ORIGINAL ARTICLE

UDC: 657.478:614]:[364.2:61
DOI: https://doi.org/10.2298/VSP210414089S

Forecasting analysis of selected health- and economy-related indicators in South Eastern European and Balkan countries

Analiza predviđanja odabranih zdravstvenih i ekonomskih indikatora u zemljama Jugoistočne Evrope i Balkana

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Abstract

Background/Aim. Health indicators provide comparable information relevant to defining health goals. The aim of this study was to perform a forecasting analysis of the selected indicators, which could help anticipate the future necessities in the health economy and prevent the problems that would predictively grow in the future. **Methods.** Health indicators are collected from publicly available databases of the World Health Organization and Eurostat. We used the quantitative forecasting technique, commonly used for historical data, to predict several years in the future concerning selected health- and economy-related indicators. **Results.** Total health expenditures as a percentage of gross domestic product (GDP) by 2025 will increase in most of the 17 surveyed countries. The percentage of direct household budget payments (out-of-pocket) for health services will decrease in half of the countries, while values of GDP expressed in US$ will increase significantly compared to the last surveyed year (2017), except in Greece. The infant mortality indicator shows that the numbers will decrease in each surveyed country, while the urban population percentage will rise almost in each country except Estonia. Life expectancy will increase in each surveyed country. **Conclusion.** Health- and economy-related indicators must be monitored over time, as they provide significant information concerning the relevant issues in the health care system. Moreover, they may indicate changes that should be made in order to accomplish progress in each individual country.

Key words:
balkan peninsula; europe, eastern; forecasting; health care costs; health care economics and organization; health care evaluation mechanisms; health care reform; statistics; health status indicators.

Apstrakt

Uvod/Cilj. Zdravstveni indikatori pružaju uporedive informacije relevantne za definisanje zdravstvenih ciljeva. Cilj ovog rada bio je da se izvrši analiza predviđanja odabranih indikatora koji bi mogli da pomognu u predviđanju budućih potreba u ekonomiji zdravstva i sprečavanju problema koji bi u budućnosti mogli prediktivno da rastu. **Metode.** Zdravstveni pokazatelji su prikupljeni iz javno dostupnih baza podataka Svetske zdravstvene organizacije i Eurostata. Koristili smo tehniku kvantitativnog predviđanja koja se obično koristi za istorijske podatke, za predviđanje nekoliko godina u budućnost, uzimajući u obzir odabrane indikatore povezane sa zdravstvom i ekonomijom. **Rezultati.** Ukupni izdaci za zdravstvo kao procenat bruto domaćeg proizvoda (BDP) do 2025. godine povećaće se u većini od 17 analiziranih zemalja. Procenat plaćanja za zdravstvene usluge direktno iz budžeta domaćinstava smanjiće se u polovini analiziranih zemalja, dok će vrednosti BDP-a, izražene u američkim dolarima, znatno porasti u poređenju sa poslednjom analiziranom godinom (2017), osim u Grčkoj. Pokazatelj mortaliteta novorođenčadi pokazuje da će se brojevi smanjiti u svakoj analiziranoj zemlji, dok će procenat gradskog stanovništva rasti gotovo u svakoj zemlji, osim u Estoniji. Očekivani životni vek će se povećati u svakoj od pomenutih zemalja. **Zaključak**. Indikatori povezani sa zdravljem i ekonomijom moraju se pratiti tokom vremena, jer pružaju značajne informacije o relevantnim pitanjima u zdravstvenom sistemu. Štaviše, oni mogu ukazivati na promene koje bi trebalo izvršiti kako bi se postigao napredak u svakoj pojedinačnoj zemlji.

Ključne reči:
balkansko poluostrvo; evropa, istočna; predviđanje; zdravstvena zaštita, troškovi; zdravstvena zaštita, ekonomija i organizacija; zdravstvena zaštita, ocena kvaliteta; zdravstvo, unapređenje; statistika; zdravstveno stanje, indikatori.

