

PRACA POGLĄDOWA
REVIEW ARTICLE

TEN INDICATORS WHICH CHARACTERIZE MEDICAL-DEMOGRAPHIC PROCESSES IN ADJACENT REGIONS OF UKRAINE AND POLAND

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ABSTRACT

Introduction: Medical-demographic processes are one of the main signs of life quality, the level of socio-economic development of society.

The aim of the work is to compare and evaluate the medical-demographic processes in the two neighboring regions of neighboring countries, due to their geographical proximity, the ratio of the size of the territories and the population.

Materials and methods: The study was conducted on the basis of official statistics published by the State Statistics Service of Ukraine and the Main Department of Statistics in Poland, the depth of the research - 2008-2017, the scope of the study - Lviv region of Ukraine and the Podkarpackie region of Poland. The system approach, demographic and medical-statistical methods were used in the work.

Review: In both territories the population aging is going on, illustrated by indicators such as the age structure of the population, the level of demographic load and the average age of the population. Data on population reproduction in both regions is narrowed, indicating a prevalence of mortality over births. The average life expectancy in the Podkarpackie region is higher and has a tendency for further growth. In the Lviv oblast, the average life expectancy is also growing, due to the positive trend towards a decrease in overall mortality, but is offset by a decline in fertility and high infant mortality and mortality rates, especially from circulatory system pathology.

Conclusions: The analysis of our 10 indicators showed the heterogeneity of medical and demographic processes in the two neighboring regions of neighboring countries, despite their geographical proximity, the ratio of the size of the territories and the population.

KEY WORDS: medical-demographic processes, population.

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INTRODUCTION

Preserving human health is one of the priorities of social development in each state, because in the system of human values health is of special significance - in case of its loss or substantial deterioration, everything else loses its meaning. The health of citizens has a significant impact on the processes and results of economic, social and cultural development of the country, the demographic situation and the state of national security, is an important social criterion for the levels of development and welfare of society [1, 2].

The gross inequalities in health that we see within and between countries present a challenge to the world. The fact that there should be a spread of life expectancy of 48 years among countries and 20 years or more within countries is not inevitable [3]. Complexity defines health. Now, more than ever, in the age of globalization, this is going that way [4].

Eight key themes related to healthy life have been identified: housing; transportation; healthcare; finances; care giving; falls; rural communities; and support systems [5].

In countries of the world, awareness is increasing that medical care alone cannot adequately improve health overall or reduce health disparities without also address-

ing where and how people live. A critical mass of relevant knowledge has accumulated, documenting associations, exploring pathways and biological mechanisms, and providing a previously unavailable scientific foundation for appreciating the role of social factors in health [6, 7, 8].

Studies of inequalities in health between rural and urban settings have produced mixed and sometimes conflicting results, depending on the national setting of the study, the level of geographic detail used to define rural areas and the health indicators studied [9, 10]. As an example, China has seen the largest human migration in history, and the country's rapid urbanization has important consequences for public health. A provincial analysis of its urbanization trends shows shifting and accelerating rural-to-urban migration across the country and accompanying rapid increases in city size and population. The growing disease burden in urban areas attributable to nutrition and lifestyle choices is a major public health challenge, as are troubling disparities in health-care access, vaccination coverage, and accidents and injuries in China's rural-to-urban migrant population. Urban environmental quality, including air and water pollution, contributes to disease both in urban and in rural areas, and traffic-related accidents pose a major

public health threat as the country becomes increasingly motorized [11].

According to Movahedi, M. and co-authors, there is still considerable inequality among the rural population and at a provincial level [12]. While rural location plays a major role in determining the nature and level of access to and provision of health services, it does not always translate into health disadvantage [13].

As E. Libanova notes, this also applies to inequalities in the length of life - children from poor families face a higher risk of premature death or illness and are less likely to realize their potential. Usually people with high incomes live longer than the poor; in turn, good health is the foundation of proper economic competitiveness [14]. As noted by Zahnd, Whitney E. and singers - health literacy is lower in rural areas [15].

However, at the moment, the questions remain about how to improve health in an economically efficient and politically acceptable manner. What makes people healthy? Why are the poor less healthy than the rich? Why do some countries have better health than others? [16]. And the main thing is the achievement of political freedom.

