

Demographic trends in the Russian Federation: the impact of cardiovascular disease

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Summary

Cardiovascular disease (CVD) is the leading cause of death in the Russian population followed by cancers and external causes. At the present time, CVD is responsible for 56.8% of all deaths in the Russian Federation. Over the past 30 years, trends in CVD mortality in Russia have undergone political, social and economic transformations characterized by rapid and sharp fluctuations in mortality rates, which were most pronounced in the working-age population. A similar situation occurred in mortality rates from external causes and, to a lesser extent, in mortality rates from cancers. Improvements in the economic situation and population prosperity since 2003 have led to improvements in living standards and quality of medical care. This has resulted in a steady reduction in CVD, external causes, and cancer mortality; and, an increase in life expectancy.

Keywords

Non-communicable disease, cardiovascular disease, cancers, external causes, mortality, life-expectancy.

From the beginning of the 20th Century non-communicable diseases (NCD) were the major cause of death in high- and medium-income countries. Today the same tendency is detected in many low-income countries. The leading NCDs include cardiovascular diseases (CVD), malignant neoplasms, and respiratory tract diseases. These are followed by infectious diseases, maternal and perinatal mortality, and diseases of malnutrition. The third position involves external causes (traumas, intoxication, accidents) [1].

Fifty seven million deaths were registered in 2008, of which 36.1 million (63.1%) died of NCD. Seventy eight percent (n=28.2 million) of deaths, associated with NCD, happened in medium- and low-income countries [2].

NCD (CVD, malignant neoplasms and external causes) are also in the top position of total mortality in the Russian Federation. CVD (n=1,137,000; 56.8% of all deaths), malignant neoplasms (n=295,000; 14.7%) and external causes (n=225,000; 11.2%) lead

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Table 1. Mortality associated with major NCD and external causes in 2009

Age	Men						Women					
	All-causes (Total mortality)	DCS			Malignant neoplasms	External causes	All causes (total mortality)	DCS			Malignant neoplasms	External causes
		Total	IHD	CerVD				Total	IHD	CerVD		
Quantity	1.42 mln.	513.5 thous.	156.9 thous.	143.8 thous.	156.9 thous.	173.1 thous.	962 thous.	623.1 thous.	306.2 thous.	228.7 thous.	136.7 thous.	51.5 thous.
Per 100,000 people European Standard	1769.2	921.8	268.0	267.8	268.0	246.3	869.9	524.5	265.4	189.5	133.9	59.3
Per 100,000 people New World Standard	1414.5	704.8	205.7	202.3	205.7	225.7	677.0	391.8	189.8	140.9	104.8	54.2
Age	Men						Women					
	All causes (total mortality)	DCS			Malignant neoplasms	External causes	All causes (total mortality)	DCS			Malignant neoplasms	External causes
		Total	IHD	CerVD				Total	IHD	CerVD		
Quantity	529 thous.	198.8 thous.	106.9 thous.	40.2 thous.	72.7 thous	132.6 thous.	209 thous.	75.0 thous.	32.1 thous.	22.1 thous.	52.6 thous.	31.2 thous.
Per 100,000 people European Standard	1477.0	573.3	330.2	118.6	212.7	350.5	483.5	173.0	79.2	51.0	120.6	72.9
Per 100,000 people New World Standard	1340.0	496.6	265.2	100.8	180.0	344.9	435.3	149.1	62.4	43.3	105.3	71.3

Note: DCS (ICD* — 11:115-147), IHD (ICD 11:121-129), CerVD (ICD — 11:133-141), malignant neoplasms (ICD — 11:56-89), external causes (ICD — 11:239-274).

* The International Classification of Diseases

to 83% of total mortality in 2009. This value among men was 81% and among women — 84% [Table 1] [3]. Ischemic heart disease (IHD) and cerebrovascular disease (CerVD) are the major contributive factors to death from CVD; mortality from IHD and CVD is equal to 82.3% of all deaths among women and to 85.8% of all deaths among men. It must be noted, that absolute death cases, associated with all forms of CVD, is

higher among men, than among women. The same tendency is detected during separate evaluation of IHD and CerVD contribution to mortality.

