

An Economic Analysis of the Romanian Healthcare System based on an European Comparative Approach

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Abstract: - The paper presents the most important characteristics of three types of healthcare systems in Europe – Beveridge, Bismarck and Semaško systems – and intends to analyse the healthcare system in Romania based on a comparison with the countries that initiated and are representative for these models (United Kingdom, Germany, Russia). In order to outline the image of the healthcare system in Romania, we used multiple regression models to emphasize the impact of economic and social determinants of health on certain indicators. The results of the conducted analysis showed that the evolution of the Romanian health indicators are not always to be ascribed to the conventionally thought to be important factors.

Key-Words: - European healthcare system, Romanian healthcare system, economic analysis, health indicators, regression models, health determinants

1 Introduction

The human health is an economic good, being produced and reproduced over and over again by individuals through their interaction with the environment, the community they live in and the companies they work for.

Analyzed from an economic perspective, the human health is perceived as a superior good that plays a double part – as a consumer good and as a capital good.

As a consumer good, the human health produces satisfaction to the individuals and enables them to consume other goods and services. It is a known fact that best consumers are the healthy persons, because they have no restricted products, like ill people do.

As a capital good, human health can be seen as an investment of each individual in producing income. Every person invests part of his/her health in order to generate further income – partly used to maintain or improve the state of health and partly used for other type of actions and activities.

Therefore, the health economy is an important element of the health policy, both from a strategic perspective (the macroeconomics) and a tactical one (the microeconomics).

2 Main characteristics of the European health systems

Health systems are constantly changing, but major changes started to occur in the late '80s. These changes were meant to adjust the irregularities in the health systems across Europe – both in countries with stable market economies and countries with state monopoly over the production factors.

Such changes proved to be either revolutionary (they implied major transformations – like the changes attempted today in the countries that were part of the former Soviet Union) or evolutive (such as the measures in the developed West-European countries that did not change the existing systems, but only improved them).

There are three main healthcare systems in Europe: the national healthcare system – NHS (Beveridge), the social health insurances system (Bismarck) and the centralized healthcare system (Semashko).

The national healthcare system was first introduced in England by William Beveridge, who wished for a future with health services placed among the national priorities. This type of system can also be found in Denmark, Finland, Ireland, Norway, Sweden, Greece, Italy, Portugal and Spain. The system is financed through general taxes, is controlled by the government and has both a state budget and a private sector. All citizens have free access to the system, the coverage is general and the state authorities manage the system. The doctors are paid

as regular employees or paid according to the number of patients subscribed on their lists; in certain cases, the patients pay a part of the cost of some medical services.

The social health insurances system is the most used national insurance system, based on compiling the main elements of the social and medical insurances. This system operates in Germany, Austria, Belgium, Switzerland, France, Luxembourg and Holland, although differences occur from one country to another. The system is financed through compulsory contributions of employers and employees – social insurance introduced by Otto von Bismarck. It offers a broad coverage, but there is a proportion of the population that remains outside the coverage area of the medical services.

The centralized health system (introduced in Russia by Nikolai Semashko) was typical for the Central and Eastern European countries, which are now experiencing a transition process to the market economy. In these countries' case, the state had full control over the production factors, health facilities and services. The doctors were state clerks and there was no private sector. The medical assistance was free for everyone and employed oversized personnel and hospitals.

Each system has its own advantages and disadvantages and needs changes: the Beveridge system has a good impact on the health state, but there are long waiting lists for certain medical services and a high level of bureaucracy; the Bismarck system offers high performances, but the expenditure it implies are among the highest in the world and the Semashko has no competition and it lacks performance.

United Kingdom

As one of the representative countries for these models, United Kingdom has made certain reforms to the Beveridge system. These reforms (such as the one conducted under the "Iron Lady" Margaret Thatcher) aimed managerial efficiency and increase of the private sector and medical competition.

UK benefits from a public healthcare system developed at local administration levels. The British have developed an unique system of healthcare, financed from public sources, with a major influence over other national healthcare systems. The model is extremely popular and has achieved much of its initial objectives, continuously and slowly reformed ever since its beginnings in 1948, while managing to survive and succeed under various governments and political ideologies.

