

The Level of Resources and Quality of the Health System in the Romanian Country

Andreea BREAZU*

Bucharest University of Economic Studies, Bucharest, Romania

**Corresponding author, andreea.breazu@man.ase.ro*

Ana Alexandra OLARIU

Bucharest University of Economic Studies, Bucharest, Romania

anaalexandra.olariu@man.ase.ro

Ștefan Cătălin POPA

Bucharest University of Economic Studies, Bucharest, Romania

catalin.popa@man.ase.ro

Cătălina Florentina POPA

Bucharest University of Economic Studies, Bucharest, Romania

catalina.albu@man.ase.ro

Abstract. *A good health system is essential for any country to achieve its social, economic, and political goals and to ensure that all citizens have the opportunity to lead healthy and productive lives. A country's healthcare system can also have an impact on its reputation and competitiveness on the global stage. Several research studies have examined the healthcare system in Romania from a comprehensive perspective. Recently, the topics most studied include healthcare workers and the impact of the pandemic on the healthcare system. This study aims to analyze the level of resources and the quality of the health system in the 42 counties of Romania. Data was collected from national statistics and several indicators were examined in relation to the resources and quality of the healthcare system. The primary indicators for healthcare resources that we used focused on the average number of doctors and hospitals, among others. While, for quality, we evaluated metrics such as the average of natality, mortality, and others. To analyze the data collected on health resources, we used a two-step cluster grouping method in SPSS, and to assess quality indicators, we performed a one-way ANOVA analysis to determine whether there were significant differences in health care quality between areas with fewer resources and areas with more resources. The findings of our research divided the country into four clusters based on the availability of medical resources per one thousand inhabitants, where medical resources are limited and where resources are high. Furthermore, we discovered that there is a statistically significant difference between medical resources and the mortality rate.*

Keywords: Romania, healthcare system, health resources, counties, Two-step cluster.

Introduction

Romania's healthcare system has undergone significant changes in recent years, with a focus on decentralization and privatization (Zota & Radulescu, 2019). Despite these changes, the system continues to face challenges such as inadequate funding, shortages of medical personnel and equipment, and a lack of access to specialized care in rural areas.

Health studies in Romania are relevant because they provide insights into the current state of the country's health system and the health of its population. Furthermore, Romania is a country

DOI: 10.2478/picbe-2023-0038

© 2023 A. Breazu; A. A. Olariu; Ș. C. Popa; C. F. Popa, published by Sciendo.

This work is licensed under the Creative Commons Attribution 4.0 License.

in transition, and understanding the health situation in the country is important for both the government and the international community to provide the appropriate assistance and implement effective policies. Additionally, Romania is a country with a rich cultural heritage and history and understanding the health situation in the country can help preserve the culture and traditions of Romania.

This study aims to provide a perspective of the 42 counties in Romania from the point of view of resources, but also from the point of view of quality of the health system. To accomplish this, we will present an examination of the relevant literature, the methodology used for this study, the key findings and the overall conclusions.

Literature review

Romania is a country located in Southeastern Europe, known for its rich culture and history, with a population of approximately 19.5 million people (INS, 2022a). The official language is Romanian, and it has a diverse culture influenced by its history as a crossroad of various civilizations. The country has a mixed economy that has been growing steadily in recent years and is a member of the European Union, NATO and the United Nations.

Before 1989, Romania was part of the communist bloc, and its healthcare system was poorly funded and had poor performance and quality. However, since 1998, Romania has shifted to a social health insurance system that is highly centralized and managed by the Ministry of Health (Pop et al., 2020). In Romania, healthcare services are provided through a mandatory social health insurance system that is strongly managed by the government. These services are available in 41 counties and the capital city and follow central government regulations. The healthcare system is divided into three levels of care: primary, secondary, and tertiary (Vlădescu et al., 2008).

Despite Romania's accession to the European Union and subsequent improvement in quality of life, the country still has the lowest healthcare expenditure as a percentage of GDP and the lowest expenditure per person among member states of the European Union (OECD, 2021). In 2019, most of healthcare spending, approximately 44%, was directed toward hospital services. Furthermore, direct payments for healthcare are above the average of the European Union and a significant part of these payments are attributed to the cost of outpatient pharmaceuticals (OECD, 2021).

