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Healthcare as a Determinant of Socioeconomic Security – Regional Disparities in Poland

Zdravotná starostlivosť ako determinant sociálno-ekonomickej bezpečnosti - regionálne rozdiely v Poľsku

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Abstract:

Healthcare constitutes essential determinant of socioeconomic security, both for individuals and in regard to national economies. It includes numerous elements, such as healthcare infrastructure, medical personnel and access to medical procedures and services. Moreover, its organizational, financial and political aspects create crucial factors of healthcare system. The main objective of the research is to identify and evaluate healthcare disparities in Poland on regional level, i.e. 16 provinces (NUTS 2 regions). The parallel aim is to assess the changes in spatial layout between 2010 and 2017. The selected method of multivariate comparative analysis was conducted. Two main research hypotheses were put forward: H_1 - Significant regional disparities in healthcare exist both in regard to healthcare infrastructure, medical personnel and intensity of healthcare services and H_2 - Inferior healthcare quality in certain regions results in lower socioeconomic security in the aforementioned regions than in the rest of Poland. Obtained research results indicated considerable regional disparities in regard to healthcare; the persistence of disparities in both healthcare infrastructure, medical personnel and healthcare services can be perceived as the essential barrier for equal socioeconomic security.

Keywords: *Healthcare, socioeconomic security, Poland, regional disparities, multivariate comparative analysis.*

Abstrakt:

Zdravotná starostlivosť je dôležitým determinantom sociálno-ekonomickej bezpečnosti tak pre jednotlivcov, ako aj pre národné hospodárstva. Zdravotná starostlivosť zahŕňa mnohé zložky, najmä infraštruktúru, zdravotnícky personál a prístup k lekárskym procedúram a službám. Okrem

toho, systém zdravotníctva tvoria organizačné a finančné aspekty, ako aj politika zdravotnej starostlivosti. Cieľom realizovaného výskumu je identifikácia a posúdenie regionálnych disproporcií v oblasti zdravotnej starostlivosti v Poľsku na regionálnej úrovni (t. j na úrovni NUTS 2). Cieľom je preskúmať zmeny v systéme priestorového usporiadania zdravotnej starostlivosti v Poľsku v rokoch 2010 až 2017. Počas výskumu boli predložené dve hlavné výskumné hypotézy: H1 - Významné regionálne rozdiely v zdravotnej starostlivosti existujú tak v oblasti zdravotníckej infraštruktúry, zdravotníckeho personálu, ako aj intenzity zdravotníckych služieb a H2 - Nízka kvalita zdravotnej starostlivosti v niektorých regiónoch má za následok nižšiu sociálno-ekonomickú bezpečnosť vo vyššie uvedených regiónoch ako v regiónoch vo zvyšku Poľska. Získané výsledky výskumu poukázali na značné regionálne rozdiely v oblasti zdravotnej starostlivosti; Pretrvávanie rozdielov v zdravotníckej infraštruktúre, zdravotníckom personále a zdravotníckych službách možno vnímať ako základnú bariéru pre rovnakú sociálno-ekonomickú bezpečnosť.

Kľúčové slová: *zdravotná starostlivosť, sociálno-ekonomické zabezpečenie, Poľsko, regionálne rozdiely, multidimenzionálna komparatívna analýza.*

Introduction

There is no single commonly accepted definition of socioeconomic security; as in the case of other categories in social sciences. Socioeconomic security is a combination of economic and social security. Healthcare constitutes an important determinant of socioeconomic security. Limited access to medical care results in decreased socioeconomic security, while healthcare improvement brings higher socioeconomic security. Healthcare is a broad and multidimensional category; it entails a number of elements, in that: healthcare infrastructure (network of hospitals, emergency medical services including dispatch centers, chronic medical care homes, nursing homes, out-patient departments, pharmacies), medical personnel (number of employed and practicing doctors, dentists, paramedics, nurses, midwives and physiotherapists), unhindered access to healthcare (primary healthcare and specialists' practices; time and cost aspects), financial healthcare aspects, healthcare system organization (local, regional and national elements; public and private units), as well as healthcare quality.

Considerable territorial disparities are characteristic for market economies. Even though, according to neoclassical theory of regional development, market mechanism should bring the reduction of disparities, the reality is quite different and one can observe persisting huge disparities. Therefore, it can be assumed that interregional disparities are of permanent character. They result in a clear division of regions in their spatial structure of a national economy. Persisting differences in socioeconomic potential, socioeconomic security and socioeconomic development remain crucial problems of contemporary economies. Such disparities counteract the process of competitive advancement. Hence, it is of vital importance to undertake actions in order to promote more balanced development.

