

## Artículo de investigación

**The impact of changes in labor relations on mortality rates in Russia****Влияние трансформации социально-трудовых отношений на уровень смертности в России**

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Written by:  
**Legchilina Elena Yurevna<sup>10</sup>****Abstract**

**Purpose.** The purpose of the study is to assess the indicators characterizing a comprehensive change in social and labor relations in Russia for the period 1992-2016 and the subsequent change in the indicators of total mortality and mortality of the working-age population.

**Methodology/approach.** Economic analysis and grouping of empirical data, construction of dynamic series and their visualization were performed. The research period is the entire post-Soviet stage of social and labor relations development, i.e. from 1992 up to the present.

**Results.** 1) the complex impact of the change in the state of social and labor relations on the population mortality rates and on the development of existing proven dependencies was estimated; 2) previously identified deferred impact of the income factor on the working age population mortality rate was confirmed; a similar influence of the labor conditions factor was revealed; 3) the influence of the working day's duration factor was observed; 4) the coincidence of the changes trends in the population death rate with the stages of social and labor relations transformation was confirmed: proto-transformation, partial transformation and complete transformation.

**Conclusions.** Practitioners can use these results in developing directions to reduce mortality and improve working life quality; researchers can use these results as a basic hypothesis for determining the degree of mortality rates dependence on social and labor relations indicators.

**Keywords:** Population mortality; working age; mortality factors; social and labor relations; transformation of social and labor relations

**JEL:** J11; J53.

**Аннотация**

Цель. Целью исследования является оценка показателей, характеризующих комплексное изменение социально-трудовых отношений в России за период 1992-2016 гг. И последующее изменение показателей общей смертности и смертности населения трудоспособного возраста.

Методология / подход. Проведен экономический анализ и группировка эмпирических данных, построение динамических рядов и их визуализация. Период исследования - это весь постсоветский этап развития социально-трудовых отношений, то есть с 1992 года по настоящее время.

Результаты. 1) оценивается комплексное влияние изменения состояния социально-трудовых отношений на уровень смертности населения и развитие существующих доказанных зависимостей; 2) подтверждено ранее выявленное отсроченное влияние фактора дохода на уровень смертности населения трудоспособного возраста; выявлено аналогичное влияние фактора условий труда; 3) наблюдалось влияние фактора продолжительности рабочего дня; 4) подтверждено совпадение тенденций изменения смертности населения с этапами трансформации социально-трудовых отношений: прототрансформация, частичная трансформация и полная трансформация.

Выводы. Практики могут использовать эти результаты при разработке направлений для снижения смертности и улучшения качества трудовой жизни; Исследователи могут использовать эти результаты в качестве основной гипотезы для определения степени зависимости уровня смертности от показателей социальных и трудовых отношений.

**Ключевые слова:** смертность населения; трудоспособный возраст; факторы смертности; социально-трудовые отношения; трансформация социально-трудов

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## Introduction

The mortality of the population, especially its employable part, is one of the indicators of the labor resources formation. According to the World Health Organization (WHO), the global death rate for the entire population was 7.8 ‰ (78 deaths per 1000 inhabitants of the planet) in 2015. Adult population (15-60 years) expected death rate in the same year was 149 people (or 14.9 ‰) (Global, 2015). At the same time, in 68 countries it exceeded the world average rate and 16 countries<sup>11</sup> of these it exceeded it more than twice. In the Russian Federation, the death probability among adult was 222 people per 1000 inhabitants in 2015.

The problems of high mortality among Russians, especially at working age, continue to remain acute, despite the declining trend developed after 2006. The maximum value of this coefficient is 8.3 deaths per 1000 people of working age recorded in 2005 (Demographic, 2015). In 2013, the mortality of this age group decreased up to 5.6 ‰, and their part in the total number of deaths was 25.6% (Demographic, 2015). In 2015, these indicators decreased, respectively to 5.48 ‰ (death rate) and 23.5% (rate deceased) (Natural, 2015).

In the opinion of demographers, the high mortality rate of the working-age population is fraught with demographic and economic threats. The demographer L.A. Tskhay (2014) notices that from the economic point of view, the premature mortality consequences may affect the gross domestic product "deficiency"; and the demographic investments related to the alimony, upbringing and education of children and young people, can significantly reduce labor input because of early decease. In this regard, the study of indicators characterizing population mortality and the associated factors continue to be in the focus of scientists and practitioners attention.

In the economic literature all factors are commonly divided into two groups in terms of the mortality demographic analysis. They are endogenous ones generated by the internal development of the human body and exogenous ones associated with the environment influence. The first group of factors include person's biological factors (age and sex), heredity pattern (i.e., a person's genetic code). It is common to refer environmental conditions

where a biological organism lives to exogenous factors. The manifestation of exogenous factors is natural disasters, epidemics, wars, domestic and industrial injuries, and others.

For the first time, the accumulated, cumulative effect of exogenous factors was suggested to be used in the analysis of death rates by the Russian demographer E. Andreev (2016); he also introduced the concept of quasi-exogenous mortality that occurs consequently and under the influence of environmental and social factors (standard of living, quality of working life, etc.). The quality of working life is considered as the main indicator of social and labor relations undergoing recently a significant transformation under the influence of objective factors of economic development worldwide. Modern Russian and world economy development tendencies are aimed at the formation of an information society (knowledge economy) based on labor-saving, resource-saving and intellectual-intensive technologies and they will accordingly lead to the replacement of heavy physical labor by intellectual labor. In this connection, the system of social and labor relations undergoes some transformations. If earlier social and labor relations were determined by the regulation and unification of the main parameters (workplace, work time, labor contract, wage guarantee), then in modern dynamic market conditions the forms of social and labor relations become more diverse due to the wide spread of their flexible and mobile models. Thus, according to E.G. Kalabina (2004), one can observe the flexibilization and de-standardization of social and labor relations.

On the one hand, the transformation processes should positively affect the demographic situation since they are aimed at the life quality improvement. However, on the other hand, these processes often negatively affect the moral and psychological state of workers, increase social tension and lead to rise in morbidity and mortality.

Sufficiently low mortality of the population (not only in employable age), observed in Russia in the 50-90's of the 20th century is customary associated with the development of the healthcare system, the introduction of new medical technologies, the increased availability

<sup>11</sup> Angola (335 per 1000 population), Côte d'Ivoire (397), Camerun (357), Central African Republic (397), Chad (356), Equatorial Guinea (320), Lesotho (484), Malawi (365), Mozambique (355), Nigeria (344), Sierra Leone (413), Somali (313), South Africa (328), South Sudan (332), Zambia (303), Zimbabwe (336)

of medicines for the population, and the healthy way of life promoted in a socialist society (Ulumbekova, 2010). However, the achieved level of social and labor relations was not an unimportant factor in reducing mortality at that time, and first of all, it became apparent in the production safety, worthy and guaranteed earnings of working people and social development of work collectives. With the collapse of the Soviet Union and the transformation of the economic system in Russia, some significant demographic changes took place, which led to an excess of mortality over birthrate. Negative natural population growth in Russia persisted for 20 consecutive years until 2012. And only, beginning in 2013, the natural increase in the population of Russia became positive.