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Introduction

A health indicator is a parameter used in order to gather information on certain priority topics concerning the health of the population or activities within the health system [1]. Health indicators provide comparable information across different geographical, organizational, or administrative territories and can track progress over time. They help monitor the key performance dimensions described in the health system performance measurement framework (HSPMF), which provides a common approach to health system management across the country [2].

Health indicators try to describe and monitor the health status of the population [3]. Attributes refer to health characteristics or qualities, while the concept of health itself encompasses physical, emotional, spiritual, environmental, mental, and social well-being [4, 5].

The reason why indicators are used in public health is to initiate health decisions. The ultimate goal is to improve the health of the population and reduce diseases and gender inequalities [6].

Health systems have a vital and lasting responsibility for human health throughout life. They are crucial for the healthy development of individuals, families, and societies everywhere [7, 8]. Real progress in health, according to the United Nations (UN) millennium development goals (UNMDG) and other national health priorities, vitally depends on a stronger health system based on primary health care [9, 10], like it was in former Yugoslavia.

Serbia and other Balkan countries share many historical specifics and a common heritage with the countries of Eastern Europe led by the Russian Federation [11]. This legacy is often attributed to the fact that the founding of the Semashko health care system was embedded in Bismarck's mixed model, accepted in the former Yugoslavia [12, 13]. The Bismarck system was established in 1893 in Germany, while the English Beveridge system was established in 1911 with many elements taken from the Russian Imperial model [14, 15].

In short, indicators play a key role in turning data into relevant information for public health decision-makers. Health indicators are relevant for defining the health goals that national health authorities should pursue [16].

Countries that have been chosen to be compared share similar historical backgrounds, but still, some of them are more successful than others in managing indicators related to different health systems [17]. Adapting the current health system and introducing the elements from the health system of other countries may be useful from the point of view of progress [18, 19].

The aim of this study was to perform a forecasting analysis of certain indicators which could help anticipate the future necessities in decision-making concerning the health economy and prevent problems that would predictively grow in the future.

Methods

The countries of interest that were surveyed are the following: Albania, Bosnia and Herzegovina, Bulgaria, Greece, Croatia, Montenegro, Northern Macedonia, Romania, Serbia, Slovenia, Turkey, Russia, Belarus, Lithuania, Latvia, Estonia, and Ukraine. The time range of surveyed indicators differs and goes from 1990 to 2019.

Health indicators were collected from publicly available databases of the World Health Organization and Eurostat, which deal with long-term evaluation and monitoring of indicators obtained from national authorities [20].

The presented research was an observational epidemiological study based on macro-aggregation data of national populations of entire countries. Since data is anonymous and does not belong to individual citizens, there is no issue of data privacy protection, i.e., the research does not require consideration by the Ethics Committee.

Following selected health- and economy-related indicators were taken into account: total health expenditure as % of gross domestic products (THE % of GDP); private households' out-of-pocket payments on health as % of total health expenditure (OOP % THE); gross domestic product US$ per capita (GDP US$); estimated infant mortality per 1,000 live births (infant mortality); estimated life expectancy at birth (life expectancy); percent of urban population (% of urban population). These indicators are the most consistent and used in order to follow the country's progress in health care protection [21,22.]

Forecasting is the process of making predictions of the future based on past and present data, most commonly by analysis of trends. Quantitative forecasting technique is used, which is commonly utilized for historical data, as is the case in our research, and it belongs to medium-termed forecasting analysis, anticipating several years in advance (by the year 2025). Prediction is similar but a more general term. Both might refer to formal statistical methods employing time series, cross-sectional or longitudinal data, or alternatively to less formal judgmental methods [23]. Forecasting analysis was performed by combining excel analysis and the SPSS program.

Results are expressed in decimal numbers, showing how many times certain indicators increased or decreased in comparison to the last surveyed year.

Results

Forecasting analysis of the THE % of GDP by 2025 shows that this indicator tends to increase in most of the monitored countries, especially in Serbia (by 2.94), while it will decrease in a smaller number of countries, such as Northern Macedonia, by more than 2.4, comparing with the last surveyed year (Figure 1, Table 1).

