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**Changes in the number and income of healthcare professionals
in Hungary**

Ph.D. Thesis

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1. INTRODUCTION

The World Health Organization (WHO) estimated that there was a global shortage of 7.2 million health professionals in 2013. By 2030, this labour shortage may reach 15 million.

Part of the global health workforce crisis is the so-called "medical brain drain". The massive migration of medical and healthcare workers is the most typical from low- and middle-income countries to higher-income countries, from developing countries to developed countries, from Western Europe to other Western European states and the USA. The effects of health migration and the potential underlying "push and pull" factors have been discussed in detail in the literature. There is widespread agreement that the migration of healthcare professionals has a negative impact on the sending countries, and a positive impact on the receiving countries. Brain drain is strongly influenced by the economic characteristics of the destination and source countries (e.g. unemployment rate).

The distribution of healthcare workers shows inequalities worldwide. The Americas region (Canada, USA) is affected by about 10% of the global disease burden and 37% of the world's health workers live in this region. In contrast, the African region accounts for 24% of the global disease burden, requiring 3% of the world's healthcare workers to manage it. The majority of African countries have the largest shortage of healthcare workers, which is already putting pressure on the healthcare systems of many countries on the continent. Healthcare systems with fewer than 2.5 healthcare workers (doctors, nurses, midwives) per 1,000 population are unable to provide basic healthcare services.

The aging society of the European Union (EU) is challenging from a professional point of view. The trend of low birth rates and higher life expectancy in recent decades results in a change in the population pyramid of the EU: the proportion of elderly people within the total population is expected to increase significantly in the coming decades. In 2021, more than a fifth (20.8%) of the EU population was over 65 years old. According to forecasts, between 2021 and 2100, the proportion of people over the age of 65 will increase from 20.8% to 31.3%, and the proportion of people over the age of 80 will increase two and a half fold, from 6.0% to 14.6% in the EU. Among EU member states, the proportion of people over 65 is the highest in Italy (23.5%), Finland (22.7%), Greece (22.5%) and Portugal (22.4%), while it is the lowest in Luxembourg (14.6 %) and in Ireland (14.8%).

In addition to an aging society, the EU is also characterized by the aging of healthcare professionals. The European Commission has previously called attention to a "retirement

wave": by 2020, as 3.2% of all European doctors are expected to retire annually. The main challenges affecting the health sector are similar in EU member states: in addition to the fact that healthcare professionals are aging, their supply has not been satisfactorily resolved either, and retention of workforce has also been a challenge for member states due to inadequate work conditions and the relatively low remuneration of some groups within the profession. According to EU forecasts, the increase in the average age of doctors and the number of the population over 65 years will dramatically increase healthcare utilisation.

The provision of a sufficient number of healthcare professionals plays an important role in the development of health indicators.

At the national level, Brazilian researchers have found a reduction in infant mortality rates in areas where the numbers were the highest prior to the initiation of the program as a result of an increase in the number of doctors working in primary healthcare. Another Brazilian study concluded that increasing the number of primary care physicians by one person per 10,000 population resulted in 7.08 times fewer infant deaths per 10,000 live births. According to Vietnamese researchers, if there are an average of 10 or more doctors and nurses per 10,000 inhabitants, infant mortality is reduced by 4.4% and 1%, respectively. This decrease is greater for midwives and pharmacists (9%, 19%). A US study concluded that increasing the number of medical staff in primary care by 10 people per 100,000 inhabitants increased life expectancy by 51.5 days; it reduced deaths of cardiovascular origin, malignant tumours, and respiratory deaths by 8.8-30.4 per million people. In addition, an Iranian study confirmed the positive effect of physician numbers on immunization levels.

Emigration of healthcare professionals, uneven regional supply of specialists, workforce retention and the training of replacements, as well as the salaries of healthcare professionals - in line with international trends - are current healthcare policy issues that also affect the Hungarian healthcare system. In recent decades, as a result of the accession of Eastern European countries to the EU, migration to Western countries has also had a significant impact on the Hungarian healthcare system. This pressure was further increased by the COVID-19 pandemic.

2. AIMS

The aim of the thesis is to explore the human resources situation of the healthcare sector in the European OECD countries through the analysis of the number of practising physicians and healthcare professionals and hospital beds. A further objective of the thesis is to examine the changes with regard to the income of physicians and healthcare professionals employed full-time in Hungary, as well as the regional inequalities in the income of hospital physicians and healthcare professionals.

The aim of the thesis is to provide in-depth information about the changes in the numbers of employees and income in healthcare from a human resources aspect. The aim of the thesis is not to determine the causal factors.

The main aims of the research are summarized as follows:

1. To identify the number of practising physicians and the number of hospital beds in the European OECD countries.
2. To explore the number of practising midwives, practising nurses and practising physiotherapists in the European OECD countries.
3. To examine time-series changes in the average monthly income of physicians employed full-time in Hungary, as well as regional inequalities in the income of physicians working in hospitals.
4. To analyse time-series changes in the average monthly income of healthcare professionals employed full-time in Hungary, as well as regional inequalities in the income of healthcare professionals working in hospitals.

