 <.0001
Trend change	67.9	67.7	68.1 <.0001
Difference between case and control	2495.5	2491.5	2499.4 <.0001
Baseline trend of difference between case and control	52.0	51.9	52.1 <.0001
Level change of difference between case and control	134.8	132.1	137.6 <.0001
Trend change of difference between case and control	-99.8	-100.1	-99.6 <.0001
General hospital			
Intercept β	1501.3	1500.1	1502.4 <.0001
Baseline trend	31.9	31.9	32.0 <.0001
Level change	367.7	367.0	368.4 <.0001
Trend change	15.8	15.7	15.8 <.0001
Difference between case and control	3422.4	3421.3	3423.6 <.0001
Baseline trend of difference between case and control	6.5	6.5	6.6 <.0001
Level change of difference between case and control	-680.5	-681.3	-679.7 <.0001
Trend change of difference between case and control	-21.7	-21.7	-21.6 <.0001
Tertiary hospital			
Intercept β	2238.2	2236.6	2239.7 <.0001
Baseline trend	65.3	65.3	65.3 <.0001
Level change	708.6	707.7	709.5 <.0001
Trend change	25.8	25.7	25.9 <.0001
Difference between case and control	6777.0	6775.4	6778.5 <.0001
Baseline trend of difference between case and control	-39.9	-39.9	-39.8 <.0001
Level change of difference between case and control	-1869.0	-1870.0	-1867.9 <.0001
Trend change of difference between case and control	-32.7	-32.8	-32.6 <.0001

Table 10 and Figure 20 report the results of the segmented regression analysis with the claim data for the average medical cost of claims of the 65 control mild diseases. The estimates of the medical cost level change in all hospitals increased 176 won and the medical cost trend change decreased by 31 won. By types of hospital, the estimates of the medical cost level change and medical cost trend change were 176 won and -27 won in clinics, respectively; 5979 won and 69 won in hospitals, respectively; 6740 won and -31 won in general hospitals, respectively; and 4918 won and -192 won in tertiary hospitals, respectively. The average medical cost of hospitals and of general and tertiary hospitals increased compared with the increase in the level change in all hospitals.

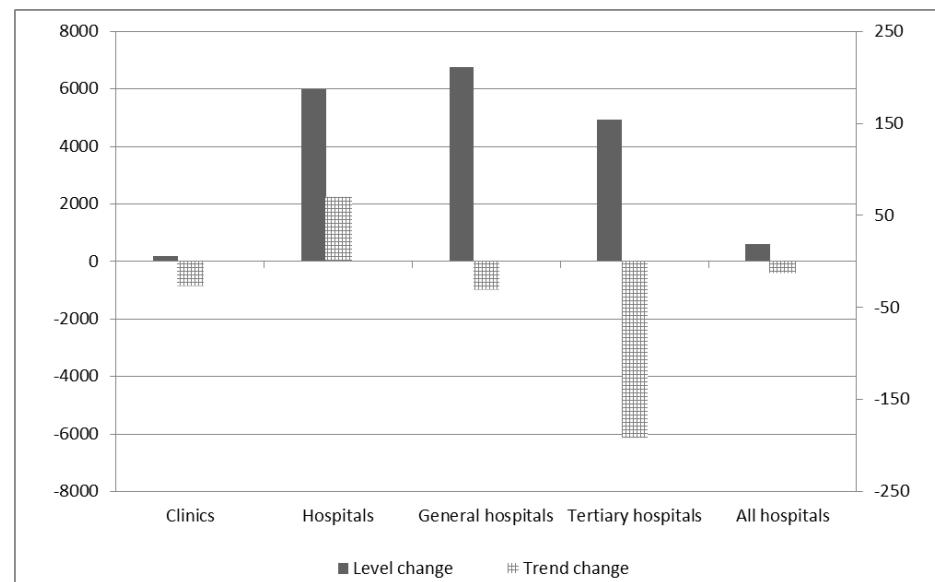


Figure 20. Results of the segmented regression analysis with control for the medical cost by hospital type

Table 10. Results of the segmented regression analysis with control for the medical cost by hospital type

Variables	Estimate	95% Confidence limits	p-value
Clinic			
Intercept β	17213	17209	.17217 <.0001
Baseline trend	-29	-29	-29 <.0001
Level change	-358	-361	-356 <.0001
Trend change	99	99	99 <.0001
Difference between case and control	-2438	-2442	-2434 <.0001
Baseline trend of difference between case and control	2	2	2 <.0001
Level change of difference between case and control	176	174	179 <.0001
Trend change of difference between case and control	-27	-27	-26 <.0001
Hospital			
Intercept β	49371	49343	49399 <.0001
Baseline trend	-174	-174	-173 <.0001
Level change	-9741	-9757	-9726 <.0001
Trend change	-117	-118	-116 <.0001
Difference between case and control	-16742	-16770	-16714 <.0001
Baseline trend of difference between case and control	69	68	69 <.0001
Level change of difference between case and control	5979	5960	5999 <.0001
Trend change of difference between case and control	69	68	71 <.0001
General hospital			
Intercept β	53834	53798	53870 <.0001
Baseline trend	-149	-150	-149 <.0001
Level change	-8598	-8619	-8577 <.0001
Trend change	11	9	13 <.0001
Difference between case and control	-17762	-17798	-17726 <.0001
Baseline trend of difference between case and control	68	67	68 <.0001
Level change of difference between case and control	6740	6715	6766 <.0001
Trend change of difference between case and control	-31	-33	-29 <.0001
Tertiary hospital			
Intercept β	69651	69617	69685 <.0001
Baseline trend	-299	-299	-298 <.0001
Level change	-7294	-7313	-7275 <.0001
Trend change	92	91	94 <.0001
Difference between case and control	-20914	-20949	-20880 <.0001
Baseline trend of difference between case and control	191	190	191 <.0001
Level change of difference between case and control	4918	4894	4943 <.0001
Trend change of difference between case and control	-192	-194	-190 <.0001



Variables	Estimate	95% Confidence limits		p-value
All hospitals				
Intercept β	21939	21935	21943	<.0001
Baseline trend	-31	-31	-31	<.0001
Level change	-1208	-1210	-1206	<.0001
Trend change	80	79	80	<.0001
Difference between case and control	-4506	-4510	-4502	<.0001
Baseline trend of difference between case and control	-3	-3	-3	<.0001
Level change of difference between case and control	613	610	615	<.0001
Trend change of difference between case and control	-13	-13	-12	<.0001

Table 11 and Figure 21 report the results of the segmented regression analysis with 65 mild diseases claim data for the average drug cost of claims. In all hospitals, the estimates of the drug cost level change decreased by 1037 won and the medical cost trend change increased by 52 won. By hospital, the estimates of the drug cost level change and drug cost trend change were -253 and 33 in clinics; -762 and -49 in hospitals; -5035 and -18 in general hospitals; and -2810 and -170 in tertiary hospitals, respectively. The average drug cost slightly decreased in clinics and hospitals and greatly decreased in general and tertiary hospitals in comparison to the total decrease of drug costs in all hospitals.

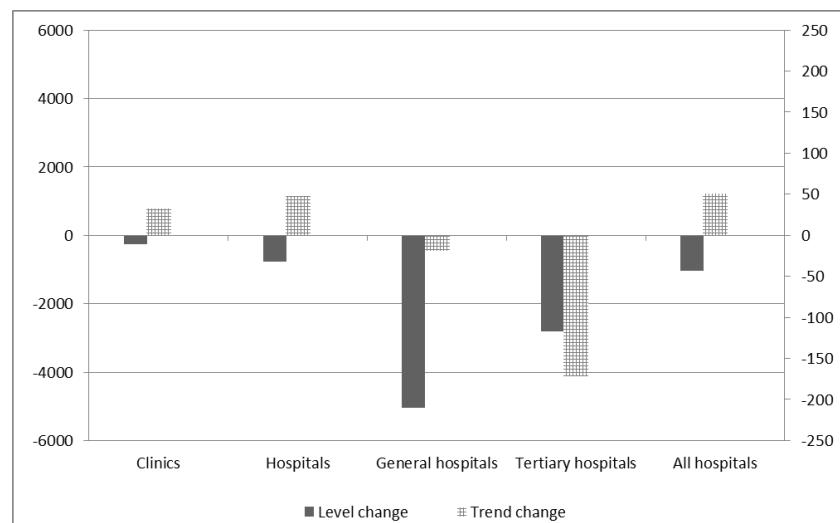


Figure 21. Results of the segmented regression analysis with control for the drug cost by hospital type

Table 11. Results of the segmented regression analysis with control for the drug cost by hospital type

Variables	Estimate	95% Confidence limits		p-value
Clinic				
Intercept β	8666	8662	8670	<.0001
Baseline trend	1	1	2	<.0001
Level change	-158	-160	-155	<.0001
Trend change	-51	-51	-51	<.0001
Difference between case and control	4844	4840	4848	<.0001
Baseline trend of difference between case and control	6	6	7	<.0001
Level change of difference between case and control	-253	-256	-250	<.0001
Trend change of difference between case and control	33	33	33	<.0001
Hospital				
Intercept β	19906	19880	19933	<.0001
Baseline trend	-3	-3	-3	<.0001
Level change	-3084	-3099	-3069	<.0001
Trend change	-173	-174	-172	<.0001
Difference between case and control	12121	12094	12148	<.0001
Baseline trend of difference between case and control	-62	-63	-62	<.0001
Level change of difference between case and control	-762	-780	-743	<.0001
Trend change of difference between case and control	49	47	50	<.0001
General hospital				
Intercept β	29881	29820	29942	<.0001
Baseline trend	-13	-14	-12	<.0001
Level change	-265	-300	-230	<.0001
Trend change	-278	-281	-275	<.0001
Difference between case and control	27779	27719	27840	<.0001
Baseline trend of difference between case and control	-192	-193	-190	<.0001
Level change of difference between case and control	-5035	-5078	-4992	<.0001
Trend change of difference between case and control	-18	-22	-14	<.0001
Tertiary hospital				
Intercept β	52181	52114	52247	<.0001
Baseline trend	-25	-26	-24	<.0001
Level change	-3060	-3097	-3023	<.0001
Trend change	-417	-420	-414	<.0001
Difference between case and control	38845	38778	38912	<.0001
Baseline trend of difference between case and control	-211	-213	-210	<.0001
Level change of difference between case and control	-2810	-2858	-2763	<.0001
Trend change of difference between case and control	-170	-174	-166	<.0001



Variables	Estimate	95% Confidence limits		p-value
All hospitals				
Intercept β	10696	10692	10700	<.0001
Baseline trend	17	17	17	<.0001
Level change	-208	-210	-205	<.0001
Trend change	-79	-79	-79	<.0001
Difference between case and control	7590	7585	7594	<.0001
Baseline trend of difference between case and control	-33	-34	-33	<.0001
Level change of difference between case and control	-1037	-1040	-1034	<.0001
Trend change of difference between case and control	52	52	52	<.0001



We performed subgroup analyses of the proportions and numbers of claims and the medical and drug costs by income level. Tables 12–14 report the results of the segmented regression analysis of the control stratified by income level.

The estimates for the proportion level change increased and trend change decreased in clinics; the results for other hospitals contrasted with these results. The proportion did not differ according to income level. The estimate for the level change for the number of claims decreased in all hospitals, while the trend change showed a decrease at low income levels in clinics. The estimates of the medical and drug cost level change increased and trend change decreased. There were no differences by income level in healthcare utilization.

