

## REGIONAL EPIDEMIOLOGICAL ASSESSMENT OF AVOIDABLE DEATHS IN ROMANIA

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**Abstract:** The research focusing on the extent of the phenomenon of avoidable deaths in Romania has identified a percentage of 15% avoidable deaths of all deaths in Romania, regarding the period 2006-2013. Among the most common causes of avoidable deaths in Romania we find: ischemic heart disease, hypertension and cerebrovascular diseases, cirrhosis, cancer of the trachea, bronchus and lung, infant mortality etc. The present study aims at assessing the dimensions and clinical and epidemiological characteristics of avoidable deaths in territory in respect to 8 regions of Romania and at the main causes that lead to such deaths. We conducted a retrospective observational study over a period of 5 years (2009-2013) of all statistical data regarding the deaths recorded in Romania during the studied period. Given that until today, there is no epidemiological study of avoidable deaths at regional level, highlighting their extent, we consider it appropriate to tackle this issue. The results would optimize primary and secondary prevention locally, through the implementation and promotion by local institutions, of the prophylactic means and of promoting health, adapted to the needs existing in the community. Thus, this study would be an indisputable scientific support for inter – and multi-sectoral regional prevention strategies.

### INTRODUCTION

The concept of avoidable deaths refers to those deaths in persons included in the age group below 65 years old and which can be influenced by means of the primary and secondary prevention.(1,2)

The studies focusing on the extent of the phenomenon of avoidable deaths in Romania during 2006-2013 identified a percentage of 15% avoidable deaths of all deaths in Romania.(3) Thus, 293 837 deaths would have been avoided by early specific curative and prophylactic methods. The same studies reveal the newest nine most common causes of avoidable deaths in our country, namely, in decreasing order of frequency: ischemic heart disease; hypertension and cerebrovascular diseases; cirrhosis; cancer of the trachea, bronchi and lungs; infant mortality; accidents caused by motor vehicles; breast cancer; cervical and endometrium cancer; tuberculosis.(4,5,6)

Starting from the above-mentioned data, we conducted a study on the territorial distribution of avoidable deaths, reported to eight development regions of Romania.

The eight development regions of Romania were created in 1998, during the special programme for the country's accession to the European Union, but they do not have legal personality. By the Emergency Ordinance no. 75/2001 of the Romanian Government, there has been regulated the creation of eight directions for regional statistics of the National Institute of Statistics, corresponding to the eight development regions.(7)

The development regions are the result of an agreement freely consented of the local and county councils. They were named according to the geographical position, as follows: North-West (Bihor, Bistrița-Năsăud, Cluj, Maramureș, Satu Mare and Sălaj), North-East (Bacău, Botoșani, Iași, Neamț, Suceava and Vaslui), South-West Oltenia (Dolj, Gorj, Mehedinți, Olt and Vâlcea), South-East region (counties of Brăila, Buzău, Constanța, Galați, Tulcea and Vrancea) South

region (Argeș, Călărași, Dambovița, Giurgiu, Ialomița, Prahova and Teleorman), West region (Arad, Caraș-Severin, Hunedoara and Timiș), Central region (Alba, Brașov, Covasna, Harghita, Mureș and Sibiu) and the Bucharest region (counties of Bucharest and Ilfov).(8,9)

So far, no studies have been conducted to evaluate the size and the clinical and epidemiological characteristics of avoidable mortality in the region.(10)

The results of such a territory analysis would streamline primary and secondary prevention locally, through the implementation and promotion by local institutions of some prophylactic means to promote health tailored to the needs existing at community level. This study would be an indisputable scientific support for inter – and multi-sectoral regional prevention strategies.

### PURPOSE

The study aims at assessing the size and clinical and epidemiological characteristics of avoidable deaths at regional level, taking into account the main causes that lead to such deaths. Thus, we will identify the vulnerable areas with a high number of avoidable deaths and we will be able to achieve correlations between the frequency of certain diseases that cause avoidable deaths and the specific of that particular region.

### MATERIALS AND METHODS

We conducted a retrospective observational study over a period of 5 years (2009-2013) of all deaths that were classified in this category of avoidable deaths, in relation to a particular region of development.