The national healthcare system was developed over several decades, through crucial events such as the Poverty Laws reform between 17th and 19th century, the National Health Insurance for workers and their families in 1891, the Exceptional National Medical Service

during World War II and the Beveridge Report in 1942. The latter was the basis for the creation of the national healthcare system in 1948. The Service was exclusively tax-financed, covering the entire population. The three initial service lines were hospital services, with employed medical doctors, health services offered by general practitioners (GPs) and dentists, with per capita/subscriber pay (both managed by public administrations) and a public healthcare service with employed personnel (managed by local authorities).

During healthcare reforms in the '70s and '80s, the NHS was restructured, with a reduction in the number of administrative layers and an attempt at integrating the highly specialized hospital and health services with the distributed and fragmented public healthcare services. Regional Healthcare Authorities were created in 1974 and subsequently integrated to Area Healthcare Authorities (AHA). The main objective was to decrease the number of hospital management committees, management boards and local healthcare boards. Further NHS reform in 1982 canceled the AHAs and transferred management responsibilities to District Health Authorities, promoting healthcare management decentralization towards hospitals and community structures. The NHS changes under the Conservative Government of the „Iron Lady” Margaret Thatcher focused on management efficiency from a policy and business point of view, private sector development, protection of taxpayer rights and interests.

Between 1977 and 1996 the number of hospital beds for in-patient care decreased from 3 to 2 per 1,000 inhabitants. Despite population aging trends, the average hospital stay diminished from 9.8 days in 1977 to 4.8 days in 1996, while community healthcare of all types developed considerably.

Management reform in the NHS system was again attempted in 1990. Three health authorities were defined: the Regional Health Authorities (RHA), the District Health Authorities (DHA) and Family Health Services Authorities (FHSA).

Further reforms in the 90s continued to focus on business-like efficiency ideals but with more emphasis on the patient as customer. These reforms offered more options for the patient as well as for the general practitioners, while also introducing the financial incentives for qualitative and efficient medical assistance. The key policies were increased competition between providers of medical services, development of community-level services and a further reduction of the number of hospital beds. Lately, FHSA's role has been expanded to include formulation of health policy, oversight and control over healthcare actors and services and the reimbursement of contractors.

The NHS is financed directly by the government out of tax revenues. Additional smaller sources of revenue

are patient payments for prescriptions and dental services. Budgets are allotted by the RHA to cover hospital services, community-level medical services and primary care, on the basis of population size and service use local factors.

The Labor Government, under the leadership of Tony Blair and in power since 1997, continued the reform process, in particular on the financing of primary care and “internal” market practices for fund managing GPs. Funding allotted to the system increased with 4 pp between 1999 and 2004, in order to cover the budget gaps of clinical services.

The last wave of reform is titled “The New NHS – a modern system we can count on”. The two key pressures for a new reform were: the large waiting lists for certain services and the variable service quality inside the system. The system's new goal was redefined as a “a healthcare system offering reliable and high quality services, when and where they are needed; a system that does not only treat patients but also improves the health state of the entire population and reduces the social inequality. Both the old centralized model of planning and control and the competitive and individualist internal market system were declaratively abandoned, and a “third way” was brought in, based on integrated healthcare services. The Third Way's main tenets were:

- a national health service with similar services across the country and homogenous national standards for quality and performance;
- local accountability for national standards;
- improved and extended partnership between NHS entities and external partners, for the best answer to patient needs;
- increased efficiency, a performance focus and reduced bureaucracy;
- quality as the most important decision criterion at all system levels;
- increased trust in the NHS as a public system, open and modeled around population needs.

The new NHS creates primary care trusts across the country, consisting of general practitioners serving population groups of 30,000-250,000, replacing the previous practice of direct contracting between GPs and health authorities. This structure accumulates yearly financial surpluses and allocates them to medical services improvement. A Commission for Health Improvement and a National Institute for Clinical Excellence, founded in 1999, further assist NHS management in improving population's health. An online system for registering patients and phone consultations is available to patients and GPs alike, as the first major milestone achieved in the true modernization of the system.

