Testing Population Health Security through a Correlative Economic Development Model

Valentin Marian Antohi
"Dunarea de Jos" University of Galati, Department of Business Administration, Romania,
"Transilvania" University of Brasov, Department of Finance, Accounting and Economic Theory, Romania
valentin_antohi@yahoo.com
valentin.antohi@unitbv.ro
Nicoleta Cristache
"Dunarea de Jos" University of Galati, Department of Business Administration, Romania,
cristache.nicoleta@yahoo.de.

Abstract

In the context of the current overlapping crises: the global financial and economic crisis, the energy crisis, the health crisis, the geopolitical and military crisis, the countries of the world are faced with multiple solutions and ways to limit public spending, health systems must increase their efficiency and provide value for money. We aim to test the health security of the population through a correlative model of economic development considering the dynamics of sustainable economic development in 6 countries (Germany, Italy, Latvia, Spain, Bulgaria and Romania). The results will be analysed in relation to the level of health security that the 6 Member States have developed in the pandemic and post-pandemic period, and the results will assess the impact of the correlation between economic deprivation and access to quality healthcare. The methods used will consist in achieving an econometric correlation with the help of multiple linear regression and will allow the identification of the need for health security policies.

Key words: health security, sustainable development, multiple crises, econometric model
J.E.L. classification: H51**,** I15

1. Introduction

The main objective of OECD (OECD, 2013) work on health is to help countries increase the performance of health systems by measuring health outcomes, to improve the ways in which health systems use their resources, and to analyse policies that improve access, efficiency and quality of health care services. OECD health data is an authoritative source of statistics and indicators for comparing health and health systems in OECD and non-OECD countries. The COVID-19 pandemic has generated enormous human, social and economic costs and revealed the vulnerabilities of health systems to withstand shocks. The pandemic put immense pressure on health care services, which were often already overstretched before the pandemic, effective health spending is an investment: stronger and more resilient health systems protect both populations and economies (OECD, 2021). The COVID-19 pandemic led to increases in health spending, but the public health crisis and unprecedented measures to reduce the spread of SARSCoV-2 had a significant negative impact on global economic activity around the world, with global gross domestic product (GDP) contracting by 3.4% in 2020 (OECD, 2021), as a result of restrictions on travel and trade activities, tourism, production limitations, services in hotels, restaurants, etc. Just as health status is an important determinant of a country's economic development, so economic status is an important determinant of health status. In all countries with low economic status, mortality, morbidity and disability rates are highest, the criteria for high health status are a range of macroeconomic determinants, educational attainment, family patterns, social networks, income and employment. Macroeconomic determinants (for example GDP per capita) partly explain the purchasing power of countries and individuals for

healthcare. The prevalence of health problems and the chances of premature death rise steadily with falling income levels, real GDP growth rates show high life expectancy values.

The objectives of the study are:

1. Identify the main directions in the literature with reference to health security in the context of sustainable economic development;
2. To test the correlation between economic development indicators and access to health services and the impact of this correlation on the health security of the population;
3. Development of a new health security assessment model in 6 (six) EU Member States (Germany, Italy, Latvia, Spain, Bulgaria and Romania).

The study continues with the presentation of the results of the literature review, the methodological elaboration of the Health Security model in terms of sustainable economic development, the presentation of the main results and conclusions.

2. Literature review

Recently there has been an increased focus on international health financing, which will continue in the future to ensure that health disparities per capita are continuously reduced (Chang et al., 2019), since the start of the pandemic and the current multiple crises (Castaño-Rosa et al., 2022; Leppold et al., 2022). There is a need to increase public spending on health to replace out-of-pocket payments in order to increase access to health care for as many people as possible in an equitable and efficient way, to ensure universal health coverage and to improve health status at all levels.

The main objective of public health systems is to increase the quality and number of years of healthy life and to eliminate health disparities. Assessing the evolution of the general health status of the population can help us to identify priority times and areas where action can be taken to improve the health status of a population or areas where action may be needed by exploring causal factors and using preventive measures. If in the past it was the states of the world could be characterized by a low standard of living, with poor hygiene and nutrition, the main causes of most premature deaths were communicable diseases and acute diseases. In periods of time to date, public health measures, such as improving socio-economic conditions, sanitary conditions, quality of food, water, air, etc., have led to a dramatic decrease in the number of deaths from infectious diseases and a significant increase in life expectancy. Infectious diseases have been replaced by chronic diseases (cardiovascular diseases, diabetes, cancer), which have become the main causes of death and require a different approach to prevention, detection and treatment than the infectious and acute diseases of the past.

