

TRENDS AND LEADING CAUSES OF DEATH IN THE REPUBLIC OF MACEDONIA (REGIONAL REVIEW)

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ABSTRACT

Mortality is one of the key demographic processes of the natural population change that greatly affects the number, distribution and population structure as well as the future demographic development. Nowadays, the number and the leading causes of death of the population in the Republic of Macedonia come as a result of the long-term changes in the trend as in the connection, determination and influence of the overall socioeconomic development, the changed living conditions and lifestyle of the population.

There are also regional variations and differences in the trend and leading causes of death of the population in the Republic of Macedonia, with a dominance of the Skopje region, primarily due to its pronounced demographic development. But, when it comes to the crude death rate and death rate by specific cause, dominates the Pelagonia Region.

This paper analysis the trend of mortality in the Republic of Macedonia, in a long period of time, with a special focus on the period from the beginning of the 21st century. The aim of this research is to conduct analyses on the number of deaths, taking into consideration the most common causes of death and treatment received before death at a national level, but also at a regional level in order to separate regions with the highest mortality rate values.

Data on the differences that are recorded in the country in terms of the number and leading causes of death would provide the basis at which can be planned the future operation of the public health system by taking preventative measures in order to reduce mortality.

Keywords: mortality, leading causes of death, Republic of Macedonia, regions.

INTRODUCTION

The mortality of the population is one of the main (negative) components of the natural population change. By definition, death is the permanent disappearance of all evidence of vital functions [9].

Mortality represents one of the key factors of the total demographic development [3], while the increased mortality rate presents a natural population growth determinant, especially in circumstances when the birth rate is quite low.

By monitoring and studying population mortality, we can obtain the necessary parameters to assess the future trends of the population change.

The Republic of Macedonia is affected by the process of demographic transition for decades and the increased mortality only shows that the society still faces negative health care, medical, social and economic conditions. However, much information can be

gleaned by observation of mortality by specific causes of death, or, more broadly, of entire categories of causes of death [1]. Cause mortality of a population is an important segment in the analysis of mortality, because it sums up all factors which influence death indicators on a certain territory in a direct way [5].

DATA SOURCES AND METHODS OF WORK

The available vital statistics data and census data allow monitoring and analysis of the mortality trends and rates, as well as the leading causes of death, its changes and differences. Mortality can be followed through the published statistical data from the official statistics, which is related to the natural population change in the country, where, among other vital events data and processes (number of births, number of infant deaths, marriages and divorces) it can be found data on the number of deaths, deaths by age and sex, by cause of death, by place of death and received treatment, deaths by ethnic affiliation, occupation and education.

In all of the studies that elaborate this issue, a standard way to register the causes of death represents the International Classification of Diseases (ICD). Any medical condition belongs to a unique category and it is given a certain code, (up to six characters). The start of the medical classification system was established in 1900, and today in use is ICD-10 (tenth revision), which was published by the World Health Organization in 1992 [4]. In the Republic of Macedonia, the ICD-10 is in use since 2006. Between 2005 and 1979 in use was the ICD-9, and before 1979, in use was the ICD-8. Data on the causes of death are mostly used by the health services in order to monitor developments in pathology and lethal outcome in the treatment of diseases, but it is also used by geographers in order to present the spatial differences in the causes of death. In the Republic of Macedonia this issue has been elaborated in some modest geographical researches, which are mainly an integral part of complex geographical researches.

More clearly, the mortality trends can be obtained through calculating the mortality rate. To calculate the mortality rate it is necessary to know the total number of the population, and therefore we used data from the regular annual publications by the Statistical Office of the Republic of Macedonia, Population estimates by sex and age by municipalities and statistical regions for the relevant years, taking in consideration the fact that the last census of the population, households and dwellings in the country was conducted in 2002. The crude mortality rate is commonly used in regions/countries where the necessary data to calculate the specific mortality rates is not available as is the case of our country. This research could have given even stronger results if we had available data to calculate the specific mortality rates, such as data on the number of persons who died of a specific disease by sex and age.

The census and vital statistics data enable monitoring and comparison of the dynamics in the demographic processes at different territorial units and different time periods. The regional review, analysis refers to the eight statistical regions in the Republic of Macedonia, i.e. the NUTS level 3, according the Nomenclature of Territorial Units for Statistics in the Republic of Macedonia [2].

For the purposes of this research are used the analytical-statistical, mathematical, statistical and comparative method. During the analysis and data processing was made a comparative analysis of the results from the research to some previous researches that treat this issue i.e., relevant demographic studies done so far. Taking time as one dimension (because the analysis refers to a half-century time period), this method of analysis allows us to include the reasons that caused these differences over time.