The NHS expenditure for healthcare in UK is smaller than the EU average, even if it increased from 4.5% of

GDP in 1970 to 5.6% in 1980 and 6.8% in 1997. Critics have though blamed this for under-financing certain critical services, such as cancer diagnosis and treatment.

The system was a top priority for all governments in the last 50 years, and remains one of the most popular and admired public institutions in UK. A continuous process of reform forced the NHS to permanently improve and adapt to healthcare needs and a changing economic environment, while providing universal access to healthcare for all of UK's population, even if its remedies for social inequity were rather less successful.

Germany

Germany is a federal state having a long tradition in the social security system of the population. The national German system of medical insurance is based on Otto von Bismarck's program and it was introduced in order to protect the workers with low incomes; it is founded on a mixture of social and medical insurance and it is financed through the social security system whose budget is formed by employers' and employees' contributions.

This program, also named "illness insurance", is based on the principle of offering medical benefits, including age pensions, benefits for disabled people and compensations for losing the ability to work. The 1883 Law of Illness Insurance stated that all workers with incomes below a specified level should be insured by the foundation of medical insurance, financed by employers' and employees' contributions.

The medical insurance foundations (Krankenkassen) could pertain to the trade union associations or to the patronage that handled their own medical assistance services, offering highly complex medical services for the members of those foundations and their families. The collateral foundations or the so-called societies of mutual services could offer medical benefits in case of accidents, funeral benefits or pensions for widows. This program then expanded, practically covering the whole population and remaining nowadays the main German foundation of social and medical security. The size of the financial contributions paid by the employers and the employees of the medical insurance foundation was correlated with their income and was not depending on the way they used medical services. The associations of medical insurance foundations and the GPs associations were negotiating the cost of the medical services, the foundations being powered to establish the percentage employer-employee on the basis of anticipated costs. In 1914, 13% of Germany population was medically insured, and this coverage increased up to 32% in 1932, 85% in 1960 and 90% in 1986. In 1983, 85% of the population was compulsory insured through local or national medical insurance foundations and 15% through

private medical insurance. Nowadays, the state system of compulsory medical insurance is financed by employers (50%) and employees (50%). The medical benefits are complex, covering the costs of the primary medical assistance, the costs incurred while staying in the hospital, dental costs, the costs of the prescribed medicines as well as the costs of the medical assistance and services carried out at the patient's home.

The lands' governments are responsible for planning the medical assistance in hospitals, half of them are managed by municipalities, third of them by non-governmental and non-profit organizations, and the rest of them by operators that function on a profit base. By the laws adopted in 1972 and 1985, the main hospital costs were covered by the state and the local administrations through the certificates of needs. The overheads were paid by the foundations of medical insurance based on the principle "days spent in hospital", standard tariffs for all the patients being established but without financial methods for stimulating a cut in prices for hospital medical assistance. The professional associations and the hospitals highly influenced the costs of medical assistance; the physicians' salaries are of a high value; the focus is put on highly sophisticated technologies, surgery interventions and costly medical services. The patients had the right to choose their physician, but they were obliged to be insured by one of the 1,241 existing medical insurance foundations, chosen by the employer or by the professional group they were pertaining at. The poor people and the unemployed were insured by AOK (Allgemeine Ortskrankenkasse) medical insurance foundation that was financially supported by the government and that was obliged to insure any person that was requiring this type of service.

In 1986, the global financing of hospitals was introduced in order to promote cost efficient medical services. This was due to the fact that Germany was a country with more hospital beds than needed, that had a low rate of use. The 1988-1993 period was characterized by a set of reforming laws intended to reduce the medical costs, as well as to limit the increase of prices, the physicians' number and the use of costly technologies in ambulatory medical assistance. The health expenditure in Germany increased from 9.2% of the GDP in 1986 to 10.6% in 1996, this country becoming the second in the world – after USA – considering the financial means allotted to health [2]. Nowadays in Germany, the governmental contribution to total medical costs represents 21%, meanwhile the contributions of employers/employees cover 60% of these costs, 11% being paid by personal funds and 8% by private medical insurance.

