LA POPULATION DES BALKANS
À L'AUBE DU XXIÈME SIÈCLE

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AT THE DAWN OF THE 21ST CENTURY

Fifth International Conference of the Balkans demography

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THE POPULATION OF THE BALKANS AT THE DAWN OF THE 21ST CENTURY

RECENT CHANGES IN THE MORTALITY IN SERBIA

Biljana RADIVOJEVIĆ, Ivan MARINKOVIĆ
University of Belgrade, the Faculty of Economics, Serbia
Institute of Social Sciences, Demographic Research Center, Belgrade, Serbia

Abstract

The paper deals with the mortality of population in Serbia since the beginning of the 21st century. The analysis is based on the observed long-term trends, but focuses on the most recent period. The aim of the analysis is to draw attention to the recent changes in the level and structure of mortality and highlight the most important issues and challenges to further reduce mortality and extend life expectancy.

The crude death rate in Serbia is about 14 per 1000. Compared with the former Yugoslav republics, the death rate is the highest in Serbia. The main reason for high death rate in Serbia is unfavourable age structure, i.e. intensified aging of the population in recent decades. In the period from 1950 to 2014, positive results were achieved in reducing mortality by age. The changes were intense in the initial period, followed by a slowdown, and then stagnation in the last decade of the 20th century. In the beginning of the 21st century mortality by age began to go down again. The greatest decrease in the most recent period (2001-2014) recorded in children and youth, moderate in the middle-aged, while it is significantly less in the people over 60 (particularly in those 80 or more). Nevertheless age-specific mortality rates in Serbia are from 2 up to 3 times higher than those of the most developed European countries.

According to the data from 2012, life expectancy for the male in Serbia was 72.2 years, and for the female 77.3 years. Compared to the 2002, the increase in life expectancy was relatively small, in men by 2.6 years and in women by 2.3 years. The changes in the mortality of the population over 65 had a more significant contribution to the increase in length of life in terms of percentage. In men, the contribution was over 31% and in women about 50%. Increasing the share of deaths from chronic non-communicable diseases in the overall population mortality, especially cardiovascular diseases and cancers indicates they are the key issues for further improvement of the general mortality conditions in the country. A growing share of aged population (over 60) and the expressed feminisation of the elderly represent a major challenge for the changes necessary in the functioning of health care. The old and older middle-aged men are identified as the most vulnerable categories of the population.

Keywords: mortality trends, differential mortality, life expectancy, causes of death, Serbia.

Introduction

The current level of mortality of population in Serbia is the result of long-term changes in its trends. The changes have been positive and meant declining mortality rates and especially the elimination of unnecessary deaths. The achieved level and structure of mortality reflects the complex relationship between the individual, biological factors and their action on one hand and living conditions over time, through the influence of numerous factors of socio-economic nature, on the other.

This paper deals with the mortality of population in Serbia since the beginning of the 21st century. The analysis is based on the observed long-term trends, but focuses on the most recent period. The aim is to draw attention to the recent changes in the level and structure of mortality and highlight the most important issues and challenges to further reduce mortality and extend life expectancy.

Mortality of the population in Serbia is relatively low. However, it is still unfavourable in comparison with countries that have a low mortality rate and high level of life expectancy. Challenges for more significant efforts of the state to improve the health infrastructure necessary for better disease diagnosis and prevention and in particular the risk factors for their occurrence, are very much inspired by the impressive results in this field in the majority of developed countries.

In the period from 1950 to 2014, positive results were achieved in reducing mortality. The changes were intense in the initial period, followed by a slowdown. In the last decade of the 20th century a number of negative factors had a negative impact on mortality, but also the overall demographic development of population in Serbia. The impoverishment of the population and the decline in living standards, with problems in the functioning of the health care system, affected the health of the entire population. As in most Eastern European countries, this has led to widening disparities in relation to the most developed countries, where the mortality rate declined steadily from the mid-20th century (Radivojević, 2005). It must be pointed out though, that compared to other countries in transition, especially former Soviet republics, adverse trends in mortality in Serbia have been relatively shorter and less intense, and can be generally described as moderate (Penev, 2003).

General mortality

At the beginning of the 21st century, the number of deaths at the annual level in Serbia[1] has amounted to just over 100 thousand (101-106 thousand). Compared with data half a century ago (in the 1960s), when the average annual number of deaths was

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[1] Research in the territory of Serbia will be limited to the region of central Serbia and Vojvodina.

around 60 thousand, the number of deaths has increased over 60%. The structure of deaths by age has also changed significantly during this period. In the early sixties children under 5 years of age accounted for over 14% of total mortality, and now with less than half a percent. People over 60 now account for over 85% of all deaths, while fifty years ago their share was 61%. The current percentage of the share of the youngest and the elderly in the total number of deaths in Serbia fully correspond to the percentages reported in the most developed regions of the world (UN, 2012).

The crude death rate in Serbia is about 14 per 1000 (in 2014 it was 14.2 per 1000). Compared to the former Yugoslav republics, the death rate is the highest in Serbia, followed by Croatia (12.0 per 1000), Montenegro (9.7 per 1000), Macedonia (9.5 per 1000), Slovenia (9.2 per 1000) and Bosnia and Herzegovina (9.1 per 1000). Of the countries in the immediate surroundings Albania is in the most favourable position by the crude death rate (7.1 per 1000) and in the most unfavourable is Bulgaria (15.1 per 1000). According to the data for 2014[2], Bulgaria has the highest mortality rate in Europe, followed by Ukraine (14.6 per 1000) and Latvia (14.3 per 1000).

The reason for the relatively high number of deaths in Serbia is, above all, the unfavourable age structure, i.e. intensified aging of the population in recent decades. According to the 2011 census data the average age of population in Serbia was 42.2 years and the ageing index was 1.25[3]. The population of Serbia was demographically the youngest in the 1960s, and the strong relationship between mortality and reached demographic age of population caused the lowest rates of mortality in that period (Table 1).