Global health status has increased dramatically over the last century due to economic progress and medical advances (vaccines, antibiotics, etc.) which have helped reduce disease (morbidity) and mortality (Lewis, 2014).

From the perspective of authors Stewart & Ware (Stewart and Ware, 1992), health status is a multidimensional concept, requiring several indicators of health status and using several methodologies for appropriate measurement. Health status measures are modified according to the objectivity of information obtained from standardised examinations of health determinants, health service utilisation and behaviours. The multidimensionality of health information and activity increases the complexity of health studies and requires the use of different data collection and measurement methods (Madans and Webster, 2015). The data obtained could be used once to provide a functional and psychosocial profile of individual patients or could be applied serially to monitor the natural history of disease or responses to standard interventions (Krabbe, 2016).

The health status of a population can be measured by a variety of factors, ranging from birth and death rates, life expectancy, quality of life, morbidity from specific diseases and conditions, environmental risk factors, use of outpatient and inpatient care, financial and geographical accessibility of staff and health facilities, health insurance coverage, and many other factors (U.S. Department of Health and Human Services, 2016).

At the global level, health status involves a great diversity of social and economic standards, diseases, disabilities and mortality, an important role being played by environmental and socio-economic factors, as well as interventions in the field of health. An important determinant in assessing these factors is the large differences between and among developed and developing

countries, but there are common concerns and shared interests in global health development (Tulchinsky and Varavikova, 2014). In order to obtain an image of the level of global health, demographic flows and socio-economic changes, studies and databases are carried out by the World Health Organization (WHO) that classifies countries according to geographical region or economic status, as the countries of the Organization for Economic Co-operation and Development (OECD) are classified.

The use of health indicators should contribute to the overall population health objectives of improving the health status of the population and reducing health inequalities. Health indicators support this objective through the following key applications: advocacy, accountability, system management, quality improvement and research. No measure can uniquely reflect the state of health of the nation, it is necessary to provide indicators that reflect a wide range of factors, such as health, the risk of disease and the performance of the health system. Over time, as new information becomes available and official indicator data sources expand, indicators may change, or new indicators may emerge. Therefore, there is no global set of indicators as perfect or permanent, potential indicators can be identified that respect the data constraints and then applied to the described framework can determine the most accurate results (Committee on the State of the USA Health Indicators, 2009).

Indicators are considered positive when they have a direct relationship (association, correlation) with health status, so the higher the value of the indicator, the better the health status of people in the population studied. Otherwise, indicators are considered negative when they have an inverse relationship (association, correlation) with health status, the higher the value of the indicator, the worse the health status of the people in the population studied (Pan American Health Organization, 2018).

3. Research methodology

In the analysis of the economic status of the population with an impact on the access to medical services for the period 2010 - 2021, we used the following indicators: GDP per capita (converted according to USD exchange rate), GDP per capita in terms of purchasing power (converted according to USD exchange rate), Consumer price index (2015=100), Real individual consumption in terms of 2015 consumer prices.

Data on the evolution of selected indicators have been taken from the Organisation for Economic Co-operation and Development (OECD) public database, OECD Statistics section, which includes data and meta-data for OECD member countries and selected non-member economies, Health subsection (OECD, 2022) for the period 2010-2021.

The analysis was performed with the help of the SPSS program version 25, the correlation tests being performed using the linear regression method, being obtained 6 correlative models for the 6 European countries analyzed: Germany, Italy, Latvia, Spain, Bulgaria and Romania.

The summary of the regression models is presented in Table no 1.

Table no. 1 Model's summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson	Notes	
					R Square Change	F Change	df1	df2	Sig. F Change		Predictors:	Dependent Variable:
De (Germany)	0.88	0.777	0.693	1622.1948	0.777	9.273	3	8	0.006	2.170	(Constant), AICDe, GDPPPSDe, CPIDe	GDPDe
It (Italy)	0.78	0.613	0.468	1767.5712	0.613	4.220	3	8	0.046	1.935	(Constant), AICIt, GDPPPSIt, CPIIt	GDPIt
Lv (Latvia)	0.98	0.953	0.936	638.7017	0.953	54.268	3	8	0.000	2.025	(Constant), AICLv, GDPPPSLv, CPILv	GDPLv

