APPLYING THE STATISTICAL SURVEY
METHOD IN EVALUATING
THE PUBLIC HEALTH CARE SYSTEM IN ROMANIA

Tudorel ANDREI

PhD, University Professor, Department of Statistics and Econometrics
University of Economics, Bucharest, Romania
(Co)Author of books: Reforma administratiei publice in Romania in perspectiva integrarii Romaniei in Uniunea Europeana (2006), Statistica si Econometrie (2003), STATISTICA- teorie si aplicatii (2003)
E-mail: andreitudorel@yahoo.com

Erika TUSA

PhD, University Professor, Department of Statistics and Econometrics
University of Economics, Bucharest, Romania
(Co)Author of the books: Statistics for Economists (2005), Aplicatii statistice (2002)
E-mail: erika_tusa@yahoo.com

Claudiu HERTELIU

PhD, Assistant Professor, Statistics and Econometrics Department
University of Economics, Bucharest, Romania
Co-author of the books: Sistemul national de indicatori pentru educatie (2005), Finantarea invatamantului preuniversitar de stat (2000)
E-mail: claudiu.herteliu@gmail.com, **Web page:** http://www.hertz.ase.ro

Stelian STANCU

PhD, University Professor, Department of Economic Cybernetics
University of Economics, Bucharest, Romania
Co-author of the books: Teoria jocurilor pentru economisti (2005), STATISTICA- teorie si aplicatii (2003)
E-mail: stelian_stancu@yahoo.com

Abstract: *The reform of the public health care system is a complex and lengthy process, involving different types of people and institutions. The papers is revising the key issues that have to be taken into account when applying the reform process of the health care system and is analyzing some of the aspects of the reform process in the Romanian public health care system based on a survey that was conducted in 2007 among the medical doctors.*

The sampling plan had two steps and several primary and secondary variables were defined. Based on the 52 questions in the questionnaire, of which 49 have been closed, 177 primary questions were set, measured on a scale from 1 (low importance) to 5 (very high importance)
Two aspects are analyzed with statistical tools in this paper: the overall opinion of the medical personnel regarding the quality of the reform process in the public health care system and the opinion regarding the quality of the factors that concur to ensuring the quality of the medical services. Two aggregated variables were defined in both cases, each based on five primary variables. The results show significant differences in the opinions according to gender, age group and personnel category of the interviewed medical doctors.

Key words: statistical *survey; public health care system; tertiary education; Romania*

1. Introduction

In analyzing the reform process in the Romanian public health system, the paper takes into account the fact that the transformation of the healthcare system have focused mostly on the curative interventions, but the integrated network of preventive, curative and rehabilitative services[1]. For the entire period of the 90's the actions taken by past governments have sought more to solve current problems, rather than defining new and efficient ways of operating it. In these circumstances, the public health system has become expensive and sometimes not functional. Most of the times, at the whole system level, inefficient solutions were taken both from professional and economic point of view. At present, the networks of health services providers do not respond in most people's expectations.

In the last 18 years a series of measures were taken in order to decentralize the system and to privatize some of the medical services. However, presently, we are witnessing a fragmentation of the public health care system, underlining an uneven territorial distribution of medical personnel and showing a declining of the disadvantaged people's access to certain types of health services. It should be mentioned that the number of doctors per capita in the rural area represent only 20% of the urban area's average. Another major drawback of the system is linked to the financing system and its correlation with the decentralization strategy of public health care system. Several times the decentralization process was a way to place a part of the burden in charge of local administrations.

The difficulties of transition process in Romania as well the poor quality of the health services has led to a reduction in life expectancy by almost 3 years in the last decade. According to studies carried out by mixed teams of Romanian and foreign specialists, the reform process of the health care system should clearly focus on the following key issues:
- the development of services based more on health needs;
- redefining an efficient structure of health care services;
- redefining of improved quality standards;
- strengthening the universal right of access to basic health care services;
- defining of a coherent financing strategy that will lead to a better use of the system's resources

The main objectives for the next period aims mainly the following aspects[2]: to intensify the efforts to prevent diseases by increasing the awareness of the risk factors, to increase the transparency in using the public money; to speed up the restructuring process of hospitals; to close the gap between the health and demographic indicators from Romania and of the developed countries, while lowering the specific pathology for underdeveloped countries.