Table 1. Standardised crude death rate of population in Serbia at the time of the 1953, 1961, 1971, 1981, 1991, 2002 and 2011population censuses (standard population in 1971)

	1953	1961	1971	1981	1991	2002	2011
Crude death rate	11,0	8,7	**9,1**	10,1	12,1	14,1	14,2
Standardized mortality rates	12,6	9,9	**9,1**	8,6	8,4	8,5	7,1

Source: Calculation based on data from the Statistical Office of the Republic of Serbia (SORS).

The difference in realised and hypothetical rates shows the importance of population ageing for the general mortality. The continued decline in the value of standardised rates indicates that mortality rates by age declined, and that the main cause of increase in the general mortality lies in the population ageing. Decomposition of differences between the crude death rates in 1960 and 2014 confirms the huge impact of changes in the age structure on the growth of mortality rate. The analysis was done for each sex separately (Preston, SH et al., 2006). In men, the crude death rate in that period

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[2] The data are taken from the Eurostat database.
[3] Elderly (60 and over) / young (under 20)

increased from 9.4 per 1000 to 14.7 per 1000. The difference of -5.3 per 1000 is the result of simultaneous action of two opposing influences. The age structures whose negative changes affected the increase in mortality rates by -9.1 per 1000, and on the other hand in age-specific mortality, which declined almost continuously and contributed to the reduction in mortality by +3.8 per 1000. In women, the rate increased from 9.2 per 1000 to 13.7 per 1000. The difference of -4.5 per 1000 is the consequence of the negative impact of the age structure of -9.9 per 1000 and positive changes in age-specific mortality of + 5.4 per 1000. Proportionately, in both men and women, the greater influence on the general mortality was achieved by age structure. Age-specific mortality decreased, which had a positive effect on the general mortality, but its impact was more than twice neutralised by changes in the age structure. This calculation gives similar results for the most recent period (2001-2014), which is a short period for this type of analysis. Changes in the age structure have a higher impact on the increase in crude death rates than changes in age-specific mortality. However, proportionally their impacts are more approximate than in the case of the entire period (1960-2014), as expected.

There are regional differences in the level of general mortality in Serbia. The Belgrade region, otherwise the most developed in the country, based on data for 2014, has lower mortality rate than the national mortality rate by almost two per mille points (12.4 per 1000). Vojvodina and Šumadija and Western Serbia have significantly higher rates (14.3 per 1000), while the highest rate is in the region of Southern and Eastern Serbia (15.9 per 1000).

Map 1. Crude death rate in Serbia (municipal level) in 2014
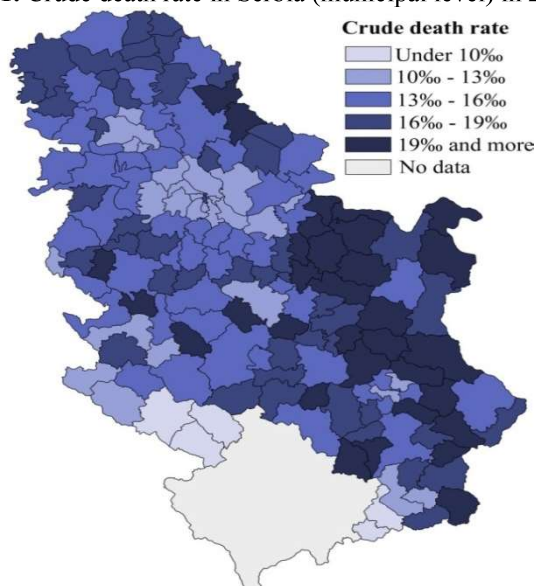
Source: Map based on data from the Statistical Office of the Republic of Serbia (SORS).

More precise spatial analysis of general mortality is evident at the municipal level (Map 1). Only five municipalities (with a majority Bosniak/Muslim and Albanian population) in Serbia have crude death rates below 10 per 1000. Municipalities that constitute or gravitate towards Belgrade and Novi Sad have relatively low rates (10-12 per 1000). The most disadvantaged municipalities are those in the eastern part of the country where mortality rates exceed 19 per 1000 (a total of 32 municipalities). The highest crude death rate in Serbia is in the municipality of Crna Trava, as much as 35.4 per 1000.

Mortality by age and sex

From the mid-20th century, the biggest decline in mortality in Serbia, seen by age groups, has been recorded in infants and children up to the age of five. The rates that were then among the highest in Europe[4] have been lowered in a relatively short time (around two decades) to a third. At the beginning of the 21st century, infant mortality rates are about 6‰. According to the data for 2014, the infant mortality rate was 5.7 deaths per 1000 live births. In the most developed countries of the world, the infant mortality rate is halved (NCHS, 2014). A major reduction in mortality was also observed among children in the age group 1-4 years, where the rates have been reduced by 30 times since the mid last century. The middle-aged and old population had more unfavourable mortality tendencies than young population. In the longer term mortality rates by age and sex were going down until the 1990s, when they stagnated, and in the beginning of the 21st century began to go down again.

