ASSESSMENT OF THE IMPACT OF LABOUR MIGRATION ON THE STAFFING OF HOSPITALS IN THE REGIONS OF SLOVAKIA
HODNOTENIE VPLYVU PRACOVNEJ MIGRÁCIE NA PERSONÁLNE ZABEZPEČENIE NEMOCNÍC V REGIÓNOCH SLOVENSKA

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ABSTRACT

Background: Labour emigration is a problem that is receiving increasing attention from the professional community. The COVID-19 pandemic has drawn attention to the emigration of health workers from the Slovak Republic to work abroad. Soon, the demand for health professions is expected to be much higher than at present and the labour shortage in Slovakia is expected to increase. This is not only due to the declining birth rate, but also due to the difficult working conditions of health workers and the relatively low wages in this sector.

Objective: The aim of the paper is to evaluate changes in the staffing of doctors and nurses in health care organizations in the regions of Slovakia in the context of a comprehensive assessment of indicators that affect the state of health care in these regions.

Methodology: Comparison of data in the period 2010 – 2020, in regions of Slovakia at NUTS 3 level, was carried out using the constructed Composite Indicator CI (10 input indicators), with the use of selected more complex multivariate statistical methods.

Results: On average, the CI value decreased by 0.01 over the study period. The best ranked region was Bratislava ($CI_{BA}^{2010} = 2.35, CI_{BA}^{2020} = 2.05$). The worst ranked region was Trnava ($CI_{TT}^{2010} = 0.37, CI_{TT}^{2020} = 0.54$). The largest percentage increase was in the Banská Bystrica region (18.35 %), the largest decrease was in the Bratislava region (-12.77 %).

Conclusion: The analysis performed provides a model for assessing the status of hospital facilities in terms of indicators that may influence the migration of health personnel. In the above analysis, the situation has worsened over the period under review. In further, more detailed analyses, other indicators recommended by the experts could be included in the composite indicator.

Key words: Labour migration**.** Healthcare. Statistical methods. Composite indicator.

ABSTRAKT

Východiská: Emigrácia pracovnej sily je problém, ktorému sa venuje čoraz väčšia pozornosť odbornej verejnosti. Pandémia COVID-19 upriamila pozornosť na sledovanie emigrácie zdravotníckych pracovníkov zo Slovenskej republiky za prácou do zahraničia. V blízkej dobe sa predpokladá oveľa väčší dopyt po zdravotníckych profesiách ako v súčasnosti a nárast nedostatku pracovných síl na Slovensku. To je nielen kvôli klesajúcej pôrodnosti, ale aj kvôli náročným pracovným podmienkam zdravotníckych pracovníkov a pomerne nízkym mzdám v tomto sektore.

Cieľ: Cieľom príspevku je zhodnotiť zmeny v personálnom zabezpečení lekárov a sestier v zdravotníckych organizáciách v regiónoch Slovenska v kontexte komplexného hodnotenia ukazovateľov, ktoré ovplyvňujú stav zdravotníctva v týchto regiónoch.

Metodika: Komparácia údajov v období 2010 – 2020, v regiónoch Slovenska na úrovni NUTS 3, bola uskutočnená pomocou skonštruovaného kompozitného indikátora CI (10 vstupných indikátorov), s využitím vybraných zložitejších viacrozmerných štatistických metód.

Výsledky: V priemere hodnota CI za sledované obdobie klesla o 0,01. Najlepšie hodnotený kraj bol Bratislavský ($CI_{BA}^{2010} = 2,35, CI_{BA}^{2020} = 2,05$). Najhoršie hodnotený kraj bol Trnavský   ($CI_{TT}^{2010} = 0,37, CI_{TT}^{2020} = 0,54$).   Najväčší percentuálny nárast bol v Banskobystrickom kraji (18,35 %), najväčší pokles bol v Bratislavskom kraji ($-12,77$ %).

Záver: Uskutočnená analýza poskytuje model hodnotenia stavu nemocničných zariadení z pohľadu indikátorov, ktoré môžu ovplyvňovať migráciu zdravotného personálu. V uvedenej analýze sa stav za sledované obdobie zhoršil. V ďalších, podrobnejších analýzach by do zloženého indikátora mohli byť zahrnuté ďalšie indikátory, odporúčané odbornou verejnosťou.

Kľúčové slová: Migrácia za prácou. Zdravotníctvo. Štatistické metódy. Kompozitný ukazovateľ.