3. IN-DEPTH EVALUATIONS

3.1. CHANGES IN THE NUMBER OF PHYSICIANS AND HOSPITAL BED CAPACITY IN EUROPEAN HEALTHCARE SYSTEMS

Introduction: Ensuring the supply of healthcare professionals is an important health policy issue nowadays.

Objectives: Our aim was to examine the numbers of practising physicians and total numbers of hospital beds in European OECD countries.

Data and methods: Data analysed were derived from the “OECD Health Statistics 2020” database between 1980 and 2018. The selected 24 European countries were grouped and compared according to the healthcare system and geographical location in the cross-sectional years 1980, 1990, 2000, 2010 and 2018 using parametric and non-parametric tests.

Results: In 1980, Bismarck-type systems showed an average number of physicians of 2.3 persons/1,000 population; in Beveridge-type systems, it was 1.7 persons. By 2018, it levelled out reaching 3.9 persons in both healthcare system types. In 1980, average physician number/1,000 population was 2.5 persons in Eastern Europe; in Western Europe, it was 1.9 persons. By 2018 this proportion changed with Western Europe having the higher number (3.7 persons; 3.9 persons). In 1980, average number of hospital beds/1,000 population was 9.6 in Bismarck-type systems whereas in Beveridge-type systems it was 8.8. By 2018, it decreased to 5.6 in Bismarck-type systems (-42%) and to 3.1 in Beveridge-type systems (-65%). In 1980, the average number of hospital beds/1,000 population in Eastern Europe was 10.3; in Western Europe, it was 8.5. By 2018, the difference between the 2 regions did not change.

Conclusions: Although the number of physicians was 33% higher in 1980 in Eastern Europe than in Western Europe, by 2018 the number of physicians was 5% higher in Western Europe.

Indicator	1980			1990			2000			2010			2018		
	Number of countries	Average	SD	Number of countries	Average	SD	Number of countries	Average	SD	Number of countries	Average	SD	Number of countries	Average	SD
Practising physicians (Density per 1,000 population (Head counts))															
Bismarckian countries	7	2.3	0.63	7	2.8	0.55	12	2.9	0.57	12	3.3	0.73	11	3.9	0.69
Beveridge countries	4	1.7	0.28	3	2.1	0.44	7	2.9	0.52	7	3.6	0.53	6	3.9	0.70
Eastern European countries	4	2.5	0.79	4	2.8	0.56	7	2.9	0.57	6	3.0	0.68	5	3.7	0.58
Western European countries	7	1.9	0.33	6	2.4	0.64	12	3.0	0.54	13	3.5	0.62	12	3.9	0.72
OECD average	--	2.1	0.59	--	2.6	0.61	--	2.9	0.53	--	3.4	0.66	--	3.9	0.67
Total hospital beds (Per 1,000 population)															
Bismarckian countries	5	9.6	2.62	7	9.0	2.57	12	7.3	1.30	14	6.3	1.20	13	5.6	1.22
Beveridge countries	6	8.8	3.52	7	6.5	3.02	10	4.6	1.28	10	3.7	0.97	10	3.1	0.63
Eastern European countries	4	10.3	2.46	4	10.0	2.84	6	7.5	1.19	7	6.4	1.05	7	5.9	1.03
Western European countries	7	8.5	3.29	10	6.9	2.64	16	5.6	1.83	17	4.7	1.71	16	3.9	1.41
OECD average	--	9.2	3.02	--	7.8	2.98	--	6.1	1.87	--	5.2	1.71	--	4.5	1.60

Table 1.
Changes in the number of practising physicians and total number of hospital beds (1980-2018).

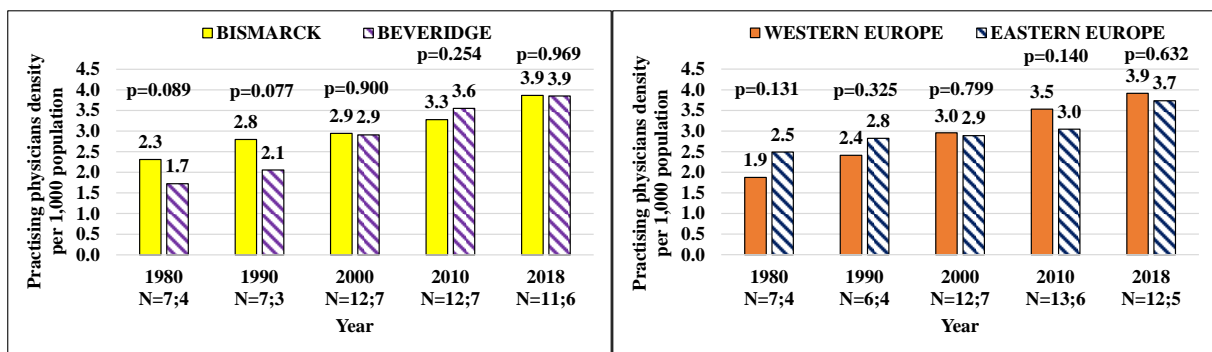


Figure 1.
Changes in the number of practising physicians per 1,000 population in Europe (1980-2018).

