Methodological guidelines for territorial health system performance assessment in the Russian Federation

Developed in the performance of Biennial Collaboration Agreement between the Ministry of Health and Social Development of the Russian Federation and the World Health Organization Regional Office for Europe for 2006/2007.

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General Description

The methodological guidelines for territorial health system performance assessment in the Russian Federation have been developed in the performance of Biennial Collaboration Agreement between the Russian Federation Ministry of Health and Social Development and the World Health Organization Regional Office for Europe for 2006/2007.

The objective of the methodological guidelines is to provide tools for assessment performance of regional and municipal health care systems in the Russian Federation.

The guidelines are designed for use by the Ministry of Health and Social Development of the Russian Federation and public health administration bodies of the Russian Federation subjects.

This guidelines are based on the methodology of health care system performance assessment suggested by World Health Organization, which is adjusted to the organizational specifics of the system of health care and informational systems in the Russian Federation.

The results of assessment allow comparing the territorial health care systems progress in succeeding with the four fundamental targets of health care systems:

1. To improve the health of population;
2. To ensure equity in the distribution of health financing burden;
3. To be responsive to the expectations of people in relation to their health;
4. To make efficient use of resources.

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1. Background

Proper performance assessment of Russian health care system and of its regional subsystems is important to make a correct choice of public health care policy priorities, both on national and regional levels.

In 2000, the Report of the World Health Organization (WHO)[1] proposed the criteria and the procedure of comparative health care performance assessment in various countries. These criteria indicate achievement of three basic goals of health care systems: 1) better health of population; 2) fairness in financial contribution; 3) responsiveness to people's expectations in regard to non-health matter. Among health care system functions that enable to achieve these goals are the following

[1] World health report 2000: health systems: improving performance. World Health Organization, 2000. http://www.who.int/whr/2000/en/index.html

ones: 1) delivering services; 2) financing; 3) creating resources; 4) stewardship. The WHO approach to comparative assessment could serve as a methodological basis for a set of indicators that compare performance of regional health care systems.

The Russian Federation has had some experience of elaboration methods to assess performance of health care systems; these methods have been used by some federal and regional public bodies. Russian government gave a new incentive to develop these methods when it started to implement result-oriented budgeting rules. Since 2004, as subjects of budget planning, federal ministries (including the Ministry of Health and Social Development) submit annual reports on their performance and main activities. Budget report includes a set of ministry goals and a set of indicators that evaluate their achievement[2]. In a few next years, this practice will be implemented on regional level. Each subject of budget process focuses its reports on priorities in allocation of budget resources and outcomes of such allocation. Although this practice is quite important, it should be noted that due to budget process requirements, the framework of health care system assessment is narrower than in the WHO approach.

The WHO approach enables us to assess performance of territorial health care systems in more wide framework and to compare them with one another and with other countries. At the same time, the WHO approach needs much methodological work to adjust it for peculiarities of Russian health care system and possibilities of corresponding data collection.

Russia has an interesting experience of the development and practical implementation in the activity of federal and some regional authorities of the methods of constructing the performance assessments of the health care sector and some of its subunits. In the majority of Subjects of the Russian Federation the performance of municipal health care systems is annually assessed on the basis of performance assessment methods developed in these regions[3]. There are used different sets of criteria and indicators they are formed of, which, as a rule, reflect other approaches to constructing relevant assessments in comparison with those adopted by the World Health Organization.

As an approach to constructing such assessments, which is most close to the one used by the WHO, we can indicate the methods for analyzing the cost effectiveness in health care at the regional and municipal levels developed in the Vologda Oblast[4]. Like in the WHO approach, here the integral index of public health status is singled out for the assessment of the health care system

[2] http://www.mzsrrf.ru/pr_min/

[3] Healthcare in the regions of the Russian Federation/ Exec. Editor S.V. Shishkin; Composite author: G.E. Besstremyannaya, A.S. Zaborovskaya, V.A. Chernets, S.V. Shishkin. – M.: Pomatur, 2006. P.36. (In Russian). http://www.socpol.ru/publications/#health2006

[4] Duganov M.D. Evaluation of cost effectiveness in health care at the regional and municipal levels. M., IET: 2007. (In Russian). http://www.iet.ru/publication.php?folder-id=44&category-id=116&publication-id=155947

performance. In this method it is the index of years of potential life lost, which is calculated on the basis of mortality rates by different age groups and the value of life interval taken as basic (65 years). As the criterion of efficiency the ratio is used of this index per 1000 people to the public health care expenses per 1000 people.

The precedent of using such kind of method in public administration is very important, but it should be noted that the index of years of potential life lost is less informative in comparison with the more well-known and regularly used index of disability adjusted life years, and that the set of criteria put forward by the WHO to assess the health care system performance is wider than the assessment of public health status.

A new impetus to the development of methods for assessing the performance of social systems was given by the Russian Federation Government that initiated the implementation of result-oriented budgeting methods. Since 2004 the federal ministries, including the Ministry of Health and Social Development, have been developing annual reports about the results and basic lines of activities of ministries as the subjects of budget planning. The Budget Report covers the system of activity objectives of the ministry and a set of indicators, which allow evaluating the level to which such objectives have been achieved. In relation to health care the Ministry has set the following objectives of their activity for the period of 2008 - 2010 [5]:

- To improve the demographic situation and the status of families with children, as well as the children that are in a difficult life situation.
- To improve the quality and accessibility of health care, drug provision, in particular for low-income populations, to provide for sanitary and epidemiological well-being.

As the indicators to estimate the achievement of the first of the objectives mentioned above the indices are used of the birth rates and death rates per 1000 people. In order to estimate the achievement of the second objective the indices are used of life expectancy at birth and average life years of chronic pathology cases after the disease diagnosis was made. The above stated general objectives are further specified with the system of subgoals and the respective system of indices.

The practice of budget report development has become popular at the regional level as well. Such reports, undoubtedly, lay the basis for carrying out systematic performance assessment of regional authorities and health care systems they manage. But the budget reports focus on the priorities and assessments of results of the utilization of budget resources, which are placed at the disposal of the relevant subject of the budgetary process. Although this practice is quite important, it should be noted that owing to the budgeting process requirements, the framework of health care system assessment is narrower than in the WHO approach. Disregarded are the aspects related to the differentiation of public health

[5]Report about the results and basic lines of activities of the Ministry of Health and Social Development of the Russian Federation as the subject of budgetary planning for 2008 and for the period up to Y2010. http://www.mzsrrf.ru/pr_min/666.html

status and the burden of health spending among different social groups, as well as responsiveness of health care systems to the requirements of the population.

Quite recently the President of the Russian Federation issued an edict "About assessing the performance of executive authorities of the subjects of Russian Federation" (of 28 June 2007 №825)[6], which covers the list of indices used for that purpose, including those to characterize the health status. In pursuance of that edict special methods have been approved[7]. For assessment of health care an extensive system of indicators was put forward to cover the following aspects of the health care system: health status of the population, volumes of the delivered health care services, resource availability of the health care system, the efficiency of resource utilization, progress in the reform of the health care system[8].

The approval of a set of indicators as normatives for carrying out systematic assessment of executive authorities' performance, including the sector of health care, is, undoubtedly, very important for intensifying the motivaton of regional authorities to improve the efficiency of health care systems. But in practice the implementation of this system of indicators will face some methodological difficulties. It will be considerably difficult to make summarized conclusions about the efficiency of different territorial systems owing to the great number of partial indicators being used (56 in total for health care) and the absence of methods for aggregating partial assessments into integral ones. Despite the

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[6] http://document.kremlin.ru/doc.asp?ID=040264

[7] Presidential Commission of the Rrussian Federation on Public Administration Development and Justice. Minutes No.1 of 18 July 2007. Methods of Performance Assessment of Executive Authorities of Subjects of the Russian Federation. http://www.president.kremlin.ru/images/V17.doc

[8] List of Approved Indicators to assess the performance of executive authorities can be grouped as follows:

- Demographics: birth rate, mortality, including infant mortality, maternal mortality, mortality by individual age groups and individual causes;
- Average length of disease-related temporary disability per one working person;
- Satisfaction of population with health care (percentage of the number of the interviewed);
- Volumes of health care servises delivered: volumes of outpatient, inpatient and emergency care per one citizen; level of hospitalization;
- Health resource availability: public expenses on health care, cost of the health care services delivered per unit of volume, the number of persons working at the public (municipal) institutions of health care and their average monthly salary, the number of beds, etc.);
- Resource utilization efficiency by the levels of health care (average bed occupancy per year, the average length of stay, volumes of inefficient expenses by the types of resources and levels of health care);
- Progress in the health care system restructuring: the share of public (municipal) health care facilities, transferred mainly to one-channel financing through the mandatory health insurance, which use medical and economic standards of medical care delivery; transferred to the performance oriented payment system; transferred to the new (sectoral) system of labor remuneration oriented towards performance.

abundance of indicators, essential aspects of performance assessment of the territorial health care systems have been left beyond the framework of that approach: these are the characteristics of health inequality, fairness of distribution of financial contribution to health care, responsiveness of health care system to the needs of the population in relation to the conditions of receiving health care services, as well as the characteristics of structural efficiency of the health care system resource utilization.

2. The WHO Criteria for Health Care Systems Performance Assessment

The World Health Organization acts on the premise that the principal goal of the health care systems is to improve population health status[9]. And yet there are two more objectives of principal importance: fairness in financial contributions and responsiveness to people's expectations in relation to non-medical aspects of health care delivery.

The notion of fairness in financial contributions reflects the requirements to share responsibility for assuring the financial risk protection in relation to emergence of the necessity to obtain health care services. Achievement of fairness in financial contribution on health care is understood as the distribution of spending on health care among the population taking into account the actual capabilities of bearing such expenses.

The notion of responsiveness, used in the WHO Report, is connected with non-medical aspects of health care system operation: assurance of the dignity of the person, personal autonomy and confidentiality of information, attention to patients, quality of health care services delivery, the freedom of choice of a health care service provider. Responsiveness characterizes the response of the health care system to people in terms of respectful attitude to patients and orientation towards their needs on the part of health care facilities.

These three goals: 1) better health of the population; 2) fairness in financial contribution on health care; and 3) responsiveness to people's expectations in regard to non-health matters are recognized as the universal goals for all national health care systems and the universal basis for their assessment. They are valuable by themselves and mutually complementary. And at the same time creating resources and financing, accessibility of health care for the population, quality of stewardship are not significant by themselves but act as the means to achieve these final objectives.

For evaluating the achievement of the objectives of better health of the population and assuring the health system responsiveness to people's expectations matter both: the average (general) levels of population health and responsiveness

[9] World health report 2000: health systems: improving performance. World Health Organization, 2000. http://www.who.int/whr/2000/en/index.html

of the system and the differences in the values of the relevant levels for different populations (distribution of levels among the groups). In relation to the health care financing it is the distribution of financial burden among the population groups that is principally valuable by itself, while the average level of financing acts as a means of attaining other objectives.

Thus, to evaluate the systems of health care it is necessary to measure their performance by the following five components:

1) Average level of population health;
2) Distribution of health inequality in the population;
3) Overall responsiveness of health system;
4) Fairness of responsiveness;
5) Fairness of financial contribution on health care.

To evaluate the average population health in the above mentioned WHO Report for Y2000 the indicator is used of disability adjusted life expectancy (DALE). Along with that the WHO approach allows using other indicators to evaluate the overall health of the population. Thus, in the Global Burden of Disease Study issued in the middle of the 90-ies[10], the WHO used the indicator of disability adjusted life years (DALY). DALY is the most well-known and most frequently used indicator of measure of health losses[11]. That indicator is convenient for distinguishing the contribution of different causes of health losses in the overall value of such losses.

To measure the distribution of the level of population health across the countries, it is preferable to use the same indicator as for the evaluation of the overall health status. But since it turned out to be hardly feasible to calculate the distribution of DALE indicator in every country, the WHO used an essentially simpler indictor – of equity of potential survivability of children calculated on the basis of infant mortality figures.

The notion of responsiveness from the instrumental aspect reflects people's idea (not necessarily of patients that received health care services) about the system of health care as compared with their expectations, about how the system of health care should treat patients in the process of health care delivery. It should be pointed out that the notion of responsiveness differs from the notion of patient's satisfaction. The notion of responsiveness reflects non-medical aspects of the health care system only and is concentrated on the conditions of service delivery. The notion of patient's satisfaction covers essentially the clinical aspects of care, its efficiency. That is why the average estimations of people's satisfaction with the delivery of health care services, their quality cannot be used to measure the level of responsiveness of the health care system.