The most recent period (2001-2014) shows lower age-specific mortality rates in all age groups. The greatest decrease is in children and youth, the moderate in the middle-aged, while it is significantly less in the people over 60 (particularly in those 80 or more). In children 0-9 years of age rates are twice lower, with the age group of 10-39 the rates are reduced by 30%, and with the age group of 39-59 the rate reduction is around 20-25%. The same percentage of decrease is recorded for the age group of 60-79, while the oldest population (over 80) has the least improvement, the rates are reduced by only 10%. The reduction of mortality rate by age is recorded in both men and women, but the reduction intensity is different. Female population has a relatively smaller decrease in mortality rates than male population for all ages up to 55 years of age. The difference is especially pronounced in children under five years of age, where the rate among girls is decreased by 31% and among boys by 59%. In the elderly, mortality rates have decreased more among women than men (graph. 1 and 2). For

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[4] In the early 1950s, infant mortality rates in Serbia (without Kosovo and Metohija) were about 100 per 1.000. The countries of Western and Northern Europe in the period 1950-1954 had a mortality rate of 20-25 per 1.000 of children under the age of one, or five times lower than in Serbia. For example, such high rates in Sweden were recorded in the period 1885-1889. (Source: Human Mortality Database).
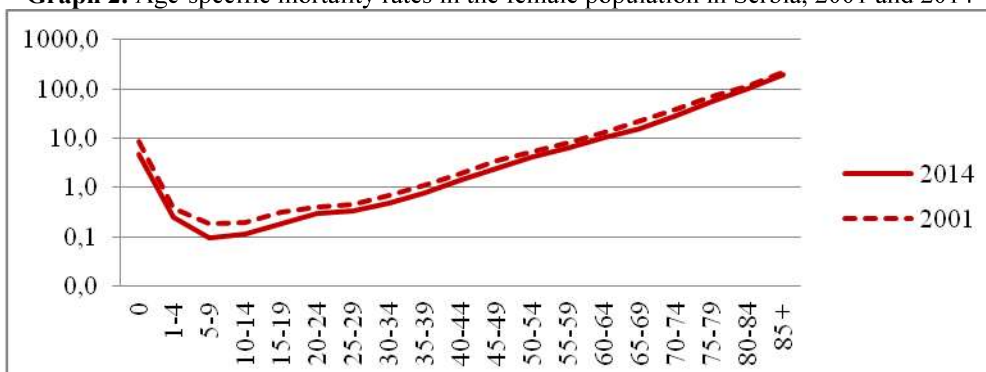
example, in the age group of 65-74 rates are by 30% lower in women, while in men by about 20%.

Graph 1. Age-specific mortality rates in the male population in Serbia, 2001 and 2014
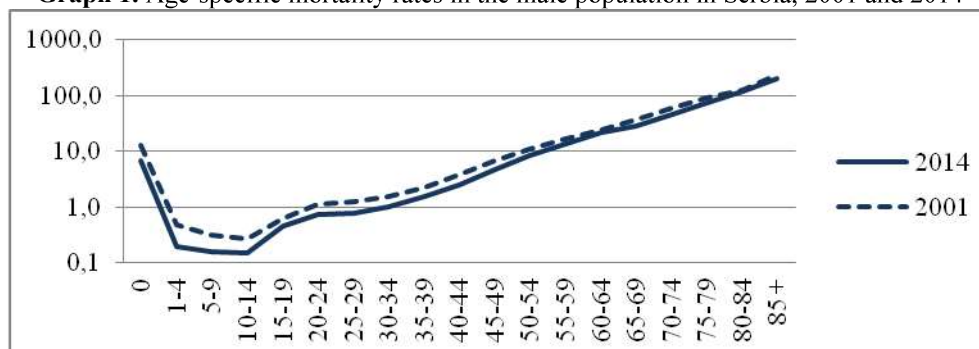
Source: Graph based on data from the Statistical Office of the Republic of Serbia (SORS).

Graph 2. Age-specific mortality rates in the female population in Serbia, 2001 and 2014

Source: Graph based on data from the Statistical Office of the Republic of Serbia (SORS).

Men have higher death rates in all age groups (except for the elderly 85 and over, where the rates are approximately the same). As mortality rates increase with age (which is biologically determined), men are more vulnerable due to higher average mortality rates. Lower mortality rates among female population mean longer life expectancy, which in addition to long-term decline in fertility and its low level means a numerical dominance of female population, especially in older contingents.

The greatest differences in mortality rates between men and women occur mainly in younger middle-aged population. According to the data for 2001, the difference is the biggest in the age group of 20-24 (m_m/m_f=2.85) and 25-29 (m_m/m_f=2.65). It is similar in 2014, although the biggest difference has shifted to the younger age group, 15-19 (m_m/m_f=2.43), and then the group of 20-24 (m_m/m_f=2.40). The causes of higher mortality of male population are primarily associated with the effect of socio-

economic factors. These factors are numerous, and over in difference in behaviour between the sexes seems to have a decisive influence. It is exactly confirmed by the mentioned age groups which record the greatest difference in mortality between men and women.

Age-specific mortality rates in Serbia are from 2 up to 3 times higher than those of the most developed European countries. Sweden can be taken as a good example for the approximation of the desired model of mortality by age. Comparison (based on data for 2011) between the two countries shows that the highest relative difference in mortality is with the youngest (Fig.3). Infant mortality rates are three times lower in Sweden. In other words, potentially 300 more children would annually reach the first year of life if Serbia hypothetically assumed infant mortality rates present in Sweden. The big difference in age-specific mortality rates among the countries is also in the age group of 35-79, where the rates are 2 times lower in Sweden (mostly with the age group of 45-54 over 2.5 times). Broken down by sex, it should be noted that men in Serbia (2011) aged 45-74 have higher rates of mortality than their counterparts in Sweden 60 years ago (Marinković, Radivojević, 2015). An example of the insufficiently intense reduction of mortality by age is the fact that in Slovenia in mid-20th century specific mortality rates were at approximately the same level as in Serbia at that time, and today, the difference between Slovenia and Sweden is only seen in the oldest population (over 80). Illustratively, Serbia and Sweden can also be compared on the basis of indicators of potential years of life lost, as an indicator of "premature mortality" (PYLL). According to data for 2009 women in Serbia lose 2 times more, and men 2.7 times more years of life than their peers in Sweden (under 70 years of age) (Marinković, 2012a).