Before the COVID-19 pandemic, Romania had made significant investments in the healthcare sector, although it started at a lower level. However, the pandemic has placed a tremendous amount of pressure on the healthcare system, revealing its vulnerabilities (Vlădescu et al., 2016). Therefore, Romania's healthcare system has been stretched thin during the pandemic, with hospitals facing shortages of staff and supplies and concerns about the ability of the system to handle a high influx of patients. The pandemic has also had a negative impact on mental health of both healthcare workers and the general population, as a result of the stress and uncertainty caused by the pandemic (Popa et al., 2022).

This study aims to focus on medical assistance in the 41 counties and the capital of Romania (Bucharest) in terms of resources and also in terms of quality of the health system, analyzing a series of indicators such as the number of doctors, the number of hospitals, the number of beds for continuous and day hospitalizations, the number of medium health personnel, but also indicators related to quality of life (natality, mortality, infant mortality and life expectancy).

The medical system in Romania from the point of view of resources

After studying the specialized literature (Cicea et al., 2011; OECD, 2021; Vlădescu et al., 2008; Vlădescu et al., 2016), we found that from the point of view of resources, Romania's medical system has some strengths and weaknesses. Some of the strengths include:

- A publicly funded healthcare system that provides access to medical care for all citizens.
- A relatively high number of medical graduates compared to some other countries in Europe.
- A well-established network of primary care clinics that provide basic medical services to patients.

The Romanian medical system has several weak points in terms of resources (Cicea et al., 2011; OECD, 2021; Vlădescu et al., 2008; Vlădescu et al., 2016), including:

- Shortage of medical personnel: Despite training a sufficient number of healthcare professionals, many choose to migrate to other countries, leading to a shortage of doctors and nurses in Romania.
- Limited access to specialized care: Rural areas in Romania often lack access to advanced medical care and care, which can lead to poorer health outcomes for residents.
- High rates of poverty, leading to poor health in many areas, and limited access to healthcare.

In Romania, the comprehensive benefits package offered by the social health insurance system includes primary care, most medications, special care for children and pregnant women, treatment for certain serious diseases, and conditions covered by national health programs (Stoichitoiu & Baicus, 2021). However, patients are responsible for paying a portion of the cost of medications taken outside of the hospital (OECD, 2021).

In addition, Romania has a robust educational system for healthcare professionals, producing a large number of graduates in the fields of medicine and nursing. However, despite having enough trained health workers, many choose to leave the country and work in other countries (Păunică et al., 2017). This has led to a shortage of medical personnel in Romania, particularly among young workers. In 2019, Romania ranked fifth in the number of medical graduates with 4967 graduates and third in nursing graduates (OECD, 2021).

Thus, analyzing the data of the National Statistics Institute of Romania (2022b), in 2021 1.6 doctors per 1000 inhabitants, with the European average being 3.9 per 1000 inhabitants. Regarding the situation reported at the level of the 42 counties of Romania but also in the city of Bucharest, it can be seen from Figure 1 that there are very few counties where the average number of physicians per 1000 inhabitants exceeds the average of the European Union, these being (Bucharest -15.98; Timișoara - 5.51; Iași - 4.72 and Cluj - 4.32), also, the areas where the rate of doctors is higher is possibly due to the fact that there are also university centers. It can also be seen that most of the averages of the counties are well below the European Union average.

Source: <http://statistici.insse.ro> Tempo-online.

Due to the uneven distribution of healthcare professionals throughout the country, many rural areas lack adequate healthcare services, resulting in unequal access for Romanian citizens. This problem is compounded by poor transportation infrastructure, making it difficult for residents of these areas to access healthcare.

Natality is a measure of the number of births that occur in a given population over a specific period of time, typically expressed as the number of births per 1000 individuals in that population (Zosin, 2022). In the last five years, Romania's birth rate was relatively higher compared to the European Union average; in 2021 for example, the country's birth rate was reported at 9.03 per 1000 inhabitants, while the European Union average was 9 people born per 1000 inhabitants (Eurostat, 2022a). Unfortunately, the death rate has also remained high over time compared to the average of the European Union. In 2021, the mortality rate was reported at 17.5 per 1000 inhabitants, while the European Union was only 11 deaths per 1000 inhabitants (Eurostat, 2022b).

DOI: 10.2478/picbe-2023-0038, pp. 388-400, ISSN 2558-9652 |
 Proceedings of the 17th International Conference on Business Excellence 2023

deaths were linked to poor eating habits, such as not eating enough fruits and vegetables and consuming excessive amounts of sugar and salt (Simionescu et al., 2019). Furthermore, in 2019, more than three quarters of Romanian adults said that they do not eat fruits during the day and a similar percentage reported not consuming vegetables. These numbers are significantly higher than those of most other countries in the European Union. Furthermore, only 32% of Romanian adults reported participating in moderate physical activity on a weekly basis, which is the lowest percentage among countries in the European Union (Eurostat, 2022c).

