
Comparative analysis of healthcare systems in European Union countries based on socio-economic and demographic indicators

Liudmyla Anisimova

Department of Environmental Management and Entrepreneurship, Faculty of Economics, Taras Shevchenko National University of Kyiv, Kyiv, Ukraine

ORCID: 0000-0001-9678-269X

Maryna Horna

Department of Statistics, Information and Analytical Systems and Demography, Faculty of Economics, Taras Shevchenko National University of Kyiv, Kyiv, Ukraine

ORCID: 0000-0002-6011-5753

Olga Demydiuk

Department of Economic Theory, Macro- and Microeconomics, Faculty of Economics, Taras Shevchenko National University of Kyiv, Kyiv, Ukraine

ORCID: 0000-0003-3191-2646

Tetiana Trubnik

Department of Statistics, Information and Analytical Systems and Demography, Faculty of Economics, Taras Shevchenko National University of Kyiv, Kyiv, Ukraine

ORCID: 0000-0002-0467-8930

Andrii Zavazhenko

Department of Economic Theory, Macro- and Microeconomics, Faculty of Economics, Taras Shevchenko National University of Kyiv, Kyiv, Ukraine

ORCID: 0000-0002-3345-1671

Abstract: The growing importance of healthcare in human capital development, enhancing labor productivity, and fostering long-term economic growth highlights the need to evaluate the performance of national healthcare systems amid population aging, increasing demand for healthcare services, and constrained financial resources. Despite a substantial body of research devoted to healthcare system models and their performance assessment, a comprehensive cross-country comparison integrating socioeconomic and demographic indicators using multivariate statistical methods remains underexplored.

The aim of this study is to compare the healthcare systems of the European Union countries and evaluate their economic efficiency using correlation and cluster analysis. The study focuses on the healthcare systems of the European Union countries and Ukraine as institutional, organizational, and financial arrangements for the provision of healthcare services. It examines the relationships between indicators of economic development, healthcare financing, and healthcare system performance, as well as the methodological approaches used to assess these relationships.

The study is based on statistical data obtained from Eurostat, OECD Health Statistics, the World Health Organization, and the World Bank. The methodological framework comprises comparative analysis, correlation analysis, hierarchical cluster analysis, and k-means clustering. The performance of healthcare systems is evaluated using indicators of gross domestic product (GDP) per capita, labor productivity, healthcare expenditure, life expectancy, and mortality.

The correlation analysis revealed statistically significant relationships between the level of economic development and population health outcomes. Specifically, higher levels of gross domestic product (GDP) per capita and labor productivity were associated with longer life expectancy and lower mortality rates. Furthermore, the findings indicate that healthcare expenditure as a share of GDP is more strongly associated with population health outcomes than the absolute level of healthcare spending.

The application of cluster analysis made it possible to identify three groups of European Union countries with distinct combinations of economic capacity, healthcare financing parameters, and healthcare system performance. The resulting typology revealed substantial heterogeneity among countries in terms of resource availability and population health outcomes. The findings confirm that the performance of national healthcare systems depends not only on the level of healthcare financing but also on the efficiency of resource allocation and utilization.

Keywords: healthcare system; economic efficiency; healthcare financing; cluster analysis; correlation analysis; socioeconomic and demographic indicators.

1. Introduction

Healthcare is a fundamental component of socioeconomic development, as it directly contributes to human capital development, labor productivity, demographic dynamics, and the competitiveness of the national economy. In the contemporary context, healthcare is regarded not only as a system for providing essential services to the population but also as a key driver of sustainable long-term economic growth and societal well-being.

The countries of the European Union exhibit considerable diversity in the organization and financing of healthcare. Historical, institutional, and economic factors have led to the development of different healthcare system models, which vary in terms of financing sources, the degree of government involvement, health insurance arrangements, and the organization of healthcare service delivery. Despite their common objective of ensuring equitable access to healthcare and improving population health outcomes, the performance of national healthcare systems differs substantially.