Mortality in the most active working age (25–64 years) contributed to 36.8% of total mortality in population: 24% of people died from CVD, 43% — from malignant neoplasms, 73% — from external causes. Analogous values among men were 39%, 46% and

Table 2. Trend of mortality associated with major NCD and external causes among male population (age 25–64 years) of the Russian Federation, 1980–2009

Causes of death	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Total	1401.9	1374.1	1338.9	1353.1	1402.8	1290.7	1086.3	1083.0	1103.7	1167.8
DCS	467.9	453.1	449.9	460.6	481.0	453.1	404.0	409.8	406.3	418.9
Malignant neoplasms	265.7	266.2	270.8	272.1	274.7	276.4	278.6	280.0	284.7	284.6
External causes	417.9	413.2	390.4	387.4	404.1	333.8	231.1	226.9	250.3	296.6
Causes of death	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Total	1228.6	1251.3	1416.7	1804.8	2052.7	1921.8	1718.5	1548.0	1497.1	1673.4
DCS	442.5	445.0	489.6	634.9	751.6	687.6	619.9	562.6	547.6	618.4
Malignant neoplasms	288.1	287.4	286.8	293.6	291.8	280.3	266.8	258.1	253.7	254.9
External causes	320.5	342.1	435.0	588.3	656.5	574.2	499.5	436.7	429.1	467.5
Causes of death	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total	1806.2	1862.0	1939.3	1981.7	1932.7	1941.0	1728.4	1598.2	1572.3	1477.0
DCS	657.8	701.0	745.4	773.0	756.7	762.8	673.7	614.8	610.6	573.3
Malignant neoplasms	252.6	242.8	238.5	233.1	229.6	224.5	217.2	213.7	212.5	212.7
External causes	511.1	535.0	550.9	545.6	529.7	512.7	450.5	411.1	385.4	350.5

Note: Mortality was calculated per 100,000 people of defined age group and standardized in accordance with European standard

Table 3. **Trend of mortality associated with major NCD and external causes among female population (age 25–64 years) of the Russian Federation, 1980–2009**

Causes of death	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Total	480.7	470.3	459.0	469.6	481.7	463.2	410.1	403.8	403.4	409.6
DCS	183.9	178.7	174.4	181.3	189.3	182.0	161.3	159.3	156.2	155.8
Malignant neoplasms	132.0	131.7	132.5	133.7	131.4	131.4	131.7	131.2	130.5	130.8
External causes	85.0	80.9	78.2	79.0	82.6	73.1	52.3	49.8	52.6	58.5
Causes of death	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Total	421.6	428.6	466.0	571.5	641.8	604.9	550.4	509.6	490.5	535.0
DCS	159.8	162.2	176.0	224.2	258.4	236.5	215.6	198.4	189.4	210.0
Malignant neoplasms	131.7	131.9	132.7	133.6	137.3	134.7	132.1	130.9	129.4	131.8
External causes	63.0	66.5	84.6	119.7	134.8	118.7	102.9	90.7	88.2	98.3
Causes of death	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Total	564.0	585.6	611.2	625.1	610.5	610.8	552.9	512.0	506.5	483.5
DCS	224.4	233.6	245.2	252.1	240.7	241.9	212.7	187.9	187.3	173.0
Malignant neoplasms	129.6	129.1	126.7	126.4	126.7	123.4	121.3	121.1	120.7	120.6
External causes	104.2	110.5	115.7	115.2	111.9	105.3	93.7	83.9	78.3	72.9

Note: Mortality was calculated per 100,000 people of defined age group and standardized in accordance with European standard

77% and among women — 12%, 38% and 61%, respectively. The total mortality structure of 25–64-year old population has the following view: CVD contribute to 37.6%, malignant neoplasms — to 13.7%, external causes — to 25% of all death cases among men; values among women are equal to 35.9%, 25% and 14.9%, respectively. In this age group, the total contribution of IHD and CerVD mortality from CVD in men was 74%, in women — 72%.