THE AIM

The aim of the work is to compare and evaluate the medical and demographic processes in two neighboring regions of neighboring countries, considering their geographical proximity, the ratio of the size of the territories and the population.

MATERIALS AND METHODS

The study was conducted on the basis of official statistics published by the State Statistics Service of Ukraine and the Main Department of Statistics (GUS) in Poland, the research depth is 2008-2017, the study volume is Lviv region of Ukraine and the Podkarpackie region of Poland, the data presented are based on gender, age, type of settlement. The system approach, demographic and medical-statistical methods were used in the work.

REVIEW

Considering the geographical proximity - the joint border, the similarity of the climatic characteristics, the area of the territory and the population of the Lviv region of Ukraine and the Podkarpackie region of Poland (Table I), we have selected 10 indicators for comparing the medical and demographic processes in these regions, which is more likely to give a full characteristic.

- 1. The population, gender and type of settlement** reflect the dynamics of change for the period from 2008 to 2017, considering the number of urban and rural population and their distribution by gender (Table II).
- 2. The age structure of the population.** The dynamics of changes in the age composition of the population

of Lviv Oblast and Podkarpackie region for 2008-2017 was calculated in 3 age groups of population (Table III).

- 3. Demographic load.** While calculating the demographic load index, a generalized quantitative characteristic of the age structure of the population is established, which shows the burden on society by the unproductive population (Table IV).
- 4. Average age of the population.** The dynamics of the change in middle age was calculated considering the place of residence of the population of Lviv region and Podkarpackie region for 2008-2017 (Table V).
- 5. Fertility and total fertility rate.** The fertility rate in Lviv Oblast and Podkarpackie region for 2008 and 2017 is provided both for the whole territory of residence and considering the place of residence of the population (Table VI). The most accurate measurement of the birth rate is total fertility rate, which characterizes the average number of births per woman in a hypothetical generation for all her life, under the conditions of preserving the existing fertility levels at each age, regardless of mortality and age composition changes (Fig. 1).
- 6. Indicator of population reproduction.** The reproduction rate of the female population shows how many middle-aged girls born by one woman throughout their lives would have survived the birth of their mother at their birth, provided that at any age the existing birth rates and deaths were maintained, provided as of January 1 for 2008-2017 and calculated indicator of the dynamics of changes during this period (Fig. 2).
- 7. Mortality of the population.** The total mortality rate in Lviv Oblast and Podkarpackie region for 2008 and 2017 was calculated for the whole territory of residence and considering the place of residence of the population (Table VII).
- 8. Mortality of infants.** One of the basic statistical indicators of demography is data on infant mortality. Indicators provided as of January 1, 2008-2017 in Lviv Oblast and Podkarpackie region (Fig. 3).
Fig.1,2,3
- 9. The main cause of death.** The main cause of mortality in both regions is the pathology of the circulatory system (Table VIII).
- 10. The average life expectancy,** as a demographic prognostic statistic and target indicator in the UN Human Development Index, indicates the average expected birth-death gap for this generation. We have analyzed the average life expectancy of the population at birth in 2008-2017 in the Lviv region and Podkarpackie region, considering the place of residence (Table IX).

DISCUSSION

As a result of the survey, despite their geographical features and proximity, the correlation between the size of the territories and the population of the Lviv region of Ukraine and the Podkarpackie region of Poland, a

Table I. Population data of Lviv region of Ukraine and Podkarpackie region of Poland

As of 31.12.2017	Lviv region (1)	Podkarpackie region (2)	Ratio (1/2)
Area, km ²	21 833	17 846	1.223
Number of population	2 511 238	2 129 138	1.179
Population per 1 km ²	115	119	0.966
Female for 100 male	111	104	1.067
Number of women in total population, %	52.6	51.0	1.031
Urban population in total population, %	60.5	41.2	1.468

Table II. Population by sex and type of settlement in Lviv region and Podkarpackie region in 2008 (31.12), 2017 (31.12)