The main aim of the paper is to evaluate the significance of healthcare as a determinant of socioeconomic security. The parallel objective is to identify and diagnose regional disparities in Poland in regard to selected elements of healthcare, namely: healthcare personnel, medical infrastructure and intensity of medical services. 16 Poland's provinces (voivodships, NUTS 2 regions) lied in the center of research. The research tools used in the article included literature studies, inductive and deductive reasoning, critical thinking, descriptive analysis and comparative analysis, in that the selected method of multivariate comparative analysis. Statistical

information provided by Central Statistical Office (Warsaw, Poland) and taken from *Statistical Yearbook of the Regions 2011*, *Statistical Yearbook of the Regions 2018*, *Health and health care in 2010*, *Health and health care in 2011* and *Health and health care in 2017* was used for the research. The main two research hypotheses were put forward: H_1 - Significant regional disparities in health care exist both in regard to health care infrastructure, healthcare personnel and intensity of medical services; H_2 - Inferior healthcare levels in certain regions result in lower socioeconomic security of the aforementioned regions compared to the remaining Polish voivodships.

1. Literature review

There have been numerous studies focusing on healthcare form various perspectives: strictly medical, but also social, organizational or economic. Bodolica and Spraggon concentrated on the creation of patient-centered care and inclusive health-care governance as exemplified by United Arab Emirates [3]. Jones, Johnson Hooper, Cuomo, Crouch, Hickam, Lestishock, Mennito and White studied seven large health care systems in regard to planning, transfer and integration of young adults from pediatric into adult healthcare [23]. Ehikpehae and Kiernan analyzed the impact of the specificity and importance of inter-professional health care teams in palliative care [12]. McClung, Obasi, Knobloch and Safdar focused on healthcare worker perspectives in regard to possible ways of reducing health care–associated infections [26], while Hart indicated possible ways of preventing outpatient health care–associated infections [17]. Cohen reviewed lean methodology, i.e. philosophy of improvement, using a set of instruments and incorporating a long-term vision aiming for continuous improvement in the area of healthcare, which should bring maximization of quality and safety for patients [10]. Problems of the US healthcare system was analyzed by Hoffer [19], while Benzies, Shah, Aziz, Lodha and Misfeldt analyzed the Canadian healthcare organization [2] and Jolanki and Tynkkynen focused on selected European health care systems and their shortages [22]. Moreover, Capelas Barbosa and Cookson [4] and Dos Santos, Perelman, de Andrade Jacinto, Tejada, Aluísio, Barros, Bertoldi, Matijasevich and Santos concentrated on the problem of inequity in health care in Brazil [11], the research project conducted by Zhang, Zhou and Si focused on selected issues of health care system in China [39] and Uğurluoğlu, Ürek and Demir made an attempt to evaluate individuals' satisfaction with health care services in Turkey [32]. Healthcare system of the Netherlands lied in the center of the research conducted by Maarse and Jeurissen [24]. Siciliani and Straume focused on the problems of competition and equity in healthcare markets [30]. Ii and Niu analyzed the satisfaction of the Japanese with the Japanese healthcare system and medical services supply [21]. Younger studied health care systems in Brazil [34], China [35], India [36] and South Africa [37]. Outbreaks of healthcare settings in North America lied in the center of the research conducted by Sood and Perl [31]. The research team formed by Margvelashvili, Karseladze, Abesadze and Kvlividze studied healthcare system of Georgia [25]. Huang, Meyer and Jin analyzed spatial access to health care and elderly ambulatory care sensitive hospitalizations [20]. When it comes healthcare as a determinant of socioeconomic security in Poland and its spatial layout, there is a research gap. The paper aims to fill in this gap.