Table 12. Results of the segmented regression analysis with control for the proportion by income level subgroup

		Level change			Trend change		
		Estimate	SE	p-value	Estimate	SE	p-value
Clinic	Low	0.0387	0.0023	<0.0001	-0.0033	0.0002	<0.0001
	Middle	0.0226	0.0017	<0.0001	-0.0004	0.0002	<0.0001
	High	0.0445	0.0024	<0.0001	-0.0031	0.0002	<0.0001
Hospital	Low	-0.0290	0.0014	<0.0001	0.0026	0.0001	<0.0001
	Middle	-0.0160	0.0009	<0.0001	0.0003	0.0001	<0.0001
	High	-0.0286	0.0012	<0.0001	0.0021	0.0001	<0.0001
General hospital	Low	-0.0046	0.0005	<0.0001	0.0003	0.0000	<0.0001
	Middle	-0.0049	0.0003	<0.0001	0.0001	0.0000	<0.0001
	High	-0.0065	0.0004	<0.0001	0.0003	0.0000	<0.0001
Tertiary hospital	Low	-0.0051	0.0006	<0.0001	0.0004	0.0001	<0.0001
	Middle	-0.0018	0.0005	<0.0001	-0.0001	0.0000	<0.0001
	High	-0.0094	0.001	<0.0001	0.0006	0.0001	<0.0001

Table 13. Results of the segmented regression analysis with control for the number of claims by income level subgroup

		Level change			Trend change		
		Estimate	SE	p-value	Estimate	SE	p-value
Clinic	Low	-47.9656	11.9836	<0.0001	-2.979	1.0862	<0.0001
	Middle	-105.609	18.6559	<0.0001	3.9574	1.7011	<0.0001
	High	-56.256	13.8114	<0.0001	2.0595	1.2629	<0.0001
Hospital	Low	-28.2619	1.2627	<0.0001	2.1762	0.1144	<0.0001
	Middle	-34.8326	1.8815	<0.0001	0.9098	0.1716	<0.0001
	High	-31.1618	1.1489	<0.0001	2.4133	0.1051	<0.0001
General hospital	Low	-5.7801	0.3416	<0.0001	0.1604	0.031	<0.0001
	Middle	-13.6562	0.5705	<0.0001	0.39	0.052	<0.0001
	High	-8.7865	0.393	<0.0001	0.4415	0.0359	<0.0001
Tertiary hospital	Low	-6.6244	0.3905	<0.0001	0.1268	0.0354	<0.0001
	Middle	-11.4866	0.6762	<0.0001	0.2495	0.0617	<0.0001
	High	-15.2882	0.6644	<0.0001	0.9063	0.0608	<0.0001

Table 14. Results of the segmented regression analysis with control for the medical cost by income level subgroup

		Level change			Trend change		
		Estimate	SE	p-value	Estimate	SE	p-value
Clinic	Low	14	2	<0.0001	1	0	<0.0001
	Middle	26	1	<0.0001	-1	0	<0.0001
	High	17	2	<0.0001	0	0	<0.0001
Hospital	Low	515	18	<0.0001	-43	1	<0.0001
	Middle	352	12	<0.0001	-26	1	<0.0001
	High	494	21	<0.0001	-38	1	<0.0001
General hospital	Low	378	25	<0.0001	-32	2	<0.0001
	Middle	357	14	<0.0001	-32	1	<0.0001
	High	377	26	<0.0001	-32	2	<0.0001
Tertiary hospital	Low	662	26	<0.0001	-66	2	<0.0001
	Middle	705	14	<0.0001	-70	1	<0.0001
	High	753	18	<0.0001	-77	1	<0.0001

Table 15. Results of the segmented regression analysis with control for the drug cost by income level subgroup

		Level change			Trend change		
		Estimate	SE	p-value	Estimate	SE	p-value
Clinic	Low	-6	2	<0.0001	0	0	<0.0001
	Middle	5	1	<0.0001	-1	0	<0.0001
	High	4	3	<0.0001	0	0	<0.0001
Hospital	Low	364	26	<0.0001	-45	2	<0.0001
	Middle	264	12	<0.0001	-21	1	<0.0001
	High	354	21	<0.0001	-31	1	<0.0001
General hospital	Low	712	48	<0.0001	-83	4	<0.0001
	Middle	558	30	<0.0001	-67	2	<0.0001
	High	536	47	<0.0001	-66	4	<0.0001
Tertiary hospital	Low	1354	66	<0.0001	-148	5	<0.0001
	Middle	1406	34	<0.0001	-154	3	<0.0001
	High	1429	47	<0.0001	-159	4	<0.0001

VI. Discussion

1. Discussion of study methods

This study conducted a segmented regression analysis of interrupted time series to estimate the effect of policy intervention. Interrupted time series analysis is a popular method for policy evaluation whose design allows a quasi-experimental approach to evaluating the longitudinal effects of interventions. Segmented regression analysis is a powerful statistical method for estimating intervention effects in interrupted time series studies that can be used to evaluate policy interventions. Most studies using segmented analysis have analyzed time-aggregate data without considering individual-level effects, though there has been a study that used segmented regression analysis with data aggregated into person-months. The present study implemented segmented regression analysis based on the method of Wagner et al.²⁹ The present study used a GEE model, which provides a flexible approach to analyzing correlated data from the same individuals over time. The main limitation of a mixed-model approach is the assumption of residual normality, as the GEE model is comparable to a continuous dependent variable. Thus, the study results were interpreted based on the GEE.

National sample cohort data provided by the National Health Insurance Service were used in the present study. In these data, it was difficult to consider whether there might have been some individuals unaffected by the difference in cost in choosing general or



tertiary hospitals due to the insurance (ex: actual insurance) they enjoyed. Furthermore, as private insurance and non-covered medical expenses were excluded from medical expenses, the analysis was conducted only for services subject to health insurance and medical care claims. Therefore, it is necessary to pay close attention to the interpretation of the results in this regard. It is important to identify how the proportion or change in medical or drug costs in the results of this study affected patient outcomes. This was difficult to identify because of the limitations of the data.

2. Discussion of study results

This study analyzed differences between the claim data for 52 covered mild diseases and 65 uncovered mild diseases to determine the impact of policy intervention on healthcare utilization.

The results of this study show that both the level change and trend change of the proportion of total claims increased in clinics, while in other medical institutions, both the level change and trend change decreased. After the policy intervention, it was found that the proportion of claims made in clinics increased.

In terms of the number of claims, the level changes increased in clinics and hospitals, and the trend changes decreased significantly in clinics and slightly increased in hospitals, while in general and tertiary hospitals, both level changes and trend changes decreased. However, since these changes are not in the same units, caution is required in interpreting them.

As a result of the medical cost analysis, a comparison of the level change and trend change increment of the medical costs in all medical institutions after the policy intervention found that medical costs increased less in clinics and increased greatly in general, tertiary, and other hospitals.

As a result of the drug cost analysis, a comparison of the level change and trend change increment of the drug costs in all medical institutions after the policy intervention

found that drug costs decreased less in clinics and hospitals and decreased greatly in general and tertiary hospitals.

We performed subgroup analyses of the data on the proportions and numbers of claims and the medical and drug costs by income level that found the only differences were by medical institution, and no significant differences were found by income level. The findings of the present study indicate that changing the coinsurance rate on prescription drug costs was associated with changes in outpatient healthcare service utilization.

In terms of the introduction of the 2011 policy, the proportion and number of claims increased in clinics and decreased in hospitals and in general and tertiary hospitals. Medical costs increased overall, and increased more in hospitals, general hospitals, and tertiary hospitals than in clinics. Drug costs decreased overall and significantly decreased in general and tertiary hospitals but only somewhat in clinics and hospitals.

Studies have reported that cost sharing reduces the needs of various healthcare services and the burden of health insurance.²⁴ The increase in the proportion of claims in clinics showed similar results to those of previous studies. However, some studies have reported no statistically significant results or only short-term effects.

Despite the increase in the proportion and number of claims in clinics, the medical costs increased less and the drug costs decreased less than in other medical institutions, which might have been caused by reductions in unnecessary prescription drug treatment and in the treatment intensity, although the decision-making process for treatment

intensity needs to be examined more carefully.²⁵ However, there could have been such influences as adverse events affecting clinical outcomes due to the reduced use of general or tertiary hospitals by patients with mild diseases.²⁶

The decline in the proportion and number of claims in tertiary hospitals may have been affected by the policy of increases in outpatient self-paid medical expenses that has been implemented only in advanced general hospitals since July 2009 as part of the reorganization of the function of medical institutions. In connection with drug costs, there is a consensus in South Korea that drug costs are rapidly rising. It is reported that one cause might be the fact that there are more prescription drug items in generic and tertiary hospitals than in clinics and hospitals. Accordingly, the total price of health insurance medical products has been uniformly lowered by an average of 14% since 2012. Due to this, there is a possibility that the decreased price difference between original and generic drugs has affected drug costs. We thus examined the effects of the 2011 policy on healthcare utilization by income level. Low-income-level subgroups are known to be more sensitive to cost changes than other income level subgroups when using medical care. However, the income level subgroup analysis in this study did not show any differences by income level, which is consistent with the results of previous studies.^{27, 28}

The present study had certain limitations due to limited data and methodology issues. Regardless of the changes in the coinsurance rate under the policy, individuals can use general or tertiary hospitals through personal insurance they joined or by individual preference, but it was difficult to take this into consideration in this analysis.

Mild diseases can be affected by socio-economic and demographic characteristics, as well as personal health status, and there may be chronic and acute diseases associated with mild diseases. We did not assess the severity of diseases, as the relevant information was not available in the present study. However, we considered severity for a more detailed study.

In the analysis of medical costs, private insurance or non-covered medical expenses were excluded due to the characteristics of data, and analysis was conducted only for services that are subject to health insurance and medical benefits. Thus, our results require careful interpretation.

Moreover, research on the clinical outcomes and quality of healthcare as well as the healthcare utilization that might have changed the factors in the selection of medical institutions is needed, but these factors could not be included in this analysis due to limitations of the data. However, we used data from a nationally representative large sample that reflects the overall medical information of South Koreans. Such data are especially helpful in establishing evidence-based health policies. Although some studies have analyzed the coinsurance rate of prescription drug costs, we are able to provide more relevant information about the effects of the policy by comparing groups with similar diseases.

VII. Conclusion

The policy of increasing the coinsurance rate on prescription drug costs increased the proportion of utilization in clinics and decreased that in other organization. Medical costs increased overall and increased significantly at other medical institutions besides clinics. Drug costs declined overall and decreased greatly in other medical institutions besides clinics and hospitals. No differences according to income level were found.

This result indicates that the price policy intended to change healthcare service utilization behaviors had limited effects in rebuilding the healthcare system or changing the functions of medical care organizations. It is important to manage the healthcare utilization of mild diseases, but the quality of medical service is also important. More studies that focus on associations between mild diseases and medical outcomes will be needed to establish evidence for deciding policy.

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Appendix

Table A1. Results of the segmented regression analysis for the proportion of clinics

Variables	Estimate	95% Confidence limits	p-vale
Intercept β	90.4230	90.4193	90.4266 <.0001
Baseline trend	-0.1135	-0.1135	-0.1134 <.0001
Level change	-2.2072	-2.2094	-2.2051 <.0001
Trend change	-0.1062	-0.1064	-0.1060 <.0001
Difference between case and control	-0.5607	-0.5643	-0.5570 <.0001
Baseline trend of difference between case and control	0.0939	0.0938	0.0940 <.0001
Level change of difference between case and control	2.3289	2.3264	2.3315 <.0001
Trend change of difference between case and control	0.0471	0.0469	0.0473 <.0001
Age			
20~29	-0.0199	-0.0216	-0.0182 <.0001
30~39	-0.0060	-0.0076	-0.0045 <.0001
40~49	-0.0034	-0.0048	-0.0019 <.0001
50~59	-0.0013	-0.0028	0.0001 0.0618
60~64	ref.		
Sex			
Male	-0.0060	-0.0069	-0.0052 <.0001
Female	ref.		
Income level			
Low (0~20%)	ref.		
Middle (21~80%)	-0.0032	-0.0042	-0.0022 <.0001
High (81~100%)	-0.0059	-0.0071	-0.0047 <.0001
Region			
Urban	0.0027	0.0018	0.0037 <.0001
Rural	ref.		
Disability			
Yes	-0.0038	-0.0058	-0.0018 0.0002
No	ref.		
Charlson comorbidity index			
0	ref.		
1	0.0078	0.0065	0.0092 <.0001
2	0.0081	0.0067	0.0095 <.0001
3 \leq	0.0119	0.0105	0.0132 <.0001
Season			
Spring	0.2023	0.2011	0.2034 <.0001
Summer	-0.4901	-0.4912	-0.4889 <.0001
Fall	0.6808	0.6796	0.6819 <.0001
Winter	ref.		