Forecasting analysis of the OPP % THE by 2025 shows that this indicator will decrease mostly in Bosnia and Herzegovina (by 19.5), as well as in Albania (by 14.8), while it tends to increase mostly in the Russian Federation by almost 17 while comparing with the last surveyed year (Figure 2, Table 1). It is interesting to find that this indicator for Slovenia is noticeably constant for the entire observed period, from 1995 to 2014, with a very similar projection by 2025.

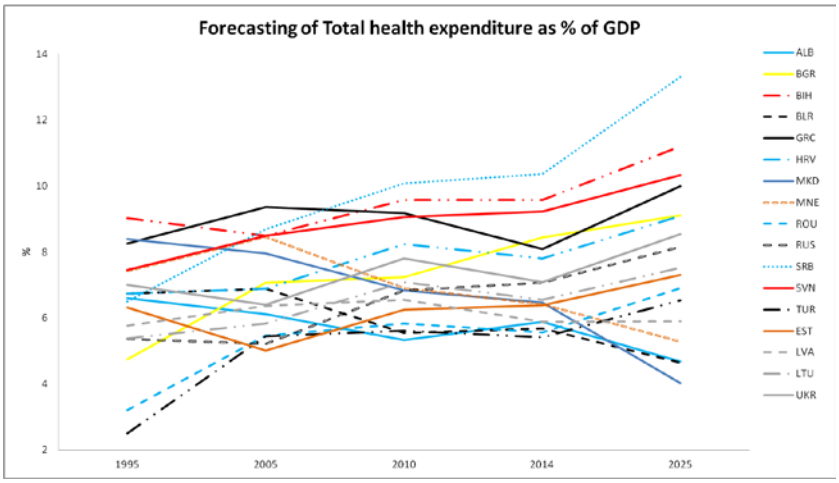

Fig. 1 − Total health expenditures % of GDP for observed countries, forecasting analysis by 2025.
Albania – ALB; Bosnia and Herzegovina – BIH; Bulgaria – BGR; Greece – GRC; Croatia – HRV; Montenegro – MNE; Northern Macedonia – MKD; Romania – ROU; Serbia – SRB; Slovenia – SVN; Turkey – TUR; Russia – RUS; Belarus – BLR; Lithuania – LTU; Latvia – LVA; Estonia – EST; Ukraine – UKR.

Table 1

Indicators of interest (% of GDP, % of OOP, GDP US$, infant mortality, life expectancy, and % of urban population) for each country showing the last year's available values, predicted values for the year 2025, and differences obtained