2. Theoretical background

Security of a state can be defined as the state of being free from danger or threat. The need for security motivates activity and development processes. Security can be analyzed both as a static category (state of security) and a dynamic one (process of security creation). National security entails both internal security and external one. It embraces both political and military security, energy and raw materials security, environmental security, cyber security, as well as socioeconomic security. Socioeconomic security consists of economic security and social security. Economic security is „the condition of having stable income or other resources to support a standard of living now and in the foreseeable future" [1]. Economic security includes "probable continued solvency, predictability of the future cash flow of an individual or a country, as well as employment security or job security" [16]. Economic security, in the context of politics and international relations, is the ability of a nation-state to follow its choice of policies to develop the national economy in the desired manner [1]. Economic aspects of security can be expressed through wealth, debt, income insecurity and / or job insecurity [15]. At present, at the time of unprecedented complexity of global world economy system characterized by not only bilateral but – in many aspects – multilateral agreements and mutual interdependence, economic security forms an important a part of national security. [16] Social security can be understood as "the principle or practice or a program of public provision (as through social insurance or assistance) for the economic security and social welfare of the individual and his or her family" [27]. Social security can also be described as „any of the measures established by legislation to maintain individual or family income or to provide income when some or all sources of income are disrupted or terminated or when exceptionally heavy expenditures have to be incurred (e.g., in bringing up children or paying for health care). Thus, social security may provide cash benefits to persons faced with sickness and disability, unemployment, maternity, responsibility for the care of young children, retirement from work, etc. Social security benefits may be provided in a form of financial assistance, access to public services or legal aid. Social security may be partly the responsibility of central government, and it may be partly provided by local governments, employers or semi-public or autonomous agencies [14; 38]. Moreover, there is strong mutual relation between socioeconomic security and socioeconomic opportunity. Social security results from the implementation of social, legal, material and institutional devices protecting the peace, work, life, health and property of citizens. Social security should be perceived as the primary goal of the social security system. Social security includes both material aspects and strictly social ones [29].

Health security is a broad category. It embraces essential factors determining health of population. Their interdependencies strongly affect the process of obtaining health effects on a social scale. On the other hand, insecurity – objective or subjective – results either directly from illness of a patient or his/her family or indirectly from low accessibility of healthcare services. Health security is created by institutions, regulations and policies which form a subsystem of health security. Health security is supposed to provide healthcare for the society. Health is essential from an economic perspective in the context of socioeconomic development. Health security is a multidimensional and multilayered category. It is strongly connected with the development of healthcare system: healthcare infrastructure, medical personnel,

healthcare policy, access to medical procedures and services (both in regard to time and cost). Healthcare can be, therefore, viewed as a determinant of socioeconomic security. Other social targets cannot be obtained if health security is not met. There is both direct and indirect impact of health security on other areas and types of security. Primary healthcare constitutes essential element required for the creation of necessary health security. Primary healthcare can be defined as "a whole-of-society approach to health focusing on people's needs and preferences as early as possible along the continuum from health promotion and disease prevention to treatment, rehabilitation and palliative care, and as close as feasible to people's everyday environment" [33].

Encyclopedia Britannica defines region (in the social sciences) as "a cohesive area that is homogeneous in selected defining criteria and is distinguished from neighboring areas or regions by those criteria. It is an intellectual construct created by the selection of features relevant to a particular problem and the disregard of other features considered to be irrelevant" [13]. In the undertaken research the category of region in administrative sense was adopted; the research focused on selected Polish regions on NUTS 2 level, i.e. voivodships – provinces.

According to neoclassical theory, market mechanism should result in gradual reduction of regional development disparities. However, a strong evidence of reality being just the opposite can be noted. Regional disparities grow over time despite market economy and its forces, including market mechanism.

Healthcare functionality on regional levels can be assessed in regard to health situation of region's inhabitants, construct of regional healthcare infrastructure and assets, regional medical personnel. One should also take into consideration intensity, quality and cost of regional healthcare services, as well as healthcare financial aspects.

3. Material and methods

Due to the fact that healthcare is a multidimensional category which embraces a number of essential elements, several variables had to be taken into account in the undertaken comparative study and overall analysis. As a result of conducted operationalization, the decision was made to include the following thirteen diagnostic variables in the research process:

- X_1 – Employed doctors per 10 thousand population;
- X_2 – Employed dentists per 10 thousand population;
- X_3 – Employed nurses per 10 thousand population;
- X_4 – Employed midwives per 10 thousand population;
- X_5 – Emergency rescue teams per 10 thousand population;
- X_6 – Beds in hospitals per 10 thousand population;
- X_7 – Out-patient departments per 10 thousand population;
- X_8 – Hospital emergency wards per 100 thousand population;
- X_9 – Beds in chronic medical care homes per 10 thousand population;
- X_{10} – Beds in nursing homes per 10 thousand population;
- X_{11} – Out-patient health care consultations per capita;
- X_{12} – Inpatients in general hospitals per 10 thousand population;
- X_{13} – Persons who received health care service in the place of occurrence per 10 thousand population.