In reforming the public health care system in Romania, the existing diagnostic studies as well as current trends from the EU countries must be considered:
(1) *In the next 50 years is expected a 30% increase of expenditure in the health care sector (as percentage of GDP).*

Due to the increase in welfare in the developed as well developing countries, people will tend to spend more for health, which will cause a greater pressure on public health systems in these countries. Among the solutions proposed for public's protection is to increase the insurance policies and compensation limits.

JAQM

Vol. 3
No. 4
Winter
2008

305

One negative aspect of this measure is a possible reduction in the number of insured persons among those with low income and from disadvantaged areas.

(2)   Universal accessibility of medical service is guaranteed in all OECD countries, except in the United States.

The principle of "appropriate treatment" is respected in all OECD countries in terms of treatment at a general practitioner, but a large part of the population can not afford medical services provided by specialists. This situation highlights an uneven distribution of medical care in favor of people with high incomes.

(3)   The notion of quality of a ' health product' is difficult to quantify in economic terms. OECD is in the stage of drafting a system of indicators to measure the quality of services provided in public health systems. Too long waiting times for a consultation or a non-uniform territorial distribution of hospitals are factors that will diminish the quality of the health in a country.

More than 60% of the EU countries are faced with increasing costs in the health care system. The only exceptions are Denmark, Spain and Luxembourg.

(4) In most of the EU countries, the main problems encountered did not aim at the financial viability of the health system, but the effectiveness of medical care and universal accessibility of citizens to these services.

Only in the Czech Republic, Slovenia, Slovakia and Poland the costs of health care are at a fairly high level, causing a matter of for concern. The universal accessibility of health care services is a problem in some countries due to unequal distribution of health facilities. For example, in these countries there are significant differences between urban centers and the rural ones.

(5)   Low wages of medical staff is another problem found in several EU countries.

(6) Outsourcing some of the services and abide them to the market rules is another solution adopted to increase the efficiency of medical services. Some of the specialized articles argue that the privatization of services represent an efficient solution to increase the profitability of the health sector[3].

(7) Adopting of financing system is one of the important issues of reform processes of public health systems.

(8)   Development of policies to increase citizens' trust in public health is another important component of a process of reform at European level.

(9) Creating an appropriate statistical system in the EU health care system and safety of the workplace.

Thus, the new Regulation of the European Parliament and of the Council regarding the statistics on public health and safety at work will mainly follow the next aspects:

(i) statistics to be collected should include information required by the community activities in the field of public health care, to support national strategies for development of high quality, accessible and sustainable health care, as well the local community strategy for health and safety at work;

(ii) to provide data for sustainable structural development and indicators of community health, as well as other sets of indicators required in order to monitor the implementation of policy measures in the public health care system and health and safety at work;

(iii) the statistical sources could consist in existing or planned household surveys, similar surveys, as well as existing or planned national administrative sources;

(iv) The statistical methodologies and data collection, which will be developed for collecting data on public health care system and health and safety at work at European level will consider, whenever necessary, coordinated activities with international organizations in order to ensure international comparability of statistics and to prevent further work in parallel.

2. The research methology

In order to analyze some of the characteristics of the public reform process in the Romanian public health care system in 2007, a survey was conducted in 2007 among the medical doctors. The sampling plan had two steps. The first step included the medical units from Bucharest (hospitals, clinics, health centers). The second step was represented by the selection of medical doctors for each primary sampling unit. For Bucharest municipality the statistically representative sample size was established at 407 persons and it was chosen a 95% confidence in the result and a representativity error of ±5%.

The structure of the sample is presented in the following table:

Table 1. The structure of the sample

Category	Persons
Family doctors	75
Medical doctors form hospitals	279
Medical doctors from clinics and health centers	53

The data was gathered within three weeks (in July 2007). This way the comparability of the answers was insured given the fact that no major decisions were made at the time by the Romanian government.

The structure of the questionnaire according to the topics of interest taken into account is presented in the following table:

Table 2. The structure of the questionnaire, by area of research

Nr. Crt.	Area of research	Number of closed questions	Number of open questions	Number of variables
1.	General aspects of the public health system reform process	5	-	41
2.	The public policy framework defined by the MPH	5	-	18
3.	The general public's education related to health aspects	7	-	18
4.	The analysis of the improper behavior of some of the personnel from the public health institutions	7		24
5.	The research capacity of the public health system	5	1	24
6.	Current activities' characteristics of the public health institutions	2	-	6
7.	Personal identification data	12		32
8.	General data	6	2	14
	Total	**49**	**3**	**177**

The questionnaire was based mainly on closed questions, with predefined answers, but there were three open questions as well.

