

CANCER MORTALITY IN THE EUROPEAN UNION (EU)

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ABSTRACT

Past twenty years proved to be favorable for the health of European population: people have lived longer because of better nutrition and health care. Unfortunately, cardiovascular disease, the previous principal cause of mortality was surpassed by malignancy that became the primary health threat. In order to express the human and social impact of malignancy in different parts of EU, this review focuses on premature mortality at 0-64 years of age, the productive years of life, for cancer. There is a remarkable difference in population malignancy between established European democracies and the post communist countries previously subjected to Soviet rule. In general, there is more malignancy in countries of the former Soviet bloc. Hungary has an unfortunate distinction to have the highest mortality from several types of cancer. It is possible that the proto-oncogenes responding to adverse environmental influence, respond to higher prevalence of smoking, alcohol, fatty meat intake and lower ingestion of protective nutrients in Eastern Europe.

Keywords: *premature mortality, cancer, established democracies, post communist countries, smoking, alcohol*

INTRODUCTION

The international community of the European Union (EU) with a population around 500 million, consists since the 2007 of 27 countries. These represent a heterogeneous group of societies with 17 traditionally democratic and with ten post-communist countries. Such relatively recent political and economic divergence still results in marked differences, with deep negative consequences on population health.

During the beginning of the 20th century, malignant disorders in Europe were on an increase. This trend was largely related to longer life expectancy. Living longer resulted in more prolonged exposure to carcinogens, leading to a higher chance for adverse genetic mutations. Remarkably, after 1980 the populations in economically developed countries started to exhibit a marked decline in cancer mortality. In this review we focus on premature mortality (0-64 years) rather than on whole population mortality for cancer. In addition to pointing out the socioeconomic consequence of disease and mortality in the most productive age, this age interval also avoids potential bias of false cancer diagnosis in the very old who may die without an accurate diagnosis of the cause of death. Most of the data are WHO statistics (1,2) from the years 2007-2008.

PREMATURE CANCER MORTALITY IN VARIOUS PARTS OF EU

A remarkable decline in mortality for specific types of malignancy has been observed since 1980 in democratic EU. This has not been the case in most of the postcommunist countries. Considering the overall male premature mortality for various disease in EU - it is remarkable that premature mortality for cancer in 2007/8 exceeded premature mortality for cardiovascular disorders - **Fig. 1**. This reflects the dramatic decline in cardiovascular mortality. Such trend is very impressive in France:

premature mortality for cancer is 40 % while premature mortality for cardiovascular disorders is only 13 %.

Fig.1

Fig 2 shows that the male premature mortality for cancer is highest in Hungary, it then gradually declines in other postcommunist countries (Romania, Slovakia, Bulgaria, Poland and Czech republic) to values observed in democratic Europe. The lowest cancer mortality is in Northern Europe. The difference in male premature mortality for cancer in EU countries is striking: 3,5 more males die of cancer in Hungary than in Sweden. The difference in cancer mortality in women is somewhat less dramatic. However, the highest female cancer mortality is again in Hungary and the lowest in Spain. In general, women have lower cancer mortality than men, with the exception of Sweden.

Fig. 2

Interestingly, when comparing the democratic and postcommunist countries, the different trend in mortality for cancer became manifest about 20 years ago. **Fig. 3** illustrates such difference between Romania and Austria. In the 1970s mortality for cancer in Romanian males was lower than in Austria. Then in the decades that followed, there was a sharp rise in cancer mortality in Romania and a decline in Austria.

Fig. 3

Tab. 1 illustrates the most frequent types of cancer causing premature male mortality in various European countries. Premature mortality for several types of cancer is significantly higher in the part of EU previously under the Soviet domination. The only exception is liver cancer, being about equally distributed on both sides of the former iron curtain divide.

Tab. 1. Premature male mortality (SDR/100 000) for most frequent types of male cancer in various EU countries. Last available WHO data are mostly for the years 2007/8 (2).