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[10] Murray CJL, Lopez AD. Regional patterns of disability- free life expectancy and disability-adjusted life expectancy: Global Burden of Disease Study. *The Lancet*, 1997, 349(9062):1347–1352.

[11] Murray CJL. Rethinking DALYs. In: Murray CJL, Lopez AD, eds. *The global burden of disease: a comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020*. Cambridge, Harvard University Press, 1996:1–98

In the WHO Report the level of responsiveness of a health care system is measured through sociological surveys, which cover a whole range of issues orientated towards evaluating different elements composing the notion of responsiveness: respect for patient's dignity, assuring of confidentiality, level of attention, amenities of adequate quality, freedom of choice of health service providers, and etc. On the basis of data obtained the integral indicator is calculated of the level of responsiveness for every national health care system and the indicator of fairness of responsiveness for different populations.

To assess how fairly the financial burden of health care is shared, the WHO used the indicator that measures the degree to which households differ in their shares of health contributions in the household spending on non-foods related needs (that is in the overall expenditure minus the foods spending). Besides, the household health expenditure here was inclusive of household members' taxation in the part allocated for public health care financing, contributions on voluntary health care insurance, out-of-pocket payments, and purchasing of pharmaceuticals and non-medical goods.

Based on the health care system assessment by the five above named criteria, two integral indexes for health care system assessment were calculated: 1) the index of overall health system attainment and 2) the index of health system performance.

The index of overall health care system attainment was calculated as the sum of estimates by five examined criteria weighted by weighting coefficients. The values of these weights were determined based on the interviews of experts.

The index of health system performance was calculated as the ratio of the indicator measuring the level of health in that country to the evaluation of the level of health that might have been attained with the given level of financial resources allocated to health. The latter parameter was determined on the basis of econometric calculations across the whole totality of countries under the analysis.

The approach to the regional health care systems assessment, put forward by the WHO, has certain benefits as compared to the methods of such assessment currently used in the Russian Federation. The WHO approach assures comprehensive coverage of the objectives of health systems functioning (better health, fairness of financing, responsiveness), the system of partial and integral assessments, the compatibility of performance of the territorial systems within the Russian Federation with other countries.

However, it is deemed hardly feasible to use the WHO methods directly to assess the performance of the regional and municipal health care systems at present due to the absence of data ware provision for the whole range of indicators that were used by the WHO. Nevertheless, based on the WHO methodology approach a set of such indicators may be suggested that will serve as the indicators of achievement of the three principal goals of the health care systems, as defined by the WHO, and which can be provided with the required data from the information systems available in Russia.

3. The Proposed Set of Indicators to Assess the Performance of the Territorial Health Care Systems in the Russian Federation

3.1. The Set of Indicators

The proposed set of indicators to assess the performance of regional health care systems in Russia is following:

1) The health status indicator (DALE).
2) The index of distribution of health inequality in the population based on DALE calculated for local units in the framework of region
3) The index of overall responsiveness of health care system that integrates eleven indices calculated on the data about the calls and complaints of citizens for different reasons that were addressed to the insurers in the mandatory health insurance system
4) The index of fairness of financial contribution on health care
5) The index of overall health system attainment that integrates the first four indicators.

In addition to these five indexes the index of structural efficiency based on three elementary indicators is used.

The following set of indicators might be used to assess on regional level the performance of municipal health care systems:

1) The health status indicator (DALE)
2) The index of overall responsiveness of health system that integrates eleven indices calculated on the data about the calls and complaints of citizens for different reasons that were addressed to the insurers in the mandatory health insurance system
3) The index of structural efficiency based on three elementary indices.

The use of more narrow set of indicators to assess the performance of municipal health care systems is caused by constraints on availability of detailed data for each municipality needed for calculation the full set of indicators.

3.2. Health Status Indicator

3.2.1. Composition of Indicators

For the purposes of comparative evaluation of population health in different regions (Subjects of the Federation) it is suggested that *the indicator of the disability adjusted life expectancy (DALE)*[12] be used.

The DALE indicator may be calculated for all the subjects of the Federation with the use of two different lists of diseases:

The First List is the so-called “Rosstat Short List of Causes of Death”, which is *de facto* the official Russian classifier of causes of death as it is used by Rosstat

[12] Formulae for calculation of that and indices suggested below will be presented in the methodological guidelines, which will be prepared at the next stage of the project.

in the official publications of information about the mortality of population. This List specifies 255 causes of death.

The Second List of diseases is a four-level classifier of diseases that is used by the WHO project on estimating the global burden of diseases implemented early in 2000[13]. In that List 160 causes of death are specified (see table A1 in the Annex 2).

It should be pointed out that the "Short List of Causes of Death" was specially developed for the purposes of analysis of mortality, that is why that list does not present the diseases of which people die seldom but are often ill with (for example, trachoma and glaucoma). That is why it is advisable to use the WHO List of Diseases, which was specially developed for the project of the global burden of diseases assessment. But that will require an essential effort on collecting and analyzing the primary data on the population mortality. Taking into account the actually available resources it is suggested that at the first stage the DALE indicator is calculated for all the Federation Subjects based on the Rosstat List of Diseases. Further on it is reasonable to carry out a package of work on obtaining the data about mortality and morbidity based on the WHO List of Diseases. That also makes a condition for comparative evaluation of the territorial health care systems of Russia with other countries.

The DALE indicator should be calculated for every subject of the Federation on the whole and individually for all the municipal entities it comprises.

3.2.2. Sources of Information for Indicator Calculation

The calculation of DALE indices for every Federation subject can be made on the basis of the following primary information:

- The number of deaths by sex, age groups and every disease out of the approved Rosstat List of Diseases;
- The average annual strength of the population by sex and age groups;
- The incidence by sex and age groups during a calendar year for every disease out of the approves Rosstat List of Diseases;
- The prevalence by sex and age groups for every disease out of the approved List of Diseases.

The data about the number of deaths during every calendar year are available at Rosstat by all 255 causes included into the Rosstat Short List of Causes of Death by all the subjects of the Federation, by sex, type of population and age groups.

As to the list of causes of death that was used by the WHO in the project on the global burden of diseases assessment, such information is available at the Rosstat central office for some of the causes of death. However, the Rosstat

[13] Mathers CD, Vos T, Lopez AD, Salomon J, Ezzati M (ed.) 2001. National Burden of Disease Studies: A Practical Guide. Edition 2.0. Global Program on Evidence for Health Policy. Geneva: World Health Organization.

territorial offices in all the Federation subjects have started collecting primary data about the deceased since 1993 in the form of computer databases of civilian registrar's offices about the mortality of population in the relevant territories. These databases besides having the information about the sex, age and municipal entity also include into every entry the ICD-10 codes of the major cause of death registered by the physician that stated the fact of death. These data make the basis for calculating the mortality indices in accordance with the above mentioned "Short List of Causes of Death" of the Rosstat. The data about the causes of death can be grouped in any other manner required, in particular, in accordance with the above mentioned WHO List of Diseases. Thus, in order to obtain the data about mortality for the causes specified by the WHO, the state statistics primary data can be used; but the methods of their further processing by Rosstat will have to be revised. If no such revision takes place, then, for the purposes of international comparison, the calculation of the indices of death by individual causes specified by the WHO will require special models to be used.

It should be pointed out that at present neither the Rosstat nor the Ministry of Health and Social Development of Russia have available information about population mortality that would meet all the criteria required to calculate the DALE indices. The indices of incidence and the number of patients by sex, age and causes of diseases both for the territory on the whole and for the municipal entities that the territory is composed of may be obtained on the basis of using the databases available at the territorial mandatory health insurance funds (MHI). These systems contain the information about all contacts of citizens with the health care facilities in relation to health service delivery by the types of diseases that are covered by the MHI funds. The detailed elaboration of such information depends on the health care payment models in the MHI system, which are used in this or that Federation Subject. In many regions the major reason for every such contact is coded in accordance with ICD-10. In order to calculate the DALE index all the territorial MHI systems will have to ensure the collection and communication of data on the incidence for the stated above lists of diseases, as well as to ensure the required detailed elaboration of such data by sex and age.

The calculation of the index of morbidity by the types of diseases will require special consideration. As a simple method of calculation can be used the one developed in the 70-ies by the RAMS Research Institute of Public Health. It consists in equating the number of patients for every Federation Subject to the number of those who turned for care (by every disease under consideration) at least once during the period of three years[14].

[14] Naturally, this method gives inaccurate evaluation of the index under consideration. The actual value of the number of cases for every specific disease in the population of the territory in question depends upon the indices values of incidence, recovery rate, case fatality, case fatality for other causes, length of disease. The majority of the listed factors are fairly difficult for reliable quantitative assessment both by means of the government statistics indices and by means of sampling epidemiological and clinical observations. In order to determine with better accuracy the consistent values of these factors and indices of case prevalence rates

3.3. The Index of Distribution of Health Inequality

It is suggested to calculate the index of distribution of health inequality (*HE)* for each regional health care system on the base of the DALE evaluation of municipal entities:

$$HE = \frac{\sum_{s=1}^{s=n}\sum_{t=1}^{t=m} | DALE_s - DALE_t |}{2 * n^2 * \overline{DALE}}$$

where:

s,t – numbers of municipal entities inside the region;

$DALE_s$, $DALE_t$ - evaluation of DALE for municipal entities *s* and *t*.

The index of distribution of health inequality is not included in the set of indicators for municipal health care system performance assessment. The calculation of the health inequality index in the population of an individual municipal entity will be difficult to implement by way of calculating the DALE index for the settlements the municipal entity is composed of. That is why to calculate the health inequality index special models will be needed, which include a range of medico-demographic indicators and the indicators of the municipal health care system status. The development of such models is beyond the scope of this project.

3.4. Index of Overall Responsiveness of Health System

The notion of responsiveness used in the WHO Report characterizes the non-medical aspects of a health care system functioning, and reflects people's ideas (not necessarily patients who received health care services) about the system of health care in comparison with their expectations in relation to how it should treat patients in the process of health care delivery.

Since conceptually responsiveness reflects the expectations of people the evaluation method for that indicator is based on the use of sociological surveys data. But at present in the absence of facilities of use of the data of sociological surveys that are under way in Russia with the view to determine the indices of responsiveness of the health care systems for all the Federation subjects. The executive authorities' performance assessment system, which is currently built up in Russia, as it has already been pointed out, includes as its element the indicator

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DISMOD can be used - a special software developed under the WHO project on the global burden of diseases (Michelle E. Kruijshaar, Jan J. Barendregt, & Nancy Hoeymans The use of models in the estimation of disease epidemiology. - Bulletin of the World Health Organization 2002, 80 (8) pp/ 622-627). This program calculates all the above listed indicators whose values are consistent in terms of being the parameters of a multi-status epidemiological simulator. To launch the program and obtain the consistent evaluations of all its parameters the user only needs to enter three sets of the above indicators: the incidence, prevalence and mortality of the population.

of people's satisfaction with the health care delivered, which will be calculated for every region based on the sociological surveys data. However such indicator cannot serve as the measuring tool for health care system responsiveness to the needs of the population as it first and foremost reflects the evaluation of clinical outcome of care. To obtain the required information surveys of the population should be held in every region on a whole package of issues that relate to different elements of the notion of responsiveness.

As an alternative to large-scale expensive sociological surveys it is suggested that the available sectoral statistical reporting is used. In the reporting established in the mandatory health insurance (MHI) system there is PG[15] form, which reflects the data about the calls and complaints of citizens for different reasons that were addressed to the health insurers (complaints about the selection by the insurer of a health care facility and the selection of a physician for health care delivery to the insured person, complaints about the sanitary condition of the health care facilities, about the ethics and deontology of health care personnel). Besides, the PG form includes also some other indices that might be used to characterize the attitude of the health care system to patients, but which are specific to the Russian Federation: for example, complaints about the supplying of drugs, including the supplying under the program of additional drug supplying for individual categories of population.

These data are proposed to be considered as characteristics of the elements of health care system responsiveness. Though, amenably to the WHO, responsiveness indicators express the opinions of individual persons, who have not necessarily come to deal with the health care services, their ideas about the health care system. But the information about complaints can be considered as a more objective characteristic of responsiveness as it reflects the actual experience of patients' contacts with the health care system. In other words, a different method of measurement of health system responsiveness is offered to use – not to measure the opinions of population on the whole, but the opinion of people that come to deal with health care facilities and medical personnel.

It should also be noted that the reporting that includes the PG form does not cover the whole health care system but health care facilities that provide health care services under the mandatory health insurance. But they make the majority of state and municipal health care facilities.