The medical insurance standards in Germany are one of the highest in the world. However, the medical

insurance foundations are not responsible for promoting the health, one of the frequent issue when considering the necessary medical reforms. The major problem of the present medical system in Germany is represented by the integration of East Germany medical system. The problem not only refers to increasing the medical assistance standards, but also to fighting against poverty, unemployment, low life and nutrition standards – important factors of the contemporaneous Germany integration process.

Russia

The public medical assistance and other social services for the Russian rural population were established in 1884 as a responsibility of the district authorities – the so-called *Zemstve* – which offered medical services financed through general taxes. The medical insurances were created in 1912, after the German model, covering approximately 20% of the industry workers. The country reconstruction plan (1918) included the concept of medical assistance elaborated by Nicolai Semaško. This concept was based on the principle of the state's responsibility for the population's health, general access to free medical services, prevention from the "social diseases", professional medical assistance and community participation.

The "social diseases" were considered to be those illnesses related to poverty and poor life conditions, mainly consisting of infectious and professional diseases. Consequently, several measures to fight against tuberculosis, cholera and malaria were taken. Also, prevention measures and prophylactic activities were intensified. Increasing the number of hospital beds, doctors and medical nurses became a national priority in order to ensure the general access to medical services. In 1937, all medical insurances companies and foundations were disabled and all hospitals were nationalized. Technically, all medical personnel became public employees.

Several special medical services were offered to certain social categories, such as ministries' employees, security services' employees and transportation workers. The state financed the medical services as a component of the national social and economic development plan. The state was in charge with the hirings, salaries payments and medical procurements for hospitals and universities. Therefore, the medical system was financed and controlled by the state and the main priority of the national medical policy, until 1990, was to increase the number of medical employees and hospital beds.

During the World War II, the Soviet medical system tried to cope with the large number of civilians and soldiers involved in the conflict and thus, despite of the harsh conditions of the war, no epidemics were spread.

The external observers have noticed the remarkable achievements in satisfying the medical needs of the war. The stability of the postwar period allowed the reconstruction of the medical services and the replacement of doctors lost in the war. Districtual systems were created and organized in order to ensure a fair access to medical services. Their compoence consisted of epidemic establishments, hospitals, polyclinics and specialized treatment institutions, according to the served population. Besides these, clinics situated in the industrial companies also existed, offering medical services to the employees.

In 1963, in response to the increasing incidence of chronic diseases, an yearly population examination schedule was implemented. In the mid '80s, the Ministry of Health announced the continuity of the medical policy's strategy focused on the development of preventive medicine. The state monopoly led to a conceptual stasis caused by the exaggerated focus on hospital medical assistance. The passive treatment strategies and the excessive hospitalization of patients proved to be resource consuming. The system was underfinanced in comparison to the new technological and medical needs. It received only 3.5% of the GDP, while industrialized countries spent between 7% and 13% of the GDP for their health systems.

After the fall of the Soviet Union in 1991, the former Soviet republics have experienced a period of political, economic and social reforms that had a major impact on the national health systems. The decline of the population's health in the '90s cannot be attributed only to the inefficiency of the health system. The increase of the mortality rate was caused by a set of factors, such as: smoking, alcohol consumption, unbalanced diet, pollution, lack of modern medical technologies. Therefore, in 1992, the president of the Russian Federation, Boris Elțin, presented the Report on Health, describing the poor state of health of the population and the necessity of medical reform. In 1993, a national program of medical insurance was adopted. This program implied the augmentation of the health expenditure, the decentralization of the medical management and the introduction of market mechanisms in the medical system. This process of decentralization increased the authonomy of the regional authorities regarding funds management and strategic changes, although the system lacked in capable managers that would abort the old dogma.

Still, the Russian medical system has an increased change potential. In order to satisfy the medical needs of the population and to raise the standards of the medical assistance, new cost-effective methods are needed. The health reform implies an increase of financial resources of the system, but this action is not recommended during transition period. Therefore, the necessary resources

must be achieved by revising priorities and resources reallocation.

