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## Dynamics of Mortality Rate in Population of the Republic of Tatarstan and Finland.

Valeeva ER<sup>1</sup>, Stepanova NV<sup>1</sup>, Ziyatdinova AI<sup>1</sup>, Kauhanen Jussi<sup>1,2</sup>, and Giniatullina RR<sup>1,2</sup>

<sup>1</sup>Kazan (Volga Region) Federal University, Institute of Fundamental Medicine and Biology, Kazan, Russia (420008, Kazan, street K. Marx, 74).

<sup>2</sup>University of Eastern Finland, 70210, Kuopio, Finland.

### ABSTRACT

The analysis of dynamics and regularities of mortality formation in urban and rural population of the Republic of Tatarstan with the account of gender peculiarities is given in the article. In recent years, the mortality rate estimation in all disease classes causes both in rural and urban areas of the Republic of Tatarstan showed significant reduction. The main causes of the population mortality in the Republic of Tatarstan are circulatory diseases, which account from 49.6% to 72.8%. The female population of rural and urban areas has higher mortality rates than the male one due to this cause. The analysis results revealed gender differences in the rank distribution of the major mortality causes: in females, neoplasms are in the second place; injuries, intoxication and some other consequences of external causes (in urban female residents) and respiratory diseases in rural female residents are in the third place. In males, injuries, poisoning and some other consequences of external causes occupy the second place, and tumors – the third place, irrespective of the place of residence. The results of the mortality causes analysis in the population showed the necessity for simultaneous implementation of there policies of non-contagious disease prevention.

**Keywords:** mortality causes, gender differences, urban and rural population.

*\*Corresponding author*

**INTRODUCTION**

The situation, which was created at the end of the XX and the beginning of the XXI centuries in Russia and other countries of the post-Soviet space, when the mortality rate significantly exceeded the birth rate, can be characterized as the demographic crisis. At a time of 1.6-fold increase in mortality, when it becomes higher than the level observed fifty years ago, depopulation takes place, which results in serious economic, social, political and other consequences. However in the year of 2013, the average life expectancy in Russia was 65.5 years in males and 76.5 years in females. In EU-27 countries, the corresponding values were 12.4 and 6.8 years higher and made 77.5 and 83.1 years correspondingly in 2012. Low life expectancy (LE) in Russia in comparison with developed countries is due to high mortality rates from external causes [1]. The effect of mortality from external causes on the difference in LE in Russia and European countries holds a firm second place after mortality from circulatory diseases. As of today, the Russian Federation ranks 32-nd in Europe for mortality rate of the population, the Republic of Tatarstan (RT) ranks 18-th among the regions of the Russian Federation [2]; as of year-end 2010, the Volga Federal Region of the RT has the lowest index (13.1‰).

The goal of research was the study of dynamics and the regularities of mortality formation with the account of gender peculiarities of the urban and rural populations of the RT and Finland. The key indicator of the natural population movement significantly providing the preservation of its size is the mortality rate [3].

**MATERIALS AND METHODS**

Methods of study: analytical, statistical. Mortality dynamics was determined by means of linear alignment of actual data series with further calculation of the approximation ratio. The processing of collected study materials was carried out on IBM PC Personal Computer with Microsoft Office application software package and SPSS Statistics 17.0 specialized statistical program.

We studied official statistical information on mortality of the whole population of the RT for the period from 1995 to 2013. Assessment and analysis of mortality rates of the rural and urban populations of the RT were carried out according to the data from study guides “Statistics on the population health and healthcare” (case studies from the RT) for the period from 2001 to 2013 published by the Ministry of Health of the Republic of Tatarstan and State Autonomous Healthcare Institution “The Republican Medical Information-Computer Center”. Dynamics of the mortality rates among rural and urban populations of the RT for the period under analysis speaks for a high mortality rate of the urban population. A decreasing trend in mortality rates among the rural and urban populations of the Republic was observed since the beginning of the year 2010. As compared to the period of 1995 – 2005, in 2013 the mortality rate of the urban population decreased by 4.9% – 14%, and that of the rural population by 12.1% – 13.8%.

Analysis of mortality rates of the population in the RT for the period of 1995 -2013 revealed no gender differences. The major causes of death among both urban males and females and the rural ones are the diseases of five classes: neoplasms, circulatory diseases, respiratory diseases, diseases of the digestive system and injuries, the cumulative percentage of which is from 77.6% to 79 % of total mortality in certain years (Tab.1).