Table A2. Results of the segmented regression analysis for the proportion of clinics
(unadjusted results)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	90.4190	90.4159 90.4222	<.0001
Baseline trend	-0.1135	-0.1135 -0.1134	<.0001
Level change	-2.2072	-2.2093 -2.2050	<.0001
Trend change	-0.1062	-0.1064 -0.1060	<.0001
Difference between case and control	-0.5580	-0.5617 -0.5544	<.0001
Baseline trend of difference between case and control	0.0939	0.0938 0.0940	<.0001
Level change of difference between case and control	2.3290	2.3264 2.3315	<.0001
Trend change of difference between case and control	0.0471	0.0469 0.0473	<.0001
Season			
Spring	0.2024	0.2012 0.2035	<.0001
Summer	-0.4899	-0.4911 -0.4888	<.0001
Fall	0.6806	0.6795 0.6818	<.0001
Winter	ref.		

Table A3. Results of the segmented regression analysis for the proportion of clinics
(using aggregation data)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	89.1941	87.8942 90.4940	<.0001
Baseline trend	-0.0902	-0.1154 -0.0651	<.0001
Level change	-1.8207	-2.7241 -0.9173	<.0001
Trend change	-0.1675	-0.2516 -0.0833	<.0001
Difference between case and control	0.0092	-1.7359 1.7543	0.9917
Baseline trend of difference between case and control	0.0810	0.0455 0.1166	<.0001
Level change of difference between case and control	2.0911	0.8185 3.3638	0.0013
Trend change of difference between case and control	0.0827	-0.0359 0.2013	0.1717
Season			
Spring	0.2330	-0.3886 0.8546	0.4625
Summer	-0.1283	-0.7452 0.4885	0.6834
Fall	0.9554	0.3237 1.5871	0.0030
Winter	ref.		

Table A4. Results of the segmented regression analysis for the proportion of hospitals

Variables	Estimate	95% Confidence limits	p-vale
Intercept β	3.9958	3.9938	.9978 <.0001
Baseline trend	0.0660	0.0660	0.0660 <.0001
Level change	1.5648	1.5636	1.5659 <.0001
Trend change	0.0610	0.0609	0.0611 <.0001
Difference between case and control	-0.8708	-0.8727	-0.8688 <.0001
Baseline trend of difference between case and control	-0.0319	-0.0319	-0.0319 <.0001
Level change of difference between case and control	-0.9732	-0.9745	-0.9718 <.0001
Trend change of difference between case and control	-0.0414	-0.0415	-0.0412 <.0001
Age			
20~29	0.0126	0.0116	0.0135 <.0001
30~39	0.0060	0.0052	0.0068 <.0001
40~49	0.0032	0.0024	0.0039 <.0001
50~59	0.0006	-0.0001	0.0014 0.0991
60~64	ref.		
Sex			
Male	0.0017	0.0012	0.0021 <.0001
Female	ref.		
Income level			
Low (0~20%)	ref.		
Middle (21~80%)	0.0021	0.0015	0.0026 <.0001
High (81~100%)	0.0031	0.0025	0.0038 <.0001
Region			
Urban	-0.0014	-0.0019	-0.0009 <.0001
Rural	ref.		
Disability			
Yes	0.0022	0.0012	0.0033 <.0001
No	ref.		
Charlson comorbidity index			
0	ref.		
1	-0.0049	-0.0056	-0.0041 <.0001
2	-0.0056	-0.0064	-0.0049 <.0001
3 ≤	-0.0082	-0.0090	-0.0075 <.0001
Season			
Spring	-0.1551	-0.1557	-0.1545 <.0001
Summer	0.1074	0.1067	0.1080 <.0001
Fall	-0.4460	-0.4466	-0.4453 <.0001
Winter	ref.		

Table A5. Results of the segmented regression analysis for the proportion of hospitals
(unadjusted results)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	3.9978	3.9961	3.9995
Baseline trend	0.0660	0.0660	0.0660
Level change	1.5647	1.5635	1.5659
Trend change	0.0611	0.0609	0.0612
Difference between case and control	-0.8725	-0.8744	-0.8705
Baseline trend of difference between case and control	-0.0319	-0.0319	-0.0319
Level change of difference between case and control	-0.9732	-0.9746	-0.9718
Trend change of difference between case and control	-0.0414	-0.0415	-0.0413
Season			
Spring	-0.1551	-0.1557	-0.1545
Summer	0.1073	0.1066	0.1079
Fall	-0.4458	-0.4465	-0.4452
Winter	ref.		

Table A6. Results of the segmented regression analysis for the proportion of hospitals
(using aggregation data)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	4.6046	3.9229	5.2864
Baseline trend	0.0538	0.0406	0.0670
Level change	1.3552	0.8814	1.8291
Trend change	0.0937	0.0496	0.1378
Difference between case and control	-1.1907	-2.1059	-0.2754
Baseline trend of difference between case and control	-0.0248	-0.0434	-0.0062
Level change of difference between case and control	-0.8511	-1.5186	-0.1837
Trend change of difference between case and control	-0.0603	-0.1225	0.0019
Season			
Spring	-0.1286	-0.4546	0.1974
Summer	0.0019	-0.3216	0.3254
Fall	-0.5822	-0.9135	-0.2509
Winter	ref.		

Table A7. Results of the segmented regression analysis for the proportion of general hospitals

Variables	Estimate	95% Confidence limits	p-vale
Intercept β	2.0623	2.0616 2.0630	<.0001
Baseline trend	0.0145	0.0145 0.0145	<.0001
Level change	0.2292	0.2288 0.2297	<.0001
Trend change	0.0170	0.0170 0.0171	<.0001
Difference between case and control	0.4551	0.4544 0.4558	<.0001
Baseline trend of difference between case and control	-0.0147	-0.0147 -0.0147	<.0001
Level change of difference between case and control	-0.4164	-0.4169 -0.4159	<.0001
Trend change of difference between case and control	-0.0028	-0.0029 -0.0028	<.0001
Age			
20~29	0.0037	0.0034 0.0040	<.0001
30~39	0.0010	0.0007 0.0013	<.0001
40~49	0.0007	0.0004 0.0010	<.0001
50~59	0.0005	0.0002 0.0008	0.0008
60~64	ref.		
Sex			
Male	0.0015	0.0013 0.0016	<.0001
Female	ref.		
Income level			
Low (0~20%)	ref.		
Middle (21~80%)	0.0004	0.0002 0.0006	<.0001
High (81~100%)	0.0010	0.0008 0.0012	<.0001
Region			
Urban	-0.0004	-0.0006 -0.0002	<.0001
Rural	ref.		
Disability			
Yes	0.0005	0.0001 0.0009	0.0082
No	ref.		
Charlson comorbidity index			
0	ref.		
1	-0.0012	-0.0014 -0.0009	<.0001
2	-0.0011	-0.0014 -0.0008	<.0001
3 ≤	-0.0016	-0.0019 -0.0013	<.0001
Season			
Spring	-0.0626	-0.0628 -0.0623	<.0001
Summer	0.0805	0.0802 0.0807	<.0001
Fall	-0.1118	-0.1120 -0.1116	<.0001
Winter	ref.		

Table A8. Results of the segmented regression analysis for the proportion of general hospitals (unadjusted results)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	2.0636	2.0630	2.0642 <.0001
Baseline trend	0.0146	0.0145	0.0146 <.0001
Level change	0.2300	0.2295	0.2304 <.0001
Trend change	0.0168	0.0168	0.0169 <.0001
Difference between case and control	0.4562	0.4555	0.4569 <.0001
Baseline trend of difference between case and control	-0.0147	-0.0147	-0.0147 <.0001
Level change of difference between case and control	-0.4173	-0.4178	-0.4168 <.0001
Trend change of difference between case and control	-0.0026	-0.0027	-0.0026 <.0001
Season			
Spring	-0.0646	-0.0648	-0.0644 <.0001
Summer	0.0780	0.0777	0.0782 <.0001
Fall	-0.1134	-0.1137	-0.1132 <.0001
Winter	ref.		

Table A9. Results of the segmented regression analysis for the proportion of general hospital (using aggregation data)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	2.2687	2.0179	2.5194 <.0001
Baseline trend	0.0107	0.0058	0.0155 <.0001
Level change	0.1690	-0.0052	0.3433 0.0573
Trend change	0.0270	0.0107	0.0432 0.0011
Difference between case and control	0.3737	0.0371	0.7102 0.0296
Baseline trend of difference between case and control	-0.0128	-0.0196	-0.0059 0.0003
Level change of difference between case and control	-0.3790	-0.6244	-0.1335 0.0025
Trend change of difference between case and control	-0.0081	-0.0310	0.0147 0.4859
Season			
Spring	-0.0668	-0.1867	0.0531 0.2746
Summer	-0.0038	-0.1228	0.1151 0.9497
Fall	-0.1487	-0.2705	-0.0269 0.0167
Winter	ref.		

Table A10. Results of the segmented regression analysis for the proportion of tertiary hospitals

Variables	Estimate	95% Confidence limits	p-vale
Intercept β	3.5189	3.5177	3.5202 <.0001
Baseline trend	0.0330	0.0329	0.0330 <.0001
Level change	0.4132	0.4125	0.4140 <.0001
Trend change	0.0281	0.0280	0.0282 <.0001
Difference between case and control	0.9763	0.9751	0.9776 <.0001
Baseline trend of difference between case and control	-0.0473	-0.0474	-0.0473 <.0001
Level change of difference between case and control	-0.9394	-0.9402	-0.9385 <.0001
Trend change of difference between case and control	-0.0029	-0.0030	-0.0028 <.0001
Age			
20~29	0.0037	0.0031	0.0042 <.0001
30~39	-0.0010	-0.0015	-0.0004 0.0003
40~49	-0.0005	-0.0010	0.0000 0.0531
50~59	0.0002	-0.0003	0.0007 0.3597
60~64	ref.		
Sex			
Male	0.0029	0.0026	0.0032 <.0001
Female	ref.		
Income level			
Low (0~20%)	ref.		
Middle (21~80%)	0.0007	0.0004	0.0011 <.0001
High (81~100%)	0.0018	0.0014	0.0022 <.0001
Region			
Urban	-0.0009	-0.0013	-0.0006 <.0001
Rural	ref.		
Disability			
Yes	0.0010	0.0003	0.0017 0.0041
No	ref.		
Charlson comorbidity index			
0	ref.		
1	-0.0018	-0.0023	-0.0014 <.0001
2	-0.0014	-0.0019	-0.0009 <.0001
3 ≤	-0.0020	-0.0025	-0.0016 <.0001
Season			
Spring	0.0153	0.0149	0.0157 <.0001
Summer	0.3022	0.3018	0.3026 <.0001
Fall	-0.1230	-0.1234	-0.1226 <.0001
Winter	ref.		

Table A11. Results of the segmented regression analysis for the proportion of tertiary hospitals (unadjusted results)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	3.5193	3.5182	3.5204 <.0001
Baseline trend	0.0331	0.0331	0.0331 <.0001
Level change	0.4156	0.4149	0.4163 <.0001
Trend change	0.0277	0.0276	0.0278 <.0001
Difference between case and control	0.9790	0.9778	0.9802 <.0001
Baseline trend of difference between case and control	-0.0475	-0.0475	-0.0474 <.0001
Level change of difference between case and control	-0.9419	-0.9428	-0.9410 <.0001
Trend change of difference between case and control	-0.0025	-0.0026	-0.0024 <.0001
Season			
Spring	0.0107	0.0103	0.0111 <.0001
Summer	0.2993	0.2989	0.2997 <.0001
Fall	-0.1263	-0.1267	-0.1259 <.0001
Winter	ref.		