Diagnostic variables X_1 to X_5 represent the area of medical personnel, diagnostic variables X_6 – X_{10} focus on healthcare infrastructure, while the remaining diagnostic variables X_{11} – X_{13} represent intensity of primary medical services.

Statistical information provided by Central Statistical Office (Warsaw, Poland) and taken from and taken from *Statistical Yearbook of the Regions 2011* and *Statistical Yearbooks of the Regions 2018* was used for the analysis. Tables 1 – 4 present the respective statistical material.

The research methods included literature studies, critical thinking, inductive reasoning, deductive reasoning, descriptive analysis and comparative analysis. The selected method of multivariate comparative analysis was adopted, namely Hellwig's taxonomic measure of development. Hellwig's method of multivariate comparative analysis made it possible to make a hierarchy of the analyzed subjects, i.e. Poland's NUTS 2 regions – 16 voivodships / 16 provinces - in terms of medical personnel, healthcare infrastructure and primary medical services measured by synthetic indices.

After selecting the set of diagnostic variables, the character of each of the variables was determined. All twelve variables were considered stimulants. The variables were standardized and development model was constructed – a model unit, where diagnostic variables were determined according to the rule, where:

$z_{0j} = \max_i (z_{ij})$ for stimulants or $z_{0j} = \min_i (z_{ij})$ for de-stimulants.

The distance of *i*-unit from the development model was calculated using Euclid's measure:

$$d_{oi} = \sqrt{\sum_{j=1}^{m} (z_{ij} - z_{oj})^2} \cdot$$

Finally, taxonomic measure of development (TMD) was calculated for each area (i.e. medical personnel, healthcare infrastructure and primary medical services) according to the formula [18; 28):

$\mathrm{TMD}_i = 1 - \frac{d_{oi}}{d_o}$, i=1,2,...,n, where: $d_0 = \bar{d}_o + 2S_0$, and:

$$\bar{d}_0 = \frac{1}{n}\sum_{i=1}^{n} d_{oi}, \quad S_0 = \sqrt{\frac{1}{n}\sum_{i=1}^{n} (d_{oi} - \bar{d}_o)^2}$$, while: $\mathrm{TMD}_i \in [0; 1]$, for i=1, 2,..., n.

The next stage of the taxonomic research was to arrange the analyzed subjects according to the level of healthcare personnel, healthcare infrastructure and intensity of medical services expressed by the synthetic indices TMD.

4. Results

Before the multivariate comparative analysis method of taxonomic measure of development was adopted, the situation in sixteen provinces of Poland in regard to each and every element (diagnostic variable) one by one was studied.

Table 1 presents input data regarding medical personnel. In 2010 the highest number of employed doctors per 10 thousand population was noted in Łódź Province (24.1) and the worst situation was observed in Greater Poland Province (14.6); the average for Poland amounted to 20.4. As far the number of employed dentists per 10 thousand population is concerned, the leading position was taken by West Pomerania (5.2) and the last place was occupied by Greater Poland (1.4); the average for Poland equaled 3.5. In the case of the number of employed nurses per 10 thousand population the best situation was observed in Silesia Province (55.5) and the worst one – again – in Greater Poland Province (39.3); the average for Poland amounted to 48. The highest number of midwives per 10 thousand population was characteristic for Subcarpathia Province (7.2) and the lowest one was noted in Pomerania Province (4.6); the average number of midwives per 10 thousand population in Poland amounted to 5.8. When it comes to the number of emergency rescue teams per 100 thousand population, the leading position was taken by Lubusz Province (5.2), while Lesser Poland Province occupied the last place (3.3); the average number of emergency rescue teams for Poland equaled 4.0 per 100 thousand population. In 2017 the top position in terms of the number of employed doctors per 10 thousand population was noted in Łódź Province (26.9) and the worst situation was observed in Greater Poland Province (16); the average for Poland amounted to 23.2. In the case of the number of employed dentists per 10 thousand population, the leading position was taken by Lubusz Province (5.8) and the last place was occupied by Greater Poland Province (0.7); the average for Poland equaled 3.75. In terms of the number of employed nurses per 10 thousand population the best situation was observed in Świętokrzyskie Province (59.3) and the worst one – again – in Greater Poland Province (38.6); the average for Poland amounted to 50.3. The highest number of midwives per 10 thousand population in 2017 was noted in Subcarpathia Province (7.5) and the lowest one was noted in Warmia-Masuria Province (4.9); the average number of midwives per 10 thousand population in Poland equaled 5.9. The leading position in terms of the number of emergency rescue teams per 100 thousand population in 2017 was taken by Warmia-Masuria Province (5.4), while Greater Poland Province occupied the last place (3.3); the average number of emergency rescue teams for Poland amounted to 4.1 per 100 thousand population.

