







# The effect of the reformed nurse staffing policy on employment of nurses in Korea

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## Abstract

**Aim:** This study aims to analyse the employment effect of reformed nurse staffing policy which is the “Integrated Nursing and Care Service” scheme that was introduced by the Korean government.

**Design:** Economic evaluation study focusing on employment effect.

**Method:** An input–output model was used to estimate the employment-inducing effect of the new staffing policy. The analysed data of 26,381 beds, of 400 hospitals that are participated in the Integrated Nursing and Care Service scheme were retrieved from the Korean National Health Insurance claims database.

**Results:** The job-creation effect of the new staffing policy was estimated to be 48.5 persons per USD 1 million expenditure, which means 28,154 persons were employed when USD 580.15 million expenditures was paid to the hospitals by the National Health Insurance Service. In addition, the policy had an employment-inducing effect which is as high as 3.09–6.07 times higher than that of similar industries and all industries.

## KEYWORDS

employment, input–output model, inter-industry analysis, nurse staffing, nursing policy

## 1 | INTRODUCTION

The shortage of nurses has resulted in nurses' burnout and the deterioration of nursing quality as some nursing services had to be transferred to guardians or private caregivers illegally (Kim et al., 2017). The 2015 outbreak of the Middle East Respiratory Syndrome in Korea, in particular, raised the issue of restricting resident guardians and visitors to resolve the overcrowding problem at medical institutions (Cho et al., 2016). The MERS outbreak urged the government to introduce the nurse staffing policy reforms in the form of the “Integrated Nursing and Care Service” (INCS) scheme in 2015 (Kim et al., 2017). INCS scheme aims to improve the quality of nursing services by enforcing nurse staffing level. It is optional for hospitals to implement this scheme and receive a compensation

of approximately 130% of the total labour costs from the national health insurance.

## 2 | BACKGROUND

In Korea, the number of nursing personnel required in a medical facility is regulated by the Medical Service Act since 1982, with the minimum criterion being the average number of annual inpatients admitted at a particular facility divided by 2.5. However, many medical institutions, including 37% of general hospitals, 71% of small-to medium-sized hospitals and 37% of medical clinics, have reportedly failed to comply with this law (Cho et al., 2016). The number of active nurses in Korea was 3.8 per 1,000 population in 2018, compared

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Equation  $(I - A)^{-1}$  is called the Leontief inverse matrix or the production inducement coefficient (Bank of Korea, 2019).

### 3.2 | Analysis methodology

The input-output matrix developed by the Bank of Korea was used to estimate the labour inducement effect in domestic sector. The final demand of the INCS scheme becomes the total accommodation cost, which refers to the sum of nursing and care service fees and hospitalization management fees. The intermediate input elements are nursing personnel, administrative support personnel, ward facilities/equipment and consumables.

The labour inducement effect indicates an increase in the number of employees in a particular industry and other sectors when production in industry  $i$  increases by one unit. In other words, it includes not only the number of employees needed directly to produce a unit of a product in a specific industry but also the number of employees needed indirectly for the production process. The labour inducement coefficient in the input-output table refers to the sum of the number of directly employed persons in the industry and the number of indirectly employed persons, inducing a chain of labour demands in other sectors required for the product because of the mutually dependent relationships between the industrial sectors by using industrial products as intermediate goods. The concept of direct employees in this study, therefore, refers to wage workers employed by wards, who give the INCS.

Estimating the labour inducement effect requires the labour inducement coefficient. The labour inducement coefficient refers to the number of employed persons directly or indirectly induced by the production of all goods, including those when the final demand for the specific goods occurs by one unit. The labour inducement coefficient is calculated as the product of the labour coefficient and the production inducement coefficient. The labour coefficient ( $E_i$ ) is calculated as  $E_i = M_i/X_i$  by dividing the labour ( $M_i$ ) input for the production activity by the total output ( $X_i$ ) during a specific period and refers to the labour directly consumed for the production of a unit. Therefore, the number of employed persons required to produce  $Y$  can be expressed by Equation (3). In this equation, the labour inducement coefficient matrix is  $\hat{E}(1 - A^d)^{-1}$ ,  $\hat{E}$  is the diagonal matrix of the labour coefficient matrix, and  $(1 - A)^{-1}$  is the production inducement coefficient or the Leontief inverse matrix. In other words, the labour inducement coefficient is the size of directly and indirectly employed persons generated by the financial spending of  $X_i$  by, the INCS scheme, and is calculated as the number of directly and indirectly employed persons per USD 1 million of financial spending.

$$M = \hat{E}X = \hat{E}(1 - A^d)^{-1}Y \quad (3)$$

This study applied a production inducement coefficient of 1,727 for the health and social service industry in the input-output table. It refers to the direct and indirect outputs to be produced in each industrial sector for one unit of the final demand in the health and

social service industry sector in the production inducement coefficient table. It then becomes the sum of the outputs of each industry in the domestic sector, consisting of column vectors (Bank of Korea, 2019).