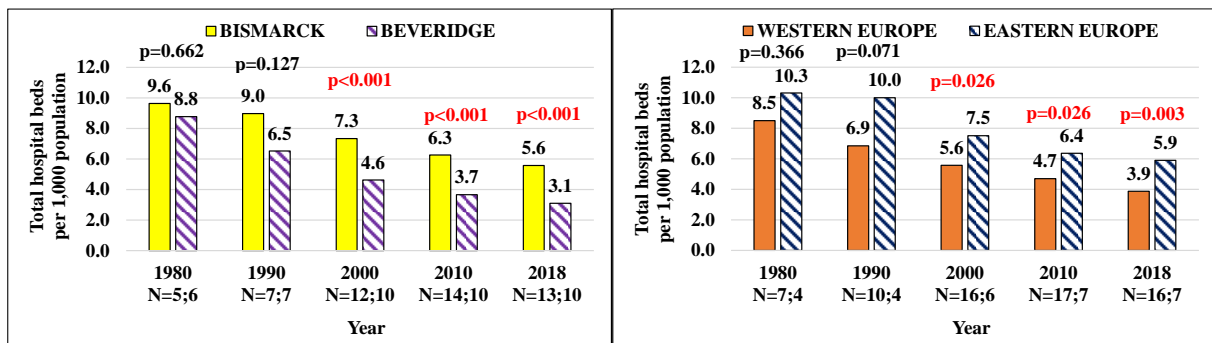


Figure 2.
Changes in the total number of hospital beds in Europe (1980-2018).

3.2 CHANGES IN THE NUMBER OF HEALTHCARE PROFESSIONALS IN EUROPEAN HEALTHCARE SYSTEMS

Introduction: Ensuring the supply of healthcare professionals is an important health policy issue nowadays.

Objectives: The aim of our research is to provide a comprehensive picture of the health workforce situation in the European OECD countries.

Data and methods: Indicators analysed regarding the numbers of practising midwives, nurses, physiotherapists and total hospital beds were derived from the “OECD Health Statistics 2021” database for the period 2000–2018. 24 European OECD countries were grouped according to the type of healthcare system and geographical location. Data were subsequently compared by parametric and nonparametric tests, focusing especially on years 2000, 2010, 2018.

Results: Between 2000 and 2018, there was a 14% increase in the average number of midwives, a 30% increase in the average number of nurses, and a 41% increase in the average number of physiotherapists per 100,000 population in the OECD countries examined. Per 100 hospital beds, the average number of midwives increased by 72%, the number of nurses by 86%, and the number of physiotherapists by 97%. Significant results for all three years analysed were obtained in the number of physiotherapists per 100 hospital beds ($p = 0.014$; $p < 0.001$; $p = 0.002$) when comparing the Western and Eastern European countries examined. As for the healthcare systems, significant results were obtained only in the number of nurses per 100 hospital beds for the year 2010 ($p = 0.048$).

Conclusion: Among healthcare professional groups, the number of physiotherapists increased the most in Europe. The numbers of healthcare professionals per 100 beds are significantly higher in Western European countries analysed compared to Eastern European countries.