Tab. 1 Input data – medical personnel [5, 6, 7, 8, 9]

Province	2017					2010				
	X_1	X_2	X_3	X_4	X_5	X_1	X_2	X_3	X_4	X_5
Dolnośląskie	21.9	3.0	49.0	5.1	0.40	19.5	2.5	49.3	5.1	0.39
Kujawsko-pomorskie	24.7	3.8	51.3	6.1	0.42	19.9	3.0	46.9	5.7	0.43
Lubelskie	24.9	3.9	58.2	7.1	0.42	23.9	4.5	54.1	6.6	0.41
Lubuskie	20.2	5.8	46.3	5.4	0.50	17.7	4.6	43.8	5.8	0.52
Łódzkie	26.9	3.9	48.9	6.4	0.40	24.1	2.8	46.8	6.0	0.39
Małopolskie	24.2	4.4	53.5	6.0	0.38	21.7	3.8	50.1	5.8	0.34
Mazowieckie	26.6	2.9	52.2	5.7	0.36	23.3	2.5	48.7	5.5	0.36
Opolskie	20.5	3.9	50.3	5.1	0.42	17.3	2.8	46.7	4.7	0.40

Podkarpackie	21.9	4.5	58.1	7.5	0.40	18.9	4.8	52.6	7.2	0.40
Podlaskie	25.0	3.8	52.1	6.5	0.46	23.6	4.3	52.4	7.0	0.45
Pomorskie	23.5	3.6	41.2	5.0	0.38	19.2	3.1	40.6	4.6	0.37
Śląskie	25.0	3.3	55.2	6.0	0.35	22.3	3.2	55.5	5.9	0.34
Świętokrzyskie	23.9	3.9	59.3	6.4	0.37	21.3	3.4	53.4	5.9	0.36
Warmińsko-mazurskie	21.0	3.7	47.0	4.9	0.54	17.4	3.4	44.2	5.7	0.50
Wielkopolskie	16.0	0.7	38.6	6.0	0.34	14.6	1.4	39.3	6.2	0.34
Zachodniopomorskie	24.8	4.8	44.3	5.4	0.48	22.2	5.2	43.5	5.5	0.48

Legend: Dolnośląskie – Lower Silesia Province; Kujawsko-Pomorskie – Kuyavia-Pomerania Province; Lubelskie – Lublin Province; Lubuskie – Lubusz Province; Łódzkie – Łódź Province; Małopolskie – Lesser Poland Province; Mazowieckie – Masovia Province; Opolskie – Opole Province; Podlaskie – Podlasie Province; Pomorskie – Pomerania Province; Śląskie – Silesia Province; Podkarpackie – Subcarpathia Province; Świętokrzyskie – Świętokrzyskie Province; Warmińsko-Mazurskie – Warmia-Masuria Province; Wielkopolskie – Greater Poland Province; Zachodniopomorskie – West Pomerania Province.

Table 2 presents input data describing healthcare infrastructure. In 2010 the best situation in terms of hospital beds was observed in Silesia Province (56.1 hospital beds per 10 thousand population), while the worst situation was characteristic for Pomerania Province (38.9 beds in hospitals per 10 thousand population); the average for Poland amounted to 46.7. In 2017 Silesia Province kept its leading position with 55.1 hospital beds per 10 thousand population and the worst situation was observed in Pomerania Province again (39.9 hospital beds per 10 thousand population); the average number of hospital beds per 10 thousand population in Poland increased up to 47.7. In 2010 the number of out-patient departments per 10 thousand population ranged from 3.2 in Kuyavia-Pomerania Province to 5.3 in Podlasie Province with the average for Poland amounting to 4.4. In 2017 the situation in terms of out-patient departments looked as follows: minimum was noted in Kuyavia-Pomerania again (4.1), while maximum was observed in Łódź Province (6.5), and the average for Poland increased up to 5.6. In 2010 the average number of hospital emergency wards per 100 thousand population for Poland amounted to 6.1 and it increased up to 6.3 in 2017. Both in 2010 and in 2017 the worst situation was observed in Silesia Province (1.9 hospital emergency wards per 100 thousand population in 2010 and 2.6 hospital emergency wards per 100 thousand population in 2017). The best situation was noted in Podlasie Province both in 2010 and in 2017 (9.2 and 8.4 hospital emergency wards per 100 thousand population respectively). When it comes to chronic medical care homes, the average number of beds per 10 thousand population in Poland increased from 4.97 in 2010 to 6.4 in 2017. There were significant regional disparities both in 2010 and in 2017: in 2010 minimum was noted in West Pomerania Province (1.8) and maximum was noted in Lubusz Province (9.9), while in 2017 the worst situation was observed in Greater Poland Province (2.2) and the best one was characteristic for Lower Silesia Province (9.5). Considerable spatial differences were also seen in regard to nursing homes' beds. The average number of beds in nursing homes per 10 thousand population in Poland amounted to 1.3 in 2010 and it increased up to 1.8 in 2017. In 2010 the number of beds in nursing homes per 10 thousand population ranged from 0 (zero!) in Opole Province to 2.7 in Subcarpathia Province. In 2017 the worst situation was characteristic for Opole Province again (0.1) and the best one was observed in Podlasie Province (4.1).