### Literature Review

A large number of works by domestic and foreign authors have been devoted to the study of the overall mortality problems, categories of mortality and factors affecting its volumes. The dependence of life expectancy and various death rates on individual indicators characterizing various aspects of social and labor relations is investigated and proved in their studies. All this confirms the continuing concern and urgency of the abovementioned issues.

The analysis of domestic and foreign studies makes it possible to differentiate them in different directions, both in the studied mortality indicators and in the factors of cause-effect dependence. At the same time, all research in this direction can be combined into two large groups:

- 1) Studies relating to the investigation of mortality in general and in the main categories, on the one hand, and the exogenous factors determining them, on the other; the focus of such studies is to research the mortality structure in order to develop a managerial impact on its reduction at the national level first of all;
- 2) Study of social and labor factors of mortality affecting the occurrence and development of diseases being the main causes of mortality; medical researchers and demographers are concerned in such studies and their interest is aimed at finding measures to reduce mortality with the help of the health care system and population social protection and the work organization.

The income level, citizens' material condition, work conditions and nature impact on the mortality causes and level, on the development of certain diseases and the possibility of proper and timely treatment are assessed in the works of such native scientists as E.M. Andreeva, A.G. Vishnevsky, G.E. Ulumbekova, N.V. Zvezdina, L.V. Ivanova (Andreev & Vishnevsky, 2002; Ulumbekova, 2010; Zvezdina & Ivanova, 2012; Burykin & Khafizyanova, 2015; Andreev et al., 2005).

Investigations of working conditions and the risk of dying at employable age are covered in the works of V.V. Yumaguzin and M.V. Vinnik (2014) who investigated traumatic occupational fatalities and came to the conclusion that high mortality from external causes was due to behavioral, environmental and economic risk factors; O.A. Kozlova, M.N. Makarova, E. H. Tukhtarova and T.V. Belenkova evaluated the working conditions and their impact on the mortality rate of the employable population (Kozlova et al., 2015); a well-known Russian demographer Yu. A. Korchak-Cheporkovsky studied the relationship between harmful working conditions and workers mortality from specific diseases in the context of industrial workers occupations for over 20 years (Korchak-Chepurovsky, 1970).

As for foreign studies, our interest is attracted to the works of Murray C.J.L. (1994), Lopez A.D. (Murray & Lopez, 1997 and 1999), Dempsey M. (1947), Maclean, J.C., Webber, D.A., French, M.T., Ettner S.L. (Maclean et al., 2015), etc., who investigated the quality of working life and its impact on the level of disability and premature mortality of the employable population. In particular, the studies of Maclean, J.C., Webber, D.A., French, M.T., Ettner S.L. prove that level, quality and job satisfaction are in close dependence of health status and life span (Maclean et al., 2015). The form of employment (wage labor or self-employment) as a factor affecting health and the main causes of mortality was investigated by Toivanen, S., Mellner, C., Vinberg, S. in Sweden in 2007 by continuous monitoring method (Toivanen et al., 2014). The results of the observation showed the increased mortality rate from all causes up to 10-32% in self-employed citizens, and up to 8-16% in private business employees in comparison with employees of large and medium-sized enterprises. Evaluation of the unemployment factor and its duration impact on the adult mortality rate conducted by Sullivan D. and Von Woher T. at US enterprises in the state of Pennsylvania (Sullivan & Von Woher, 2009)

showed the probability of fatality in the first year after being discharged at the level of 50-100 % and an increase of this level in the following 20 years by 10-15% annually. The effect of the unemployment duration on mortality from of cardiovascular system diseases was investigated by Brenner M. (2016).

Evaluation of health status connection with the probability of obtaining a stable and paid work was performed in the works of Rutledge M.S. (2016) and others.

At the same time, the variety of studies does not provide an opportunity to get a full assessment of the social and labor relations impact on the mortality rate. Moreover, we have found out that Russian and foreign scientists investigated different indicators characterizing their condition. The influence of the transformation of social and labor relations in Russia and in the former socialist countries (caused by their economies transformation) on the population mortality in these countries remains not to be fully investigated. Thus, the author of the presented study makes the first attempt to fill the gap in the researches of her compatriots drawing attention to the consequences of changing social and labor relations, especially in Russia and their impact on the overall population mortality and the employable population mortality.

On this basis, the aim of the study is to evaluate the indicators characterizing the change in social and labor relations in Russia for the period of 1992-2016 and the change of the overall population mortality and the death rate of the employable population against these indicators.

### **Materials and methods**

Social and labor relations in the modern sense are considered as relations between people that arise on the basis of the division of labor (Fauzer et al., 2010) and represent two groups of relations concerning the reproduction of labor and relations arising directly in the course of labor activity (Bezzubko and Nekhoda, 2013). Their condition is influenced by the place and role of a man in production, the degree of labor organization and productivity, the labor remuneration mechanism, the working life quality, the level of social security beyond the labor sphere, the possibility to appropriate a part of the profit (income) from property. In foreign literature, social and labor relations imply the activities of institutions and the observance of procedures designed to determine the conditions for employment, labor remuneration and

employees' social security in order to bring these conditions into line with changing circumstances, and also to represent the social partners' interests: trade unions, employers (Buchele & Christiansen, 1999; Walton et al., 2000). Only the unity of national and foreign approaches made it possible to identify the main components of social and labor relations being the subject of this study: conditions, nature and safety of employment, remuneration level and social security of employed workers.

The indicators of the annual reports of the Federal State Statistics Service concerning labor, employment, income, etc. have been taken to study the level and dynamics of social and labor relations in the Russian Federation. ([www.gks.ru](http://www.gks.ru)).

Demographic data of the World Health Organization (WHO) "Mortality and global health estimates" ([www.who.int/gho/en](http://www.who.int/gho/en)), databases and annual reports of the Federal State Statistics Service of the Russian Federation ([www.gks.ru](http://www.gks.ru), <https://nangs.org>) have been taken to analyze the population mortality rate.

Separate indicators characterizing the level and factors of mortality in the countries of the European Union are taken on the website Eurostat Statistics Explained (<http://ec.europa.eu/>) и official publication of the Federal State Statistics Service of Russia (Russia and the European Union countries, 2015).