Table 2 (men) and Table 3 (women) show mortality trend in the most active working age population from CVD, malignant neoplasms and external causes during last three decades (1980–2009) [4]. It was shown earlier that the period of political, social and economic transformations in Russia was characterized by rapid and sharp increase and decrease of mortality, which were the most pronounced in working-age population [5–7]. Comparative analysis of mortality rates can be divided into 3 periods: the first one (1980–1989) — period of relative political and economic stability, the second (1990–1999) — period of political and economic transformations (dissolution of the USSR, reforms, economic crisis) and the third (2000–2009) — period of adaptation to new political and economic transformations (reforms). It must be noted that during all thirty years total mortality and mortality from CVD and malignant neoplasms among men were 2–3 times higher and from external causes — 3–4 times higher than among women. Odds of total mortality, CVD and external causes' mortality had a mild trend to decrease in the first period, but such minimal values of mortality were not attained during two subsequent periods. There was a slight increase of mortality from malignant neoplasms among men at the end of the first period;

values of mortality among women were stable during all the first period. The first half of the second period (1990–1994) was characterized by sharp increase of mortality among men as well as among women: total mortality increased on 67% and 52%, CVD mortality — on 70% and 62%, mortality from external causes — more than 2 times, respectively. Mortality from malignant neoplasms among men and women was almost stable during all second period. At the second half of the second period (1994–1999) there was detected a gradual decline of mortality (total mortality, CVD mortality and mortality from external causes) among men and women. Nevertheless mortality remained higher than in the beginning of transformation period. A decrease in mortality from malignant neoplasms was detected among men in the second half of the second period; almost no changes were visualized among women. The third period (2000–2009) can be also divided into two intervals: the interval of increase in total, CVD and mortality from external causes (2000–2003); and the interval of slight (after 2003 year) and then (from the beginning of the 2006 year) more prominent decrease of total, CVD and mortality from external causes among men and women. In spite of mortality decrease it must be noted, that by 2009 values of total, CVD and mortality from external causes among men as well as women were higher than in 1989. At the same time there was detected a reduction of mortality from malignancies among men and women during all follow-up period.

Population dynamics repeats the trends in mortality in the country. The first period of relevant political and economic stability was characterized by the 5 million increase of the male population (from 64 million

Table 4. Dynamics of the male population of the Russian Federation in 1980 to 2009

Age groups (years)	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
0–4	5,421	5,464	5,536	5,667	5,808	5,913	6,024	6,135	6,157	6,058
5–14	9,809	9,920	10,072	10,248	10,419	10,569	10,699	10,833	11,027	11,233
25–64	32,252	32,869	33,527	34,191	34,858	35,553	36,252	36,894	37,410	37,770
≥65+	3,813	3,797	3,745	3,722	3,708	3,656	3,619	3,617	3,657	3,769
0 – ≥85	63,813	64,231	64,700	65,246	65,807	66,359	67,003	67,720	68,391	68,904
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
0–4	5,877	5,407	5,214	4,766	4,370	4,048	3,765	3,550	3,431	3,310
5–14	11,397	11,655	11,747	11,901	11,950	11,957	11,814	11,538	11,097	10,490
25–64	37,985	37,943	37,866	37,620	37,420	37,299	37,226	37,248	37,364	37,332
≥65	3,947	4,343	4,502	4,827	5,107	5,336	5,512	5,646	5,712	5,687
0 – ≥85	69,266	69,522	69,565	69,530	69,455	69,388	69,159	68,926	68,717	68,051
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
0–4	3,232	3,238	3,239	3,298	3,400	3,566	3,659	3,767	3,888	4,018
5–14	9,986	9,492	8,832	8,328	7,801	7,468	7,124	6,911	6,848	6,870
25–64	37,358	37,373	36,951	36,732	36,517	36,621	36,645	36,912	37,456	38,085
≥65	5,708	5,816	5,959	6,106	6,250	6,370	6,404	6,330	6,110	5,848
0 – ≥85	67,678	67,533	67,114	66,720	66,267	66,383	66,006	65,783	65,679	65,641

people to 69 million people due to child and working age population (Table 4). Distinguishing feature of two subsequent decades (1990–2009) was a decrease of male population size by 3.5 million people; male population size was equal to 65 million people in 2009. Total decrease was mainly associated with decrease of child population: at the age of 0–4 years — by 2 million people (34%), at the age of 5–14 years — by 4,364 million people (40%).