JAQM

**Vol. 3
No. 4
Winter
2008**

307

Based on the questions within the questionnaire primary variables have been defined. For each area of analysis specified in table 2 the number of primary variables. Based on the 52 questions in the questionnaire, of which 49 have been closed, 177 primary questions were set. The 177 data sets are used for the calculation of descriptive indicators, but also to calculate some aggregated variables based on which econometric models are defined in order to better understand certain aspects of the public health system.

To define the questions in a questionnaire that has the goal to identify the impact of the reforms in the public health care system, three major aspects have to be considered: the reform measures undertaken by the Ministry of Public Health, the models applied in the European Union for analyzing the performance of the public health system and the stakeholders that will contribute to an efficient implementation of the reform measures.

3. The quality of the reform process in the public health care system

In order to measure the overall opinion of the medical personnel regarding the quality of the reform process in the public health care system, an aggregated variable based on five primary characteristics was defined; the five primary variables refers to aspects of the financing of public health system, the reform process at the medical units level, procurement of medicines, the decentralization policy and employment and promotion of staff.

Starting from the questions of the questionnaire the following five primary variables have been defined: the quality of financing the public health care system (A1_1); the reform measures at the health care institution level (A1_2), the procurement system of medicines (A1_3), the process of decentralization in the health care system (A1_4), the opinion of medical personnel regarding the reform process based on the hiring and promotion policy of medical personnel with university degree and secondary education (RPS).

The five primary characteristics are measured on a measurement scale with five values, assigned as follows: 1 - if the reform of public health care system has a very weak impact on the item considered; 2 - where the impact of reform is poorly perceived in relation to the item considered; 3 - the impact is satisfactory; 4 - if the impact of the reform process is a good one 5 - to where the impact is very favorable.

The first-level aggregated variable (RSS) is calculated as an average of the primary variables defined directly on the recorded responses to questions from the questionnaire. In these circumstances, the aggregate variable is defined using the application below:

$$RSS : P \rightarrow [1, 4]$$

The values of the *RSS* variable are defined based on the average operator applied to the values of the primary variables:

$$RSS_i = E(A_i1\_1,..., A_i1\_4, RPS)$$

In the above relationship $E(\cdot)$ is the operator of the average values of the five primary variables defined on the basis of the five questions in the questionnaire. A high value of the variable indicates a favorable perception among medical personnel on the process of reform in the public health.

The main aspects of the reform process can be analyzed at first using the descriptive statistics measures.

JAQM

Vol. 3
No. 4
Winter
2008

308

Average indicators as well as indicators of variation and skeweness calculated for the five primary variables are presented in Table 3 (from Appendixes). Based on the five sets of data histogram was drawn (see Fig. 1 from Appendixes).

The values of the RSS variables can vary according to different characteristics of the respondents, such as age or gender. These differences are analyzed as follows, and for each case the descriptive indicators are presented to analyze the central tendency, variance and shape of the distribution.

In order to establish if there is a statistically significant difference between the averages calculated for each group (according to gender, age etc) the analysis of variance (ANOVA) method is use. For each case the value of the F statistics and the significance level are presented as well.

Table 6. Differences in opinions according to gender

Gender	Minimum	Maximum	Mean	Standard Deviation
M	0,00	3,83	2,204	0,666
F	0,00	3,83	2,086	0,664

The value of the F statistics, equal to 2.77, shows that for a level of significance equal to 0.09, there is a significant difference between the two genders. In other words, the male doctors have a better opinion on the reform process of public health care system compared to the female doctors. Should be noted that both groups of persons have quite a negative opinion on the process of reform in the public health system.

Table 7. Differences in opinions according to age

Age groups (years)	Mean	Standard deviation	Minimum	Maximum
Under 30	1.85	0,572	1.00	3.67
31-40	2.12	0,632	0.83	3.83
41-50	2.21	0,720	0.83	3.83
51-60	2.18	0,708	0.00	3.83
Above 61	2.24	0,518	1.50	3.33
Total	2,12	0,666	0,00	3,83

The value of F statistics, equal to 2.73, shows that the average level differs significantly between the age groups. The results are guaranteed for a significance level of 0.03. Moreover, the perception of the quality of reform process is more negative at young people. In all cases the average is well below three, meaning that, overall, there is a negative perception of the medical staff with higher education on the reform process of this system. Using a test of homogeneity of variance it results that there is no significant differences among the six age groups.