INTRODUCTION

We are currently witnessing huge changes in migration flows as a result of the economic, social, health and cultural changes taking place around the world. In particular, we are seeing a significant impact of migration on the labour market. Developments in the labour market point to significant changes in labour supply and demand, with the health and social assistance sector showing one of the most significant mismatches. The migration of healthcare workers to more economically developed countries, driven by global healthcare workers shortages and high demand, is likely to continue in the coming years (OECD, 2019). International migration of health workers is largely due to the fact that the profession of doctors and nurses in the health sector is not tied to a particular country or nation. Healthcare is comparable everywhere in the world, within reason, differing mainly in the level of service provided, the level of knowledge of staff, cultural practices and more or less modern equipment. The impact of migration on the functioning of

the health system is dramatic. The mobility of health workers is increasing, particularly because of ageing populations and skills shortages in some economies (Lozano et al., 2015; Buchan, 2015). Europe has been facing the problem of migration of doctors for a long time. The labour markets of the developed countries have opened up and there is a real risk that the countries of Central and Eastern Europe will act as source countries in the long term to replace the shortage of skilled workers in the better-off countries, with all the positive and negative consequences. The exodus of doctors and nurses may disrupt the provision of health services and also their quality. A major problem is the uneven coverage of health workers in the different regions of the country. Migration from unattractive regions and the current reluctance to migrate to these regions has many economic and social consequences for patients, doctors, hospitals and the state. For hospitals and the state, this means high pressure from staff, the public and higher financial expenditure (Tupá et al., 2020). From the point of view of long-term sustainability, it is essential for Slovakia to create a favourable environment, to improve working conditions for all healthcare workers, including using new technologies, so that the demand for these services is met not only in developed regions, but also in less developed regions.

RESEARCH PROBLEM

The labour market in European countries is characterised by a shortage of highly skilled labour. There is a shortage of IT specialists, industrial professionals as well as doctors and nurses. Related to this issue, the labour market in Slovakia is particularly dramatic in the health and social care sector (Tupá et al., 2020). Labour shortages in the health professions have long been observed in the countries of Western Europe, which, following the enlargement of the European Union, has been using the immigration of skilled and highly skilled labour from the newly acceding countries as a source of labour in this sector (Yates, 2010; Kovacheva et al., 2015; Pichlhöfer et al., 2015). The issue of labour migration is closely related to shifts in the labour market. Several studies showed that an influx of high-skilled health migrants can depress the wages and displace native health workers seeking similar job opportunities (Krajňáková et al., 2020; Lo Sasso, 2021). The healthcare labour market is not a homogeneous mass of workers. The workforce is characterised by long training periods for some workers, extensive regulation of entry and of conduct once in the sector, a broad set of employment contracts and types of employment, and individuals frequently working in teams (Lee et al., 2019). In the long term, there is a critical shortage of nurses and doctors in developed countries. This is due to an ageing population, generally unattractive working conditions in the health sector, particularly excessive working hours, shift work and relatively lower wages compared to other sectors (OECD, 2021). The push and pull factors of migration include salary, working conditions and lack of opportunities for personal growth. In this context, the Slovak Republic is seen as a potential source country that could supply rich EU countries with the missing doctors and nurses. The dissatisfaction of young doctors and nurses with their pay is well known. This is compounded by their good knowledge of foreign languages and no major administrative obstacles to working abroad. In Slovakia, the risk of these health workers leaving is often associated with a threat to the availability and quality of healthcare. In its paper (Páleník, 2021) the Health Policy Institute summarises the future gap between the demand and supply of labour in the Slovak health labour market. It is based on the projected supply of graduates and the expansion and replacement demand. Trends in health worker emigration that emerged after Slovakia became an EU member state have undermined the sustainability of health workers and health care provision. The problems became apparent during the COVID-19 pandemic (Vojtovič et al., 2021). This study specified four key drivers of migration: human resource development, economic factors, working conditions and social factors. In 2019, the Health Policy Institute conducted a survey on the reasons for nurses leaving. Primarily, there were three factors identified: low wages, overwork (which was reflected in the amount of overtime), and the nurses' status in society. However, the problem of the Slovak health care system is not only the departure of doctors and nurses abroad, but also the migration of these workers to richer regions in the country itself. Despite the considerable progress in health inequality measurement in the EU countries, there is still a lack of comparable health-related data across countries and regions. The existing measures and indicators of health condition and quality of life are not considered sufficient to capture a holistic understanding of population health with multiple

determinants. Explanations of why some populations are healthier than others, what policies are needed to address disparities, what research agenda is needed, and where resources should be allocated are lacking (Santana et al., 2017; Saisana et al., 2002). Their work quantified key health determinants (22 indicators) in 269 EU regions (NUTS2). Regional policy is a key tool for addressing and investing in interventions that tackle health inequalities in regions. A detailed analysis of the health labour market is needed to reduce the outflow of health workers. It is essential to monitor the evolution of shifts in the health worker labour market in the regions of Slovakia based on official indicators. A quantitative approach to the issue can predict the future situation and help to set priorities and procedures to reduce migration processes in the health sector in Slovakia. The paper assesses the possible causes of migration of doctors and nurses, assessed by a comprehensive statistical assessment of the level of healthcare in the regions using a selected ten quantitative indicators, aggregated into a Composite Indicator (CI).