Sex, residence	Year, ratio (2017/2008)	Lviv region	Podkarpackie region
All, all	2008	2 534 559	2 099 495
	2017	2 511 238	2 129 138
	Ratio	99.08%	101.41%
Male, all	2008	1 197 351	1 026 117
	2017	1 190 549	1 042 812
	Ratio	99.43%	101.63%
Female, all	2008	1 337 208	1 073 378
	2017	1 320 689	1 086 326
	Ratio	98.76%	101.21%
All, urban	2008	1 524 256	859 465
	2017	1 519 161	876 243
	Ratio	99.40%	101.95%
Male, urban	2008	717 011	410 664
	2017	712 780	419 464
	Ratio	99.41%	102.14%
Female, urban	2008	807 245	448 801
	2017	806 381	456 779
	Ratio	99.89%	101.78%
All, rural	2008	1 010 303	1 240 030
	2017	992 077	1 252 895
	Ratio	98.20%	101.04%
Male, rural	2008	480 340	615 453
	2017	477 769	623 348
	Ratio	99.46%	101.28%
Female, rural	2008	529 963	624 577
	2017	514 308	629 547
	Ratio	97.05%	100.80%

significant difference was found in the development processes of the regions of the two adjacent states in terms of medical and demographic indicators. Thus, for the period chosen for the calculation period, a positive balance of the population of Podkarpackie region was established

(+ 1.41%), while in Lviv region it was reduced (-0.92%). However, these indicators differed among females: the largest decrease was in the Lviv region (-1.24%). Against the background of demographic changes for the 10th anniversary, the number of women (-1.24%), especially in

Table III. Change in the age composition of the population of Lviv region and Podkarpackie region in 2017 compared to 2008

Kind of settlement	Lviv region (persons)				Podkarpackie region (persons)			
	All	0-14	15-64	65 and older	All	0-14	15-64	65 and older
All								
All	-0,92	3,90	-2,21	0,05	1,41	-6,78	-0,80	23,78
Urban	-0,33	5,91	-4,00	13,49	1,95	-0,40	-4,47	43,09
Rural	-1,80	1,27	0,79	-14,56	1,04	-10,38	1,90	11,66
Male								
All	-0,57	4,28	-1,85	0,40	1,63	-6,89	-0,19	28,84
Urban	-0,59	6,22	-3,51	10,56	2,14	-0,24	-3,57	49,05
Rural	-0,54	1,73	0,80	-11,99	1,28	-10,63	2,17	16,17
Female								
All	-1,24	3,51	-2,56	-0,14	1,21	-6,67	-1,42	20,61
Urban	-0,11	5,58	-4,45	15,15	1,78	-0,57	-5,32	39,36
Rural	-2,95	0,80	0,77	-15,79	0,80	-10,12	1,62	8,83

Table IV. Demographic burden of the population of Lviv region and Podkarpackie region for 2017 (31.12.) up to 2008 (31.12.), %%

Type of settlement	Lviv region	Podkarpackie region
All	104.35	107.58
Urban	113.94	125.12
Rural	92.55	97.28

Table V. Average age of the population of Lviv region and Podkarpackie region for 2008 (31.12.) and 2017 (31.12.)

The region	Average age of population 2008/2017			Correlation 2017 to 2008		
	All	Urban	Rural	All	Urban	Rural
Lviv region	40.70/40.52	40.16/40.61	41.52/40.38	99.55%	101.12%	97.24%
Podkarpackie region	39.83 / 41.49	40.14 / 42.37	39.62/40.88	104.17%	105.57%	103.17%

Table VI. Fertility per 1000 live population on 31.12 the year in Lviv region and Podkarpackie region

The region	Birth rate in 2008/2017			Value of 2017 to 2008		
	All	Urban	Rural	All	Urban	Rural
Lviv region	11.30/9.90	10.80/9.20	12.20/10.90	87.61%	85.19%	89.34%
Podkarpackie region	10.55/10.31	9.93/9.74	10.98/10.70	97.73%	98.09%	97.45%

Table VII. Mortality of the existing population at 31.12 the year in Lviv region and Podkarpackie region, ‰

The region	Mortality in 2008/2017			Correlation 2017 to 2008		
	All	Urban	Rural	All	Urban	Rural
Lviv region	12.87/12.67	10.82/11.10	16.04/15.20	-1.55%	+2.59%	-5.24%
Podkarpackie region	8.85/9.08	8.24/8.69	9.28/9.36	+ 2.60%	+5.46%	+0.86%