In 2018, ischemic heart disease was the leading cause of death in Romania, accounting for a third of all deaths. The death rate from this disease was more than twice the EU average (Budig & Harding, 2021). Stroke was the second leading cause of death, accounting for 16% of all deaths, and lung cancer was the most prevalent cause of cancer-related deaths, and the death rate has also increased by 11% since 2000, due to high smoking rates (OECD, 2021). Furthermore, death rates from other types of cancer have also increased in recent years.

The quality of a healthcare system can be measured by its infant mortality rate, which has decreased significantly in Europe over the past 50 years, with a two-thirds decrease in the last 30 years. This trend is also evident in Romania, where the number of infant deaths per 1000 live births dropped from 55.2 in 1968 to 26.1 in 1989 during the communist regime (Pop et al., 2000). However, Romania still has the highest infant mortality rate in the European Union in 2021, with 5.6 deaths per 1000 live births compared to the European Union average of 3.1 deaths per 1000 live births (Eurostat, 2022d).

Between 2000 and 2019, Romanian life expectancy increased by more than four years, then fell by 1.4 years in 2020 due to the COVID-19 pandemic. There is a significant difference in life expectancy between men and women, with women living on average eight years longer (OECD, 2021). According to Eurostat (2022e), in 2021, life expectancy in Romania was reported to be 72.9 years, while the average of the European Union was 81 years.

Methodology

Resources within a health system play a key role and influence the quality of health care. From our literature review, we observed that most studies focus on indicators at a country level, however, very few of them analyze the situation specifically in the 42 Romanian counties.

Therefore, the aim of our research is to make a classification of the 41 Romanian counties and the capital (Bucharest) to determine which county is the best equipped and which is the poorest in terms of medical resources. Furthermore, we intend to analyze whether there are differences in the quality of the health system in poor areas and developed areas.

To accomplish the goal of the study, we collected data from the database of the National Statistics Institute of Romania (Tempo-online, 2022) in December 2022 regarding the number of hospitals, the number of doctors, the number of beds for continuous hospitalization and day hospitalization, but not least regarding the number of nurses from each analyzed county. Furthermore, we collected data on the quality of the health system from the same source to analyze whether there are differences between counties in terms of health resources and quality of care. The indicators regarding the quality of the health system collected refer to the birth rate, the mortality, and infant mortality rate, but also the life expectancy.

Data were cleaned and organized for statistical analysis by creating units of measure based on 1000 people. And for their analysis, we used a cluster analysis called Two-step Cluster in IBM SPSS Statistics (Version 26) since we wanted to group the counties into three categories: low, medium, and high healthcare resources. Finally, we used the ANOVA statistical test to verify our

results, but also to observe differences between medical resources in the 42 counties and the quality of the health system.

Results and discussions

Chiu et al. (2001) developed the two-step SPSS clustering method for analyzing large data sets. This method involves two stages of computation (Bacher et al., 2004): (1) The first step of two-step clustering is pre-clustering of cases, in which a sequential approach is employed. The objective is to reduce the number of cases by creating a new data matrix, using the preclusters and their characteristics, called cluster functions, as the new cases. (2) The second step of two-step clustering is clustering of cases, in which a model-based hierarchical technique is utilized. This technique is similar to hierarchical clustering in that the (pre)clusters are combined in stages until they are all part of a single cluster. However, it differs in that it employs a basic statistical model. Additionally, it offers two options for measuring distance: Euclidean distance and logical probability distance.

Therefore, in the case of these investigations, there were five variables related to 42 counties in Romania to reduce the number of cases by creating a new data matrix. These were the following:

- Total number of hospitals per 1000 inhabitants, abbreviated "hospitals".
- Total number of beds for continuous hospitalization per 1000 inhabitants, abbreviated as 'long-term hospitalization'.
- Total numbers of beds for daily hospitalization per 1000 inhabitants, abbreviated as "daily Hospitalization".
- Total number of doctors per 1000 inhabitants abbreviated "doctors".
- Total number of health personnel (nurses) per 1000 inhabitants, abbreviated as "nurses".