Population ageing, the increasing prevalence of chronic diseases, the technological transformation of healthcare, and growing fiscal constraints have intensified the need to improve the efficiency of resource utilization within the healthcare sector. Under these conditions, the comprehensive evaluation of national healthcare system models has become particularly important, taking into account the economic, financial, and demographic characteristics that determine their capacity to achieve favorable population health outcomes.

The scientific literature has devoted considerable attention to the classification of healthcare system models, the evaluation of the efficiency of healthcare financing, and the analysis of the relationships between economic development and population health outcomes. However, most existing studies focus on individual aspects of healthcare system performance, while comprehensive cross-country comparisons integrating socioeconomic and demographic indicators remain relatively underexplored. Moreover, only a limited number of studies have applied correlation and cluster analysis to develop a typology of European Union countries based on these characteristics. In addition, the position of Ukraine within the comparative framework of European healthcare system models requires further investigation.

2. Object and subject of research

The object of the study is the healthcare systems of the European Union countries and Ukraine, viewed as complex socioeconomic systems whose primary purpose is to provide healthcare services, protect and improve population health, increase life expectancy, and support the quality of human capital.

Healthcare systems are characterized by a set of institutional, organizational, and financial-economic attributes that determine their functioning and performance. Their key characteristics include healthcare financing mechanisms, the extent of government regulation, health insurance arrangements, the organization of healthcare service delivery, the availability of healthcare resources, and the efficiency of their utilization. The performance of healthcare systems is reflected in population health outcomes and broader socioeconomic development indicators.

To provide a quantitative characterization of the research object, the analysis employs indicators of gross domestic product (GDP) per capita, labor productivity, gross value added per hour worked, healthcare expenditure as a share of GDP, total healthcare expenditure, life expectancy at birth, and the crude mortality rate. Collectively, these indicators enable an assessment of the relationships between economic development, the level of healthcare financing, and healthcare system performance.

Several principal models of healthcare organization have evolved in international practice, the most prominent being the Beveridge model, the Bismarck model, the National Health Insurance model, and mixed models. These models differ in terms of their financing mechanisms, the extent of government involvement, organizational arrangements, and the principles governing access to healthcare services. Such institutional diversity largely explains the differences in the performance of healthcare systems across countries.

Ukraine's healthcare system is undergoing a process of transformation, combining elements of budget-funded healthcare with strategic purchasing mechanisms implemented through the National Health Service of Ukraine. Examining European experience and comparing Ukraine's healthcare system with those of the European Union countries provide a basis for identifying promising directions for improving resource efficiency and strengthening healthcare governance.

The subject of the study is the statistical relationships between indicators of economic development, healthcare financing, and the performance of national healthcare systems, as well as the methodological approaches used to assess these relationships through correlation and cluster analysis.

Regardless of their organizational model, contemporary healthcare systems face a number of common challenges, including population ageing, growing demand for healthcare services, rising healthcare costs, shortages of healthcare professionals, unequal access to healthcare, and increasing pressure on financial resources. At the same time, higher levels of healthcare expenditure do not necessarily translate into proportional improvements in population health outcomes, highlighting differences in the efficiency of resource utilization and the performance of healthcare systems. These challenges underscore the need for comparative analyses aimed at identifying the factors that determine the effectiveness of different healthcare system models.

3. Target of research

The aim of this study is to identify the distinctive features of healthcare system performance across the European Union countries, compare their organizational models, and evaluate their economic efficiency in the field of public health. In addition, the study seeks to develop a typology of countries based on a set of socioeconomic and demographic characteristics using correlation and cluster analysis.

4. Literature analysis

A substantial body of literature has examined the typology and comparative analysis of healthcare systems. Contemporary research primarily focuses on the classification of healthcare system models, the assessment of their efficiency, and the investigation of the relationships between economic resources and health outcomes. One of the most widely adopted approaches is the typological classification of healthcare systems. For example, the studies by Wendt et al. [19] and

Böhm et al. [2] proposed conceptual frameworks for the classification of healthcare systems, enabling their comparison in terms of financing arrangements, the role of government, and organizational structure.