Table A12. Results of the segmented regression analysis for the proportion of tertiary hospitals (using aggregation data)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	3.9327	3.4999	4.3654 <.0001
Baseline trend	0.0257	0.0174	0.0341 <.0001
Level change	0.2964	-0.0043	0.5972 0.0534
Trend change	0.0468	0.0188	0.0748 0.0011
Difference between case and control	0.8078	0.2268	1.3888 0.0064
Baseline trend of difference between case and control	-0.0434	-0.0553	-0.0316 <.0001
Level change of difference between case and control	-0.8610	-1.2847	-0.4373 <.0001
Trend change of difference between case and control	-0.0143	-0.0537	0.0252 0.4786
Season			
Spring	-0.0376	-0.2446	0.1693 0.7216
Summer	0.1303	-0.0750	0.3357 0.2136
Fall	-0.2244	-0.4347	-0.0141 0.0365
Winter	ref.		

Table A13. Results of the segmented regression analysis for the number of claims of clinics

Variables	Estimate	95% Confidence limits	p-vale
Intercept β	78809.45	78756.4	.78862.49 <.0001
Baseline trend	342.2353	341.3359	343.1347 <.0001
Level change	-1008.95	-1040.52	-977.378 <.0001
Trend change	-191.398	-194.259	-188.536 <.0001
Difference between case and control	101108.4	101055.5	101161.3 <.0001
Baseline trend of difference between case and control	971.2163	970.1524	972.2802 <.0001
Level change of difference between case and control	6255.515	6218.337	6292.693 <.0001
Trend change of difference between case and control	-1413.65	-1417.04	-1410.26 <.0001
Age			
20~29	210.4794	186.0791	234.8796 <.0001
30~39	341.8174	319.3016	364.3332 <.0001
40~49	137.3491	116.255	158.4432 <.0001
50~59	28.8791	8.3481	49.4101 0.0058
60~64	ref.		
Sex			
Male	-164.998	-177.227	-152.768 <.0001
Female	ref.		
Income level			
Low (0~20%)	ref.		
Middle (21~80%)	-11.4189	-26.4176	3.5797 0.1357
High (81~100%)	-24.7376	-41.9633	-7.5119 0.0049
Region			
Urban	54.065	40.0259	68.1042 <.0001
Rural	ref.		
Disability			
Yes	-13.5026	-42.6399	15.6346 0.3637
No	ref.		
Charlson comorbidity index			
0	ref.		
1	-12.8307	-32.8286	7.1672 0.2086
2	-79.1877	-99.6437	-58.7316 <.0001
3 ≤	-115.995	-135.909	-96.0817 <.0001
Season			
Spring	-3349.02	-3365.7	-3332.34 <.0001
Summer	-24421.1	-24437.9	-24404.4 <.0001
Fall	-1921.4	-1938.24	-1904.57 <.0001
Winter	ref.		

Table A14. Results of the segmented regression analysis for the number of claims of clinics
(unadjusted results)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	78839.9	78794.04	.78885.75 <.0001
Baseline trend	341.7941	340.8949	342.6934 <.0001
Level change	-1010.58	-1042.15	-979.007 <.0001
Trend change	-191.024	-193.885	-188.162 <.0001
Difference between case and control	101104.8	101052.4	101157.3 <.0001
Baseline trend of difference between case and control	971.5645	970.5006	972.6284 <.0001
Level change of difference between case and control	6256.667	6219.487	6293.847 <.0001
Trend change of difference between case and control	-1414.09	-1417.48	-1410.7 <.0001
Season			
Spring	-3349.1	-3365.78	-3332.42 <.0001
Summer	-24423.9	-24440.7	-24407.1 <.0001
Fall	-1915.95	-1932.79	-1899.12 <.0001
Winter	ref.		

Table A15. Results of the segmented regression analysis for the number of claims of clinics (using aggregation data)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	70855.37	56677.51	85033.23 <.0001
Baseline trend	413.1965	138.7343	687.6587 0.0032
Level change	93.9488	-9759.67	9947.57 0.9851
Trend change	-370.735	-1288.66	547.1878 0.4286
Difference between case and control	96483.06	77449.75	115516.4 <.0001
Baseline trend of difference between case and control	1055.908	668.3412	1443.474 <.0001
Level change of difference between case and control	7138.075	-6742.4	21018.55 0.3135
Trend change of difference between case and control	-1584.51	-2877.81	-291.218 0.0163
Season			
Spring	-1157.96	-7937.9	5621.981 0.7378
Summer	-14039.2	-20766.9	-7311.58 <.0001
Fall	2304.298	-4585.54	9194.132 0.5121
Winter	ref.		

Table A16. Results of the segmented regression analysis for the number of claims of hospitals

Variables	Estimate	95% Confidence limits	p-vale
Intercept β	2458.393	2454.432	.2462.355 <.0001
Baseline trend	114.285	114.2178	114.3522 <.0001
Level change	2009.838	2007.48	2012.195 <.0001
Trend change	67.9856	67.7719	68.1993 <.0001
Difference between case and control	2495.514	2491.562	2499.465 <.0001
Baseline trend of difference between case and control	52.0325	51.9531	52.112 <.0001
Level change of difference between case and control	134.8794	132.1029	137.6559 <.0001
Trend change of difference between case and control	-99.8981	-100.151	-99.6451 <.0001
Age			
20~29	25.6922	23.87	27.5145 <.0001
30~39	19.4394	17.7579	21.1209 <.0001
40~49	9.5169	7.9415	11.0922 <.0001
50~59	1.9831	0.4498	3.5164 0.0112
60~64	ref.		
Sex			
Male	-5.2167	-6.13	-4.3034 <.0001
Female	ref.		
Income level			
Low (0~20%)	ref.		
Middle (21~80%)	2.8548	1.7346	3.9749 <.0001
High (81~100%)	2.6641	1.3776	3.9505 <.0001
Region			
Urban	-1.3345	-2.383	-0.2861 0.0126
Rural	ref.		
Disability			
Yes	2.3039	0.1278	4.4799 0.038
No	ref.		
Charlson comorbidity index			
0	ref.		
1	-10.1364	-11.6298	-8.6429 <.0001
2	-14.7712	-16.2989	-13.2435 <.0001
3 ≤	-20.6126	-22.0998	-19.1254 <.0001
Season			
Spring	-527.401	-528.646	-526.155 <.0001
Summer	-1065.63	-1066.88	-1064.38 <.0001
Fall	-1060.53	-1061.78	-1059.27 <.0001
Winter	ref.		

Table A17. Results of the segmented regression analysis for the number of claims of hospitals (unadjusted results)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	2458.16	2454.736	2461.585
Baseline trend	114.2546	114.1875	114.3218
Level change	2009.709	2007.351	2012.067
Trend change	68.0188	67.8051	68.2326
Difference between case and control	2492.123	2488.206	2496.041
Baseline trend of difference between case and control	52.0546	51.9751	52.134
Level change of difference between case and control	134.9164	132.1397	137.6931
Trend change of difference between case and control	-99.9261	-100.179	-99.6731
Season			
Spring	-527.469	-528.714	-526.223
Summer	-1065.87	-1067.13	-1064.62
Fall	-1060.14	-1061.4	-1058.88
Winter	ref.		

Table A18. Results of the segmented regression analysis for the number of claims of hospitals (using aggregation data)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	2521.184	1487.683	3554.684
Baseline trend	107.2887	87.2817	127.2957
Level change	1849.334	1131.051	2567.618
Trend change	88.5915	21.6791	155.5038
Difference between case and control	2401.21	1013.77	3788.651
Baseline trend of difference between case and control	53.4009	25.1491	81.6528
Level change of difference between case and control	178.4922	-833.33	1190.315
Trend change of difference between case and control	-104.602	-198.877	-10.3265
Season			
Spring	-300.039	-794.265	194.1874
Summer	-617.105	-1107.52	-126.69
Fall	-829.405	-1331.64	-327.168
Winter	ref.		

Table A19. Results of the segmented regression analysis for the number of claims of general hospitals

Variables	Estimate	95% Confidence limits	p-vale
Intercept β	1501.317	1500.148 1502.486	<.0001
Baseline trend	31.99	31.9702 32.0099	<.0001
Level change	367.7909	367.0952 368.4867	<.0001
Trend change	15.8317	15.7686 15.8947	<.0001
Difference between case and control	3422.495	3421.329 3423.662	<.0001
Baseline trend of difference between case and control	6.5975	6.5741 6.621	<.0001
Level change of difference between case and control	-680.519	-681.339 -679.7	<.0001
Trend change of difference between case and control	-21.7104	-21.7851 -21.6357	<.0001
Age			
20~29	8.6109	8.0732 9.1487	<.0001
30~39	7.6635	7.1673 8.1597	<.0001
40~49	3.7703	3.3054 4.2352	<.0001
50~59	1.3344	0.8819 1.7868	<.0001
60~64	ref.		
Sex			
Male	-1.6793	-1.9488 -1.4098	<.0001
Female	ref.		
Income level			
Low (0~20%)	ref.		
Middle (21~80%)	0.3111	-0.0194 0.6417	0.0651
High (81~100%)	0.5953	0.2156 0.9749	0.0021
Region			
Urban	0.4407	0.1313 0.7501	0.0052
Rural	ref.		
Disability			
Yes	0.229	-0.4131 0.8712	0.4846
No	ref.		
Charlson comorbidity index			
0	ref.		
1	-2.277	-2.7177 -1.8363	<.0001
2	-3.6349	-4.0857 -3.1841	<.0001
3 ≤	-5.1031	-5.542 -4.6642	<.0001
Season			
Spring	-212.289	-212.657 -211.922	<.0001
Summer	-374.765	-375.134 -374.395	<.0001
Fall	-275.4	-275.771 -275.029	<.0001
Winter	ref.		

Table A20. Results of the segmented regression analysis for the number of claims of general hospitals (unadjusted results)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	1502.597	1501.586	1503.608
Baseline trend	31.9801	31.9603	31.9999
Level change	367.7486	367.0528	368.4444
Trend change	15.8418	15.7787	15.9049
Difference between case and control	3421.883	3420.727	3423.039
Baseline trend of difference between case and control	6.605	6.5816	6.6285
Level change of difference between case and control	-680.505	-681.325	-679.686
Trend change of difference between case and control	-21.7197	-21.7943	-21.645
Season			
Spring	-212.312	-212.679	-211.944
Summer	-374.848	-375.217	-374.478
Fall	-275.275	-275.646	-274.904
Winter	ref.		

Table A21. Results of the segmented regression analysis for the number of claims of general hospitals (using aggregation data)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	1495.471	1178.733	1812.208
Baseline trend	30.1924	24.0609	36.324
Level change	327.9969	107.8641	548.1297
Trend change	21.0395	0.5328	41.5462
Difference between case and control	3322.641	2897.432	3747.851
Baseline trend of difference between case and control	8.4282	-0.2302	17.0865
Level change of difference between case and control	-632.05	-942.144	-321.956
Trend change of difference between case and control	-26.7167	-55.6093	2.1759
Season			
Spring	-136.491	-287.957	14.9748
Summer	-238.563	-388.861	-88.2655
Fall	-177.982	-331.903	-24.0611
Winter	ref.		

Table A22. Results of the segmented regression analysis for the number of claims of tertiary hospitals

Variables	Estimate	95% Confidence limits	p-vale
Intercept β	2238.237	2236.694	2239.78
Baseline trend	65.3412	65.315	65.3673
Level change	708.6349	707.7164	709.5534
Trend change	25.8694	25.7862	25.9527
Difference between case and control	6777.033	6775.494	6778.572
Baseline trend of difference between case and control	-39.9102	-39.9412	-39.8793
Level change of difference between case and control	-1869	-1870.08	-1867.91
Trend change of difference between case and control	-32.7853	-32.8838	-32.6867
Age			
20~29	7.4898	6.7799	8.1997
30~39	5.7782	5.1231	6.4333
40~49	2.8642	2.2505	3.4779
50~59	1.2388	0.6415	1.8362
60~64	ref.		
Sex			
Male	-1.1842	-1.5401	-0.8284
Female	ref.		
Income level			
Low (0~20%)	ref.		
Middle (21~80%)	0.0976	-0.3388	0.534
High (81~100%)	0.6808	0.1797	1.182
Region			
Urban	0.1211	-0.2873	0.5296
Rural	ref.		
Disability			
Yes	0.935	0.0873	1.7827
No	ref.		
Charlson comorbidity index			
0	ref.		
1	-2.1892	-2.7711	-1.6074
2	-3.2015	-3.7967	-2.6063
3 ≤	-4.3477	-4.927	-3.7683
Season			
Spring	-9.3301	-9.8154	-8.8448
Summer	-105.048	-105.536	-104.56
Fall	-217.131	-217.621	-216.642
Winter	ref.		