We studied the statistical data belonging to the National Statistics Institute, National Institute of Public Health, Public Health Directorate County, Yearbook of Health Statistics of the National Center for Statistics and Public Health, and the

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statistics found on the website of the “Mina Minovici” Forensic National Institute of Bucharest.

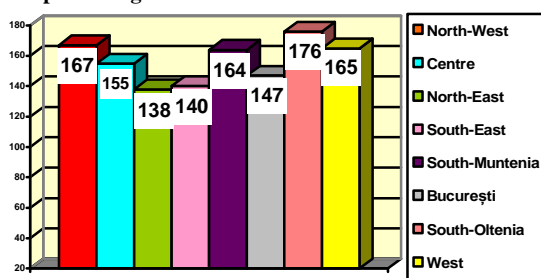
**RESULTS**

Between 2009 and 2013, in Romania, there took place a total of 174 283 avoidable deaths caused by one of the nine most common causes of avoidable deaths. Identified average mortality rate was 157.08 avoidable deaths per 100 000 inhabitants, and the highest mortality rate was registered in South-Oltenia region (176.36 avoidable deaths per 100 000 inhabitants). In contrast, the lowest rate of avoidable mortality was of 138.42 avoidable deaths per 100 000 inhabitants in the North-East region (table no. 1, figure no. 1).

**Table no. 1. Avoidable deaths/mortality in the development regions**

	No. of avoidable deaths	Avoidable mortality per 100 000 inhabitants
North-West	23 835	167.43
Centre	20 540	155.16
North-East	26 879	138.42
South-East	20 468	140.88
South-Muntenia	27 429	164.24
București	18 273	147.18
South-Oltenia	20 057	176.36
West	16 802	165.44
Total	174 283	157.08

**Figure no. 1. Repartition of avoidable mortality in the development regions**



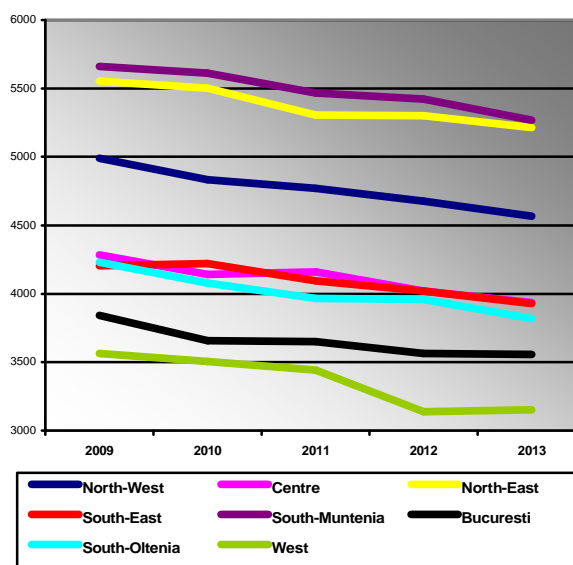
In the period under study, we observed that the overall trend is slowly descending; in 2013 a decrease in avoidable deaths was recorded due to the most common diseases, by about 8% (7.93%) compared to 2009. Higher amplitudes of avoidable deaths decline in 2013 compared to 2009 were evident in the West region (11.51%), South-Oltenia region (9.66%) and North-West region (8.53%). Decreased values below the national average were found in the South-Muntenia region (6.87%), South-East (6.58%) and North-East (6.10%) (table no. 2, figure no. 2).

**Table no. 2. Repartition of avoidable deaths according to region between 2009 and 2013**

	2009	2010	2011	2012	2013	2013 vs. 2009
North-West	4 991	4 832	4 772	4 675	4 565	-8.54%
Centre	4 283	4 141	4 160	4 021	3 935	-8.12%
North-East	5 553	5 504	5 305	5 303	5 214	-6.10%
South-East	4 205	4 223	4 093	4 019	3 928	-6.59%
South-Muntenia	5 659	5 611	5 467	5 422	5 270	-6.87%
București	3 840	3 659	3 652	3 565	3 557	-7.37%
South-Oltenia	4 230	4 081	3 967	3 958	3 821	-9.67%
West	3 564	3 504	3 441	3 139	3 154	-11.51%
Total	36 325	35 555	34 857	34 102	33 444	-