A considerable number of studies have also investigated the economic efficiency of healthcare systems. Joumard et al. [10] demonstrated that the relationship between healthcare expenditure and health outcomes, such as life expectancy and mortality, is nonlinear and that system efficiency depends largely on institutional characteristics. Similar conclusions were reached by Tchouaket et al. [17], who identified substantial variation in the efficiency of healthcare systems across OECD countries despite comparable levels of available resources.

Another important area of research examines the impact of economic factors on healthcare outcomes. In particular, Ivanková et al. [9] found that increased healthcare financing and higher gross domestic product (GDP) per capita contribute to lower premature mortality rates, confirming the close relationship between economic development and population health. Similarly, Chuang and Hu [3] demonstrated that the resilience of healthcare systems depends on the complex interaction of economic, institutional, and social factors.

Cluster analysis has become an important methodological tool in contemporary healthcare research, as it enables the grouping of countries according to shared characteristics. For example, Yalçın Balçık et al. [22] and Top and Cinaroglu [18] applied cluster analysis to European countries, identifying groups with different levels of healthcare system performance based on healthcare expenditure, life expectancy, and resource availability. Likewise, Proksch et al. [15] employed a clustering approach to examine the innovativeness of healthcare systems, enabling the identification of both leading countries and those with lower levels of development.

Similar approaches have also been applied in regional studies. For example, Letunovska et al. [13] used cluster analysis to evaluate the development of healthcare systems at the regional level, taking into account socioeconomic factors. Their approach made it possible to identify regional disparities and determine policy priorities. Likewise, Halásková and Bednář [7] conducted a comparative analysis of European Union countries based on key healthcare indicators.

Particular attention has also been paid to assessing the economic similarity of countries. Fgaier and Zrubka [5] summarized methodological approaches to constructing indices of economic similarity, which can be applied to improve the accuracy of country grouping in cluster analysis.

The healthcare system of Ukraine has been examined in the studies of Lekhan et al. [12] and in the reports of the World Health Organization and the World Bank [20, 21], which emphasize its ongoing transformation and the need for reforms in healthcare financing. Ukraine is characterized as a healthcare system incorporating elements of different organizational models and undergoing a transition toward a more efficient and resilient structure.

Overall, the existing literature indicates that integrating economic indicators with cluster analysis provides an effective approach for the comparative assessment of healthcare systems. Most studies conclude that higher levels of economic development and healthcare financing are generally associated with better population health outcomes; however, institutional, social, and organizational factors ultimately play a decisive role in determining healthcare system performance. These findings highlight the importance of applying comprehensive analytical approaches that simultaneously account for economic, financial, and demographic dimensions when evaluating and comparing national healthcare systems.

5. Research methods

To achieve the research objective, a combination of complementary methods was employed. The study is primarily based on a comparative analysis of the major healthcare system models, namely the Beveridge, Bismarck, National Health Insurance, and mixed models. The empirical analysis relies on correlation analysis to examine the strength and direction of the relationships among key socioeconomic indicators, including gross domestic product (GDP) per capita, healthcare

expenditure, life expectancy at birth, labor productivity, and the mortality rate. To classify countries according to the similarity of their characteristics, cluster analysis was performed using both the k-means algorithm and hierarchical clustering.

The study covers the European Union countries and Ukraine. The empirical analysis is based on official statistical data obtained from Eurostat [4], OECD Health Statistics [14], and World Health Organization and World Bank reports on healthcare system reform in Ukraine [20, 21]. All statistical analyses were conducted using RStudio software. This methodological framework ensures the objectivity and reproducibility of the findings while enabling a comprehensive assessment of healthcare system performance.

6. Research results

Several principal healthcare system models have evolved worldwide, differing in their financing mechanisms, the role of government, and the organization of healthcare service delivery. Table 1 presents a comparative overview of the four major healthcare system models that predominate in contemporary healthcare systems.