J A Q M

Vol. 3
No. 4
Winter
2008

309

Table 8. Differences in opinions according to personnel category

Personnel category	Mean	Standard deviation	Minimum	Maximum
Managers	2.4143	0.69354	1.00	3.50
Specialists	2.0653	0.61543	0.00	3.83
Primary medical doctors	2.1975	0.69035	0.67	3.83
Residents	1.7939	0.52112	0.83	3.00
Other	2.2308	0.72181	1.33	3.83
Total	2.1237	0.66594	0.00	3.83

The value of F statistics, equal to 6.22, shows that for a significance level of 0.00 there are significant differences in the perception of the reform process in the different categories of medical doctors. In all cases the opinion is unfavorable, with two exceptions:

- doctors from management have a slightly more positive perception;
- resident doctorss have a totally negative perception of the reform process.

The homogeneity test (F = 2.14 and the level of significance is 0.08) shows that the degree of homogeneity between the five groups is significantly different between the groups. It should be noted that the most homogeneous group is the one of residents.

4. The analysis of the opinion regarding the quality of the factors that concur to ensuring the quality of the medical services

A quality medical service can be assured only if a minimal number of conditions are met, related to the facilities, training and motivation of medical staff, a performing management etc.

In this research, five important issues that ensure the quality of the medical services in the public health care institutions are vconsidered: the endowment with medical equipment (A7_1), provision of the necessary medicines (A7_2), the internal organization of the institution (A7_3), ensuring required staff with higher education (A7_4); ensuring required with staff medium education (nurses) (A7_5).

The five primary variables are measured on a scale from 1 to 5, values assigned as follows: 1 to where the doctors felt that the item is very poor in ensuring the quality of medical services; 2 for a poor situation; 3 - situation in which public opinion is acceptable; 4 – the interviewed person's opinion is good; 5 the interviewed person's opinion is a very good.

For an overall assessment of the opinion of the medical doctors regarding the factors that are contributing to ensure high quality medical services, a new aggregated variable (CF) is defined:

$$CF : P \rightarrow [1, 5]$$

Where the values are defined based on the following application:

$$CF_i = E(A_i 7\_1, ..., A_i 7\_5). \tag{3}$$

For the calculation of average and variance indicators the answers from the questionnaire are taken into account. The total number of valid answers is equal to 393. The share of non-responses to each of the five characteristics are as follows: for A7_1 is 1% to

2% is A7_2 for A7_3 is 2.2% for A7_4 is 1.5% and for A7_5 is 1, 7%. The calculated descriptive measures for the five variables are presented in the table below.

Table 9. Descriptive indicators for the variables A7_1,...,A7_5

	Mean	Standard deviation	Coefficient of Skewness	Coefficient of Kurtosis
1. Medical endowment	2.63	1.038	0.287	-0.497
2. Assuring the required stock of medicines	2.60	1.023	0.272	-0.583
3. Internal organization of the institution	2.96	1.054	0.042	-0.371
4. Assuring highly qualified medical staff (with university degree)	3.37	1.059	-0.275	-0.619
5. Assuring medical staff (nurses)	2.92	1.084	-0.050	-0.897

After tabulating the data from the five primary variable, the following results are obtained for the first level aggregated variable:

- The histogram is presented in the following graph:
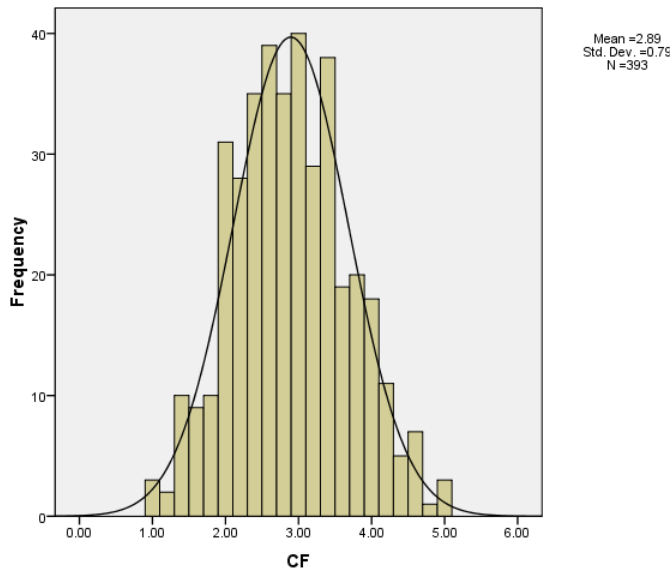
Figure 3. The histogram of the CF aggregated variable

- The average level of the variable is 2.89 and the standard deviation is 0.79. The average value calculated for this variable differs significantly from three for a significance level of 0.01 (the Student t-statistics is equal to -2.66).