As the source of information for evaluating the parameters of health care systems responsiveness it is also suggested that form No.47 should be used of the state sectoral statistical accounting. It reflects the indices of the status of material and technical basis of health care facilities (such as central water supply, the number of facilities in need of overhaul, and etc.). These reporting data are collected from all government and municipal medical facilities.

[15] The form was approved by the order of Federal Mandatory Health Insurance Fund (No. 64 of 2 June 2006)

The indicators put forward for measuring the level of responsiveness of the regional health care systems are shown in Table 1.

Table 1.

The Indicators of Measuring Responsiveness of Regional Health Care Systems

Responsiveness elements	**Russia Relevant Indicators**
Dignity	The share of patients that applied with complaints about the ethics and deontology of medical personnel to the total number of patients served. The share of patients that applied with complaints about the organization of health facility operation to the total number of patients served.
Prompt attention	The share of calls for emergency care teams with the response time overdue as compared with the norms of emergency care response. The share of patients that applied with complaints about the denial of health care delivery under the MHI package on the insurance covered territory to the total number of patients served. The share of patients that applied with complaints about the provision with drugs to the total number of patients served: - at the inpatient care facility; - at the hospital-substitute facility; - at the outpatient care facility. The share of patients that applied with complaints about the provision of drugs under the program of additional drug supply for individual categories of citizens to the total number of citizens of relevant categories.
Quality of basic amenities	The share of patients that applied with complaints about the sanitary condition of health care facilities to the total number of patients served. The share of health care facilities, which lack centralized water supply, to the total number of health care facilities. The share of health care facilities that are in need of capital repairs to the total number of medical facilities.
Freedom to select provider of health care	The share of patients that applied with complaints about the choice of a health care facility under the MHI system (on the insurance covered territory) to the total number of patients served. The share of patients that applied with complaints about the choice of a physician to the total number of patients served.

On comparison of the offered list of indicators to evaluate the level of responsiveness of territorial health care systems with the WHO approach to the responsiveness evaluation it should be noted that the currently available statistical information does not allow evaluating some of the responsiveness elements specified by the WHO: patients autonomy, confidentiality of information and accessibility to the social support systems.

On the basis of partial indicators shown in Table 1 the overall responsiveness index can be calculated for a regional health care system as the weighted sum of the above stated partial indicators. Initially, all the specified elements of responsiveness can be considered equally significant, i.e., to give “l” value to all weight coefficients when calculating the aggregated responsiveness index on the basis of partial indices. It would be advisable further on to implement a special study on the sociological surveys basis with the view to determine the specific weight of each of the elements under consideration in the formation of the aggregate responsiveness evaluation.

In order to determine the equitability of responsiveness for the population groups an additional section will have to be inserted into the statistical reporting PG form, to present the information about the distribution of patients, who applied with complaints, by social and economic status.

3.5. Index of Fairness of Financial Contribution on Health Care

To assess the fairness of financial contribution on health care we propose to use the index that measures the level of inequality among the households in the share of health contribution of the household spending on non-food related needs (i.e., of the total spending minus the expenditure on foods). That index is similar to the one used by the WHO to assess the national health care systems:

$$F = 1 - 4\frac{\sum_{j=1}^{5} |H_j - \overline{H}|^3}{0{,}625},$$

where:

F – the index of fairness of financial contribution ranging from 0 to 1;

H_j – the share of households contribution on health, that relate to j-th quintile by income, to the household expenditure of that quintile on the non-food related needs.

$\overline{H}$ - the average share of household expenditure on health care to the household expenditure on the needs that are not related to food.

The household expenditure on health includes: voluntary health insurance contributions, out-of-pocket payments for medical services, and purchasing of drugs.

In comparison with the WHO it is suggested that the structure of household contribution on health does not include the taxation of household members in the part the government allocates for health care. In Russia a flat schedule of rates is

applied to the income of physical persons (13%). The share of the state budget revenues from other types of taxes to be charged of physical persons is inconsiderably small in comparison with the tax revenues from the income of physical persons. The expenditure on the mandatory health insurance of the working population is integrated in the social tax paid by the employers. So it is quite fair to deem that the burden of taxation in the part of health financing is distributed among households equally.

The index *F* is calculated for every region individually. As the source of information may serve the data of household budget surveys carried out by Rosstat annually. That is the only survey whose sampling includes households from all the regions. Their number, though, varies from 100 to 800, so for some regions where the sampling is small the collected data will hardly be representative. In order to obtain representative data for all the regions it will be necessary to expand the sampling.

3.6. The index of overall health system attainment

The index of overall health system attainment is composite measure of achievement in the level of health, the distribution of health, the level of responsiveness, and fairness of financial contribution on health care.

It is constructed on the first four indicators for health system performance assessment:

1) The health status indicator - the disability adjusted life expectancy (DALE)
2) The index of distribution of health inequality
3) The index of overall responsiveness of health system
4) The index of fairness of fairness of financial contribution on health care

The index of overall health system attainment ranges from 0 to 1. The contribution of each component is proportional its weight coefficient. The weights are defined by experts in points.

3.7. The Health Resources Structural Efficiency Indicators

3.7.1. The Set of Structural Efficiency Indicators

Besides the health care system performance indices used in the WHO report 2000, the index of structural efficiency is to be added as well for assessment territorial health care system in Russia. The need for that is conditioned by the existence of serious structural disproportions in health care, the lack of motivation for the principal subjects of health care to overcome them.

In the health care system there has been formed an ineffective proportion between the primary care and secondary care. The level of development of primary care is extremely low and tends to go worse. There is some accepted understanding of the regularity pattern in the world practice: the higher the share of primary care physicians in the total strength of physicians (correspondingly, the lower is the

share of narrow specialists) the less is required to achieve the target outcomes of the health care system performance. In the Russian health care the share of physicians of the catchment area services does not exceed 25% versus 45-55% in Western countries.

The rate of patient's referrals to specialists by the catchment area physicians in Russia is above 30% of the number of primary visits, while in the western countries it is 4% - 10%. That increases the inpatient care load. The level of hospitalization and the length of stay in Russian inpatient facilities are noticeably higher than in the European countries. The integrated index of hospitalization volumes – the number of bed-days per 1 citizen – is almost two times higher than the average for the European Union. The share of inpatient care in the overall health expenditure in Russia exceeds 60% versus 30-40% in the European countries. About 30% of admissions, in particular in therapy, neurology and gynecology, are inappropriate from the medical and economic aspects: the treatment of patients could have been effective and cheaper if carried out in the outpatient settings.

The issue of structural efficiency remains to be extremely acute, which essentially decreases the value of some part of additional investments in health care.

As the *structural efficiency indicators* it is suggested that the following should be used:

1. The share of inpatient care expenditure in the total public financing allocated to health care, in %.
2. The share of primary care physicians (catchment area therapists, pediatricians, general practitioners) in the total number of physicians, in %.
3. The share of bed-days spent in the day care hospitals in the total number of bed-days of inpatient care.

   These indicators characterize respectively:

   - The correlation between the inpatient and outpatient care;
   - The development level of primary care, its position in the overall health care system;
   - The level of development of hospital-substitute technologies that will be able to reduce the burden of round-the-clock inpatient care facilities.

The above mentioned indicators are considered as elementary indicators of structural efficiency. On the base of these elementary indicators the integrated index of structural efficiency can be calculated.

3.6.2. Sources of Information for Indicators Calculation

Government expenditure on health and the expenditure on outpatient and inpatient care for the reporting year (to calculate indicator1) can be taken from form No.62 "Information about public health care delivery and financing" approved with the order of the MOH of Russia and CMIF of 13.11.2003 No.542/58. That form is annually filled out by the health authorities in the RF subjects. At the level of the Russian Federation the verified data are aggregated by

the Ministry of Health and Social Development in the form "Formation and implementation of the Territorial Health Benefits Package".

The overall number of positions of physicians, outpatient care physicians by medical specialties in order to calculate the indicator 2 can be taken from form No.30 approved with the enactment of Goscomstat of Russia, table 3210.

The number of cases treated at the day care hospitals and round-the-clock hospitals (to calculate indicator 3) can be determined from form No.62.

4. Calculation of Health Status Indicator

4.1. Health status indicator

For the purposes of comparative analysis of population health statuses in different regions (RF subjects) the indicator is used *of the disability adjusted life expectancy - DALE.*

That indicator is used as the basic indicator for the population health status of the Federation subjects, as well as the population of municipal entities within every subject of the Russian Federation.

The DALE indicator is calculated for every subject of the Russian Federation on the whole and individually for all the municipal entities it includes for the established calendar period.

4.2.Classifier of diseases to calculate the DALE indicator.

The DALE indicator is calculated for every territory (Federal subject, municipal entity) on the basis of four-level classifier of diseases used for the WHO project on the estimation of the national burden of diseases[16] (See Table A1 in the Appendix.

That classifier specifies such causes of death, which have four levels of disaggregation and cover 160 individual diseases and traumas. At the first level general mortality is split into three full-scale groups of causes:

- Group I consists of infectious diseases, causes of maternal mortality, diseases of perinatal period and nutrition problems;
- Group II includes all non-communicable diseases;
- Group III includes all deliberate and unintentional traumas and poisonings.

Each group is subdivided into several sub-categories of diseases and traumas, which, in the aggregate, are mutually exclusive and exhaust the whole range of diseases covered by the respective group. Group I is divided into 5 sub-categories (infectious and parasitic diseases, respiratory infections, maternal mortality cases, diseases of perinatal period and nutrition disorders). Group II is

[16] Mathers C D, Vos T, Lopez A D, Salomon J, Ezzati M (ed.) 2001. National Burden of Disease Studies: A Practical Guide. Edition 2.0. Global Program on Evidence for Health Policy. Geneva: World Health Organization.

divided into 14 sub-categories. Group III is divided into 2 categories: deliberate and unintentional injuries.

The third level of disaggregation is used for identifying more specific causes of health disturbances within each of the 21 sub-categories. For example, within the respiratory infections category such specific causes were determined as infections of the upper air passages, infections of the lower air passages and otitis (otitis media).

For some diseases, such as the sexually transmitted diseases (STD) the fourth level of disaggregation is presented (for that group it is syphilis, clamidiosis and gonorrhea).

4.3. Sequence of DALE Index Calculation

To calculate the DALE index – disability adjusted life expectancy –short tables of life years (TOLY) are calculated for the population of the following age groups: 0, 1–4, 5–9, 10–14, …, 85+. For each age group the following indicators are consistently calculated:

- Disability adjusted life years related to health disorders that do not bring about fatal termination;
- Likelihood of dying in different age groups;
- Number of person-years lived up to different ages;
- Number of person-years lived in different age groups;
- Accumulated number of person-years lived in different age groups;
- Life expectancy for person-years lived up to different ages;
- Health disorders prevalence with taking into account the severity and comorbidities of these disorders;
- The number of person-years lived and the accumulated numbers of person-years lived in different age groups with and without health disorders;
- Disability adjusted life expectancy for person-years lived up to different ages.

4.4. Calculation of Index of Disability Adjusted Life Years in Relation to Health Disorders that Do Not Bring About Fatal Termination

The calculation of disability adjusted life years in relation to health disorders that do not bring about fatal termination is carried out on the basis of data about the prevalence/morbidity of each of the diseases under consideration as of the middle of the period in question (calendar year).

These data are calculated by way of summing up the data of the territorial mandatory health insurance funds for three calendar years on the use of health care by population differed by age, gender, municipal entities and reasons of applying for care (types of diseases).

The indicator of disability adjusted life years of persons of *x* age because of disease *j*, that do not bring about fatal termination (YLD_x^j), shall be calculated by the formula:

$$\mathrm{YLD}_x^j = I_x^j \cdot \mathrm{DW}_x^j,$$

Where I_x^j — the number of persons aged *x*, with the health disorder in question of *j*-type (exhausted prevalence/morbidity) during the period under consideration;

DW_x^j — Weight (severity) of the health disorder of *j*-type for people aged *x*, with the health disorder in question of *j*-type (given by a figure within the range from 0 to 1; for less severe disorders of health that value is closer to zero, and for more severe health disturbances it is closer to one).

The DW_x^j values are given in Table A2 in the Appendix. These coefficients are given only for the "source" diseases. i.e. for such diseases, traumas and health disorders, which do not make classes of diseases and their individual groups. For all the other classes and groups of diseases (comorbidities) the indices of YLD shall be calculated as sums of corresponding source lines. The List of comorbidities and initial diseases they consists of is given in Table A3 in the Appendix.