RESULTS AND DISCUSSION

In this paper are analyzed the causes of death in the Republic of Macedonia for a longer period of time, so, as a result comes the use of different classification of diseases and thus less data reliability. But, since 1975, by converting the ninth and tenth Revision of the ICD, Injuries and Causes of Death, it has been achieved a satisfactory level of data comparability with the leading causes of death [4].

Table 1. Leading causes of death in the Republic of Macedonia (1965-2015)⁶

Cause of death	1965	1971	1976	1986	1991	1994	1998	2002	2006	2010	2015
A00-B99	576	1182	605	508	267	256	187	137	91	62	36
C00-D48	878	1182	1358	1915	2207	2510	2962	3129	3419	3705	3741
E00-E88	34	106	166	238	319	376	455	557	744	741	878
I00-I99	1850	3987	3719	6531	7330	8418	9296	10236	10932	11069	11939
J00-J98	1343	1530	1493	1141	878	708	542	592	691	712	761
K00-K92	503	251	258	391	319	313	369	379	334	370	378
N00-N98	259	151	94	203	198	217	234	245	248	262	323
P00-P96	3118	442	337	588	398	340	255	169	165	125	145
R00-R99	1761	2296	2957	1858	1898	1753	1604	1508	1134	1245	1335
Injury/Poisoning	468	607	654	746	695	648	708	750	653	588	513
Other	1968	713	736	319	280	232	258	260	219	234	412
TOTAL	12758	12447	12377	14438	14789	15771	16870	17962	18630	19113	20461
Percentage share of the leading causes of death in the Republic of Macedonia											
A00-B99	4.5	9.5	4.9	3.5	1.8	1.6	1.1	0.8	0.5	0.3	0.2
C00-D48	6.9	9.5	10.9	13.3	14.9	15.9	17.6	17.4	18.4	19.4	18.3
E00-E88	0.3	0.9	1.3	1.6	2.2	2.4	2.7	3.1	3.9	3.9	4.3
I00-I99	14.5	32.0	30.1	45.2	49.6	53.4	55.1	56.9	58.7	57.9	58.3
J00-J98	10.5	12.3	12.1	7.9	5.9	4.5	3.2	3.3	3.7	3.7	3.7
K00-K92	3.9	2.0	2.1	2.7	2.2	1.9	2.2	2.1	1.8	1.9	1.9
N00-N98	2.0	1.2	0.8	1.4	1.3	1.4	1.4	1.4	1.3	1.4	1.6
P00-P96	24.5	3.6	2.7	4.1	2.7	2.2	1.5	0.9	0.9	0.7	0.7
R00-R99	13.8	18.4	23.9	12.9	12.8	11.1	9.5	8.4	6.1	6.5	6.5
Injury/Poisoning	3.7	4.9	5.3	5.2	4.7	4.1	4.2	4.2	3.5	3.1	2.5
Other	15.4	5.7	5.9	2.2	1.9	1.5	1.5	1.5	1.2	1.2	2.0
TOTAL	100	100	100	100	100	100	100	100	100	100	100

Source: [7]

The leading causes of death in the observed period include: diseases of the circulatory system, of neoplasms, of symptoms and signs and abnormal clinical and laboratory findings, not elsewhere classified, followed by endocrine, nutritional and metabolic

⁶ Codes in bold are according to ICD-10 and codes in italic are according to ICD-9:

Certain infectious and parasitic diseases: **A00-B99** (001-033, 034.1-134, 136-139, 771.3)

Neoplasms: **C00-D48** (140-239)

Endocrine, nutritional and metabolic diseases: **E00-E88** (240-278)

Diseases of the circulatory system: **I00-I99** (390-434, 436-459)

Diseases of the respiratory system: **J00-J98** (034.0, 460-519)

Diseases of the digestive system: **K00-K92** (520-579)

Diseases of the genitourinary system: **N00-N98** (580-629)

Certain conditions originating in the perinatal period: **P00-P96** (760-771.2, 771.4-779)

Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified: **R00-R99** (780-799)

Injuries: **V01-X39, X50-X59** (800-849, 880-929)

Poisoning, searing, complications of medical and surgical care, and certain other consequences of external causes: **X00-X09, X40-X49, X40-X49, X60-X99, Y00-Y99** (850-879, 924.1, 930-999)

diseases, diseases of the respiratory system and injuries or poisoning. The other causes of death are much less present.