Country	% of GDP			% OOP			GDP US$			Infant mortality			Life expectancy			% Urban pop.		
	Last	Predict	dif	Last	Predict	dif	Last	Predict	dif	Last	Predict	dif	Last	Predict	dif	Last	Predict	dif
Albania	5.90	4.69	-1.20	49.9	35.10	-14.8	4538	5991	1454	10.3	-1.7	-12.0	79.1	81.8	2.7	52.2	65.7	13.5
Bulgaria	8.44	9.11	0.67	44.2	53.90	9.7	8228	11212	2985	5.6	2.4	-3.2	75.1	76.9	1.8	72.3	77.0	4.7
Bosnia	9.57	11.20	1.62	27.9	8.45	-19.5	5148	6794	1646	5.4	-0.2	-5.6	77.4	79.2	1.9	39.2	42.5	3.3
Belarus	5.69	4.64	-1.05	32.0	39.10	7.1	5728	9505	3777	2.5	-1.9	-4.4	74.5	78.4	3.9	74.6	80.0	5.4
Greece	8.08	9.99	1.91	34.9	23.71	-11.2	18613	17529	-1085	3.7	1.6	-2.1	81.7	83.1	1.4	76.3	80.9	4.6
Croatia	7.80	9.10	1.30	11.2	9.18	-2.0	13383	15890	2507	4.0	1.9	-2.1	78.6	80.1	1.5	57.5	62.6	5.1
Macedonia	6.48	4.03	-2.44	36.7	27.60	-9.1	5415	7222	1808	5.6	1.9	-3.7	76.6	77.8	1.2	/	/	/
Montenegro	6.42	5.28	-1.14	42.8	53.37	10.5	7783	10232	2499	2.4	-2.0	-4.4	76.7	78.8	2.1	63.1	66.2	3.1
Romania	5.57	6.90	1.34	18.9	17.62	-1.2	10818	14264	3446	5.8	0.1	-5.7	75.6	77.6	2.0	53.8	57.0	3.2
Russia	7.07	8.16	1.09	45.8	62.69	16.8	10743	17610	6867	7.4	-1.0	-8.4	68.9	75.6	6.7	73.7	75.3	1.6
Serbia	10.37	13.30	2.94	36.6	45.33	8.7	5900	7767	1867	4.8	-0.1	-4.9	76.0	77.4	1.4	55.2	57.4	2.2
Slovenia	9.23	10.34	1.11	12.1	12.42	0.4	23597	27245	3648	2.1	-0.1	-2.2	81.6	84.0	2.4	50	50.5	0.5
Turkey	5.41	6.54	1.12	17.8	6.53	-11.2	10546	15618	5072	9.1	-6.2	-15.3	79.1	83.1	4.0	70.7	77.7	7.0
Estonia	6.38	7.30	0.92	20.7	22.78	2.1	19705	26249	6545	1.6	-2.7	-4.3	79.0	82.4	3.4	68.1	67.5	-0.6
Latvia	5.88	5.91	0.03	35.1	26.51	-8.6	15594	20628	5034	3.4	-1.0	-4.4	75.7	78.1	2.4	67.7	67.9	0.2
Lithuania	6.55	7.53	0.97	31.3	33.12	1.9	16681	22613	5932	3.3	0.1	-3.2	76.5	78.6	2.1	66.8	67.3	0.5
Ukraine	7.10	8.54	1.44	46.2	47.43	1.2	2640	3699	1060	7.1	3.0	-4.1	73.4	76.7	3.3	68.7	72.1	3.4

Last − the last available year of observation; Predict − predicted value in the year 2025; dif − the difference between predicted and last year's available, shown as a negative or positive difference.
% of GDP – total health expenditure as % of GDP; % OOP – private households' out-of-pocket payments on health as % of total health expenditure; GDP US$ – gross domestic product (GDP), US$ per capita; Infant mortality – estimated infant mortality per 1,000 live births; Life expectancy – estimated life expectancy at birth; % of urban pop. – % of the urban population.

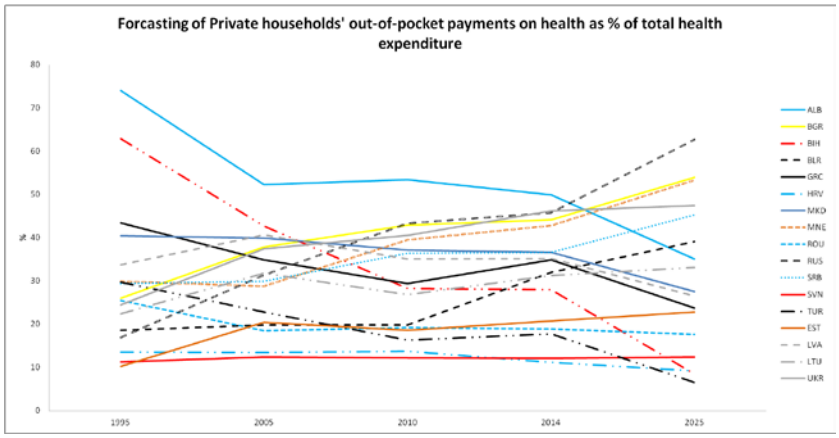

Fig. 2 − Private households' out-of-pocket payments on health as % of total health expenditure for surveyed countries, forecasting analysis by 2025.
Albania – ALB; Bosnia and Herzegovina – BIH; Bulgaria – BGR; Greece – GRC; Croatia – HRV; Montenegro – MNE; Northern Macedonia – MKD; Romania – ROU; Serbia – SRB; Slovenia – SVN; Turkey – TUR; Russia – RUS; Belarus – BLR;

