

## Correspondence:

### Adequacy of the physician workforce for preparing for future society in Korea: an English translation

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## Abstract

**Purpose:** This study aimed to assess whether the current physician workforce in Korea is sufficient to meet future healthcare demands, considering demographic changes and increasing medical needs. The objective was to project the future supply and demand for physicians and identify potential regional disparities.

**Methods:** Data on outpatient and inpatient utilization rates were obtained from the 2018 Health Insurance Statistical Yearbook, and population projections were sourced from Statistics Korea (2017–2067). Medical demand was estimated by multiplying these utilization rates by the population projections. The supply of

physicians was projected using a cohort-component model that incorporated medical school quotas and age-specific attrition rates. Two scenarios were developed to account for changes in productivity: Scenario 1 assumed a 50% decrease in productivity for physicians aged 65–75, and Scenario 2 assumed a 75% decrease. Additionally, regional projections were analyzed using data from provincial and secondary medical service areas.

**Results:** National-level projections suggest a looming shortage of physicians, despite an increase in medical school admissions. Both scenarios predict a physician shortage, particularly in regions such as North Gyeongsang, South Chungcheong, and Jeju Island, by 2047. In contrast, Seoul is likely to see a surplus of physicians. The regional analysis underscores substantial disparities in physician distribution, with underserved areas experiencing increasingly severe shortages.

**Conclusion:** The study concludes that without flexible adjustments to medical school admission quotas and healthcare delivery systems, Korea will face significant physician shortages in the coming decades. To address this, it is necessary to increase the number of physicians in underserved regions and improve the efficiency of healthcare utilization.

**Keywords:** Medically underserved area; Patient acceptance of health care; Population forecast; Physicians; Workforce

## Introduction

### Background

Estimating the demand for and supply of an appropriate number of physicians, and planning for their adequate provision, is crucial for the proper functioning of healthcare services.

### Objectives

This study was conducted to determine whether the current number of physicians is adequate to meet the

needs of a future society, considering that social changes, such as demographic shifts, are expected to increase medical demand. Thus, instead of evaluating whether the current physician workforce is excessive or insufficient, this study projects the future physician workforce based on the assumption that the number of physicians in 2018 was appropriate.

## Methods

### Ethics statement

This study does not involve human subjects. Therefore, approval by the institutional review board and the acquisition of informed consent were not required.

### Study design

This study is a simulation based on various data sources, including the Health Insurance Statistical Yearbook, the Report of Statistics Korea, and the number of physicians in Korea.

### Data sources and analyses

Since medical demand reflects the population's use of medical services, we utilized data from the 2018 Health Insurance Statistical Yearbook to calculate per capita outpatient and inpatient utilization by age and gender. We then used population projection data from Statistics Korea (2017–2067) to estimate medical demand. Assuming a workload ratio of 1:3 between outpatient and inpatient services, we multiplied the outpatient demand by 3 to estimate the total demand.

For the supply side, we estimated the number of physicians based on medical school quotas using a cohort-component algorithm. We assumed a 95% pass rate for students taking the national medical licensing examination, allowing for those who were unsuccessful to retake the exam in subsequent years. We made projections by age groups (20s, 30s, 40s, 50s, 60s, 65s, 70s), using the mortality rates for each age group from 2018 Statistics Korea data to calculate attrition rates. The retirement age was set at 75 years.

To calculate the balance between supply and demand, we first needed to quantify medical demand in terms of the number of physicians required to meet it. We estimated the daily workload for each physician, based on the assumption that they work 265 days per year, using data from 2018. For physicians aged 65 to 75, we adjusted their expected daily productivity to 50% of that of their younger colleagues in Scenario 1, and to 75% in Scenario 2. Additionally, we factored in an annual increase of 0.5% in the daily work capacity of a physician, attributing this improvement to technological advancements. With these calculations, we determined the required number of physicians each year and compared it to the projected physician supply for that year.

Regional data were categorized into two groups: by province and by secondary medical service area. Physician supply projections utilized age-specific physician data from either the province or the secondary medical service area, as specified in the 2016 data from the Ministry of Health and Welfare. Medical demand for each province was estimated using population projections from Statistics Korea for the years 2017 to 2047. As there were no distinct projections available for secondary medical service areas, the 2018 population ratios were applied to the national projections.