Although the descending tendency is expressed in death rates by age in Serbia, their current level leaves room for further reduction. Further reduction of specific mortality by age would not only make positive effect on the level of natural growth in Serbia but also on the increase in life expectancy. Natural growth has been negative for more than two decades and is the main cause of depopulation in Serbia. Hypothetically, if there was a significant reduction of mortality by age, at the level present in Sweden, the impact on the population dynamics would be significant. The reduction in mortality would alleviate depopulation, which would be restored to the current level in two decades time. This would leave sufficient time for the population measures to impact the current level of births and the net migration (Marinković, Radivojević, 2015).

Graph 3. Age-specific mortality rates of population in Serbia and Sweden, 2011

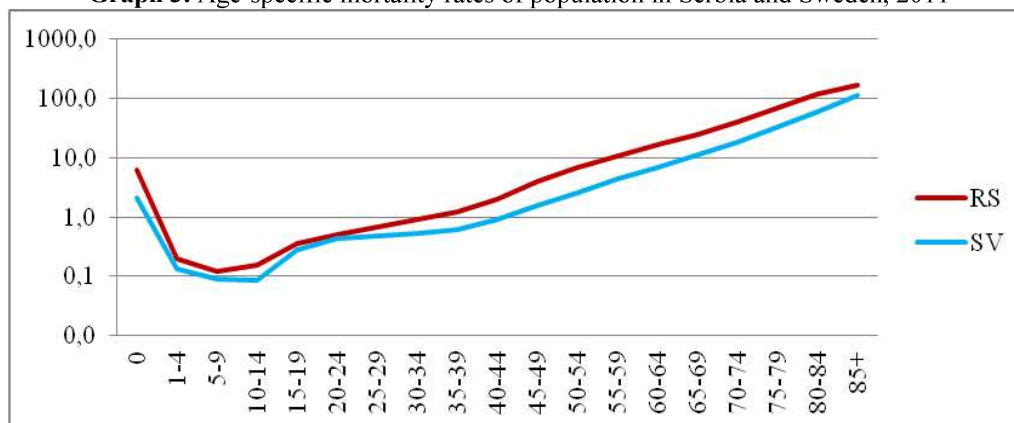*Source:* Graph based on data from the Statistical Office of the Republic of Serbia (SORS) and Statistics Sweden.

Life expectancy

In the second half of the 20th century Serbia recorded a significant increase in life expectancy. The increase was the highest in the initial period, after which it was slower, and there were periods of stagnation and even of a reduction in life expectancy in some periods. The most recent period (2002-2012) shows a relatively small increase, in men by 2.6 years and in women by 2.3 years. According to the data from 2012, life expectancy for male in Serbia was 72.2 years, and for female 77.3 years.

Of the countries bordering with Serbia or the former Yugoslav republics, the longest life expectancy at birth (for both sexes) is in Slovenia (Tab. 2). In the Balkans, the longest life span is in Greece. In the surrounding countries, only women in Macedonia live on average shorter (76.9) than women in Serbia. Shorter life expectancy than men in Serbia is that of men in Bulgaria, Romania and Hungary. In Europe, according to the data for 2012, the longest life expectancy for men is in Iceland, followed by Switzerland, Sweden and Italy, and for women in Spain, France and Switzerland.

Table 2. Life expectancy at birth for selected European countries in 2012

GEO/SEX	Eo_2012.				
GEO/SEX	Males	Females	GEO/SEX	Males	Females
Iceland	81,6	84,3	Portugal	77,3	83,6
Switzerland	80,6	84,9	Slovenia	77,1	83,3
Sweden	79,9	83,6	Czech Republic	75,1	81,2
Italy	79,8	84,8	Turkey	74,8	80,5
Liechtenstein	79,7	85,2	Montenegro	74,2	78,3
Norway	79,5	83,5	Croatia	73,9	80,6
Spain	79,5	85,5	Macedonia	73,0	76,9
Netherlands	79,3	83,0	Poland	72,6	81,1
Luxembourg	79,1	83,8	Slovakia	72,5	79,9
United Kingdom	79,1	82,8	Serbia	72,2	77,3
Cyprus	78,9	83,4	Azerbaijan	71,6	76,6
France	78,7	85,4	Hungary	71,6	78,7
Ireland	78,7	83,2	Estonia	71,4	81,5
Germany	78,6	83,3	Bulgaria	70,9	77,9
Malta	78,6	83,0	Romania	70,9	78,1
Austria	78,4	83,6	Latvia	68,9	78,9
Denmark	78,1	82,1	Lithuania	68,4	79,6
Greece	78,0	83,4	Moldova	67,0	74,9
Belgium	77,8	83,1	Belarus	66,6	77,8
Finland	77,7	83,7	Ukraine	66,1	76,1

Source: Statistical office of the European Union (Eurostat).

The increase in life expectancy in Serbia in the second half of the 20th century was mostly due to the reduction of mortality in the younger population. Of the total increase in life expectancy of the Serbian population from 1960 to 2012, the highest percentage belongs to the changes in mortality up to the first year of life[5]. For males, the increase in this period was 8.2 years, and as much as 58.9% of this increase is due to the reduction of mortality in the first year. When it comes to women, the increase was higher, 10.6 years, but the changes in mortality to the first year accounted for a smaller percentage, 44.4%. The age group of 1-4 had a higher percentage contribution to the increase in life expectancy in men than its contribution in women (9.0% vs. 7.5%). In the most recent period (2002-2012), the contribution of specific age groups to the increase in life expectancy has resulted in a different distribution (Table 3). In