From figure no. 2, it results that in the North-West region, the downward trend is relatively stable, with comparable reductions in the studied years. Slight increases in avoidable deaths are noticed in 2010 in the South-East region (from 4 205 avoidable deaths in 2009 to 4 223 in 2010), as well as in 2011 at Central region level (from 4 141 avoidable deaths in 2010 to 4 160 in 2011). The number of avoidable deaths in the West region has been decreasing in the years 2009-2013, with a significant magnitude of the decrease in their number in the year 2012 (from 3 441 in 2011 to 3 139 avoidable deaths in 2012, signifying a decline by 9% in one single year). Regarding the South-Oltenia and South-Muntenia regions, the downward trend has been relatively constant, with a slight emphasis in the period 2012-2013. Regarding the Bucharest region, we have seen a more significant fall between 2009 and 2010; then the number of avoidable deaths in the period 2011-2013 being relatively constant, with minimal variations from one year to the other.

**Figure no. 2. Dynamics of avoidable deaths per regions**



Myocardial ischemia, the most common condition that causes avoidable deaths, has been decreasing over the studied period, in all regions, but with a different magnitude of the decrease.

At territorial level, there were found the highest rates of avoidable mortality caused by myocardial ischemia in North-West region (56.18 avoidable deaths caused by myocardial ischemia per 100 000 inhabitants) and in the Central Region (52.14). In the South-East region, we found the lowest rate of avoidable mortality caused by this condition (27.04), which is significantly lower than the maximum value highlighted.

Analyzing the dynamics of avoidable deaths secondary to myocardial ischemia in 2013 compared to 2009, we have seen that the most significant decline of these avoidable deaths was registered in Bucharest, nearly by 20 percent (19.09%). A significant decrease was also emphasized in the South-Muntenia region; in 2013 their number decreased by 15% compared to 2009. The line representing avoidable deaths in evolution regarding the South-East region, the region with the lowest rate of avoidable mortality caused by myocardial ischemia, is approximately horizontal, the decrease was of only 2% in 2013 compared to 2009 (table no. 3, figure no. 3 and figure no. 4).

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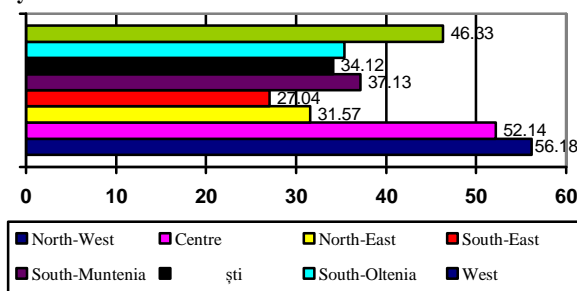
**Table no. 3. Repartition of avoidable deaths caused by myocardial ischemia according to region, between 2009 and 2013**

Myocardial ischemia	2009	2010	2011	2012	2013	Total no.	Mortality per 100 000 inhabitants	2013 vs. 2009
North-West	1 669	1 638	1 586	1 563	1 541	7 997	56.18	-7.67%
Centre	1 435	1 377	1 370	1 366	1 355	6 903	52.14	-5.57%
North-East	1 282	1 266	1 213	1 214	1 160	6 135	31.57	-9.51%
South-East	792	799	788	807	776	3 962	27.04	-2.02%
South-Muntenia	1 328	1 281	1 268	1 215	1 132	6 224	37.13	-14.75%
București	953	901	821	795	771	4 241	34.10	-19.09%
South-Oltenia	849	829	790	787	769	4 024	35.33	-9.42%
West	990	1 006	957	894	882	4 729	46.33	-10.90%
<b>Total</b>	<b>9 298</b>	<b>9 097</b>	<b>8 793</b>	<b>8 641</b>	<b>8 386</b>	<b>44 215</b>	-	-