**Table 1: Mortality among male and female population in the urban area of the RT according to classes of diseases for the period 1995-2013 (per 100 thousand population)**

Classes of diseases acc. ICD - 10	1995		2000.		2005		2008		2010		2013	
	m	f	m	f	m	f	m	f	m	f	m	f
Neo	204,1	141,9	198,7	144,5	200,1	144,5	209,9	148,1	205,4	148,5	214,1	150,2
CD	570,9	642,3	654,9	688,5	779,0	698,2	712,1	693,2	745,5	727,3	612,2	578,2
RD	68,9	29,0	86,3	28,3	78,2	23,5	71,6	21,2	70,5	20,5	66,5	20,8
DSD	59,3	31,1	53,5	27,9	67,0	35,4	58,83	38,61	65,1	39,4	68,6	40,3
Injuries	323,8	75,3	304,6	69,7	302,5	65,8	228,7	57,0	215,4	51,5	176,2	44,6

Note:: Neo – neoplasms, CD – circulatory diseases, RD – respiratory diseases, DSD –digestive system diseases, m - males, f - females

Circulatory diseases, the incidence of which is 7.2% higher in females than in males, rank first among causes of death in the urban population. Neoplasms, the incidence of which increased by 5.8% for the period under study, rank second among females. Injuries, poisoning and other consequences of external causes rank second in the male mortality pattern, their incidence decreasing by 45.6% in 2013 as compared with the year of 1995. Neoplasms, the incidence of which increased by 4.9% among the male population; and injuries, poisoning and other consequences of external causes among the female population, their incidence decreasing by 40.8% in the urban area over the years under study, rank third. Deaths from respiratory diseases (decreased by 3.5%) and deaths from diseases of the digestive system (increased by 15.6%) rank next among males. Diseases of the digestive system (increased by 29.5%) and respiratory diseases (decreased by 28.3%) are next in the ranking of mortality causes in urban females.

The study of mortality dynamics among urban males for the period of 1995 – 2013 showed statistically significant decrease of the mortality rates in neoplasms ( $R^2=0.53$ ), in injuries, poisoning and other consequences of external causes ( $R^2=0.93$ ), in diseases of the digestive system ( $R^2 = 0.46$ ). The mortality rate in neoplasms ( $R^2=0.93$ ), in injuries, poisoning and certain other consequences of external causes ( $R^2=0.90$ ), in respiratory diseases ( $R^2=0.80$ ), decreased significantly among the female urban population during the same period.

**RESULTS**

Analysis of mortality among the rural population with the account of gender peculiarities identified five major classes of diseases, the cumulative percentage of which of the total mortality among the rural population was 79.0% in the year of 1995 and 77.6% in 2013. Circulatory diseases rank first among causes of death in the male and female rural population, the percentage of the given group of diseases being 44.2% and 73.4 % of the total mortality in 1995; in the year of 2013 it increased by 2.5 % in males and decreased by 21.4% in females. Neoplasms, the percentage of which decreased by 13.2%, rank second in the mortality pattern of the population (Fig.1)