In general, the values of GDP, compared to the first surveyed year, increased significantly (Figure 3, Table 1). Forecast analysis of the value of GDP US$ by 2025 shows that this indicator will decrease only in Greece (by $1,085), while this sum of money will increase in the rest of the surveyed countries, mostly in the Russian Federation (by $6,867) and Estonia (by $6,545) in comparison to the last surveyed year.

The projection of infant mortality shows that it will decrease in each surveyed country in South Eastern Europe and the Balkan peninsula by 2025 (Figure 4, Table 1). There will be a large reduction in infant mortality per 1,000 live births in Albania (by 12.0, respectively) in comparison to the last surveyed year, with the largest decrease in Turkey (by 15.3).

Estimated life expectancy at birth will increase in each surveyed country by the year 2025, with the largest increment in the Russian Federation and Belarus (by 6.7 and 3.9, respectively), while the smallest one will be in Macedonia and Greece (by 1.2 and 1.4) (Figure 5, Table 1). That indicates that the number of elderly people will continue to grow in this region.

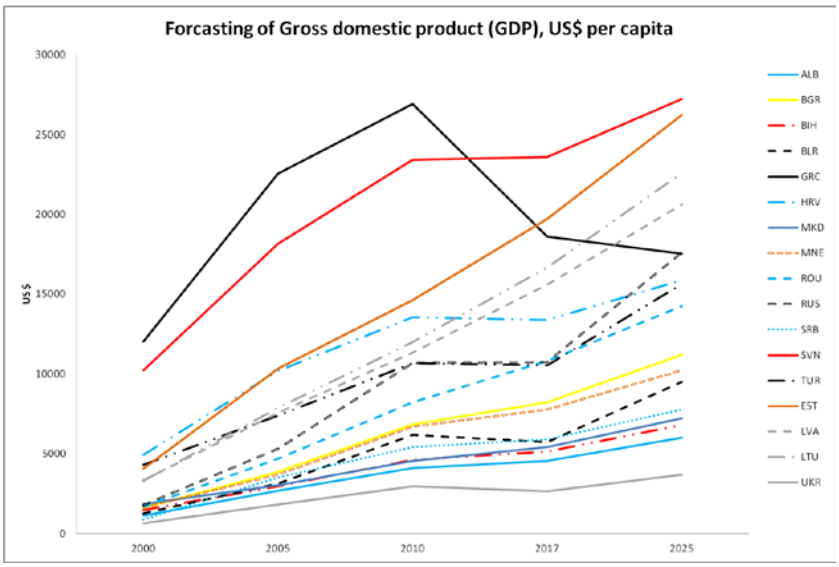

Fig. 3 – Gross domestic product (GDP), US$ per capita for surveyed countries, forecasting analysis by 2025.
Albania – ALB; Bosnia and Herzegovina – BIH; Bulgaria – BGR; Greece – GRC; Croatia – HRV; Montenegro – MNE; Northern Macedonia – MKD; Romania – ROU; Serbia – SRB; Slovenia – SVN; Turkey – TUR; Russia – RUS; Belarus – BLR; Lithuania – LTU; Latvia – LVA; Estonia – EST; Ukraine – UKR.