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[5] The used methodology described in Preston, S.H. et al. 2001

other words, the percentage contribution of the youngest group is expectedly significantly lower, given that infant mortality is relatively low. In men it was 15.1% and in women only 8.5%. The younger age groups under forty on average contributed 1 to 2% to the increase in life expectancy. It is notable, however, that the changes in the mortality of the population over 60 had in terms of percentage a more significant contribution to the increase in length of life. In men, the contribution of the group of 65-69 was 11.6% and 10.4% for the group of 65-69. In women, the percentages are higher and in some age groups even twice the percentage of the youngest. The contribution of the group 70-74 was 17.4%, group 65-69 was 14.7%, and group 75-79 was 12.5%. The higher contribution of these age groups, especially among women, is the consequence of the stagnation and certain deterioration of mortality rates in these age groups during the nineties of the 20th century. Adverse trends in the previous period and further deterioration in the nineties also resulted in a small decrease in life expectancy among women. Research from that period indicates that the mortality reduction of the elderly is exactly the chance to increase the length of life in Serbia, at already relatively low mortality rates in younger age (Radivojević, 2002). Otherwise, it is known that with the increase in life expectancy the contribution of specific age groups to that increase shifts toward the older ages. In the group of developed countries (excluding countries of Eastern Europe), 35% of increase in life expectancy in the period from 1950-1955 to 2005-2010, which was 13 years, is largely due to the increase in survival in people over 60 (UN, 2012).

Table 3. Contribution of certain age groups to the increase in life expectancy at birth in Serbia in periods 1960-2012 and 2002-2012

Age groups	Males				Females			
	1960-2012		2002-2012		1960-2012		2002-2012	
	Δe_x	%	Δe_x	%	Δe_x	%	Δe_x	%
0-19	5,99	73,17	0,54	21,06	5,94	56,10	0,34	14,81
20-59	0,95	11,66	0,98	38,53	2,22	20,93	0,53	23,55
60+	1,24	15,18	1,03	40,41	2,43	22,96	1,40	61,65
Total	8,18	100	2,56	100	10,59	100	2,27	100

Source: Calculated on the basis of life tables for ten-year age intervals for 2010, using the methodology described in Preston, SH et al. 2001.

Looking at the regional level, women live the longest in the Belgrade region (78.5) and Šumadija and Western Serbia (78.0), while on average women in Vojvodina (77.3) and Southern and Eastern Serbia (77.0) live a year shorter. In men, people in Vojvodina live the shortest (71.5), and in Belgrade, even two years longer (73.6). Residents of Šumadija and Western Serbia (73.1) on average live almost a year longer than residents of Southern and Eastern Serbia (72.3).

In all municipalities in Serbia in 2011, women live longer on average. The difference by sex ranges from 1.4 to 9.1 years. The biggest difference is in the municipality of

Rekovac and Mali Iđoš, and the smallest is in Čačak. In large municipalities, the biggest difference is in the Belgrade municipality of Savski Venac (6.9), and the smallest in the above mentioned Čačak. In as many as 100 municipalities (out of 168) in Serbia sex difference is over five years, which is the national average.

Out of Vojvodina's 46 municipalities, in 24 men have life expectancy at birth below 70 years (Map 2). The shortest life expectancy in Serbia is in Alibunar (67.3 years). Men living in Ćuprija, Nova Crnja, Novi Kneževac, Mali Iđoš and Žitište also live shorter than 68 years. Out of the most populated municipalities, the shortest life expectancy is of men in Subotica (69.0) and Zrenjanin (69.4). Municipalities with a relatively "long lifespan" for men are Žagubica (76.1), Žabari (75.7), Jagodina and Vrnjačka Banja (75.6 both). When it comes to the Belgrade municipalities, the longest lifespan is in Mladenovac and Voždovac (73.9), and the shortest in Rakovica (69.3).

Map 2. Life expectancy at birth for men in Serbia (municipal level, 2011)
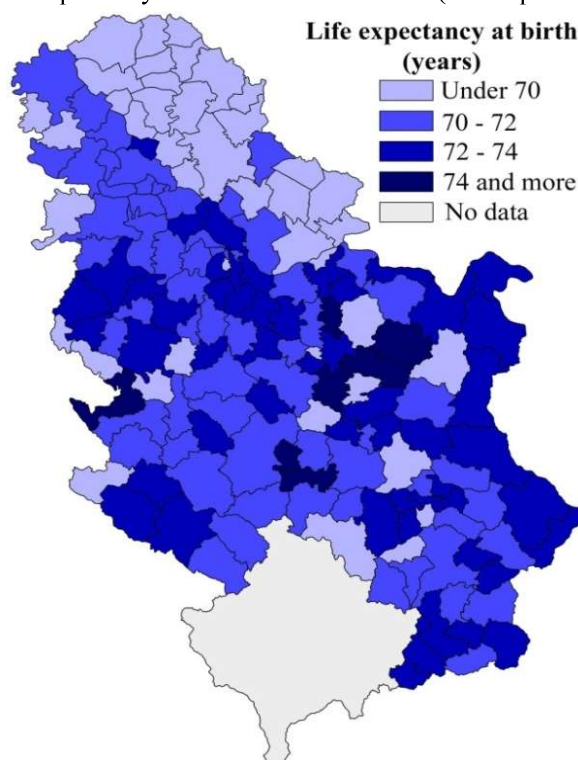
Source: Map based on data from the Statistical Office of the Republic of Serbia (SORS).