The countries of eastern and central part of Europe and the Balkans, still have extremely high rates of mortality from diseases of the circulatory system [4]. This is also the case of the Republic of Macedonia. Namely, top 1 in the leading causes of death are diseases of the circulatory system. The trend in the number of deaths is constantly increasing and so is the percentage share in the total number of deaths. This share since 1994 is more than 50%. The reasons should be sought primarily in the unsatisfactory economic situation, which is reflected in the poor quality of life and the awareness about the fact that the age structure of the population is very unfavourable [4], but also in the quality of the environment (ex. air pollution in the winter period) because, mortality caused by diseases of the circulatory system mostly affects an aging population. As a second in the row of the leading causes of death appears neoplasms. The number of deaths in the country is continuously increasing and so is the percentage share. This share increased from 6.9% in 1965, to 14.9% in 1991, 17.4% in 2002 and 18.3% in 2015. Third most common cause of death are Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified that until 1994 participated with around 10% in the total number of deaths, but since then, this share is constantly below 10%. The endocrine, nutritional and metabolic diseases mark a slight increase in the analyzed period, while the diseases of the respiratory system mark a slight decrease, but they are still present with over 3% in the total number of deaths which places this causes of death in the top 5 leading causes of death in the country.

Table 2. Deaths by sex, place of death and treatment received in the Republic of Macedonia (1965-2015), in %

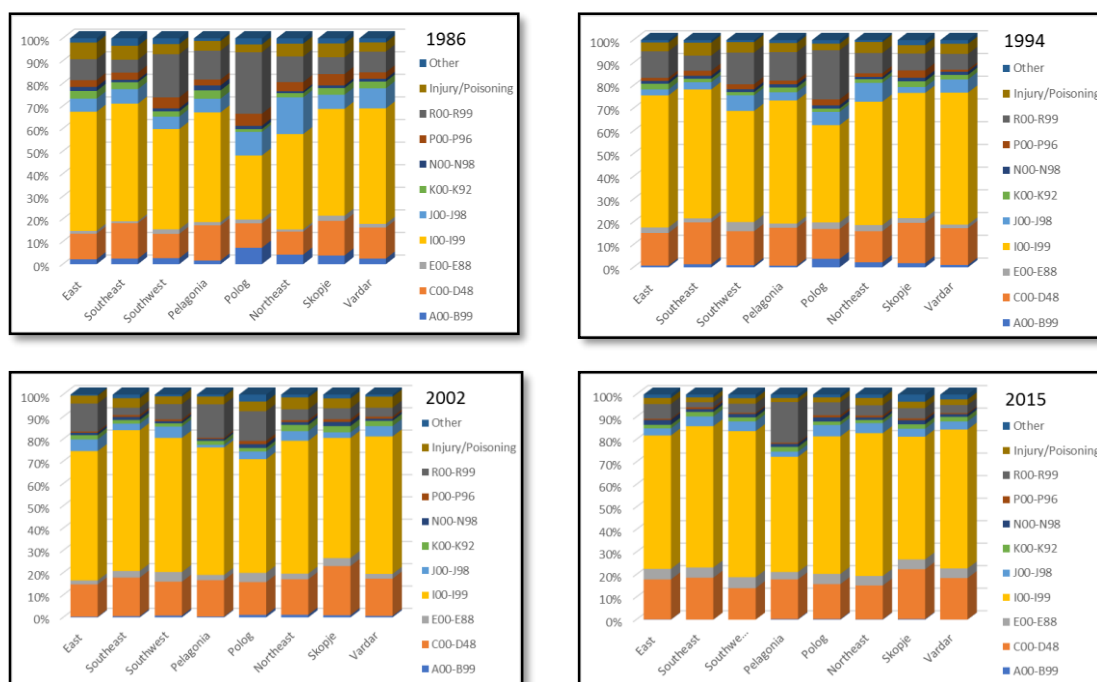
	1965	1971	1976	1986	1991	1994	1998	2002	2006	2010	2015
Male	51.8	53.1	54.9	55.1	55.7	55.7	54.3	55.1	53.7	53.2	51.6
Female	48.2	46.9	45.1	44.9	44.3	44.3	45.7	44.9	46.3	46.8	48.4
Treatment received	48.9	66.3	74.5	87.3	89.1	91.3	92.9	92.9	92.2	93.2	93.3
Treatment not received	51.1	33.7	25.5	12.7	10.9	8.7	7.1	7.1	7.8	6.8	6.7
Medical facility	19.1	19.7	22.9	29.3	22.1	28.8	27.8	26.3	27.4	28.2	31.8
Elsewhere	80.9	80.3	77.1	70.7	77.9	71.2	72.2	73.7	72.6	71.8	68.2