The study includes demographic (total mortality, mortality due to specific causes, employed population mortality) and socio-economic (population's incomes, the proportion of the population with incomes below the subsistence level, unemployment level, underemployment level, occupational diseases and occupational injuries and etc.) indicators. The employable population in the Russian Federation includes women aged 16-54 inclusive and men aged 16-59, also inclusive.

The research period covers the entire post-Soviet stage of social and labor relations development, i.e. from 1992 up to the present. The indicators of total mortality and employable population mortality have been taken since 1990 to compare them with the stages of social and labor relations transformation. Individual indicators characterizing social and labor relations related to decent work indicators have been studied since 2001, i.e. from the year of their official statistical observation by the state statistics bodies of the Russian Federation.

Dynamic series were constructed and their graphic visualization was carried out basing on the available empirical data.

## Results and discussion

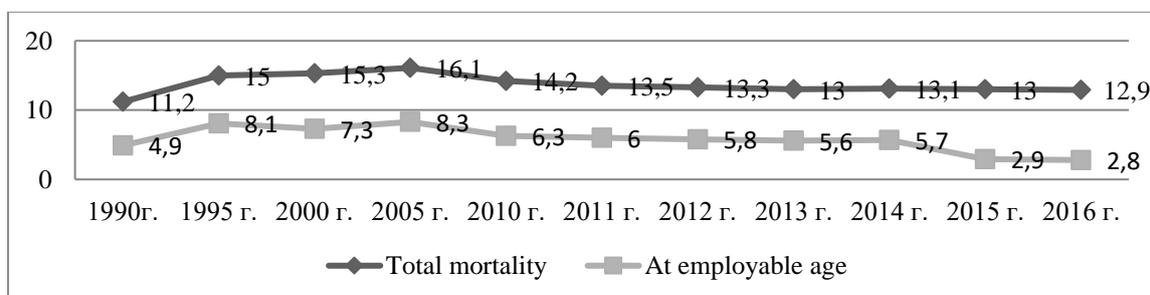
In the present study the social and labor relations transformation is understood as the process of absorbing changes from the external environment and integrating these changes into the overall system, which leads to the emergence of new traits and principles for such a system. Basing on the methodology of the system and synergetic approach, the social and labor relations transformation stages at the phases of the economic system life cycle are the proto-transformation, partial transformation and complete transformation.

The stage of proto-transformation is considered as the social and labor relations system reframing, proceeding on the principal basis of dynamic conformity to the goals and needs of the economic system. At this stage, a new economic system and new ideas concerning the role of the social and labor relations system in the processes of the economic system development and functioning are being formed. At this stage, there are some contradictions in the interaction of the employable population and the social and labor relations system, which are caused by the inability of the old system to function in a new emerging economic system, and it leads to an increase in the social tension level and to a decrease in the employees motivation when performing labor operations. At this stage the change resulted in an increase in unemployment, informal forms of employment, self-employment with low quality of working conditions, and so on. This stage is characterized by value characteristics and motivational factors destruction (alteration) in the employees' activities. The employable population suffers immense psycho-emotional overloads and on the whole, it negatively affects the demographic

situation. In the process of partial transformation of social and labor relations on the basis of the reframing phase, only some parameters and characteristics of social and labor relations system are changing (or partially changing). At the same time, the overall structural and functional system of social and labor relations remains unchanged, it happens due to the influence of some external and internal factors, including the one that social and labor relations system is not ready for complete transformation. The stage of their partial transformation is characterized by the processes adapting a new values system and individual's modus operandi, which are included into a new social and labor relations system.

Full transformation involves a complex modification of the social and labor relations system, when it completely transforms (converts) into a new state acquiring new features and characteristics. At the stage of "complete transformation" their restructuring is completed and the mechanisms of interaction with the environment and renewal mechanisms are formed. The construction of interaction with the environment is carried out basing on the viability principle characterized by the presence of self-reproduction synergetics mechanisms and social and labor relations system self-development; all this ensures the existence and survival of the social and labor relations system in the new conditions. The stage is characterized by the integration of the organization workers transformed values into the new social and labor relations system.

Numerous studies of social and labor relations transformation in Russia date the first period from 1990 to 2000, the second period from 2000 to 2010, and the third one from 2011 up to the present. The dynamics of the population mortality at all stages of the system transformation is reflected in Fig. 1.



**Fig.1** Dynamics of total mortality and mortality at employable age calculated per 1000 people of the population (compiled on the basis of the: Natural Movement, 2015; Demographic, 2015; Russia in Figures, 2017)

The figure clearly shows three periods of change in the overall mortality and mortality at employable age: they increased till 2005 and they have two periods of decline - from 2005 to 2010 and from 2010 up to the present. Thus, we can state that the trend in change of death rates and the transformation stages of social and labor relations coincide. This fact is to be checked during the rates analysis and their graphic visualization.

Analyzing the statistics data of the death rate in Russia during the period of social and labor relations proto-transformation (1990-2000) it is possible to note a sharp increase of the overall mortality and mortality of employable citizens during this period. Also, statistics shows a decline in the natural movement rates associated with a sharp decline in the birth rate during this period, as well as an increase in the Russians labor immigration rate (Demographic, 2015, Russia in Figures, 2017). At the stage of partial transformation, the decline in demographic rates is stabilizing, mortality rates are decreasing. At the stage of full transformation (2010 – present time), the birth rate increase and the death rate decrease are recorded.

It should be noted that the change in the overall mortality rates and mortality rates at employable age was ambiguous over the past 17 years. The maximum value of this rate since 2000 was

registered in 2005; for the same year, the maximum mortality rate of the employable population is 16.1 and 8.3 people, respectively, per 1000 population (see Fig. 1). The annual growth of these rates also had the highest value in 2005 - 1,053 and 1,137, respectively. In subsequent years, reliable unidirectional decreases in these rates were recorded. However, in a comparative assessment of the population mortality rate in the EU member states and in the Russian Federation, it became possible to reveal that this rate remained higher in Russia than in the countries of Europe. According to official statistics (Russia, 2015) in 2013 only three EU countries had a higher overall mortality rate than Russia did (13.0 per 1000 people) - Bulgaria (14.4), Latvia (14.2) and Lithuania (14.0). The lowest mortality rate was recorded in Cyprus (6.0), Ireland (6.5), Luxembourg (7.1) and Malta (7.6). The average mortality rate for the EU member states in 2013 was 10.0 per 1,000 people.

The nature of the social and labor relations transformation related to its impact on mortality rate can be characterized by the following indicators recommended by the International Labor Organization (ILO) as indicators of decent work. The bodies of state statistics of Russia carry out their annual measurement starting from 2001. The indicators related to the subject of our study are summarized in Table 1.