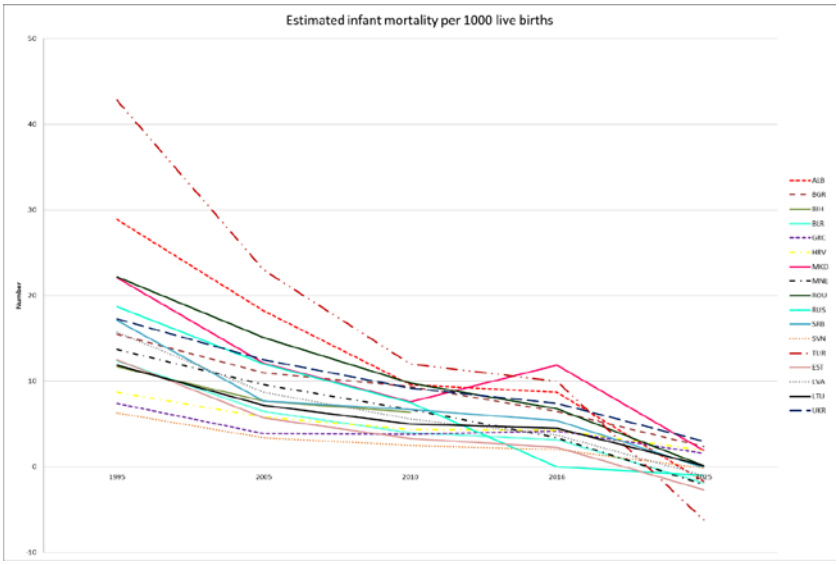

Fig. 4 − Estimated infant mortality per 1,000 live births for surveyed countries, forecasting analysis by 2025.
Albania – ALB; Bosnia and Herzegovina – BIH; Bulgaria – BGR; Greece – GRC; Croatia – HRV; Montenegro – MNE; Northern Macedonia – MKD; Romania – ROU; Serbia – SRB; Slovenia – SVN; Turkey – TUR; Russia – RUS; Belarus – BLR; Lithuania – LTU; Latvia – LVA; Estonia – EST; Ukraine – UKR.

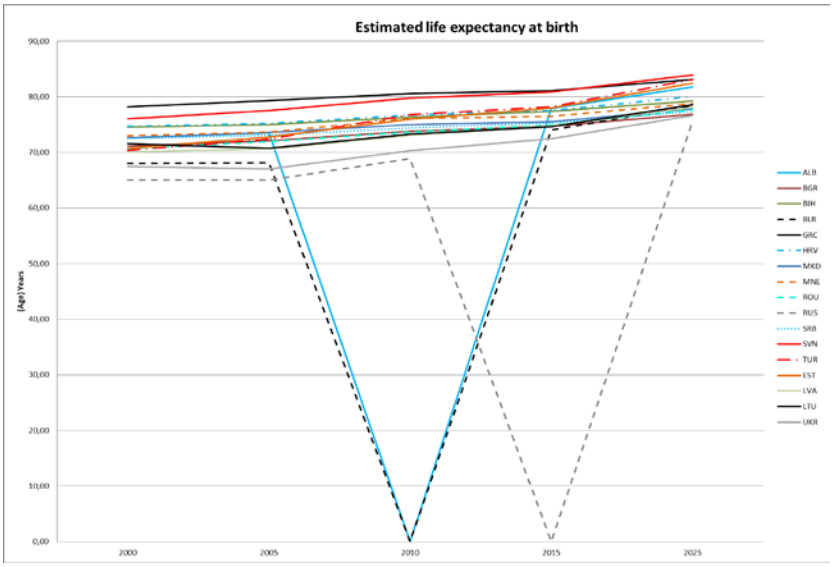

Fig. 5 − Estimated life expectancy at birth for surveyed countries, forecasting analysis by 2025.
Albania – ALB; Bosnia and Herzegovina – BIH; Bulgaria – BGR; Greece – GRC; Croatia – HRV; Montenegro – MNE; Northern Macedonia – MKD; Romania – ROU; Serbia – SRB; Slovenia – SVN; Turkey – TUR; Russia – RUS; Belarus – BLR; Lithuania – LTU; Latvia – LVA; Estonia – EST; Ukraine – UKR.

