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Original article

Intersectoral cooperation in the sphere of public health care: ways of optimization

Natan G. Korshever, Sergei A. Sidelnikov

Saratov State Medical University n.a. V.I. Razumovsky, Saratov, Russia

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Abstract: The *aim* of the work was to investigate intersectoral cooperation in the sphere of public health care and to substantiate technologies of its optimization.
Material and Methods — There were analyzed the normative legal field of public health care, the results of anonymous survey of 838 physicians – health care organizers including 34 experts, and of 6,106 persons not engaged in medical professions.
Results — There were established the list and significance of 37 health determinants; the effect produced on them by 23 state and public sectors engaged in health care; characteristics of these sectors' interaction. There were substantiated 38 informative vectors for evaluating the effectiveness of intersectoral cooperation in the sphere of public health care – 22 simple (each representing a single informative criterion) and 16 complex (consisting of several, from 3 to 12) informative criteria. There was developed an automatic multi-vector method for assessing success in intersectoral cooperation in the sphere of public health care in a territorial formation (formations), and there was designed an appropriate technology of optimization, including the primary multi-vector analysis, purposeful correction and dynamic evaluation.
Conclusion — Public health care optimization is a process which should be carried out with regard to hierarchic interaction of the engaged sectors and peculiarities of their influence on health determinants, multi-vector evaluation of intersectoral cooperation efficacy aimed to substantiate and choose such administrative decisions which prove to be the best from the viewpoint of resulting effective achievements. The obtained materials may be realized in everyday practice of public health care.

Keywords: public health care, optimization, population, determinants, intersectoral cooperation

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Correspondence to Sergei A. Sidelnikov. Phone: +7-927-224-7213. E-mail: ssidelnikov@mail.ru.

Introduction

The problem of public health care is, undoubtedly, of utmost importance in all countries including Russia. In order to solve the urgent problem of public health care the World Health Organization (WHO) actively propagandizes the necessity to form a policy of coordinated activities of all state and social sectors (the so-called 'intersectoral cooperation or interaction'), based on health determinants, i.e. factors influencing the health [1-6].

Such an approach to public health care is being realized in many countries. During the last years it has received recognition, including legal recognition, in our country. According to the Federal Law of the Russian Federation "On the bases of health care of citizens in the Russian Federation" (dated at November, 21 in 2011, № 323-FL), health care is a system of measures of political, economic, legal, social, scientific, medical including sanitary-anti-epidemic (prophylactic) character exercised by the RF state power organs, state power organs of the RF subjects, organs of municipal self-government, by organizations, their authorities and other persons and citizens with the purpose of preventing diseases, preservation and strengthening of physical and psychic health of each individual, maintenance of his/her long-lasting active life, providing him/her with medical aid.

Despite quite a significant number of publications devoted to investigation of public health care, the scientific apparatus of the corresponding intersectoral cooperation requires further substantiation. It seems to be useful to take into consideration the hierarchy of multi-factorial influence on health, i.e. to establish the complete spectrum and significance of these factors, since often either a single group of health determinants or certain health determinants are analyzed.

There has been established neither a list of state and social sectors which must perform the work regarding public health care, i.e. produce an influence on determinants, nor the importance of such an influence.

Up to the present there is lacking a scientifically substantiated method for evaluating intersectoral cooperation effectiveness, which might make it possible to determine the directions of public health care optimization.

The enumerated circumstances have determined the aim of the work, which is concerned with the investigation of intersectoral cooperation in the sphere of public health care and substantiation of the technology of its optimization.

Material and Methods

The objects of the study were health determinants and sectors engaged in health care.

The matter of the study is the technology of optimizing intersectoral cooperation in the sphere of public health care. Intersectoral cooperation is regarded as a generally accepted interconnection between state and social sectors, established in order to take measures and fulfill actions concerning public health care.

There were analyzed the normative legal field of public health protection, the results of anonymous survey (by specially designed questionnaires) of 804 physicians during the course of their post-graduate advanced professional training at Saratov State Medical University n.a. V.I. Razumovsky (Saratov, Russia) in the specialty 'Organization of health care system and public health', as well as of 6,106 persons (not engaged in medical professions) living in the city of Saratov and Saratov region (Russia) and undergoing a planned examination in health care centers.

Quantitative representation of the sampling sum totals when questioning both physicians and persons not engaged in medical professions was observed and it was determined according to the formula of V. Paniotto, M. Maksimenko, N. Kharchenko [7]:

$$n = 1 / (m^2 + 1/N),$$

where m is the sampling error (it is 0.05 in our case), N is the volume of the general sum total.

Qualitative representation was provided by realization of the method of mechanical selection [8].

There was carried out an anonymous questioning of 34 experts: 14 persons were from professor-teaching staff of organizational departments (those of public health and health care; economy and management of health care and pharmacy) of Saratov State Medical University n.a. V.I. Razumovsky (Saratov, Russia), and 20 persons – specialists in the sphere of health care management (heads of medical organizations of the city of Saratov and Saratov region, Russia). Selection of the experts (including their quantitative composition) was carried out in accordance with the requirements pointed out in [9-13]. Professional experience in the specialty of each expert was not less than 10 years, competence coefficient, i.e. the joint index, was above 4 points according to the accepted 5-point scale (there was used the self-esteem method with determination of the mean value of the level of theoretical knowledge, practical skills and prognostic capabilities), the degree of coordination of opinions, calculated by applying Kendall's concordance, corresponded to a high value and was reliable.

All questionnaires were designed by the authors of the article. In this work we used only those questions, from the questionnaire designed for physicians, which were concerned with establishing of health determinants, sectors engaged in health care, interaction of these sectors and their influence on health determinants. As to the results of questioning of individuals not engaged in medical professions, only the materials dealing with health determinants were realized.

The experts participated in designing a criterial-diagnostic apparatus for evaluating effectiveness of intersectoral cooperation in the sphere of public health care (determination of informative indices, their gradation and significance, model variants), and in projecting the appropriate technology of its optimization (substantiation of the algorithm).

The examined individuals, including the experts, were offered questions in the form of certain lists, for instance, those of determinants, sectors, informative indices (they are given in the section "Results"), with which the questioned persons were asked either to agree, or 'to delete', or (and) to insert other variants.

The significance of the characteristics under consideration was assessed according to the 10-point scale:

- 0 points to 1 point – 'of no significance',
- above 1 point to 4 points – 'of some significance',
- above 4 points to 7 points – 'of great significance',
- above 7 points to 10 points – 'of vital significance'.