### 3.3 | Data

The input-output table analysed in this study was recently published by the Bank of Korea in 2019 and is available on the Bank of Korea website. In this study, the input-output table was organized into 33 major, 83 middle and 165 sub-classifications for a total of 381 basic classifications according to the International Industrial Classification (ISIC Rev. 4) and the Korean Standard Industrial Classification (KSIC 10th). This study employed the input-output table of the domestic transaction table, the domestic input coefficient check, the production coefficient table, and the value-added inducement coefficient table presented in the input-output table. In the input-output table, INCS is included in the health and social service sector. The employment status and operation status data of the INCS came from the internal data of the NHIS Benefits Division and were obtained from the information disclosure government web portal (<https://www.open.go.kr/>).

### 3.4 | Ethical consideration

The input-output table used in this study was previously published by the Bank of Korea. The data about the operation status of the INCS were obtained from the NHIS through an information disclosure request and did not have information for personal identification. This study is exempted from being examined by the Seoul National University institutional review board based on Subparagraph 3 of Paragraph 1 of Article 13 of the Bioethics and Safety Act of 2017 (IRB No. E1710/002-003).

## 4 | RESULTS

### 4.1 | The INCS schemes

In December 2017, a total of 400 hospitals, 647 wards, and 26,381 beds were found to be participating in the INCS scheme. All 43 tertiary general hospitals were participating, and 189 of 301 general hospitals (62.8%) and 168 of 1,466 small-to medium-sized hospitals except for long-term care hospitals (5.6%).

The numbers of Registered Nurses employed in INCS wards were 12,381, including 2,079 (16.8%) in tertiary general hospitals, 7,111 (57.4%) in general hospitals and 3,191 (25.8%) in small-to medium-sized hospitals. In the case of certified nursing assistants, 413 (10.2%), 2,260 (56.1%) and 1,354 (33.6%) were employed, respectively. With the total of 2,167 nursing assistant personnel, 211 (9.7%) were employed in tertiary general hospitals, 949 (43.8%) in

general hospitals and 1,007 (46.5%) in small-to medium-sized hospitals, indicating that most worked in small-to medium-sized hospitals (Table 1).

The costs involved in operating the INCS schemes include hospitalization fees and nursing care fees. In December 2017, the national financial expenditures by NHIS involved USD 211.58 million in hospitalization fees and 368.57 million in nursing care fees, for a total financial expenditure of USD 580.15 million (Table 1).

#### 4.2 | Assessment of the effect on job creation

We estimated the effect of the INCS scheme on employment creation for nursing personnel using the Bank of Korea's input-output model. Since no statistical data on indirectly employed persons was available, the labour coefficient in this study was estimated from the labour coefficient/employment coefficient ratio of the health and social services. The estimated employment coefficient based on the nursing personnel employed in INCS schemes was 28.1, indicating that 28.1 persons were directly employed for each USD one million of final service demands. Moreover, the employment inducement coefficient was 48.5 people, indicating that 48.5 wage employees were induced for each USD 1 million of final service demands in the nursing and care industry and related industries. The labour inducement coefficient, which indicates the effect of the INCS scheme on direct and indirect employment creation, was estimated to be 51.6 persons for each one million dollars. It was found out to be about 3 to 4 times higher than the other sectors. The indirect labour inducement coefficient is the labour inducement coefficient subtracted by the labour coefficient. Under the INCS scheme, 21.7 people were indirectly employed per USD 1 million, and the indirect employment inducement coefficient was estimated to be 20.4 people per USD 1 million (Table 2).

At the end of 2017, the final demand generated for the INCS scheme was USD 580.15 million. Based on the data gathered, the number of jobs created directly or indirectly from the scheme was estimated, and it was found that the annual number for direct labour

was 17,321 persons, and indirect labour 12,592 persons, with a total of 29,914. We compared the number of jobs in the health and social service industry with all industries. The total number of staff was 10,501 for health and social services, showing that the INCS scheme was 2.85 times more effective in job creation than the health and social service industry. The number was 6,846 for all businesses, indicating that the INCS scheme was 4.37 times more effective in job creation than all industries (Table 3).

#### 5 | DISCUSSION

The shortage of nurses is a worldwide problem, and governments have implemented various measures to remedy this, sometimes by recruiting foreign nurses or retaining locals. The Korean government already has a policy of promoting a larger number of new nurses and has implemented a differential nursing fee system to address this problem. Despite this, medical institutions have difficulties recruiting nurses, and additionally, only 63% of general hospitals and 19% of small-to medium-sized hospitals have complied with the legal nursing personnel standard (Cho et al., 2016). As a result, a new fee payment system for caregiving and reforming the nurse staffing level has been implemented under the INCS scheme, which has become an effective incentive for hiring nurses. Therefore, more institutions are participating in the INCS scheme, leading to an upgrade in nurse staffing standards. This study investigated the macroeconomic effect of the INCS scheme on job creation by considering the chronic shortage of nursing personnel in Korea.