Tab. 2 Input data – healthcare infrastructure [5, 9]

Province	2017					2010				
	X_6	X_7	X_8	X_9	X_{10}	X_6	X_7	X_8	X_9	X_{10}
Dolnośląskie	50.4	5.3	0.55	9.5	3.6	49.1	4.1	0.45	8.9	2.5
Kujawsko-pomorskie	47.0	4.1	0.48	5.8	2.2	43.6	3.2	0.63	4.5	1.5
Lubelskie	52.6	6.0	0.75	6.1	1.1	52.5	4.5	0.88	3.7	1.1
Lubuskie	43.3	5.8	0.79	9.0	0.4	41.5	4.6	0.69	9.9	0.6
Łódzkie	51.5	6.5	0.69	6.7	0.9	53.4	5.0	0.67	3.9	1.0
Małopolskie	44.3	5.7	0.62	9.3	0.3	43.1	4.2	0.69	6.5	0.3
Mazowieckie	48.5	5.6	0.56	8.8	2.4	46.1	3.8	0.51	6.1	2.1
Opolskie	46.1	5.5	0.71	9.4	0.1	42.7	4.2	0.49	8.6	0.0
Podkarpackie	48.0	5.8	0.61	6.6	3.0	45.4	4.3	0.52	5.3	2.7
Podlaskie	50.3	6.4	0.84	3.4	4.1	50.2	5.3	0.93	2.4	2.2
Pomorskie	39.9	4.4	0.56	5.6	0.9	38.9	3.5	0.54	3.6	0.1
Śląskie	55.1	6.3	0.26	7.1	3.2	56.1	5.3	0.19	5.6	2.3
Świętokrzyskie	49.0	5.0	0.80	6.5	0.5	50.9	3.9	0.71	4.1	0.3
Warmińsko-mazurskie	46.8	6.1	0.77	3.6	1.6	41.9	5.0	0.63	2.4	1.4
Wielkopolskie	44.8	5.5	0.69	2.3	1.7	45.7	4.4	0.76	2.2	1.2
Zachodniopomorskie	46.3	5.7	0.47	2.8	2.6	46.0	4.6	0.47	1.8	2.2

Table 3 presents input data regarding primary healthcare services. In 2010 out-patient healthcare consultations per capita ranged from 6.4 in Lubusz Province to 8.0 in Łódź Province, with the average for Poland amounting to 7.3. In 2017 the average number of out-patient healthcare consultations in Poland increased to 8.3; it maximum was noted in Masovia Province (9.1) and its minimum was observed in Opole Province (7.4). There was a slight decrease in the average number of inpatients in general hospitals per 10 thousand population in the analyzed period of time: from 2031 in 2010 down to 2013 in 2017. In 2010 the number of inpatients in general hospitals per 10 thousand population ranged from 1738 in Lubusz Province to 2537 in Łódź Province, while in 2017 it ranged from 1652 in Opole Province to 2274 in Świętokrzyskie Province. There were really huge regional disparities in regard to the number of persons who received healthcare service in the place of occurrence: in 2010 the number of persons who received health care service in the place of occurrence per 10 thousand population ranged from 517 in Greater Poland Province to 955 in Lower Silesia Province (the average for Poland amounted to 753 then) and in 2017 it ranged from 581 in Greater Poland Province to over 1046 in West Pomerania province (the average for Poland equaled a bit over 835 then).