It must be noted, that the decrease of male population (early childhood — 0–4 years) was registered until 2003, when a gradual increase of child population started. At the same time this period was characterized by a growth of aged population (≥65 years) by 2 million people, while the working age population almost did not change. Population dynamics among

women was similar to population dynamics among men. Female population growth by 4 million people (from 74,671 million to 78,426 million) was detected in 1980–1989. It was driven by an increase of child and working age population (Table 5). Two subsequent decades of transformations and adaptation to transformations were characterized by a decrease of female population due to decrease of child population at the age of 0–4 years (by 2 million people; 35%) and at the age of 5–14 years (by 4,364 million people; 40%). Female population was estimated as 76,269 million people in 2009. The decrease of female population at the age of 0–4 years also continued until 2003. Then gradual growth of this age grade population was detected. It should be pointed out that this period was also characterized by an increase of female population

Table 5. Dynamics of the female population of the Russian Federation in 1980 to 2009

Age groups	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
0–4	5,242	5,278	5,342	5,463	5,600	5,703	5,812	5,918	5,933	5,828
5–14	9,508	9,601	9,734	9,893	10,061	10,226	10,370	10,509	10,700	10,899
25–64	37,610	38,072	38,634	39,170	39,663	40,209	40,749	41,169	41,411	41,471
≥65	10,327	10,356	10,290	10,279	10,286	10,222	10,186	10,223	10,341	10,577
0 – ≥85	74,671	74,990	75,364	75,810	76,253	76,672	77,155	77,664	78,103	78,426
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
0–4	5,639	5,169	4,978	4,535	4,147	3,839	3,573	3,370	3,259	3,142
5–14	11,050	11,290	11,376	11,511	11,563	11,519	11,362	11,081	10,638	10,037
25–64	41,418	41,146	41,022	40,746	40,506	40,343	40,278	40,309	40,447	40,460
≥65	10,892	11,407	11,580	11,894	12,146	12,363	12,523	12,626	12,649	12,522
0 – ≥85	78,649	78,756	78,748	78,619	78,488	78,386	78,214	78,012	77,816	77,118
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
0–4	3,063	3,066	3,080	3,135	3,228	3,386	3,471	3,569	3,682	3,806
5–14	9,543	9,063	8,447	7,960	7,450	7,138	6,809	6,605	6,540	6,553
25–64	40,615	40,794	40,945	40,776	40,594	40,786	40,872	41,214	41,897	42,690
≥65	12,481	12,592	12,692	12,919	13,178	13,410	13,510	13,441	13,134	12,746
0 – ≥85	76,822	76,853	76,996	76,733	76,423	76,731	76,481	76,332	76,277	76,269

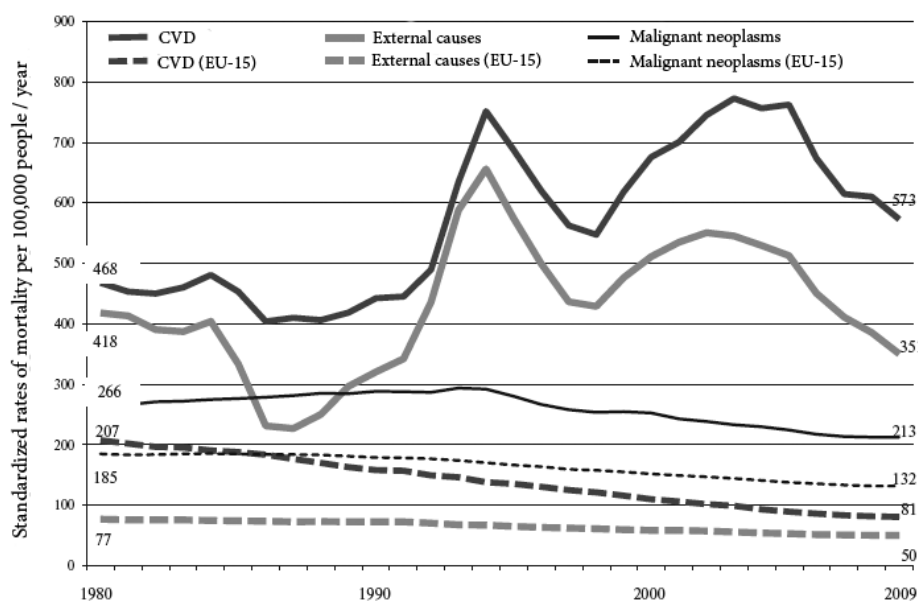


Figure 1. Trend in mortality from major NCDs and external causes among male population of the Russian Federation and 15 European countries (EU-15) in 1980–2009. Age — 25–64 years