Moreover, the Two-step SPSS cluster analysis automatically determines the number of clusters, but we wanted to determine an exact number of clusters and respectively minimum four by calculating the Likelihood distance. The silhouette measure, which assesses cluster quality by evaluating cohesion and separation, indicated a good cluster solution with an average value of 0.6. Cluster analysis provided valuable insights into the characteristics of the four clusters, which are presented below and illustrated in Table 1 and Figure 2, based on the five variables used to form them.

Table 1. Cluster distribution

			N	% of Total	Mean
Cluster	1	Low healthcare resources	24	57.1%	5.121
	2	Medium-health care resources	10	23.8%	9.203
	3	High healthcare resources	7	16.7%	16.193
	4	Super high healthcare resources	1	2.4%	62.856
	Total		42	100%	

Note: N - represents the number of counties in Romania.

Mean - represents the average of the five variables in a cluster

Source: Authors' own research

The first cluster with low healthcare resources represents 57.1% of our total results with a mean score of 5.121, consisting of the following counties: Tulcea, Bistrița Năsăud, Covasna, Dâmbovița, Giurgiu, Mehedinți, Ialomița, Botoșani, Vaslui, Harghita, Brăila, Satu -Mare, Caraș-Severin, Călărași, Sălaj, Olt, Vrancea, Teleorman, Neamț, Gorj, Buzău, Ilfov, Hunedoara and Galați. The results indicate that more than half of the country has limited health resources, a fact that can also affect the quality of the health system.

The second cluster with medium healthcare resources represents 23.8% of our total cases with a mean score of 9.203, consisting of the following counties: Vâlcea, Alba, Sibiu, Arad, Suceava, Maramureș, Bihor, Mureș, Bacău, Argeș.

The third cluster with high healthcare resources represents 16.7% of our total cases with a mean score of 16.193 made up of the following counties: Constanța, Timiș, Dolj, Brașov, Prahova, Iași, and Cluj. It is interesting that all these mentioned counties are also university centers.

The last cluster represents an exceptional situation in our analysis composed only of the city of Bucharest, which is also the capital of the country. Thus, it represents 2.4% of the total population, having a mean score of 62.856 for all five variables analyzed. The situation shows us that the resources in the country's capital are extremely high compared to the opposite pole, the counties in the first cluster.

Given that the capital is the largest city in Romania, it is normal to have more resources compared to a small county, however, it is clear that there are many geographical areas that face shortages for various reasons, such as the migration of young people graduates in bigger cities or even outside the country.

Figure 2 shows the cluster comparison for the five variables analyzed, and as can be seen from this, the capital is a special situation, while the rest of the country is placed in the graph according to the averages of the variables and also according to the grouping of the clusters.

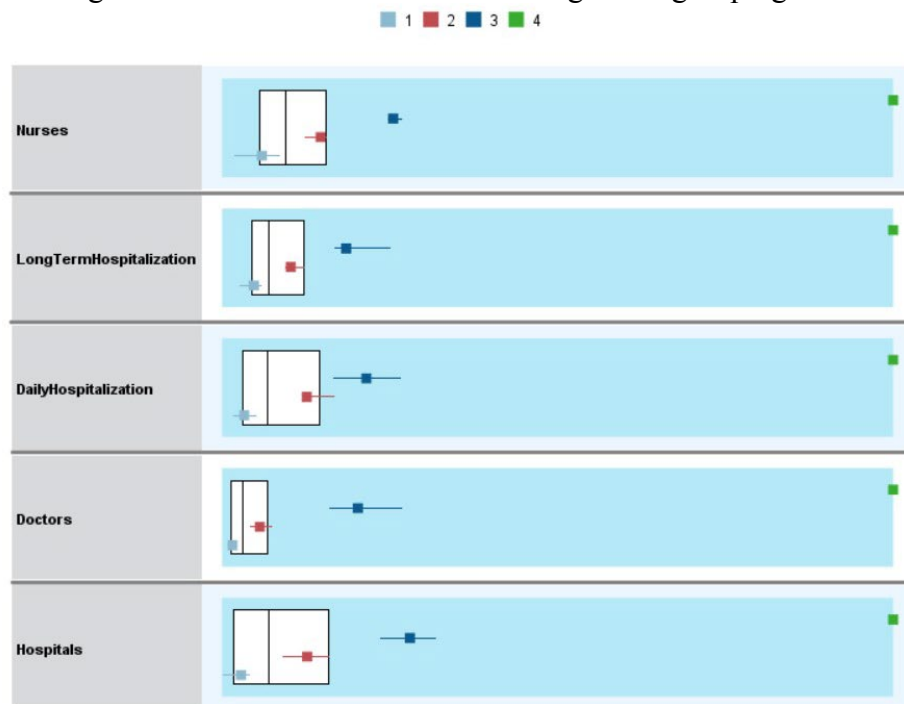


Figure 2. Cluster comparison

Source: Authors' own research with SPSS Statistics 26.0.