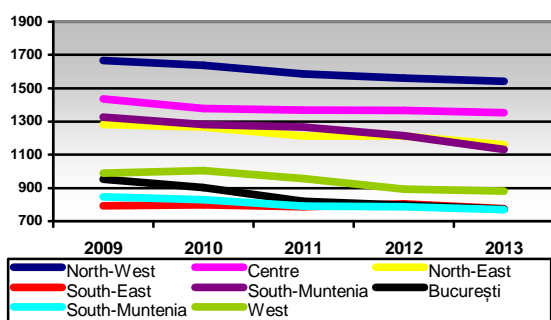
**Table no. 4. Repartition of avoidable deaths caused by cerebro-vascular diseases and hypertension according to region, between 2009 and 2013**

Cerebro-vascular diseases, hypertension	2009	2010	2011	2012	2013	Total nr.	Mortality per 100 000 inhabitants	2013 vs. 2009-%
North-West	1 058	1 014	982	957	921	4 933	34.65	-12.95
Centre	712	735	719	672	664	3 502	26.45	-6.74
North-East	1 190	1 185	1 126	1 123	1 136	5 760	29.64	-4.54
South-East	990	1 010	942	879	884	4 705	32.11	-10.70
South-Muntenia	1 685	1 555	1 528	1 538	1 392	7 699	45.93	-17.39
București	826	780	832	851	805	4 094	32.91	-2.54
South-Oltenia	1 461	1 431	1 401	1 377	1 376	7 046	61.86	-5.82
West	826	802	768	641	724	3 762	36.86	-12.35
<b>Total</b>	<b>8 748</b>	<b>8 512</b>	<b>8 298</b>	<b>8 041</b>	<b>7 902</b>	<b>41 501</b>	-	-

**Figure no. 3. Repartition of avoidable deaths caused by myocardial ischemia**



**Figure no. 4. Dynamics of avoidable deaths caused by myocardial ischemia**

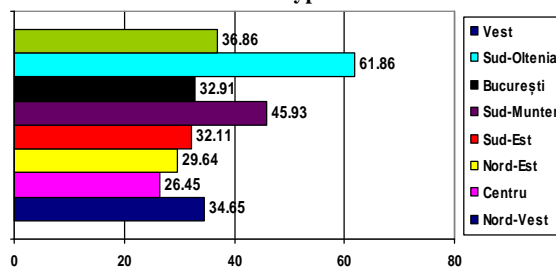


Cerebrovascular diseases and high blood pressure (hypertension) is the second cause of avoidable deaths in Romania. Distribution of cases of avoidable deaths due to these diseases at territorial level as well as their dynamics emerges from table no. 4, figures no. 5 and 6. In South-Oltenia region, there has been highlighted the highest mortality rate at territorial level, respectively 61.86 deaths from cerebrovascular diseases or hypertension were found in 100 000 people under the age of 65 years old.

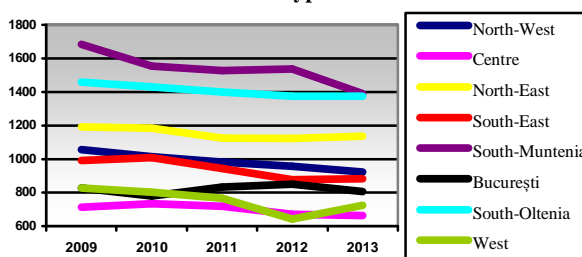
On the second place in terms of frequency of causes of avoidable deaths, South-Muntenia region was identified, with a mortality rate of 45.93 avoidable deaths per 100 000 inhabitants.

In opposition, with 26.45 avoidable deaths per 100 000 inhabitants caused by the studied diseases, the Central Region was identified. Low levels of avoidable mortality were highlighted in the North-East Region (29.64 deaths per 100 000 inhabitants) and South East (32.11 deaths per 100 000 inhabitants).

**Figure no. 5. Repartition of avoidable deaths caused by cerebrovascular diseases and hypertension**



**Figure no. 6. Dynamics of avoidable deaths caused by cerebrovascular diseases and hypertension**



The dynamics in the studied period showed a reduction in the phenomenon in all regions. The most significant decrease in avoidable deaths caused by these diseases was observed in the South-Muntenia region, so in 2013, the number of avoidable deaths in the region fell by 17 percent compared to 2009, from 1 685 to 1 392. Important decreases were also noticed in the West region (in 2013, there were 12.35% fewer avoidable deaths compared to 2009). In the Central region, in addition to the lowest mortality rate from this type of death, there has been also found a decline of this phenomenon, from

712 deaths in 2009 to 664 in 2013, which means a percentage reduction of only 6.74%. The most reduced decrease in avoidable deaths caused by these diseases was of 2.54% in the Bucharest region (from 826 deaths in 2009 to 805 in 2013). Regarding the South-Oltenia region, where there has been found the highest rate of avoidable mortality caused by cerebrovascular diseases and hypertension, the decrease in 2013 was smaller than that compared to 2009, of only 5.82%.