MATERIALS AND METHODS

The methodology which was used to build a Composite indicator (CI) is described in detail in OECD document (OECD, 2008). CI is an indicator that is built from several sub-indicators that assess a region from different perspectives. There are several calculation methods for indicators, such as multivariate statistical- analytic ones or statistical-descriptive ones. Multivariate methods are used in the construction of summary indicators to find the optimal number of input indicators, reduce them, and reveal the similarity of the objects under study, assigning weights. The basic model of construction is as follows. There is a set of units (regions) $I = \{1, \dots, n\}$ to be evaluated with respect to the set of dimensions $J = \{1, \dots, m\}$ (or case dimension is input indicator), the value of which are x_{ij}. For each $i \in I$ unit, the $\boldsymbol{x}_i = [x_{ij}, \dots, x_{im}]$ vector represents a group and the values assigned to that unit in the dimensions from J and vector $\boldsymbol{y}_i = [y_{ij}, \dots, y_{im}]$ is its normalization. The weight w_j is specified for each $j \in J$ dimension, such that $w_j \geq 0$ for all $j \in J$ and $\sum_{j=1}^{m} w_j = 1$. With given a $\boldsymbol{w} = [w_1, \dots, w_m]$ weight vector, the formula for calculating the composite indicator for each unit $i \in I$ is

$CI(\boldsymbol{x}_i, \boldsymbol{w}) = \sum_{j=1}^{m} y_{ij} w_j$. According to the CI value, the evaluated objects can be ranked. A value higher than 1 place the region in the above-average category. Studies in the health care field have shown that health systems are complex entities for which performance analyses require the aggregation of multiple relevant dimensions into a single measure of health or health care [17,18]. In this case, it is appropriate to use CI (Smith, 2002). These are useful for monitoring changes in health outcomes, identifying poor outcomes, and setting priorities for improvement.

RESULTS

To assess the situation and trends in health care in the regions of Slovakia, it is necessary to compare the situation in the monitored indicators with other countries. We assume that most doctors and nurses who have studied abroad have a nationality that is not identical to the country in which they currently work. Data were analysed from the official OECD database (OECD, 2021). The years 2010 and 2020 were compared. Table 1 shows the percentage of foreign-trained doctors (nurses) to the total number of doctors working in a given country each year.

Changes in the number of doctors and nurses between 2010 and 2020 were also assessed at the level of Slovakia and subsequently at the level of the regions (Bratislava – BA, Trnava – TT, Trenčín – TN, Nitra – NR, Žilina – ZA, Banská Bystrica – BB, Prešov – PO, Košice – KE). We have looked in more detail at the change in the age structure of nurses. It is important to focus on age categories to examine the trend in the number of nurses over the period. Table 2 shows the percentage increase or decrease in the number of nurses in each age category: Number of nurses aged $25 - 34$ has decreased by almost 60 % from 2010 to 2020. The number of nurses of post-retirement age, i.e., over 65, has increased by up to 183 %.

The aim of the paper is to assess changes at the regional level NUTS 3, as it is necessary to quantify regional disparities in the issue at hand. A detailed analysis of the evolution of the number of doctors and nurses in each region is provided in Table 3, which shows their percentage increase per capita in each region.

