

QUALITY OF NATIONAL HEALTHCARE SYSTEMS IN VISEGRAD GROUP COUNTRIES COMPARED TO SELECTED EU COUNTRIES

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Abstract

The quality of national healthcare systems in Visegrad Group countries (G4), was analyzed based on data obtained from Eurostat, WHO, and Health Consumer Powerhouse for 2004 and 2012 and compared to selected EU countries. The non-parametric DEA method was applied to analyze efficiency and the standardized result of the Euro Health Consumer Index was employed to analyze effectiveness. Relying on these two measures, the performance of national healthcare systems was assessed by means of the “modified” Pareto ordering. An index which takes into account 4 dimensions: efficiency, effectiveness, patients' satisfaction and social welfare growth was proposed for system quality assessment. In the analyzed period, the performance of social healthcare systems in G4 countries increased the most in Slovakia (by 23 percentage points), Hungary (21 points) and the Czech Republic (8 points). In Poland the system performance decreased by 1 percentage point. The quality of healthcare systems in G4 countries is higher than in Portugal and Spain and comparable to the system quality in the United Kingdom and Germany when we treat each dimension equally. When the quality of the system is measured from patients' point of view (performance and patients' satisfaction weigh more), G4 countries offer a significantly lower quality of healthcare systems.

Keywords: healthcare system, quality, DEA, EHCI (Euro Health Consumer Index)

JEL Codes: I13, I18, O57

1. Introduction

One of the basic tasks of the policy is to provide good health care, because it works for health and invests in people. A healthy society is capable of effectively creating material goods. Health therefore has economic significance in the context of socio-economic development of each country [Bhargava, A. et al., 2001]. The aim of this paper is to analyze the quality (medical treatment efficiency and effectiveness) of national healthcare systems in Visegrad Group countries: the Czech Republic, Hungary, Poland and Slovakia compared to selected EU countries [tab. 1, 2, 3].

Tab. 1. Visegrad Group, 2016

Country	Area	Population	GDP \$ per capita	GDP \$ billions
The Czech Republic	78866	10538275	33223	350.8

Hungary	93030	9848000	26222	258.4
Poland	312685	38483957	27714	1052.2
Slovakia	49035	5421349	29720	160.9

Source: <http://www.visegradgroup.eu/>

The fundamental problem with determining the “adequately high quality” and the strategic decision-making process in the healthcare system depends largely on the environment. The complexity of the problem, in particular in the analyzed countries, deepens the limitation of the budget allocated to the activities of healthcare institutions. Therefore, the assessment of the systems will depend on the government’s selection of such solutions as are compliant with the principle of economic efficiency, activity effectiveness and social justice [Fukuyama, 2005]. The structure of the article is: The performance of national healthcare systems will be assessed based on data on health obtained from Eurostat, WHO, and Health Consumer Powerhouse. The system’s performance depends on its efficiency and effectiveness. Efficiency was calculated with the DEA method, whereas effectiveness (patients’ satisfaction) was determined based on the EHCI (**Euro Health Consumer Index**). The systems were compared in terms of performance with the use of a modified Pareto efficiency. Afterwards, in order to obtain a fuller picture of social welfare of the analyzed countries (Cf. Fukuyama), the relative social welfare increase was calculated, with a country’s social welfare being measured with Sen’s abbreviated welfare function. The analysis should help identify the directions of healthcare system transformation such that their effectiveness and efficiency is improved, thus increasing patient satisfaction [Hollingsworth B., 2008].