Table 1. Comparative Overview of Major Healthcare System Models

Health System Model	Financing Mechanism	Role of the State	Coverage and Access	Main Advantage	Main Limitation
Beveridge Model	General taxation	Direct public financing and stewardship	Universal coverage	Universal access and equity	Potential waiting times and budget constraints
Bismarck Model	Mandatory social health insurance contributions	Regulatory oversight	Universal insurance-based coverage	High-quality care and timely access	Higher administrative and labor costs
National Health Insurance (NHI) Model	Single-payer public insurance	Single public payer with centralized financing	Universal coverage through a single-payer system	Cost control and administrative efficiency	Potential delays in adopting medical innovations
Private Insurance Model	Private health insurance premiums	Limited government involvement	Market-based access	Innovation and flexibility	Unequal access and high healthcare expenditure

The Beveridge model (National Health Service model) is financed primarily through general taxation and is characterized by a dominant role of the government, which acts as both the principal provider and the primary purchaser of healthcare services. Representative examples include the United Kingdom, Sweden, and Spain.

The Bismarck model (social health insurance model) is based on mandatory social insurance financed jointly by employers and employees. In this model, the government performs a regulatory role, ensuring universal coverage, while healthcare services are delivered mainly by independent public and private providers. Representative countries include Germany, France, and Belgium.

The National Health Insurance (NHI) model combines a single public payer, typically financed through taxation, with healthcare services provided by both public and private institutions. Canada is the best-known example of this model.

The Private Insurance model is characterized by the predominance of private health insurance and a limited role of government in healthcare financing and service provision. This model is most prominently represented by the United States.

Ukraine's healthcare system is best described as a hybrid model that combines elements of the Beveridge model – particularly the state-guaranteed Medical Guarantees Programme—with strategic purchasing mechanisms implemented through the National Health Service of Ukraine, while gradually incorporating features of social health insurance.

For the empirical assessment of the economic efficiency of healthcare systems in the European Union, data for 2023 were used to compare different healthcare system models in terms of the relationships between healthcare expenditure, economic resources, and population health outcomes. The analysis encompasses three key dimensions: cost efficiency (healthcare expenditure as a share of GDP and total healthcare expenditure), healthcare system performance (life expectancy at birth and the crude death rate), and the economic context (GDP per capita, labor productivity per person employed, and gross value added per hour worked). This set of indicators provides a comprehensive framework for evaluating the relationships between the level of economic development, healthcare expenditure, and healthcare system performance.

As part of the empirical analysis, a correlation matrix (Figure 1) was constructed to examine the relationships among key indicators of economic development, labor productivity, and healthcare system performance across the European Union countries.

	Crude death rate	Nominal labour productivity per person employed	Total health care expenditure percentage of GDP	Life expectancy	Real GDP per capita	Gross value added per hour worked	Total health care expenditure
Crude death rate	1						
Nominal labour productivity per person employed	-0.733	1					
Total health care expenditure Percentage of GDP	-0.149	0.020	1				
Life expectancy	-0.809	0.586	0.616	1			
Real GDP per capita	-0.695	0.910	0.092	0.660	1		
Gross value added per hour worked	-0.678	0.810	-0.096	0.362	0.733	1	
Total health care expenditure	-0.006	0.126	0.564	0.302	0.136	0.179	1

Figure 1. Correlation matrix of economic, healthcare expenditure, and health outcome indicators in European Union countries, 2023.

The correlation analysis revealed several pronounced relationships among the selected indicators. In particular, the crude death rate exhibited a strong negative correlation with life expectancy ($r = -0.81$), GDP per capita ($r = -0.69$), and labor productivity per person employed ($r = -0.73$). Conversely, life expectancy was positively correlated with GDP per capita ($r = 0.66$) and labor productivity per person employed ($r = 0.59$). The strongest association was observed between labor productivity per person employed and GDP per capita ($r = 0.91$), highlighting the close relationship between labor productivity and the level of economic development. Healthcare expenditure as a percentage of GDP showed a moderate positive correlation with life expectancy ($r = 0.62$) but only weak associations with the economic indicators. In contrast, total healthcare expenditure (million euro) demonstrated little association with the selected health outcome indicators.

Overall, the findings indicate a close relationship between labor productivity, GDP per capita, and population health outcomes, particularly life expectancy and mortality. Countries with stronger economic performance generally tend to achieve more favorable health outcomes. At the same time, healthcare expenditure as a percentage of GDP appears to be more closely associated with longevity than with broader indicators of economic performance. Taken together, these findings suggest that the performance of healthcare systems depends not only on the amount of financial resources allocated to healthcare but also on the efficiency with which these resources are utilized.