Tab. 3 Input data – primary healthcare services [5, 9]

Province	2017			2010		
	X_{11}	X_{12}	X_{13}	X_{11}	X_{12}	X_{13}
Dolnośląskie	8.5	2005.0	1036.9	7.5	2215.6	954.7
Kujawsko-pomorskie	8.5	1861.0	890.1	7.6	1809.0	833.5
Lubelskie	8.8	1933.0	913.9	7.8	2144.1	843.9
Lubuskie	7.6	2004.0	775.1	6.4	1737.8	751.8
Łódzkie	9.0	2253.0	830.6	8.0	2537.3	820.2

Małopolskie	8.6	1855.0	689.9	7.4	1910.2	633.9
Mazowieckie	9.1	2167.0	892.1	7.5	2179.4	800.8
Opolskie	7.4	1652.0	724.4	6.5	1752.1	644.1
Podkarpackie	7.8	2014.0	685.7	6.8	1930.0	599.0
Podlaskie	8.7	2221.0	716.3	7.9	2061.0	793.3
Pomorskie	8.3	1667.0	725.0	7.3	1814.8	613.6
Śląskie	8.8	2050.0	921.5	8.0	2020.8	785.4
Świętokrzyskie	7.6	2274.0	1043.5	7.0	2283.6	804.8
Warmińsko-mazurskie	7.7	2051.0	891.4	7.1	1863.6	775.8
Wielkopolskie	8.1	2065.0	581.6	7.2	2301.0	517.0
Zachodniopomorskie	8.5	2131.0	1046.5	7.4	193,78	870.0

Due to the abovementioned complexity of the category of healthcare security, and each of its studied areas, i.e. medical personnel, healthcare infrastructure and primary healthcare services, statistical research with the adoption of the selected method of multivariate comparative analysis was conducted. It made it possible to identify and evaluate the disparities among the studied regions not only separately in terms of each element (each diagnostic variable), but also altogether in regard to each analyzed area. The obtained results of research with the implementation of Hellwig's taxonomic measure of development are presented in table 4 (synthetic index of medical personnel), table 5 (synthetic index of healthcare infrastructure) and table 6 (synthetic index of primary healthcare services).

Tab. 4 Synthetic index of medical personnel [Own calculations]

Position	Province	TMD 2017	Province	TMD 2010
1	Lubelskie	0.619	Podlaskie	0.771
2	Podlaskie	0.608	Lubelskie	0.701
3	Podkarpackie	0.584	Podkarpackie	0.613
4	Kujawsko-pomorskie	0.524	Zachodniopomorskie	0.520
5	Małopolskie	0.499	Lubuskie	0.478
6	Łódzkie	0.498	Świętokrzyskie	0.468
7	Świętokrzyskie	0.492	Kujawsko-Pomorskie	0.453
8	Zachodniopomorskie	0.465	Ślaskie	0.451
9	Lubuskie	0.444	Łódzkie	0.447
10	Śląskie	0.396	Małopolskie	0.439
11	Mazowieckie	0.359	Warmińsko-mazurskie	0.421
12	Warmińsko-mazurskie	0.357	Mazowieckie	0.364
13	Opolskie	0.350	Dolnośląskie	0.329
14	Dolnośląskie	0.302	Opolskie	0.255
15	Pomorskie	0.244	Pomorskie	0.189
16	Wielkopolskie	0.001	Wielkopolskie	0.080

When it comes to the synthetic index of medical personnel, Lublin Province, Podlasie Province and Subcarpathia Province formed the top trio both in 2010 and 2017, while Greater Poland Province and Pomerania Province created the duo with the lowest value of the index. In the case of healthcare infrastructure, Podlasie Province obtained the highest level of the synthetic index both in 2010 and in 2017. Lublin

Province took the second highest position in 2010 and it was classified on the third place in 2017. Łódź Province was positioned among the top three Poland's regions in regard to the synthetic index of healthcare infrastructure in 2010, but in 2017 it took the fifth position. On the other hand, Lower Silesia Province was classified as the fourth region according to the synthetic index of healthcare infrastructure in 2010, and in 2017 it took the second position (just behind Podlasie Province). Pomerania Province and Kuyavia-Pomerania Province were the two regions with the lowest value of the synthetic index of healthcare infrastructure both in 2010 and in 2017.