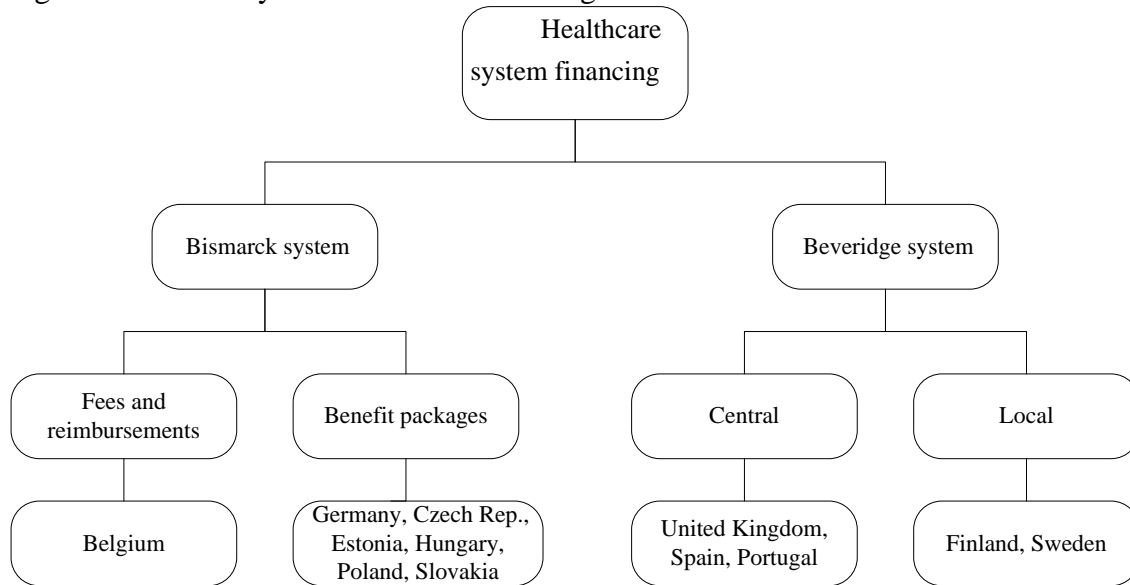
Modern healthcare systems operate in an unstable environment resulting from the following social transition factors:

- Demographic changes (aging societies),
- Fast pace of technological innovations,
- Changing (more demanding) expectations of patients and society,
- Increased costs as a consequence of previous factors.

Therefore the efficiency of entire system and of specific medical institutions should be optimized so as to meet the social expectations. The member states of the European Union use the two basic systems of financing healthcare. First, Bismarck insurance system is derived from solutions adopted by sickness insurance law initiated by Otto von Bismarck in 1883. It provided for compulsory participation by all industrial wage earners. The cost of the insurance was divided between employers and the employed, the workers were protected from consequences of random events such as the loss of material safety of workers’ families [Kautsch M., Klich J., Whitfeld M. (2001)].

The Beveridge model was introduced in 1948 in the United Kingdom (UK) and excluded medical care from the 1911 social insurance system. Medical care is provided and financed by the government through general taxes. Thus the healthcare system monopolized by the state provided health services to all citizens. Figure 1 shows how Bismarck and Beveridge systems are implemented in selected countries of the European Union (Biernacki, M., 2017).

Fig. 1. Healthcare systems and their financing in selected countries



Source: modification for Niznik J., 2004

2. Description of selected national healthcare systems

The Euro Health Consumer Index (EHCI), which has been calculated annually by Health Consumer Powerhouse since 2004, was used for assessing the effectiveness of national healthcare systems in Europe. The idea of the measurement is to assess the efficiency of providing healthcare services from the patient's viewpoint. In 2012, the assessment included five categories: 1. Patient's rights and information, 2. Waiting time for treatment, 3. Effects of treatment, 4. Scope and range of the provided services, and 5. Pharmaceuticals. There were a few or even a dozen or so subcategories distinguished in each category. The set of values of each of the indicators calculating the value in each subcategory was broken down into three subsets. The indicators assume three point values: 1, 2, 3, depending on the subset into which the value of the examined characteristic falls. The closer the value of the characteristic to the desired one, the higher the result. The number of indicators in individual subcategories varies and therefore the weighted average was applied to assess the system within the subcategories. The maximum number of points in each annual edition is 1,000. This enables the analysis of the growth rate of European healthcare systems and shows how the treatment process can be improved by ensuring a better availability of services, reducing the risk of medical failures, improving treatment results – even in the conditions of increasing limitations of the budget – and expanding the scope and availability of financial benefits from public funds.

With the use of Eurostat data for 2004 and 2012, the non-parametric DEA method was applied to assess the efficiency of selected European healthcare systems. The following were adopted as input data of the process: % of GDP allocated to healthcare, GDP purchasing power parity per capita, the number of physicians per 100 thousand inhabitants. The output data of the healthcare process include: deaths in thousand due to cancers and cardiovascular diseases per 100 thousand inhabitants, as well as life expectancy (E) and the average number of healthy life years (HLY). The data are presented in Table 2.