Coefficients of the informative indices' significance were determined by using the method of paired comparison [14].

For the statistical analysis, the software package Statistica 6.1 (StatSoft Inc., Tulsa, Oklahoma, USA) was used. We applied the Shapiro–Wilk test to check whether studied data are approximately normally distributed. To compare the multiple variables, we used the Mann–Whitney's test, or t-test.

The obtained results were processed with the help of the programmed package Statistica (StatSoft Inc., USA) and samples' checking on normal distribution by calculating parametric (Student's) and non-parametric (Mann–Whitney's) criteria of distinctions. The data are presented as mean values with a standard deviation (M±SD).

Results

Investigation of health determinants

The data on the investigation of health determinants' significance are given in *Table* 1 and *Figure* 1.

It has been established that the group 'Life style' plays the leading role. Five out of seven considered constituents in this group have been given more than 7 points (two of them have been given more than 8 points) by physicians-health care organizers, i.e. they have been evaluated as 'of vital significance'. In other groups this fact has not been marked, and among extra-group determinants only heredity has been given 7.5 points. Besides, only the determinants 'participation of the population in developing of agendas and making decisions concerning public health policies' and 'gender' have been evaluated as 'of some significance', and the rest determinants – as 'of great significance'.

The logic of distribution of the data obtained at questioning of the population coincides on the whole with the results of questioning of physicians-managers. However, to the opinion of physicians-managers, as compared to the answers received from the population, such determinants as 'use of narcotics' and 'heredity' are of a reliably more statistical significance ($P<0.05$). At the same time, significance of a number of other determinants has received a lower evaluation, for instance, of such determinants as 'participation of the population in developing of agendas concerning health care policies', 'climate', 'weather', 'occupation', 'place of habitation', 'conditions of hiring for a job and supply with a worthy job', 'gender'($P<0.05$).

Table 1. Data of the investigation of health determinants' significance, points

№	*Health determinants*	*Viewpoint of individuals not engaged in medical professions, M±SD*	*Viewpoint of physicians, M±SD*	*Groups*
1	Quality of nutrition	8.52±0.59	8.10±0.72	Life style
2	Physical activity	8.09±0.59	7.36±0.65	
3	Tobacco smoking	7.19±0.70	7.14±0.53	
4	Use of alcohol	6.94±0.72	7.07±0.56	
5	Sexual behavior	6.45±0.85	6.10±0.74	
6	Use of narcotics	5.92±0.95	8.31±0.89	
7	Medical activity	6.26±0.78	6.50±0.54	
8	Supply of housing, including sanitary-hygienic conditions	6.61±0.82	5.90±0.63	Living and working conditions
9	Workspace conditions including sanitary-hygienic conditions	6.55±0.68	6.62±0.75	
10	Organization of labor safety	6.20±0.60	6.50±0.70	
11	Availability of services including functioning of residential fund servicing and maintenance network	6.02±0.76	6.17±0.80	
12	Availability of the required level of comfort	5.99±0.75	5.00±0.62	
13	Opportunities for education	5.86±0.82	5.69±0.69	
14	Transport supply, particularly condition of road-transport network and functioning of personal and public transportation systems	5.35±0.78	5.38±0.58	
15	Arrangement of the territory	5.54±0.75	4.81±0.53	
16	Supply of social guarantees, including those for pensioners, individuals with unstable occupations (including the unemployed, freelancers, those working from home and those engaged in caring for the sick) in such special situations as disease and disability	6.15±0.72	4.05±0.32	
17	Responsibilities of the authorities for their actions and justice in regard to public health care	6.27±0.81	6.07±0.65	Factors widely influencing the society
18	General social-economic conditions, including funding of measures influencing on social health determinants and providing equal health for all	6.28±0.80	6.43±0.49	
19	Participation of the population in developing of agendas and making decisions concerning public health policies	5.75±0.75	3.74±0.52	
20	Climate	6.07±0.68	4.74±0.36	
21	Weather	6.25±0.70	4.62±0.45	
22	Ecological environment	6.34±0.73	6.55±0.40	
23	Functioning of mass media, particularly in hygienic education of the population, encouraging of healthy life style	6.02±0.72	5.55±0.44	
24	Public safety and legal order	5.85±0.71	5.33±0.63	
25	Occupation, status in social hierarchy	6.11±0.75	4.83±0.59	Struct. indices of SEI
26	Income level	6.45±0.69	6.60±0.47	
27	Place of habitation	6.37±0.72	5.26±0.59	
28	Conditions of hiring for a job and supplying with a worthy job	6.30±0.75	5.43±0.63	
29	Social isolation, particularly for immigrants, national minorities, foreign workers, refugees and their children	5.94±0.83	4.88±0.55	
30	Heredity	6.48±0.77	7.50±0.39	Extra group
31	Gender	5.22±0.93	3.29±0.43	
32	Age	5.77±0.82	5.29±0.34	
33	Individual psychological peculiarities	5.76±0.77	5.40±0.48	
34	Level of education (of a certain person)	5.78±0.78	5.33±0.58	
35	Level of culture (of a certain person)	5.80±0.80	5.21±0.48	
36	System of interrelations between people, including those with family, friends, close relations, colleagues, help of the society members to each other in unpleasant situations	6.27±0.77	5.60±0.66	
37	Medical service – the work of the organs and institutions of public health care system	6.43±0.72	6.00±0.42	

Struct., structural; SEI, social-economic inequality.

Table 2 (part 1). Evaluation of significance of the links between the sectors during their work in the sphere of public health care, points

