

# Geographical divergence of mortality in Ukraine

## *Description of the topic*

Ukraine is a large and diverse country, wedged between European Union and Russian Federation and torn up inside by internal differences. This contrast among its remote parts is visible on the scale of many dimensions: socio-economic situation, political preferences, cultural habits, lifestyles, and, thus, access to medical care, and surviving. This contrast was even more sharpened by the crisis, which stroke Ukraine at the end of XXth century and increased inequalities in the society. In the recent years the situation may have still worsened in already vulnerable regions.

Therefore, demographic characteristics, and mortality in particular, experience divergence as well. The difference between maximum and minimum life expectancy reaches 5 years. This gap is even more pronounced for males – almost 7 years, and to a lesser extend for females – 3.6 year (according to 2001 census). The investigation and explanation of variations in mortality across regions in Ukraine is relatively a new focus. Studies highlighting inequalities were not greeted in Soviet state, which pursued an ideology of social homogeneity. The access to the data was limited and operating with huge dataset existing only in paper form required rigorous efforts. Even more challenging was to perform analysis on the sub-regional (district) level given the large number of districts, a quite complex administrative structure, and the uncertain quality of data.

This paper is a first attempt to uncover inter-regional as well as inter-district differences in respect to cause-specific mortality. The role of cities is tent to be identified as well. The study period refers to the very recent years, 2005-2010.

## *Data and method*

Administratively, Ukraine is divided into 27 territorial units: 24 regions (*oblasts*), the Autonomous Republic of Crimea (*AR Krym*), and two cities with special status: Kyiv, the capital city, and Sebastopol agglomeration. The average population of one region is 1.8 mln people. Regions are subdivided into districts (*raions*) and cities of oblast or republic (for AR Krym) importance. There were 490 raions and 174 cities and urban agglomerations at the moment of census in 2001. The average population of a district is around 50 thousand people.

For our analysis we decided to affiliate units with “special status” to the districts on which territory they are physically located, so to avoid problem of “ruralizing” of some of the districts. Therefore, instead of 490 districts and 174 cities with special status we have 496 territorial entities of the 3rd level (still named districts), each of which has rural and urban population. Subsequent summing up of all districts of one region will produce a region’s total.

The basic and most reliable source on population is the 2001 census. This data is complemented with vital statistics about natural movement of population. Beginning from 2005 (the year of switch to the 10<sup>th</sup> revision of the International Classification of Diseases) the data by cause of death by districts became available. Deaths are spread into 19 broad classes of causes with some subdivision into smaller groups for particular classes (i.e., for infectious

diseases, psychic disorders, circulatory and digestive system diseases, and external causes of death), however, number of deaths is given only for total population.

Table 1. Availability of demographic information by districts - State Statistics Office of Ukraine

Forms	Type of data	Period	№ units	Age grouping	Comments
	Pop count by age, sex & place of residence	end of 2001	490+174	0, 1, 2...100+, unknown	Census data
A-1	Birth; deaths by sex & place of residence	2002-2010	490+174	0, total	
C-1p	Deaths by sex, place of residence and year of birth	2003-2010	44 (cities)	0, 1, 2...100+	unknown are redistributed
C-14	Deaths by territory & cause of death	2005-2010	490+174	Total	19 classes according to ICD-10
RN-2	Pop count by age, sex & place of residence	2003-2010	33 (cities)	0, 1, 2...100+	unknown are redistributed

Source: summarized by the author

Using available information different indicators can be calculated.

1) First, by-district population distributed in age groups was estimated using census and regional figures as reference:  $\frac{prop_x^{j,n}}{prop_x^{r,n}} = \frac{prop_x^{j,census}}{prop_x^{r,census}}$

$prop_x^{j,n}$  - share of population of age  $x$  in the total population of district  $j$  in the year  $n$ ;

$prop_x^{r,n}$  - share of population of age  $x$  in the total population of region  $r$  in the year  $n$ ;

$prop_x^{j,census}$  - share of population of age  $x$  in the total population of district  $j$  in the census year ;

$prop_x^{r,census}$  - share of population of age  $x$  in the total population of region  $r$  in the census year;

2) To measure mortality we use Standardized Mortality Ratio, which is a relationship of actual to hypothetical number of deaths. The later is found through applying “standard” (in our case Ukraine’s) age-cause specific mortality profile to actual (estimated) population of each district.