Table 1 Differences in the number of doctors and nurses (foreign educated) in selected EU countries (%)

EU countries	Doctors			Nurses		
	2010	2020	Difference	2010	2020	Difference
Austria	3.9	6.4	2.5	17.2	18.1	0.9
Belgium	8.2	12.7	4.5	1.5	4.1	2.7
Czech Rep.	4.4	7.5	3.1	-	-	-
Denmark	8.8	9.4	0.6	2.0	1.9	-0.1
Finland	20.9	19.9	-1.0	-	-	-
France	7.5	11.6	4.1	2.4	2.9	0.5
Germany	6.6	13.1	6.6	6.1	8.9	2.8
Hungary	7.7	8.2	0.5	1.2	1.6	0.4
Italy	0.8	0.9	0.1	5.8	5.0	-0.9
Netherlands	2.6	3.1	0.5	1.1	1.3	0.2
Norway	34.4	41.3	6.9	7.9	6.1	-1.8
Poland	2.1	2.2	0.2	-	-	-
Slovak Rep.	2.6	3.0	0.4	-	-	-
Sweden	23.5	28.7	5.1	2.6	3.2	0.6
Switzerland	24.1	37.4	13.2	14.7	25.9	11.2
United Kingdom	29.8	30.7	0.9	11.3	16.1	4.9

Source: author's own using OECD data (2022)

In the next section, a CI was constructed for each region i. To assess the current situation and changes in the health sector and the health care potential of the regions, a number of official statistical indicators were selected j: x_1 – Number of doctors, x_2 – Number of nurses, x_3 – Number of healthcare workers, x_4 – Number of healthcare facilities, x_5 – Number of beds in healthcare facilities, x_6 – Separate GP surgeries for children, x_7 – Separate GP surgeries for adults, x_8 – Rapid medical aid, x_9 – Hospitals (general and specialised), x_{10} – Regional GDP. The data were converted to the number of people in a given region and year. A CI was built to assess comprehensively the healthcare potential of the regions. The input data x_{ij} ($i = 1, ..., 8; j = 1, ... 10$) calculated per capita were normalized (y_{ij}) through the Min-Max method. Then, using the PCA analysis, the data were assigned w_j weights. The values were then aggregated additively into the $CI(x_i, w) = CI_i^t$ for each ($t = \{2010, 2020\}$). The CI values for each region are listed in the Table 4.

The above-average rating of the Bratislava region (the region is the capital city) is evident CI reaches far higher values than in other regions of Slovakia. To make the assessment of changes easier to interpret, the calculated values of the CI are shown in Figure 1.

Table 2 Changes in the number of nurses by age category (%)

Age Category	20-24	25-34	35-44	45-54	55-64	65+
Percentage Increase	9.7	**-57.7**	-18.2	7.5	57.5	**183**

Source: SOSR, author's calculations

**Table 3** Changes in the number of doctors and nurses in Slovak regions (%)

Region	BA	TT	NR	TN	BB	ZA	PO	KE
Doctors	7.0	17.1	15.3	8.9	9.9	17.8	13.9	-5.3
Nurses	-12.9	-3.8	2.5	-2.1	-3.4	1.5	-1.1	-9.1

Source: SOSR, author's calculations
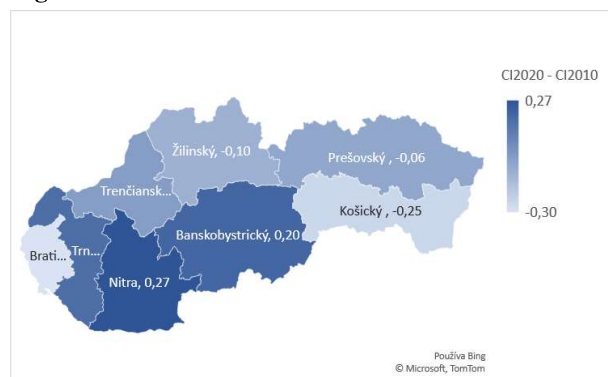
Table 4 CI values for Slovak regions

i	BA	TT	NR	TN	BB	ZA	PO	KE
CI_i^{2010}	2.35	0.37	0.48	0.70	1.09	0.69	1.00	1.33
CI_i^{2020}	2.05	0.54	0.75	0.68	1.29	0.59	0.94	1.08

Source: SOSR, author's calculations

Figure 1 CI value comparison
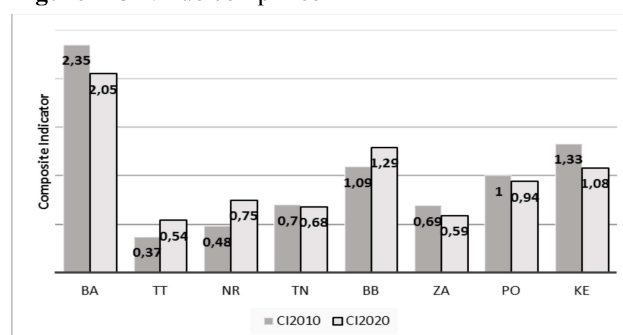
Source: SOSR, author's calculations

Figure 2 Difference between CI_{2020} and CI_{2010}

Source: SOSR, author's calculations

Changes in the healthcare labour market are also shown in the cartogram (Figure 2). From the bar chart and the cartogram, some changes can be observed that are reflected in the value of the CI index.