Indicator	2000			2010			2018		
	Number of countries	Average	SD	Number of countries	Average	SD	Number of countries	Average	SD
Practising midwives per 100,000 population									
Bismarckian countries	10	29.9	14.35	12	30.3	15.54	11	32.7	14.95
Beveridge countries	5	37.4	20.02	6	44.7	18.64	6	44.8	18.98
Eastern European countries	5	39.8	13.26	6	30.0	18.89	5	28.2	10.85
Western European countries	10	28.7	16.77	12	37.7	17.05	12	40.7	18.06
OECD average	--	32.4	16.13	--	35.1	17.52	--	37.0	16.97
Practising nurses per 100,000 population									
Bismarckian countries	10	726.8	212.90	11	860.0	284.77	10	998.5	360.15
Beveridge countries	6	734.8	336.59	8	911.3	445.03	7	881.3	471.30
Eastern European countries	6	636.2	116.72	6	687.8	118.58	5	787.0	155.26
Western European countries	10	786.0	302.27	13	971.0	388.37	12	1,018.3	454.43
OECD average	--	729.8	254.90	--	881.6	350.35	--	950.2	399.74
Practising physiotherapists per 100,000 population									
Bismarckian countries	11	76.4	51.02	13	93.4	64.80	11	110.5	71.63
Beveridge countries	7	82.9	63.70	9	107.8	81.93	9	111.8	68.93
Eastern European countries	5	46.6	27.89	7	50.3	25.05	6	69.5	36.94
Western European countries	13	91.3	57.89	15	122.1	74.06	14	128.9	72.17
OECD average	--	78.9	54.53	--	99.3	70.78	--	111.1	68.57
Practising midwives per 100 hospital beds									
Bismarckian countries	8	3.7	1.50	12	4.9	2.46	11	5.9	2.89
Beveridge countries	5	8.8	6.48	6	12.7	8.26	6	16.6	10.49
Eastern European countries	4	4.5	1.45	6	4.6	2.78	5	4.9	1.96
Western European countries	9	6.1	5.60	12	9.0	6.99	12	11.7	9.04
OECD average	--	5.6	4.69	--	7.5	6.20	--	9.7	8.20
Practising nurses per 100 hospital beds									
Bismarckian countries	8	102.8	38.75	11	140.5	62.09	10	190.4	101.09
Beveridge countries	6	163.7	79.21	8	245.4	112.23	7	311.5	165.39
Eastern European countries	5	91.7	22.94	6	112.6	35.44	5	142.5	50.97
Western European countries	9	149.5	72.24	13	217.9	102.43	12	281.0	147.22
OECD average	--	128.9	64.81	--	184.7	99.38	--	240.3	140.65
Practising physiotherapists per 100 hospital beds									
Bismarckian countries	9	12.1	9.74	13	15.9	13.28	11	20.5	16.81
Beveridge countries	7	17.5	11.85	9	28.3	17.55	9	38.2	23.47
Eastern European countries	4	6.8	3.51	7	7.9	3.50	6	11.9	5.54
Western European countries	12	17.0	11.14	15	27.0	15.99	14	35.5	22.00
OECD average	--	14.5	10.70	--	20.9	16.04	--	28.5	21.51

Table 2.
Changes in the number of healthcare professionals in proportion to the population and the number of beds (2000-2018).

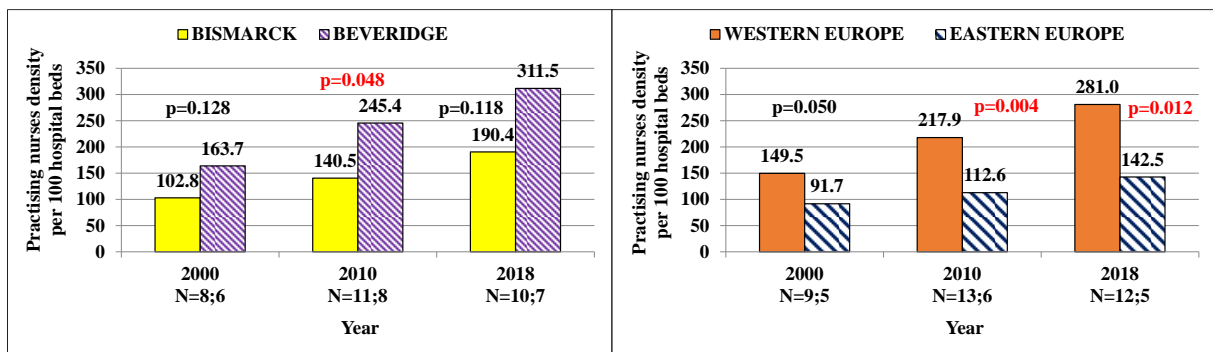


Figure 3.
Changes in the number of practising nurses in proportion to the number of beds according to healthcare system and geographical location (2000-2018).

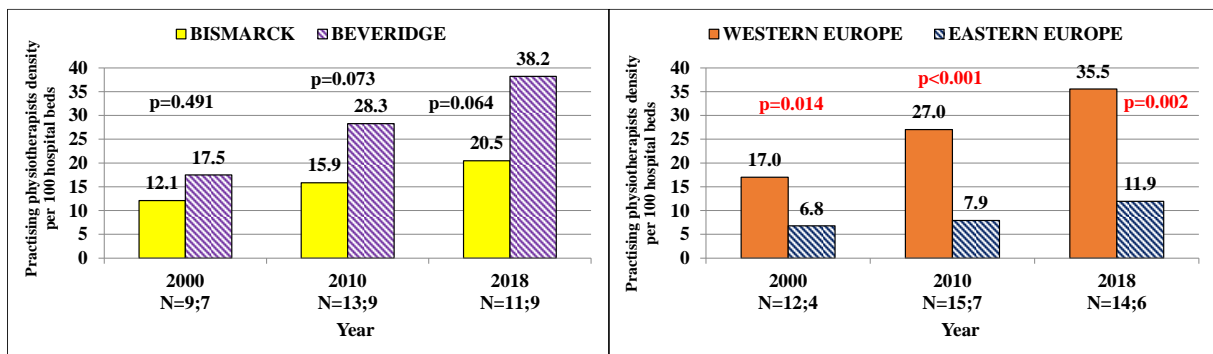


Figure 4.
Changes in the number of practising physiotherapists in proportion to the number of beds according to healthcare system and geographical location (2000-2018).