The analysis covered Visegrad Group countries, that is the Czech Republic, Hungary, Poland and Slovakia, which have adopted the Bismarck system of financing, and the countries which represent various healthcare financing methods: Bismarck and Beveridge. Representatives of the Beveridge central system are the UK, Spain and Portugal, while of the

Beveridge local system – Finland and Sweden. The Bismarck system, with benefits in kind, is represented by Germany and Belgium.

Table 2. Selected descriptive data of national healthcare systems, 2004 and 2012

Country	2004			2012		
	%GDP	Phys	E	%GDP	Phys	E
Belgium	9,68	286,8	79,1	11,2	295,2	80,5
Czech Rep	6.9	351.8	76.0	7.24	398.9	78.4
Estonia	5.13	321.3	72.3	5.72	328.3	76.6
Finland	8.21	259.0	79.0	9.4	301.7	81.2
Germany	10.67	339.1	79.4	11.3	405.4	80.7
Hungary	8.22	333.7	73.0	8.05	320.9	75.8
Poland	6.2	229.0	75.0	6.66	221.4	77.3
Portugal	10.5	328.3	78.4	9.71	339.5	80.9
Slovakia	7.21	314.6	74.4	8.21	342.8	75.7
Spain	8.22	346.3	80.5	8.88	381.3	83.2
Sweden	9.09	344.8	80.6	9.71	411.7	82.1
UK	7.91	231.3	79.0	9.12	278.0	81.2

Source: Eurostat ec.europa.eu/eurostat/statistics-explained/.../Healthcare_statistics

Indicators with regard to financing system are given in columns 2 and 5 (national health expenditure (% GDP)). Columns 3 and 6 represent current conditions of healthcare system: numbers of physicians per 100 thousand inhabitants.

In order to assess social welfare in the analyzed countries, Sen's abbreviated welfare function was employed: $IS = \mu (1 - G)$, where μ – GDP per capita, Gini (G) – the Gini coefficient measuring income distribution unevenness. The data and results are presented in Table 3.

Table 3. Comparison of social welfare in selected countries

Country	Gini	2004			2012		$\frac{IS_{12} - IS_4}{IS_4}$
		μ	$\mu(1-G)$	G	μ	$\mu(1-G)$	
Belgium	.305	35589	24734	.275	44740	32436	0.311
Czech Rep.	.275	25571	18539	.261	28307	20919	0.128
Estonia	.336	22219	14753	.329	25287	16968	0.150
Finland	.279	38700	27903	.271	39489	28788	0.032
Germany	.304	37924	26395	.283	43035	30856	0.169
Hungary	.299	22190	15555	.308	22337	15457	-0.006

Poland	.354	16987	10974	.324	22872	15462	0.409
Portugal	.389	26744	16341	.360	25953	16610	0.017
Slovakia	.271	19490	14208	.261	25507	18850	0.327
Spain	.333	33377	22263	.354	31657	20450	-0.081
Sweden	.261	41184	30435	.271	43263	31539	0.036
UK	.360	36851	23585	.323	36765	24890	0.055

Source: own elaboration based on data from <http://ec.europa.eu/eurostat/web/products-datasets/-/tps00152>

3. Analyzing the quality of healthcare systems

Table 4 presents the performance of the healthcare systems in the analyzed countries in 2004 and 2012. A system's performance depends on its efficiency and effectiveness. System efficiency was measured with the DEA method. Since in this dimension we are interested in the effectiveness of healthcare system, we want to measure how "wasteful" the system is, that is how well the expenditures (financial resources) are used. I also assume that in the analyzed national healthcare systems treatment techniques are similar and hence I adopt input oriented CCR model. The closer the result to unity, the more efficient the system. Treatment effectiveness is assessed with the value of the Euro Health Consumer Index standardized to one. The countries which improved their treatment efficiency in the period were Estonia, Hungary, and Slovakia. The Czech Republic and Poland decreased their treatment efficiency, while treatment effectiveness measured with the EHCI improved by 0.3 in the Czech Republic and only by 0.1 in Poland (Table 4). According to the EHCI, the Czech Republic and Estonia have the best healthcare systems from among Central and Eastern European countries. In this group, Poland has the most efficient healthcare system, yet it is one of the least effective ones in Europe. Estonia has the lowest total health expenditure per capita and is ranked second in terms of treatment effectiveness among Central and Eastern European countries. It is worth noting that healthcare system effectiveness is strongly (positively) correlated with the country's wealth and (negatively) correlated with the number of inhabitants. Correlation coefficient between DEA and EHCI in the analyzed countries in 2004 was $\rho = 0,258$, and in 2012 it was negative and equal to $\rho = (- 0,376)$.