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson	Notes	
					R Square Change	F Change	df1	df2	Sig. F Change		Predictors:	Dependent Variable:
Es (Spain)	0.47	0.224	-0.066	1831.3691	0.224	0.772	3	8	0.542	1.975	(Constant), AICEs, GDPPPSEs, CPIEs	GDPEs
Bg (Bulgaria)	0.97	0.934	0.909	436.6436	0.934	37.798	3	8	0.000	1.994	(Constant), AICBg, CPIBg, GDPPPSBg	GDPBg
Ro (Romania)	0.97	0.935	0.910	634.4722	0.935	38.049	3	8	0.000	2.030	(Constant), AICRo, GDPPPSRo, CPIRo	GDPRo

Source: Authors' calculations using SPSS v 25

It can be seen from the table that most models (with the exception of Spain and Italy) have values of the coefficients of determination (Adjusted R Square) of a high statistical significance that allow their validation from the point of view of objective 2 of the research: the economic status and the access to medical services are in direct correlation and ensure the health security of the population. As far as the two countries are concerned, the situation during the pandemic period, which put economic status and access to health services in counter correlation, demonstrates by antithesis the objective of the research, i.e. in order to achieve health security for the population, access to health services must be correlated with the economic status of the Member State.

To validate the model, the null hypothesis was tested for the 6 models using the ANOVA test and the results are shown in Table no 2.

Table no. 2 ANOVA method

Model	Distribution test	Sum of Squares	df	Mean Square	F	Sig.
De (Germany)	Regression	73206417.274	3	24402139.091	9.273	0.006
	Residual	21052126.932	8	2631515.867		
	Total	94258544.207	11			
It (Italy)	Regression	39558305.732	3	13186101.911	4.220	0.046
	Residual	24994464.748	8	3124308.094		
	Total	64552770.480	11			
Lv (Latvia)	Regression	66414603.907	3	22138201.302	54.268	0
	Residual	3263518.722	8	407939.840		
	Total	69678122.629	11			
Es (Spain)	Regression	7765687.211	3	2588562.404	0.772	0.542
	Residual	26831301.878	8	3353912.735		
	Total	34596989.089	11			
Bg (Bulgaria)	Regression	21619714.572	3	7206571.524	37.798	0
	Residual	1525260.930	8	190657.616		
	Total	23144975.503	11			
Ro (Romania)	Regression	45949923.497	3	15316641.166	38.049	0
	Residual	3220439.773	8	402554.972		
	Total	49170363.269	11			

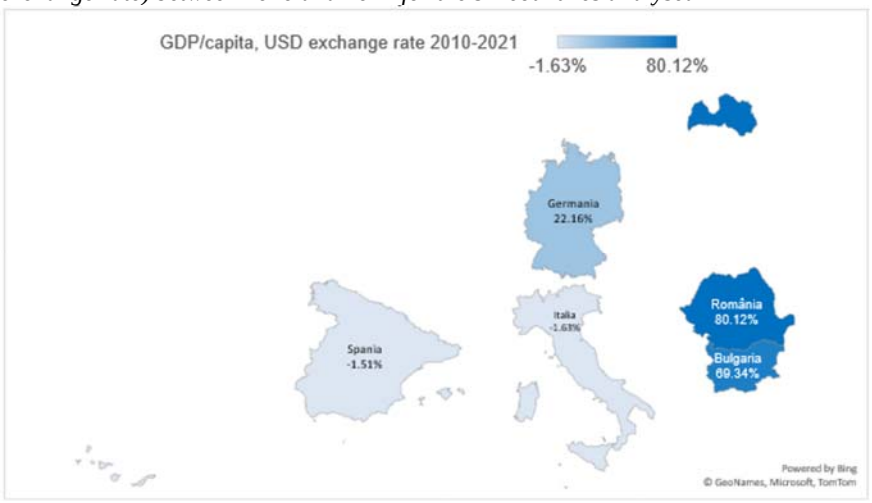
Source: Authors' calculations using SPSS v 25

The ANOVA method allowed the rejection of the null hypothesis, keeping the alternative hypothesis in all cases except Spain. For Italy, the coefficient of significance of the representation of errors was close to the maximum selected limit ($\alpha<0.05$) without, however, crossing the representation threshold. The results of the ANOVA test confirm the objective of the study and justify the implementation of health policies more favourable to national health safety in the context of large disparities at EU level.