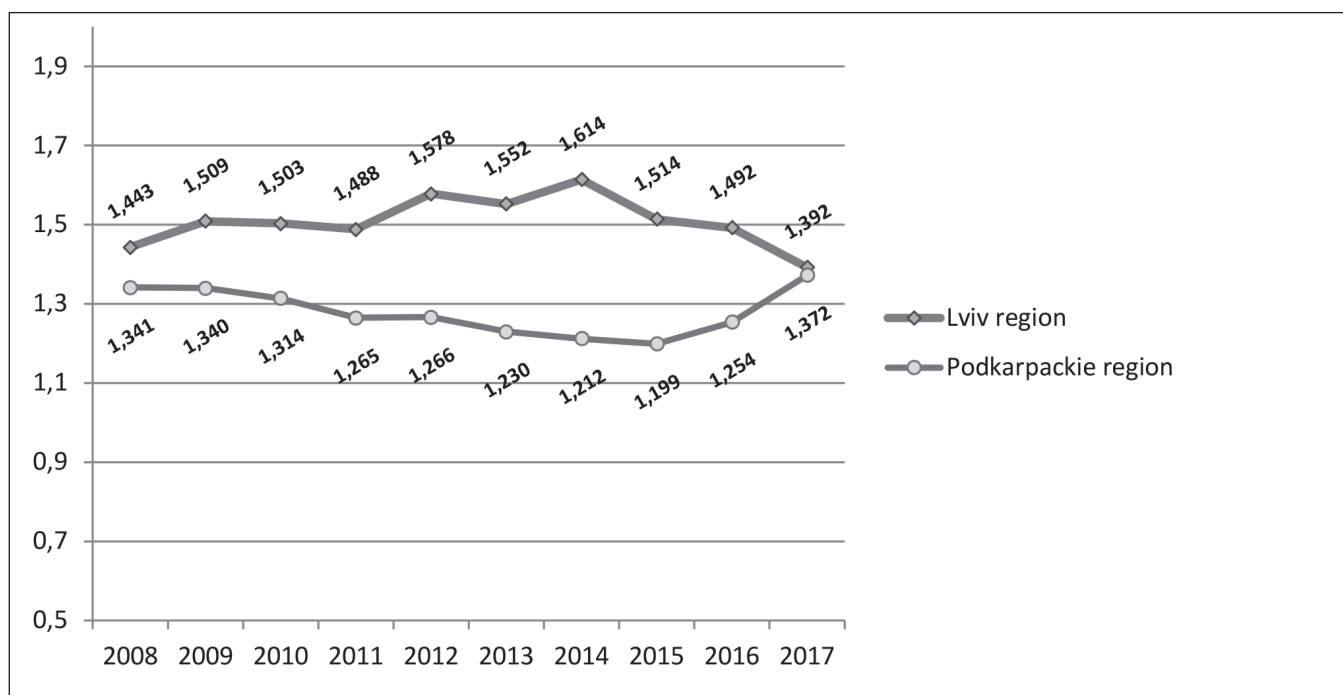
rural areas (-2.95%), was the most pronounced decrease in Lviv oblast. At the same time, in the Podkarpackie region, with the increase in the population, it was the smallest among women (+ 1.21%), including among residents of rural areas (+ 0.80%). Thus, population changes

occurred in both regions with opposite development and synchronous changes among residents, both by gender and by place of residence.

Studying the change in the age structure of the population of these regions, the positive dynamics of the

Table VIII. Mortality of population caused by pathology of the blood circulation system and its share of total mortality, as of 31.12 the year in the Lviv region and Podkarpackie region for 2008-2017

Years old	Mortality per 100 thousand population		Part of the total mortality	
	Lviv region	Podkarpackie region	Lviv region	Podkarpackie region
2008	888.6	422.8	64.7	48.9
2009	839.5	459.5	65.2	51.9
2010	832.4	449.8	64.9	52.3
2011	785.7	430.5	64.1	50.3
2012	805.8	437.5	64.6	50.6
2013	814.5	441.6	65.3	50.6
2014	824.0	398.0	64.4	46.1
2015	835.6	487.3	64.5	53.4
2016	790.0	419.5	62.1	46.7
2017	790.5	391.9	62.4	43.1
%% 2017 until 2008	-11.04%	-7.31%	-	-

**Fig. 1.** The dynamics of the total fertility rate (for 1 woman) as of 31.12 of the corresponding year in Lviv region and Podkarpackie region for 2008-2017.

population aged 0-14 in the Lviv region (+ 3.90%) with a more pronounced growth among the inhabitants of urban settlements (+ 5.91%) was found. The more pronounced is the change in the number of people aged 65 and older: urban settlements experienced an increase of + 13.49%, and among residents of rural areas - a decrease of -14.56%. The same multi-directional dynamics was observed both among male and female population of the region.