Furthermore, to facilitate the understanding of the cluster comparison model, we made Table 2 to provide information on each cluster variable.

Table 2. Cluster Centroids

Cluster	Hospitals		Long-term hospitalization		Daily Hospitalization		Doctors		Nurses	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1	0.006	0.002	1.763	0.514	0.075	0.024	0.597	0.211	2.685	0.757
2	0.013	0.004	3.189	0.564	0.174	0.032	1.364	0.534	4.463	0.693
3	0.024	0.006	5.467	1.379	0.256	0.073	3.545	1.450	6.900	0.688
4	0.076		22.605		1.014		15.98		23.180	

Note: SD - Standard deviation shows the variation or dispersion of variables.

Source: Authors' own research with SPSS Statistics 26.0

Thus, as can be seen from Table 2 but also from the cluster comparison, the mean score of each variable in the first cluster is small (Hospitals - 0.006, Long-term hospitalization - 1.763, Daily Hospitalization - 0.075, Doctors - 0.597 and Nurses - 2.685) in comparison with those in cluster three, which was categorized as having high resources, (Hospitals - 0.024, Long-term hospitalization - 5.467, Daily Hospitalization - 0.256 Doctors - 3.545 and Nurses - 6.900). However, we observe from these results that in each cluster there is a variable that has higher values but also lower values. In the first cluster, the average of hospitals has the lowest value, from which we deduce that there is not a staffing problem in that geographic area directly, but there is a lack of the number of medical units where patients can be treated. We observe that the same phenomenon also occurs in the other clusters, respectively, in other areas of the country. However, a larger number of hospitals would mean higher values for the other variables used in the analysis.

We checked the accuracy of the final cluster grouping, as also suggests Hair et al. (2010) in predicting outcomes by determining if there were any significant statistical differences between the clusters (Popa & Ștefan, 2015). To do this, we conducted a One-Way ANOVA analysis using five variables as the dependent variables and cluster membership as the independent variable. As Table 3 shows, the results of all the variables (p value < 0.05) indicate the cluster's ability to make accurate predictions, providing evidence of its validity.

Table 3. One-Way ANOVA for cluster validity

Variables	Cluster Members	F	p -value
Hospitals	(1-4)	131.912	0.000
Long Term Hospitalization	(1-4)	287.333	0.000
Daily Hospitalization	(1-4)	217.942	0.000
Doctors	(1-4)	201.264	0.000
Nurses	(1-4)	290.086	0.000

Source: Authors' own research with SPSS Statistics 26.0.

Further, we wanted to perform a One-Way ANOVA analysis to determine if there are statistically significant differences between the clusters in terms of quality of the health system, thus we considered the following as independent variables:

- The birth rate per 1000 people in each county is abbreviated as "natality".
- The mortality rate reported per 1000 people in each county is abbreviated as "mortality".
- The life expectancy rate in each county is abbreviated as "life expectancy".
- The infant mortality rate per 1000 people in each county is abbreviated as "infant mortality".

For the dependent variable, we used the cluster membership from Two-step analysis. Thus,

Table 4 presents a descriptive statistic that presents key information about their characteristics in each cluster, but also the results of the analysis. As a result, the average of the first variable "natality" in the clusters is low in the counties with low medical resources (7.879), while in the counties with developed resources the mean score is increasingly higher (8.457 in Constanța, Timiș, Dolj, Brașov, Prahova, Iași and Cluj) and (8.800) in the capital of Romania, Bucharest. However, even the highest average is not higher compared to the average birth rate average, which in 2021 was 9 people born per 1000 inhabitants (OECD, 2021).