№ of the link	*Intersectoral cooperation*	*Strength of the links, points, M±SD*
1.	Administration of the territory * – Deputies of the territorial Duma	7.16±0.83
2.	Administration of the territory * – Mass media and press	6.27±0.72
3.	Administration of the territory * – Public health care	7.48±0.86
4.	Administration of the territory * – Sph. of education	5.76±0.67
5.	Administration of the territory * – Sph. of youth policy, physical training, sports and tourism	5.47±0.64
6.	Administration of the territory * – Public organizations	4.51±0.58
7.	Administration of the territory * – Organs of internal affairs and public prosecution	5.10±0.70
8.	Administration of the territory * – Military commissariat	4.50±0.67
9.	Administration of the territory * – Sph. of social development	5.84±0.83
10.	Administration of the territory * – Sph. of environment and nature protection	5.05±0.71
11.	Administration of the territory * – Sph. of finances	6.28±0.74
12.	Administration of the territory * – Sph. of supplying safety of the population's life activities	5.82±0.64
13.	Deputies of the territorial Duma – Mass media and press	5.66±0.65
14.	Deputies of the territorial Duma – Public health care	6.30±0.78
15.	Deputies of the territorial Duma – Sph. of education	4.76±0.64
16.	Deputies of the territorial Duma – Sph. of youth policy, physical training, sports and tourism	5.05±0.58
17.	Deputies of the territorial Duma – Sph. of public organizations	4.05±0.64
18.	Deputies of the territorial Duma – Organs of internal affairs and public prosecution	4.21±0.61
19.	Deputies of the territorial Duma – Military commissariat	3.63±0.61
20.	Deputies of the territorial Duma – Sph. of social development	5.38±0.65
21.	Deputies of the territorial Duma – Sph. of environment and nature protection	4.65±0.69
22.	Deputies of the territorial Duma – Sph. of finances	5.74±0.80
23.	Deputies of the territorial Duma – Sph. of supplying safety of the population's life activities	5.11±0.66
24.	Mass media and press – Public health care	6.75±0.66
25.	Mass media and press – Sph. of education	5.00±0.65
26.	Mass media and press – Sph. of youth policy, physical training, sports and tourism	5.27±0.63
27.	Mass media and press – Public organizations	4.36±0.66
28.	Mass media and press – Organs of internal affairs and public prosecution	4.16±0.57
29.	Mass media and press – Military commissariat	3.17±0.52
30.	Mass media and press – Sph. of social development	4.83±0.69
31.	Mass media and press – Sph. of environment and nature protection	4.90±0.66
32.	Mass media and press – Sph. of finances	4.27±0.70
33.	Mass media and press – Sph. of supplying safety of the population's life activities	5.11±0.66
34.	Public health care – Sph. of education	5.80±0.68
35.	Public health care – Sph. of youth policy, physical training, sports and tourism	5.52±0.68
36.	Public health care – Public organizations	4.83±0.65
37.	Public health care – Organs of internal affairs and public prosecution	4.60±0.70
38.	Public health care – Military commissariat	5.24±0.77
39.	Public health care – Sph. of social development	6.04±0.66
40.	Public health care – Sph. of environment and nature protection	4.77±0.64
41.	Public health care – Sph. of finances	5.76±0.81
42.	Public health care – Sph. of supplying safety of the population's life activities	5.37±0.73
43.	Sph. of education – Sph. of youth policy, physical training, sports and tourism	5.61±0.58
44.	Sph. of education – Public organizations	4.26±0.67
45.	Sph. of education – Organs of internal affairs and public prosecution	4.01±0.63
46.	Sph. of education – Military commissariat	3.88±0.81
47.	Sph. of education – Sph. of social development	4.91±0.73
48.	Sph. of education – Sph. of environment and nature protection	4.17±0.58
49.	Sph. of education – Sph. of finances	4.49±0.67
50.	Sph. of education – Sph. of supplying safety of the population's life activities	4.65±0.56
51.	Sph. of youth policy, physical training, sports and tourism – Public organizations	5.29±0.56
52.	Sph. of youth policy, physical training, sports and tourism – Organs of internal affairs and public prosecution	3.57±0.56
53.	Sph. of youth policy, physical training, sports and tourism – Military commissariat	3.82±0.61
54.	Sph. of youth policy, physical training, sports and tourism – Sph. of social development	4.30±0.55
55.	Sph. of youth policy, physical training, sports and tourism – Sph. of environment and nature protection	4.03±0.56
56.	Sph. of youth policy, physical training, sports and tourism – Sph. of finances	4.47±0.63
57.	Sph. of youth policy, physical training, sports and tourism – Sph. of supplying safety of the population's life activities	4.34±0.61
58.	Public organizations – Organs of internal affairs and public prosecution	3.67±0.61
59.	Public organizations – Military commissariat	3.25±0.54
60.	Public organizations – Sph. of social development	4.53±0.61
61.	Public organizations – Sph. of environment and nature protection	4.07±0.57
62.	Public organizations – Sph. of finances	3.54±0.56
63.	Public organizations – Sph. of supplying safety of the population's life activities	3.99±0.58

***** The apparatus of head of administration. Sph., Sphere.

Table 2 (part 2). Evaluation of significance of the links between the sectors during their work in the sphere of public health care, points

№ of the link	*Intersectoral cooperation*	*Strength of the links, points, M±SD*
64.	Organs of internal affairs and public prosecution – Military commissariat	4.75±0.51
65.	Organs of internal affairs and public prosecution – Sph. of social development	4.53±0.57
66.	Organs of internal affairs and public prosecution – Sph. of environment and nature protection	4.86±0.61
67.	Organs of internal affairs and public prosecution – Sph. of finances	5.15±0.57
68.	Organs of internal affairs and public prosecution – Sph. of supplying safety of the population's life activities	5.27±0.67
69.	Military commissariat – Sph. of social development	2.83±0.46
70.	Military commissariat – Sph. of environment and nature protection	2.17±0.37
71.	Military commissariat – Sph. of finances	2.79±0.47
72.	Military commissariat – Sph. of supplying safety of the population's life activities	3.42±0.59
73.	Sph. of social development – Sph. of environment and nature protection	3.93±0.55
74.	Sph. of social development – Sph. of finances	4.92±0.56
75.	Sph. of social development – Sph. of supplying safety of the population's life activities	4.15±0.61
76.	Sph. of environment and nature protection – Sph. of finances	4.07±0.63
77.	Sph. of environment and nature protection – Sph. of supplying safety of the population's life activities	4.63±0.53
78.	Sph. of finances – Sph. of supplying safety of the population's life activities	4.66±0.60