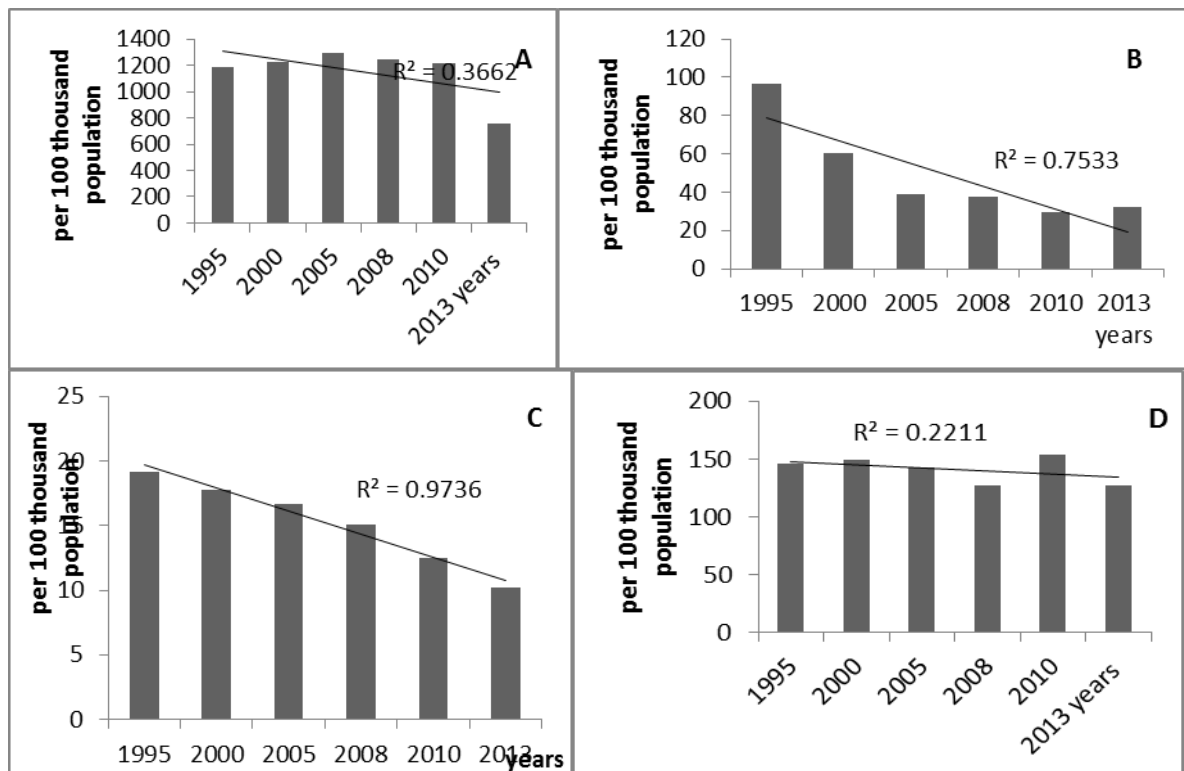


Figure 1: Mortality among female population in the rural are of the RT according to classes of diseases for the period 1995-2013(per 100 thousand corresponding population)  
A - CD, B - RD, C – endocrine system diseases, D – Neo

Injuries, poisoning and other consequences of external causes (decreased by 30.9% in 2013 as compared with 1995) rank second in the male mortality pattern. Neoplasms, the percentage of which decreased by 13.2% among the male population, and respiratory diseases among the female population (decreased by 67%) rank third. In males, the percentage of respiratory diseases in the mortality pattern decreased by 26.5%, and that of diseases of the digestive system - by 2.6% over the years under study. In female population, the percentage of injuries, poisoning and other consequences of external causes and diseases of the digestive system in the mortality pattern decreased by 11.7% and 31.8% correspondingly.

The mortality pattern undergoes changes over different periods of time, this fact being due to either progress (or regression) in the field of medicine, healthcare and quality of life as a whole, and changes in age and gender composition of the population. In Russia, from the mid-1970-ies more than half of deaths were caused by circulatory diseases. In certain years (from 2007 to 2008) the percentage of those, who died due to this class of causes of death, reached 57% [5-7]. In 2013, according to the data of operative monthly records, it was 53.2%. In the RT, in certain years, this index was 59 - 68% in the rural area and 52-63% in the urban one. However there was visible positive dynamics the last 3 years: in the year 2013, circulatory diseases amounted to 49.5% among the rural residents of the RT and 53.9% among the urban population in the mortality pattern. Circulatory diseases (ischemic heart disease, stroke) are the major cause of death all over the world. About half of all deaths (30 - 65%) in developed countries are due to this group of diseases. But, if in Germany, Sweden, United Kingdom such cases make 8.7 per 100 thousand of population, then in Russia, Belarus and in Ukraine – 114.7, and in the RT – 635.5. Over the last 10 years the incidence of circulatory diseases among the adult population of the RT increased and made 15.5% - 19.5% in the morbidity pattern, and the absolute gain as compared to the year of 2004 reached 44.5% [8-9]. According to the data of WHO, the morbidity pattern in European region undergo changes: those causes of death, which are associated with current demographic changes and current social and economic conditions, prevail. In 2012, almost 50% of these causes were due to circulatory diseases (these indices being higher in males). So far, the contribution of prophylaxis and risk factors correction to decrease of mortality rates due to circulatory diseases makes from 45% to 75%, and that of various therapies is from 25% to 55% [10- 11].