4. Findings

The GDP/capita indicator (converted according to the USD exchange rate) over the period 2010-2021 at the level of the analysed countries evolved as follows (Figure 1): in Germany the indicator increased by 22.16%, from 41572.5$ GDP/capita, USD exchange rate in 2010 to 50786.1$ GDP/capita, USD exchange rate in 2021. The minimum value was reached in 2015 (41103.3$ GDP/capita, USD exchange rate). The maximum value was reached in 2021 (50786.1$ GDP/capita, USD exchange rate). In Italy the indicator decreased by -1.63%, from 36035.6$ GDP/capita, USD exchange rate in 2010 to 35449.3$ GDP/capita USD exchange rate in 2021. The minimum value was reached in 2015 (30242.4$ GDP/capita, USD exchange rate). The maximum value was reached in 2011 (38649.6$ GDP/capita, USD exchange rate). In Latvia the indicator increased by 79.72%, from 11424.7$ GDP/capita, USD exchange rate in 2010 to 20532.5$ GDP/capita, USD exchange rate in 2021.

Figure no. 1. Mapping the dynamics of the GDP/capita indicator (converted according to the USD exchange rate) between 2010 and 2021 for the six countries analysed



Source: Elaborated by the authors based on Organisation for Economic Co-operation and Development public data (OECD, 2022)

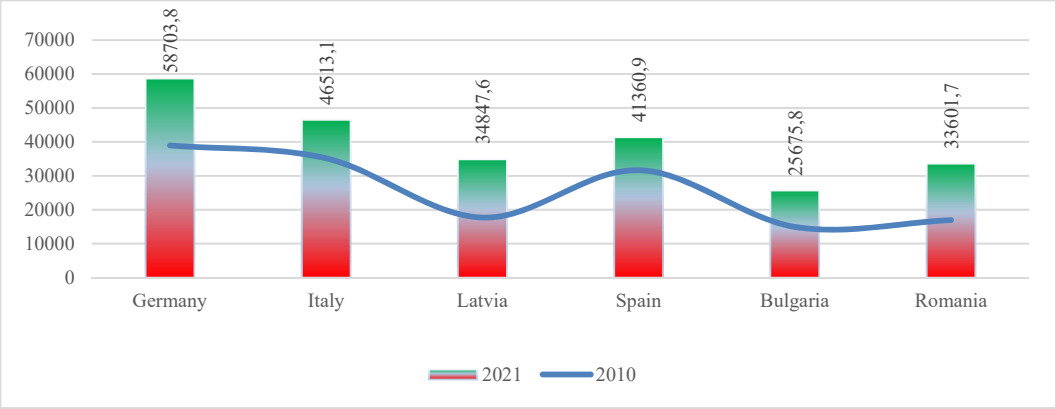
The minimum value was reached in 2010 (11424.7$ GDP/capita, USD exchange rate). The maximum value was reached in 2021 (20532.5$ GDP/capita, USD exchange rate). In Spain the indicator decreased by -1.51%, from 30532.5$ GDP/ capita, USD exchange rate in 2010 to 30070$ GDP/capita, USD exchange rate in 2021. The minimum value was reached in 2015 (25742.4$ GDP/capita, USD exchange rate). The maximum value was reached in 2011 (31677.9$ GDP/capita, USD exchange rate).

In Bulgaria, the indicator increased by 69.34%, from 6853$ GDP/capita, USD exchange rate in 2010 to 11605.1$ GDP/capita, USD exchange rate in 2021. The minimum value was reached in 2010 (6853$ GDP/capita, USD exchange rate). The maximum value was reached in 2021 (11605.1$ GDP/capita, USD exchange rate). In Romania the indicator increased by 80.12%, from 8214.1$ GDP/capita, USD exchange rate in 2010 to 14794.9$ GDP/capita, USD exchange rate in 2021. The minimum value was reached in 2010 (8214.1$ GDP/capita, USD exchange rate). The maximum value was reached in 2021 (14794.9$ GDP/capita, USD exchange rate).

The GDP/capita indicator in terms of purchasing power (converted according to the USD exchange rate) over the period 2010-2021 at the level of the analysed countries evolved as follows (Figure 2): in Germany the indicator increased by 50.71%, from 38952.7$ GDP/capita, USD exchange rate in 2010 to 58703.8$ GDP/capita, USD exchange rate in 2021. The minimum was reached in 2010 (38952.7$ GDP/inhabitant, USD exchange rate). The maximum value was reached in 2021 (58703.8$ GDP/capita, USD exchange rate). In Italy, the indicator recorded an increase of 32.3%, respectively from 35158.4$ GDP/ capita, USD exchange rate in 2010 to 46513.1$ of GDP/capita, USD exchange rate in 2021. The minimum value was reached in 2010 (35158.4$

GDP/capita, USD exchange rate). The maximum value was reached in 2021 (46513.1$ GDP/capita, USD exchange rate). In Latvia, the indicator recorded an increase of 96.8%, respectively from 17706.9$ GDP/capita, USD exchange rate in 2010 to 34847.6$ in GDP/inhabitant, USD exchange rate in 2021. The minimum was reached in 2010 (17706.9$ GDP/capita, USD exchange rate). The maximum value was reached in 2021 (34847.6$ GDP/capita, USD exchange rate).