Map 3. Life expectancy at birth for women in Serbia (municipal level), 2011
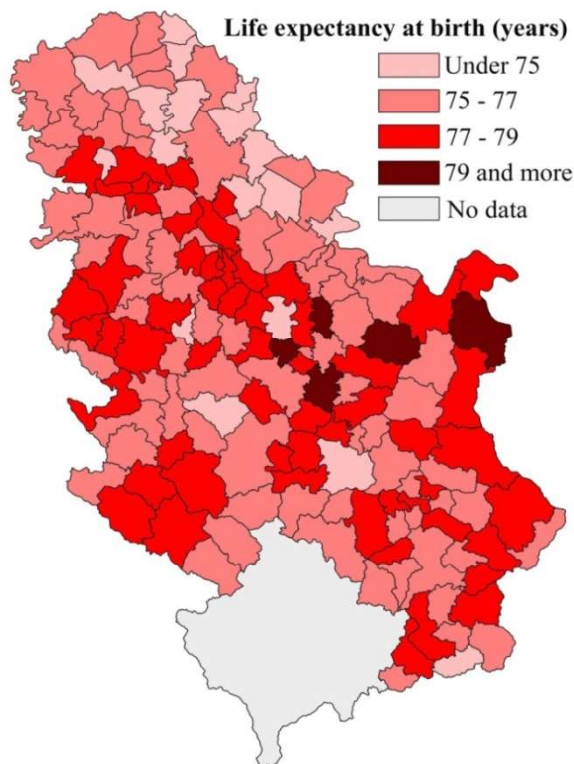
Source: Map based on data from the Statistical Office of the Republic of Serbia (SORS).

In female population, according to the data for 2011, the division between Vojvodina municipalities and other municipalities is not as highlighted as among men (Map 3). Women in Čačak (71.7) and Sečanj (72.2) live the shortest, and in Žagubica (79.6) and Jagodina (79.4) the longest. In the municipalities of Belgrade, in Voždovac women live the longest (78.9) and in Novi Beograd the shortest (75.5). It should be emphasised that the difference between municipalities with the shortest and longest E_0 in women is almost eight, while in men is as many as nine years.

Causes of death

As a rule, the process of mortality decline is accompanied by changes in the structure of the dead by cause of death. At the same time, changes in the age-specific mortality rates can be largely explained by changes in the model of the cause of death. More intense mortality decline occurred among those ages predominately affected by the so-called exogenous causes of death, whose suppression could have been affected by more favourable living conditions over a long period and in particular improvements

in the organisation and implementation of health care. However, in the age groups with the emphasised biological conditionality of mortality, rates are far less reduced.

In Serbia, the leading causes of death are the same as in the most developed countries of the world. Chronic non-communicable diseases as the leading diseases of modern times are the primary cause of death in Serbia. At the same time these diseases are the leading causes of morbidity and disability of population. According to the data for 2013, circulatory diseases and cancers accounted for 74.8% of all deaths of men and as much as 79.9% of the total number of deaths of women.

The population in Serbia has high rates of mortality from cardiovascular diseases. They are largely responsible for the relatively low levels of life expectancy for both sexes. In fact, while most of the countries from the northern and western part of Europe, even during the 1970s greatly reduced the death rate from cardiovascular diseases, it was not the case in Serbia (Marinković, 2012b). The largest share of deaths from cardiovascular diseases in Serbia was recorded in 2005, and since then, with minor yearly fluctuations, has shown the trend of slight decline. The share of cardiovascular diseases in overall mortality in 2013 is 53.2% and since 2006 (57.3%) the share has been continuously decreasing. In most of the countries of Eastern Europe the share of cardiovascular deaths in the overall mortality rate is around 50%, while in the developed countries it is even twice lower, 25-30% (Marinković, 2010a). Mortality rates from diseases of the circulatory system in Serbia are among the highest in Europe (Table 4). According to data for 2012, the standardised rate for male population of Serbia is 4 times higher than the lowest recorded (in France) and in women it is even 5.4 times higher.

In addition to diseases of the circulatory system, neoplasms have a large share in the total mortality. Unlike the cardiovascular diseases that show the trend of share reduction in total mortality, each year cancer shows significant increase (in 2013 the share was 21.6%, while in the early 21st century it was around 18%). At the European level the mortality rate of cancer in Serbia is among the higher ones, although the difference between the maximum and minimum rates is significantly lower than for cardiovascular diseases. The rate in Serbia in 2012 is about 1.4 times higher than the lowest recorded, and it is almost to the same extent lower than the highest rate (Table 4).

In the last decade, and diseases of the respiratory system has shown an increase in the share in total mortality (from 3.4% to 4.8%). The share increase has also been recorded in diseases of the digestive system (from 2.9% to 3.4%). The share of violent deaths has continuously gone down since the early 1990s, and is 3.2% in 2013.

Table 4. Causes of death - Standardised death rate for some European countries, 2012

ICD10_2012	Cardiovascular diseases		Neoplasms		External causes of mortality	
GEO/SEX	Males	Females	Males	Females	Males	Females
Bulgaria	1.365,1	1.018,4	342,0	184,7	69,9	18,8
Croatia	801,0	607,5	495,9	246,1	109,0	48,6
France	286,0	177,1	365,5	187,8	85,0	38,0
Greece	496,3	402,6	342,5	172,2	46,3	12,5
Hungary	944,3	670,1	514,1	276,3	107,8	41,2
Italy	413,1	295,2	368,8	203,5	50,5	24,0
Latvia	1.198,1	759,9	492,7	223,1	160,2	39,4
Lithuania	1.138,1	751,0	446,9	196,5	212,5	50,4
Netherlands	353,0	243,3	394,3	249,9	56,3	35,1
Norway	380,2	259,2	337,1	220,5	71,2	38,9
Poland	813,8	542,0	442,1	234,8	110,6	30,4
Portugal	372,1	286,2	360,6	173,0	59,5	20,1
Romania	1.192,0	924,6	376,6	192,5	93,5	23,6
Serbia	1.126,7	948,1	401,1	239,3	75,4	22,6
Slovakia	836,7	621,3	464,1	235,5	119,6	43,0
Slovenia	534,0	412,5	439,5	230,0	119,6	53,7
Spain	320,8	231,0	368,5	167,1	43,4	18,0
Sweden	460,5	306,9	301,8	216,6	70,0	32,3

Source: Statistical office of the European Union (Eurostat).