3.3 CHANGES OF PHYSICIANS' INCOME BETWEEN 1998-2021 IN HUNGARY

Introduction: The development of the medical career model is priority issue from the point of view of safe patient care.

Objectives: In our research, we aimed to examine the average monthly income of physicians employed in Hungary between 1998-2021, especially with regard to the significant increase in medical income in 2021.

Data and methods: Data were derived from the database of the National Directorate General for Hospitals. Physicians employed full-time in all public health institutions were included in our time-series analysis. In our institutional-level analysis, we considered all employed physicians of all public hospitals. Each healthcare institution was grouped according to the type of institution.

Results: The average monthly income of full-time employees in Hungary increased 16.1 times between 1998-2021. In 2020, the average monthly income of hospital physicians at the national level was 767,505 Ft/2,186 €, while in 2021, as a result of increase in medical income, it was 1,415,481 Ft/3,948 € (+84%). In 2021 this was 1,435,972 Ft/4,005 € in national institutes, 1,204,258 Ft/3,359 € in clinical centres, 1,397,181 Ft/3,897 € in capital hospitals, 1,520,821 Ft/4,242 € in county hospitals and 1,688,726 Ft/4,710 € in city hospitals. The difference between the highest and lowest average monthly income was 1.90 times in national institutes, 1.26 times in clinical centres, 1.93 times in hospitals in the capital, 1.47 times in county hospitals and 1.75 in city hospitals.

Conclusions: In 2021, as a result of the increase in physicians' incomes, physicians' incomes and average incomes increased significantly. We observed significant differences between the types of institutions.

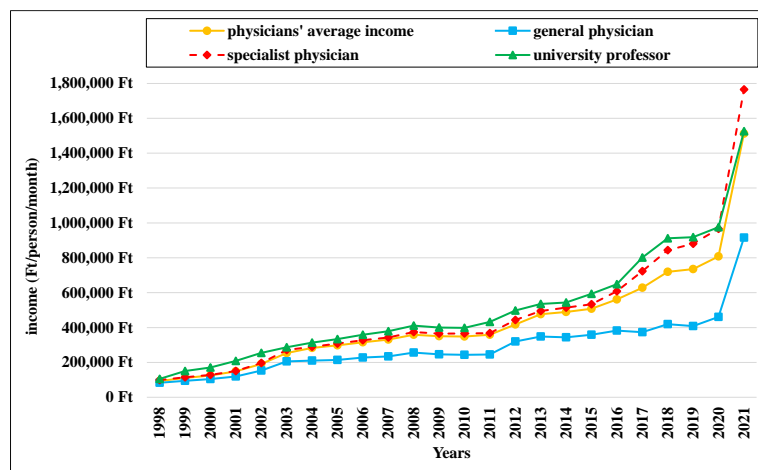


Figure 5.

Average monthly income of physicians employed full-time (1998-2021) (source: National Directorate General for Hospitals, National Statistical Data Collection Program 1626, 2204).

2020						
Type of institution	Number of hospitals	Physicians' average income (Ft)	SD	as a percentage of the national average		
city hospital	44	851,363 Ft (2,424 €)	175,911	110.9%		
county hospital	17	799,633 Ft (2,277 €)	103,858	104.2%		
capital hospital	9	715,333 Ft (2,037 €)	107,839	93.2%		
clinical centre	4	701,306 Ft (1,997 €)	67,340	91.4%		
national institute	11	807,068 Ft (2,298 €)	182,729	105.2%		
National total/average	85	767,505 Ft (2,186 €)	158,579	--		
2021						
Type of institution	Number of hospitals	Physicians' average income (Ft)	SD	as a percentage of the national average	Change 2020-2021	Increase 2020-2021
city hospital	44	1,662,311 Ft (4,637 €)	378,805	117.4%	1.95	95%
county hospital	17	1,520,821 Ft (4,242 €)	163,334	107.4%	1.90	90%
capital hospital	8	1,397,181 Ft (3,897 €)	286,392	98.7%	1.95	95%
clinical centre	4	1,204,258 Ft (3,359 €)	133,344	85.1%	1.72	72%
national institute	9	1,435,972 Ft (4,005 €)	254,062	101.4%	1.78	78%
National total/average	82	1,415,481 Ft (3,948 €)	322,568	--	1.84	84%

Table 3.

Average monthly income of hospital physicians by type of institution (2020-2021) (source: National Directorate General for Hospitals, National Statistical Data Collection Program 1626, 2204).

3.4 CHANGES OF HEALTHCARE PROFESSIONAL INCOME BETWEEN 2004-2021 IN HUNGARY

Introduction: The development of the healthcare professional career model is priority issue from the point of view of safe patient care.

Objectives: In our research, we aimed to examine the average monthly income of healthcare professionals employed in Hungary between 2004-2021, especially with regard to the year 2021.