Country	Lung, larynx, trachea	Colon, rectum, anus	Oral cavity, lip	Liver, bile ducts	Pancreas
EU: posttotalitarian countries					
Hungary	68,5	17,7	22,8	4,5	8,5
Romania	48,4	9,9	13,0	7,8	6,5
Poland	45,3	9,9	6,3	2,4	5,9
Bulgaria	46,3	11,3	5,4	5,6	6,8
Slovakia	37,4	16	17,5	3,7	5,4
Czech R	31,8	12,7	7,7	3,1	6,8
<i>Mean</i>	<i>46,3 ± 12,6</i>	<i>12,9 ± 3,3</i>	<i>12,1 ± 7,0</i>	<i>4,5 ± 2,0</i>	<i>6,7 ± 1,1</i>
EU: Democratic countries					
France	34,5	6,6	6,8	5,8	5,0
Spain	33,5	8,7	5,0	4,3	4,3
Germany	24,1	8,1	5,3	2,8	5,1
Austria	23,3	6,9	5,2	4,0	5,9
Italy	22,1	6,7	3,1	5,0	4,7
England	16,9	7,1	2,5	2,1	3,8
Sweden	10,1	5,3	1,5	2,0	3,9
<i>Mean</i>	<i>22,8 ± 7,7</i>	<i>6,9 ± 1,1</i>	<i>4,2 ± 1,6</i>	<i>3,7 ± 1,3</i>	<i>4,6 ± 0,7</i>
P =	0,001	0,0001	0,003	not signif.	0,001

DISCUSSION

An all important question is what may be responsible for such a dramatic difference in the health of populations of the democratic and postcommunist countries in EU? The failure of central planning in countries dominated by the Soviets adversely affected the health, along with human rights and the economy. Rather than motivating people to join the effort to improve their health, among others by prevention, totality led the citizen to rely on the government, including their health. Failing economy and restrictions on movement and on information proved to have an eminently adverse effect. General frustration from suppression of individual freedoms enforced negativistic attitudes. Consequently, while in democratic countries general health steadily improved, under communism population health stagnated or even declined.

Remarkably, even twenty years after the fall of the iron curtain there persists a gap in cancer mortality between the democratic and the postcommunist countries in EU. Main suggested causes of such higher mortality is the legacy of communism. Besides a lower socioeconomic standard and more limited funding for health care it is an unhealthy life style: alcoholism, smoking and an inadequate intake of protective nutrients. Potentially contributing to cancer is alcoholism, especially binge drinking, a prominent adverse factor in Hungary, Romania and Slovakia. There is a general consensus that more than 30 % of cancer may be preventable by avoiding the risk of tobacco, excess alcohol intake, air pollution, physical inactivity, obesity, deficient intake of nutrients in fruits and vegetable and sexually transmitted viral infection.

Hungary with its extremely unfavorable cancer data, is difficult to interpret. There are three possible explanations: a) extremely high prevalence of smoking; b) role of other risk factors including alcohol (Hungarian males also have an extremely high mortality for liver

cirrhosis) and; c) specific genetic predisposition related to Hungarian ethnicity.

Malignancy is mostly of genetic origin. Cellular changes leading to the malignant growth are always a consequence of DNA mutations of specific genes. Genes whose mutations lead to the initiation and development of cancer belong to three types: a) Oncogenes directly stimulate the cell growth either by stimulating mitosis or by inhibiting apoptosis. Their mutations are active and within a cell they are autosomal dominant: for the outcome suffices only a mutation of one of the gene pairs; b) Proto- oncogenes are believed to turn into oncogenes when exposed to particular carcinogens; c) Tumor suppressor genes that repair an impaired DNA. Their damage strongly potentiates the risk of mutation with subsequent uncontrolled cell replication.

The cancer difference between the democratic and postcommunist countries can hardly be explained by the population status of oncogenes or the tumor suppressor genes. The role of proto-oncogenes is more likely. Proto- oncogenes can be transformed into oncogenes under the environmental influences, most likely smoking and alcohol intake. When considering the trend in malignancies among EU countries, most attention is focused on the lung cancer. More individuals die from lung cancer than from oral cavity, colon, liver, pancreas, leukemia and prostate cancer combined. This has stimulated intensive research in lung cancer (3 – 7). Cancer of the lung has frequently been cited as an example of a malignancy that is largely determined by the environment (8). However, numerous studies also suggest the involvement of genetic factors. Their results localize a major susceptibility locus influencing lung cancer risk to 6q 23-25 (3).

From the EU perspective, studies related to ethnic Hungarians (9) are of an utmost interest: Hungary has one of the highest world incidence of lung cancer. These data indicate a strong founder effect for some mutations of BRCA1 gene in Hungary. Of interest is a report of Hungarian researchers (10) that the generation of retinoids and rexinoids

with restricted selectivity has opened new possibilities for lung cancer chemoprevention and therapy. It is probable that demethylating and chromatin remodeling agents currently under investigation could be combined with these new retinoids.

Remarkably, countries with high proportion of Hungarian and Roma minorities (Romania, Slovakia) display the second and third highest male cancer mortality in the EU. Besides Hungarians, the Roma people also have prominently high cancer mortality (11).