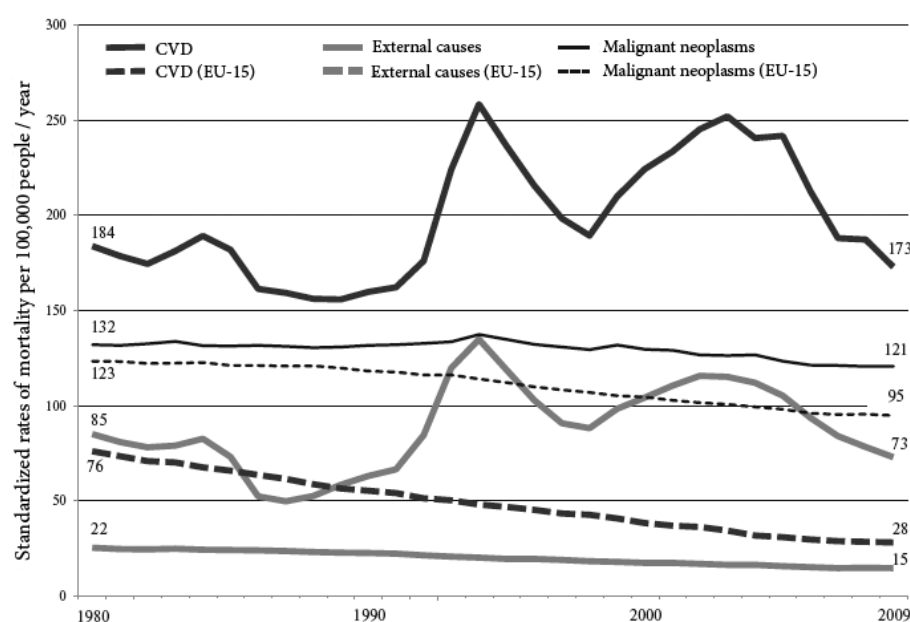


Figure 2. Trend in mortality from major NCDs and external causes among female population of the Russian Federation and 15 European countries in 1980–2009. Age — 25–64 years

at the age of ≥ 65 years by 2.2 million people and of female working age population by 1.2 million people, which did not match with the demographic situation among men.

The present demographic situation in Russia stems from not only low birth rate, but also from high rates of premature death from NCD (mainly from CVD) among working age population. In the face of above mentioned information it is supposed that demographic situation can be improved by realization of effective, long term national programs aimed at birth rate escalation as well as reduction of NCD incidence (mainly CVD incidence). Primary prevention must be a priority, as improvement of diagnostic and treatment measures alone can only lead to an increase in CVD prevalence due to advances in disease detection. Improvement of diagnosis and treatment of increasing number of

patients will only lead to raising expenditures on healthcare.

Early publications have shown that in spite of existing similar mortality structure in Russia and other economically developed countries, including European countries, U.S. and Japan, standardized rates of mortality associated with NCD and external causes are different, especially when comparing working age population [6,7]. Mortality trends in Russia and economically developed countries are also different. Thus during mentioned 30-year period scientists detected gradual decrease of mortality, associated with CVD, external causes and malignancies, among working age male (Figure 1) and female (Figure 2) population of 15 economically developed countries, which entered European Union (EU-15). At the same time mortality from CVD and external causes was characterized by marked rises and falls in Russia, especially during the

Table 6. **The dynamics of life expectancy at birth in the population of the Russian Federation, and 15 European countries (EU-15), 1980 to 2009**

Sex	1980		1990		2000		2009	
	Russia	EU-15	Russia	EU-15	Russia	EU-15	Russia	EU-15*
Male	61.5	70.6	63.3	73.1	58.4	75.8	61.8	77.2
Female	73.1	77.3	73.9	79.8	71.9	81.8	74.2	82.6