4.5. Calculation of Likelihood of Dying per Different Age Groups.

The indices of the likelihood to die in different age groups q_x shall be calculated on the basis of the aggregate age coefficients of mortality M_x.

For every age group *x*, with the exception of the last age group, the q_x index shall be calculated by the following formula:

$$_nq_x = \frac{n \cdot {}_nM_x}{1 + n \cdot (1 + {}_na_x) \cdot {}_nM_x},$$

Where $_nq_x$ — likelihood to die for the age group of [*x*, *x* + *n*] years;

$_nM_x$ — age coefficient of mortality for that age group,

n — size (width) of the age group (in years); the width of the first age group (0 years is equal to 1 year, of the second age group (1–4 years) is equal to 4 years, of all the following age groups, except the last one, is 5 years;

$_na_x$ —share of the age range, which within the age group will be lived by those who died at a given age.

The ${}_n a_x$ values for all the age groups, except the first two, are taken as equal to 0.5. That is based on the assumption that the individuals that died at the ages in question die evenly in the course of the corresponding five-year periods. For the first age group (0 years) ${}_1 a_0 = 0.1$, which is in line with the observed patterns of development of a baby of the first year; and for the second age group (1–4 years) ${}_4 a_1 = 0.4$, which reflects the visibly higher mortality of children within the first years of the age period in question.

For the last age group the above formula is not applied and the value of $a_{85} = 1$ (since the maximum age of people included in that last age group is unlimited, the likelihood of dying for the members of that group is equal to 1).

After calculation of the likelihood of dying ${}_n q_x$, for each age group the ${}_n p_x$ values are calculated of the likelihood of surviving within the age range of [*x*, *x* + *n*] years by the following formula:

$$ {}_n p_x = 1 - {}_n q_x $$

4.6. Calculating the Numbers of Person-years Lived up to Different Ages.

Index l_x — the numbers of person-years lived up to *x* age is the estimate of the number of people in a conditional cohort who live up to age *x* exactly, provided that the initial strength of that cohort was quantified as l_0.

The initial strength of the conditional cohort l_0 is called *radix* or the root of the life table (LT). For calculation the radix of LT l_0 can be taken as equal to 1 or 1000, or 100 000.

In contrast to the other LT indices, the index of l_x refers to the exact age but not to the age range. The populations of those surviving up to the initial ages of every following age range of LT are determined by the following ratios:

$$ l_{x+n} = l_x \cdot {}_n p_x = l_x \cdot (1 - {}_n q_x), $$
$$ {}_n d_x = l_x - l_{x+n} = l_x \cdot {}_n q_x . $$

Where ${}_n d_x$ — is the index of LT referred to further as the number of deaths in the LT between the exact ages *x* and *x*+*n* (or the number of deaths in LT at the age period [*x*, *x* + *n*] years).

For the last age group of LT the number of deceased in the LT will equal the number of those surviving.

Indices l_x are conditional figures. They belong only to the LT with the given radix (initial population of the born in the conditional population cohort), and do

not reflect the actual number of individuals, both born and those who have lived up to the age x exactly in the actual population of every territory. At the same time, the aggregate of l_x values is a general characteristic of mortality level of actual population in the calendar year under consideration, that is why the LT constructed by the current statistics data of mortality are referred to as the current LT.

4.7. Calcualtion of Numbers of Person-years Lived in Different Age Groups.

In brief LT every individual, that survived in the period of $[x, x + n]$ years puts in n years of life (n — duration of the period) to the total number of life years of the individuals of a conditional cohort consisting of l_0 "births", and every individual, that dies within that range puts in a number of years equal to the product of value ${}_n a_x$, by the duration of that period.

Index ${}_n L_x$ — the number of person-years lived in the x age group — in the LT is determined as the total number of person-years lived by all those surviving in the age range of $[x, x + n]$ (both by those who have lived through that age range and those who have died at the age from x to $x + n$). That indicator is calculated by the formula:

$$ {}_n L_x = n \cdot (l_{x+n} + {}_n a_x \cdot {}_n d_x) .$$

Whereas, $l_{x+n} = l_x - {}_n d_x$, and respectively ${}_n d_x = l_x - l_{x+n}$, then

$$ {}_n L_x = n \cdot (l_{x+n} \cdot (1 - {}_n a_x) + {}_n a_x \cdot l_x) .$$

Thus, the index of ${}_n L_x$ shall be calculated as the weighted average of indices l_{x+n} and l_x, multiplied by the measure of the age range of n.

Since the last age range has no fixed length the number of those living in that range is determined by means of another formula:

$$ {}_n L_x = \frac{{}_n d_x}{{}_n M_x} .$$

4.8. Calculation of Cumulative Numbers of Person-years Lived in Different Age Groups.

The index of the cumulative number of person-years lived in the (T_x) age group characterizes the number of person-years lived by the members of the conditional cohort after the age of x. T_x, as well as l_x refers to exact age of x , but not to the age range of $[x, x + n]$.

Index T_x is calculated as an accumulated sum of numbers of living ${}_nL_x$, stating with the last age range:

$$T_x = T_{x+n} + {}_nL_x,$$

whereas $T_{85} = L_{85+}$; $T_{80} = T_{85} + {}_5L_{80}$ and so on.

Indices q_x,; l_x, ${}_nL_x$, T_x are auxiliary indices for the calculation of the main indices of the LT.

4.9. Calculation of Indices of Life Expectancy for Person-years Lived up to Different Ages.

The indices of life expectancy for person-years lived up to different ages — e_x.

For every *x* age the index of life expectancy e_x is determined as an expected (average) number of years that every person that has reached the age of *x* accounts for.

Since age *x* is lived up to in the current LT by l_x people, and the total number of remaining life years for these people is given by the index of T_x, the value of e_x for every age included in the LT shall be calculated by the following formula:

$$e_x = \frac{T_x}{l_x}.$$

The average number of years that one newly born accounts for in a conditional cohort (e_0), is referred to as *life expectancy* at birth, or an average life expectancy. The value of that index is determined as the ratio:

$$e_0 = \frac{T_0}{l_0}.$$

4.10. Calculation of the Index of Prevalence Rate.

Index of RYLD_x^j — the prevalence of health disorders among persons of age *x* in the result of disease *j* taking into account the severity and comorbidity of these disorders shall be calculated on the basis of calculated indices of losses from non-lethal health disorders YLD_x^j (See Section 4.4).

The said indices should be transformed into relative values of severity of health disorders dividing them by per year average populations in accordance with the appropriate age groups:

$$\mathrm{RYLD}_x^j = \frac{\mathrm{YLD}_x^j}{P_x},$$

Where P_x — the annual average population in question at the age-gender group of x.

The calculations are carried out for all diseases that were determined above in Section 4.2. as the initial diseases and presented in Table A1 in the Annex 2.

By means of the obtained values of the severity of health disorders in the result of the initial diseases the calculation of such values is made for co-morbidity cases, which have been specified in Section 4.4. and shown in Table A3. It should be taken into consideration that Table A3 presents several levels of co-diseases for all of which the relative values should be calculated for the severity of health disorder by the formula:

$$\mathrm{RYLD}_x^j = 1 - \prod_{k \in G} (1 - \mathrm{RYLD}_x^k),$$

Here $\prod_{k \in G}$ — the symbol of product by all diseases *k*, included in the group of the initial and related to the one and the same co-disease *G*.

For example, there is line U111 in Table A3, which corresponds to the mixed case (group) “Diseases of the respiratory apparatus”, which covers the diseases with codes U112, U113 and U114. Then the relative index of the severity of health disorder for the “Diseases of the respiratory apparatus” taking into account the comorbidity is calculated as follows:

$$\mathrm{RYLD}_x^{\mathrm{U111}} = 1 - (1 - \mathrm{RYLD}_x^{\mathrm{U112}}) \cdot (1 - \mathrm{RYLD}_x^{\mathrm{U113}}) \cdot (1 - \mathrm{RYLD}_x^{\mathrm{U114}}).$$

The end purpose of all intermediate calculations is to obtain the estimate of prevalence of health disorders with taking into account the comorbidity of these disorders for the group of diseases of “All diseases” U000 — $\mathrm{RYLD}_x^{\mathrm{U000}}$.

That indicator is calculated for all age and gender populations.

4.11. Calculation of the Total Numbers of Person-Years Lived and Total Numbers of Person-Years Lived after Age x in Different Age and Gender Populations with and without Health Disorders.

On obtaining the values of indices $\mathrm{RYLD}_x^{\mathrm{U000}}$ the calculations are made of the indices of:

YWD_x — the number of person-years lived without health disorders in the age *x* population groups and older;

TYWD_x — the accumulated number of person-years lived without health disorders in the *x* age groups and older.

The calculation of the indices for the number of person-years lived with health disorders is made by the following formulas:

$$\mathrm{YWD}_x = \left(1 - \mathrm{RYLD}_x^{\mathrm{U000}}\right)_n L_x,$$

where ${}_nL_x$ is the number of live people in the *x* age population.

The indices of accumulated numbers of person-years lived without health disorders are calculated as accumulated sums of numbers of person-years lived without health disorders YWD_x, beginning with the last age range:

$$\mathrm{TYWD}_{85+} = \mathrm{YWD}_{85+},$$

$$\mathrm{TYWD}_x = \mathrm{TYWD}_{x+n} + \mathrm{YWD}_x.$$

4.12. Calculation of Disability Adjusted Life Expectancy for Different Persons-Years Lived.

The index of disability adjusted life expectancy for person-years lived up to age *x*, DALE_x, is calculated by the following formula:

$$\mathrm{DALE}_x = \frac{\mathrm{TYWD}_x}{l_x},$$

where l_x — the index of the number of person-ears lived up to age *x* (Section 4.6.);

TYWD_x — accumulated number of person-years lived in *x* age groups and older (Section 4.8).

The sought DALE value is calculated by the formula:

$$\mathrm{DALE} = \mathrm{DALE}_0 = \frac{\mathrm{TYWD}_0}{l_0}$$

The numerical illustration of calculating the indices: l_x, ${}_5L_x$, e_x, YWD_x, DALE_x is presented in Table A4 in the Appendix .

5. Calculation of Index of Distribution of Health Inequality in the Population

The index of distribution of health inequality in the population is calculated for the health care system of every region and it measures variances in disability

adjusted life expectancy (DALE) among the populations of municipal entities that make a region (subject of the Russian Federation).

Index HE — the distribution of health inequality in the population of a region is calculated by the formula:

$$HE = \frac{\sum_{s=1}^{n}\sum_{t=1}^{m}\left|DALE_s - DALE_t\right|}{2 \cdot n^2 \cdot \overline{DALE}},$$

Where *s*, *t* —number of a municipal entity within a region;

n — the number of municipal entities in the region;

$DALE_s$, $DALE_t$ — values of DALE indices by the total of the region municipal entities.

$\overline{DALE}$ — the average value of DALE index by the total of the region municipal entities.

6. Calculation of Health Care System Overall Responsiveness Index

6.1. The concept of health care system responsiveness is connected with non-medical (non-clinical) aspects of its functioning: ensuring respect for human dignity, autonomy and confidentiality of information, attention to patients, quality of amenities, freedom to choose the provider of health services.

The index of overall responsiveness of a health care system characterizes the attitudes of a health care system to people in terms of respect for people's dignity, care for patients, amenities of adequate quality for patients, the free choice of a health care facility.

The overall responsiveness index is calculated for the health care system of every region (for every *i*-territory).

6.2. The overall responsiveness index is calculated on the basis of 11 specific responsiveness indicators.

6.2.1. *Share of patients that lodged valid complaints about the health personnel's ethics and deontology in the total number of the insured under MHI in region* C_E is calculated by the formula:

$$C_E = \frac{N_E}{N_I},$$

where N_E — the number of valid patients' complaints about the ethics and deontology of health personnel.

N_I — the total number of people in this territory insured under the MHI system.

The number of complaints of that kind is a sum of all said complaints, written or verbal, submitted to the TMHIF and health insurance organizations (HIO). The value of the index is calculated as the sum of columns 7 and 8 by line 8 of Table 1.2. “Complaints and reasons for people to lodge their complaints” of the form of departmental statistical monitoring No. PG.

The total number of people insured in the territory under the MHI system is the sum of the insured at the health insurance organizations operating in the *i*-territory and the branch offices of the Territorial Mandatory Health Insurance Fund (TMHIF). The data are provided by the TMHIF.

6.2.2. *Share of patients that lodged valid complaints about the operational arrangements of health care facilities in the total number of the insured under MHI in region* C_E is calculated by the formula:

$$C_O = \frac{N_O}{N_I},$$

where N_O — the number of valid complaints about the arrangement of health care facility operation.