Chronic non-communicable diseases and their high representation in morbidity and mortality in Serbia are related to the changes in age structure. The high average age of Serbian population greatly contributes to the high share and high rates of mortality from cardiovascular disease in particular. Half of all people who died from cardiovascular diseases in 2013 were 80 and over years of age, and 93% over 60. People under 40 make up only half a percent of deaths from this cause. Although the presence of tumours in the mortality of population is largely concentrated in the older generations, it is less pronounced than in circulatory diseases. The people 80 and over account for 17.5% of total deaths from this cause, and 60 and over with 77.6%. Population under 40 is represented with 2% in the total number of deaths from tumours.

Although the two leading causes of death (circulatory diseases and cancer) have similar manifestation during life, fatality is different. Table 5 shows proportions of deaths from these diseases for certain ages. On the basis of specific death rates by age and cause of death in 2010, the proportion of live-born infants who will die from circulatory diseases is 48.7% for male and 58.4% for female children. The proportion of those who will die of cancer is 22.6% for male and 16.9% for female live-born children. The difference between the two groups of diseases, except in intensity, can also be seen in terms of age, starting from the middle-aged population. Namely, in

circulatory diseases, the proportion of deaths increases after each year, until the end of life. In cancer it decreases after 55 years of age. For example, the proportion of men who lived to 75 to die from cancers accounted for 14.2%, and the proportion of those who lived to 85 to die from cancer is 7.4%

Table 5. Proportion of deaths from circulatory diseases and cancer
by age and sex in Serbia 2010

Age groups	Diseases of the circulatory system		Neoplasms	
	Males	Females	Males	Females
0	0,487	0,584	0,226	0,169
1	0,490	0,587	0,228	0,170
5	0,491	0,588	0,228	0,170
15	0,492	0,588	0,228	0,170
25	0,494	0,590	0,229	0,170
35	0,498	0,592	0,230	0,169
45	0,504	0,596	0,230	0,166
55	0,518	0,609	0,224	0,153
65	0,549	0,635	0,194	0,127
75	0,591	0,669	0,142	0,088
85	0,600	0,655	0,074	0,047

Source: Calculated on the basis of life tables for ten-year age intervals for 2010, using the methodology described in Preston, SH et al. 2001.

Although both cardiovascular diseases and cancer are the causes highly represented in the oldest age groups of population, their influence is also reflected in the population under 70. Based on data for 2010, the most potential years of life lost (PYLL) is due to mortality from neoplasms (31%). Although in the total mortality cardiovascular diseases account for more than 50%, in PYLL the share is 27%. Cancer is a more significant cause of premature death in women than in men (Marinković, 2012a). Singling out three basic groups of causes of death (cardiovascular diseases, cancers and violent death) we can note a significantly different structure of the leading causes of death in PYLL by sex in Serbia (Graph. 4).

Graph 4. Structure of leading causes of death in PYLL by sex 2010
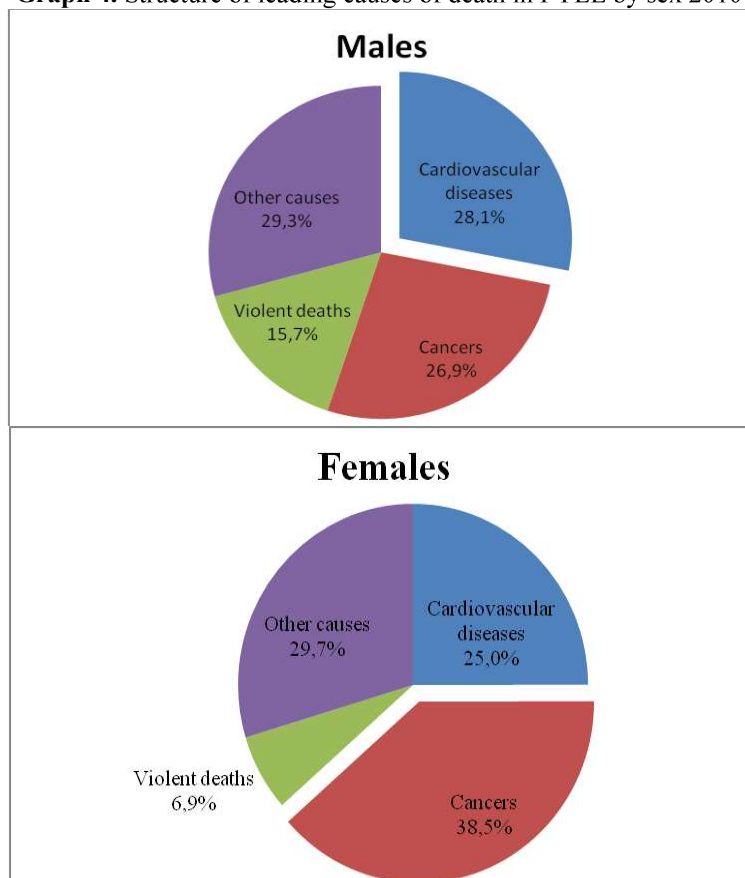
Mortality from circulatory diseases and cancer differs between the sexes. In circulatory diseases, the general rate is higher among women, while in cancers the rate is higher for the male population. According to the data from2013, mortality rates from circulatory diseases among women amounted to 785.2 per 100000 and among men to 702.5 per 100000 (Table 6). The rate of tumours was 355.2 per 100000 in men, compared to 251.8 per 100000 in women. Moreover, the rates in violent causes of death are three times higher among men than among women (67.0 per 100000 versus 22.7 per 100000), and are higher in respiratory diseases (80.8 for men versus 54.8 for women).