Note: *Information was obtained in 2008. The economic and fiscal consequences of ageing, with special focus on health and long term care. Bartosz Przywara European Commission, DG ECFIN Ageing and Haemophilia-EHC Roundtable of Stakeholders. Brussels, 23 February 2010. Sources: <http://www.demographic-research.org/volumes/Vol.20/8/doi:10.4054/DemRes.2009.20.8>.

period of political and economic transformations. As a result, differences in mortality of working age (26–54 years) male and female population became more pronounced between the Russian Federation and EU-15, when comparing data obtained in 1980 and in 2009. Differences in mortality from CVD and external causes among male population are characterized by 2–7-fold and 5–7-fold increase (Figure 1) and among female population — by 2–6-fold and 4–5-fold increase (Figure 2), respectively.

Mortality trends reflect changes of population size as well as life expectancy (LE). Table 6 reflects the LE dynamics among male and female population of Russian Federation and EU-15 during 30-year period. The first period (1989–1990) was characterized by an increase of LE among male and female population of the Russian Federation. Then there was a marked decrease of LE (by 5 years among men and by 2 years among women) in the second period (1990–2000). The third period was marked by an increase of LE by 3.4 years among male population and by 2.3 years among female population. Nevertheless male LE had not yet reached the level in 1990, when political and economic transformations happened. LE in EU-15 on the contrary was characterized by a constant increase during the observation period. It reached 77.2 years for male population and 82.6 years for female population in 2009 and exceeded comparable values, determined in 1980, by 6.6 years among men and by 5.3 years among women. As a result marked differences in LE formed between the Russian Federation and EU-15 during a 30-year period. LE dissemblance elevated from 9.1 in 1980 to 15.4 in 2009 between male populations and from 4.2 to 8.4 years between female populations, respectively.

Conclusion

In the beginning of the 21st Century NCD, mainly CVD, remain the major cause of death in high- and medium-income countries. The same situation is observed in Russia, where CVD is the leading cause of mortality. Nevertheless mortality trends and standardized values per 100,000 people in Russia differ

from analogous values in economically developed countries, including countries of Western Europe. It is generally recognized nowadays that high prevalence of CVD is associated with living habits and risk factors, including smoking, unhealthy diet, low physical activity, alcohol consumption. These factors contribute to high prevalence of hypertension, hypercholesterolemia, diabetes mellitus and obesity in population, which in turn promote the development and progression of main forms of CVD. Marked fluctuations of mortality from CVD and external causes in the period of social and economic transformations in Russia were probably associated with psychosocial factors, because no increase of other risk factors was detected during that period. There were distinguished seven major risk factors of premature mortality in the Russian Federation: high blood pressure (BP) (35.5%), hypercholesterolemia (23%), smoking (17.1%), unhealthy diet, including the lack of fruit and vegetable consumption (12.9%), obesity (12.5%), alcohol abuse (11.9%) and low physical activity (9%) [8]. These risk factors are also the main cause of physical disability among working age population: alcohol abuse (16.5%), high BP (16.3%), smoking (13.4%), hypercholesterolemia (12.3%), obesity (8.5%), unhealthy diet, including the lack of fruit and vegetable consumption (7.9%), low physical activity (4.6%) [8].

Taking the above mentioned into consideration it must be noted that preventive measures should be aimed primarily on improvement of lifestyle and lowering of relevant risk factors prevalence. Scientists from different countries have detected, that this measures can result in 44–60% reduction of CVD-associated mortality [9]. Contribution of treatment in the reduction of mortality, associated with CVD, is also high (23–47%), so improvement of treatment quality must be taken into account. Constant mortality reduction, LE increase and population growth in foreign countries is a result of growth in prosperity as well as implementation of primary and secondary preventive measures that lead to reduction of risk factors prevalence and enhancement of treatment efficiency [9,10]. In accordance with the one of the first

analysis of CVD mortality in the Russian Federation, «a sustained reduction of CVD-associated mortality is unachievable until improvement of economic situation and population prosperity» [5]. Improvements of economic situation and population prosperity were registered in the end of 2003. They certainly had an impact on lifestyle and quality of medical care, so further reduction of CVD-associated mortality and increase of LE is expected.

Conflict of interest: None declared

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