Source: [7]

During the observed period, the decades-long upward trend in the difference between the male and female population in the life expectancy at birth was terminated [6], especially in the last decade. The differences between the expectation of life for male and female dropped from 4.79 years in 2002 (the expectation of life for male was 70.77 and 75.56 for female), to 3.95 years in 2015 (the expectation of life for male was 73.46 and for female was 77.41). The reduced differences can be also confirmed with the percentage share of the male and female population in the total number of deaths (see Table 2). This phenomenon is also due to the growing participation of women in jobs that are more demanding, stressful and responsible as well as the growing number of women who "break down" stereotypes by using cigarettes and alcohol, which also leads to reduced differences in the participation of women and men in the total number of deaths. In the future, it is expected that the life expectancy will increase, especially for men.

The advantage of studies using mortality as an indicator of the health of the population lies in the fact that mortality is a clear indicator of the outcome, unlike data on the number of patients who are hospitalized or have received treatment which may be misinterpreted

or unregistered [6]. Namely, in Table 2 we can record that the percent of the persons who received treatment before death is high, and since 1994 is above 90%, while the percentage share of those who died in a medical facility is constantly increasing.



Figures 1-4. Leading causes of death in the eight statistical regions (1986-2015), in %

Like in the case of the annual number of deaths, the upward trend is also recorded in the crude death rate. This is the case in all eight statistical regions.

Regional incidence is influenced mainly by differences in the demographic structure of the population and its living conditions in different regions [10].

Table 3. Number of population and deaths in % and crude death rate in the Republic of Macedonia (1965-2015), by regions

Region	2002		2010			2015			
	population	deaths	rate	population	deaths	rate	population	deaths	rate
East	8.99	9.33	9.2	8.75	9.52	10.1	8.56	9.16	10.6
Southeast	8.48	8.32	8.7	8.41	9.04	9.9	8.38	9.09	10.7
Southwest	10.86	10.28	8.4	10.80	10.04	8.6	10.62	9.68	9.0
Pelagonia	11.77	16.55	12.4	11.39	15.62	12.7	11.16	14.76	13.1
Polog	15.13	12.96	7.6	15.32	11.78	7.1	15.45	11.50	7.3
Northeast	8.54	8.62	8.9	8.52	8.65	9.4	8.51	8.48	9.8
Skopje	28.58	26.04	8.1	29.33	26.96	8.5	29.91	28.49	9.4
Vardar	7.64	7.91	9.2	7.49	8.39	10.4	7.40	8.83	11.8
Total	100.00	100.00	8.9	100.00	100.00	9.3	100.00	100.00	9.8

Source: [9], [8]

In the total crude death rate, dominates the Pelagonia Region, while these values are lowest in the Polog Region. This condition can be explained by the fact that the leading causes of death present in the country, mostly affects older people, and the Pelagonia Region has the highest mean age of the population, (40 in 2002 and 40.7 in 2015), while

the Polog region has the lowest values of the mean age of the population (34 in 2002 and 35.8 in 2015).

Table 4. The specific death rate of the top 3 leading causes of death in the Republic of Macedonia (1986-2015), by regions, per 100.000

	Cause of death	2002	2010	2015
East Region	C00-D48	133.62	191.36	187.98
	I00-I99	534.48	628.58	627.17
	R00-R99	116.02	40.61	69.43
	Total	784.13	860.54	884.59
Southeast Region	C00-D48	151.09	222.15	199.35
	I00-I99	550.71	605.12	672.39
	R00-R99	28.59	22.56	23.62
	Total	730.39	849.83	895.37
Southwest Region	C00-D48	127.88	131.17	125.97
	I00-I99	506.05	557.12	584.38
	R00-R99	57.80	35.16	36.38
	Total	691.72	723.45	746.73
Pelagonia Region	C00-D48	204.09	235.76	230.60
	I00-I99	713.88	658.16	668.87
	R00-R99	187.29	210.56	236.22
	Total	1.105.25	1.104.48	1.135.69
Polog Region	C00-D48	112.12	108.96	114.41
	I00-I99	388.00	447.58	449.18
	R00-R99	101.66	43.20	42.20
	Total	601.77	599.74	605.78
Northeast Region	C00-D48	142.95	157.10	148.12
	I00-I99	534.18	612.99	624.84
	R00-R99	43.98	39.99	44.83
	Total	721.12	810.08	817.80
Skopje Region	C00-D48	178.50	201.10	208.63
	I00-I99	436.22	444.02	513.02
	R00-R99	39.96	45.30	42.95
	Total	654.68	690.42	764.60
Vardar Region	C00-D48	154.01	197.58	217.51
	I00-I99	566.86	622.65	728.31
	R00-R99	36.88	53.95	42.46
	Total	757.76	874.18	988.28
Republic of Macedonia	C00-D48	154.71	180.29	180.70
	I00-I99	506.09	538.64	576.70
	R00-R99	74.56	60.58	64.49
	Total	735.36	779.51	821.89