N_I — the total number of people insured in the territory under the MHI system.

The number of complaints of that kind is the sum of all said complaints, written or verbal, submitted to the TMHIF and HIO. The index value is calculated as the sum of columns 7 and 8 by line 6 of Table 1.2. “Complaints and reasons for people to lodge their complaints” of the form of departmental statistical monitoring No. PG.

6.2.3. *Share of emergency calls with response time above the standard for emergency care teams* A_L. That indicator is collected from the regions of the Russian Federation by a particular inquiry of the Ministry of Health and Social Development. Since 2008 that indicator has been included in form No.40 “Emergency care service performance” of the departmental statistic reporting.

6.2.4. *Share of patients that lodged their complaints about refusals to deliver health care under the MHI program in the insurance covered territory in region* C_R is calculated by the formula:

$$C_R = \frac{N_R}{N_I},$$

where N_R — the number of complaints about refusals to deliver health care services under the MHI program.

N_I — the total number of people in the territory insured under the MHI system.

The number of complaints of that kind is the sum of all said complaints, written or verbal, submitted to the TMHIF and HIO. The index value is calculated as the sum of columns 7 and 8 by line 11.1 of Table 1.2. “Complaints and reasons for people to lodge their complaints” of the form of departmental statistical monitoring No. PG.

6.2.5. *Share of patients that lodged their valid complaints about drug supply in the total number of people insured under the MHI in region* C_D is calculated by the formula:

$$C_D = \frac{N_D}{N_I},$$

where N_D — the number of justifiable complaints about insufficient drug supply

- At hospital,
- At inpatient care replacing facility,
- At outpatient care facility.

N_I — the total number of people insured under MHI system on this territory.

The number of complaints of that kind is the sum of all said complaints, written or verbal, submitted to the TMHIF and HIO. The index value is calculated as the sum of columns 7 and 8 by line 10, 10.1, 10.2 and 10.3 of Table 1.2. “Complaints and reasons for people to lodge their complaints” of the form of departmental statistical monitoring No. PG.

6.2.6. *Share of patients that lodged their valid complaints about drug supply under the Program for supplementary drug supply for certain categories of people in the total number of specific categories of people on social assistance in the form of a set of social services* C_A is calculated by the formula:

$$C_A = \frac{N_A}{N_C},$$

where N_A — the number of valid complaints about deficiencies of drug supplying under the program for supplementary drug supply,

N_C — the total number of people of the favorable contingent who get social assistance in the form of a set of social services and who live of the territory of the region.

The number of complaints of that kind is the sum of all said complaints, written or verbal, submitted to the TMHIF and HIO. The index value is calculated as the sum of columns 7 and 8 by line 10.4 of Table 1.2. “Complaints and reasons for people to lodge their complaints” of the form of departmental statistical monitoring No. PG.

Information about the quantities of fovourable brackets that live on the territory of the region is provided by the regional office of the Pension Fund.

6.2.7. *Share of patients that lodged their valid complaints about sanitary status of health care facilities in the total number of the insured under the MHI in region* C_S shall be calculated by the following formula:

$$C_S = \frac{N_S}{N_I},$$

where N_S — the number of complaints about sanitary status of health care facilities.

N_I — total number of people insured under the MHI in this territory.

The number of complaints of that kind is the sum of all said complaints, written or verbal, submitted to the TMHIF and HIO. The index value is calculated as the sum of columns 7 and 8 by line 7 of Table 1.2. “Complaints and reasons for people to lodge their complaints” of the form of departmental statistical monitoring No. PG.

6.2.8. *Share of health care facilities, which lack central water supply system in the total number of health care facilities* U_W .

The source of information is Form No.47 of the state departmental statistical reporting – consolidated report “Information about health care network and performance”. The data show the indices of material and technical basis of health care facilities (such as the presence of central water supply, the number of health care facilities in need of capital repairs, etc.). These data are collected from all state and municipal health care facilities.

6.2.9. *Share of health care facilities in need of capital repairs in the total number of health care facilities.*

The source of information is Form No.47 of the state departmental statistical reporting – consolidated report “Information about health care network and performance”.

6.2.10. *Share of patients that applied with valid complaints about the selection of a health care facility under the MHI system (on the insurance territory) in the total number of people insured under the MHI in region* C_U shall be calculated by the following formula:

$$C_U = \frac{N_U}{N_I},$$

where N_U — the number of valid complaints about the selection of a health care facility under the MHI system.

N_I — total number of people insured under the MHI on that territory.

The number of complaints of that kind is the sum of all said complaints, written or verbal, submitted to the TMHIF and HIO. The index value is calculated as the sum of columns 7 and 8 by line 4.1of Table 1.2. “Complaints and reasons for people to lodge their complaints” of the form of departmental statistical monitoring No. PG.

6.2.11. *Share of patients that lodged their valid complaints about the selection of a physician in the total number of people insured under the MHI system in region* C_P shall be calculated by the following formula:

$$C_P = \frac{N_P}{N_I},$$

where N_P — the number of valid complaints about the selection of a physician;

N_I — the total number of people insured under the MHI system in that territory.

The number of complaints of that kind is the sum of all said complaints, written or verbal, submitted to the TMHIF and HIO. The index value is calculated as the sum of columns 7 and 8 by line 5 of Table 1.2. “Complaints and reasons for people to lodge their complaints” of the form of departmental statistical monitoring No. PG.

6.3. It is not the calculated values of particular indicators of responsiveness indices proper that are included in the responsiveness index of *i*-territory, but their *contributions*. If Z^i — is one of 11 particular indicators of responsiveness described in para. 6.2, then its contribution $C(Z^i)$ for *i*-territory shall be calculated by the following algorithm:

1) Let us consider the first particular indicator responsiveness index Z_1^i for *i*-territory. Out of all calculated values of the first particular indicator of responsiveness for all the categories we find the lowest value *a* and the highest value *b*:

$$a = \min_i(Z_1^i) \text{ и } b = \max_i(Z_1^i).$$

Then, similarly, we determine the minimum and the maximum values for the second, the third and all successive particular indicators of responsiveness indices Z_k^i, $k = 2,3,...,11$.

2) The lowest value *a* and the highest value *b* of each particular indicator of responsiveness determine the best and the worst values for all territories, and all values are in the range of [*a, b*].

3) Contribution of $C(Z_k^i)$ *k*-particular indicator of responsiveness for *i*-territory is calculated by the following formula:

$$C(Z_k^i) = \frac{b - Z_k^i}{b - a}.$$

Thus, for *i*-territory the contributions are calculated for 11 particular indicators of responsiveness: $C(C_E^i)$, $C(C_O^i)$, $C(A_L^i)$, $C(C_R^i)$, $C(C_D^i)$, $C(C_A^i)$, $C(C_S^i)$, $C(U_W^i)$, $C(U_R^i)$, $C(C_U^i)$, $C(C_P^i)$.

6.4. Based on the calculated indices of contributions of particular indicators of responsiveness the indices of responsiveness are calculated for: *dignity, attention, quality of amenities, freedom to select provider of health care.*

Dignity. That element characterizes the level of respect with which the health care system treats its patients, their rights and interests.

Prompt attention. That indicator characterizes the level of access to the services delivered by the health care system.

Quality of basic amenities. The indicator characterizes the basic living conditions under which health services are delivered.

Freedom to select provider of health care. That indicator reflects the ability of a patient to select an individual and a health care facility when getting health care services.

The indicator of *dignity* D^i for *i*-territory is calculated as:

$$D^i = C(C_E^i) + C(C_O^i).$$

The indicator of *prompt attention* A^i for *i*-territory is calculated by the formula:

$$A^i = C(A_L^i) + C(C_R^i) + C(C_D^i) + C(C_A^i).$$

The indicator of *quality of basic amenities* Q^i for *i*-territory is calculated by the formula:

$$Q^i = C(C_S^i) + C(U_W^i) + C(U_R^i).$$

The indicator of *freedom to select provider of health care* C^i for *i*-territory is calculated by the formula:

$$C^i = C(C_U^i) + C(C_P^i).$$

6.5. *The index of the overall responsiveness* R^i for *i*-territory is calculated by the formula:

$$R^i = D^i + A^i + Q^i + C^i.$$

The indicator of overall responsiveness calculated by the given algorithm takes values in the range from 0 to 11 and the higher are the values of individual elements of responsiveness the higher is the indicator.

Ranked by territories the contributions of every particular indicator of responsiveness show the reason why (for which individual element of responsiveness) every territory gets or loses the points of the overall responsiveness indicator.

7. Calculation of Index of Fairness of Financial Contribution on Health Care

7.1. The index of fairness of financial contribution on health care measures the degree of variance (inequity) among households in the share of health costs in the overall household expenses minus the cost of food.

7.2. The index of fairness of distribution of health care burden of expenses is calculated by the selected data about the household receipts and expenditures in a subject of the Russian Federation (*i*-territory), that belong to the year under analysis.

By the data about the distribution of per capita (per one household member) receipts of households for the year under analysis the whole sampling of households in *i*-territory is ranked by the increase of per capita income and then grouped into five equal populations (quintiles).

7.3. For each *j*-quintile the indicator H_j is calculated.

H_j — average portion of health expenditure in the overall household expenditures of *j*-quintile minus the expenditure on food; the H_j value is calculated as decimal fraction.

The household health expenditures cover: the contributions for voluntary health insurance, paying for health care services and purchasing of drugs and medical goods.

7.4. For the whole sampling of households the indicator $\overline{H}$ is calculated:

$\overline{H}$ — average portion of household health care expenditure in the overall household expenditures minus the expenditure on food; the $\overline{H}$ value is calculated as decimal fraction.

7.5. Calculation of indicators of H_j and $\overline{H}$ for the Russian Federation subjects can be done by the Federal Service for State Statistics (Rosstat) or its territorial entities in the subjects of the Russian Federation on the request of the

Ministry of Health and Social Development of the Russian Federation or health authorities in the subjects of the Russian Federation. The source of information for calculations is the data of household budget surveys that Rosstat holds annually.

7.6. *Index of fairness of financial contribution on health care* F_i for *i*-territory is calculated by the following formula:

$$F_i = 1 - 4\frac{\sum_{j=1}^{5}|H_j - H|^3}{0.625}.$$

The index of fairness of financial contribution on health care varies within the range from 0 to 1. The value of 1 corresponds to an even distribution of health care burden of expenditure between households that belong to different income groups (quintiles). The closer to zero the calculated value is the less fair the burden of health care expenses has been distributed in the population.

8. Calculation of Overall Health System Attainment Index.

8.1. The integral indicator of performance evaluation of territorial health care systems is calculated on the basis of the following component indices:

1. The health status indicator.
2. The index of distribution of health inequality in the population.
3. The index of overall responsiveness of health system.
4. The index of fairness of financial contribution on health care.

8.2. Let us examine the constituent parts of overall health system attainment index.

As an health status indicator the index of DALE is used – disability adjusted life expectancy. Calculation of the DALE indicator is described in Section 4.

Calculation of values of the index of distribution of health inequality in the population is described in Section 5.

The index of overall responsiveness of health system is the aggregate of values of 11 particular indicators, which reflect the complaints of population about the performance of the health care system, the health care system responsiveness to people's requests, amenities of health care service delivery. The constituent parts of the index of overall responsiveness of health system allow making evaluation of such components of responsiveness, in addition, as dignity, attention to patients, quality of amenities, and free choice of care service provider.

Calculation of the indicator values is described in Section 6.

The index of fairness of financial contribution on health care is measured by way of quantitative estimation of inequity in the distribution of the burden of health expenditure described in Section 7.

8.3. The *overall health system attainment index* is a number in the range from 0 to 1. The contribution of every constituent index to that number is proportional to the significance (weight) of the constituent index. The values of significance of constituent indices established within the framework of that procedure are given below.

Table 2.

Weights of particular indices that constitute the overall health system attainment index

	Indicator	**Weight**
1	Health status of population DALE — disability adjusted life expectancy	10
2	Distribution of health inequality in the population	6
3	Overall responsiveness of health system	4
4	Fairness of financial contribution on health care	7

8.4. The overall health system attainment index E^i for *i*-territory is calculated by the following formula:

$$E^i = \frac{\sum_{k=1}^{4} q_k^i}{\sum_{k=1}^{4} h_k},$$

Where q_k^i — *evaluation of contribution of k*-constituent index for *i*-territory to the overall health system attainment index.

h_k — weight of constituent index *k* (*k* = 1, 2, 3, 4).