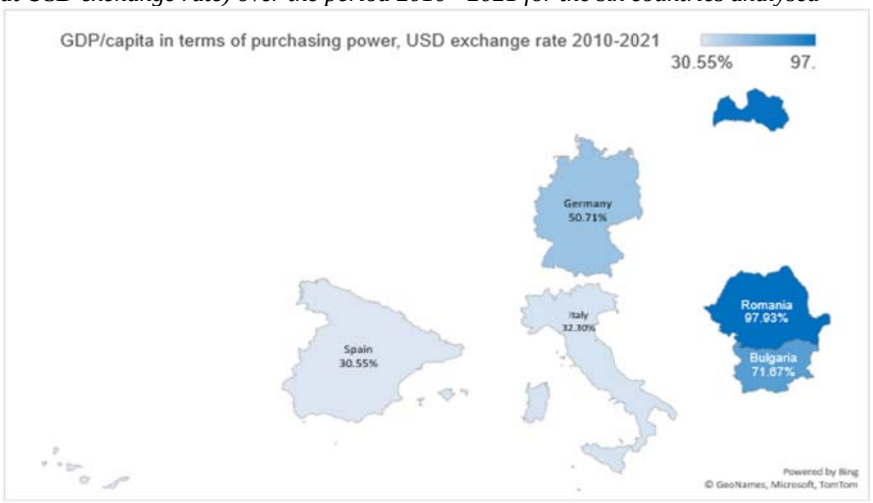
Figure no. 2. Change in purchasing power in 2021 vs. 2010 for the six countries analysed



Source: Elaborated by the authors based on Organisation for Economic Co-operation and Development public data (OECD, 2022)

In Spain, the indicator recorded an increase of 30.55%, respectively from 31682.7$ GDP/capita, USD exchange rate in 2010 to 41360.9$ of GDP/capita, USD exchange rate in 2021. The minimum was reached in 2010 (31682.7$ GDP/capita, USD exchange rate). The maximum value was reached in 2019 (41695.1$ GDP/capita, USD exchange rate). In Bulgaria, the indicator recorded an increase of 71.67%, respectively from 14956.5$ GDP/inhabitant, USD exchange rate in 2010 to 25675.8$ of GDP/capita, USD exchange rate in 2021. The minimum was reached in 2010 (14956.5$ GDP/capita, USD exchange rate). The maximum value was reached in 2021 (25675.8$ GDP/capita, USD exchange rate). In Romania, the indicator recorded an increase of 97.93%, respectively from 16976.3$ GDP/inhabitant, USD exchange rate in 2010 to 33601.7$ of GDP/capita, USD exchange rate in 2021. The minimum was reached in 2010 (16976.3$ GDP/capita, USD exchange rate). The maximum value was reached in 2021 (33601.7$ GDP/capita, USD exchange rate) (Figure 3).

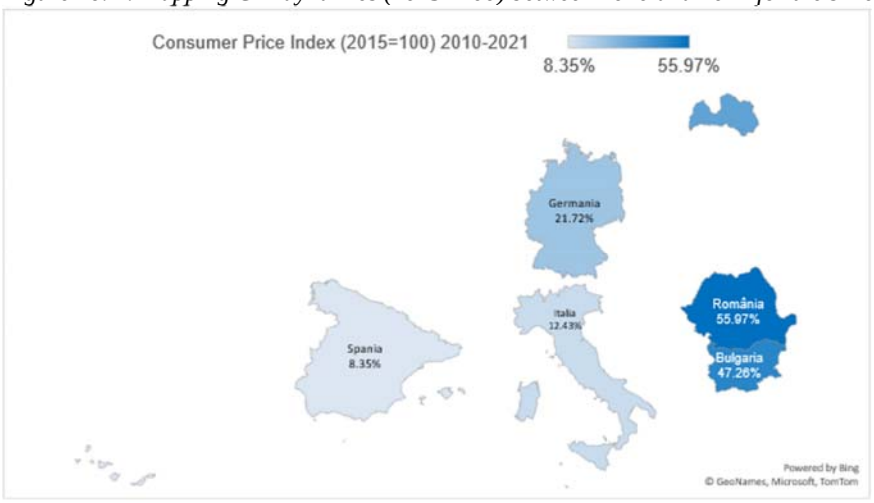
Figure no. 3Mapping the dynamics of the GDP/capita indicator in terms of purchasing power (converted at USD exchange rate) over the period 2010 - 2021 for the six countries analysed



Source: Elaborated by the authors based on Organisation for Economic Co-operation and Development public data (OECD, 2022)

The Consumer Price Index - CPI (2015=100) recorded increases over the period 2010-2021 in all countries analysed (Figure 4). The highest value was in Romania, where there was an increase of 55.97%, from 85.4% in 2010 to 133.2% in 2021.