**Table 1.** The dynamics of decent work indicators recommended by the ILO characterizing the social and labor relations transformation in 2001-2016. (Indicators, 2017)

List of indicators recommended by the ILO	2001	2005	2010	2011	2012	2013	2014	2015	2016
<b>Employment .1</b>									
The share of employed persons in the total population aged 15 - 72, %	54,2	61,3	62,7	63,9	64,9	64,8	65,3	65,3	65,7
Unemployment rate (15 - 72), %	8,9	7,1	7,3	6,5	5,5	5,5	5,2	5,6	5,5
The share of the informal sector in total employment, %	14,1	18,3	16,4	18,2	19,0	19,7	20,1	20,5	21,2
<b>Decent Income .2</b>									
Employed poor people <sup>12</sup> , %	23,9	24,4	x	13,1	x	7,8	x	10,7	x
Inequality in income distribution (P90 / P10)	13,9	15,2	16,6	16,2	16,4	16,3	16,0	15,7	15,7
<b>Working Conditions .3</b>									

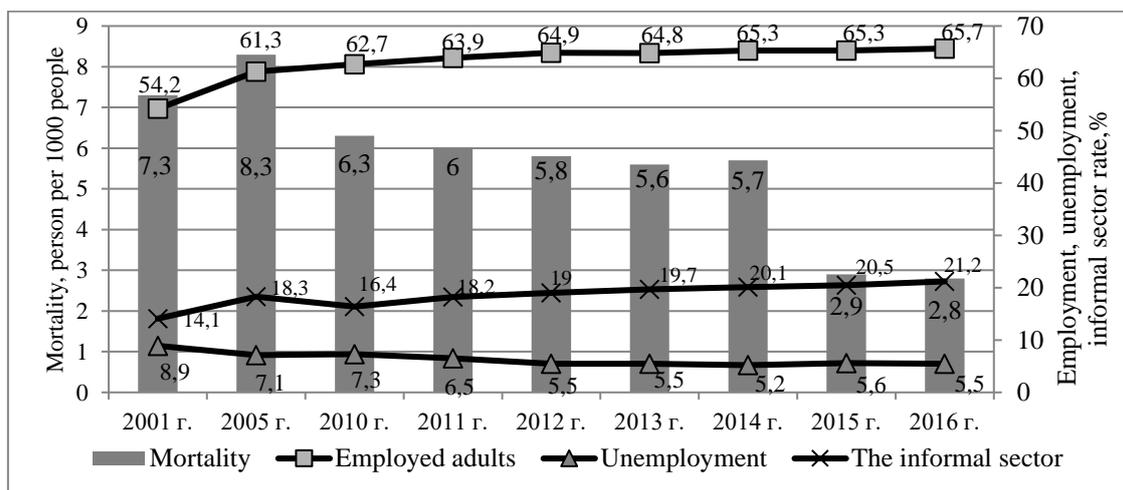
<sup>12</sup> Surveys of organizations (without small business entities) based on the sample, for April, are conducted every two years

The share of employees with excessive hours of work (more than 48 hours per week; "actual" number of hours), %	7,3	7,1	4,7	4,4	4,3	4,4	4,7	4,5	4,5
Industrial accidents rate with fatal outcome (per 100,000 workers), people	15	12,4	9,4	8,6	8,4	8,0	6,7	6,2	6,2
Industrial accidents rate with non-fatal outcome (per 100,000 workers), people	482	300	215	198	179	159	139	129	129
<b>Working days lost in case of temporary disability per one injury</b>	28,4	32,2	46,8	48,4	45,6	47,4	48,7	48,6	49,0

Thus, in particular, decent work indicators in Russia for 2001-2016 testify that, in general, they are improving: the share of employed persons in the total population has increased; the unemployment rate has decreased; the level of industrial injuries with a fatal outcome is decreasing, etc. At the same time, it is necessary to note quite unfavorable trends directly determining the level of social and labor relations: it is a high proportion of employees with low wages; there is one more index indirectly affecting the level of social and labor relations: it is an increased share of informal sector employees. In addition, a high level of inequality in the income distribution between the lower and upper strata of society remains in

Russia. Table 1 shows that this indicator characterizing the income differentiation has grown from 13.9 times in 2001 up to 16.4 times in 2012. In world practice there is an opinion that if this indicator exceeds the income differentiation by more than 10 times, then this society is at risk to social instability and the risk to diseases development leading to premature mortality (circulatory system, drug and alcohol addiction, mental disorders, etc.).

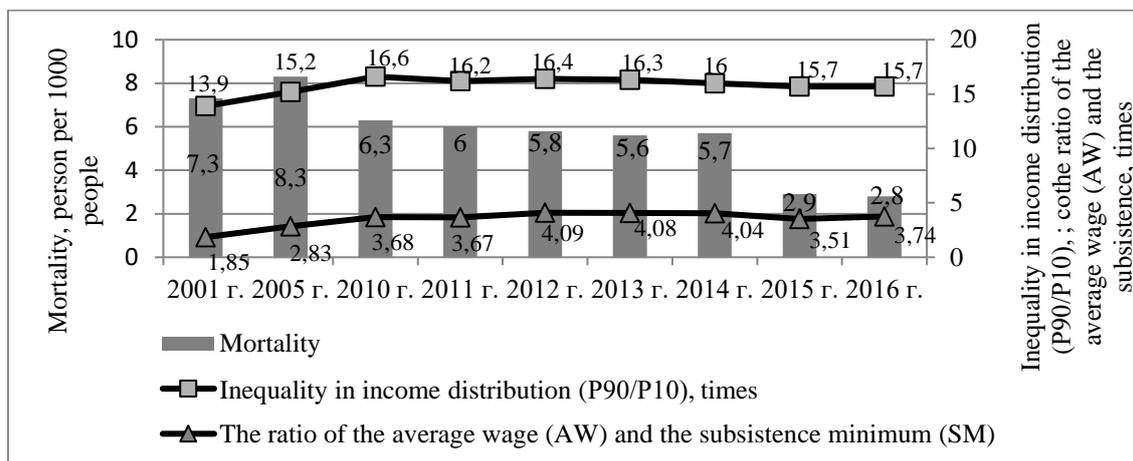
Figures 2-a, 2-b and 2-c clearly show the change in the mortality rate of the employable population under the influence of the indicators groups change in Table 1.



**Fig. 2-a.** The relationship between the mortality rate of the employed population and the group of indicators characterizing employment possibility (Table 1) in 2001-2016 (based on data from Table 1 and Russia in figures, 2017).

The figure shows an increase in the mortality rate of the employed population in 2001-2005 against an increase in the employment level of the adult population aged 15-72 and an increase in the share of the informal sector with poor working conditions and an increased risk of cardiovascular diseases caused by emotional and psychophysiological loads.