Table 4. Comparison of efficiency and effectiveness of national healthcare systems

Country	2004		2012	
	DEA	EHCI	DEA	EHCI
1. Belgium	0.8470	0.533	0.6243	0,820
2. Czech Republic	0.6953	0.403	0.5440	0.714
3. Estonia	0.5597	0.421	0.6154	0.677

4. Finland	0.9458	0.496	0.7536	0.846
5. Germany	0.6823	0.571	0.5652	0.812
6. Hungary	0.3464	0.453	0.6274	0.601
7. Poland	1.000	0.409	0.8787	0.511
8. Portugal	0.9399	0.435	0.5288	0.722
9. Slovak Republic	0.4515	0.369	0.6226	0.665
10. Spain (H)	1.000	0.437	0.5886	0.670
11. Sweden (S)	1.000	0.566	0.5619	0.761
12. UK (U)	1.000	0.436	0.7536	0.718

Source: own elaboration based on data from <http://ec.europa.eu/eurostat/web/products-datasets/-/tps00152>; <https://healthpowerhouse.com/>

The modified Pareto efficiency, presented in Fig. 2, is defined in two stages. At the first stage, the arithmetic mean of efficiency and effectiveness of a given country's healthcare system is calculated. At the second stage, it is determined in which of the 9 formed squares the analyzed country is located. A unit segment is divided into three equal parts and it is checked to which of them DEA and EHCI results of a particular country belong.

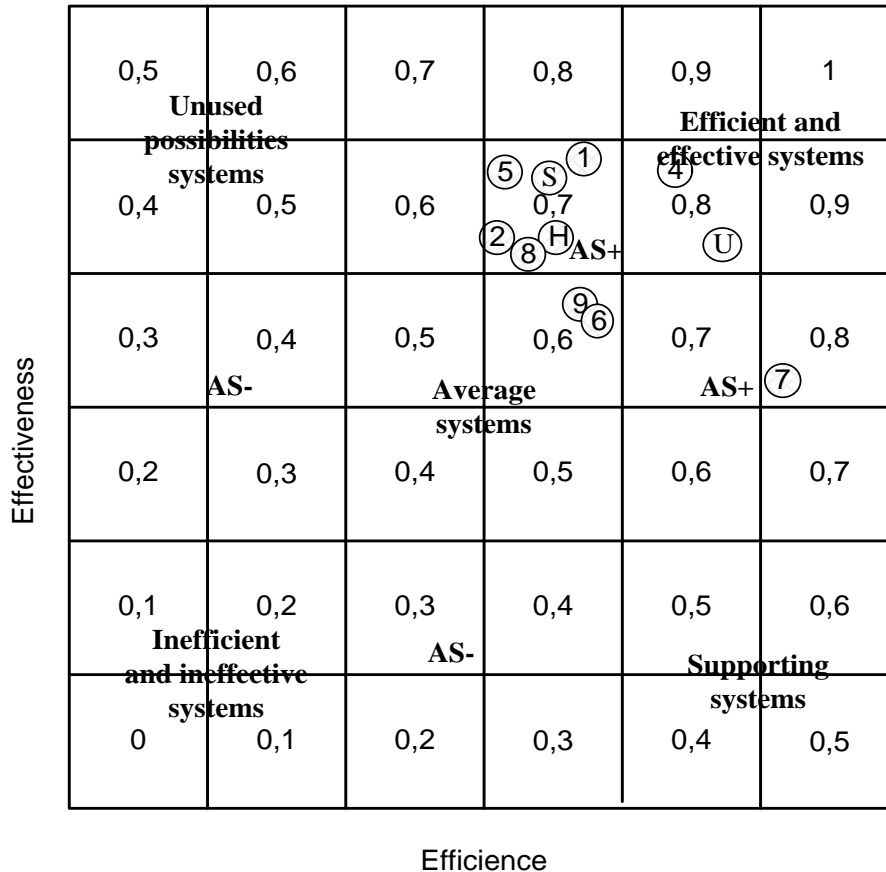
Table 5. Comparison of performance of national healthcare systems