Summing in the numerator is carried out for all four component indices. In the denominator is the sum of all values of the component indices, hence the formula denominator has the value of 10 + 6 + 4 + 7 = 27 for any territory.

8.5. The calculation of evaluation of contribution q_k^i for every component indicator *k* for territory *i* is carried out as follows:

Let us designate the calculated value of *k*-component index for *i*-territory as w_k^i.

For the first of the four component indices the values of w_1^i are calculated for all territories. Among all calculated values there is the minimum *a* value and the maximum *b* value:

$$a = \min_i(w_1^i) \text{ и } b = \max_i(w_1^i).$$

Then, in a similar way the minimum and the maximum values are determined for the second, the third and the fourth component indices.

The minimum value of *a* and the maximum value of *b* of each component index determine the best and the worst values for all territories, and all the values of the component indicator are in the range of [*a*, *b*].

The estimation of contribution q_k^i of the component index with the value of h_k for *i*-territory is calculated by the following formula:

$$q_k^i = \frac{w_k^i - a}{b - a} \cdot h_k .$$

8.6. The calculated overall health system attainment index E^i for *i*-territory is the bigger, the higher is the effectiveness of the health care system on that territory.

8.7. Ranked by the territories evaluations of contribution of each component index show for what reason (because of which component index) every territory gets or looses fractions of points of the overall health system attainment index.

9. Calculation of Index of Structural Efficiency

9.1. The index of structural efficiency of territorial health care systems reflects comparative efficiency of resource utilization in the subjects of the Russian Federation or municipal entities of the Russian Federation subjects.

9.2. The index of structural efficiency is calculated on the basis of the following particular indicators:

1) The share of expenditure for inpatient care in the expenditures for the territorial State Benefits Package (in per cents).

2) The portion of primary care — catchment area therapists, catchment area pediatricians, general practitioners in the total number of physicians (in per cents).

3) The ratio of the number of bed/days spent in day care hospitals to the number of bed/days of inpatient care (in per cents).

The first particular indicator V_1^i — the share of expenditure for inpatient care in the spending on the territorial State Benefits Package (in per cents) for *i*-territory is calculated by the following formula:

$$V_1^i = \frac{P_C}{P_B},$$

Where P_C — the actual public expenditure on inpatient care in roubles for *i*-territory per year,

P_B — total actual public expenditures on health care for *i*-territory per year,

are taken from бform No. 62 “Information about public health care services delivery and financing” approved by the ordinance of Rosstat No. 90 of 21.11.07 Table 2000, column 19.

The second particular indicator V_2^i — the portion of primary care — catchment area therapists, catchment area pediatricians, general practitioners in the total number of physicians (in per cents) for *i*-territory is calculated by the following formula:

$$V_2^i = \frac{D_P}{D_B},$$

Where D_P — the average per year number of primary care physicians (physical persons) for *i*-territory,

D_B — the average per year number of physicians of all specialties (physical persons) for *i*-territory,

are taken from form No. 30 “Information about health care facility” approved by the ordinance of Goscomstat of Russian of 10.09.2002, No 175, Table 3210.

The third particular indicator V_3^i — the ratio of the number of bed/days spent in the day care hospitals to the number of bed/days of inpatient care (in per cents) is calculated by the following formula:

$$V_3^i = \frac{D_D}{D_C},$$

Where D_D — the number of patient/days of care in the day care hospital environment of all types per one year for *i*-territory,

D_C — the number of bed/days of inpatient care per one year for *i*-territory,

are taken from form No. 62.

Values V_1^i, V_2^i and V_3^i are transformed into percentage format.

Particular indicators shall be calculated for all territories taking part in the comparison process.

9.3. The index of structural efficiency is a number in the range from 0 to 1. The contribution of each particular indicator to that figure is proportionate to the weight of particular indicator. Weights — numbers g_1, g_2 and g_3, are determined by experts per one per each particular indicator, they are measured by a ten-point scale.

1) The portion of costs for inpatient care in the expenditure on the territorial State Benefits Package (in per cent) has weight g_1, equal to 10.

2) The portion of primary care physicians — catchment area therapists, catchment area pediatricians, general practitioners in the total number of physicians (in per cents) has weight g_2, equal to 7.

3) The ratio of the number of bed/days spent in day care hospitals to the number of bed/days of inpatient care has weight g_3, equal to 4.

The first indicator characterizes the aggregate influence on the structural efficiency of a complex of factors — increase of the role and extension of primary health care functions, transfer of some part of inpatient care to the outpatient stage, development of day-care hospitals, formation of a multi-level system of health care delivery and etc. Its decrease to a maximum extent characterizes the systemic nature of measures undertaken to improve structural efficiency. That is why the significance of that indicator is taken the highest.

The second indicator reflects the level of development of primary health care. Cross-country and cross-territorial comparisons show that to a higher resource provision of primary care correspond higher indicators of public health, essentially lower volumes of inpatient care and much lower costs of health care. At the same time that indicator has some “synthetic” nature as compared to the first one, that is why it is given a somewhat lower value.

The third indicator characterizes the level of development of inpatient care replacing technologies able to reduce the burden of round-the-clock hospitals. But the place of these technologies in the general system of health service delivery is remarkably lower than of the primary care. So its significance is lower accordingly.

The contribution of indicators into the index of structural efficiency for the territory is the higher - the lower is the value of the first particular indicator, and the higher values the second and the third indicators have.

9.4. The *index of structural efficiency* S^i for *i*-territory is calculated by the following formula:

$$S^i = \frac{\sum_{k=1}^{3} r_k^i}{\sum_{k=1}^{3} g_k},$$

Where r_k^i — *evaluation of contribution of k*-particular indicator of *i*-territory to the integral indicator of structural efficiency. In the numerator the summing up is done for three particular indicators. In the denominator the values of g_k are summed up for all particular indicators as well, hence the denominator of the formula has the value of 10 + 7 + 4 = 21 for any territory.

The evaluation of contribution of particular indicator is carried out by the following algorithm:

1) Among all calculated values of the first particular indicator for all territories V_1^i there is the lowest value *a* and the highest value *b*:

$$a = \min_i(V_1^i) \text{ и } b = \max_i(V_1^i).$$

Then, similarly, the minimum and the maximum values are determined for the second and the third particular indicators.

2) The minimum value *a* and the maximum value *b* of each particular indicator determine the best and the worst values for all subjects, and all the values lie in the range of [*a*, *b*]. For municipal entities by the decision of the health authority, which controls the correctness of calculation of indicators in the subject of the Russian Federation and the correctness of comparison by the integral indicator of structural efficiency that range can be narrowed by replacing one or both limits of the range by the expert values a_e and b_e.[17]

3) Evaluation of contribution r_1^i of the indicator:

[17] Such replacement makes sense in order not to differentiate between all those values that drop out from the range of $[a_e, b_e]$. For example, if in some municipal entity there is not any day care hospital bed, then it can be taken that a_e for the third elementary indicator has the value of the lowest limit without taking into account that municipal entity, and for that municipal entity the value of the third elementary indicator is equal to a_e, and not to zero. Such narrowing of the range is done in order to avoid that the falling out values of the indicator affect the algorithm sensitivity.

- The share of costs for inpatient care in the expenditures on the territorial State Benefits Package (in per cent)

with the value v_1^i for *i*-territory is calculated by the following formula:

$$r_1^i = \frac{b - V_1^i}{b - a} \cdot g_1,$$

And the evaluation of following indicators contribution:

- The portion of primary care physicians — catchment area therapists, catchment area pediatricians, general practitioners in the total number of physicians (in per cent).
- The ratio of the number of bed/days spent in day care hospitals to the number of bed/days of inpatient care (in per cent).

— by the formula:

$$r_k^i = \frac{V_k^i - a}{b - a} \cdot g_k.$$

Where $k = 2, 3$ for the listed indicators respectively. For each indicator its maximum and minimum values are used.

9.5. Calculated by the given algorithm index of structural efficiency S^i for *i*-territory is the higher - the higher is the efficiency of use of resources on that territory. At the same time, estimates of contributions of each particular indicator, ranked by the territories, show for what reason (because of which particular indicator) every territory gets or loses fractions of points of the index of structural efficiency.

Annex 1. Glossary

Probability of dying in different age groups — a share of deaths in every age group (age range) out of the number of person-years lived up to the beginning of each respective age range. The indicator of the probability of dying is a measure of death rate at a given age and is calculated by a special formula with the use of the value of age-specific mortality rate.

Disability weight at age x — a quantitative value of severity of different health disturbances, the estimates of which for different diseases were first obtained within the framework of the WHO project on assessing the global burden of diseases on the basis of using special surveys of people that suffer from certain diseases and with the consequent processing of the results of these surveys by means of the theory of utility techniques. Severity of diseases is calculated in such a way that the weight takes the value in the range of [0,1], and a to more severe diseases corresponds a higher weight.

Age-specific mortality rate (ASMR) — a ratio of the absolute number of deceased at the given age per year to the average per year strength of population of that age. ASMR characterizes average mortality rate in every age group. The age and gender mortality rates are determined similarly to ASMR but individually for each sex. Age -specific mortality rates are determined individually by causes of death for every cause of death.

Global burden of diseases (GBD) — a concept suggested for quantitative analysis of public health taking into account, besides the premature deaths, but also wit taking into consideration morbidity and other health conditions. That concept made the basis for the project of "Studying the global burden of diseases" implemented under the aegis of the WHO. The project objective was to expose public health lost in different countries of the world and to recommend priority lines of development for health care programs in these countries. To make a quantitative assessment of health lost in the population under study within the framework of the GBD concept the indicator is used of the disability adjusted life years and the indicator of life years lost due to premature mortality.

Life expectancy at birth (average life expectancy) — a number of years expected for a person to live on the average from the born generation provided that throughout the life period of that generation the mortality rate at each age remains the same as at a given (current) period. Life expectancy is a generalizing characteristic of the level of mortality in different age groups and shall be calculated in full life tables, in which one year age groups are presented or in short life tables in which age groups are presented by broader age ranges, five-years, as a rule.

Life expectancy at different ages – a number of years expected to live for a person that have lived up to a certain age in the life tables provided that throughout

the remaining years of life for that age the mortality rate remains to be the same as at a given (current) period.

Responsiveness of health care system — a concept reflecting people's idea of how the system of health care should treat patients in the process of delivery of health care services. The concept of responsiveness characterizes non-medical aspects of functioning of a health care system and focuses on the conditions under which health care services are delivered.

Disability adjusted life years (DALY) — the indicator that is calculated for all age groups as the sum of life years lost due to mortality and life years lost due to prevalence and disability (diseases, groups and classes of diseases).

Disability adjusted life expectancy (DALE) — the indicator similar to the indicator of life expectancy, which is calculated with taking into consideration the life years lost due to prevalence and disability (diseases, groups and classes of diseases).

Life years lost due to disability — generalization of the life table by integrating in its indicators the prevalence and comorbidity (mutual effect) of these conditions.

Potential years of life lost (PYLL) — the indicator expressing the degree of influence of premature mortality on the population. PYLL is calculated as the sum of differences in years between the value of "the standard or the highest life expectancy observed for any nation" and the actual age of death of all persons deceased during a year. PYLL can take into account mortality of both: all causes and individual causes of death.

Prevalence rate — the major intermediate indicator for calculating the DALE indicator model, which by special formulas takes into account besides the prevalence of individual diseases their possible joint effect on health deterioration of patients by groups and classes of diseases.

Life tables (LT)) — ordered series of interrelated quantities, which show the decrease with the years of totality of the bourn due to death. In the LT such indicators are calculated as life expectancy at birth, life expectancy at different ages, probability of living up to age *x*, probability of dying in different age groups, and etc.

Fairness of financial contribution on health care — a concept that reflects public requirements to shared responsibility of people to ensure protection against financial risks connected with the emergence of necessity to get health care. To achieve fairness in the financial contribution on health care is understood here as to distribute health care expenditure (payment for health services and purchasing of drugs) in the population taking into account the actual ability to incur these expenses.

Structural efficiency of a health care system — a correlation between different kinds of health care, which determine the final outcome of utilizing the sector resources

Number of person-years lived up to different ages — an indicator of the life tables, which characterize the number of persons that have lived up to a given age out of the initial totality of the bourn.

The total number of person-years lived in different age groups – indicator of life tables equal to an average out of the number of person-years lived to ages of the given age range, as a rule, multiplied by the length of that range. The ***total number of person-years lived by age x*** is a sum of numbers of person-years lived in all age ranges after and including the range in question.

Annex 2. Tables for Calculating DALE Indicator

Table A1.