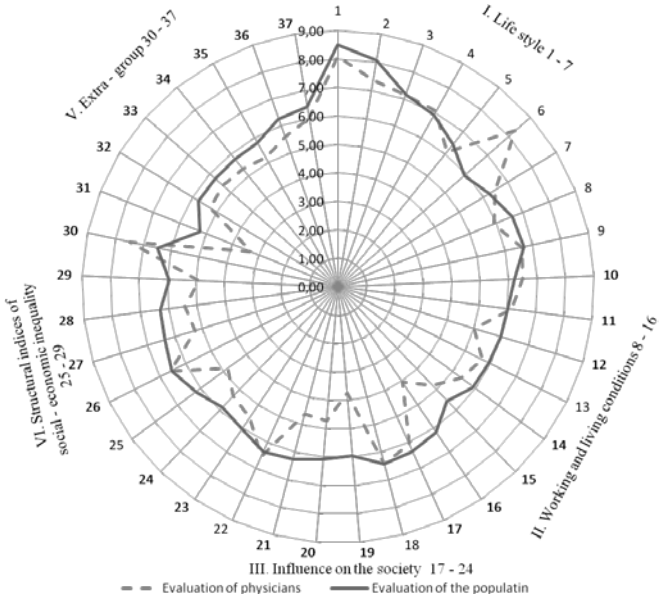

Figure 1. Characteristics of health determinants' significance, points

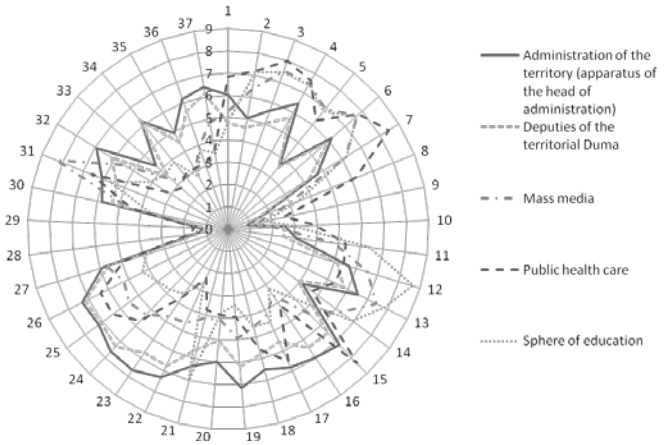

Figure 2. The effect produced by 5 sectors most engaged in health protection on health determinants, points

Sectors engaged in public health care and health determinants

The obtained results have allowed us to analyze the influence of the engaged sectors on health determinants. For this purpose health care managers have established the sectors participating in activities of public health care, and pointed out 13 basic sectors (arranged according to the decrease of significance level):

i) public health care, administration of the territory (the apparatus of head of administration),
ii) mass media and press,
iii) sphere of education,
iv) deputies of the territorial Duma,
v) sphere of supplying safety of the population's life activities,
vi) sphere of youth policy,
vii) physical training, sports and tourism,
viii) sphere of environment and nature protection,
ix) sphere of social development,
x) sphere of finances,
xi) public organizations,
xii) organs of internal affairs and public prosecution,
xiii) military commissariat.

Here, significance of the sectors 'health care' and 'administration of the territory (the apparatus of head of administration)' has been equally evaluated and takes the 1st–2nd rank places ($P<0.05$).

The total number of sectors participating in intersectoral cooperation is not less than 23. Except for the above listed 13 basic sectors there have been established the following 10 sectors: construction and housing-communal economy, agriculture, veterinary, industry and energetic, sphere of culture, transport, sphere of commerce, road-traffic economy, hunting and fishing economy, forestry economy.

The proportion of each sector's participation in the sphere of public health care, as a rule, corresponds to the evaluated significance.

The degree of the listed sectors' effect on health determinants regarding health has been then determined and it appears, of

course, to be different. Moreover, there are the determinants on which they do not practically influence: 'gender', 'age', 'climate', and 'weather'. Only the sector 'public health care' makes an influence on the heredity implying gene engineering – 6.15±0.86 points. Besides, such sectors as 'organs of internal affairs and public prosecution' and 'military commissariat' produce the effect on a significantly less number of health determinants than the rest sectors. For instance, the sector 'military commissariat' reliably influences only on 18 out of 37 studied determinants, and the sector 'organs of internal affairs and public prosecution' – on 26 determinants.

There have been obtained the data which quantitatively characterize a probable effect of a certain sector on each health determinant, and the list of the sectors which may produce an influence on a separate determinant. The influence of five sectors, most engaged in public health care, on health determinants is presented in *Figure* 2.

Public health care organizers have evaluated the significance of the links between the basic 13 authorized sectors during their work (*Table* 2).

The data presented in *Table* 2 demonstrate that out of 78 variants of links between the engaged sectors the most significant ones ('of vital significance') are as follows: those of administration of the territory (the apparatus of head of administration) and public health care and deputies of the territorial Duma, i.e. №1 and 3. Fourteen (14) variants – № 19, 29, 46, 52, 53, 58, 59, 62, 63, 69-73 have been evaluated as less significant ('of some significance'). The rest links (and they are in majority) have been assessed as those 'of great significance'.

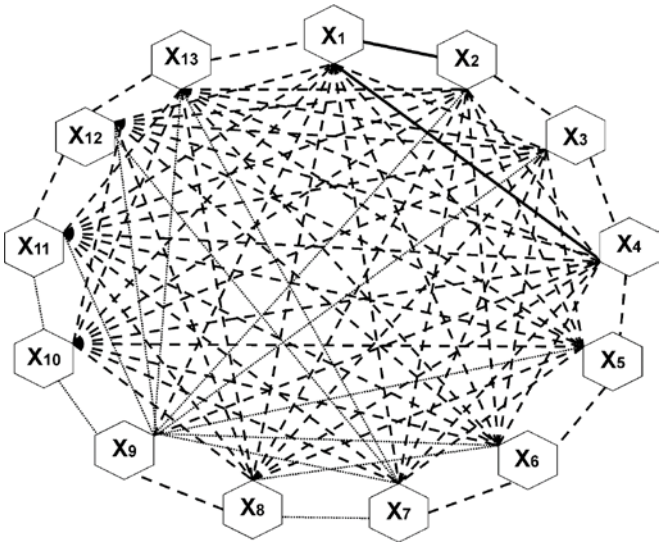

Figure 3. Characteristics of significance of the links between the basic authorized sectors.

X_1-X_{13} – the basic sectors: X_1, territorial administration (head of administration and its staff); X_2, territorial Duma's deputies; X_3, mass media; X_4, health service; X_5, sphere of education; X_6, sphere of youth policy, physical training, sports and tourism; X_7, public organizations; X_8, authorities of internal affairs and prosecutor's office; X_9, military commissariat; X_{10}, social development; X_{11}, environmental protection and natural resources usage; X_{12}, financial sphere; X_{13}, public life safety.

…… the link has the meaning 'of some significance' (above 1 point to 4 points); - - - - - - - the link has the meaning 'of great significance' (above 4 points to 7 points); _____ the link has the meaning 'of vital significance' (above 7 points to 10 points).