The more saturated the colouring of the region, the better the observed change was ranked.

The composite indicator CI varied from the worst difference of -0.30 for the Bratislava region to the most positive change in the Nitra region, the change was +0.27.

DISCUSSION

Given the changes in the health care labour market in Slovakia, it is necessary to assess the migration of doctors and nurses in smaller territorial units. These changes need to be compared with data in selected EU countries, which represent the destination of emigration of Slovak doctors and nurses in search of work. In 2020, one in two doctors in Norway was educated outside Norway. Over the last decade, there has been a significant increase in the number of foreign-educated doctors in all developed European countries. In 2010, the highest number of foreign-educated nurses worked in Austria (17.2 %), with only a slight increase in the following years. A detailed study of the migration of nurses in Slovakia and worldwide has been reported by Ondrušová et al. (2023). Currently, the highest number of nurses with foreign education is working in Switzerland, with an increase of 11.2% over the period under review. The increase in the number of nurses in German-speaking countries is also linked to the migration of nurses from Slovakia. The reasons may vary, but according to surveys, the biggest reason is salary. As nurses go to these countries to work on a block basis, the family stays in Slovakia and thus does not have the expenses associated with

permanent residence. Related to this is the observed decline in the number of nurses in Slovakia between the ages of 25 and 34. Tupá (2020) reports that there is a shortage of 4500 nurses in the 20 − 39 age group in Slovakia. This brings with it the negative situation observed in Slovakia, where the number of nurses aged 65 years and over in health care institutions in Slovakia has increased. This increase amounts to 183 % over the 10 years under review. Some regional differences in the number of doctors and nurses also occur in Slovakia itself. Changes in emigration of health workers in the NUTS 3 regions of the Slovak Republic are examined in detail by Tupá (2020). In the article, she compares each region separately and tracks the evolution of the number of nurses and doctors between 2008 and 2018. Similarly, she notes the deteriorating situation in terms of the number of nurses and doctors. A similar study from the perspective of the whole of Slovakia is presented by NCZI (2021). In terms of the number of doctors, the largest percentage decrease over the period under review is in the Košice region. On the contrary, in all other regions the number of doctors has increased. The situation is much worse in the number of nurses. Over the ten years under review, there has been a significant decrease in all regions except Žilina and Nitra. The biggest decrease is recorded in the Bratislava region. This situation is alarming, as the capital city is home to the largest specialised healthcare facilities in Slovakia. The geographical proximity to Austria and the financial valuation of nurses in that country probably play a major role here. In the long term, the most successful region, evaluated according to selected indicators, is the Bratislava region. The worst situation is in the Trnava region. Although the value of CI in the Trnava region has increased from 2010 to 2020, its value is still below average. In five regions CI values have even decreased. There is also a high degree of variability between regions. Thus, the situation and changes in the potential of the health care system in the regions are heterogeneous. The findings do not suggest any changes for the better during the decade under review. There is currently a shortage of more than three thousand nurses in Slovakia. In 2004, the average number of nurses in Slovakia was 6.7 nurses per 1 000 inhabitants and in 2021 it was 5.4. The EU average is 8.1. The shortage of nurses is caused by their age structure, changing educational standards and labour migration. Changes need to be made to legislation, staffing standards,

pay, working conditions to make nursing a more attractive profession. Short-term solutions would be to increase nurses' salaries to stabilise medical staff, increase coefficients, but also systemic measures in the form of subsidies for students, wage allowances for graduates returning to their hometowns, support for adaptive language training for foreign workers, a mentoring allowance, a one-off subsidy for recruitment, and support for lifelong learning. The medium-term objective is to improve the social status of the nursing profession, the financing of health care and working conditions.

CONCLUSION

The study, the results of which are described in the article, deals with a topical issue in Slovakia, the migration of doctors and nurses to work in more advanced European countries. Changes in the number of doctors and nurses were examined in the context of changes in the level of health care in the regions, in terms of several indicators. Aggregating the indicators into an aggregate index made it possible to compare regions and track changes over time. There are differences between regions, which may be influenced by the migration of doctors and nurses abroad or to more economically developed regions of Slovakia. The presented approach can serve as a model to which other official indicators can be added. In the long term, it is very important to monitor the situation in the Slovak healthcare system. Without studying and analysing this issue, it will not be possible to find solutions to the deteriorating situation in the health sector in the regions of Slovakia.

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