The enigma of Hungarian lung cancer invokes several questions. Can lung cancer statistics be affected by timing of the diagnosis relative to age? High Hungarian mortality for cancer is not a statistical bias related to age selection: statistics on Hungarian male cancer mortality for all ages provide similar information. The highest cancer mortality in Europe is an unfortunate distinction of Hungarian males and females. Neither the East- West socio- economic gradient appears to be involved. Hungary is in the center of Eastern Europe. It had more liberal economy under communism and compared with its more easterly neighbors, it has a solid research base with several well known scientists.

CONCLUSION

The legacy of the communist totalitarian rule for over forty years left its indelible consequences also in cancer mortality. EU countries with established democracy experienced in the past thirty years a prominent decline in cancer while in the former communist countries the drop in malignancy has been slower or even stagnant. Plausible explanation is the response of proto-oncogenes to adverse environmental effects more prevalent in Eastern EU countries: smoking, alcohol, deficient protective nutrients. Hungary with its highest European cancer mortality should stimulate research, yielding important clues to the role of genetic and environmental prevention. A dramatic general decline of cancer mortality in much EU democratic states in just thirty years is a vigorous positive

stimulus to oncologists, environmentalists and geneticists, suggesting that cancer, the primary population killer is preventable and manageable.

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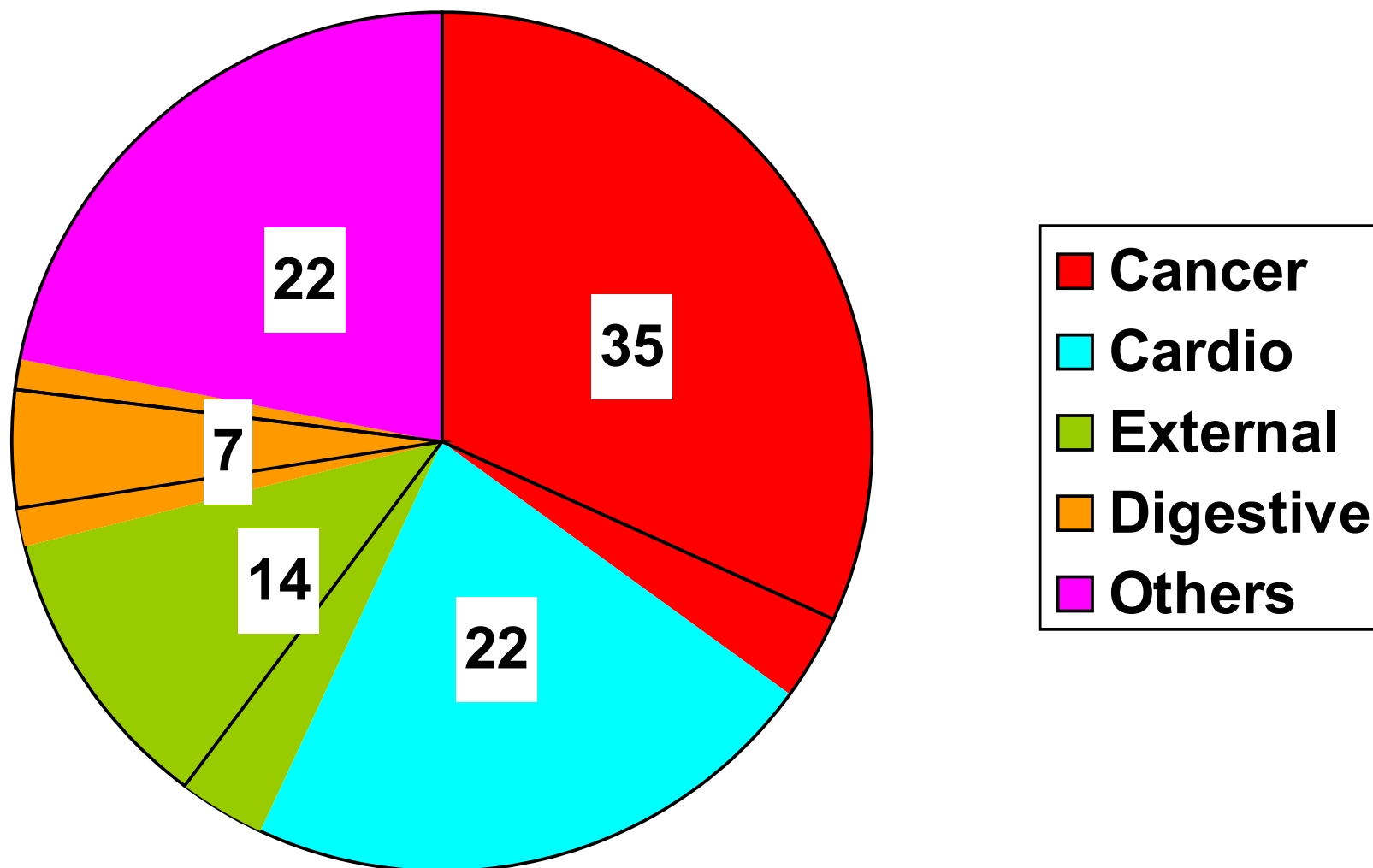
Figure legends

Fig.1. Structure of premature mortality in European Union in 2008.