### DISCUSSIONS

The analysis of the distribution and frequency of avoidable deaths at territorial level, depending on the development region, highlighted the particular circumstances and vulnerabilities regarding the causation of these deaths. From this research, it results that the region with the most increased avoidable mortality is South-Oltenia (176.36 avoidable deaths per 100 000 inhabitants). This situation can be explained by the greater percentage of rural residents, which can mean a difficult accessibility to medical services or a poor medical education that decreases the addressability to health care system. Also, the increased percentage in this region can be explained partly by higher overall mortality rate compared to other regions. Across all regions, the number of avoidable deaths is decreasing, observing the trend demonstrated nationally and internationally, but with a reduced magnitude of these declines. Decreased percentage values of the number of avoidable deaths in 2013 compared to 2009 are different from region to region, ranging between 6.10% (the North-East region) and 11.51% (West region).

According to data from the literature, myocardial ischaemia is the most common cause of avoidable death in people aged under 65 years old (in Romania, during 2006-2013, 73 512 deaths were due to myocardial ischemia and occurred in people aged under 65, representing 25.02% of all avoidable deaths in our country). (11,12) Through this study, we found that at territorial level, the situation is different, myocardial ischemia being the most common cause of death only in certain regions, for example in the North-West region (56.18 avoidable deaths caused by myocardial ischemia per 100 000 inhabitants), in the Central region (52.14) and in the West region (46.33). We found that the most significant decreases in avoidable deaths secondary to myocardial ischemia recorded in 2013 compared to 2009 were in the Bucharest region, most likely due to more efficient means of emergency treatment required for this condition (fibrinolytic therapy, coronary angioplasty for revascularization of the infarcted area). Cerebrovascular disease and hypertension, nationally and internationally is the second cause of avoidable death, according to studies in the field. (13) Through the analysis we performed, we showed a higher rate of avoidable mortality by these diseases in South-Oltenia region (61.86 deaths per 100 000 inhabitants) and South-Muntenia region (45.93 deaths avoidable per 100 000 inhabitants). The regions where we detected the smallest decreases in this phenomenon over the years are the Bucharest, North-East and South-Oltenia regions (with percentages less than 6%).

### CONCLUSIONS

- § Between 2009 and 2013, we identified 174 283 avoidable deaths in Romania caused by the most common nine conditions that led to such deaths, the nationwide average avoidable mortality rate being of 157.08 avoidable deaths per 100 000 inhabitants.
- § Related to the eight development regions, we found that the highest rate of avoidable death was recorded in South-Oltenia region (176.36 avoidable deaths per 100 000 people), while the lowest was recorded in North-East region (138.42 avoidable deaths per 100 000 inhabitants).

- § The dynamics of avoidable deaths caused by the nine most common disorders identified by the first survey was slowly downward, with a decrease of about 8% in 2013 compared to 2009. The most significant decreases were noticed in the West region (with 11.51% less in 2013 compared to 2009) and South-Oltenia region (with 9.66%). In contrast, in the North-East and South-East regions, the magnitude of the fall of this phenomenon was low (6.10%, respectively 6.58%).
- § The most common cause of avoidable death certified by national and international research, myocardial ischemia, was ranked first as the value of mortality rate at territorial level in the North-West region.
- § Avoidable mortality rate by cerebrovascular diseases and hypertension in South-Oltenia region was the highest in Romania (regardless of the cause that led to avoidable death) being of 61.86 deaths per 100 000 inhabitants.
- § We have identified significant differences in mortality rates recorded at regional level, in the case of avoidable deaths due to myocardial ischemia and those due to cerebrovascular disease and hypertension.

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