Table 6. Mortality rates by age and sex for the most frequent cases of death in Serbia, 2013 (per 100000)

	Diseases of the circulatory system		Neoplasms		Diseases of the respiratory system		External causes of mortality	
	Males	Females	Males	Females	Males	Females	Males	Females
Total	702,5	785,2	355,2	251,8	80,8	54,8	67,0	22,7
0	3,0	3,1	0,0	6,2	20,7	18,7	11,8	3,1
1-4	0,0	2,3	2,9	3,9	0,0	0,8	5,8	5,4
5-9	1,1	0,6	2,8	3,0	0,6	0,6	2,8	4,2
10-14	1,7	1,2	5,5	1,2	0,6	0,0	4,4	4,7
15-19	3,5	1,1	6,5	3,7	3,0	0,5	21,5	8,0
20-24	4,1	1,4	8,2	1,9	0,9	2,9	41,9	9,6
25-29	9,1	4,3	10,3	12,1	2,1	1,7	46,7	12,1
30-34	18,7	9,1	12,4	20,6	3,2	2,5	58,6	9,9
35-39	35,0	14,1	30,7	32,2	2,4	3,6	48,0	8,8
40-44	65,2	18,1	47,9	64,3	9,3	3,8	58,0	17,6
45-49	148,3	54,1	127,8	124,3	17,5	6,7	70,5	19,5
50-54	284,9	96,0	265,6	220,8	31,8	15,7	78,5	18,0
55-59	481,5	185,4	523,6	332,3	49,1	25,3	87,1	22,5
60-64	754,6	336,0	808,6	448,2	91,6	45,5	95,4	30,1
65-69	1231,5	649,3	1020,2	553,4	176,8	72,9	90,5	21,5
70-74	2143,7	1476,1	1291,4	712,2	277,9	139,0	121,7	44,7
75-79	4050,1	3409,5	1649,2	878,0	496,4	227,5	186,9	64,8
80-84	7378,7	7104,8	1909,2	996,7	796,2	428,3	222,9	88,1
85 +	14126,6	14669,7	1991,6	1115,7	1252,2	699,0	264,3	124,5

Source: Statistical Office of the Republic of Serbia (SORS).

Mortality rates among young population are low for the leading causes of death, except in the case of violent deaths. According to the data from2013, mortality rates from this cause for the age 0-19 amounted to 9.3 per 100000 for male and to 5.5 per 100000 for female population. If we bear in mind that it is the age with usually low mortality rate, it is clear that activities within society should be aimed at the highest possible elimination of violent deaths. Otherwise, in the total number of deaths in the age interval 15-24, violent deaths make up to 56.7% for male and 41.7% for female population. Accidents, especially those in traffic are particularly represented in the total number of deaths in the mentioned age group. In 2013, they accounted for 36.1% of men and 28.6% of women.

Conclusion

Analysis of mortality in Serbia has shown that there is a positive trend in the mortality reduction by age but that in comparison with other countries, it is not intense enough. Increasing the share of deaths from chronic non-communicable diseases in the overall population mortality, especially the cardiovascular diseases and cancers indicates they are the key issues for further improvement of the general mortality conditions in the country. A growing share of aged population (over 60) and the expressed feminisation of the elderly represents a major challenge for the changes necessary in the functioning of health care. The old and older middle-aged men are identified as the most vulnerable categories of the population. Regionally looking, the most vulnerable is Vojvodina (Marinković, 2010b; Radivojević, Marinković, 2014) when it comes to mortality from tumours and violent deaths, and the south-eastern part of Serbia when it comes to cardiovascular diseases. These are the areas where preventive measures from these diseases and causes of death should be primarily focused.

A number of factors are responsible for the formation of vascular diseases and tumours. One of the confirmed risk factors responsible for the occurrence of cardiovascular and cerebrovascular diseases, as well as the complications of other diseases, is hypertension. According to a survey of the health status of the population in Serbia in 2013 (Institut za javno zdravlje Republike Srbije "Batut", 2014) every third adult (33.9%) was diagnosed with hypertension, as compared to 2006 (28.5%). However, the aetiology of some individual diseases in these groups of diseases is not yet fully explained, but is largely associated with lifestyle and individual behaviour. Deepened differences in mortality between eastern and western European countries during the eighties and nineties are attributed to particularly traditional eating habits and excessive use of cigarettes and alcohol (Mesle, 1996). Eating habits that depend on various factors such as culture and traditions, family influence and social environment, contribute to the risk of overweight and obesity. According to the survey conducted by the Batut Institute, every second person was overweight (54.5%), while only 38.3% was of normal weight. Two-thirds of the adult population of Serbia spend their free time physically inactive, and a third of employees are engaged in sedentary type of work. The harmful role of smoking has been proven in many studies, and tobacco is the major risk factor for many diseases, especially in some localities. In many developed countries in recent years, mortality rates have declined due to the implementation of a series of national programs to combat smoking. The use of tobacco in Serbia has for many years been one of the most common risk factors for various diseases. According to data for 2013, more than half of the population smoked during their lifetime. Men have a higher percentage of smokers than women. In 2010, Serbia adopted the Law on the Protection of Population from Exposure to Tobacco Smoke, which limits the use of tobacco products. A third of persons aged 15-19 consumed alcohol, and at least once a month 5.5% of young people got drunk. The same survey empathises some of the risk factors relating to the health of the

population of Vojvodina, which largely explains the unfavourable mortality parameters, specifically the causes of death in relation to the rest of Serbia. Of the total of 6 regions this survey divided Serbia in two, Vojvodina was ranked last by the amount of consumption of fruit and vegetables, and first by the use of animal fats in diet. The largest share of the overweight, along with eastern Serbia, was recorded in Vojvodina (over 20%). Vojvodina also recorded on average more smokers, and adult injuries are significantly higher than in other regions. Alleviation of risk factors should increasingly be an obligation of personal responsibility and care for own health. Health promotion, as a strategy adopted by many countries, is a sure way to change bad habits and generally individual behaviour towards a healthy lifestyle.

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