Standardized Mortality Ratio from all causes	Standardized Mortality Ratio for cause $c$
$SMR_j = \frac{D_j^n}{\sum P_{x,j}^n \cdot m_x^{st,n}}$	$SMR_j = \frac{D_{j,c}^n}{\sum P_{x,j}^n \cdot m_{x,c}^{st,n}}$ , where

$P_{x,j}^n$  = age structure of the population in the region  $j$  in the year  $n$ ;

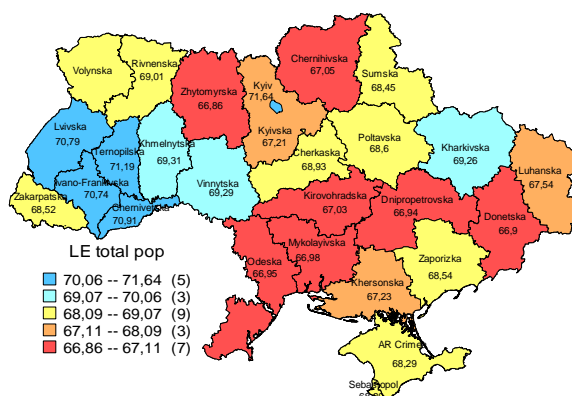
$D_{j,c}^n$  = total of deaths in the district  $j$  for year  $n$  for the cause  $c$ (or all causes together);

$m_{x,c}^{st,n}$  = standard death rate at age  $x$  for the year  $n$  for the cause  $c$  (or all causes together).

## Findings

Calculation of life expectancy for recent years (2005-2010) put on evidence several facts: first, there is a visible contrast between western and south-eastern parts. Second, regions with similar level of mortality tend to be in groups. The exception is the city of Kyiv where life expectancy is the highest, while on the other hand, the region of Kyiv and its neighbours demonstrate one of the worst situation. These three regions (Zhytomyrska, Kyivska and Chernihivska oblasts) have created one dark zone over more or less well-doing north-west during recent decades only. Their phenomenon is often explained by Chernobyl catastrophe, though there is no direct link meaning that mortality from cancer is no higher than in other regions, and sometimes is even lower. In regard to urban-rural differences, life expectancy is always higher in urban areas (66.9 vs. 69.5), except in Zakarpatska oblast, the region behind Carpathian Mountains.

Figure 1. Life expectancy by regions in Ukraine, 2005-2010



The nosological structure of mortality in Ukraine reminds a mixed type (table 1 and figure 2). While mortality due to chronic diseases is now prevailing, infectious diseases remain rather high. This is especially true for the south-eastern belt. It also somewhat overlaps with mortality of digestive system. Diseases of circulatory system as a cause of death prevail on the North; here they highly negatively correlate with neoplasms (which is unexpectedly). Cancer mortality is peculiar for industrial zone of Donbas. However, the sharpest contrast between eastern and western part is observed according to external causes of death.

Table 1 Hierarchy of causes of death in 2006-2009, Ukraine

Cause	% in total deaths	coeff of variat, %
Diseases of the circulatory system	63.8	17.5
Neoplasms	12.0	18.0
External causes of morbidity and mortality	8.1	27.7
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	3.5	134.4
Diseases of the respiratory system	3.2	61.3
Certain infectious and parasitic diseases	2.2	50.8
Others	7.3	-

While western Ukraine shows patterns that are usually more favourable, there are some causes of death that take lead in these regions comparing to others. For example SMR for diseases of the respiratory system is a mirror image of SMR for infectious diseases: the worst situation is on the west and in the centre and the best is on the south.

A closer look to mortality distribution by districts gives the impression that regions are quite heterogeneous inside of themselves. The coefficient of variation almost doubles (from 7.3 to 12.5) while we move from regional to district dimension. The most homogenous is the western part of Ukraine.

Figure 2 SMR for certain causes of death by regions (on the left) and by districts (on the right), Ukraine 2006-2009