Table A23. Results of the segmented regression analysis for the number of claims of tertiary hospitals (unadjusted results)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	2239.091	2237.757	2240.425
Baseline trend	65.3337	65.3076	65.3599
Level change	708.6026	707.6841	709.5211
Trend change	25.8773	25.794	25.9606
Difference between case and control	6776.427	6774.901	6777.953
Baseline trend of difference between case and control	-39.9048	-39.9358	-39.8738
Level change of difference between case and control	-1868.99	-1870.07	-1867.91
Trend change of difference between case and control	-32.7922	-32.8907	-32.6936
Season			
Spring	-9.3485	-9.8338	-8.8632
Summer	-105.111	-105.599	-104.623
Fall	-217.033	-217.523	-216.543
Winter	ref.		

Table A24. Results of the segmented regression analysis for the number of claims of tertiary hospitals (using aggregation data)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	2364.378	1919.961	2808.795
Baseline trend	61.5214	52.9182	70.1247
Level change	619.1844	310.3144	928.0544
Trend change	36.9979	8.2248	65.771
Difference between case and control	6555.988	5959.373	7152.603
Baseline trend of difference between case and control	-35.3844	-47.533	-23.2358
Level change of difference between case and control	-1759.47	-2194.57	-1324.37
Trend change of difference between case and control	-45.8809	-86.4204	-5.3414
Season			
Spring	-5.5748	-218.098	206.9481
Summer	-23.0105	-233.894	187.8734
Fall	-152.731	-368.698	63.2368
Winter	ref.		

Table A25. Results of the segmented regression analysis for the medical cost of clinics

Variables	Estimate	95% Confidence limits	p-vale
Intercept β	17213.28	17209.25	17217.3 <.0001
Baseline trend	-29.5506	-29.6197	-29.4815 <.0001
Level change	-358.827	-361.2400	-356.415 <.0001
Trend change	99.4256	99.2033	99.648 <.0001
Difference between case and control	-2438.71	-2442.72	-2434.7 <.0001
Baseline trend of difference between case and control	2.9089	2.8280	2.9898 <.0001
Level change of difference between case and control	176.972	174.1568	179.7872 <.0001
Trend change of difference between case and control	-27.071	-27.3308	-26.8112 <.0001
Age			
20~29	14.2072	12.3831	16.0313 <.0001
30~39	2.4845	0.8086	4.1604 0.0037
40~49	1.0027	-0.5710	2.5764 0.2117
50~59	0.3924	-1.1428	1.9275 0.6164
60~64	ref.		
Sex			
Male	7.5943	6.6811	8.5075 <.0001
Female	ref.		
Income level			
Low (0~20%)	ref.		
Middle (21~80%)	1.8928	0.7768	3.0089 0.0009
High (81~100%)	3.7783	2.4952	5.0615 <.0001
Region			
Urban	-2.5986	-3.6359	-1.5614 <.0001
Rural	ref.		
Disability			
Yes	-4.6781	-6.8842	-2.4721 <.0001
No	ref.		
Charlson comorbidity index			
0	ref.		
1	-9.1202	-10.6012	-7.6393 <.0001
2	-9.7919	-11.3074	-8.2764 <.0001
3 ≤	-18.4110	-19.8889	-16.9332 <.0001
Season			
Spring	413.7247	412.4820	414.9674 <.0001
Summer	148.8799	147.6263	150.1335 <.0001
Fall	-314.696	-315.948	-313.443 <.0001
Winter	ref.		

Table A26. Results of the segmented regression analysis for the medical cost of clinics (unadjusted results)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	17210.56	17207.05	17214.06 <.0001
Baseline trend	-29.5631	-29.6322	-29.4939 <.0001
Level change	-358.873	-361.2860	-356.461 <.0001
Trend change	99.4429	99.2206	99.6652 <.0001
Difference between case and control	-2441.08	-2445.05	-2437.1 <.0001
Baseline trend of difference between case and control	2.9161	2.8352	2.997 <.0001
Level change of difference between case and control	176.9302	174.1149	179.7455 <.0001
Trend change of difference between case and control	-27.0750	-27.3348	-26.8152 <.0001
Season			
Spring	413.6383	412.3956	414.881 <.0001
Summer	148.7087	147.4552	149.9623 <.0001
Fall	-314.582	-315.835	-313.3290 <.0001
Winter	ref.		

Table A27. Results of the segmented regression analysis for the medical cost of clinics (using aggregation data)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	17210.56	17207.05	17214.06 <.0001
Baseline trend	-29.5631	-29.6322	-29.4939 <.0001
Level change	-358.873	-361.286	-356.461 <.0001
Trend change	99.4429	99.2206	99.6652 <.0001
Difference between case and control	-2441.08	-2445.05	-2437.1 <.0001
Baseline trend of difference between case and control	2.9161	2.8352	2.997 <.0001
Level change of difference between case and control	176.9302	174.1149	179.7455 <.0001
Trend change of difference between case and control	-27.075	-27.3348	-26.8152 <.0001
Season			
Spring	413.6383	412.3956	414.881 <.0001
Summer	148.7087	147.4552	149.9623 <.0001
Fall	-314.582	-315.835	-313.329 <.0001
Winter	ref.		

Table A28. Results of the segmented regression analysis for the medical cost of hospitals

Variables	Estimate	95% Confidence limits	p-vale
Intercept β	49371.32	49343.63	49399.0 <.0001
Baseline trend	-174.1	-174.525	-173.676 <.0001
Level change	-9741.98	-9757.43	-9726.54 <.0001
Trend change	-117.616	-118.881	-116.35 <.0001
Difference between case and control	-16742.6	-16770.6	-16714.6 <.0001
Baseline trend of difference between case and control	69.2286	68.6822	69.7749 <.0001
Level change of difference between case and control	5979.827	5960.233	5999.42 <.0001
Trend change of difference between case and control	69.6561	68.0176	71.2946 <.0001
Age			
20~29	-24.7338	-38.8232	-10.6444 0.0006
30~39	-8.2195	-22.0115	5.5725 0.2428
40~49	-18.5297	-31.5661	-5.4934 0.0053
50~59	-22.2047	-34.9618	-9.4475 0.0006
60~64	ref.		
Sex			
Male	0.4882	-6.6377	7.6140 0.8932
Female	ref.		
Income level			
Low (0~20%)	ref.		
Middle (21~80%)	-6.5916	-14.8791	1.6960 0.1190
High (81~100%)	-12.3313	-22.3022	-2.3604 0.0154
Region			
Urban	3.9278	-4.7242	12.5798 0.3736
Rural	ref.		
Disability			
Yes	-39.2402	-55.4661	-23.0143 <.0001
No	ref.		
Charlson comorbidity index			
0	ref.		
1	2.8575	-8.1467	13.8618 0.6108
2	8.7759	-2.6088	20.1606 0.1308
3 ≤	3.6892	-7.5848	14.9632 0.5213
Season			
Spring	965.3125	955.8617	974.7634 <.0001
Summer	1489.997	1480.6660	1499.3280 <.0001
Fall	1583.945	1574.2870	1593.6030 <.0001
Winter	ref.		

Table A29. Results of the segmented regression analysis for the medical cost of hospitals (unadjusted results)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	49351.68	49329.12	.49374.24 <.0001
Baseline trend	-174.131	-174.555	-173.708 <.0001
Level change	-9742.04	-9757.48	-9726.59 <.0001
Trend change	-117.59	-118.855	-116.324 <.0001
Difference between case and control	-16741.7	-16769.3	-16714.1 <.0001
Baseline trend of difference between case and control	69.2606	68.7151	69.8062 <.0001
Level change of difference between case and control	5979.842	5960.248	5999.435 <.0001
Trend change of difference between case and control	69.6309	67.9926	71.2692 <.0001
Season			
Spring	965.3512	955.901	974.8014 <.0001
Summer	1489.967	1480.637	1499.297 <.0001
Fall	1583.973	1574.315	1593.632 <.0001
Winter	ref.		

Table A30. Results of the segmented regression analysis for the medical cost of hospitals (using aggregation data)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	49351.68	49329.12	.49374.24 <.0001
Baseline trend	-174.131	-174.555	-173.708 <.0001
Level change	-9742.04	-9757.48	-9726.59 <.0001
Trend change	-117.59	-118.855	-116.324 <.0001
Difference between case and control	-16741.7	-16769.3	-16714.1 <.0001
Baseline trend of difference between case and control	69.2606	68.7151	69.8062 <.0001
Level change of difference between case and control	5979.842	5960.248	5999.435 <.0001
Trend change of difference between case and control	69.6309	67.9926	71.2692 <.0001
Season			
Spring	965.3512	955.901	974.8014 <.0001
Summer	1489.967	1480.637	1499.297 <.0001
Fall	1583.973	1574.315	1593.632 <.0001
Winter	ref.		

Table A31. Results of the segmented regression analysis for the medical cost of general hospitals

Variables	Estimate	95% Confidence limits	p-vale
Intercept β	53834.54	53798.47	53870.6
Baseline trend	-149.942	-150.525	-149.359
Level change	-8598.78	-8619.62	-8577.94
Trend change	11.5546	9.7742	13.335
Difference between case and control	-17762.6	-17798.5	-17726.7
Baseline trend of difference between case and control	68.0585	67.3432	68.7738
Level change of difference between case and control	6740.79	6715.503	6766.089
Trend change of difference between case and control	-31.7044	-33.9152	-29.4936
Age			
20~29	4.5652	-12.7765	21.9068
30~39	-16.6953	-32.5082	-0.8823
40~49	-17.5854	-32.1026	-3.0682
50~59	-8.7344	-22.6301	5.1614
60~64	ref.		
Sex			
Male	5.8821	-2.6231	14.3873
Female	ref.		
Income level			
Low (0~20%)	ref.		
Middle (21~80%)	-12.9553	-23.6260	-2.2847
High (81~100%)	-4.6511	-17.0350	7.7327
Region			
Urban	6.6489	-3.6765	16.9744
Rural	ref.		
Disability			
Yes	-31.3849	-49.3150	-13.4548
No	ref.		
Charlson comorbidity index			
0	ref.		
1	1.1172	-14.5846	16.8191
2	-8.7653	-24.6459	7.1153
3 \leq	-1.3575	-16.6494	13.9344
Season			
Spring	626.0986	614.2245	637.9727
Summer	959.4175	947.6977	971.1374
Fall	814.0528	802.0278	826.0777
Winter	ref.		

Table A32. Results of the segmented regression analysis for the medical cost of general hospitals (unadjusted results)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	53815.94	53785.73	53846.15 <.0001
Baseline trend	-149.93	-150.513	-149.348 <.0001
Level change	-8599.4	-8620.23	-8578.56 <.0001
Trend change	11.5729	9.7926	13.3532 <.0001
Difference between case and control	-17759.5	-17795.0	-17724.0 <.0001
Baseline trend of difference between case and control	68.0333	67.3186	68.7481 <.0001
Level change of difference between case and control	6741.057	6715.766	6766.348 <.0001
Trend change of difference between case and control	-31.7062	-33.917	-29.4955 <.0001
Season			
Spring	626.1285	614.2552	638.0017 <.0001
Summer	959.3705	947.6517	971.0893 <.0001
Fall	814.0529	802.0282	826.0775 <.0001
Winter	ref.		