Source: [7]

At a regional level, with the number of deaths caused by the diseases of the circulatory system dominates the Skopje Region that in 2015 participated with 26.6% in the total number of deaths from this cause in the country, and with 54.5% in the total number of deaths in this region. The Skopje Region is followed by Pelagonia Region, where in 2015, 51.2% of the number of deaths were caused by diseases of the circulatory system and this region participated with 12.9% in the total number of deaths from this cause in the country. Then comes the Polog Region, with participation of 12% in the total number of

deaths from this cause in the country and even 61.1% of the total number of deaths in the region.

Unlike the changes in the mortality trends in the most advanced European countries in which, during the past ten or so years has been noted a decrease in the share of deaths caused by diseases of the circulatory system, as contrasted to the share of neoplasms [10], in the Republic of Macedonia, the trend is increasing in both causes of death, diseases of the circulatory system and of neoplasms.

We can agree with the opinion that the fight against neoplasms, in order to be comprehensive, must involve the spatial aspect which is best applied especially in the field of medical geography [10].

It should now be mentioned that these geographic differences are also, above all, the result of differences in the population age structure of each of the regions [6]. This way, the regions with the highest crude death rates are also the demographically oldest, and regions with the lowest crude death rate are also the demographically youngest. The dynamics, level and regional differences in the number of deaths and crude death rates are directly conditioned by the differences in the demographic structure of the population and the living conditions in different regions.

CONCLUSION

Changes in the structure of the leading causes of death of the population in the Republic of Macedonia in the period 1965-2015 are typical of the elderly population. The high mortality rate can be largely attributed to the unfavorable age structure. The increase in the birth rate and improving the age structure is difficult to influence, while improving the conditions of mortality, which is rarely the subject of interest, can achieve significant results [1]. Thus, measures of population policy should be focused on reducing the mortality rate in order to provide a safe and balanced demographic and economic prosperity [3]. Modelling population mortality based on causes of deaths data bears much information, primarily in which direction should the health policies of a country flow and what are the priorities for decreasing mortality and increasing life expectancy. If we want to extend the life and increase expected life duration, we should undertake preventive actions on the older population.

The lifestyle and changed everyday habits greatly influenced the current trends in mortality. Stressful jobs, poor diet, physical inactivity and high blood pressure are characteristic of the XXI century [3]. This global trend has not passed by the Republic of Macedonia, which can be confirmed by the high percentage share of deaths caused by diseases of the circulatory system that is dominant since the seventy of the last century, which coincides with the beginning of the process of urbanization, migration from rural to urban, and therefore, more stressful jobs and changed lifestyle. Since 1994, diseases of the circulatory system, participate with more than 50% in the total number of deaths. Since the eighty years as a second reason for mortality instead diseases of the respiratory system, appears Neoplasms and since then, the percentage share continuously increases. The differences between the share of the male and female population in the total number of deaths are just like in the countries characterized by the modern mortality patterns [6], i.e., the percentage share of the male is higher than the share of female.

There are also differences at a regional level. The Skopje region participates in the total number of deaths in the country the most, due to its population development and this percentage share continues to increase. An increase is recorded in the Vardar Region and Southeast Region. When it comes to the death rate, dominates the Pelagonia Region, but

the death rate increases in all regions with no exceptions. The leading causes of death are same in all regions.

Programs of primary prevention and education of the population must necessarily lead to the optimization of lifestyle, especially, to activities supporting non-smoking, fight against alcoholism and obesity as well as an increase in physical activity, healthy eating, and protection against sun radiation [10].

The health care system should take into consideration the demographic characteristics of the population, the level of the economic development and lifestyle while creating policies for prevention and health care of the population, reduction of mortality and increased life expectancy at birth. Hence, development of a Strategy for the Elderly will be an imperative. In the coming decades priorities should be focused on prevention, early detection, and suppression of negative risk factors [3].

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