It is quite difficult to assess with certainty the positive impact of fall in unemployment to mortality decrease during the period under review. As the national and world practice shows, the ones unemployed in the formal sector of the economy tend to find jobs in the informal sector, which both positively (in this case) and negatively affects the level of mortality at employable age.



**Fig. 2-b.** The relationship between the mortality rate of the employed population and the indicators characterizing a decent income (based on data from Table 1 and [Russia in Figures, 2017]).

It is evident that till 2005 the increase in mortality coincides with the growth of differentiation (inequality) in the income distribution and with the widening gap between the average charged wages (AW) and the subsistence minimum (SM). From 2010 till 2012 both decent income indicators are unstable, perhaps because of the economic crisis in 2008. However, there is a further gradual decrease in the mortality rate. Since 2012, the income gap has been reduced; the employable population mortality rate has the same dynamics of decline. According to researchers studying the dependence of the mortality rate (King, 2007, Boykov, 1995) on the income factor, there is a delay in this factor effect

or so-called "lagged effect". In this case, the income factor effect is manifested in the refusal or delay of the people with low incomes to treat their diseases, and it can subsequently lead to premature mortality. According to Table 1, there were 10.7% of such "employed poor people" who received payment for their labor at a rate lower than the subsistence minimum according to the observation results for 2015. Income level influences the decision concerning the treatment completeness and quality and it subsequently affects life expectancy. In our opinion, this can explain a significant reduction in the mortality rate of the employable population in 2015-2016 due to income indicators stabilization.

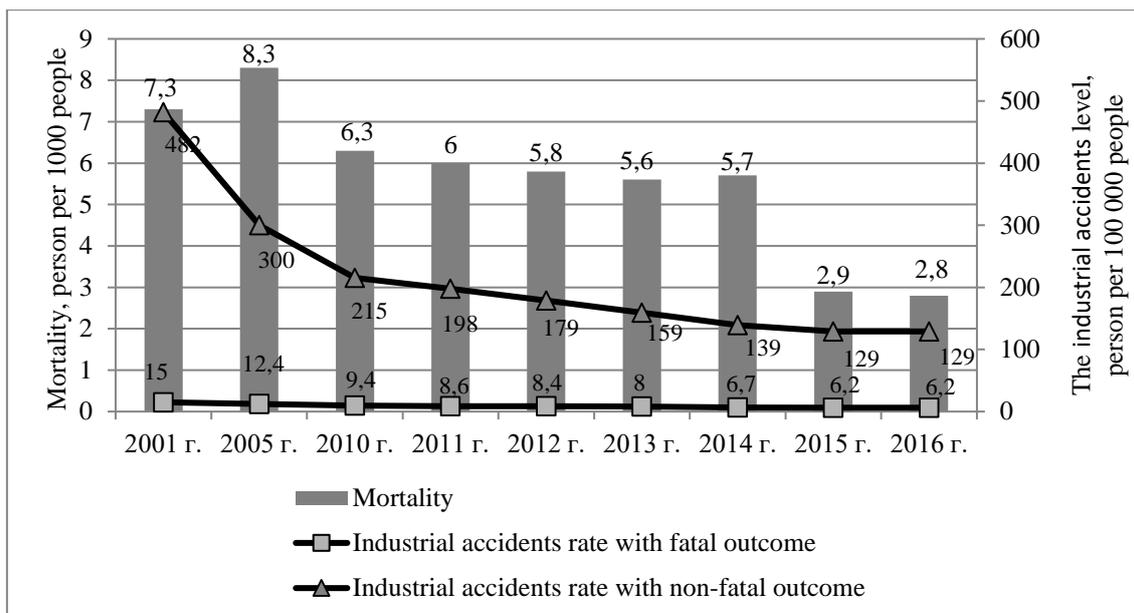
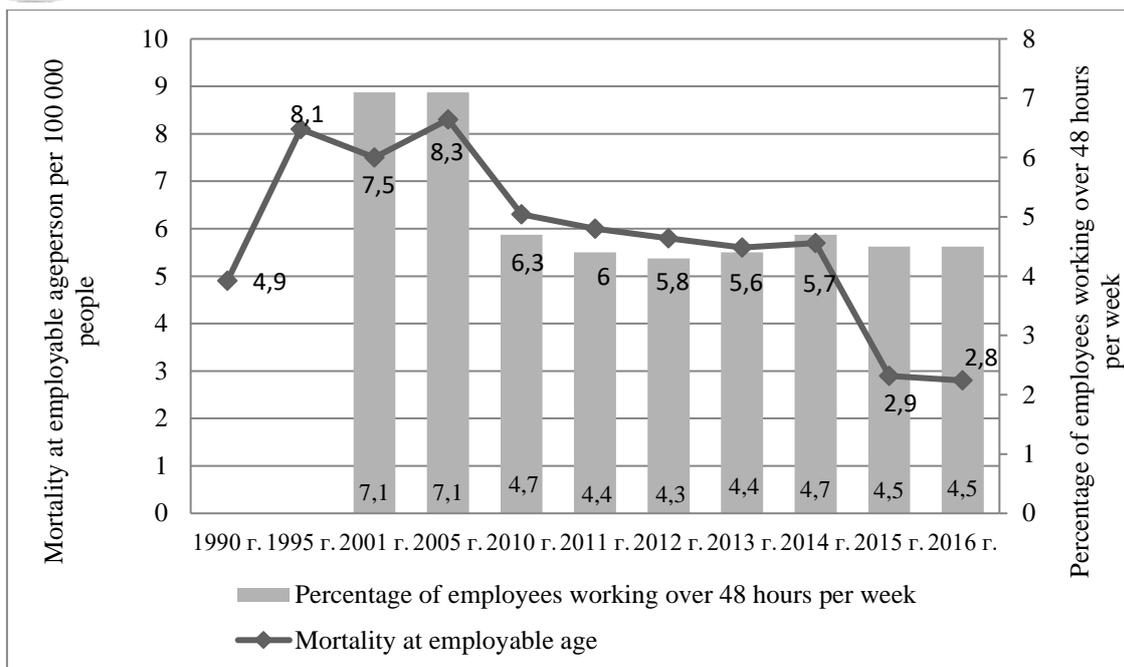


Fig. 2-c. Employable people mortality rate and industrial accidents level (with fatal and non-fatal outcome) relationship (based on Table 1 and (Russia in figures, 2017).