Table A33. Results of the segmented regression analysis for the medical cost of general hospitals (using aggregation data)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	53815.94	53785.73	53846.15 <.0001
Baseline trend	-149.93	-150.513	-149.348 <.0001
Level change	-8599.4	-8620.23	-8578.56 <.0001
Trend change	11.5729	9.7926	13.3532 <.0001
Difference between case and control	-17759.5	-17795.0	-17724.0 <.0001
Baseline trend of difference between case and control	68.0333	67.3186	68.7481 <.0001
Level change of difference between case and control	6741.057	6715.766	6766.348 <.0001
Trend change of difference between case and control	-31.7062	-33.917	-29.4955 <.0001
Season			
Spring	626.1285	614.2552	638.0017 <.0001
Summer	959.3705	947.6517	971.0893 <.0001
Fall	814.0529	802.0282	826.0775 <.0001
Winter	ref.		

Table A34. Results of the segmented regression analysis for the medical cost of tertiary hospitals

Variables	Estimate	95% Confidence limits	p-vale
Intercept β	69651.28	69617.25	69685.3 <.0001
Baseline trend	-299.068	-299.603	-298.533 <.0001
Level change	-7294.31	-7313.43	-7275.19 <.0001
Trend change	92.677	91.0554	94.2986 <.0001
Difference between case and control	-20914.7	-20949.2	-20880.3 <.0001
Baseline trend of difference between case and control	191.1826	190.4972	191.868 <.0001
Level change of difference between case and control	4918.994	4894.7600	4943.228 <.0001
Trend change of difference between case and control	-192.372	-194.5120	-190.232 <.0001
Age			
20~29	13.7800	-3.4183	30.9784 0.1163
30~39	-6.8396	-22.2352	8.5560 0.3839
40~49	-32.2083	-45.7660	-18.6506 <.0001
50~59	0.7715	-11.8488	13.3918 0.9046
60~64		ref.	
Sex			
Male	14.7730	6.4293	23.1168 0.0005
Female		ref.	
Income level			
Low (0~20%)		ref.	
Middle (21~80%)	0.8944	-10.4683	12.2571 0.8774
High (81~100%)	-0.4254	-12.5560	11.7052 0.9452
Region			
Urban	-0.8331	-11.3125	9.6463 0.8762
Rural		ref.	
Disability			
Yes	-22.1140	-39.4722	-4.7557 0.0125
No		ref.	
Charlson comorbidity index			
0		ref.	
1	2.1063	-14.0619	18.2745 0.7985
2	7.4344	-8.8000	23.6687 0.3694
3 ≤	17.6576	2.3426	32.9727 0.0238
Season			
Spring	388.8419	377.0936	400.5903 <.0001
Summer	396.0674	384.5183	407.6164 <.0001
Fall	1013.344	1001.4100	1025.2790 <.0001
Winter		ref.	

Table A35. Results of the segmented regression analysis for the medical cost of tertiary hospitals (unadjusted results)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	69660.27	69632.3	69688.25 <.0001
Baseline trend	-299.055	-299.59	-298.52 <.0001
Level change	-7294.62	-7313.74	-7275.5 <.0001
Trend change	92.6518	91.0302	94.2734 <.0001
Difference between case and control	-20914.3	-20948.2	-20880.3 <.0001
Baseline trend of difference between case and control	191.1646	190.4793	191.8498 <.0001
Level change of difference between case and control	4919.251	4895.017	4943.485 <.0001
Trend change of difference between case and control	-192.359	-194.499	-190.219 <.0001
Season			
Spring	388.8706	377.1222	400.6189 <.0001
Summer	395.9042	384.3551	407.4534 <.0001
Fall	1013.265	1001.33	1025.2 <.0001
Winter	ref.		

Table A36. Results of the segmented regression analysis for the medical cost of tertiary hospitals (using aggregation data)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	69660.27	69632.3	69688.25 <.0001
Baseline trend	-299.055	-299.59	-298.52 <.0001
Level change	-7294.62	-7313.74	-7275.5 <.0001
Trend change	92.6518	91.0302	94.2734 <.0001
Difference between case and control	-20914.3	-20948.2	-20880.3 <.0001
Baseline trend of difference between case and control	191.1646	190.4793	191.8498 <.0001
Level change of difference between case and control	4919.251	4895.017	4943.485 <.0001
Trend change of difference between case and control	-192.359	-194.499	-190.219 <.0001
Season			
Spring	388.8706	377.1222	400.6189 <.0001
Summer	395.9042	384.3551	407.4534 <.0001
Fall	1013.265	1001.33	1025.2 <.0001
Winter	ref.		

Table A37. Results of the segmented regression analysis for the medical cost of all hospital

Variables	Estimate	95% Confidence limits	p-vale
Intercept β	10696.55	10692.14	10700.97
Baseline trend	17.1039	17.0291	17.1787
Level change	-208.316	-210.941	-205.691
Trend change	-79.3737	-79.6117	-79.1358
Difference between case and control	7590.272	7585.873	7594.672
Baseline trend of difference between case and control	-33.9791	-34.0676	-33.8906
Level change of difference between case and control	-1037.11	-1040.2	-1034.02
Trend change of difference between case and control	52.3511	52.0694	52.6328
Age			
20~29	-14.9266	-16.9553	-12.8978
30~39	-15.6197	-17.4918	-13.7476
40~49	-9.0795	-10.8334	-7.3256
50~59	-1.5719	-3.279	0.1351
60~64	ref.		
Sex			
Male	5.5054	4.4886	6.5222
Female	ref.		
Income level			
Low (0~20%)	ref.		
Middle (21~80%)	-0.9759	-2.223	0.2712
High (81~100%)	-0.2526	-1.6848	1.1796
Region			
Urban	-0.3436	-1.5108	0.8237
Rural	ref.		
Disability			
Yes	0.5283	-1.8943	2.9509
No	ref.		
Charlson comorbidity index			
0	ref.		
1	4.5851	2.9224	6.2479
2	10.2069	8.506	11.9077
3 ≤	12.2141	10.5584	13.8698
Season			
Spring	143.5308	142.1439	144.9176
Summer	1732.681	1731.286	1734.076
Fall	151.4176	150.0179	152.8173
Winter	ref.		

Table A38. Results of the segmented regression analysis for the medical cost of all hospitals (unadjusted results)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	10696.43	10692.62	10700.24
Baseline trend	17.1274	17.0526	17.2021
Level change	-208.223	-210.848	-205.598
Trend change	-79.3977	-79.6356	-79.1597
Difference between case and control	7591.906	7587.544	7596.267
Baseline trend of difference between case and control	-33.9969	-34.0853	-33.9084
Level change of difference between case and control	-1037.16	-1040.25	-1034.07
Trend change of difference between case and control	52.3735	52.0918	52.6551
Season			
Spring	143.5693	142.1825	144.9562
Summer	1732.849	1731.455	1734.244
Fall	151.1473	149.7477	152.547
Winter	ref.		

Table A39. Results of the segmented regression analysis for the medical cost of all hospitals (using aggregation data)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	10787.69	10002.83	11572.55
Baseline trend	18.9119	-2.466	40.2898
Level change	-272.738	-1533.63	988.1517
Trend change	-77.9963	-146.946	-9.047
Difference between case and control	6206.304	5200.111	7212.496
Baseline trend of difference between case and control	-2.1479	-32.3262	28.0303
Level change of difference between case and control	-1893.31	-3671.56	-115.053
Trend change of difference between case and control	44.5114	-52.8985	141.9212
Season			
Spring	73.2472	-505.745	652.2399
Summer	1248.414	673.1474	1823.68
Fall	12.4311	-575.634	600.4965
Winter	ref.		

Table A40. Results of the segmented regression analysis for the drug cost of clinics

Variables	Estimate	95% Confidence limits	p-vale
Intercept β	8666.639	8662.425	8670.853
Baseline trend	1.9955	1.9231	2.0679
Level change	-158.401	-160.926	-155.876
Trend change	-51.6538	-51.8865	-51.421
Difference between case and control	4844.298	4840.101	4848.495
Baseline trend of difference between case and control	6.9656	6.8809	7.0503
Level change of difference between case and control	-253.491	-256.438	-250.544
Trend change of difference between case and control	33.607	33.335	33.8789
Age			
20~29	-8.0508	-9.9603	-6.1413
30~39	-9.9740	-11.7284	-8.2196
40~49	-4.9487	-6.5961	-3.3013
50~59	-0.0970	-1.7041	1.5100
60~64	ref.		
Sex			
Male	4.1031	3.1471	5.0590
Female	ref.		
Income level			
Low (0~20%)	ref.		
Middle (21~80%)	-0.8635	-2.0318	0.3049
High (81~100%)	-0.5475	-1.8907	0.7957
Region			
Urban	-0.6516	-1.7375	0.4342
Rural	ref.		
Disability			
Yes	-1.0821	-3.3914	1.2273
No	ref.		
Charlson comorbidity index			
0	ref.		
1	3.5338	1.9835	5.0841
2	7.7936	6.2071	9.3801
3 ≤	8.4197	6.8726	9.9668
Season			
Spring	74.5374	73.2365	75.8383
Summer	1494.396	1493.084	1495.708
Fall	119.3378	118.0263	120.6494
Winter	ref.		

Table A41. Results of the segmented regression analysis for the drug cost of clinics (unadjusted results)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	8667.912	8664.245	8671.579 <.0001
Baseline trend	2.0115	1.9391	2.0838 <.0001
Level change	-158.34	-160.865	-155.815 <.0001
Trend change	-51.6694	-51.9021	-51.4366 <.0001
Difference between case and control	4844.899	4840.737	4849.062 <.0001
Baseline trend of difference between case and control	6.9547	6.87	7.0394 <.0001
Level change of difference between case and control	-253.521	-256.468	-250.573 <.0001
Trend change of difference between case and control	33.6211	33.3492	33.8931 <.0001
Season			
Spring	74.5383	73.2374	75.8392 <.0001
Summer	1494.497	1493.185	1495.809 <.0001
Fall	119.1476	117.8362	120.459 <.0001
Winter	ref.		

Table A42. Results of the segmented regression analysis for the drug cost of clinics (using aggregation data)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	8667.912	8664.245	8671.579 <.0001
Baseline trend	2.0115	1.9391	2.0838 <.0001
Level change	-158.34	-160.865	-155.815 <.0001
Trend change	-51.6694	-51.9021	-51.4366 <.0001
Difference between case and control	4844.899	4840.737	4849.062 <.0001
Baseline trend of difference between case and control	6.9547	6.87	7.0394 <.0001
Level change of difference between case and control	-253.521	-256.468	-250.573 <.0001
Trend change of difference between case and control	33.6211	33.3492	33.8931 <.0001
Season			
Spring	74.5383	73.2374	75.8392 <.0001
Summer	1494.497	1493.185	1495.809 <.0001
Fall	119.1476	117.8362	120.459 <.0001
Winter	ref.		

Table A43. Results of the segmented regression analysis for the drug cost of hospital

Variables	Estimate	95% Confidence limits	p-vale
Intercept β	19906.69	19880.23	19933.16
Baseline trend	-3.4697	-3.8754	-3.0641
Level change	-3084.74	-3099.51	-3069.97
Trend change	-173.532	-174.742	-172.323
Difference between case and control	12121.72	12094.99	12148.45
Baseline trend of difference between case and control	-62.9788	-63.5012	-62.4565
Level change of difference between case and control	-762.196	-780.927	-743.465
Trend change of difference between case and control	49.1579	47.5915	50.7243
Age			
20~29	-39.1934	-52.6626	-25.7242
30~39	-9.4043	-22.5892	3.7807
40~49	-16.0381	-28.5006	-3.5755
50~59	-14.4787	-26.6744	-2.2831
60~64	ref.		
Sex			
Male	0.7068	-6.1055	7.5190
Female	ref.		
Income level			
Low (0~20%)	ref.		
Middle (21~80%)	-4.2060	-12.1288	3.7168
High (81~100%)	-8.1246	-17.6566	1.4074
Region			
Urban	1.0152	-7.2560	9.2864
Rural	ref.		
Disability			
Yes	-20.9141	-36.4258	-5.4024
No	ref.		
Charlson comorbidity index			
0	ref.		
1	-4.8738	-15.3937	5.6461
2	-1.3620	-12.2455	9.5216
3 \leq	-13.4098	-24.1875	-2.6320
Season			
Spring	206.6982	197.6633	215.7331
Summer	1393.835	1384.915	1402.756
Fall	1007.154	997.9211	1016.387
Winter	ref.		