Data and methods: Data were derived from the database of the National Directorate General for Hospitals. Healthcare professionals employed full-time in all public health institutions were included in our time-series analysis. In our institutional-level analysis, we considered all employed healthcare professionals of all public hospitals. Each healthcare institution was grouped according to the type of institution.

Results: The average monthly income of full-time healthcare professionals in Hungary increased by 3.65 times between 2004-2021. In 2020, the average monthly income of hospital healthcare professionals at the national level was 447,956 Ft/1,276 €, while in 2021, it was 495,933 Ft/1,383 € volt (+11%). In 2021 this was 561,412 Ft/1,566 € in national institutes, 538,055 Ft/1,501 € in clinical centres, 536,196 Ft/1,496 € in capital hospitals, 473,044 Ft/1,319 € in county hospitals and 461,473 Ft/1,287 € in city hospitals. The difference between the highest and lowest average monthly income was 1.73 times in national institutes, 1.14 times in clinical centres, 1.14 times in capital hospitals, 1.25 times in county hospitals and 1.28 in city hospitals.

Conclusions: Between 2004-2021, the average monthly income of full-time healthcare professionals increased by 3.65 times. In 2021, the average monthly income of hospital healthcare professionals in Hungary was the highest in national institutes.

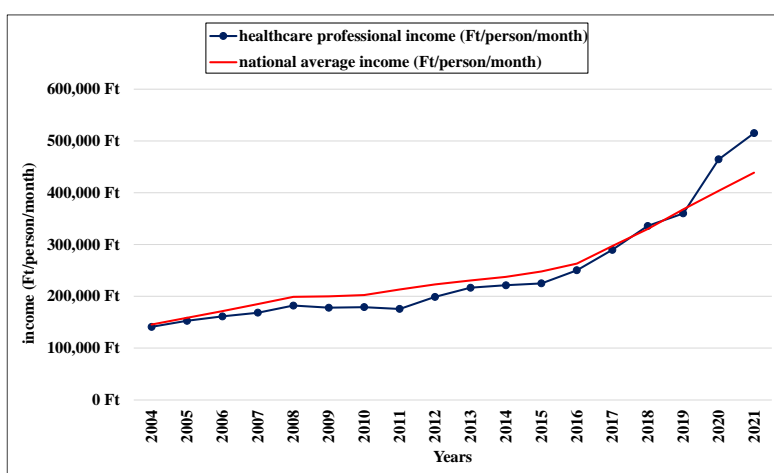


Figure 6.

Average monthly income of full-time healthcare professionals compared to the national average income (2004-2021) (source: National Directorate General for Hospitals, National Statistical Data Collection Program 1626, 2204; Hungarian Central Statistical Office).

2020						
Type of institution	Number of hospitals	Healthcare professional average income (Ft)	SD	as a percentage of the national average		
city hospital	44	410,850 Ft (1,170 €)	35,419	91.7%		
county hospital	17	431,031 Ft (1,227 €)	20,486	96.2%		
capital hospital	9	473,378 Ft (1,348 €)	47,313	105.7%		
clinical centre	4	491,845 Ft (1,401 €)	35,023	109.8%		
national institute	11	493,874 Ft (1,406 €)	71,921	110.3%		
National total/average	85	447,956 Ft (1,276 €)	51,154	--		
2021						
Type of institution	Number of hospitals	Healthcare professional average income (Ft)	SD	as a percentage of the national average	Change 2020-2021	Increase 2020-2021
city hospital	44	456,946 Ft (1,275 €)	53,697	92.1%	1.11	11%
county hospital	17	473,044 Ft (1,319 €)	31,577	95.4%	1.10	10%
capital hospital	8	536,196 Ft (1,496 €)	23,792	108.1%	1.13	13%
clinical centre	4	538,055 Ft (1,501 €)	33,149	108.5%	1.09	9%
national institute	9	561,412 Ft (1,566 €)	88,395	113.2%	1.14	14%
National total/average	82	495,933 Ft (1,383 €)	67,070	--	1.11	11%

Table 4.

Average monthly income of hospital healthcare professionals by institution type (2020-2021) (source: National Directorate General for Hospitals, National Statistical Data Collection Program 1626, 2204)

4. DISCUSSION

The supply of healthcare professionals is a pivotal international and domestic policy issue nowadays. Therefore, the first part of the research was aimed at examining the human resources supply of the Hungarian healthcare sector through a comparison with the European OECD countries.

The trend in the number of practising physicians and healthcare professionals showed a positive picture in proportion to the population in the European OECD region: in the examined European countries, the number of physicians increased from 2.1 to 3.9 per 1,000 population on average, between 1980 and 2018. The number of practising midwives, practising nurses and practising physiotherapists - similar to that of physicians - increased from 32.4 to 37.0, from 729.8 to 950.2, from 78.9 to 111.1 per 100,000 population, while it increased from 5.6 to 9.7, from 128.9 to 240.3 and from 14.5 to 28.5 between 2000 and 2018 per 100 hospital beds.