Consideration of the summarized links' significance, established by construction of a contiguity matrix, has showed that the most significant sectors engaged in public health care (out of the basic ones) are as follows: the first and second rank places ($P<0.05$) – 'administration of the territory (the apparatus of head of administration)' – 69.24 points and 'public health care' – 68.47 points; the third rank place – 'deputies of the territorial Duma' – 61.72 points; the fourth rank place – 'mass media and press' – 59.76 points; the fifth rank place – 'sphere of education' – 57.32 points. The last rank place has been given to 'military commissariat' – 43.46 points.

Characteristics of significance of the links between the basic engaged sectors are presented in *Figure* 3. The data presented in the form of a graph make it possible to submit more obviously the links between the basic sectors engaged in the sphere of public health care.

Designing of the criterial-diagnostic apparatus

The experts have established 38 informative vectors for evaluating the efficiency of intersectoral cooperation in the sphere of public health care in a territorial formation:

- responsibility for actions and justice in public health (№1);
- knowledge of the aims, tasks and regulations of intersectoral cooperation by the engaged structures' supervisors (№2);
- knowledge of the real conditions in which intersectoral cooperation is carried out (№3);
- personnel policy regarding intersectoral cooperation (№4);
- the level of professional training of the engaged structures' supervisors in the sphere of public health care (№5);
- their motivation for intersectoral cooperation (№6);
- capability to make appropriate decisions (№7);
- notions of possible results (№8);
- planning of intersectoral cooperation (№9);
- health condition of the population (№10);
- reproductive health improvement and increase in birth rate (№11);
- support of early development for children (and teenagers) (№12);
- improvement in everyday living conditions of the population (№13);
- guarantees of public health equality for urban and rural citizens (№14);
- equal opportunities for hiring for a job and for a worthy job, social guarantees and labor safety (№15);
- social protection throughout the whole life span (№16);
- support of the population with healthy nutrition (№17);
- support of physical activity (№18);
- combat against drug and alcohol abuse and tobacco smoking (№19);
- supply of road and transportation safety (№20);
- combat against socially conditioned diseases (№21);

- supply of medical care availability (№22);
- immunization of the population (№23);
- maintenance of a good sanitary-epidemiological condition (№24);
- encouraging a healthy life style (№25);
- funding programs influencing social health determinants and providing equality in health for all (№26);
- participation of the private sector (market) in public health protection (№27);
- guarantees of gender equality (№28);
- giving political power to the population in developing agendas and taking decisions regarding health (№29);
- guarantees of public security and legal order (№30);
- protection of the population from technogenic accidents and extreme natural disasters (№31);
- nature-preserving and strategic ecological safety activities (№32);
- organization of military recruits' training (№33);
- existence of factual data on the population's health condition, social health determinants and ways of their correction (№34);
- performing medical and social expertise of social-economic and technical plans, projects and programs (№35);
- organization of scientific research in the field of intersectoral cooperation regarding public health care (№36);
- organization of reporting the results of the work (№37);
- evaluation of the efficiency of intersectoral cooperation in the sphere of public health care (№38).

We have used the term 'an informative vector', since it is obvious that part of the enumerated indices may be now described with a number of informative criteria. That is why the formed informative vectors of intersectoral cooperation evaluation have been divided into simple (they are 22 in number, each representing a single informative criterion – № 1-9, 14, 16, 21, 23, 24, 26, 29, 33-38) and complex ones (they are 16 in number, each consisting of several – from 3 to 12 – informative criteria – № 10-13, 15, 17-20, 22, 25, 27, 28, 30-32).

For example, a complex vector 'Nature-preserving and strategic ecological safety activities' includes 10 informative criteria: mentality status of the authorities and population in the sphere of environmental protection and natural resources' usage; existence and condition of the ecological map of the ecologically zoned territory; planning and funding of nature-preserving measures; formation of ecological infrastructure; realization of the measures in the sphere of ecological safety of transport means; realization of the measures in the sphere of industry aimed to optimize relations with the environment; organization of solid wastes' reprocessing; reducing the effect of radioactive natural and technogenic sources produced on the population; existence and realization of the program for reproducing forests, parks and common tract of land of the natural framework of the territory; monitoring and zoning of the forests with isolating and equipping recreation and rest zones; maintenance of biological variety of the territorial ecosystems.

Each simple informative vector and each informative criterion of the complex vector have been graded into high, average and low levels.

For example, a simple vector 'Organization of reporting the results of the work' has the following gradation: a high level – authorized executors present objective and timely data on the results of activities in the sphere of public health care to the supervisors of the engaged sectors and into the coordinating centre; an average level – the objective data are presented but there are cases of untimely presentation and incomplete content of the records; a low level – presentation of the results does not correspond to the requirements of high and average levels.

A certain vector and a certain criterion are, of course, evaluated separately and in different units, that is why each level has been given marking points (a high level – 30, an average level – 20, a low level – 10 points) so that it may be possible to perform further formal calculations.

Not all vectors and criteria equally influence on the integral index that is why for each of them we have established coefficients of significance based on questioning of the experts according to the well-known method of paired comparisons.

Besides, the experts have divided all vectors into 2 groups: relatively more significant and relatively less significant.

This methodical approach allowed us to substantiate the so-called 'model variants' and to evaluate the effectiveness of intersectoral cooperation in the sphere of public health care in the following way:

i) 'excellent' – all vectors with a higher significance coefficient (≥'marginal') have been given 30 points, the rest – at least 20 points;
ii) 'good' – at least 50% of the vectors with a higher significance coefficient have been given 30 points, all the rest – at least 20 points;
iii) 'satisfactory' – more than 50% of the vectors with a higher significance coefficient have been given 20 points while the rest – 30 points, and not more than 50% of the vectors with a lower significance coefficient – 10 points;
iv) 'unsatisfactory' – at least one of the vectors with a higher significance coefficient or more than 50% of others have been given 10 points.

Each of the complex vectors has been evaluated in the same way before multi-vector evaluation using the analysis of the informative criteria included in it. Integral marks 'excellent' and 'good' are considered as a high gradation level of a certain complex vector, 'satisfactory' – as an average gradation level, and 'unsatisfactory' – as a low gradation level.

The designed method has been automated on the basis of the systemic program '1C: Enterprise', which makes it significantly easier to evaluate not only a singular formation but also a number of territorial formations, it allows to arrange them in order of priority decrease, to determine the essential number of the best and the worst formations and, most importantly, to indicate the vectors and criteria which have conditioned the given mark. It becomes possible to determine the causes of current problems, i.e. to purposefully control intersectoral cooperation which is directly associated with its optimization.