Categories of diseases and traumas planned to be used in evaluating DALE indicators for the subjects of RF and municipal entities

Code of conventional category		Names of disease or group of diseases				ICD -10 Code
U000		All diseases				
U001	I.	Communicable, maternal, perinatal and nutritional conditions				A00-B99, G00-G04, N70-N73, J00-J06, J10-J18, J20-J22, H65-H66, O00-O99, P00-P96, E00-E02, E40-E46, E50, D50-D64
U002		A.	Infectious and parasitic diseases			A00-B99, G00, N70-N73
U003			1	Tuberculosis		A15-A19, B90
U004			2	Sexually transmitted diseases, excluding HIV		A50-A64, N70-N73
U005				a.	Syphilis	A50-A53
U006				b.	Chlamydia	A55-A56
U007				c.	Gonorrhoea	A54
U008					Other STDs	A57-A64, N70-N73
U009			3	HIV/AIDS		B20-B24
U010			4	Diarrheal diseases		A00, A01,A03, A04, A06-A09
U011			5	Childhood-cluster diseases		A33-37, A80, B05, B91
U012				a.	Pertussis	A37
U013				b.	Poliomyelitis	A80,B91
U014				c.	Diphtheria	A36
U015				d.	Measles	B05
U016				e.	Tetanus	A33-A35
U017			6	Meningitis		A39, G00, G03
U018			7	Hepatitis B		B16-B19
U019				Hepatitis C		
U020			8	Malaria		B50-B54
U021			9	Tropical-cluster diseases		B55-B57, B65, B73, B74.0-B74.2
U022				a.	Trypanosomiasis	B56
U023				b.	Chagas disease	B57
U024				c.	Schistosomiasis	B65
U025				d.	Leishmaniasis	B55
U026				e.	Lymphatic filariasis	B74.0-B74.2
U027				f.	Onchoceriasis	B73

Code of conventional category		Names of disease or group of diseases				ICD -10 Code
U028			10	Leprosy		A30
U029			11	Dengue		A90-A91
U030			12	Japanese encephalitis		A83.0
U031			13	Trachoma		A71
U032			14	Intestinal nematode infections		B76-B81
U033				a.	Ascariasis	B77
U034				b.	Trichuriasis	B79
U035				c.	Hookworm diseases	B76
U036					Other intestinal infections	B78, B80,B81
U037				Other infectious diseases		A02,A05,A20-A28,A31,A32,A38,A40-A49,A65-A70,A74-A79,A81,A82,A83.1-A83.9,A84-A89,A92-A99,B00-B04,B06-B15,B25-B49,B58-B60,B64,B66-B72,B74.3-B74.9,B75,B82-B89,B92-B99, G04
U038		B.	Respiratory infections			J00-J06, J10-J18, J20-J22, H65-H66
U039			1	Lower respiratory infections		J10-J18, J20-J22
U040			2	Upper respiratory infections		J00-J06
U041			3	Otitis media		H65-H66
U042		C.	Maternal conditions			O00-O99
U043			1	Maternal haemorrhage		O44-O46, O67, O72
U044			2	Maternal sepsis		O85-O86
U045			3	Hypertensive disorders		O10-O16
U046			4	Obstructed labour		O64-O66
U047			5	Abortion		O00-O08
U048				Other maternal conditions		O20-O43,O47-O63,O68-O71,O73-O84,O87-O99
U049		D.	Perinatal conditions			P00-P96
U050			1	Low birth weight		P05-P07
U051			2	Birth asphyxia and birth trauma		P03, P10-P15, P20-P29
U052				Other perinatal conditions		P00-P02, P04, P08, P35-P96
U053		E.	Nutritional deficiencies			E00-E02, E40-E46, E50, D50-D64
U054			1	Protein-energy malnutrition		E40-E46
U055			2	Iodine deficiency		E00-E02
U056			3	Vitamin A deficiency		E50
U057			4	Iron-deficiency anemia		D50-D64
U058				Other nutritional disorders		E51-E64
U059	II.	Noncommunicable diseases				C00-C97, D00-D48, D65-D89, E03-E07, E10-E16, E20-E34, E51-E89, F01-F99, G06-G99, H00-H61, H68-H95, I00-I99, J30-J99, K00-K92, N00-N64, N75-N99, L00-L99, M00-M99, Q00-Q99
U060		A.	Malignant neoplasms			C00-C97
U061			1	Mouth and oropharynx cancers		C00-C14
U062			2	Oesophagus cancer		C15
U063			3	Stomach cancer		C16
U064			4	Colon and rectum cancer		C18-C21
U065			5	Liver cancer		C22

Code of conventional category		Names of disease or group of diseases				ICD -10 Code
U066			6	Pancreas cancer		C25
U067			7	Trachea, bronchus, lungs cancer		C33-C34
U068			8	Melanoma and other skin cancers		C43-C44
U069			9	Breast cancer		C50
U070			10	Рак шейки мCervix uteri cancer		C53
U071			11	Corpus uteri cancer		C54-C55
U072			12	Ovary cancer		C56
U073			13	Prostate cancer		C61
U074			14	Bladder cancer		C67
U075			15	Lymphomas and multiple myeloma		C81-C90, C96
U076			16	Leukaemia		C91-C95
U077				Other malignant neoplasms		C17,C23,C24,C26-C32,C37-C41,C45-C49,C51,C52,C57-C60,C62-C66,C68-C80,C97
U078		B.	Other neoplasms			D00-D48
U079		C.	Diabetes mellitus			E10-E14
U080		D.	Endocrine disorders			D65-D89, E03-E07, E15-E16, E20-E34, E51-E89
U081		E.	Neuropsychiatric conditions			F01-F99, G06-G99
U082			1	Unipolar depressive disorders		F32-F33
U083			2	Bipolar disorders		F30-F31
U084			3	Schizophrenia		F20-F29
U085			4	Epilepsy		G40-G41
U086			5	Alcohol use disorders		F10
U087			6	Alzheimer and other dementias		F01, F03, G30-G31
U088			7	Parkinson disease		G20-G21
U089			8	Multiple sclerosis		G35
U090			9	Drug use disorders		F11-F16, F18-F19
U091			10	Post-traumatic stress disorders		F43
U092			11	Obsessive-compulsive disorder		F42
U093			12	Panic disorder		F40.0, F41.0
U094			13	Insomnia (primary)		F51
U095			14	Migraine		G43
U096			15	Mental retardation, lead-caused		F70-F73
U097				Other neuropsychiatric disorders		F04-F09,F17,F34-F39,F401-F409,F411-F419,F44-F50, F52-F69, F74-F99,G06-G011,G12,G23-G25,G36,G37,G44-G99
U098		F.	Sense organ diseases			H00-H61, H68-H95
U099			1	Glaucoma		H40
U100			2	Cataracts		H25-H26
U101			3	Vision disorders, age-related		
U102			4	Hearing loss, adult onset		
U103				Other sense organ disorders		H00-H21,H27-H35, H43-H61,H68-H95
U104		G.	Cardiovascular diseases			I00-I99
U105			1	Rheumatic heart disease		I01-I09
U106			2	Hypertensive heart disease		I10-I15

Code of conventional category		Names of disease or group of diseases				ICD -10 Code
U107			3	Ischaemic health disease		I20-I25
U108			4	Cerebrovascular diseases		I60-I69
U109			5	Inflammatory heart disease		I30-I33, I38, I40, I42
U110				Other cardiovascular diseases		I00, I26-I28, I34-I37, I44-I51, I70-I99
U111		H.	Respiratory diseases			J30-J99
U112			1	Chronic obstructive pulmonary disease		J40-J44
U113			2	Asthma		J45-J46
U114				Other respiratory diseases		J30-J39,J47-J99
U115		I.	Digestive diseases			K20-K92
U116			1	Peptic ulcer disease		K25-K27
U117			2	Cirrhosis of the liver		K70, K74
U118			3	Appendicitis		K35-K37
U119				Other digestive diseases		K20-K22,K28-K31,K38,K40-K66,K71-K73,K75-K92
U120		J.	Genitourinary diseases			N00-N64, N75-N99
U121			1	Nephritis and nephrosis		N00-N19
U122			2	Benign prostatic hypertrophy		N40
U123				Other genitourinary system diseases		N20-N39, N41-N64, N75-N99
U124		K.	Skin diseases			L00-L99
U125		L.	Musculoskeletal diseases			M00-M99
U126			1	Rheumatoid arthritis		M05-M06
U127			2	Osteoarthritis		M15-M19
U128			3	Goat		
U129			4	Low back pain		
U130				Other musculoskeletal disorders		M00-M02, M08-M13, M20-M99
U131		M.	Congenital anomalies			Q00-Q99
U132			1	Abdominal wall defect		Q79.2-Q79.5
U133			2	Anencephaly		Q00
U134			3	Anorectal atresia		Q42
U135			4	Cleft lip		Q36
U136			5	Cleft palate		Q35, Q37
U137			6	Oesophageal atresia		Q39.0-Q39.1
U138			7	Renal agenesis		Q60
U139			8	Down syndrome		Q90
U140			9	Congenital heart anomalies		Q20-Q28
U141			10	Spina bifida		Q05
U142				Other congenital anomalies		Q01-Q04, Q06-Q18, Q30-Q34, Q38, Q392-Q399, Q40-Q41, Q43-Q56, Q61-Q78, Q790, Q791, Q796, Q798, Q799, Q80-Q89, Q91-Q99
U143		N.	Oral conditions			K00-K14
U144			1	Dental caries		K02
U145			2	Periodontal disease		K05
U146			3	Edentulism		-
U147				Other oral diseases		K00, K01,K03,K04,K06-K14
U148	III.	Traumas				S01-T99

Code of conventional category		Names of disease or group of diseases				ICD -10 Code
U271			Internal injuries			
U272				Fracture of skull and facial bones		S02
U273				Fracture of neck, chest or pelvis bones		S12,S22, S32,T08
U274				Thigh bone fracture		S72
U275				Fracture of other extremity bones		S42,S52,S62,S82, S92,T10, T12
U276				Fractures capturing several body areas		T02
U277				Dislocations, strains and deformations of specified and multiple regions		S03,S13, S23,S33,S43,S53, S63,S73, S83,S93, T03
U278				Eye and eye socket injury		S05
U279				Intracranial trauma		S06
U280				Other internal injuries		S26-S27, S36-S37
U281				Smashing (crushing) and traumatic amputations of specified and multiple regions		S07-S08, S17-S18,S28,S38, S47-S48, S57-S58, S67-S68, S77-S78, S87-S88, S97-S98, T04-T05
U282				Other injuries of specified, unspecified and multiple regions		S00-S01, S04,S09-S11, S14-S16, S19-S21, S24-S25, S29-S31, S34-S35, S39-S41, S44-S46, S49-S51, S54-S56, S59-S61, S64-S66, S69-S71, S74-S76, S79-S81, S84-S86, S89-S91, S94-S96, S99, T00-T01, T06-T07, T09,T11, T13-T14
U283			Results of foreign object intervention through natural openings			T15-T19
U284			Thermal and chemical burns (corrosions)			T20-T32
U285			Poisoning			U286-U287
U286				Drugs and biological substance-induced poisonings		T36-T50
U287				Toxic effect of non-medical substances		T51-T65
U288			Brutal treatment syndrome			T74
U289			Other and unspecified effects of external causes			T33-T35,T66-T73, T75-T78
U290			Complications and results of injuries			U291-U292
U291				Early after injury complications and surgery-induced complications not classified under other headings		T79-T88
U292				Aftereffects of injuries, poisonings and other external causes		T90-T98
U306	IV	Other causes				
U307			Symptoms, signs and ill-defined conditions			R00 -R99

Code of conventional category		Names of disease or group of diseases				ICD -10 Code
U308				Stomach and pelvis pains		R10
U309				Cryptogenous fever		R50
U310				Senility		R54
U311				Other symptoms, signs and abnormalities		R00-R09, R11-R49, R51-R53,R55-R99
U312			Ill-defined cardiovascular diseases			I46, I47.2, I49.0, I50, I51.4–I51.6, I51.9, I70.9,

Table A2[18]

Disability weights

Code of conventional category	Names of diseases or groups of diseases			Disability weights	
				Men	Women
U003	1	Tuberculosis		0.295	0.295
U005		a.	Syphilis	0.017	0.017
U006		b.	Chlamydia	0.067	0.304
U007		c.	Gonorrhea	0.067	0.306
U008			Other STD	0.067	0.067
U009	3	HIV/AIDS		0.375	0.375
U010	4	Diarrheal diseases		0.058	0.058
U012		a.	Pertussis	0.164	0.164
U013		b.	Poliomyelitis	0.369	0.369
U014		c.	Diphtheria	0	0
U015		d.	Measles	0.152	0.152
U016		e.	Tetanus	0.612	0.612
U017	6	Meningitis		0.554	0.554
U018	7	Hepatitis B		0.328	0.328
U019		Hepatitis C		0.328	0.328
U020	8	Malaria		0.18	0.18
U022		a.	Trypanosomiasis	0.350	0.350
U023		b.	Chagas dosease	0.186	0.186
U024		c.	Schistosomiasis	0.006	0.006
U025		d.	Leishmaniasis	0.03	0.03
U026		e.	Lymphatic filariasis	0.113	0.113
U027		f.	Onchocerciasis	0.15	0.15
U028	10	Leprosy		0.153	0.153
U029	11	Dengue		0.037	0.037
U030	12	Japanese encephalitis		0.427	0.427
U031	13	Trachoma		0.35	0.35
U033		a.	Ascariasis	0.006	0.006
U034		b.	Trichuriasis	0.006	0.006
U035		c.	Hookworm disease	0.024	0.024
U036			Other intestinal infections	0.024	0.024
U039	1	Lower respiratory infections		0.373	0.373
U040	2	Upper respiratory infections		0.019	0.019

[18] Published weight values are used of the rates, which determine a relative severity of different health disorders, calculated within the framework of the WHO project on the assessment of the global burden of diseases in Australia.