## Results

### National-level physician workforce supply and demand projections

#### *National-level projections scenario 1*

Assuming that the supply and demand of physicians were appropriately balanced in 2018, even with an increase in the admission quota for medical schools and graduate medical schools to 1,500 students starting in 2021, a shortage of physicians is still predicted. However, since an excess in the physician workforce may emerge after a certain period, it is necessary to implement flexible adjustments by appropriately increasing or decreasing quotas (Fig. 1, Table 1).

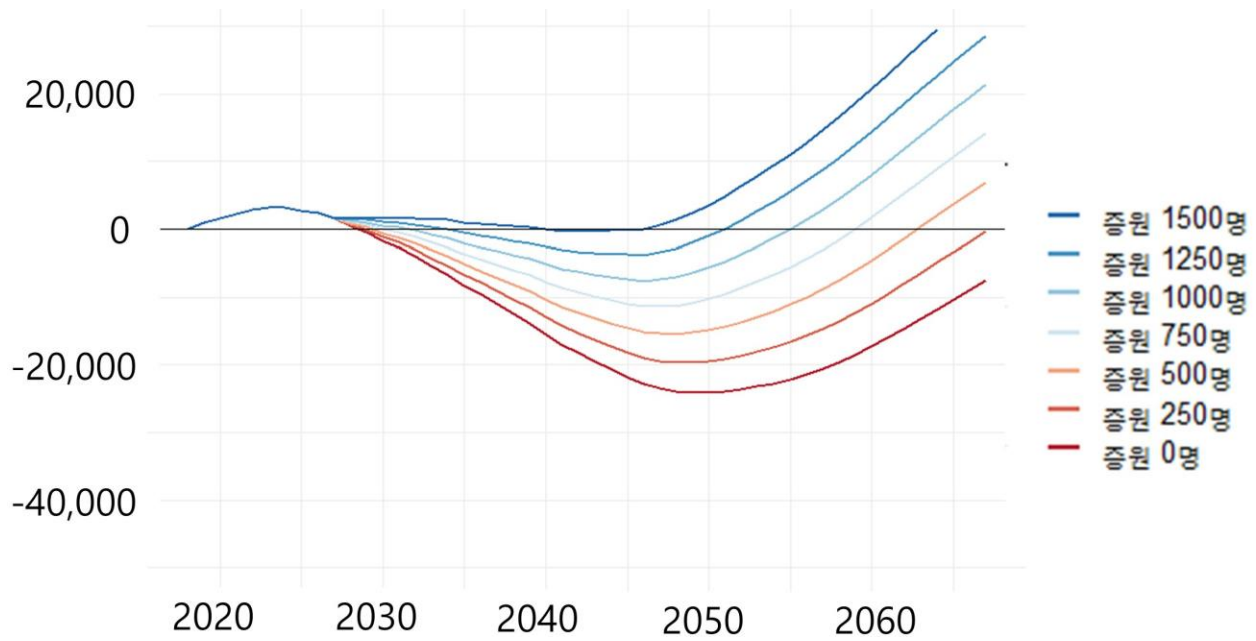


Fig. 1. Scenario 1 of the national supply and demand of physicians in Korea.

Table 1. Timing and magnitude of physician shortages based on assumed increases in medical school admission quotas

Admission quota (assumption)	Year of greatest physician shortage	Magnitude of shortage (number of physicians)
Maintain current quota	2050	26,570
250	2048	22,237
500	2048	18,059
750	2046	14,018
1,000	2046	10,231
1,250	2046	6,445
1,500	2043	3,035

### *National-level projections scenario 2*

Even assuming that the productivity of physicians aged 65 and over decreases not by 50% but by 75%, a shortage of physicians is still predicted, even with an increase in the admission quota to 1,500 students starting in 2021. However, this scenario could also lead to an excess of the physician workforce after a certain period. Therefore, measures to appropriately adjust the quotas are deemed necessary (Table 2).