Dependence of deaths and occupational injuries can be traced quite clearly on the chart. Many researchers (Andreev & Vishnevsky, 2002; Ulumbekova, 2010; Zvezdina & Ivanova, 2012; Burykin & Khafizyanova, 2015) studying the relationship between mortality of employable people and working conditions noted that health and safety policies had almost no attention from top management in 1990-2000. During this period, the top management had to rearrange their economic ties and general management according to the influence of the external environment and general economic conditions. The situation has changed positively since 2001 when a number of administrative measures were adopted. This fact is evidenced by official statistics: the number of violations revealed during the Federal Labor Inspectorate control was reduced more than fourfold (from 992,400 cases to 136,100) in 1990-1996. During the same period, the number of violations in the field of training and instructing workers in

occupational safety was reduced by more than three times; violations in the workers provision with individual and collective protection equipment was reduced by 44.6%; violations related to the conduct of medical examinations and inspections was reduced by 13%; violations in the field of payment and work measurement was twice reduced (Russia in Figures, 2017, Social and Labor Relations, 2016). Indicators of excessive work hours (more than 48 hours per week) are closely related to the mortality rate from the circulatory system diseases (risk of hypertension) and mortality from external causes (smoking and alcohol abuse, sedentary lifestyle, obesity, chronic psycho-emotional overstrain). This same influence was revealed in the works of national (Ulumbekova, 2010) and foreign (Toivanen, 2014) researchers. Figure 3 shows the change in mortality due to excessive work hours factor (more than 48 hours per week)<sup>13</sup>. It is obvious that the change in both indicators practically coincide from 2001 to 2014.

<sup>13</sup> This indicator is included in the list of indicators of sample population surveys concerning employment (labor force surveys) conducted since 2001.



**Fig. 3.** The impact of a change in the excessive working hours (more than 48 hours per week) on the employable age population mortality (based on: Demographic, 2015)

Thus, the analysis of the charts showing the results of the direct influence of decent labor factors on the employable population mortality rate, identified by the author in terms of indicators of 2001-2016, is consistent with the results of earlier Russian and foreign researchers' investigations who also determined these indicators direct dependence.

The presented indicators of decent work are not the only ones, so social and labor relations can also be characterized by such indicators as:

- Job replacement factor (the ratio of jobs gained to jobs lost);
- Proportion of part-time workers in the average annual calculation in the total number of employed citizens;
- Proportion of idle time workers due to the employer's fault calculated in the total number of employed citizens;

- Level of labor legislation violations revealed in the course of inspections by the State Labor Inspectorate per 1000 employees;
- Level of occupational morbidity per 100,000 employees for the reporting period;
- Level of industrial accidents resulted in victims disability for one working day or more and with a fatal outcome (per 1000 employees);
- Share of investments in fixed assets renewal (machinery, equipment, vehicles) in the total volume of fixed assets investments.

Table 2 also presents an assessment of the social and labor relations transformation in Russia according to the foregoing indicators from 1992 to 2016.

**Table 2.** Dynamics of indicators characterizing the social and labor relations transformation

	1992	2000	2005	2010	2015	2016
Job replacement factor	x	x	x	0,798	0,882	0,899
The level of employment (concerning economically active population)	0,948	0,894	0,936	0,927	0,944	0,945
Proportion of part-time workers	x	5,05	1,78	0,53	1,2	1,3

Proportion of idle time workers	x	x	x	1,16	0,34	0,27
Level of labor legislation violations	x	x	x	14,2	8,05	6,62
Level of occupational morbidity	14,927	14,262	11,848	11,243	8,726	7,625
Level of industrial accidents resulted in victims disability for one working day or more and with a fatal outcome	6,2	5,1	3,1	2,2	1,3	1,3
Average monthly wage, correlated with the subsistence minimum	3,16	1,85	2,83	3,68	3,51	3,74
Share of investments in fixed assets renewal (machinery, equipment, vehicles) in the total volume of fixed assets investments	x	0,366	0,411	0,379	0,315	0,306

(Based on: Labor and Employment, 2015, Russia in Figures, 2017, Human Resources, 2017)

Considering the social and labor relations transformation in Russia in 1992-2016, the following trends should be noted. In the analyzed period, the level of employment of economically active population has slightly increased after the periodical fall in 2010. On the one hand, this is related to workplaces renovation (job replacement factor has increased to 0.899, or 10.1% for the seven analyzed years); on the other hand, it is related to the greater possibility for self-employment and business development. At the same time, the level of employment in the informal sector of the economy has increased by 7.1% for the analyzed period. Most often, this sector avoids to formalize the social and labor relations with employees; workers, often having no rights and protection in the course of employment, are deprived of social guarantees such as social, medical and pension insurance, both during the period of work and after it.

The indicators characterizing the change in working conditions, above all, labor safety, have a positive dynamics of decline: the level of occupational morbidity is almost twice lower; level of industrial accidents resulted in victims disability for one working day or more and with a fatal outcome has almost decreased five times; level of occupational injuries with a fatal outcome per 100,000 workers has decreased twice. Thus, on the whole, it can be concluded that there has been an improvement in working conditions.

At the same time, there was a fall in investments spent on the renewal of machinery, equipment, vehicles; their share in the total volume of fixed assets investments has decreased by 10.5% since 2005. Enterprise losses from temporary disability due to industrial accidents in the workplace (calculated per trauma) increased (Table 1) from 28.4 days in 2005 to 49 days in 2016. Increased

attention of the senior management stimulated by the state at the administrative level has made it possible to reduce the number of labor legislation violations revealed during inspections by the state labor inspectorates for 856.3 thousand cases or per 1000 employees from 14.2 to 6.62 units.

At the same time, we see a decline in the overall mortality rate: from 16.1 per 1,000 in 2005 to 12.9 in 2016 and the mortality rate of the employable population from 8.3. per 1000 people in 2005 to 2.9 in 2016 (see above, in Figure 1).