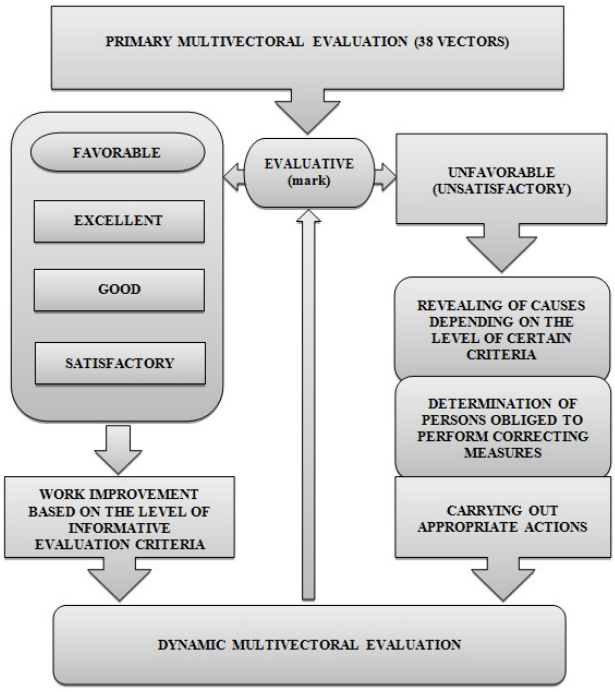

Figure 4. Technology of optimization of intersectoral cooperation

Projecting the technology of intersectoral cooperation optimization

There has been projected the technology of optimization of intersectoral cooperation in the sphere of public health care (*Figure* 4). The data presented in *Figure* 4 demonstrate that the initial stage of optimization of the functioning system of intersectoral cooperation in the sphere of public health care is the primary evaluation made by applying the designed method. Even in case favorable results have been revealed, measures on activities' improvement are carried out. In case of unsatisfactory evaluation, there are detected those vectors and criteria which have determined it, and necessary purposeful correcting measures are carried out. Further on dynamic evaluation is carried out and etc.

Discussion

Analysis of the literature data gives the evidence that the basis for solving the problem of public health care is the influence of the engaged state and social sectors on health determinants. The necessity to reveal and consider these determinants both abroad [15-18] and in our country [19-23] has been recognized as one of most timely scientific and practical tasks.

At the same time, as a rule separate health determinants are analyzed. There are works in which the effects of a number of factors on health are taken into consideration. In Russia there are considered classic the results of investigations performed by Lisitsyn [24, 25], who has proved the priority of the influence of life style (60%), as well as heredity, environmental pollution, activities of organs and institutions of the health care system on health condition. Whitehead and Dahlgren [26] have distributed health determinants (but by no means all of them and without their significance analysis) according to half-spheres, 'layers' of influence, beginning from the individual level and ending with the level of the whole society. In other investigations there has been revealed an effect of structural indices of economic inequality on health [27, 28, etc.]. It has been pointed out that structural factors (occupation, income level, place of habitation) have a much greater effect on health condition than life style. There has been recognized a model [29] which assumes the investigation of the effects of a social status of individuals and social context on health.

However, a complete list of health determinants has not been established. The results obtained in the present study have made it possible to eliminate this shortcoming and to establish quite an extensive list of 37 health determinants (constituting 4 groups and extra group ones) and their significance.

There are significant difficulties concerning incorporation of intersectoral cooperation in the sphere of public health care. For instance, the data presented in [30] evidence that in conditions of an economical crisis and measures of strict economy, people often think about health not in the first but rather in the last order; most countries attach prior significance to the economical, commercial and industrial policy. Amlaev [31] believes that in municipal formations of the Russian territory there has not been completely realized the unified, integral, multistage, scientifically substantiated, intersectoral project in the sphere of public health care. As a rule, only departmental programs and projects are realized, and even if they are interdepartmental the number of key partners is limited.

The probable causes impeding such a realization are as follows: not all sectors engaged in health care have been determined; the significance and proportion of their activities, characteristics of cooperation, and their influence on health determinants have not been established.

These shortcomings have been eliminated to a certain extent in the carried out investigation. There have been established 23 sectors engaged in public health care, including 13 basic sectors, proportion of each sector's activities in intersectoral cooperation, directions and strength of interaction between them and, finally, significance of each sector's influence on each health determinant. The obtained materials may be used in solving practical tasks for developing special programs aimed to protect the health of the population.

It is well known that optimization of any process may be carried out on the basis of its effectiveness. At the same time, although evaluative procedures in the problematic sphere under consideration are widely spread, their application, first, is often limited to revelation of the influence of singular declarations (projects, programs, plans) on health, including those at the stage of their formation [32, 33]; second, there are usually realized models of evaluating the activities of only the health care system [34, 35, etc.]; third, there are made only indirect attempts to evaluate the activities in the sphere of health care at the regional and territorial levels. For instance, Kruchek and Molchanova [36], using the method of regressive analysis, have substantiated a special evaluation system which includes the following blocks: medico-demographic indices; social-demographic composition of the population; social-economic development; availability of medical services; ecology and natural-climatic conditions; social stress. In [37], there has been developed a system of supporting decision making in controlling health risks for the population, which have been caused by the effect of social-economic factors (also performed on the basis of the method of regressive analysis).

There has been suggested the technology of evaluation and standardization of human habitation environment – a model of complex medico-ecological evaluation of the system 'environment – human health' [38]. There has been presented a system of evaluation and analysis of the medico-ecological situation at the territories (the space centre 'Eastern'), which regards social-daily, anthropogenic (technogenic), natural factors of habitation environment and other factors influencing the health of the population [39]. There has been considered a model of the region's development (according to the data on Rostov region) in regard to the risks to the population's health – parameters describing the dependence of the mean value of the lifespan on the indices of social-economic development have been evaluated [40]. On the basis of statistical data of sanitary-hygienic monitoring (the Uljanovsk region, Russia), there is being developed an informational-analytical system of keeping under surveillance the health of the population and environmental condition by means of modeling the interrelation 'environment – human organism' and constructing prognostic patterns of behavior of discrete social-economic factors [41].