3 The case of Romania

Romania, as well as other former socialist countries, has had a healthcare system based on the Russian Semashko model. The fall of the communism has brought a set of reforms that are meant to bring Romania's health system closer to the German model and to also implement a private, competitive health sector.

Since the reforms conducted in the past years have often been criticized for not taking into consideration the implication of certain determinants in the population's health state, we have created regression models in order to determine to which extent the changes of the system alter the health indicators.

3.1 Concept and methodology

The determinants of the health state are distributed into four major categories [4], each category including both direct and indirect determinants:

- 1) macroeconomic determinants;
- 2) environmental factors;
- 3) socio-demographic factors;
- 4) educational factors.

The direct determinants category includes smoking and drinking habits, drug usage, nutrition, access to health services, domestic violence etc. In the indirect determinants category, the most important ones are GDP/capita, poverty, the demographic structure (urban vs. rural) etc.

Taking this into consideration, we have created regression models that measure the impact that some of these determinants have on the health state of the Romanian population; for a more easy usage of these determinants, we have given them abbreviated names. The determinants that have been used in our analysis are:

- the GDP/capita – GDP;
- the percentage of the population that lives in the urban area (which in Romania is much more developed than the rural area) – UP;
- the liters of alcohol consumed every year/capita – ALCH;
- the number of hospitals/100,000 persons – H;
- the number of doctors/100,000 persons – DR.

The data available for Romania is taken from the National Institute of Statistics [10] for the "GDP" and from the World Health Organization (WHO) – *Health for All Database* [15] for all the other determinants and ranges, yearly, from 1980 until 2003. The data is used to generate five different regression models that show how

health indicators vary if the health determinants modify over time.

The first health indicator analyzed is the life expectancy at birth (named in abbreviation LE0), a synthetic indicator that measures the population's health state. It is calculated by WHO/EURO for all countries which report detailed mortality data, using Wiesler's method.

Unfortunately, some countries are not able to ensure complete registration of all death cases and births. Therefore, life expectancy calculated using incomplete mortality data is higher than it actually is. WHO calculations of life expectancy at birth use accurate population estimates as denominator.

Since life conditions vary from one decade to another, we have taken for further analysis two more health indicators, similar to the previous one – life expectancy at age 45 (LE45) and life expectancy at age 65 (LE65).

It is important to show how life expectancy varies from birth to a certain age, under the influence of economic, social or demographic factors.

Mortality is a negative component of the natural movement of a population, meaning the demographic phenomena of deaths occurred in that certain population and in a certain period of time. Therefore, the fourth health indicator is neonatal deaths per 1,000 live births (named NND), which represent the number of deaths for infants under 28 days of age in a year, per 1,000 live births in that year.

The fifth indicator implies another mortality rate – maternal deaths per 100,000 live births (MD). A maternal death is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes. There are two alternative sources of information on maternal mortality which are used to calculate this indicator:

- routine mortality data by cause, statistics regularly reported to WHO (in most cases from Central Statistical Offices);
- hospital data reported to Ministries of Health.

Normally, the number of maternal deaths from both sources should be identical, this being the case in most Western countries.

However, in some countries, mainly of Eastern Europe, there are large differences because of national practices of death certification and coding. In such cases hospital data are more accurate. Since January 2001, the maternal mortality rate is calculated using both data (when both figures are reported), taking the larger figure if unequal.

The last indicator submitted to analysis is live births per 1,000 populations (LB), indicator that takes into consideration all breathing new-born babies. The number of live births includes all live births during the given calendar year, irrespective of registration of the date of birth. WHO receives for most countries the number of live births as part of the annual reporting of mortality and population data.