Given the relationships identified through the correlation analysis, cluster analysis was subsequently applied to develop a typology of European Union countries based on a set of socioeconomic characteristics. To improve the robustness of the clustering procedure and reduce the dimensionality of the dataset, the initial set of indicators was reduced to five variables: GDP per capita, gross value added per hour worked, life expectancy at birth, the crude death rate, and healthcare expenditure as a percentage of GDP. Variable selection was based on the correlation matrix, with highly correlated variables excluded according to predefined correlation thresholds. This procedure minimized the effects of multicollinearity and reduced the influence of redundant information on the clustering results.

The selected variables capture complementary dimensions of healthcare system performance, including economic development, labor productivity, population health, and healthcare financing, thereby improving the interpretability and robustness of the resulting clusters. Both hierarchical clustering (Figure 2) and the k-means algorithm were employed to classify countries into three clusters. The application of two complementary clustering techniques also enabled validation of the classification results and facilitated the identification of countries exhibiting transitional characteristics between clusters.

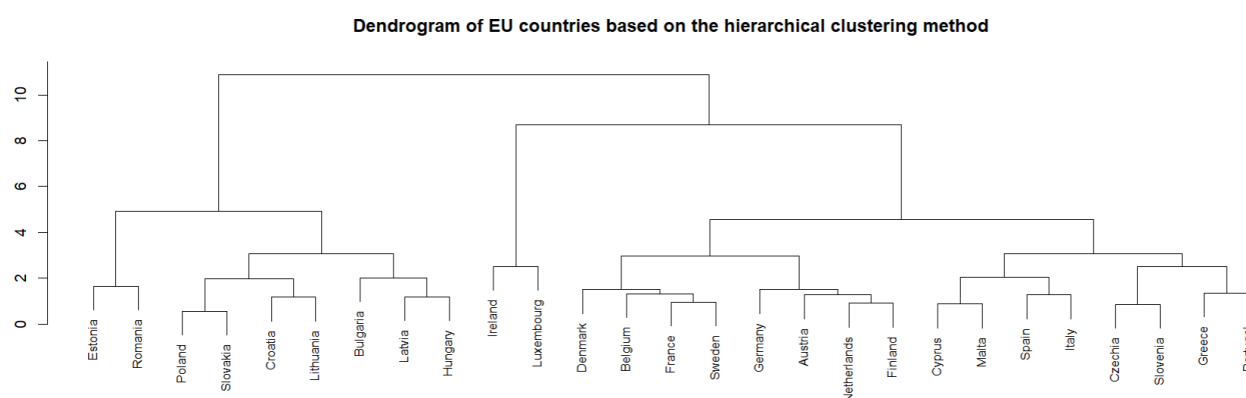


Figure 2. Dendrogram of EU countries based on the hierarchical clustering method (2023).

The cluster analysis identified three distinct groups of European Union countries based on their socioeconomic and healthcare-related indicators.

Cluster 1 comprises Belgium, Denmark, Germany, Spain, France, Italy, the Netherlands, Austria, Finland, Sweden, as well as Czechia, Greece, Cyprus, Malta, Portugal, and Slovenia. This cluster is characterized by relatively high levels of GDP per capita, longer life expectancy, and comparatively strong healthcare system performance.

Cluster 2 includes Bulgaria, Estonia, Croatia, Latvia, Lithuania, Hungary, Poland, Romania, and Slovakia. Compared with Cluster 1, these countries exhibit lower levels of economic development and less favorable population health indicators.

Cluster 3 consists of Ireland and Luxembourg, which form a separate group because of their exceptionally high GDP per capita and distinctive economic profiles.