These results show that, overall, the quality of the factors that concur to the medical act is less than acceptable.

The contribution of the five factors considered is though different. Thus, there are three situations: the contribution is negative with respect to providing the necessary medicines and medical equipment; it is a relatively acceptable to the internal organization of medical institutions and the provision of medical staff with secondary education, the situation is relatively good in the report by providing medical staff with higher education.

There are differences of opinion in relation to the quality of the factors that concur to a quality of medical act at the level of medical units by age groups. For each age group in the table below is presented the average and standard deviation. From the table below it can be observed that there is a more favorable opinion in relation to the quality of the factors among the older doctors.

Table 10. The analysis according to age groups of the medical doctors' opinion regarding the quality of the factors

Total	Under 30	31-40	41-50	51-60	Over 61	F Statistics and significance level
2,89 (0,790)	2,54 (0,504)	2,93 (0,761)	2,87 (0,809)	3,01 (0,873)	3,16 (1,027)	2,57 (0,03)

The views are different as well for the groups defined for category of staff. In the next table are presented the results for each group, as well as the F statistics. The most favorable opinion is expressed by the staff in management positions within the health care institutions, which assess as acceptable the factors that contribute to ensuring quality medical service. The less favorable opinion is expressed by residents.

Table 11. The analysis according to staff category of the medical doctors' opinion regarding the quality of the factors

Total	Management staff	Specialists	Primary doctors	Residents	Other categories	F Statistics and significance level
2,89 (0,790)	3,13 (0,940)	3,00 (0,747)	2,87 (0,804)	2,52 (0,569)	3,11 (0,958)	4,52 (0,001)

According to staff category from the public health care system there are no significant differences in opinions regarding the quality of the factors that contribute to ensuring quality medical service.

5. Conclusions

In order to measure the overall opinion of the medical personnel regarding the quality of the reform process in the public health care system, an aggregated variable based on five primary characteristics was defined; the five primary variables refers to aspects of the financing of public health system, the reform process at the medical units level, procurement of medicines, the decentralization policy and employment and promotion of staff.

The five primary characteristics are measured on a measurement scale with five values, from 1 corresponding to a very weak impact of the considered variable on the reform of public health care system up to 5 corresponding to a very high impact. The first aggregated variable was defined as the average values of the five primary variables. The results show a negative perception among medical personnel of the process of reform in the public health.

Moreover, there are significant differences in opinions by gender, age group and personnel category of the interviewed medical doctors.

Another aspect of the research concerned the opinion of the medical doctors regarding the factors that concur to ensuring the quality of the medical services. In this case five important issues that ensure the quality of the medical services in the public health care institutions were considered: the endowment with medical equipment, provision of the necessary medicines, the internal organization of the institution, ensuring required staff with higher education, ensuring required with staff medium education (nurses). Based on these five variables, an aggregated variable was defined.

The results of the analysis show that, overall, the quality of the factors that concur to the medical act are perceived as less than acceptable. There are significant differences between gender and age groups but no differences in opinions regarding the quality of the factors that contribute to ensuring quality medical services according to staff category.