Moreover, in the case of mortality, we observe that the average score is low in poorly equipped regions, whereas in highly developed regions such as the capital there is an increased mortality rate. The average mortality was reported to be 5.979 in the first cluster which includes areas such as Mehedinți, Ialomița, Botoșani, Vaslui and others and 29.200 in the capital of the country. Despite these results, we still consider the values to be normal, since the capital's population represents 11% of the entire country's population, which was reported in 2022 at 19.5 million inhabitants (INS, 2022a). We believe that these results are also related to the population of the areas analyzed. Furthermore, this result may be a research problem for future research, considering that usually the mortality rate in low-income and rural areas is often higher than in urban and developed areas due to lack of access to healthcare, poor conditions of life and education, and limited economic. Factors such as poverty, poor nutrition, and limited access to clean water and sanitation may also contribute to higher rates of illness and disease in these areas.

Regarding the life expectancy for the clusters made in the previous analysis, we notice that it is low in the case of the first cluster (74 years) where there are fewer medical resources compared to the areas with more medical resources (the score mean varies between 74 and 75 years) for clusters three and four. The European Union's average for life expectancy was reported to be 81 years in 2021 (OECD, 2021), however it can be observed that we are below this value with a significant difference even for developed areas.

Regarding infant mortality, it is considered a good indicator for measuring the quality of a health system. Our results indicate that the highest rate of infant mortality was not reported in the areas with the lowest medical resources, the first cluster (5.916), but in the second cluster with medium healthcare resources and with a high average score for infant mortality (6.520). However, even as we mentioned in the specialized literature study, this is very high compared to the average of the European Union.

The ANOVA results suggest that there is no statistical difference between the average quality level and the average of available resources in the four clusters made in the previous stage analysis, regarding the natality ($F_{(3,38)} = 0.702$; $p = 0.557 > 0.05$), life expectancy ($F_{(3,38)} = 1.981$; $p = 0.133 > 0.05$), and infant mortality ($F_{(3,38)} = 1.623$; $p = 0.200 > 0.05$). In other words, in areas where there are fewer resources, the quality of the system is low and in areas where resources are higher, the level of quality of the medical system is better. Regarding the mortality variable, it is find a statistically significant difference ($F_{(3,38)} = 77.225$, $p = 0.000 < 0.05$) between the average of the resources available in the 42 counties of Romania and the mortality rate, therefore it is observe that in this case the mortality rate is not conditioned by the level of resources. It is an unusual situation that the mortality rate is not influenced by the level of medical resources, however, we believe that this result is also due to the population of the analyzed areas.

Table 4. Descriptive statistics and One-Way ANOVA for the quality of health system in clusters

Variables	Cluster Members	N	Mean	SD	Std. Error	F	p-value
Nativity	1	24	7.879	1.117	0.228	0.702	0.557
	2	10	7.870	1.282	0.405		
	3	7	8.457	0.795	0.300		
	4	1	8.800	-	-		
	Total	42	7.995	1.103	0.170		
Mortality	1	24	5.979	1.597	0.326	77.225	0.000
	2	10	8.430	1.817	0.574		
	3	7	11.042	1.430	0.540		
	4	1	29.200	-	-		
	Total	42	7.959	4.175	0.644		
Life expectancy	1	24	74.731	1.425	0.290	1.981	0.133
	2	10	74.786	0.623	0.197		
	3	7	75.367	0.786	0.297		
	4	1	77.370	-	-		
	Total	42	74.913	1.233	0.190		
Infant mortality	1	24	5.916	2.034	0.415	1.623	0.200
	2	10	6.520	0.977	0.309		
	3	7	5.657	1.794	0.678		
	4	1	2.500	-	-		
	Total	42	5.935	1.840	0.283		

Source: Authors' own research with SPSS Statistics 26.0.

Conclusions

The findings of our research can provide insight into the availability of resources in each county in Romania, as well as offer some key information about the quality of health services. We also think that this research has delved into an area that researchers have not extensively studied by researchers in the past, probably because there are already statistics available on the healthcare system at both the European and national level. However, we consider our study to be relevant for researchers or organizations interested in the health system in different particular areas of Romania.

We also believe that health resources are important to quality of life because they provide people with access to the necessary medical care and treatment. Without health resources, people may not be able to receive the care they need, which can lead to poor health outcomes and a lower quality of life. Therefore, we found that more than half of Romania has limited resources in the health system, there are very few geographical areas in the country where the average of resources is close to the average of the European Union.