At the same time it is necessary to make an all-round evaluation of the current condition of intersectoral cooperation in the sphere of public health care. Regarding the complexity and multi-component composition of the problem under consideration, it is probably expedient to design a multi-criterial (multi-vector) method of evaluation. Using the experience in developing similar methods [42-46] it has become possible to design such a criterial-diagnostic apparatus - and the informative vectors (simple and complex), their gradation, significance, model variants of evaluation have been substantiated. This apparatus permits to carry out both the monitoring of intersectoral cooperation condition and, if necessary, purposeful correcting measures. Appropriate automation greatly contributes to it.

Since the developed method makes it possible to evaluate the condition of intersectoral cooperation in the sphere of public health care in any number of various territorial formations (in cities, districts, regions, etc.), it may be concluded that there has been designed a multilevel hierarchic diagnostic system.

The results of the study have allowed us to substantiate the technology of optimization of intersectoral cooperation in the sphere of public health care, which is realized within the repeated cyclic process including the primary analysis by means of the designed multi-vector evaluating method, purposeful correction and dynamic evaluation.

Conclusion

Optimization of public health care is a process which must be carried out with regard to hierarchic interaction of the engaged sectors and the peculiarities of their influence on health determinants, as well as to multi-vector evaluation of intersectoral cooperation efficiency with the purpose of justification and choice of such administrative decisions which prove to be the best from the viewpoint of achieving the most effective results. The obtained materials may be realized in everyday practice of public health care. It seems to be productive to further investigate significance of the involved sectors' influence not only on health determinants but also on the informative indices of public health care evaluation, which will make it possible to perform correction of the considered process more objectively.

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References

1. The Ottawa Charter for health promotion. 1986. http://www.who.int/healthpromotion/conferences/previous/ottawa/en. [cited 2017 Jan 19]
2. The Bangkok Charter for health promotion in the globalized world. 2005. http://www.who.int/healthpromotion/conferences/6gchp/bangkok_charter/en. [cited 2017 Jan 19]
3. Adelaide statement on health in all policies: moving towards a shared governance for health and well-being. Geneva: WHO, 2010; 4 p. Russian http://www.who.int/social_determinants/russian_adelaide_statement_for_web.pdf. [cited 2017 Jan 19]
4. Contributing to social and economic development: sustainable action across sectors to improve health and health equity (follow-up of the 8th Global Conference on Health Promotion). Geneva: WHO, 2015. http://apps.who.int/gb/ebwha/pdf_files/WHA68/A68_17-en.pdf. [cited 2017 Jan 19]
5. Closing the gap in a generation: health equity through action on the social determinants of health. Final report of the Commission on Social Determinants of Health World Health Organization. Geneva: WHO, 2008. http://www.searo.who.int/LinkFiles/SDH_SDH_FinalReport.pdf. [cited 2017 Jan 19]
6. Review of social determinants and the health divide in the WHO European Region. Final report. Copenhagen: WHO Regional Office for Europe, 2014; 214 p. http://www.euro.who.int/ru/health-topics/health-policy/health-2020-the-european-policy-for-health-and-well-being/the-evidence/review-of-social-determinants-and-the-health-divide-in-the-who-european-region.-final-report. [cited 2017 Jan 19]
7. Paniotto V, Maksimenko V, Kharchenko N. Statistical analysis of sociological data. Kiev: Izdatel'skiy Dom «KM Akademiya», 2004; 270 p. Russian
8. Erugina MV, Korshever NG, Miloserdov VP, Bobrova LV, Voyteshak AA, Sazanova GYu, et al. Basics of medical statistics: textbook. Saratov, Russia, 2013; 152 p. Russian
9. Beshelev SD, Gurvich FG. Mathematical-statistical methods of expert assessments. Moscow, Russia: Statistics, 1976; 116 p. Russian
10. Koshevoy OS, Golosova ES, Seidov ShG. Organization of expert questioning with bringing in specialists of state and municipal administrative organs. *News of Higher Educational Establishments. Volga region. Social sciences* 2012; (1): 98-107. Russian. https://elibrary.ru/item.asp?id=17745033.
11. Krymsoskokiy SB, Zhilin BB, Paniotto VI, Bevzenko LD, Burgin MS, Vlasenko IM, et al. Expert assessments in sociological investigations. Kiev: Naukovadumka, 1990; 320 p. Russian
12. Maslennikov VE. Features of selection of experts. *Sociology* 2010; (2): 82-93. Russian. https://elibrary.ru/item.asp?id=15550558.
13. Eitingon VN, Kravets MA, Pankratova NP. Methods of expertise organization and processing of expert assessments in management. Voronezh, Russia: VGU, 2004; 44 p. Russian
14. Anokhin AM, Glotov VA, Pavel'ev VV, Cherkashin AM. Methods determining the coefficients of criteria's importance. *Automatics and Telemechanics* 1997; (8): 3-35. Russian
15. A conceptual framework for action on the social determinants of health. Geneva: WHO, 2010. http://www.who.int/sdhconference/resources/ConceptualframeworkforactiononSDH_eng.pdf [cited 2017 Jan 19].
16. Intermediate report on social determinants and differences in health indices in the European region of World Health Organization. Executive summary. European survey of social determinants and differences in health indices. Geneva: WHO, 2010. http://www.euro.who.int/__data/assets/pdf_file/0017/124460/e94370R.pdf [cited 2017 Jan 19]. Russian