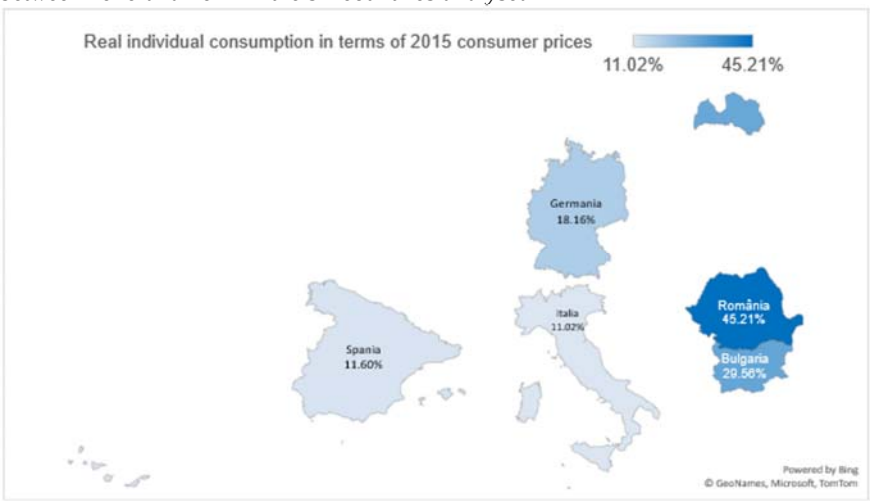
Figure no. 4. Mapping CPI dynamics (2015=100) between 2010 and 2021 for the six countries analysed



Source: Elaborated by the authors based on Organisation for Economic Co-operation and Development public data (OECD, 2022)

The minimum value was reached in 2010 (85.4%). The maximum value was reached in 2021 (133.2%). Spain recorded the lowest growth rate of 8.35%, starting in 200 from 99.4% and reaching 107.7% in 2021. The minimum value was reached in 2012 (99.3%). The maximum value was reached in 2021 (107.7%). In Germany the indicator increased by 21.72%, from 92.1% in 2010 to 112.1% in 2021. The minimum value was reached in 2010 (92.1%). The maximum value was reached in 2021 (112.1%). The consumer price index in Italy increased by 12.43%, from 94.1% in 2010 to 105.8% in 2021. The minimum value was reached in 2010 (94.1%). The maximum value was reached in 2021 (105.8%). In Latvia, the index increased by 35.17%, from 87.3% in 2010 to 118% in 2021. The minimum value was reached in 2010 (87.3%). The maximum value was reached in 2021 (118%). In Bulgaria the indicator increased by 47.26% from 89.3% in 2010 to 131.5% in 2021. The minimum value was reached in 2010 (89.3%). The maximum value was reached in 2021 (131.5%).

Figure no. 5. Mapping the dynamics of real individual consumption in terms of 2015 consumer prices between 2010 and 2021 in the six countries analysed



Source: Elaborated by the authors based on Organisation for Economic Co-operation and Development public data (OECD, 2022)

Real individual consumption in terms of consumer prices 2015 between 2010-2021, at the level of the countries analysed, had an increasing trend (Figure 5). The highest level was recorded in Romania, of 45.21%, respectively from 87.6% in 2010 to 127.2% in 2021. The minimum value was reached in 2010 (87.6%). The maximum value was reached in 2021 (127.2%). The lowest level was recorded in Italy, with an increase of only 11.02%, respectively from 94.4% in 2010 to 104.8% in 2021. Real individual consumption in Germany increased by 18.16%, respectively from 93.6% in 2010 to 110.6% in 2021. The minimum value was reached in 2010 (93.6%). The maximum value was reached in 2021 (110.6%). In Latvia the indicator increased by 28.92%, respectively from 89.9% in 2010 to 115.9% in 2021. The minimum value was reached in 2010 (89.9%). The maximum value was reached in 2021 (115.9%). In Spain the indicator increased by 11.6% from 95.7% in 2010 to 106.8% in 2021 and in Bulgaria consumption increased by 29.56% from 91% in 2010 to 117.9% in 2021. The minimum value was reached in 2010 (91%). The maximum value was reached in 2021 (117.9%).