Table A44. Results of the segmented regression analysis for the drug cost of hospital (unadjusted results)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	19878.32	19856.76	19899.89 <.0001
Baseline trend	-3.5237	-3.9284 -3.119	<.0001
Level change	-3084.56	-3099.32 -3069.79	<.0001
Trend change	-173.483	-174.693 -172.273	<.0001
Difference between case and control	12122.93	12096.54 12149.31	<.0001
Baseline trend of difference between case and control	-62.9336	-63.4551 -62.412	<.0001
Level change of difference between case and control	-762.294	-781.025 -743.563	<.0001
Trend change of difference between case and control	49.12	47.5537 50.6862	<.0001
Season			
Spring	206.7694	197.7352 215.8037	<.0001
Summer	1393.893	1384.973 1402.812	<.0001
Fall	1007.139	997.9063 1016.372	<.0001
Winter	ref.		

Table A45. Results of the segmented regression analysis for the drug cost of hospital (using aggregation data)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	19878.32	19856.76	19899.89 <.0001
Baseline trend	-3.5237	-3.9284 -3.119	<.0001
Level change	-3084.56	-3099.32 -3069.79	<.0001
Trend change	-173.483	-174.693 -172.273	<.0001
Difference between case and control	12122.93	12096.54 12149.31	<.0001
Baseline trend of difference between case and control	-62.9336	-63.4551 -62.412	<.0001
Level change of difference between case and control	-762.294	-781.025 -743.563	<.0001
Trend change of difference between case and control	49.12	47.5537 50.6862	<.0001
Season			
Spring	206.7694	197.7352 215.8037	<.0001
Summer	1393.893	1384.9730 1402.812	<.0001
Fall	1007.139	997.9063 1016.372	<.0001
Winter	ref.		

Table A46. Results of the segmented regression analysis for the drug cost of general hospital

Variables	Estimate	95% Confidence limits	p-vale
Intercept β	29881.2	29820.09	29942.31
Baseline trend	-13.7253	-14.7131	-12.7375
Level change	-265.498	-300.81	-230.185
Trend change	-278.149	-281.166	-275.131
Difference between case and control	27779.91	27719.03	27840.79
Baseline trend of difference between case and control	-192.055	-193.268	-190.843
Level change of difference between case and control	-5035.24	-5078.1	-4992.38
Trend change of difference between case and control	-18.468	-22.2144	-14.7216
Age			
20~29	-181.606	-210.993	-152.219
30~39	-131.068	-157.865	-104.272
40~49	-79.7367	-104.3370	-55.1362
50~59	-30.8509	-54.3983	-7.3035
60~64	ref.		
Sex			
Male	-1.3689	-15.7816	13.0438
Female	ref.		
Income level			
Low (0~20%)	ref.		
Middle (21~80%)	-28.0001	-46.0823	-9.9179
High (81~100%)	-35.0872	-56.0726	-14.1018
Region			
Urban	31.4609	13.9637	48.9582
Rural	ref.		
Disability			
Yes	-25.3200	-55.7039	5.0640
No	ref.		
Charlson comorbidity index			
0	ref.		
1	19.8344	-6.7736	46.4423
2	10.7256	-16.1854	37.6365
3 \leq	20.9194	-4.9939	46.8328
Season			
Spring	737.2648	717.1431	757.3864
Summer	2036.044	2016.184	2055.904
Fall	1209.805	1189.428	1230.182
Winter	ref.		

Table A47. Results of the segmented regression analysis for the drug cost of general hospital (unadjusted results)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	29770.38	29719.17	.29821.58 <.0001
Baseline trend	-13.5578	-14.5449	-12.5708 <.0001
Level change	-261.682	-296.997	-226.368 <.0001
Trend change	-278.102	-281.119	-275.084 <.0001
Difference between case and control	27825.43	27765.26	27885.6 <.0001
Baseline trend of difference between case and control	-192.337	-193.548	-191.125 <.0001
Level change of difference between case and control	-5039.55	-5082.42	-4996.69 <.0001
Trend change of difference between case and control	-18.471	-22.218	-14.7241 <.0001
Season			
Spring	739.194	719.0704	759.3175 <.0001
Summer	2038.099	2018.237	2057.961 <.0001
Fall	1209.279	1188.898	1229.659 <.0001
Winter	ref.		

Table A48. Results of the segmented regression analysis for the drug cost of general hospital (using aggregation data)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	29770.38	29719.17	.29821.58 <.0001
Baseline trend	-13.5578	-14.5449	-12.5708 <.0001
Level change	-261.682	-296.997	-226.368 <.0001
Trend change	-278.102	-281.119	-275.084 <.0001
Difference between case and control	27825.43	27765.26	27885.6 <.0001
Baseline trend of difference between case and control	-192.337	-193.548	-191.125 <.0001
Level change of difference between case and control	-5039.55	-5082.42	-4996.690 <.0001
Trend change of difference between case and control	-18.471	-22.218	-14.7241 <.0001
Season			
Spring	739.194	719.0704	759.3175 <.0001
Summer	2038.099	2018.237	2057.961 <.0001
Fall	1209.279	1188.898	1229.659 <.0001
Winter	ref.		

Table A49. Results of the segmented regression analysis for the drug cost of tertiary hospital

Variables	Estimate	95% Confidence limits	p-vale
Intercept β	52181.19	52114.91	.52247.47 <.0001
Baseline trend	-25.8908	-26.9333	-24.8483 <.0001
Level change	-3060.36	-3097.61	-3023.11 <.0001
Trend change	-417.463	-420.622	-414.304 <.0001
Difference between case and control	38845.18	38778.06	38912.29 <.0001
Baseline trend of difference between case and control	-211.743	-213.078	-210.408 <.0001
Level change of difference between case and control	-2810.85	-2858.06	-2763.64 <.0001
Trend change of difference between case and control	-170.771	-174.94	-166.602 <.0001
Age			
20~29	-160.16	-193.663	-126.656 <.0001
30~39	-99.6482	-129.64	-69.6566 <.0001
40~49	-80.6820	-107.093	-54.2706 <.0001
50~59	-15.6503	-40.2354	8.9348 0.2122
60~64	ref.		
Sex			
Male	20.2677	4.0136	36.5218 0.0145
Female	ref.		
Income level			
Low (0~20%)	ref.		
Middle (21~80%)	-9.9553	-32.0905	12.1800 0.3781
High (81~100%)	-29.4228	-53.0540	-5.7915 0.0147
Region			
Urban	15.7067	-4.7078	36.1213 0.1316
Rural	ref.		
Disability			
Yes	-13.5876	-47.4026	20.2275 0.4310
No	ref.		
Charlson comorbidity index			
0	ref.		
1	17.1511	-14.3457	48.6478 0.2859
2	43.7187	12.0931	75.3443 0.0067
3 ≤	55.2807	25.4459	85.1155 0.0003
Season			
Spring	489.9828	467.0962	512.8693 <.0001
Summer	866.9646	844.4662	889.4629 <.0001
Fall	1661.507	1638.257	1684.757 <.0001
Winter	ref.		

Table A50. Results of the segmented regression analysis for the drug cost of tertiary hospital (unadjusted results)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	52141.67	52087.16	52196.17 <.0001
Baseline trend	-25.7593	-26.8015	-24.717 <.0001
Level change	-3058.03	-3095.27	-3020.78 <.0001
Trend change	-417.678	-420.838	-414.519 <.0001
Difference between case and control	38874.54	38808.34	38940.75 <.0001
Baseline trend of difference between case and control	-211.924	-213.259	-210.589 <.0001
Level change of difference between case and control	-2812.34	-2859.55	-2765.12 <.0001
Trend change of difference between case and control	-170.628	-174.798	-166.459 <.0001
Season			
Spring	491.1992	468.3112	514.0872 <.0001
Summer	867.1813	844.6813	889.6813 <.0001
Fall	1660.698	1637.447	1683.95 <.0001
Winter	ref.		

Table A51. Results of the segmented regression analysis for the drug cost of tertiary hospital (using aggregation data)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	52141.67	52087.16	52196.17 <.0001
Baseline trend	-25.7593	-26.8015	-24.717 <.0001
Level change	-3058.03	-3095.27	-3020.78 <.0001
Trend change	-417.678	-420.838	-414.519 <.0001
Difference between case and control	38874.54	38808.34	38940.75 <.0001
Baseline trend of difference between case and control	-211.924	-213.259	-210.589 <.0001
Level change of difference between case and control	-2812.34	-2859.55	-2765.12 <.0001
Trend change of difference between case and control	-170.628	-174.798	-166.459 <.0001
Season			
Spring	491.1992	468.3112	514.0872 <.0001
Summer	867.1813	844.6813	889.6813 <.0001
Fall	1660.698	1637.447	1683.95 <.0001
Winter	ref.		

Table A52. Results of the segmented regression analysis for the medical cost of all hospital

Variables	Estimate	95% Confidence limits	p-vale
Intercept β	21939.19	21935.38	21943.01
Baseline trend	-31.2911	-31.3558	-31.2264
Level change	-1208.61	-1210.88	-1206.34
Trend change	80.0575	79.8517	80.2633
Difference between case and control	-4506.32	-4510.13	-4502.52
Baseline trend of difference between case and control	-3.4962	-3.5727	-3.4197
Level change of difference between case and control	613.1293	610.4554	615.8033
Trend change of difference between case and control	-13.2118	-13.4554	-12.9681
Age			
20~29	11.2579	9.503	13.0129
30~39	-0.1456	-1.765	1.4738
40~49	-0.7978	-2.315	0.7193
50~59	0.5805	-0.8962	2.0571
60~64	ref.		
Sex			
Male	8.7399	7.8604	9.6195
Female	ref.		
Income level			
Low (0~20%)	ref.		
Middle (21~80%)	2.691	1.6123	3.7697
High (81~100%)	4.9999	3.7609	6.2388
Region			
Urban	-2.6621	-3.6718	-1.6524
Rural	ref.		
Disability			
Yes	0.9255	-1.1701	3.0212
No	ref.		
Charlson comorbidity index			
0	ref.		
1	-7.5326	-8.9709	-6.0943
2	-6.8794	-8.3506	-5.4081
3 \leq	-11.8241	-13.2563	-10.3919
Season			
Spring	428.2014	427.0017	429.401
Summer	360.5793	359.3729	361.7858
Fall	-248.214	-249.425	-247.004
Winter	ref.		

Table A53. Results of the segmented regression analysis for the medical cost of all hospitals (unadjusted results)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	21939.61	21936.31	21942.91
Baseline trend	-31.2943	-31.359	-31.2296
Level change	-1208.63	-1210.9	-1206.36
Trend change	80.0666	79.8608	80.2724
Difference between case and control	-4508.33	-4512.11	-4504.56
Baseline trend of difference between case and control	-3.4955	-3.572	-3.419
Level change of difference between case and control	613.0862	610.4122	615.7602
Trend change of difference between case and control	-13.2106	-13.4542	-12.9669
Season			
Spring	428.1164	426.9168	429.316
Summer	360.4669	359.2604	361.6733
Fall	-248.186	-249.397	-246.975
Winter	ref.		

Table A54. Results of the segmented regression analysis for the medical cost of all hospitals (using aggregation data)

Variables	Estimate	95% Confidence limits	p-value
Intercept β	21356.14	20448.46	22263.81
Baseline trend	-26.2419	-50.965	-1.5188
Level change	-211.072	-1669.26	1247.117
Trend change	42.9678	-36.7704	122.7061
Difference between case and control	-4062.29	-5225.93	-2898.65
Baseline trend of difference between case and control	-7.8983	-42.7987	27.0021
Level change of difference between case and control	59.4374	-1997.07	2115.945
Trend change of difference between case and control	11.2285	-101.424	123.8806
Season			
Spring	515.0028	-154.588	1184.594
Summer	84.269	-581.013	749.5507
Fall	-424.134	-1104.22	255.9497
Winter	ref.		