Country	2004		2012	
	Average performance	Rating	Average performance	Rating
1. Belgium	0.690	EE	0.722	EE
2. Czech Rep.	0.5492	AS	0.629	AS+
3. Estonia	0.4904	AS	0.6462	AS+
4. Finland	0.7209	AS+	0.7998	EE
5. Germany	0.6267	AS+	0.6886	AS+
6. Hungary	0.3997	AS	0.6142	AS
7. Poland	0.7045	AS+	0.6949	AS+
8. Portugal	0.6875	AS+	0.6254	AS+
9. Slovak Rep.	0.4103	AS	0.6438	AS+
10. Spain (H)	0.7185	AS+	0.6293	AS+
11. Sweden (S)	0.783	AS+	0.6615	AS+
12. UK (U)	0.718	AS+	0.7358	EE

Source: own elaboration based on data from <http://ec.europa.eu/eurostat/web/products-datasets/-/tps00152>; <https://healthpowerhouse.com/>

The numbers assigned to particular squares and countries (figure 2) are the values of the function $f(x, y) = \frac{x+y}{2}$, and more precisely the values of contour lines of this function. We can also assume that the value of efficiency is presented as a normalized distance from the beginning of the coordinate system (0, 0), that is $f(x, y) = \sqrt{x^2 + y^2} / \sqrt{2}$.

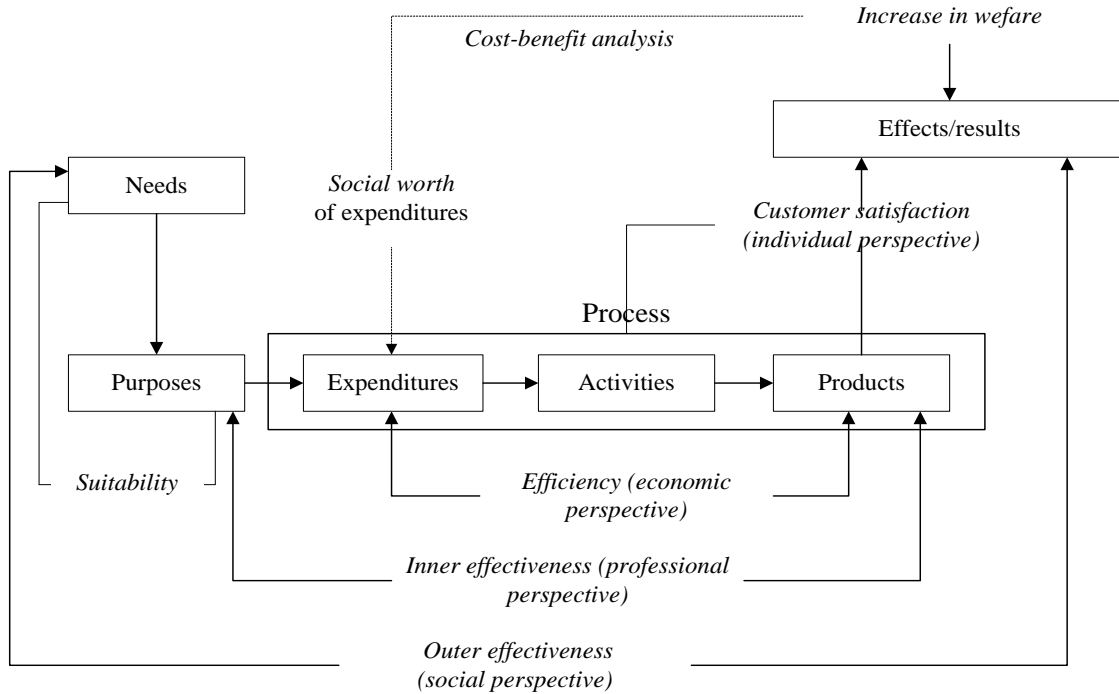
Fig. 2. Comparison of effectiveness and efficiency levels, 2012