Furthermore, we found that in certain regions of Romania such as Suceava, Bihor, Bacău, among others, the infant mortality rate is more than twice as high (6.52 per 1000 inhabitants) compared to the European Union average (3.1 per 1000 inhabitants). Additionally, many families in these areas may not have access to prenatal care or may not be able to afford necessary medical treatments for their infants. This can make it more difficult to detect and treat potential health problems early on, which can lead to higher infant mortality rates. Furthermore, socioeconomic factors such as poverty, low education levels, and unemployment can also have an impact on health outcomes, including infant mortality. Mothers living in these conditions may have limited access to information, resources, and support to ensure the health of newborns, which can lead to poor health outcomes. It is important to note that the government, healthcare system, and other

organizations are working to improve the situation by increasing access to healthcare, promoting healthy behaviors and reducing poverty; however, these efforts take time.

Several studies have been conducted on healthcare services in Romania, some researchers looking at the performance of healthcare workers (Popa et al., 2022), while others have examined the impact of economic crises on the healthcare system (Carausu et al., 2017), and others focused on leadership style over quality of the medical act (Corbos et al., 2021). Additionally, researchers have also analyzed how the Romanian healthcare system responded to the COVID-19 pandemic (Dascalu, 2020). Despite these efforts, there are relatively few studies that have examined the healthcare system in each county of Romania specifically. However, some researchers have focused on analyzing the private and public health system across all regions of the country (Zota & Radulescu, 2019). Summing up, the results of this study can contribute to the development of the literature by providing information on the availability of resources in the health system in each county in Romania, as well as by providing key information on the quality of health services.

Limitations of the study include the fact that each county was not examined in depth, but rather a general overview was provided. Additionally, we acknowledge that there may be other indicators that could be used to measure the quality of a healthcare system. Perhaps future research could focus on one specific indicator, such as mortality rate, or include multiple indicators in the analysis.

Acknowledgment

This study was conducted through advanced doctoral and post-doctoral research programs in the field of management, at the Bucharest University of Economic Studies.

References

- Bacher, J., Wenzig, K., & Vogler, M. (2004). *SPSS Twostep Cluster - A First Evaluation* (2nd ed.). Lehrstuhl für Soziologie, Nürnberg.
- Budig, K., & Harding, E. (2021). *Secondary prevention of heart attack and stroke: country profile for Romania*. London: The Health Policy Partnership.
- Carausu, E.M., Paris, S., Burlea, L.S., Tucmeanu, A.I., & Antohe, I. (2017). The Crisis Impact on the Romanian Health System and Population Health. *Revista de cercetare si interventie sociala*, 57, 120-137.
- Chiu, T., Fang, D., Chen, J., Wang, Y., & Jeris, C. (2001). A robust and scalable clustering algorithm for mixed type attributes in large database environment. *In Proceedings of the seventh ACM SIGKDD international conference on knowledge discovery and data mining*, 263-268. <https://doi.org/10.1145/502512.502549>
- Cicea, C., Busu, C., & Armeanu, E. (2011). The SWOT analysis of the Romanian health care system and the key elements for resources allocation. *Management Research & Practice*, 3(3), 31-42.
- Corbos, R.A., Cristian, D.A., Popescu, R.I., Bunea, O.I., & Scaunasu, R. (2021). Leadership Style, Interpersonal Relationships and The Quality of the Medical Act During the Covid-19 Pandemic Within a State Hospital. *In Proceedings of the International Management Conference*, 15(1), 792-801. Faculty of Management, Academy of Economic Studies, Bucharest, Romania.
- Dascalu, S. (2020). The successes and failures of the initial COVID-19 pandemic response in Romania. *Frontiers in Public Health*, 8, 344. <https://doi.org/10.3389/fpubh.2020.00344>