Table 1: Variables used in the regression models

Notation	Meaning	Type
GDP	Per capita GDP in purchasing power parity (PPP) US\$	HD
UP	Urban population as percentage of total population	HD
ALCH	Pure alcohol consumption, litres per capita	HD
H	Hospitals per 100,000 persons	HD
DR	Physicians per 100,000 persons	HD
LE0	Life expectancy at birth, in years	HI
LE45	Life expectancy at age 45, in years	HI
LE65	Life expectancy at age 65, in years	HI
NND	Neonatal deaths per 1,000 live births	HI
MD	Maternal deaths per 100,000 live births	HI
LB	Live births per 1,000 persons	HI

Note: HD = health determinant; HI = health indicator

Table 2: Research Hypothesis

Notation	Expected impact on					
	LE0	LE45	LE65	NND	MD	LB
GDP	↑	↑	↑	↓	↑	↑
UP	↑	↑	↑	↓	↑	↑
ALCH	↓	↓	↓	↑	↑	↓
H	↑	↑	↑	↓	↓	↑
DR	↑	↑	↑	↓	↓	↑

Note: ↑ = positive; ↓ = negative

Table 2 shows all the initial hypothesis of our research. It has been observed that there is a strong relationship between the overall economic performance, measured by per capita GDP and a set of health indicators, especially life expectancy, among developing countries – the lower per capita GDP, the lower the life expectancy [14]. Nevertheless, once countries attain a certain degree of people's prosperity the above mentioned connection disappears; further increase in per capita GDP no longer appears to be associated with health improvement [12].

3.2 Results and findings

For each regression model we analyzed the stationarity and the multicollinearity before performing the regression.

More precisely, the stochastic relationships analyzed take the following forms for investigating statistical significance of the independent variables through six multiple ordinary least squares regressions:

$$Y_i = \alpha_i + \beta_{i1}X_1 + \beta_{i2}X_2 + \beta_{i3}X_3 + \beta_{i4}X_4 + \beta_{i5}X_5 + \epsilon_i \quad (1)$$

where Y_i , $i=1,2,\dots,6$ represents the dependent variables, namely the health indicators and X_j , $j=1,2,\dots,5$ stand for the explanatory variables.

Before constructing our models, all the available data was imported in Eviews 4.1 and it was initially processed, respectively for each time series the logarithm: $\ln Y_i = \ln(Y_{it}/Y_{it-1})$ and $\ln X_j = \ln(X_{jt}/X_{jt-1})$ was generated.

Thus, the significance of variables in the present analysis has been examined through multiple log-linear regressions.

Graph 1: GDP - logarithm

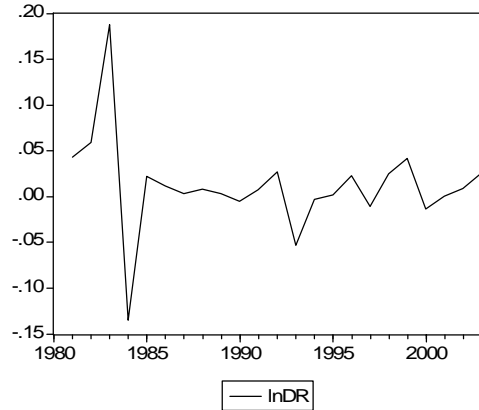


We performed the unit root test in order to assess the stationarity of the time series. Except for the $\ln GDP$ (see Graph 1) all the other series were stationary in level (see Graphs from 2 to 5). Therefore, we used $\ln GDP$'s first difference: $\ln GDP_d$. (see Graph 6).