The overall clustering structure was largely consistent across the hierarchical clustering and k-means methods. Both approaches identified a distinct group of economically advanced countries and revealed a broad East–West pattern among the remaining European Union countries. Minor differences were observed in the classification of Czechia, Greece, Portugal, and Slovenia. While the hierarchical clustering method assigned these countries to the higher-performing cluster, the k-means algorithm classified them within the group characterized by comparatively lower socioeconomic indicators. This finding suggests that these countries occupy intermediate positions in the multidimensional feature space and therefore represent borderline cases whose classification depends on the clustering algorithm applied.

7. Prospects for further research development

Future research should focus on expanding both the empirical scope and the methodological framework of the analysis, particularly by incorporating a temporal dimension and applying panel data clustering techniques to examine changes in the relative positions of European Union countries over time. Another promising direction is to broaden the set of explanatory variables by including indicators of institutional quality, innovation capacity, and healthcare system performance, thereby improving the explanatory power of the analytical framework. The proposed methodological approach offers considerable potential for further application owing to its combination of statistical robustness and the interpretability of the results.

8. Conclusions

This study provides a comparative assessment of healthcare systems across European Union countries by integrating socioeconomic indicators with correlation and cluster analysis, thereby identifying key structural differences among national healthcare systems. The findings reveal a close relationship between economic development and population health outcomes. In particular, life expectancy is positively correlated with GDP per capita and labor productivity, whereas the crude death rate is negatively associated with these indicators, highlighting the close relationship between economic prosperity and population health.

The correlation analysis further demonstrates that labor productivity and GDP per capita exhibit the strongest association, reflecting the close interdependence between economic performance and human capital development. At the same time, healthcare expenditure expressed as a percentage of GDP is more closely associated with population health outcomes than the absolute level of healthcare expenditure, suggesting that the efficiency of resource allocation is at least as important as the volume of financial resources available to the healthcare sector.

The cluster analysis identified three distinct groups of European Union countries. The first cluster comprises countries characterized by relatively high levels of economic development and favorable health outcomes. The second cluster includes mainly Central and Eastern European countries with comparatively lower socioeconomic and health indicators. The third cluster consists of Ireland and Luxembourg, whose exceptionally high GDP per capita distinguishes them from the remaining countries. The consistency of the overall clustering structure across both the hierarchical clustering and k-means methods supports the robustness of the proposed classification while also highlighting several borderline cases whose cluster membership depends on the clustering algorithm employed.

Overall, the findings indicate that healthcare system performance cannot be explained solely by the level of healthcare expenditure but is shaped by the interaction of economic development, labor productivity, healthcare financing, and institutional arrangements. The study also demonstrates the value of combining multiple clustering techniques to enhance the robustness and interpretability of comparative analyses of healthcare systems. Future research should incorporate a temporal dimension through panel data clustering and expand the analytical framework by including indicators of institutional quality, innovation capacity, and healthcare system efficiency, thereby providing a more comprehensive understanding of the factors influencing healthcare system performance.

References:

- 1) Afonso, A., & Aubyn, M. S. (2005). Non-parametric approaches to education and health efficiency in OECD countries. *Journal of Applied Economics*, 8(2), 227–246. <https://doi.org/10.1080/15140326.2005.12040626>
- 2) Böhm, K., Schmid, A., Götze, R., Landwehr, C., & Rothgang, H. (2013). Five types of OECD healthcare systems. *Health Policy*, 113(3), 258–269. <https://doi.org/10.1016/j.healthpol.2013.09.003>