5. Conclusions

The authors set out to and carried out a test of population health security through a correlative economic model of economic development. Using analytical and empirical methods, the objectives of the research were achieved, respectively to test the state of correlation of economic development indicators and access to health services and the impact of this correlation on the health security of the population and to develop a new model for assessing health security at the level of 6 (six) Member States of the European Union (Germany, Italy, Latvia, Spain, Bulgaria and Romania).

The analysis of the economic indicator's GDP/capita standardized by currency conversion USD and GDP/capita in terms of purchasing power showed that they have a directly proportional variability in relation to purchasing power regardless of the type of profile studied (segregated profile or general profile). In medical terms the health status of the population is sensitive to purchasing power, with margin differences of the segregated profile in relation to the general profile depending on the level of socio-economic development of the subject state and the health risk factors impacting the health of the population in the target state.

It was demonstrated during the modelling and validation of 4 models out of the 6 proposed that the economic status and access to medical services are in direct correlation and ensure the health security of the population.

It was confirmed the objective of the study that motivates the implementation of health policies more favourable to the national sanitization safety in the context of great disparities at the level of the European Union (the results of the research have applicability being taken over by the authorities for the improvement of the health policies and for the level of health funding at the level of the EU Member States).

6. Acknowledgement

This research was conducted within the internal research grant RF 1821/31.03.2023 provided by "Dunarea de Jos" University of Galati.

7. References

- Castaño-Rosa, R., Pelsmakers, S., Järventausta, H., Poutanen, J., Tähtinen, L., Rashidfarokhi, A. and Toivonen, S., 2022. Resilience in the built environment: Key characteristics for solutions to multiple crises. *Sustainable Cities and Society*, [online] 87, 104259. https://doi.org/https://doi.org/10.1016/j.scs.2022.104259
- Chang, A.Y., Cowling, K., Micah, A.E., Chapin, A., Chen, C.S., Ikilezi, G., Sadat, N., Tsakalos, G., Wu, J., Younker, T., Zhao, Y., Zlavog, B.S., Abbafati, C., Ahmed, A.E., Alam, K., Alipour, V., Aljunid, S.M., Almalki, M.J., Alvis-Guzman, N., Ammar, W., Andrei, C.L., Anjomshoa, M., Antonio, C.A.T., Arabloo, J., Aremu, O., Ausloos, M., Avila-Burgos, L., Awasthi, A., Ayanore, M.A., Azari, S., Azzopardi-Muscat, N., Bagherzadeh, M., Bärnighausen, T.W., Baune, B.T., Bayati, M., Belay, Y.B., Belay, Y.A., Belete, H., Berbada, D.A., Berman, A.E., Beuran, M., Bijani, A., Busse, R., Cahuana-Hurtado, L., Cámera, L.A., Catalá-López, F., Chauhan, B.G., Constantin, M.-M., Crowe, C.S., Cucu,