Source: Modification for Gori, Vittadini, 1999

Health can be treated as a capital good which influences a household's income, that is economic welfare, as well as a consumer good, which directly influences an individual's welfare. On the other hand, the purpose of healthcare and education is to improve social welfare of a country's citizens. Hence the proposal of a synthetic index (Biernacki *et al.*, 2013) to comprise the economic dimension, that is efficiency, the professional dimension, that is treatment effectiveness, the personal dimension, that is patient satisfaction, and the social dimension, that is social welfare improvement (Fig. 3). Since the EHCI contains the dimensions of internal effectiveness and patient satisfaction, it is proposed that IQ index has equal weights for each dimension: 0.25 for DEA, 0.25 for the effectiveness of treatment, 0.25 for patient satisfaction and 0.25 for welfare growth. The results of the synthetic IQ index, which assesses the healthcare system quality, are provided in Table 5. From the viewpoint of the patient, who is not much interested in system efficiency, IQ_P weights could be as follows: 0.7 for EHCI (0.35 for the effectiveness of treatment and 0.35 for patient satisfaction), 0.2 for DEA, and 0.1 for the relative welfare increase. The IQ index value and the ranking list of national healthcare systems will change then.

Fig. 3. The basic elements of the assessment of a public institution



Source: Modification for Lubinska T., 2009,

Table 6 . Results of the synthetic index of the quality of the healthcare system

2012					
Country	$\frac{IS_{12} - IS_4}{IS_4}$	Average performance	Rating	IQ	IQ _P
Belgium	0.311	0.722	EE	0.6438	0.7280
Czech Rep	0.128	0.629	St+	0.5250	0.6214
Estonia	0.150	0.6462	St+	0.5299	0.6120
Finland	0.032	0.7998	EE	0.6194	0.7461
Germany	0.169	0.6886	St+	0.5896	0.6983
Hungary	-0.006	0.6142	St	0.4559	0.5456
Poland	0.409	0.6949	St+	0.5774	0.5743
Portugal	0.017	0.6254	St+	0.4975	0.6129
Slovak Rep	0.327	0.6438	St+	0.5699	0.6227
Spain	-0.081	0.6293	St+	0.4619	0.5786

Sweden	0.036	0.6615	St+	0.5300	0.6487
England	0.055	0.7358	EE	0.5612	0.6588

Source: own elaboration based on data from <http://ec.europa.eu/eurostat/web/products-datasets/-/tps00152>; <https://healthpowerhouse.com/>

4. Conclusion

Analyzing the performance of healthcare systems in G4 countries in 2012 we can state that it was Poland that had the best performance of 69.49%, although it decreased by 1 percentage point compared to 2004. The next were Slovakia (64.38%) – an increase by 23 percentage points, the Czech Republic (62.9%) – an increase by 8 percentage points and Hungary (61.42%) – an increase by 21 points. Among other analyzed countries a decrease in the performance of healthcare systems was observed. In Portugal the performance of the system was 62.54% - a decrease by 6 percentage points. In Spain it was 62.93% - a decrease by 9 percentage points and in Sweden 62.93% - a decrease by 12 points. An increase in the performance of the system was observed in the United Kingdom (by 2) and Germany (by 6 percentage points) where it was 73.58% and 68.86% respectively.

Comparing the quality of healthcare systems by means of aggregate index with equal weights evaluating the four dimensions: effectiveness of treatment, performance of the system, patients' satisfaction and welfare growth, we can say that the system is better in G4 countries than in Portugal and Spain and comparable to the systems in the United Kingdom and Germany. Among G4 countries Poland is slightly better than Slovakia, the Czech Republic and Hungary. The ranking list of G4 countries with respect to the quality as perceived by the patient, that is such in which the effectiveness of treatment and patient satisfaction have the highest weights (0.35), is as follows: Slovakia, the Czech Republic, Poland, and Hungary. In terms of this index, G4 countries are the weakest among the analyzed countries.

It is healthcare that is responsible for social health although, according to Lalonde, social health is influenced by the following factors: genetics, behaviors and lifestyle, environment, that is economic, social, cultural, and physical factors, as well as organization of the healthcare system. In 1995, Badura [Badura B. (1995)] broke down the factors influencing mortality resulting from various diseases into percentages; in the case of cardiovascular diseases, the distribution was as follows: 25% (biology), 9% (environment), 54% (lifestyle), and 12% (healthcare); and in the case of cancers: 29%, 24%, 37%, and 10%, respectively.

Therefore, in order to considerably improve social health in the analyzed countries, promotion of healthy lifestyle should be enhanced and preventive genetic and oncological programs should be introduced.

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