Fig. 2. Premature cancer mortality of males and females in EU (mostly for the years 2007/8). SDR = standardized death rate

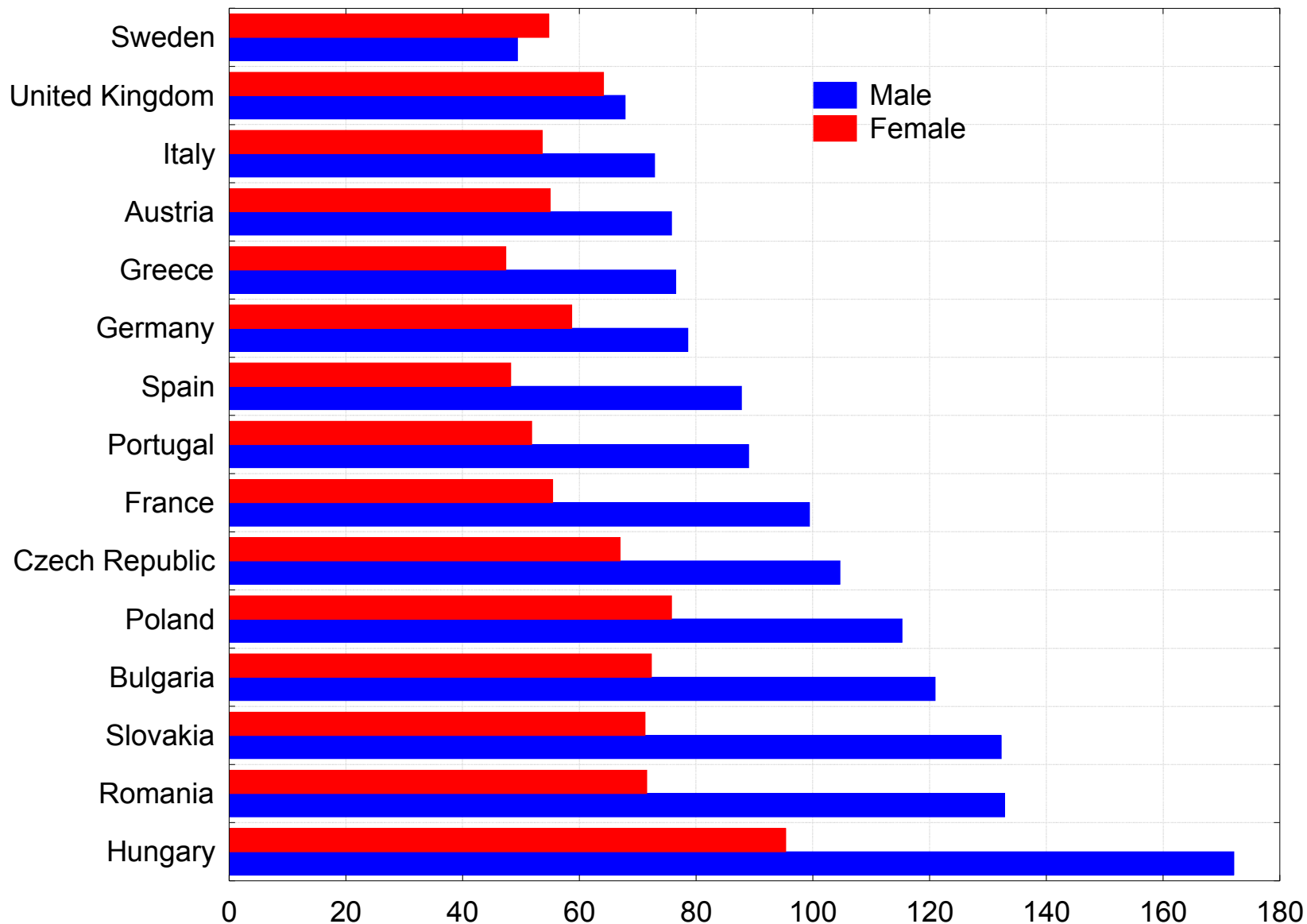
Fig. 3. Different trends of premature cancer mortality of males in Romania and Austria. SDR = standardized death rate

Structure of premature mortality (%) in EU



2

Cancer premature mortality in EU (SDR/100 000)



Trends in male premature cancer mortality in Romania and Austria (SDR/100 000)