A., Dalal, K., De Neve, J.-W., Deiparine, S., Demeke, F.M., Do, H.P., Dubey, M., El Tantawi, M., Eskandarieh, S., Esmaeili, R., Fakhar, M., Fazaeli, A.A., Fischer, F., Foigt, N.A., Fukumoto, T., Fullman, N., Galan, A., Gamkrelidze, A., Gezae, K.E., Ghajar, A., Ghashghaee, A., Goginashvili, K., Haakenstad, A., Haghparast Bidgoli, H., Hamidi, S., Harb, H.L., Hasanpoor, E., Hassen, H.Y., Hay, S.I., Hendrie, D., Henok, A., Heredia-Pi, I., Herteliu, C., Hoang, C.L., Hole, M.K., Homaie Rad, E., Hossain, N., Hosseinzadeh, M., Hostiuc, S., Ilesanmi, O.S., Irvani, S.S.N., Jakovljevic, M., Jalali, A., James, S.L., Jonas, J.B., Jürisson, M., Kadel, R., Karami Matin, B., Kasaeian, A., Kasaye, H.K., Kassaw, M.W., Kazemi Karyani, A., Khabiri, R., Khan, J., Khan, M.N., Khang, Y.-H., Kisa, A., Kissimova-Skarbek, K., Kohler, S., Koyanagi, A., Krohn, K.J., Leung, R., Lim, L.-L., Lorkowski, S., Majeed, A., Malekzadeh, R., Mansourian, M., Mantovani, L.G., Massenburg, B.B., McKee, M., Mehta, V., Meretoja, A., Meretoja, T.J., Milevska Kostova, N., Miller, T.R., Mirrakhimov, E.M., Mohajer, B., Mohammad Darwesh, A., Mohammed, S., Mohebi, F., Mokdad, A.H., Morrison, S.D., Mousavi, S.M., Muthupandian, S., Nagarajan, A.J., Nangia, V., Negoi, I., Nguyen, C.T., Nguyen, H.L.T., Nguyen, S.H., Nosratnejad, S., Oladimeji, O., Olgiati, S., Olusanya, J.O., Onwujekwe, O.E., Otstavnov, S.S., Pana, A., Pereira, D.M., Piroozi, B., Prada, S.I., Qorbani, M., Rabiee, M., Rabiee, N., Rafiei, A., Rahim, F., Rahimi-Movaghar, V., Ram, U., Ranabhat, C.L., Ranta, A., Rawaf, D.L., Rawaf, S., Rezaei, S., Roro, E.M., Rostami, A., Rubino, S., Salahshoor, M., Samy, A.M., Sanabria, J., Santos, J.V., Santric Milicevic, M.M., Sao Jose, B.P., Savic, M., Schwendicke, F., Sepanlou, S.G., Sepehrimanesh, M., Sheikh, A., Shrime, M.G., Sisay, S., Soltani, S., Soofi, M., Soofi, M., Srinivasan, V., Tabarés-Seisdedos, R., Torre, A., Tovani-Palone, M.R., Tran, B.X., Tran, K.B., Undurraga, E.A., Valdez, P.R., van Boven, J.F.M., Vargas, V., Veisani, Y., Violante, F.S., Vladimirov, S.K., Vlassov, V., Vollmer, S., Vu, G.T., Wolfe, C.D.A., Yonemoto, N., Younis, M.Z., Yousefifard, M., Zaman, S. Bin, Zangeneh, A., Zegeye, E.A., Ziapour, A., Chew, A., Murray, C.J.L. and Dieleman, J.L., 2019. Past, present, and future of global health financing: a review of development assistance, government, out-of-pocket, and other private spending on health for 195 countries, 1995–2050. *The Lancet*, [online] 393(10187), pp.2233–2260. https://doi.org/https://doi.org/10.1016/S0140-6736(19)30841-4

- Committee on the State of the USA Health Indicators, 2009. *State of the USA Health Indicators: Letter Report*. [online] Available at: <https://www.ncbi.nlm.nih.gov/books/NBK215063/>.
- Krabbe, P., 2016. *The Measurement of Health and Health Status: Concepts, Methods and Applications from a Multidisciplinary Perspective*.
- Leppold, C., Gibbs, L., Block, K., Reifels, L. and Quinn, P., 2022. Public health implications of multiple disaster exposures. *The Lancet Public Health*, [online] 7(3), pp.e274–e286. https://doi.org/https://doi.org/10.1016/S2468-2667(21)00255-3.
- Lewis, M., 2014. What Is the Impact of Health on Economic Growth – and of Growth on Health? In: *Encyclopedia of Health Economics*. https://doi.org/https://doi.org/10.1016/B978-0-12-375678-7.00602-7.
- Madans, J.H. and Webster, K.M., 2015. Health Surveys. In: J.D.B.T.-I.E. of the S.& B.S. (Second E. Wright, ed. [online] Oxford: Elsevier.pp.725–730. https://doi.org/https://doi.org/10.1016/B978-0-08-097086-8.14031-0.
- OECD, 2013. *OECD Work on Statistics brochure 2013*. [online] Available at: <https://www.oecd.org/sdd/OECD-Work-on-Statistics-brochure2013.pdf>.
- OECD, 2021. *Health at a Glance 2021: OECD Indicators*. [online] https://doi.org/https://doi.org/10.1787/ae3016b9-en.
- OECD, 2022. *OECD Statistics*. [online] Available at: <https://stats.oecd.org/>.
- Pan American Health Organization, 2018. *Health Indicators - Conceptual and operational considerations*. [online] Available at: <https://iris.paho.org/handle/10665.2/49056>.
- Stewart, A.L. and Ware, J.E.J., 1992. *Measuring Functioning and Well-Being: The Medical Outcomes Study Approach*. Duke University Press Books. https://doi.org/https://doi.org/10.7249/CB361.
- Tulchinsky, T.H. and Varavikova, E.A., 2014. *The New Public Health*. Elsevier Academic Press.
- U.S. Department of Health and Human Services, 2016. *The Healthy People 2020 Midcourse Review*. [online] Available at: <https://www.cdc.gov/nchs/healthy_people/hp2020/hp2020_midcourse_review.htm>.