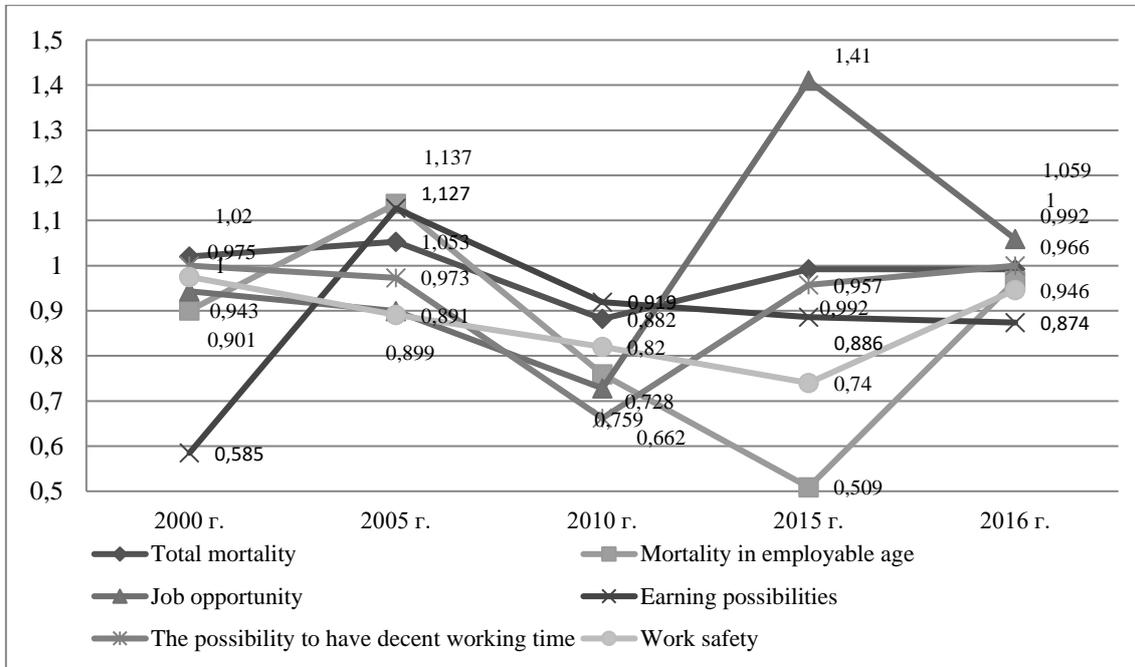
We tried to track the rate of change in the mortality rates (general and employable population) and indicators comprehensively characterizing social and labor relations and decent work. The data is presented in Figure 4. For the purpose of data comparability, all indicators of Tables 1 and 2 are summarized into indicator groups characterizing decent work. Indicative growth factors are calculated according to these groups:

- 1) Job opportunity factor (the group includes indicators of population employment level, informal employment level, job replacement and part-time workers proportion);
- 2) Adequate earnings and productive employment factor (the average monthly wage, correlated with the subsistence minimum and the change of the working poor);
- 3) Decent working hours factor (the proportion of employees with excessive working hours (more than 48 hours a week; "the actual number of hours");
- 4) Safe work factor (the level of labor legislation violations, occupational morbidity level, the level of industrial accidents resulted in victims disability

for one working day or more and with a fatal outcome; the level of occupational injuries with a fatal outcome; the number of working days lost in case of temporary disability per one injury; share of investment in fixed assets renewal (machinery, equipment,

vehicles) in total fixed assets investments).

The indicative factors presented on the chart describe the situation since 2000, thereby characterizing the rate of growth (decrease) in the analyzed values in 2000 related to 1992.



**Fig. 4.** The relationship between the change in the mortality rate and the indicators characterizing social and labor relations transformation (calculated according to: Labor and Employment, 2015, Russia in Figures, 2017, Human Resources, 2017)

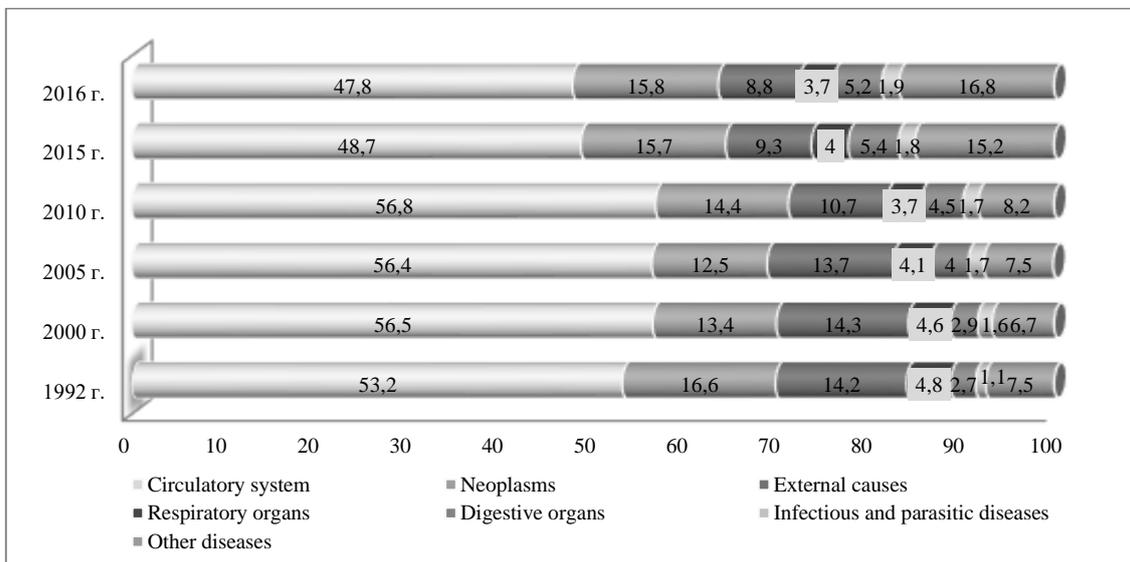
Thus, it is obvious that the figure shows two periods of indicators impact on mortality rates: the first one until 2005, when the rate of change in the overall mortality and mortality of the employable population had a positive growth trend even after 2005, when these indicators began to decline. In the first period, there is an advance growth of mortality rates while there is an advance growth of the employable population mortality rate against the negative growth rates of job opportunity factor, the possibility factor for a decent working time and the safety of the workplace factor. In the first period, from 2000 to 2005, the gap between the average accrued wages and the subsistence minimum is reduced twice. However, this factor alone could not have a positive effect on reducing the mortality growth rate. In the second period, since 2005, there is a negative growth rate of the overall mortality and mortality in employable age under the influence of all factors characterizing social and labor relations and decent work. The graphical

measurement results presented in Figure 3 are in full agreement with our hypothesis about the changes of mortality indicators under the influence of social and labor relations transformation (Figures 1 and 2 a, b, c).

Previously, we have presented the dependence of working conditions individual factors on the development of diseases, leading to premature death. In the course of the analysis, we are to note that the study of mortality rates, bearing in its causes mind, allows us to get a more complete picture of its dependence on economic, social, labor and other factors. In Russia in 2016, the highest mortality was observed from the circulatory system diseases (47.8%). The dynamics of this indicator having its peak in 2010, i.e. 56.8% of the total number of deaths, has decreased by 2016. In the EU countries mortality from circulatory diseases is also the main cause of death (Eurostat, 2017).

The next most significant cause of death in Russia is the mortality from neoplasms (15.8% in 2016). Mortality from external causes ranks the third in Russia (8.8%), in the EU-28 countries it is one of the last. The dynamics of death causes in Russia demonstrates insignificant fluctuations.

And if the proportion of deaths from neoplasms has been increasing since 2005, then there has been a decline in the external causes indicator and its value has reached the level of the late 1980s (Figure 5) (Russia in Figures, 2017).