17. Social determinants of health. Informational bulletin. Documentation centre of World Health Organization. FSBE Central Research Institute of health care organization and information. Release 2; 2010. http://whodc.mednet.ru/ru/component/attachments/download/79.html [cited 2017 Jan 19]. Russian
18. Interim second report on social determinants of health and the health divide in the WHO European Region. European Region. Baku, Azerbaijan, 2011. http://www.euro.who.int/__data/assets/pdf_file/0020/150095/RC61_rInfDoc5.pdf [cited 2017 Jan 19].
19. Gareeval A. The role of social determinants in public health. *Power and Management in the East of Russia* 2009; (2): 114-121. Russian. https://elibrary.ru/item.asp?id=12943467.
20. Panova LV. The model of social determinants as the basis of a multi-level methodology of investigation of health. In: Petersburg's sociology today: collection of scientific works of RSA Sociological institute. Edition 4. St.Petersburg, 2013: 221-252.Russian
21. Lebedeva-Nesevrya NA. Theory, methodology and practice of analyzing socially determined health risks to the population: DSc thesis. Volgograd, Russia, 2014; 46 p. Russian
22. Kiseleva LS. Social determinants of Russians' health. *Regionologiya* 2016; (1): 133-142. Russian. https://elibrary.ru/item.asp?id=25603075.
23. Lesanova IN, Bistyaykina DA. Methodological approaches to the study of social health. In: Health condition: medical, social and psychological-pedagogical aspects: collection of articles of the VII International scientific-practical internet conference. Chita, 2016: 733-738. Russian
24. Lisitsyn YuP. Healthy life style. History and contemporary situation. Moscow: Research Institute of the history of medicine of RMSA, 2012; 136 p. Russian
25. Lisitsyn YuP. Life style and health. Moscow, Russia: MGMSU, 2011; 192 p. Russian
26. Whitehead M, Dahlgren G. What can we do about inequalities in health? *Lancet* 1991; 338: 1059-1063. https://dx.doi.org/10.1016/0140-6736(91)91911-D.
27. Stronks K, Van de Mheen Loomon H, Casper WN, Mackenbach J-P. Behavioral and structural factors in the explanation of socio-economic inequalities in health: an empirical analysis. *Sociology of Health and Illness* 1996; 18: 653-674. https://dx.doi.org/10.1111/1467-9566.ep10934524.
28. Kiselev AS. Dynamica of the population's health in dependence on the income levels. *Health Care Economy* 2005; (1): 22-29. Russian
29. Diderichsen F, Evans T, Whitehead M, Bhuiya A, Wirth M. The social basis of disparities in health. In: Challenging Inequities in Health: From Ethics to Action. M. Whitehead, Ed. New York: Oxford University Press, 2001: 13-23. https://dx.doi.org/10.1093/acprof:oso/9780195137408.003.0002.
30. Promoting intersectoral action for health and well-being in the WHO European Region: health is a political choice. Regional Committee for Europe. 65th session. Vilnius, Lithuania, 14–17 September 2015. http://www.euro.who.int/__data/assets/pdf_file/0006/284955/65wd16r_PromotingIntersectoralAction_150619.pdf [cited 2017 Jan 19].
31. Amlaev KR. Scientific substantiation of mechanisms of realization of the municipal policy in the sphere of protection and strengthening of the population's health: DSc diccertation. Moscow, Russia, 2010; 264 p. Russian
32. Ison E. Health Impact Assessment Toolkit. 2005. http://www.skb.org.tr/english/wp-content/uploads/2010/08/hia_tool_kit_1.pdf [cited 2017 Jan 19].
33. Balashova TN, Isurina GL, Tsvetkova LA, Volkova EN, Bonner BL. Methodology of design of FASD preventive programme. *Bulletin of Saint-Petersburg University. Series 16. Psychology. Pedagogy* 2012; (4): 61-70. Russian. https://elibrary.ru/item.asp?id=18348143.
34. Tsyganova OA, Shul'gina SV. A complex model of medical-social evaluation of the regional health care system. *Social Aspects of the Population's Health* 2016; (6). Russian. https://dx.doi.org/10.21045/2071-5021-2016-52-6-5.
35. Korshever NG, Grechishnikov AV. Optimization of medical service of the population of Saratov municipal region. Saratov, Russia: Saratov Military-Medical Institute, 2010; 172 p. Russian
36. Kruchek MM, Molchanova EV. Investigation of medical-demographic processes in the regions of Russia by means of the method of regressive analysis of paneled data. *Regional Economy: Theory and Practice* 2013; (18): 41-50. Russian. https://elibrary.ru/item.asp?id=19032034.
37. Gurvich VB, Nikonov BI, Malykh OL, Kochneva NI, Varaksin AN, Maslakova TA, et al. Application of regression models in the system of maintaining decision making in controlling risks to the population's health in the result of the effect of social-economic factors. *Medical Journal of Uralsk* 2008; (8): 26-33. Russian. https://elibrary.ru/item.asp?id=11749279.
38. Veremchuk LV. Technology of a complex evaluation and standardization of human habitation environment in the seaside provinces (at the example of the Primorsky region): PhD thesis. Vladivostok, Russia, 1999; 28 p. Russian
39. Filippov VL, Rembovskiy VR, Krinitsyn NV, Filippova YuV, Eremin GB, Kozyakov VP, et al. System of complex assessment and analysis of medical and environmental situation in territories adjacent to the cosmodrome Vostochny. *Amursky Medical Journal* 2014; (3): 15-20. Russian. https://elibrary.ru/item.asp?id=23828784.
40. Anopchenko TYu, Muryleva OA. The model of a region's stable development regarding the risks to the population's health. *Bulletin of Belgorod University of Cooperation, Economy and Law* 2010; (2): 83-89. Russian. https://elibrary.ru/item.asp?id=15057061&.
41. Ermolaeva SV, Zhuravlev VM, Smagin AA, Lipatova SV. Model-based decision support system for assessment of environmental factors impact on population health. *Human Ecology* 2016; (3): 9-17. Russian. https://elibrary.ru/item.asp?id=25693920.
42. Reshetnikov VA, Korshever NG, Gurov AN, Safronov VV, Polkovov SV, Vodyanenko IM. Activities in health care of the service-men: a multi-criterial evaluation and optimization. Saratov, Russia: Publishing House of Saratov Medical University, 1999; 161 p. Russian
43. Korshever NG, Safronov VV, Polkovov SV, Cherevko SN. The activities in health care: systemic approach and optimization. *Healthcare of the Russian Federation* 1999; (3): 38-42. Russian
44. Korshever NG, Polkovov SV, Lavrinenko OV, Krupnov PA, Anastasov KN. Diagnostics and technology of optimization of medical security of the military unit. *Voen Med Zh* 2000; 321(5): 17-20. Russian. https://www.ncbi.nlm.nih.gov/pubmed/10860445.
45. Korshever NG, Onishchenko AN, Trayster SV. Adaptation of the security subdivisions' personal staff to conditions of the military-professional activities. Saratov, Russia: Saratov Military-Medical Institute, 2002; 174 p. Russian
46. Dorovskaya AI, Erugina MV, Korshever NG. An organizational-methodical substantiation of optimization of physicians' carrier management in medical organizations. Saratov, Russia: Publishing House of Saratov State Medical University, 2016; 140 p. Russian

Authors:
Natan G. Korshever – MD, DSc, Professor, Department of Health Organization and Public Health with the Courses of Law and History of Medicine, Saratov State Medical University n.a. V.I. Razumovsky, Saratov, Russia. http://orcid.org/0000-0002-5545-6844.
Sergei A. Sidelnikov – MD, PhD, Head of Department of Disaster Medicine, Saratov State Medical University n.a. V.I. Razumovsky, Saratov, Russia. http://orcid.org/0000-0002-9913-5364.