Table A55. The average proportion according to hospital type in low income level

	Before intervention		After intervention		p-value
	2007.1. ~ 2009. 6.	2009.7. ~ 2011.9.	2011.10. ~ 2013.12.		
Clinic					
Case	89.9	1.2	88.8	0.5	85.3
Control	89.9	1.2	88.7	0.5	85.3
Hospital					
Case	4.7	0.5	5.3	0.3	8.3
Control	4.7	0.5	5.4	0.3	8.3
General hospital					
Case	2.2	0.3	2.5	0.1	2.8
Control	2.2	0.3	2.5	0.1	2.8
Tertiary hospital					
Case	3.1	0.4	3.4	0.2	3.6
Control	3.2	0.4	3.4	0.2	3.6

Table A56. The average proportion according to hospital type in middle income level

	Before intervention		After intervention		p-value
	2007.1. ~ 2009. 6.	2009.7. ~ 2011.9.	2011.10. ~ 2013.12.		
Clinic					
Case	89.0	1.3	88.0	0.5	85.0
Control	88.9	1.4	88.0	0.6	84.9
Hospital					
Case	5.0	0.6	5.4	0.2	8.0
Control	5.0	0.6	5.4	0.2	8.0
General hospital					
Case	2.4	0.3	2.6	0.1	2.9
Control	2.4	0.3	2.6	0.1	2.9
Tertiary hospital					
Case	3.7	0.5	4.0	0.2	4.1
Control	3.7	0.5	4.0	0.2	4.1

Table A57. The average proportion according to hospital type in high income level

	Before intervention		After intervention		p-value
	2007.1. ~ 2009. 6.	2009.7. ~ 2011.9.	2011.10. ~ 2013.12.		
Clinic					
Case	88.5	1.4	87.6	0.6	84.8
Control	88.5	1.4	87.5	0.6	84.7
Hospital					
Case	4.1	0.5	4.5	0.2	6.9
Control	4.1	0.5	4.5	0.2	6.9
General hospital					
Case	2.3	0.3	2.5	0.1	2.7
Control	2.3	0.3	2.5	0.1	2.7
Tertiary hospital					
Case	5.1	0.7	5.5	0.3	5.6
Control	5.2	0.7	5.5	0.3	5.6

Table A58. The average number of medical claims according to hospital type in low income level

	Before intervention		After intervention		p-value
	2007.1. ~ 2009. 6.	2009.7. ~ 2011.9.	2011.10. ~ 2013.12.		
Clinic					
Case	61567.7	9122.2	71683.7	5370.7	78480.7
Control	61294.7	8966.1	71422.4	5394.0	78273.2
Hospital					
Case	3177.7	328.2	4314.6	333.1	7626.2
Control	3166.0	320.5	4311.7	335.6	7639.0
General hospital					
Case	1500.7	139.9	1994.9	164.7	2543.4
Control	1496.2	137.4	1992.2	164.4	2548.0
Tertiary hospital					
Case	2107.7	141.1	2737.1	166.7	3313.2
Control	2108.0	141.0	2737.1	168.7	3320.8



Table A59. The average number of medical claims according to hospital type in middle income level

	Before intervention				After intervention		p-value
	2007.1. ~ 2009. 6.		2009.7. ~ 2011.9.		2011.10. ~ 2013.12.		
Clinic							
Case	142581.0	20609.3	163256.2	12194.3	175979.2	10365.5	<0.0001
Control	141680.5	20442.9	162614.7	12261.2	175420.4	10608.7	<0.0001
Hospital							
Case	7861.3	603.1	9969.2	670.6	16595.7	1608.9	<0.0001
Control	7831.2	588.1	9952.7	671.2	16608.2	1569.2	<0.0001
General hospital							
Case	3771.4	296.7	4839.2	350.6	6001.0	438.2	<0.0001
Control	3759.7	291.1	4828.6	348.4	6002.1	429.6	<0.0001
Tertiary hospital							
Case	5762.9	306.9	7307.1	435.0	8486.8	555.7	<0.0001
Control	5757.9	306.6	7305.0	435.9	8497.9	548.7	<0.0001

Table A60. The average number of medical claims according to hospital type in high income level

	Before intervention				After intervention		p-value
	2007.1. ~ 2009. 6.		2009.7. ~ 2011.9.		2011.10. ~ 2013.12.		
Clinic							
Case	72206.3	10352.4	80777.0	6097.5	85815.7	5352.5	<0.0001
Control	71796.8	10251.8	80470.9	6137.1	85534.8	5471.6	<0.0001
Hospital							
Case	3275.8	258.0	4115.5	253.2	6922.9	714.5	<0.0001
Control	3265.8	251.7	4112.6	253.7	6933.7	693.8	<0.0001
General hospital							
Case	1834.8	123.5	2262.4	176.5	2754.1	209.5	<0.0001
Control	1831.6	120.5	2258.5	174.6	2757.3	207.0	<0.0001
Tertiary hospital							
Case	4110.5	217.4	5046.6	233.0	5665.2	362.1	<0.0001
Control	4108.8	215.9	5044.5	229.3	5672.3	356.7	<0.0001



Table A61. The average medical cost according to hospital type in low income level

	Before intervention				After intervention		p-value
	2007.1. ~ 2009. 6.	2009.7. ~ 2011.9.		2011.10. ~ 2013.12.			
Clinic							
Case	14677	2073	14223	303	14529	317	<0.0001
Control	14663	2029	14241	305	14548	323	<0.0001
Hospital							
Case	32376	1299	34000	1119	23133	2552	<0.0001
Control	32426	1314	34073	1126	23057	2324	<0.0001
General hospital							
Case	36253	1349	37430	1743	31187	1826	<0.0001
Control	36271	1343	37524	1707	31191	1734	<0.0001
Tertiary hospital							
Case	49470	1385	49231	1775	40055	2624	<0.0001
Control	49478	1396	49276	1815	39993	2493	<0.0001

Table A62. The average medical cost according to hospital type in middle income level

	Before intervention				After intervention		p-value
	2007.1. ~ 2009. 6.	2009.7. ~ 2011.9.		2011.10. ~ 2013.12.			
Clinic							
Case	14735	2093	14286	304	14536	299	<0.0001
Control	14740	2073	14304	305	14555	303	<0.0001
Hospital							
Case	32202	1248	33845	1036	23313	2389	<0.0001
Control	32208	1225	33892	1039	23244	2182	<0.0001
General hospital							
Case	36885	1274	37311	1240	30640	1507	<0.0001
Control	36884	1267	37364	1296	30618	1431	<0.0001
Tertiary hospital							
Case	49926	1348	48752	1607	39973	2054	<0.0001
Control	49928	1352	48798	1681	39922	1938	<0.0001

Table A63. The average medical cost according to hospital type in high income level

	Before intervention		After intervention		p-value
	2007.1. ~ 2009. 6.	2009.7. ~ 2011.9.	2011.10. ~ 2013.12.		
Clinic					
Case	14734	2040	14263	289	14502
Control	14733	2014	14280	291	14519
Hospital					
Case	33268	1533	34561	1341	23658
Control	33232	1538	34623	1349	23574
General hospital					
Case	36974	1632	37604	1795	31081
Control	36995	1643	37722	1861	31028
Tertiary hospital					
Case	49609	1546	47988	1435	38830
Control	49589	1544.	48022	1476	38781
					<0.0001
					<0.0001
					<0.0001
					<0.0001
					<0.0001

Table A64. The average drug cost according to hospital type in low income level

	Before intervention		After intervention		p-value
	2007.1. ~ 2009. 6.	2009.7. ~ 2011.9.	2011.10. ~ 2013.12.		
Clinic					
Case	12343	2032	13017	665	12454
Control	12401	2088	13059	678	12480
Hospital					
Case	24967	3119	27872	3700	19832
Control	25028	3184	27851	3523	19746
General hospital					
Case	46122	3161	44624	2369	30108
Control	46164	3250	44569	2514	29972
Tertiary hospital					
Case	73277	4979	71202	5581	49231
Control	73242	4983	71110	5482	49022
					<0.0001
					<0.0001
					<0.0001
					<0.0001

Table A65. The average drug cost according to hospital type in middle income level

	Before intervention			After intervention		p-value
	2007.1. ~ 2009. 6.	2009.7. ~ 2011.9.		2011.10. ~ 2013.12.		
Clinic						
Case	12326	1986	12968	723	12404	659 <0.0001
Control	12380	2028	13014	735	12431	665 <0.0001
Hospital						
Case	25309	2853	26812	1218	19634	1973 <0.0001
Control	25326	2874	26859	1213	19552	1828 <0.0001
General hospital						
Case	46040	3240	45317	2178	31179	3392 <0.0001
Control	46060	3252	45216	2366	31100	3223 <0.0001
Tertiary hospital						
Case	72355	5128	71048	1714	50553	5214 <0.0001
Control	72340	5126	70965	1869	50340	5000 <0.0001

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	Before intervention			After intervention		p-value
	2007.1. ~ 2009. 6.	2009.7. ~ 2011.9.		2011.10. ~ 2013.12.		
Clinic						
Case	13163	2138	13735	770	13102	694 <0.0001
Control	13227	2195	13785	786	13127	697 <0.0001
Hospital						
Case	25917	3205	27347	982	19646	1985 <0.0001
Control	25899	3251	27370	992	19561	1830 <0.0001
General hospital						
Case	47634	3550	45667	2016	31987	3661 <0.0001
Control	47582	3501	45550	2190	31837	3453 <0.0001
Tertiary hospital						
Case	79183	6176	78202	1726	56771	6267 <0.0001
Control	79125	6159	78133	1761	56549	6033 <0.0001

Korean Abstract

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경증 질환자의 의료이용에 미친 영향

서론: 정부는 환자의 의료전달체계에 따른 의료이용과 요양기관별 역할을 확립하기 위하여 의료기관 기능 재정립 정책을 실시하였다. 이 일환으로 2011년 10월 상급 및 종합병원을 이용하는 52개 경증질환자를 대상으로 약제비 본인부담률을 인상하였다. 이 제도는 52개의 경증외래질환으로 종합병원을 이용하는 경우 기존 30%였던 약제비 본인부담률을 40%로, 상급종합병원을 이용하는 경우 50%로 인상시켰다.

연구목적: 이 연구의 목적은 52개 경증질환자를 대상으로 시행된 외래 약제비 본인부담 차등정책으로 인한 의료이용의 변화가 정책의 적용을 받지 않는 경증질환자와 차이가 있었는지 평가하고자 한다.

연구방법: 이 연구는 국민건강보험공단에서 제공하는 표본 코호트 자료 중 2007년 1월부터 2013년 12월까지 자료를 활용하였다. 정책의 효과를 분석하기 위해 정책의 적용을 받은 52개 경증질환과 정책의 적용을 받지 않은 경증질환 65개를 선정하여 의료기관 이용 분율, 이용 건 수, 진료비, 약제비를 분석하였다. 또한 소득별로 나누어 세부군 분석을 시행하였다. 이 연구는 의료이용에 영향을 미칠 수 있는 요인들을 통제하였으며 통계분석방법으로는 단절적 시계열 연구를 이용하였다.



연구결과: 정책의 적용을 받지 않은 65 개 경증질환과 비교하여 분석한 결과, 정책 개입 이후 의원의 분율 및 청구 건수는 증가하였고, 그 외 병원, 종합 및 상급종합병원에서는 감소하였다. 총 진료비는 전체적으로 모든 의료기관에서 증가하였고, 그 증가량에 비교하여 의원 보다 병원, 종합 및 상급종합병원에서 많이 증가하였다. 약제비는 전체적으로 모든 의료기관에서 감소하였고, 그 감소량에 비교하여 의원 및 병원 보다 종합 및 상급종합병원에서 많이 감소하였다. 소득 수준에 따라 세부군 분석을 시행 한 결과, 정책 개입에 따른 차이를 확인하지 못하였다.

결론: 이 정책의 정책 개입으로 인하여 의료기관별로 의료이용에 영향이 있는 것으로 확인되었다. 향후 경증질환자의 의료기관 변경으로 인한 환자의 의료결과 및 의료서비스의 질 관리 측면에서도 많은 연구가 필요할 것이다.

핵심어: 약제비 본인부담, 의료이용, 경증질환