Tab. 5 Synthetic index of healthcare infrastructure [Own calculations]

Position	Province	TMD 2017	Province	TMD 2010
1	Podlaskie	0.562	Podlaskie	0.486
2	Dolnośląskie	0.541	Lubelskie	0.466
3	Lubelskie	0.533	Łódzkie	0.459
4	Podkarpackie	0.531	Dolnośląskie	0.428
5	Łódzkie	0.521	Podkarpackie	0.369
6	Mazowieckie	0.501	Lubuskie	0.340
7	Warmińsko-Mazurskie	0.394	Mazowieckie	0.326
8	Śląskie	0.377	Wielkopolskie	0.300
9	Świętokrzyskie	0.351	Ślaskie	0.300
10	Opolskie	0.328	Świętokrzyskie	0.293
11	Lubuskie	0.310	Małopolskie	0.288
12	Małopolskie	0.292	Warmińsko-Mazurskie	0.254
13	Zachodniopomorskie	0.271	Zachodniopomorskie	0.250
14	Wielkopolskie	0.257	Opolskie	0.202
15	Kujawsko-Pomorskie	0.181	Kujawsko-Pomorskie	0.177
16	Pomorskie	0.038	Pomorskie	0.001

Tab. 6 Synthetic index of primary healthcare services [Own calculations]

Position	Province	TMD 2017	Province	TMD 2010
1	Mazowieckie	0.784	Łódzkie	0.822
2	Zachodniopomorskie	0.749	Dolnośląskie	0.730
3	Łódzkie	0.728	Lubelskie	0.689
4	Śląskie	0.720	Mazowieckie	0.646
5	Dolnośląskie	0.677	Podlaskie	0.612
6	Lubelskie	0.624	Świętokrzyskie	0.589
7	Podlaskie	0.562	Śląskie	0.584
8	Kujawsko-Pomorskie	0.521	Zachodniopomorskie	0.537
9	Świętokrzyskie	0.515	Kujawsko-Pomorskie	0.465
10	Warmińsko-Mazurskie	0.448	Warmińsko-Mazurskie	0.412
11	Małopolskie	0.383	Małopolskie	0.370
12	Lubuskie	0.345	Wielkopolskie	0.349
13	Podkarpackie	0.329	Pomorskie	0.298
14	Wielkopolskie	0.312	Podkarpackie	0.269
15	Pomorskie	0.252	Lubuskie	0.211
16	Opolskie	0.108	Opolskie	0.177

As far as the intensity of primary healthcare services is concerned, the lowest value of the synthetic index was noted for Opole Province both in 2010 and in 2017. In 2010 the leading position in terms of primary healthcare services measured by the synthetic index was noted in Łódź Province, Lower Silesia Province took the second position and Lublin Province was classified on the third place. In 2017 Masovia Province took the top position, West Pomerania Province was positioned on the second place and Łódź Province was classified as the third best region.

Conclusion

Poland's healthcare system is far from satisfactory. There are several problems on both central and regional level due to insufficient financing, medical staff limitations and restricted access to healthcare services. The conducted research made it possible to positively verify the adopted hypotheses. Obtained research results indicated persistence of considerable regional disparities. Undoubtedly, the regional disparities can be perceived as an essential barrier for equal socioeconomic security.

Practical implications resulting from the research focus on economic policy recommendations, in particular for an active creation of a more effective healthcare system in Poland, in order to promote a more balanced regional layout. Having in mind the main objective of health care policy on regional level, i.e. the improvement of health and health security of inhabitants of the province, it is recommended to:

- undertake necessary measures in order to adapt healthcare infrastructure to demographic, epidemiological and economic conditions;
- strengthen human resources for health care (both in regard to number and professional competence of doctors, dentists, paramedics with the stress on medical dispatchers, nurses, midwives and physiotherapists).
- intensify health promotion, health threats prevention and early detection of diseases (primary and secondary prophylaxis);
- support innovative medical solutions and development of medical technologies in health care.

Limitations of the research relate to the period of time taken into consideration as well as the scope of research in regard to indices.

Further research could and should include additional elements relating to healthcare, in that: quality of health services, availability of health procedures (both in regard to cost and waiting time). Additionally, health status of the society should be studied with the use of selected health indices (e.g. life expectancy at birth, average age of a citizen, mortality rate, infant mortality rate, incidence of selected civilization diseases). More detailed research project focusing on the disparities between rural and urban areas in terms of medical personnel, healthcare infrastructure and accessibility of medical services should also be undertaken. Moreover, future research should focus on the comparison of the situation in Polish healthcare with other European Union Member States, having in mind also the regional dimension.

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