The findings show that the new nurse staffing policy reform was 2 to 3 times more effective in job creation for nurses compared to other industries or the health and social service industry. The reason is that the budget given by the INCS is a very good incentive for medical institutions to hire more nurses. The hospitalization fee system in Korea typically consists of a medical service fee (40%) hospital management fee (35%) and nursing fee (25%). However, wards that operate INCS are being paid with nursing and care fees and an

**TABLE 1** Characteristics of the integrated nursing units, nursing personnel, and expenditures

	Tertiary general hospital N or \$(%)	General hospital N or \$(%)	Small-to medium sized hospital N or \$(%)	Total N or \$(%)
Hospitals	43 (10.8)	189 (47.3)	168 (42.0)	400 (100.0)
Participation rate in INCS scheme (%)	100.0	62.8	11.5	22.1
Wards	58 (9.0)	338 (52.2)	251 (38.8)	647 (100.0)
Beds	2,417 (9.2)	14,447 (54.8)	9,517 (36.1)	26,381 (100.0)
Registered Nurses	2,079 (16.8)	7,111 (57.4)	3,191 (25.8)	12,381 (100.0)
Certified Nursing Assistants	413 (10.2)	2,260 (56.1)	1,354 (33.6)	4,027 (100.0)
Nursing assistants	211 (9.7)	949 (43.8)	1,007 (46.5)	2,167 (100.0)
Total employment	2,703 (14.5)	10,321 (55.6)	5,552 (29.9)	18,575 (100.0)
Accommodation costs(USD in millions)	34.60 (16.4)	116.58 (55.1)	60.40 (28.5)	211.58 (100.0)
Integrated nursing fee(USD in millions)	60.28 (16.4)	203.07 (55.1)	105.22 (28.5)	368.57 (100.0)
Total expenditure(USD in millions)	94.88 (16.4)	319.64 (55.1)	165.62 (28.5)	580.15 (100.0)

**TABLE 2** Employment effect per USD one million expenditures (unit: persons/one million dollars)

	Integrated nursing and care service	Health and social service industry	All industries	A/B	A/C
	(A)	(B)	(C)		
Labor <sup>a</sup> coefficient	29.9	13.6	6.2	2.20	4.82
Employment <sup>b</sup> coefficient	28.1	12.8	4.5	2.20	6.24
Direct inducement coefficient					
Labor	29.9	13.6	6.2	2.20	4.82
Employment	28.1	12.8	4.5	2.20	6.24
Indirect inducement coefficient					
Labor	21.7	4.5	5.6	4.82	3.88
Employment	20.4	2.9	3.5	7.04	5.84
Total inducement coefficient					
Labor	51.6	18.1	11.8	2.85	4.37
Employment	48.5	15.7	8.0	3.09	6.07

<sup>a</sup>Labor: Wage worker + self-employed + unpaid family worker.

<sup>b</sup>Employment: Wage worker employed for the INCS.

**TABLE 3** Comparison of employment creation effect per USD 580.15 million expenditures

	Integrated nursing and care service	Health and social service industry	All industries	A/B	A/C
	Number of persons (A)	Number of persons (B)	Number of persons (C)		
Direct labourer <sup>a</sup>	17,321	7,890	3,597	2.20	4.82
Indirect labourer	12,592	2,611	3,249	4.82	3.88
Total labourer	29,914	10,501	6,846	2.85	4.37
Direct employee <sup>b</sup>	16,302	7,426	2,611	2.20	6.24
Indirect employee	11,852	1,682	2,031	7.04	5.84
Total employee	28,154	9,108	4,641	3.09	6.07

<sup>a</sup>Laborer: Wage worker + self-employed + unpaid family worker.

<sup>b</sup>Employee: Wage worker employed for the INCS.

incentive that is part of the new policy. This policy incentive is a 10% additional fee payment in consideration of environmental improvement and various administrative expenses for the establishment of the integrated nursing wards. Based on a six-person room in a general hospital, the daily hospitalization fee per patient in such an integrated nursing and care service ward was 23.7% higher than that in a general ward (Kim et al., 2017). Moreover, if the number of nurses for exclusive night time services accounts for 5% or more of the total number of nurses, 30% is added to the fee payment to compensate for the nursing service quality. Payments for other fees are added differentially according to the nurse-to-patient ratio and the number of patients served by the ward support personnel or nursing aids (Kim et al., 2017).