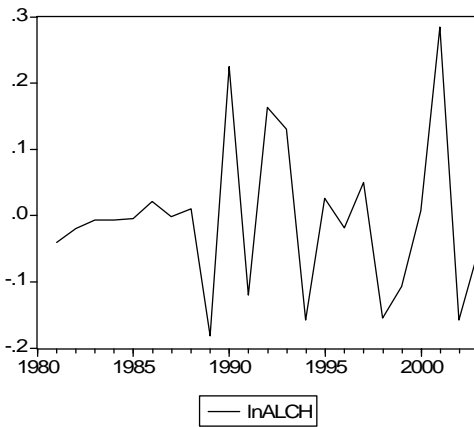
Graph 2: UP - logarithm



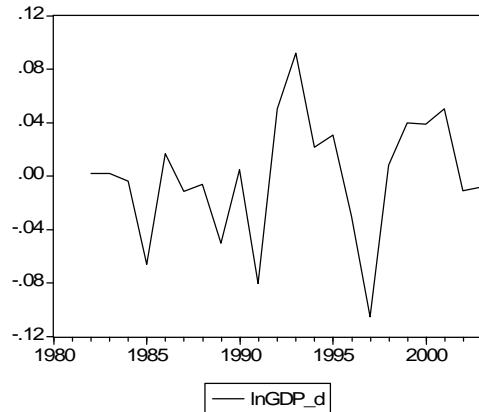
Graph 5: DR - logarithm



Graph 3: ALCH - logarithm



Graph 6: GDP - logarithm, first difference



Graph 4: H - logarithm



According to the rule of thumb [5] if the pair-wise or zero order correlation between two regressors is high (exceeds $|0.8|$), then multicollinearity becomes a serious problem. Therefore, pair-wise correlation has been tested for our models and the results demonstrate the absence of the troublesome multicollinearity (see Table 3).

Table 3: Correlation Matrix

	lnGDP_d	lnUP	lnALCH	lnH	lnDR
lnGDP_d	1.000				
lnUP	-0.104	1.000			
lnALCH	0.377	0.179	1.000		
lnH	0.069	-0.327	0.096	1.000	
lnDR	-0.058	0.203	-0.130	0.030	1.000

The reported results (see Table 4) were the ones with statistically significant coefficients at approximately 10 percent levels. When all the five X_j were used in the

regression models, the explanatory variables appeared to have statistically insignificant coefficients.

Consequently, we progressively eliminated some health determinants.

Table 4: Results

Model 1	<i>Regressors</i>	lnALCH		
	<i>Coefficient</i>	0.298		
	<i>p-value</i>	0.017		
	lnNND	R^2 0.215		
	<i>Heteroscedasticity (White test)</i>	<i>Obs*R-squared</i>	<i>p-value</i>	
		6.210	0.045	
	<i>Durbin-Watson stat</i>	d_L	d_U	
	1.810	1.257	1.437	
Model 2	<i>Regressors</i>	lnH		
	<i>Coefficient</i>	-4.653		
	<i>p-value</i>	0.058		
	lnMD	R^2 0.075		
	<i>Heteroscedasticity (White test)</i>	<i>Obs*R-squared</i>	<i>p-value</i>	
		0.469	0.790	
	<i>Durbin-Watson stat</i>	d_L	d_U	
	1.860	1.257	1.437	
Model 3	<i>Regressors</i>	lnUP	lnALCH	lnDR
	<i>Coefficient</i>	0.286	-0.028	-0.070
	<i>p-value</i>	0.088	0.128	0.090
	lnLE45	R^2 0.230		
	<i>Heteroscedasticity (White test)</i>	<i>Obs*R-squared</i>	<i>p-value</i>	
		6.730	0.340	
	<i>Durbin-Watson stat</i>	d_L	d_U	
	1.460	1.078	1.660	
Model 4	<i>Regressors</i>	lnUP	lnDR	
	<i>Coefficient</i>	0.676	-0.144	
	<i>p-value</i>	0.014	0.032	
	lnLE65	R^2 0.286		
	<i>Heteroscedasticity (White test)</i>	<i>Obs*R-squared</i>	<i>p-value</i>	
		1.640	0.800	
	<i>Durbin-Watson stat</i>	d_L	d_U	
	1.960	1.168	1.543	
Model 5	<i>Regressors</i>	constant	lnALCH	lnDR
	<i>Coefficient</i>	-0.022	-0.140	-0.435
	<i>p-value</i>	0.060	0.141	0.046
	lnLB	R^2 0.235		
	<i>Heteroscedasticity (White test)</i>	<i>Obs*R-squared</i>	<i>p-value</i>	
		0.550	0.960	
	<i>Durbin-Watson stat</i>	d_L	d_U	
	0.980	1.168	1.543	

In order to test for homoscedasticity, the White's heteroscedasticity test was run. For accuracy purposes, we give the results for all five identified models (see Table 4). Therefore, one can conclude, on the basis of the White test, that there is no strong heteroscedasticity as far as the residual variables are concerned.