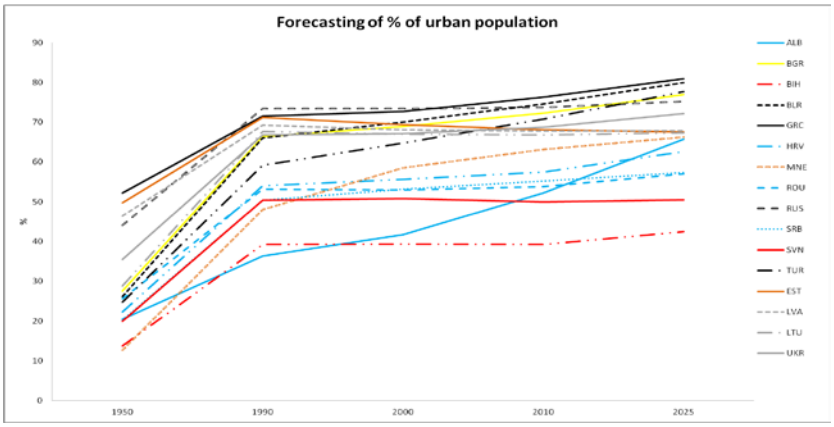

Fig. 6 − Percent of urban population for surveyed countries, forecasting analysis by 2025.
Albania – ALB; Bosnia and Herzegovina – BIH; Bulgaria – BGR; Greece – GRC; Croatia – HRV; Montenegro – MNE; Northern Macedonia – MKD; Romania – ROU; Serbia – SRB; Slovenia – SVN; Turkey – TUR; Russia – RUS; Belarus – BLR; Lithuania – LTU; Latvia – LVA; Estonia – EST; Ukraine – UKR.

Percentage of the urban population until 2025 will rise almost in every country except Estonia, which will have a slight decrement (by 0.6) (Figure 6, Table 1). The largest enhancement of the urban population, expressed in percentages, is estimated to take place in Albania (by 13.5) and Turkey (by 7) in comparison to the last surveyed year. There are no data concerning Northern Macedonia's urban population during the whole surveyed period.

Discussion

Global aging becomes more and more of a reality as time passes. Progress in both the medical and non-medical spheres of living, such as the development of the drug industry, medical technologies, and industry development, as a whole, explains by itself the fact that elderly people are becoming the leading age group nowadays [24, 25]. The share of the world population aged 65 and older will double, and the fast-growing group of people over the age of eighty will become four times larger by 2040 [26]. The expected years of life would change in parallel with all previously mentioned developments in human society [27]. All of this makes it even more important to address the issue of healthcare investments. All people must be treated equally by the health sector regardless of age, gender, and ethnicity [3]. A large percentage of older people is living in developing countries, and by 2025 it will even increase [28, 29]. Moreover, globally, the percentage of people living in urban areas will grow,

which is in line with the predictions from our research. In parallel with the demographic and economic transition, investments in the health sector are expected to grow, even sharply [30, 31]. The forecasting analysis shows increased investments in health, according to the obtained economic indicators. Namely, the ability to predict what impact these changes will have on the overall healthcare costs, both in public and private health sectors, is of key importance.

Health spending per capita for the period from 2015 to 2030 is projected to grow more than 4% per year in the Slovak Republic, Turkey, and the Republic of Korea [32]. On the contrary, in Lithuania, Chile, and Latvia, growth rates are projected to be over two percentage points lower than historical rates [1, 31]. The Organization for Economic Co-operation and Development (OECD) countries reported some of the highest growth rates in health spending per capita from 2000 to 2015 [33]. Our research also shows some variation concerning per capita spending.

Health expenditure as a share of GDP in the world is projected to rise to 10.2% by 2030, in comparison to 8.8% in 2015 [34, 35]. The only countries for which a slight decrease is expected to happen are Latvia, Hungary, and Lithuania [36]. Most countries are expected to experience a moderate increase in health expenditure as a share of GDP [37]. Based on the results of our research, it can be concluded that several countries are likely to have reduced percentage of investment by the year 2025, like Northern Macedonia, Albania, and Bosnia and Herzegovina, but countries such as Serbia are expected to have large increment.