Following the implementation of the policy incentive in 2015, the number of medical institutions participating in the INCS scheme in December 2019 was 506 (1,047 units and 43,960 beds), accounting for 27.9% of the total number of hospitals in Korea and an increase of 394 from 112 in 2015. The scheme pays the nursing and care fees

only when the minimum nurse staffing level has been met, and the surcharges for the hiring of night time nurses and the reinforcement of nurse staffing levels induce medical institutions to participate in the scheme, resulting in higher employment creation.

The Korean government has plans to expand the INCS scheme to more than 100,000 beds by 2022. However, many aspects relating to the scheme need to be addressed and improved before its expansion, such as the high workload of integrated nursing care ward nurses, ambiguous division of roles between nurses and nursing aides, and low compensation compared with the workload. In particular, 79% of nurses in a study responded that, while the INCS scheme was good, it was also a burden on nurses (Kim et al., 2017). This indicates that the nursing staffing level should be improved since the scheme is expected to increase the intensity and degree of responsibility of nurses. The nurse staffing standard for tertiary general hospitals graded Level 1 in Korea is a nurse-to-patient ratio of 1:7–1:10, whereas that for acute internal surgery wards in Australia is 1:4, and that for California in the

United States is 1:5. Hence, it is necessary to strengthen staffing standards in Korea.

The nurse-to-patient ratio can affect the number of nurses assigned to each unit according to the severity of the patients' illness and bed turnover. However, the 5:20 ratio in Victoria, Australia is advantageous because it is based on the minimum number of nurses per ward rather than per patient and can increase the nursing personnel staffing level and respond sensitively to the number of patients (Gerdtz & Nelson, 2007). In other words, although the recommended ratio of four patients per nurse may be changed due to changes in the patients' nursing needs, the ratio of 5:20 must be maintained at each ward. This flexible scheme empowers the nursing manager to give team-based nursing by granting the autonomy of the skill mix at an Enrolled Nurse ratio below 20% as long as the 5:20 ratio is maintained.

In Australia, decreased patient waiting times in hospitals, increased number of years of service among nurses, improved hospital economic performance, decreased patient mortality, and decreased nurse burnout have been reported after the reinforcement of the nurse staffing level (Aiken et al., 2002; Duffield et al., 2011). In California, an increase in the number of nurses by 80,000 between 1999–2007 and a reduction of nurse turnover and vacancy rates to less than 5% has been reported (Jones & Gates, 2007).

With all these factors in mind, it is necessary to improve the working environment of nurses, by improving the ward structure and reinforcing the nurse staffing level. Moreover, a compensation system befitting the increased workload and responsibility compared to general wards should be prepared.

## 6 | CONCLUSION

This study analysed the macroeconomic effect of the new nurse staffing level after the implementation of the INCS scheme in connection with nurse employment in Korea. According to the input-output model, based on the input-output table of the Bank of Korea in 2019, the national financial expenditure of USD one million led to the employment of 48.5 wage workers, including 28.1 nursing staffs through the hospitals and 20.4 wage workers through indirect employment. The scheme was highly effective in job creation, as the job creation effect was 3.09–6.07 times higher than that of similar industries and all industries. The INCS scheme is expected to be fully expanded in the future, and the effect of job creation is therefore expected to expand. In preparation for securing a stable manpower along with an increase in jobs, employers should also improve the working environment.

## 7 | LIMITATIONS

The limitation of this study is that the employment quality aspect was not considered as only the quantitative data of budget and input

personnel from the aspect of the employment creation effect was used. Considering that the employment quality of nursing personnel could have affected the results of the subjects, future studies should analyse qualitative aspects of employment, such as employment stability, wage level and workload.

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## CONFLICT OF INTEREST

All authors declared that they have no conflicts of interest to disclose.

## AUTHOR CONTRIBUTIONS

Jinhyun & Hyunji conceived the presented research concept and verified the analytical methods. Jinhyun encouraged Jayon and Hyunjeong to investigate and collect data and supervised the findings of this work. All authors discussed the results and contributed to the final manuscript. Hyunji and Sungjae performed the analytic calculations and performed the numerical simulations. Eunhee aided in interpreting the results and worked on the manuscript. Jinhyun & Hyunji wrote the manuscript with the support from Sungjae, Eunhee, Jayon and Hyunjeong. All authors gave their critical feedback and helped shape the research, analysis and manuscript. All authors have agreed on the final version and meet at least one of the following criteria [recommended by the ICMJE (<https://www.icmje.org/recommendations/>): substantial contributions to conception and design, acquisition of data or analysis and interpretation of data; drafting the article or revising it critically for important intellectual content.

## ETHICAL STATEMENT

This study is exempted from being examined by the Seoul National University institutional review board based on Subparagraph 3 of Paragraph 1 of Article 13 of the Bioethics and Safety Act of 2017 (IRB No. E1710/002-003).

## DATA AVAILABILITY STATEMENT

The authors confirm that the data supporting the findings of this study are available in the article

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