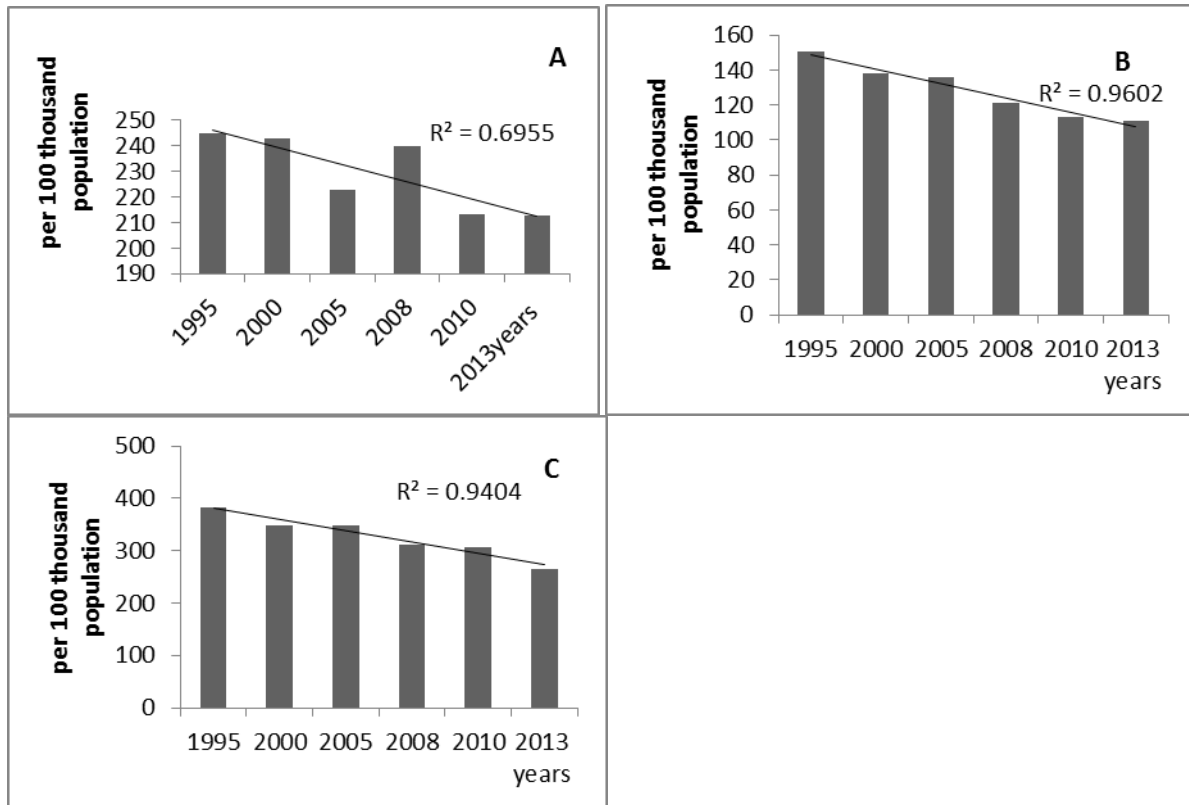
The Karelia National Project developed in Finland is a vivid example of fight oriented to the decrease of cardio-vascular diseases. The indices achieved by Finland are the target rates of mortality for the whole world, Europe, Russian Federation as a whole, and for the Republic of Tatarstan in particular. In 1972, the mortality rate due to ischemic heart disease in Finland was comparable to the mortality rate in Russia in 2012. To decrease the death rate from cardio-vascular diseases, a lifestyle change program (changes in nutritional/dietary pattern and smoking cessation) was elaborated. This program was addressed mainly to the working-age population, especially males. It was assumed that positive results could be achieved relatively quickly in this population segment, and it is this segment that has the greatest influence on changes in the lifestyle of the whole local community. At the next stage, particular attention was paid to children and youth, as well as to elderly people. It resulted in 5-fold decrease of ischemic heart disease mortality rate in the North Karelia and Finland during 22 years.

In 2012, noninfectious respiratory diseases produced 68% of all deaths as compared with 60% in the year 2000 in Finland. Average life expectancy is 74-76 years for males and 81-83years for females. All these facts can be confidently evaluated as a contribution of medical services of Finland as well. It is worthy of note that Finnish physicians consider the diseases of the cardio-vascular system to rank first, the diseases caused by alcohol consumption to rank second, and accidents and suicides to rank third among causes of death.