People with the same health issues may end up spending differently due to different types of insurance, socioeconomic status, or comorbid diseases that can make treatment unsuccessful [38–42]. According to the data from The World Bank in 2018, Ukraine had 49.35% of OOP spending on health; Albania 44.58%; Russia and Serbia 38.31%, and the least among all surveyed countries – Slovenia and Croatia with 12% [43]. Our forecast analysis showed that most of the surveyed countries would experience a drop in the percentage of OOP share on health, especially Albania and Bosnia and Herzegovina, which is not the case with the Russian Federation. That means that health systems differ, and some countries cope better with health expenditures than others [44, 45].

The infant mortality rate is considered one of the indicators for describing both demographic conditions and socioeconomic well-being of a country [46–48]. The millennium development goal 4 (MDG 4) of the UN had set the goal of reducing high rates of infant mortality by two-thirds, to be reached by 2015, by using 1990 as the benchmark year [46].

Institut national d'études démographiques (INED) calculated the infant mortality rate (per 1,000 live births) in Europe and other developed OECD countries [49]. The results from 2018 showed that the largest infant mortality had Mexico, Colombia, Kosovo, and Albania (8.9 per 1,000); Romania (6 per 1,000) and Bulgaria (5.8 per 1,000) had moderate values, while Estonia (1.6 per 1,000), Slovenia (1.7 per 1,000), and Liechtenstein with no child mortality, were at the bottom of the list. By analysis of the last available data on infant mortality indicators, Estonia and Slovenia were the countries that had the smallest numbers in infant mortality (1.6 and 2.1 per 1,000). All surveyed countries in our research are expected to reduce infant mortality by 2025.

Population aging is increasing not only in low-mortality industrialized countries but also in several Eastern European countries, including Russia [50]. These countries have a slower pace of mortality improvement in several stages of life span compared to low-mortality countries, which delayed the aging problem [51]. Due to the evolved medical and pharmaceutical technology, as well as more accessible medical care, life expectancy should be prolonged [52, 53]. Our forecast analysis indicated that life expectancy would rise in each of the surveyed countries, and longevity would be the highest in the Russian Federation and Belarus.

In 2015, the UN reported that 54% of the global population lived in urban areas [54]. The level of Europe urbanization is expected to increase to approximately 83.7% in 2050 [55]. By 2030, urban residential areas are expected to expand a lot [56]. The highest growth (in percent) of urban residential areas, about 6%, is expected in Romania and Belgium [57]. Urban construction will certainly affect the relocation of residents from rural to urban areas; therefore, the percentage of people living in urban areas is expected to rise [58, 59]. Our forecast showed that this might happen and that in 2025 the growth in the percentage of the urban population in each surveyed country is realistic, except Estonia. The largest increment in the percentage of growth can be expected in Albania and Croatia. All age groups move to urban areas, the younger ones in order to get proper education, the middle age group are looking for a job, and the older ones are often placed in nursing homes. All of this brings problems for the authorities and the population which need to be solved.

Conclusion

Seventeen selected South Eastern European and Balkan countries we compared showed similar pathways in the progress of selected indicators, but some of them are expected to have more success than others. Total health expenditures as a percentage of GDP by 2025 will increase in most of the surveyed countries. The percentage of household payments OOP will decrease in half of them, while values of GDP expressed in US$ will increase significantly compared to the last surveyed year (2017), except in Greece. The infant mortality indicator shows decrement numbers in each surveyed country by 2025, while estimated life expectancy at birth will increase by the same year. Our forecast also showed that the growth in the percentage of the urban population in each surveyed country is realistic, except for Estonia.

Therefore, health- and economy-related indicators should be surveyed over time, as they enable significant and relevant information concerning the contemporary issues in health systems, also indicating where changes should be made and allowing further progress in the health care of the individual country.

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Received on April 14, 2021
Revised on October 16, 2021
Accepted on October 21, 2021
Online First October 2021