Cause of death patterns in Ukraine's regions

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Description of the topic

There are substantial differences in mortality across regions in Ukraine - life expectancy is high on the West and low on the East and South. The interregional difference between max and min life expectancy reaches 5.3 year. Unfavorable situation in population health is also explained by preservation of archaic for the XXI century nosological structure of mortality, which combines features of traditional and modern structures of pathologies (Pirozhkov, 2004; Levchuk *et al*, 2007). Namely it is characterized by high mortality rates from endogenous (cerebrovascular diseases, cancers) and exogenous (infectious and parasitic diseases, respiratory and digestive system disease, violent deaths) components at the same time .

Cause-mortality profiles differ across Ukraine. Thematic maps do not give a complex view of regions' distribution according to death rates from different causes at the same time. In this paper we employ correspondence analysis in order to visualize associations that may exist between regions and particular causes of death, and to classify regions in some subcategories.

Data and method

The causes we want to pay particular attention are in the table below (*Table 1*). These are causes that detail three most important classes of diseases in Ukraine:1) circulatory system diseases, 2) neoplasm, and 3) external causes of death; plus some specific cases. The reasons why they are selected are different: a high share in total (circulatory system diseases), social importance (tuberculosis, alcohol related causes), suspicion in high variation (external causes of death, respiratory system disease) etc.

Years for analysis are chosen around the year of last census in Ukraine, 2001. Contingency table for statistical analysis is presented by Standardized Death Rates[1] from group of causes listed above for 26 regions of Ukraine.

[1] All-Ukraine's population for the same period (2000-2003) used as a standard.

Table 1: Selected causes of death in the mortality structure, Ukraine, 2000-2003

№	Code in ICD9	Cause	Class	% in total
1	009-013	Tuberculosis	Infectious diseases	1.4
2	45-51	Cancer of digestive organs	Neoplasms	4.9
3	52-54	Cancer of respiratory organs	Neoplasms	2.7
4		Other cancers	Neoplasms	5.1
5	090-094	Ischaemic heart diseases	Diseases of circulatory system	42.2
6	86-90, 92, 94, 98	Cerebrovascular diseases	Diseases of circulatory system	10.2
7	099	Cerebrovascular disorders without hypertensive disease	Diseases of circulatory system	10.8
8	100	Diseases of arteries, arterioles and capillaries	Diseases of circulatory system	4.9
9	105-107	Pneumonia	Diseases of respiratory system	0.9
10	108	Chronic bronchitis	Diseases of respiratory system	3.0
11		Other respiratory diseases	Diseases of respiratory system	0.6
12	115-127	Diseases of digestive system	Diseases of digestive system	3.1
12	160-162	Transport accidents	External causes of death	1.2
13	173	Suicide	External causes of death	1.8
14	174	Homicide	External causes of death	0.8
15		Other external causes	External causes of death	6.3
16	 073 075 122 163	Alcohol related causes = Alcoholic psychosis Chronic alcoholism Alcoholic liver disease Accidental poisoning by alcohol	 Mental and behavioral disorders Mental and behavioral disorders Diseases of digestive system External causes of death	1.9

Source: author calculation using data of the State Statistics Service of Ukraine

Correspondence analysis (CA) is used as a statistical visualization method for picturing the rows (regions) and columns (causes) of a two-way contingency table such that the positions of the row and column points are consistent with their associations in the table. In mathematical terms it is decomposing the overall Chi-square statistic by identifying a small number of dimensions in which the deviations from the expected values can be represented.

The axes are chosen in such way so to maximize the distance between the region or cause points. The name of a specific cause is placed near region for which that specific cause is overrepresented. The size of a point tells how well it represents a cause in a space.

Findings

As graphical display in Figure 1 show, the first axe catches 39.4% of variation, and together with the second axe – 68.9%. Adding third axe as in the Figure 2 improves representation up to 81.3%.

From the two figures below one may see that distribution of regions according to cause-specific mortality profile has a shape of triangle with three vertices represented by pathologies of circulatory system: ischaemic heart disease; cerebrovascular disorders without hypertensive disease; and diseases of arteries, arterioles and capillaries. These categories have the most of weight and are responsible for disparities. At the same time not less important cerebrovascular diseases do not cause interregional gaps and their level of SDR is around the average in each region. This finding stresses the importance of treating circulatory system diseases separately, as they are playing not just an important but a determinant role in shaping interregional variation.