- 3) Chuang, Y., & Hu, J. (2025). Comparative Assessment of Health Systems Resilience: A Cross-Country Analysis Using Key Performance Indicators. *Syst.*, 13, 663. <https://doi.org/10.3390/systems13080663>
- 4) Eurostat. (2026). Eurostat Database. European Commission. <https://ec.europa.eu/eurostat>
- 5) Fgaier, M., & Zrubka, Z. (2023). Cross-country comparison and ranking: a scoping review of economic similarity indexes. 2023 IEEE 23rd International Symposium on Computational Intelligence and Informatics (CINTI), 000171-000176. <https://doi.org/10.1109/cinti59972.2023.10382121>
- 6) Hadad, S., Hadad, Y., & Simon-Tuval, T. (2013). Determinants of healthcare system's efficiency in OECD countries. *The European Journal of Health Economics*, 14(2), 253–265. <https://doi.org/10.1007/s10198-011-0366-3>
- 7) Halásková, R., & Bednář, P. (2021). Evaluation of Selected Indicators of Health Care in the Context of Health care Systems: Case of 27 European Union Countries. *Scientific Papers of the University of Pardubice, Series D: Faculty of Economics and Administration*. <https://doi.org/10.46585/sp29031355>
- 8) Hollingsworth, B. (2008). The measurement of efficiency and productivity of health care delivery. *Health Economics*, 17(10), 1107–1128. <https://doi.org/10.1002/hec.1391>
- 9) Ivanková, V., Gavurová, B., Khouri, S., & Szabó, G. (2021). Examining the Economic Perspective of Treatable Mortality: The Role of Health Care Financing and the Importance for Economic Prosperity. *Frontiers in Public Health*, 9. <https://doi.org/10.3389/fpubh.2021.780390>
- 10) Joumard, I., André, C., & Nicq, C. (2010). Health care systems: Efficiency and institutions (OECD Economics Department Working Papers No. 769). <https://doi.org/10.1787/5kmfp51f5f9t-en>
- 11) Kaufman, L., & Rousseeuw, P. J. (2009). Finding groups in data: An introduction to cluster analysis. John Wiley & Sons. <https://doi.org/10.1002/9780470316801>
- 12) Lekhan, V., Rudiy, V., Richardson, E., & Nolte, E. (2015). Ukraine: Health system review. *Health Systems in Transition*, 17(2). <https://iris.who.int/handle/10665/176099>
- 13) Letunovska, N., Saher, L., Syhyda, L., & Yevdokymova, A. (2023). Analysis of health care system development in the regions amidst economic inclusiveness and social determinants of health. *WSEAS Transactions on Environment and Development*, 19, 120–129. <https://doi.org/10.37394/232015.2023.19.14>
- 14) OECD (2023), *OECD Compendium of Productivity Indicators 2023*, OECD Publishing, Paris, <https://doi.org/10.1787/74623e5b-en>.
- 15) Proksch, D., Busch-Casler, J., Haberstroh, M., & Pinkwart, A. (2019). National health innovation systems: Clustering the OECD countries by innovative output in healthcare using a multi indicator approach. *Research Policy*. <https://doi.org/10.1016/j.respol.2018.08.004>.
- 16) Purssell, E., Frood, S., & Sagoo, R. (2025). Beyond the labels: Classifying countries by child health outcomes – A cluster analysis of child mortality and child-health data. *Global Health Action*, 18. <https://doi.org/10.1080/16549716.2025.2526315>.
- 17) Tchouaket, E., Lamarche, P., Goulet, L., & Contandriopoulos, A. (2012). Health care system performance of 27 OECD countries.. *The International journal of health planning and management*, 27 2, 104-29 . <https://doi.org/10.1002/hpm.1110>.
- 18) Top M, Cinaroglu S. Cluster analysis of health systems in Europe according to life expectancy at birth. *Int J Health Plann Mgmt*. 2021;36(6):2162-2181. <https://doi.org/10.1002/hpm.3283>
- 19) Wendt, C., Frisina, L., & Rothgang, H. (2009). Healthcare system types: A conceptual framework for comparison. *Social Policy & Administration*, 43(1), 70–90. <https://doi.org/10.1111/j.1467-9515.2008.00647.x>
- 20) World Health Organization & World Bank. (2022). Health financing reform in Ukraine. <https://www.who.int/europe/publications/i/item/WHO-EURO-2022-5657-45422-65003>
- 21) World Health Organization & World Bank. (2024). Health financing in Ukraine. <https://www.who.int/europe/publications/i/item/WHO-EURO-2024-10570-50342-75964>

22) Yalçın Balçık, P., Demirci, Ş., & Konca, M. (2021). Comparison of European countries' health indicators and health expenditures by clustering analysis. *Ömer Halisdemir Üniversitesi İktisadi Ve İdari Bilimler Fakültesi Dergisi*, 14(2), 365-377. <https://doi.org/10.25287/ohuiibf.696742>