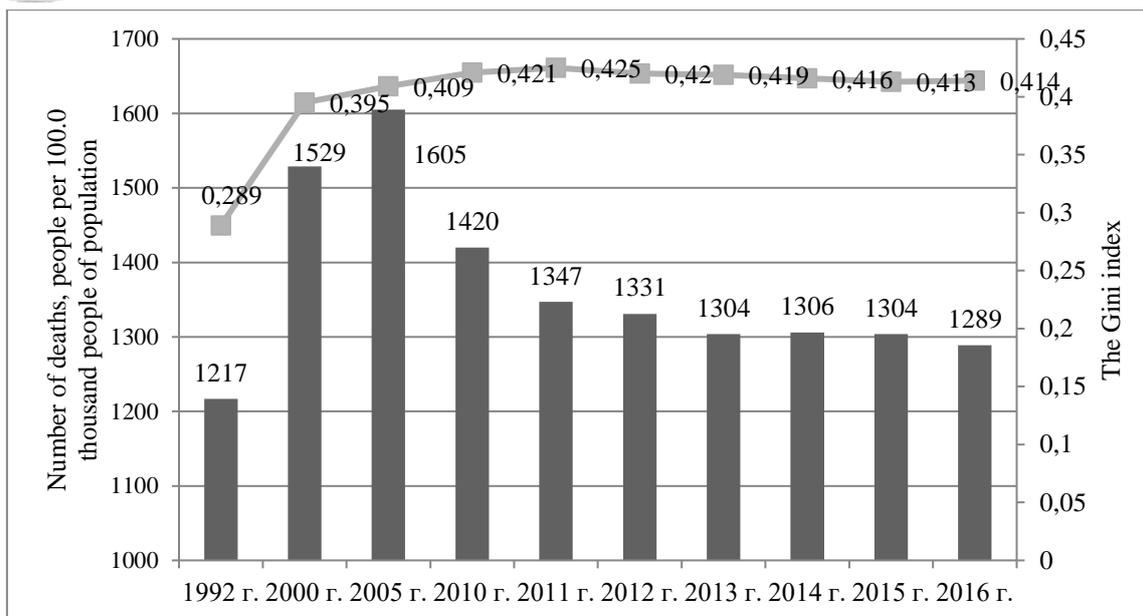
**Fig. 5.** Dynamics of mortality causes change, % (calculated according to: Russia in Figures, 2017)

Mortality from external causes, which is most often attributed to production and life factors, in most EU countries occupies one of the last places in the mortality causes structure. The highest rate is in Lithuania (122.1 people per 100 thousand died in 2012). For comparison, in Russia it was 118.1 per 100 thousand dead in 2013.

Such a comparison allows us to state the existence of significant reserves to reduce the mortality rate and the employable population mortality rate in our country. This is confirmed by the already achieved reduction of these indicators from 16.1 people and 8.3 people per 1000 people (respectively for the population as a whole and for the employable age population) in 2005, and to 12.9 and 2.8 people per 1,000 people in 2016 (see Figure 1 above).

According to national demographers (Andreev E.M, Vishnevsky A.G, Ulumbekova G.E, etc.), the high mortality rate of the population in the Russian Federation can be related to the high prevalence of risk factors, such as alcohol consumption, smoking, inadequate health care financing, high cost of treatment and inadequate income in order to receive timely and quality medical treatment.

Figure 6 shows the mortality rates from all causes and the value of the Gini index for the period 1992-2016. Analysis of the charts reflects the presence of certain patterns of mortality changes and the Gini index characterizing the income concentration.



**Fig. 6.** The dynamics of mortality rates from all causes and the Gini index for the period 1992-2016. (based on: Russia in Figures, 2017, Labor and Employment, 2015)

If we compare these changes with the social factors existed in the analyzed period, we can note the following patterns. According to economic sources, in 1992 the standards of living deteriorated sharply due to the transition to new economic conditions and a change in the economic system (Boykov, 1995). At the end of the 20<sup>th</sup> century, there was an economic crisis accompanied by the national currency devaluation, wage cut and decrease of the purchasing power of the population. These events led to the mortality rate increase also due to such causes as the circulatory system diseases and the cardiovascular system diseases and mortality from external causes (suicide, alcoholism, etc.).

As a result of the research, we have found out that the indicators characterizing social and labor relations such as income level, income differentiation degree and the proportion of working poor (i.e., the proportion the employed citizens earning less than the minimum subsistence level) have the greatest impact on the mortality rate.

A clear dependence of the change in the employable people mortality rate due to working conditions was revealed (Fig. 3). If the working conditions integral index declines (reduction of occupational diseases, occupational injuries, violations of occupational safety and health

legislation), the mortality rates change in the same proportions.

The income level had a significant impact on the mortality rate in the first years of reform (1992-1995) and during the economic crises (late 20<sup>th</sup> century). Hence, the specific impact of this factor was manifested.

### Conclusions

Results analysis of the studies performed to investigate and assess the causes of death in Russia during the last 20 years emphasises the researchers' attention to the interdependence between high mortality rates in general, mortality in terms of reasons and among employable citizens (primarily low-income ones), increase in the cost of additional medical services, decrease in the quality of compulsory medical care, increase in the risk of mortality external factors. The study of the working conditions impact on the mortality rate dynamics was used to be carried out only within the category of employable citizens, without taking into account these factors effect on the labor activity termination, while unsatisfactory working conditions may cause deferred mortality and may shorten life expectancy.

Our study has assessed the complex effect of the change in social and labor relations state on mortality rates developing already proven dependencies of mortality on the main factors

such as income level, poverty and working conditions. The study confirms the previously identified deferred income factor impact on the mortality rate in employable age, as well as the deferred impact of the labor conditions factor.

The study confirmed the coincidence of the trends in the mortality rate changes (growth till 2005 and decline in subsequent years) with three stages of social and labor relations transformation: proto-transformation (1990-2000) - deterioration of social and labor relations indicators and mortality increase; partial transformation (2000 - 2010) - stabilization of these indicators and a slowdown in mortality improvement, with the subsequent mortality reduction; full transformation (2010 - present) - further mortality rates reduction against improvement of social and labor relations indicators.

In addition, the influence of previously unexplored indicators (e.g. length of a working day increasing the risk of circulatory system diseases being the main mortality factor, and income inequality) has been revealed. The income inequality factor exerting influence on mortality rates has a lagged action effect and is manifested in inability to receive timely and proper treatment by citizens having their labor income below the subsistence minimum (so-called working poor).

The results of the study may be used by practitioners in determining measures to reduce the mortality and to improve the working life quality; they may also be of help to research scientists as a basic hypothesis for determining the degree of the studied indicators dependence.

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