- Dumitrache L., Nae M., Simion G., & Taloş A-M. (2020). Modelling Potential Geographical Access of the Population to Public Hospitals and Quality Health Care in Romania. *International Journal of Environmental Research and Public Health*, 17(22) 8487. <https://doi.org/10.3390/ijerph17228487>
- Eurostat. (2022a). *Live births and crude birth rate*. Retrieved from: <https://ec.europa.eu/eurostat/databrowser/view/tps00204/default/table?lang=en> (accessed January 13th, 2023).
- Eurostat. (2022b). *Deaths and crude death rate*. Retrieved from: <https://ec.europa.eu/eurostat/databrowser/view/tps00029/default/table?lang=en> (accessed January 13th, 2023).
- Eurostat. (2022c). *How much fruit and vegetables do you eat daily?*. Retrieved from: <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20220104-1> (accessed January 14th, 2023).
- Eurostat. (2022d). *Infant mortality rates*. Retrieved from: https://ec.europa.eu/eurostat/databrowser/view/demo_minfind/default/table?lang=en (accessed January 14th, 2023).
- Eurostat. (2022e). *Life expectancy by age and sex*. Retrieved from: https://ec.europa.eu/eurostat/databrowser/view/demo_mlexpec/default/table?lang=en (accessed January 14th, 2023).
- Hair, J.F., Black, W.C., Babin, B.J., Anderson, R.E., & Tatham, R. (2010). *Multivariate data analysis* (7th ed). Harlow: Pearson Education Limited.
- IBM Corp. (2020). *IBM SPSS Statistics for Windows*. (Version 26.0) [Computer software]. IBM Corp.
- INS. (2022a). *Populația rezidentă a României*. Retrieved from: <https://insse.ro/cms/> (accessed January 13th, 2023).
- INS. (2022b). *Personalul medico-sanitar pe categorii, forme de proprietate, judete si localitati*. Retrieved from: <http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table> (accessed January 13th, 2023).
- OECD. (2021). *Romania: Profilul Sănătății în 2021 în ceea ce privește sănătatea*. OECD Publishing, Paris. Retrieved from: <https://doi.org/10.1787/b1c792f4-ro> (accessed January 13th, 2023).
- Păunică, M., Pitulice, I.C., & Ștefănescu, A. (2017). International migration from public health systems. Case of Romania. *Amfiteatru Economic Journal*, 19(46), 742-756.
- Pop, T.L., Burlea, M., Falup-Pecurariu, O., Borzan, C., Gabor-Harosa, F., Herdea, V., Pop, C.F., Rajka, D., Ognean, M.L., & Căinap, S.S. (2020). Overview of the pediatric healthcare system in Romania. *Turkish Archives of Pediatrics/Türk Pediatri Arşivi*, 55(Suppl 1), 69-84. <https://doi.org/10.14744/TurkPediatriArs.2020.77775>
- Popa, I., & Ștefan, S.C. (2015). Why do Some Nations Succeed and Others Fail in International Competition Factor Analysis and Cluster Analysis t European Level. *Annals of the University of Oradea, Economic Science Series*, 24(1), 1149-1157.
- Popa, I., Ștefan, S.C., Olariu, A.A., Popa, Ș.C., & Popa, C.F. (2022). Modelling the COVID-19 Pandemic Effects on Employees' Health and Performance: A PLS-SEM Mediation Approach. *International Journal of Environmental Research and Public Health*, 19(3), 1865. <https://doi.org/10.3390/ijerph19031865>
- Simionescu, M., Bilan, S., Gavurova, B., & Bordea, E-N. (2019). Health Policies in Romania to Reduce the Mortality Caused by Cardiovascular Diseases. *International Journal of*

Environmental Research and Public Health, 16(17), 3080. <https://doi.org/10.3390/ijerph16173080>

Stoichitoiu, L.E., & Baicus, C. (2021), COVID-19 pandemic preparedness period through healthcare workers' eyes: A qualitative study from a Romanian healthcare facility. *PloS one*, 16(10), e0257381. <https://doi.org/10.1371/journal.pone.0257381>

Tempo-online. (2022). *Baze de date statistice*. Retrieved from: <http://statistici.insse.ro:8077/tempo-online/#/pages/tables/insse-table> (accessed December 12th, 2023).

PICBE |
400

Vlădescu, C., Scîntee, G., Olsavszky, V., Allin, S., & Mladovsky, P. (2008). Romania: Health system review. *Health systems in transition*, 10(3), 1-172.

Vlădescu, C., Scîntee, S. G., Olsavszky, V., Hernández-Quevedo, C., & Sagan, A. (2016). Romania: health system review. *Health Systems in Transition*, 18(4):1-170.

Wang, H., Chukwuma, A., Comsa, R., Dmytraczenko, T., Gong, E., & Onofrei, L. (2021). "Generating Political Priority for Primary Health Care Reform in Romania. *Health Systems & Reform*, 7(2), e1898187. <https://doi.org/10.1080/23288604.2021.1898187>

Zosin, I. (2022). Family health and natality at the beginning of XXI century from an endocrinological perspective. The Publishing House *Medicine of the Romanian Academy, Series B*, 24(1), 63–72.

Zota, A. G., & Radulescu, A. (2019). A Cluster Analysis of The Romanian Counties Based on The Number of Healthcare Institutions And Health Workforce: Public Versus Private Sector. *Management Research and Practice*, 11(3), 5-17.