In all cases, Hungary followed the international trend: the average number of physicians increased from 2.3 to 3.4 per 1,000 population between 1980 and 2018. The average number of midwives per 100,000 population increased from 21 to 25, nurses from 528 to 662 and physiotherapists from 14 to 54. Per 100 hospital beds, the average number of midwives increased from 2.5 to 3.6, nurses from 64.7 to 95.2, and physiotherapists from 1.7 to 7.8. Our results regarding the number of practising physicians and healthcare professionals are consistent with the results of international organizations (e.g. OECD) and other research. Despite the positive change in the number of healthcare professionals, regional inequalities still exist in several countries e.g. Hungary, which may result in serious supply problems.

The second part of the research intended to take a close look at the domestic income situation through comparison with international data and domestic analysis. In general, it can be said that between 2010 and 2020, the income of general practitioners and specialists increased in most OECD countries. Growth in incomes varied across countries. According to the OECD, one of the most prominent increases among the member states for both general practitioners (4.8%) and specialists (6.4%) was in Hungary. In addition to Hungary, the increase in general practitioner income was the largest in Latvia (5.5%) and Turkey (4.4%). Regarding specialists, there was a considerable increase in incomes in Slovakia (5.3%) and the Czech Republic (4.3%). (Figure 7.)

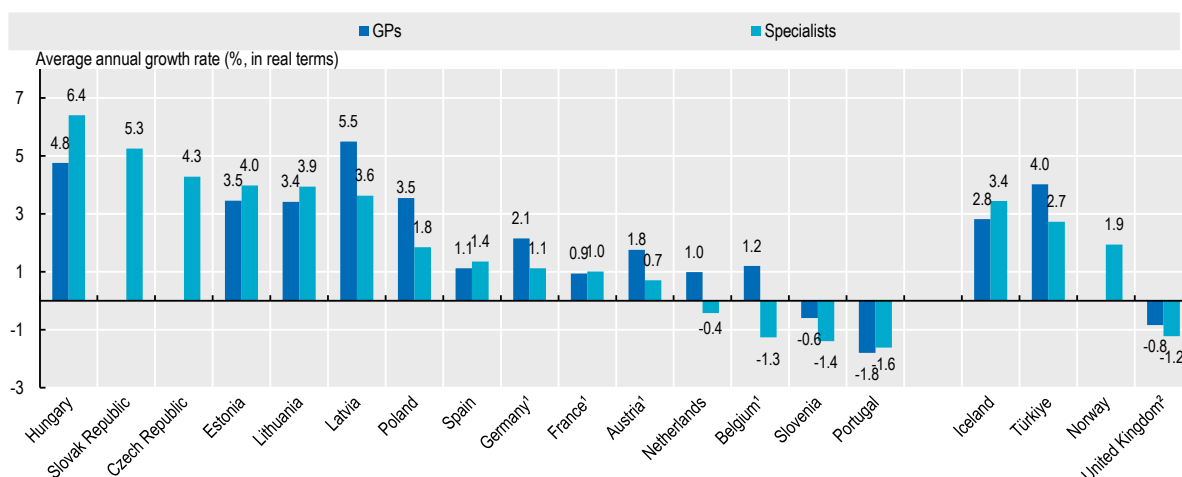


Figure 7.
Trends in remuneration of GPs and specialists (in real terms), 2010-20 (or nearest years
(source: OECD)

In the past decade - before the introduction of the Health Service Act - the Hungarian Government has taken several measures regarding the salary increases of physicians in order to reduce emigration and deal with the shortage of physicians, in line with the trend highlighted by the OECD:

On July 1, 2012, a fixed monthly increase in wages of healthcare professionals began in Hungary as part of an increase of physicians' salaries, the first phase of which affected approximately 90,000 physicians and other healthcare professionals. The second phase affected general practitioners, health visitors and dental workers. The introduction of the Resident Support Program scholarships was also one of the milestones of the wage improvement. The purpose of the scholarships was to support the beginning of the careers of physician and pharmacist residents and to strengthen their commitment to working in Hungarian healthcare. The success of the programme providing a monthly scholarship of 100,000-300,000 Ft net during residency training is shown by the fact that the proportion of residents receiving scholarships increased by 23% between 2011 and 2021, and an average of 749 residents won a scholarship each year.

The Resident Support Program system is currently available in our country for residents. In addition to the Resident Support Program, the Support Program for Young Specialists was also introduced for specialists physicians and pharmacists who obtained their first physician or hospital, clinical pharmacy specialist certificate for 5 years after obtaining their specialist certificate, however, the program was phased out over the years. The next measure was

introduced in 2016, when a salary supplement of 107,000 Ft was added to the salary scale for specialists from January 1, 2017, and another 100,000 Ft from November 1, 2017. In addition to physicians, the wage increases also affected other healthcare professionals.