References

1. Davies, J.K. **European Health Promotion Indicator Development (EUHPID Project),** European Commission, www.health.brighton.ac.uk/euhpid/2007
2. Fugueras, J., Saltman, R.B., Busse, R. and Dubois, H.F.W. **Patterns and performance in social health insurance systems,** in Saltman, R.B., Busse, R. and Figueras, J. (eds.) "Social health Insurance System in Western Europe", European Observatory on Health Systems and Policies Series, Open University Press, McGraw-Hill Education, Maidenhead, England, 2004
3. Hakkinen, U. and Joumard, I. **Cross-country Analysis of Efficiency in OECD Health Care Sectors: Options for Research,** OECD Economics Department Working Papers No. 554, OECD Publishing, 2007
4. Jagger, C., Cox, B., Le Roy, S. *et al.* **Health Expectancy Calculation by the Sullivan Method: A Practical Guide,** EHEMU Technical Report 2006_3, June 2007
5. Lenaway, D., Halverson, P., Sotnikov, S., Corso, L. and Millington, W. **Public Health Systems Research: Setting a National Agenda,** American Journal of Public Health, Vol. 96, No. 3, March 2006, pp. 410-413,
6. Miner, K.R., Childers, W.K. and Alperin, M. **The MACH Model: From Competencies to Instruction and Performance of the Public Health Workforce,** Public Health Reports, volume 120, 2005
7. Mossialos, E., Allin, S., and Figueras, J. (eds.), **Health Systems in Transition: Template for Analysis,** Copenhagen, WHO Regional Office for Europe on behalf of the European Observatory on Health Systems and Policies, 2007
8. Orosz, E. and Morgan, D. **SHA-Based national Health Accounts in Thirteeen OECD Countries: A Comparative Analysis,** OECD Health Working Papers, No. 16/2004, OECD, Directorate for Employment, Labour and Social Affaires, Paris, France; 2004
9. Saltman, R.B. and Ferroussier-Davis, O. **Conceptul de administrare in politica de sanatate,** Buletin OMS 2000, 78:732-9, 2000
10. Trochim, W.M., Cabrera, D.A., Milstein, B., Gallagher, R.S. and Leischow, S.J. **Practical Challenges of Systems Thinking and Modelling in Public Health,** American Journal of Public Health, March 2006, Vol. 96, No. 3, 2006, pp. 538-546
11. Verhoeven, M., Gunnarsson, V. and Lugaresi, S. **The Health sector in The Slovak Republic: Efficiency and Reform,** IMF Working Paper No. 226, September 2007

JAQM

Vol. 3
No. 4
Winter
2008

313

Appendixes
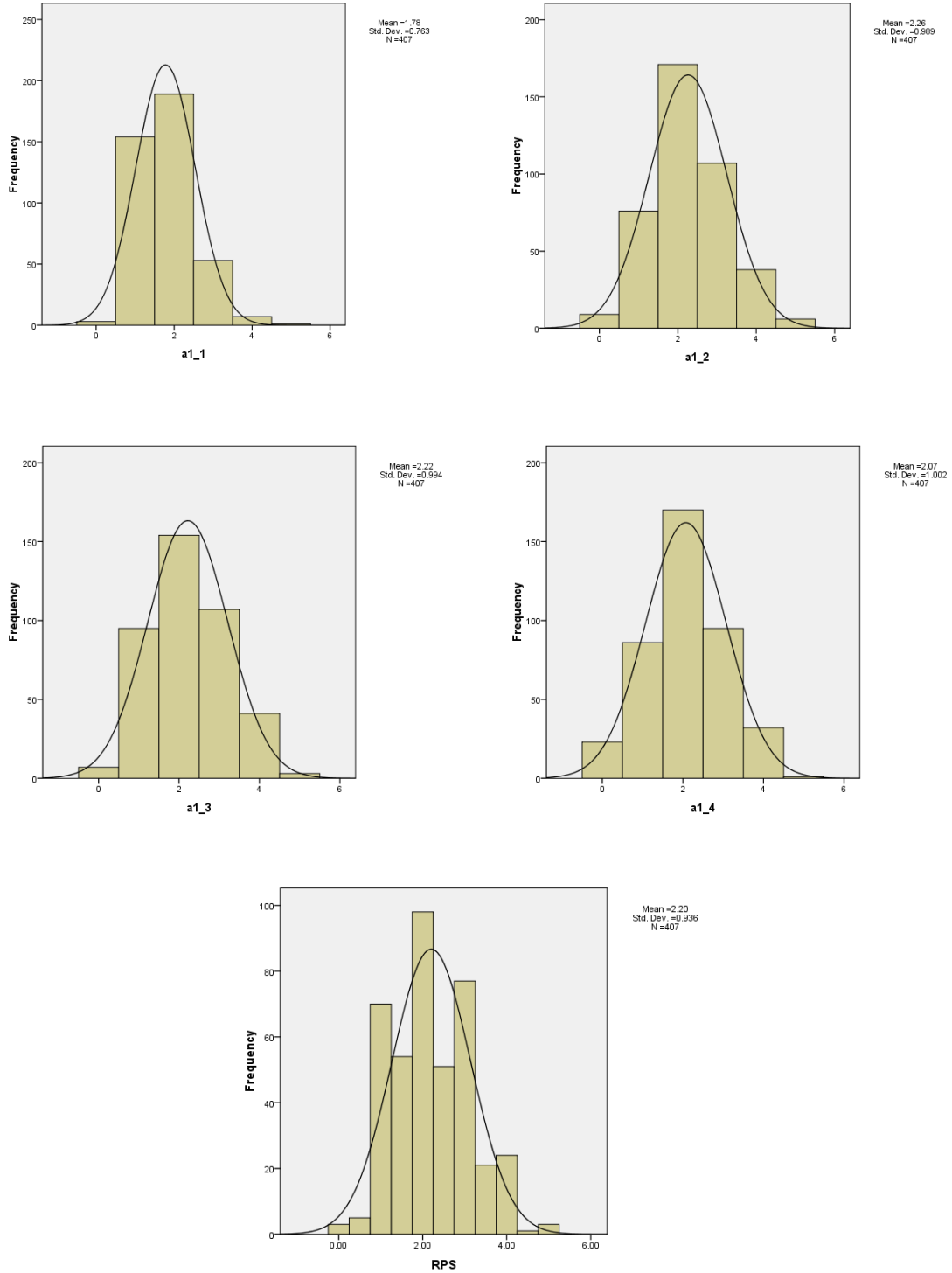
Figure 1. The distribution of answers reflecting the medical staff opinion regarding the characteristics of the reform process in the public health care system