Code of conventional category	Names of diseases or groups of diseases			Disability weights	
				Men	Women
U041	3	Otitis media		0.233	0.233
U043	1	Maternal haemorrhage			0.04
U044	2	Maternal sepsis			0.494
U045	3	Hypertensive disorders			0.16
U046	4	Obstructed labour			0.349
U047	5	Abortions			0.18
U050	1	Low birth weight		0.263	0.263
U051	2	Birth asphyxia and birth trauma		0.275	0.275
U052		Other perinatal conditions		0.275	0.275
U054	1	Protein-energy malnutrition		0.002	0.002
U055	2	Iodine deficiency		0.006	0.006
U056	3	Vitamin A deficiency		0.006	0.006
U057	4	Iron-deficiency anemia		0.04	0.04
U058		Other nutritional disorders		0.04	0.04
U061	1	Mouth and oropharynx cancers		0.398	0.398
U062	2	Oesophagus cancer		0.606	0.606
U063	3	Stomach cancer		0.515	0.515
U064	4	Colon and rectum cancer		0.387	0.387
U065	5	Liver cancer		0.39	0.39
U066	6	Pancreas cancer		0.566	0.566
U067	7	Trachea, bronchus, lungs cancer		0.881	0.881
U068	8	Melanoma and other skin cancers		0.211	0.211
U069	9	Breast cancer		0.348	0.328
U070	10	Cervix uteri cancer			0.237
U071	11	Corpus uteri cancer			0.231
U072	12	Ovary cancer			0.316
U073	13	Prostate cancer		0.221	
U074	14	Bladder cancer		0.204	0.204
U075	15	Lymphomas, multiple myeloma		0.251	0.251
U076	16	Leukaemia		0.343	0.343
U077		Other malignant neoplasms		0.3	0.3
U078	Other neoplasms			0.211	0.211
U079	Diabetes mellitus			0.067	0.067
U080	Endocrine disorders			0.067	0.067
U082	1	Unipolar depressive disorders		0.496	0.496
U083	2	Bipolar disorders		0.513	0.513
U084	3	Schizophrenia		0.414	0.414
U085	4	Epilepsy		0.082	0.082
U086	5	Alcohol use disorders		0.180	0.180
U087	6	Alzheimer and other dementias		0.667	0.667
U088	7	Parkinson disease		0.346	0.346
U089	8	Multiple sclerosis		0.437	0.437
U090	9	Drug use disorders		0.250	0.250

Code of conventional category	Names of diseases or groups of diseases			Disability weights	
				Men	Women
U091	10	Post-traumatic stress disorders		0.108	0.108
U092	11	Obsessive-compulsive disorders		0.129	0.129
U093	12	Panic disorder		0.152	0.152
U094	13	Insomnia (primary)		0.04	0.04
U095	14	Migraine		0.04	0.04
U096	15	Mental retardation (lead-caused)		0.04	0.04
U097		Other neuropsychiatric disorders		0.04	0.04
U099	1	Glaucoma		0.600	0.600
U100	2	Cataracts		0.511	0.511
U101	3	Vision disorders, age-related		0.01	0.01
U102	4	Hearing loss, adult onset		0.01	0.01
U103		Other sense organ disorders		0.01	0.01
U105	1	Rheumatic heart disease		0.186	0.186
U106	2	Hypertensive heart disease		0.186	0.186
U107	3	Ischaemic heart disease		0.186	0.186
U108	4	Cerebrovascular disease		0.263	0.263
U109	5	Inflammatory heart disease		0.186	0.186
U110		Other cardiovascular diseases		0.186	0.186
U112	1	Chronic obstructive pulmonary disease		0.392	0.392
U113	2	Asthma		0.061	0.061
U114		Other respiratory diseases		0.2	0.2
U116	1	Peptic ulcer disease		0.014	0.014
U117	2	Cirrhosis of the liver		0.330	0.330
U118	3	Appendicitis		0.463	0.463
U119		Other digestive diseases		0.1	0.1
U121	1	Nephritis and nephrosis		0.097	0.097
U122	2	Benign prostatic hypertrophy		0.038	0.038
U123		Other genitourinary system diseases		0.014	0.014
U124	Skin diseases			0.014	0.014
U126	1	Rheumatoid arthritis		0.185	0.185
U127	2	Osteoarthritis		0.118	0.118
U128	3	Gout		0.118	0.118
U129	4	Low back pain		0.118	0.118
U130		Other musculoskeletal disorders		0.118	0.118
U132	1	Congenital anomalies wall defect		0.85	0.85
U133	2	Anencephaly		0.85	0.85
U134	3	Congenital anorectal atresia		0.845	0.845
U135	4	Cleft lip		0.05	0.05
U136	5	Cleft palate		0.1	0.1
U137	6	Oesophageal atresia		0.576	0.576
U138	7	Renal agenesis		0.85	0.85
U139	8	Down syndrome		0.593	0.593
U140	9	Congenital heart anomalies		0.323	0.323

Code of conventional category	Names of diseases or groups of diseases			Disability weights	
				Men	Women
U141	10	Spina bifida		0.520	0.520
U142		Other congenital anomalies		0.323	0.323
U144	1	Dental caries		0.081	0.081
U145	2	Periodontal disease		0.001	0.001
U146	3	Edentulism		0.007	0.007
U147		Other oral diseases			
U272		Fracture of skull and facial bones		0.359	0.359
U273		Fracture of neck, chest or pelvis bones		0.199	0.199
U274		Thigh bone fracture		0.322	0.322
U275		Fracture of other extremity bones		0.199	0.199
U276		Fractures capturing several body areas		0.199	0.199
U277		Dislocations, strains and deformations of specified and multiple regions		0.074	0.074
U278		Eye and eye socket injury		0.310	0.310
U279		Intracranial trauma		0.359	0.359
U280		Other internal injuries		0.188	0.188
U281		Smashing (crushing) and traumatic amputations of specified and multiple regions		0.218	0.218
U282		Other injuries of specified, unspecified and multiple regions		0.067	0.067
U283	Results of foreign object intervention through natural openings			0.2	0.2
U284	Thermal and chemical burns (corrosions)			0.3	0.3
U286		Drugs and biological substance-induced poisonings		0.255	0.255
U287		Toxic effect of non-medical substances		0.255	0.255
U288	Brutal treatment syndrome			0.1	0.1
U289	Other and unspecified effects of external causes			0.1	0.1
U291		Early after injury complications and surgery-induced complications not classified under other headings		0.1	0.1
U292		Aftereffects of injuries, poisonings and other external causes		0.1	0.1
U308		Stomach and pelvis pains		0.1	0.1
U309		Cryptogenous fever		0.1	0.1
U310		Senility		0.1	0.1
U311		Other symptoms, signs and abnormalities		0.1	0.1
U312	Ill-defined cardiovascular diseases			0.2	0.2

Table A3.

Groups of diseases to calculate co-morbidity

Conventional code of category		Names of diseases of groups of diseases			Disease categories for co-morbidity
U000		All diseases			U001+U059+U148+U306
U001	I.	Communicable, maternal, perinatal and nutritional conditions			U002+U038+U042+U049+U053
U002		A.	Infectious and parasitic diseases		U003+U004+U009+U010+U011+U017+U018 +U019+U020+U021+U028+U029+U030+U031 +U032+U037
U004			2	Sexually transmitted diseases excluding HIV	U005+U006+U007+U008
U011			5	Childhood-cluster diseases	U012+U013+U014+U015+U016
U021			9	Tropical-cluster diseases	U022+U023+U024+U025+U026+U027
U032			14	Intestinal nematode infections	U033+U034+U035+U036
U038		B.	Respiratory infections		U039+U040+U041
U042		C.	Maternal conditions		U043+U044+U045+U046+U047+U048
U049		D.	Perinatal conditions		U050+U051+U052
U053		E.	Nutritional deficiency		U054+U055+U056+U057+U058
U059	II.	Non-communicable diseases			U060+U078+U079+U080+U081+U098 +U104+U111+U115+U120+U124+U125+ U131+U143
U060		A.	Malignant neoplasms		U061+U062+U063+U064+U065+U066 +U067+U068+U069+U070+U071+U072 +U073+U074+U075+U076+U077
U081		E.	Neuropsychiatric conditions		U082+U083+U084+U085+U086+U087+U088 +U089+U090+U091+U092+U093+U094+U095 +U096+U097
U098		F.	Sense organ diseases		U099+U100+U101+U102+U103
U104		G.	Cardiovascular diseases		U105+U106+U107+U108+U109+U110
U111		H.	Respiratory diseases		U112+U113+U114
U115		I.	Digestive diseases		U116+U117+U118+U119
U120		J.	Genitourinary system diseases		U121+U122+U123
U125		L.	Musculoskeletal diseases		U126+U127+U128+U129+U130
U131		M.	Congenital anomalies		U132+U133+U134+U135+U136+U137+U138 +U139+U140+U141+U142
U143		N.	Oral conditions		U144+U145+U146+U147
U148	III.	Injuries			U271+U283+U284+U285+U290
U271			Internal injuries		U272+U273+U274+U275+U276+U277 +U278+U279+U280+U281+U282
U285			Poisonings		U286+U287

Conventional code of category		Names of diseases of groups of diseases			Disease categories for co-morbidity
U290			Complications and results of injuries		U291+U292
U306		Other causes			U307+ U312+U313
U307			Signs, symptoms and ill-defined conditions		U308+U309+U310+U311

Table *A4.*

Illustration to calculate DALE indicator

Regular life table				Addendum to calculate disability adjusted life expectancy		
	Person-years lived up to l_x	Person-years lived ${}_5L_x$	Life expectancy e_x	Disability prevalence rate (in %) $RYLD_x$	Age	Disability adjusted life expectancy $DALE_x$
0	100000	496210	74.98	4.5	474080	58.38
5	99134	495425	70.63	9.6	447919	54.11
10	99045	495018	65.69	8.6	452450	49.64
15	98940	493916	60.76	5.7	465816	45.12
20	98572	491448	55.98	7.6	454015	40.56
25	97997	488469	51.29	8.5	446846	36.17
30	97383	485285	46.60	10.6	434005	31.81
35	96722	481816	41.90	12.2	422803	27.54
40	95988	477781	37.20	14.3	409534	23.34
45	95079	472220	32.53	17.9	387713	19.26
50	93701	463324	27.97	23.5	354558	15.40
55	91452	448652	23.59	30.9	309872	11.90
60	87702	424469	19.48	41.6	247731	8.88
65	81656	386806	15.73	44.0	216541	6.50
70	72512	332217	12.38	58.3	138691	4.34
75	59796	259645	9.45	59.6	104931	2.94
80	43550	173081	7.02	73.2	46409	1.63
85	25802	132424	5.13	81.5	24508	0.95

Notes: The first four columns are taken from a standard (regular) life table.

l_x – number of person-years lived up to age x in a hypothetic cohort of life table.

${}_5L_x$ – number of person-years lived in a hypothetic cohort of life table between ages x and x + 5.

$RYLD_x$ – disability prevalence rate between ages x and x + 5.

Number of person-years lived without disability $YWD_x = L_x \cdot (1 - RYLD_x)$

$DALE_x$ = number of person-years lived without disability at the ages over x, divided by l_x