In Hungary, the most significant increase in physicians' salaries was provided by Act C of 2020 on the Healthcare Service Relationship, which was created in recognition of the work done during the COVID-19 pandemic. In Hungary, between 2020-2021, the average income of hospital physicians increased by 84% from 767,505 Ft (2,186 €) to 1,415,481 Ft (3,948 €), in institutions providing state healthcare. Irrespective of this unprecedented salary increase, regional inequalities continue to exist per institution: between 2020-2021, the relative positions in terms of the average monthly physicians' income did not change according to the types of institution: the city hospitals, the county hospitals and the national institutes had the highest average medical income, while it was the lowest in clinical centres and hospitals in the capital. The difference between the lowest and the highest physician average income was 2.44-fold in 2021 depending on the hospital.

Due to the COVID-19 pandemic, increasing attention has been devoted to the retention and income of healthcare professionals - especially nurses. In EU countries, the average income of nurses in 2020 was somewhat higher than the national average wage. Exceptions to this were, for example, Finland, Latvia, France, and Lithuania, where nurses earned less, below the national average wage. In this respect, Hungary belonged to the top quarter of the EU countries at the same level as Greece and slightly above the average of the EU countries. Regarding the Visegrad group we obtained the 3rd place in 2020.

In our country, the income of healthcare professionals reached the national average wage in the period between 2017-2019, and then surpassed it from 2020 onward. Several important health policy decisions have contributed to achieving the above target:

In the framework of the 2016-2019 four-stage salary development programme for healthcare professionals, on average a 26.5% increase was determined from September 1, 2016, followed by 12% from November 1, 2017, 8% from November 1, 2018, then 8% again from July 1, 2019. The Mihalicza scholarship, starting in 2017, was introduced as part of the salary increase for healthcare professionals - similar to the Resident Support Program - to support the post-graduate training of nurses having a higher education certificate. The BSc scholarship, which has been available since 2018, was created to support students participating in various health sciences BSc programs. Both scholarships are still available, 417 nurses were awarded the Mihalicza scholarship between 2017-2022 (an average of 70 nurses per year), while a total of

3,508 students received the BSc scholarship between 2018-2022 (an average of 702 students per year).

In 2019, the Government launched a new multi-stage salary increase programme for healthcare professionals, which resulted in a 14% increase from January 1, 2020, a 20% increase from November 1, 2020, and a further 21% increase from January 1, 2022.

In Hungary, between 2020-2021, the average income of hospital healthcare professionals increased by +11% from 447,956 Ft (1,276 €) to 495,933 Ft (1,383 €), in institutions providing state healthcare. Despite continuous salary increases, regional inequalities per type of institution still exist: between 2020-2021, the relative positions in terms of the average monthly income of healthcare professionals did not change when comparing the types of institutions: national institutes, clinical centres and hospitals in the capital had the highest income, while salaries were the lowest in county and city hospitals. The difference between the lowest and the highest average income was 1.73-fold between hospitals in 2021.

Identifying and reducing the underlying causes of the regional inequalities in the income of medical and healthcare professionals continues to pose a challenge to domestic healthcare policy. Mitigation of regional income inequalities and wage differences between healthcare professions is essential for maintaining an efficient and stable healthcare system.

5. NOVEL RESULTS, PRACTICAL ASPECTS

Novel results as discussed in previous chapters and their practical implications are summarised as follows:

Novel results:

1. We examined and identified the changes in the number of practising physicians and hospital beds in proportion to the population in different healthcare systems and according to geographical location in the European OECD countries as well as in Hungary between 1980-2018.
2. We explored the changes in the number of practising midwives, practising nurses and practising physiotherapists in proportion to the population and number of hospital beds according to healthcare system and geographical location in the European OECD countries and also in Hungary between 2000-2018.
3. We examined the changes in the average monthly income of full-time employed physicians in the long term, and in the time interval between 1998-2021, and the regional inequalities in hospital physicians' income by type of institution in Hungary for the years 2020 and 2021.
4. We analysed the changes in the average monthly income of full-time healthcare professionals in the long term, and during the time interval between 2004-2021, and the regional inequalities in the income of hospital healthcare professionals by type of institution in Hungary for the years 2020 and 2021.

Practical aspects and implementation of the research:

The practical significance of our research is that, on the one hand, our results can serve as a benchmark and on the other hand, they can support the preparation of professional policy decisions that examine the possibilities of healthcare resource planning and mobility trends.

Based on our research focusing on the number of practising medical and healthcare professionals in the European OECD countries, we recommend specifying the numbers per

hospital beds within each indicator. We also recommend the development of indicators for the number of full-time (FTE) employees.

Regarding our investigations into the income situation of physicians and healthcare professionals working in Hungary and regional inequalities discovered, we recommend a predictable, scheduled development of healthcare income, the elimination of regional and institutional-level inequalities and exploration the underlying reasons for the purpose of workforce retention and development. It is also necessary to continuously examine the labour force retention effect of the salary increases for healthcare professionals introduced in recent years.

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7. LIST OF PUBLICATIONS

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