Ignoring diseases of circulatory system one may observe some kind of regularity in the spread of cause points – mortality of exogenous starts in the lower part of the graph, and is replaced by endogenous pathologies in the upper part. The distribution of row points follows similar vertical pattern designing southern and eastern regions at the bottom while northern and western at the top. Correspondingly one may roughly distinguish two main groups.

First group concentrating in the upper part display the best performing regions in terms of life expectancy. They are characterized by prevailing ischaemic heart diseases and bronchitis in nosological structure. These are all western regions: Vinnytska, Chernivetska, Ternopilska, Ivano-FrankivskaRivnenska, Lvivska oblasts, and also Chernihivksa and Zhytomyrska oblasts from the North.

Second group includes regions found in the bottom part of graphs and that have rather unfavorable mortality profile meaning prevailing mortality from cerevrovascular diseases, different types of cancer, some respiratory and digestive diseases, and also some violent causes of death. These are: one the most eastern of western regions (Khmelnytska oblast), some regions from the center (Kirovohradska and Poltavska oblasts), and some eastern regions (Luhanska, Donetska, and Kharkivska oblast). A particular extension of this cluster to the South and East is due to violent causes, such as homicides and suicides, and also tuberculosis and pneumonia.

Such analysis helps to verify that “all-causes” rates mask very different cause-specific structures (for example, two northern neighbors Chernihivska and Sumska oblast have SDR around 1590 deaths, appear on different sides of triangle) and that mortality patterns should be studied in their integrity.

Figure 1: Correspondence analysis of cause-specific death rates in Ukraine's regions in two-dimensional space, both sexes combined, 2000-2003

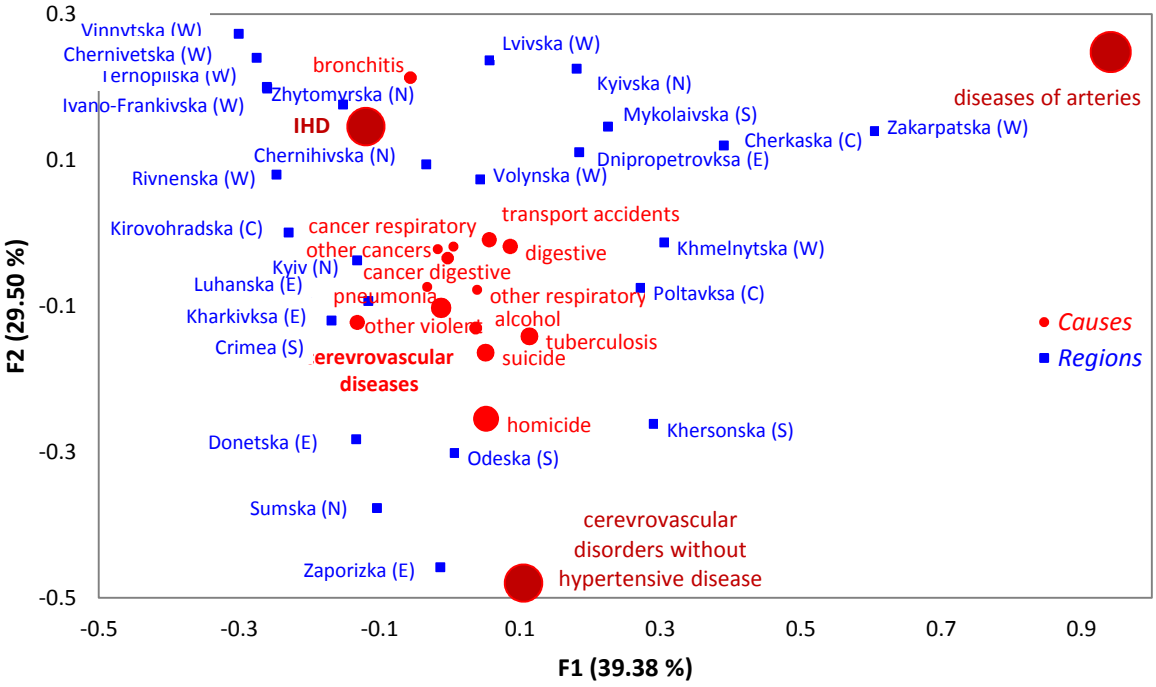

Figure 2: Correspondence analysis of cause-specific death rates in Ukraine's regions in three dimensional space, both sexes combined, 2000-2003