JAQM

Vol. 3
No. 4
Winter
2008

314

Table 3. Descriptive indicators for primary variables used to characterized the reform process in the public health care system

	Financing of public health care system (A1_1)	Reform measures at institution level (A1_2)	Procurement system for medicines (A1_3)	Decentralization process in healthcare system (A1_4)	Hiring and promotion policy of medical personnel (RPS)
Mean	1.78	2.26	2.22	2.07	2.20
Median	2.00	2.00	2.00	2.00	2.00
Standard deviation	0.763	0.989	0.994	1.002	0.937
Coefficient of Skewness	0.664	0.268	0.245	0.043	0.313
Coefficient of Kurtosis	0.548	-0.028	-0.437	-0.238	-0.341

Table 4. Descriptive indicators of the RSS variable

	Minimum	Maximum	Mean	Standard Deviation	Coefficient of Skewness	Coefficient of Kurtosis
Total	0,00	3,83	2,124	0,666	0,401	-0,044
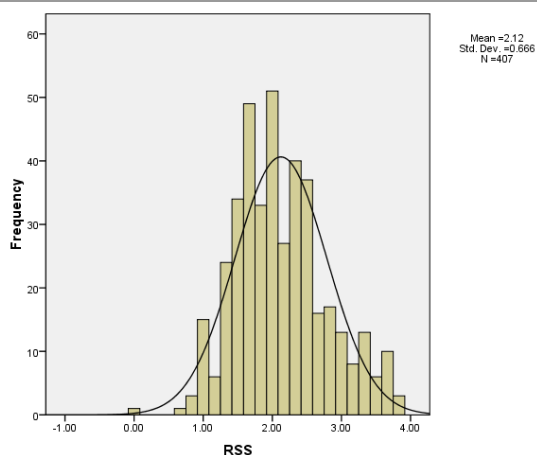
Figure 2. The distribution of the RSS variable

Table 5. The correlation matrix for the primary variables

	a1_1	a1_2	a1_3	a1_4	RPS
a1_1	1.000	0.345**	0.366**	0.276**	0.391**
a1_2	0.345**	1.000	0.310**	0.279**	0.403**
a1_3	0.366**	0.310**	1.000	0.396**	0.406**
a1_4	0.276**	0.279**	.396**	1.000	0.355**
RPS	0.391**	0.403**	0.406**	0.355**	1.000

Observation: ** the linear coefficient of correlation is significantly different from zero for $\alpha \leq 0,01$

---

[1] According to a study developed by the GRASP-USAID Program, 2004, Bucharest

[2] Pre-accession Economic Program – December 2005

[3] Woolhandler, S. (2003), Costs of Health Care Administration in the United States and Canada: New England Journal of Medicine (JSTOR)

JAQM

Vol. 3
No. 4
Winter
2008

315