It is of interest that across Europe the death probability due to cardiovascular pathology is higher in females than in males: cardio-vascular diseases become the cause of 54% of deaths among females and only 43% among males; in EU countries – 45% and 38% correspondingly. In the Republic of Tatarstan, this index was 72.8% among rural females, 51.9% - among males, and 66.5% and 49.6%, correspondingly, among urban residents of the Republic [4].

Comparative analysis of the mortality rate among the adult female population of Finland for the period from 1990 to 2011 showed statistically significant decrease of the mortality rate (the value of the trend line approximation  $R^2 = 0.94$ ), in the Russian Federation – the mortality rate changed slightly ( $R^2 = 0.26$ ), whereas in the Republic of Tatarstan, it increased significantly  $R^2 = 0.88$ .

The study of mortality rate dynamics in the adult male population of Finland for the period from 1990 to 2011 showed that the significance of the linear trend approximation was  $R^2 = 0.8381$ , in the Russian Federation,  $R^2 = 0.2166$ , and in the Republic of Tatarstan,  $R^2 = 0.7642$  (Fig.2).



**Figure 2: Mortality among adult male population in the rural are of the RT according to classes of diseases for the period of 1995 -2013 (per 100 thousand corresponding population)**  
A - Neo, B - RD, C – injuries

**CONCLUSION**

Analysis of mortality rates in the Republic of Tatarstan in all classes of diseases in rural and urban areas showed the statistically significant decrease in recent years. The primary cause of the population mortality in the RT, as well as in the RF, is circulatory diseases, the percentage of which is from 51.9% of deaths in males and 72.8% in females in rural and 49.6% and 66.5% in urban areas, correspondingly. The analysis revealed gender differences in ranking of primary causes of mortality: in females, neoplasms rank second; injuries, poisoning and other consequences of external causes (urban area) and respiratory diseases in rural area rank third. In males, irrespective of the place of residence, injuries, poisoning and certain other consequences of external causes rank second; neoplasms - rank third. The dynamics of mortality rates of the female and male population in the Republic of Tatarstan surpasses these indices in Finland and in the Russian Federation.

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**REFERENCES**

[1] Life Table. Eurostat Database. 2012. Available from: <http://appsso.eurostat.ec.europa.eu/nui/show.do>

[2] Yumaguzin V.V., Vinnik M.V. Assessment of contribution of external causes of deaths to change of life expectancy in Russia in 1990-2010. *Social aspects of population health* [electronic scientific journal 2012. 28(6). <http://vestnik.mednet.ru/content/view/445/30/lang>,

- [3] Farrakhov A.Z. Mortality of population in the Republic of Tatarstan and key trends in formation of healthy lifestyle. 2008; .5: pp. 20-21.
- [4] Government Resolution of the RF No. 946 of 27.11.2010 On organization of the system of the Federal statistical observation of socio-demographic problems and monitoring of economic losses due to mortality, morbidity and disability of population in Russian Federation.
- [5] Kamalova F.M. Trends and mortality formation patterns on the regional level. Kazan Medical Journal. 2008: 5; 704-706.
- [6] Fomina S.F., Stepanova N.V., Svyatova N.V. Regional peculiarities of morbidity rate among population of the Republic of Tatarstan. Fundamental research. 2013; 12 (part 2): 350-355.
- [7] Oganov R.G., Maslennikova G.Ya. Demographic trends in Russian Federation: contribution of circulatory diseases Cardiovascular therapy. 2012; 11 (1): pp. 5-10.
- [8] Kamalova F.M., Valeeva E.R., Stepanova N.V. Modern trends of mortality among population in the Republic of Tatarstan. Gigiena i sanitariia 2015; 8: 17-20.Scopus
- [9] Valeeva E.R., Stepanova N.V., Kamalova F.M., Kauhanen Yu., Giniatullina R.R. Morbidity and mortality formation patterns due to malignant neoplasms among population in the Republic of Tatarstan. Gigiena i sanitariia. 2015; 9: 34-39. Scopus
- [10] Valeeva E.R., Stepanova N.V., Kamalova F.M., Kauhanen Yu., Giniatullina R.R. The regularities of development of cancer morbidity and mortality rate of the population in the republic of tatarstan and finland. Gigiena i sanitariia. 2015; 11 (94): 8-12 Scopus
- [11] Stepanova N.V., Valeeva E.R., Kamalova F.M., Kauhanen Yu., Giniatullina R.R. Regional Features of infectious diseases of the population in Tatarstan. Gigiena i sanitariia 2015; 8: 23-26. Sopus