Table 2. Surplus or shortage of physicians per 1,000 population in 2018 and 2047

Region	Year	Surplus/Shortage of physicians per 1,000 population	
		Scenario 1	Scenario 2
Seoul	2018	1.14	1.16
	2047	1.79	1.97
Busan	2018	0.26	0.28
	2047	0.68	0.8
Daegu	2018	0.39	0.4
	2047	0.71	0.83
Incheon	2018	-0.25	-0.26
	2047	-0.83	-0.79
Gwangju	2018	0.49	0.5
	2047	0.75	0.87
Daejeon	2018	0.54	0.55
	2047	0.67	0.79
Ulsan	2018	-0.23	-0.23
	2047	-0.48	-0.42
Sejong	2018	-1.12	-1.14
	2047	-1.91	-1.94
Gyeonggi	2018	-0.3	-0.31
	2047	-0.91	-0.87
Gangwon	2018	-0.49	-0.49
	2047	-1.02	-0.97
Chungcheongbuk-do	2018	-0.55	-0.56
	2047	-1.13	-1.1
Chungcheongnam-do	2018	-0.71	-0.73
	2047	-1.34	-1.32
Jeollabuk-do	2018	-0.31	-0.31
	204	-0.46	-0.39
Jeollanam-do	2018	-0.74	-0.75
	2047	-1.08	-1.04
Gyeongsangbuk-do	2018	-0.93	-0.94
	2047	-1.48	-1.46
Gyeongsangnam-do	2018	-0.44	-0.44
	2047	-0.84	-0.79

Jeju	2018	-0.32	-0.33
	2047	-1.06	-1.03

### Regional physician workforce supply and demand projections

The projection of physician workforce supply and demand by region revealed that Seoul had the highest concentration of physicians, with a ratio exceeding 1.14–1.16 physicians per 1,000 population as of 2018. In contrast, regions such as Chungcheong, Jeolla, Gyeongsang Provinces, and Jeju Island had fewer than 1 physician per 1,000 population. Given the current trends, by 2047, these regions are expected to face a more severe shortage of physicians.

### Projections for secondary medical service areas

In an analysis of 56 secondary medical service areas, Hongseong was identified as having the most significant physician shortage in 2018, with approximately 1.58 fewer physicians per 1,000 people than the national average. This shortage was closely followed by Mungyeong and Sokcho, each with a deficit of 1.45 physicians per 1,000 population, Sacheon with 1.42, and both Jincheon and Andong with 1.40. On the other hand, Seoul had the highest surplus of physicians in 2018, with about 1.02 more physicians per 1,000 population than the national average. Following Seoul were Yangsan with 0.64 additional physicians per 1,000 population, Bucheon with 0.21, Gwangju with 0.18, and Busan with 0.16.

In 2018, most secondary medical service areas in metropolitan cities had an excess of physicians, whereas areas experiencing a shortage of physicians were predominantly found in the Chungcheong, Jeolla, and Gangwon regions.

Assuming no increase in medical school quotas, projections for the physician supply and demand in 2035 suggest a deepening shortage in Hongseong, which already had the most significant shortage in 2018. By 2035, the shortage is expected to reach approximately 2.29 physicians per 1,000 population. Following closely are Mungyeong, with a projected shortage of 2.19 physicians per 1,000 population, Andong with 2.12,

Sacheon with 2.10, and Sokcho with 2.04, all of which are anticipated to experience worsening shortages compared to 2018. Conversely, areas like Seoul, Yangsan, Bucheon, Suwon, and Cheonan are expected to have an excess of physicians. The surplus is particularly notable in Seoul and Yangsan, where the excess is predicted to exceed 1.41 and 1.12 physicians per 1,000 population, respectively, relative to 2018.

## Conclusion

According to the regional supply and demand projection scenarios from a study on the adequacy of the physician workforce, the areas anticipated to experience the most significant shortages of physicians by 2047—excluding the Gyeonggi area in the metropolitan region—are North Gyeongsang Province, South Chungcheong Province, North Chungcheong Province, South Jeolla Province, and Jeju Island.

Therefore, it will be necessary to increase the number of physicians providing medical services in regions experiencing shortages. Meanwhile, according to 2018 OECD data, South Korea has fewer clinical physicians than the OECD average, yet it records the highest number of outpatient visits per capita, at 16.9 times per year. This indicates a significant imbalance in physician supply and demand, underscoring an urgent need to enhance healthcare utilization behaviors and the overall healthcare delivery system.

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## Authors' contribution

All work was done by Yun Chul Hong

## Conflict of interest

No potential conflict of interest relevant to this article was reported.

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#### Data availability

Please contact the corresponding author for research data.

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Not applicable.

#### Supplementary materials

Not applicable.

**Editor's note:** This is an essential article on the estimated number of physicians needed to prepare for the future of society in Korea. Therefore, it will be helpful to cite the author's work. The article was supplemented according to the journal's style and format. An abstract was also included.