As far as the autocorrelation in the disturbance term is regarded, we considered the Durbin-Watson test. As for all models, excepting of the third and fifth ones, the Durbin-Watson statistic is sufficiently close to 2, as a rule of thumb, one may assume that there is no first-order autocorrelation, either positive or negative.

Concerning the third model, though the correlogram shows no sign of autocorrelation, the Durbin-Watson test suggests we are in the zone of indecision. Regarding to the fifth model, the correlogram plot gives an initial clue about the likely nature of the disturbance term and Durbin-Watson statistic indicates positive autocorrelation.

The four valid resulted models confirmed our hypothesis presented in Table 2 regarding expected impact of:

- alcohol consumption on neonatal deaths and life expectancy at age 45;
- the number of hospitals on the number of maternal deaths;
- the population living in the urban area on life expectancy at age 45 and at age 65.

The impact of the number of physicians on life expectancies at ages 45 and at age 65 was not confirmed, as shown by models 3 and 4. A possible explanation for this raised issue could be that during the communist regime, the medical facilities had an oversized number of physicians and beds, but still the health indicators had a descendent trend, showing the inefficiency of the Romanian healthcare system and the deterioration of the population's state of health.

All the other hypothesis have not been confirmed by our models, therefore we may conclude that gains and losses of the Romanian health indicators should not always be attributed to the factors that are conventionally thought to be important; (our results confirm the findings of [6]).

4 Conclusion

The data available for Romania did not allow creating large time series for the determinants and health indicators taken into consideration. This was caused by a lack of reported data for a large period of time under the communist regime. However, all the elements that were taken into analysis are relevant for assessing a certain population's state of health. Previous literature shows that there are sensitive (and also logical) connections between the economic development of a country and the state of health [6]. This idea is fully sustained by a comparative approach of health indicators in various countries throughout the world. As previously shown in the analysis, industrialized and developed countries range better than developing or poor countries. The economic development proves to be a factor that either

sustains the national healthcare system or, when not achieved, it becomes a factor that slows the health reform process.

As mentioned before, after the Second World War, Romania organized the national healthcare system according to the Russian model Semashko, based on free access to medical services for every citizen. Because of the lack of the private sector and the lack of motivation for the medical personnel (transformed into clerks), the Romanian system started showing its weaknesses:

- little health expenditure as percentage in the GDP;
- centralized allocation of resources which led to no reaction of the state leaders to local needs;
- low quality of primary medical assistance;
- overrated hospital services – ambulatory and primary medical assistance delivered also in hospitals which led to oversized medical facilities, and number of physicians and beds;
- lack of professional medical equipment and drugs;
- inequity in medical services delivery across the regions of the country;
- low managerial capacity within the system.

Taking into consideration the inheritance that the communist regime left for the Romanian healthcare system and the analyzed indicators of our model (although irrelevant from an econometric perspective, but relevant as shown by health systems' evolution throughout the world), there are certain measures applicable for Romania, in order to help the reform process and the transition to a new healthcare system based on both public and private medical sectors:

- decentralization of the healthcare management, based on the principle of subsidiarity;
- partial privatization of the health patrimony;
- sustained development of the private health assistance (in public and also in private health facilities);
- separation between the suppliers (physicians and medical organizations) and the buyers of medical assistance (the state and the National House of Health Insurances) and implementation of a relationship based on framework contracts;
- development of the health services according to the demand/needs and not starting from the offer;
- improvement of preventive medicine and promotion of the health state;
- increase of the medical personnel's income in order to improve motivation;
- equity of the health services (from geographic, social and economic perspective) – since health services are considered to be a collective social

asset, they must be accessible to all citizen regardless their capacity to pay for such services;

- general coverage of the population according to the European health policy.

In order to achieve these incentives, a useful action would be a better cooperation between health authorities and other sectors that can generate impact on the state of health (such as the industrial sector, media etc), being known that the state of health depends only in a small proportion on the medical sector.

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