In the Podkarpackie region, when estimating the age structure of the population, it was found that the pop-

ulation in both age groups: 0-14 years old and 15-65 years, decreased, and same among men and women. At the same time there was a pronounced increase in the number of persons in the senior age group (65 years or more). Overall growth for 10 years is 23.78%. Significantly, it was among the urban population - +43.09%, among men +49.05%. In rural areas, this increase was +11.66%, including among the male population at +16.17%. Thus, population aging was observed in both regions of the study. However, it was very clear in the Podkarpackie

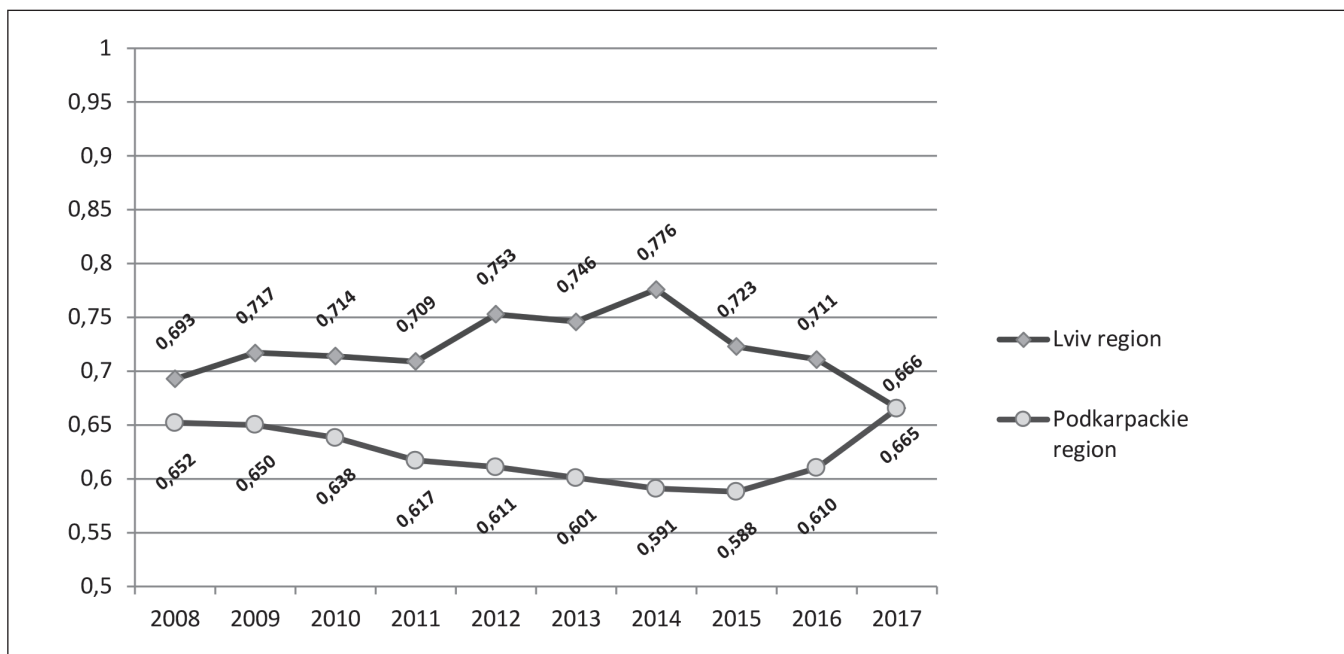


Fig. 2. The dynamics of the reproduction rate of the population (per 1 woman) as of 31.12 of the corresponding year in Lviv region and Podkarpackie region for 2008-2017.

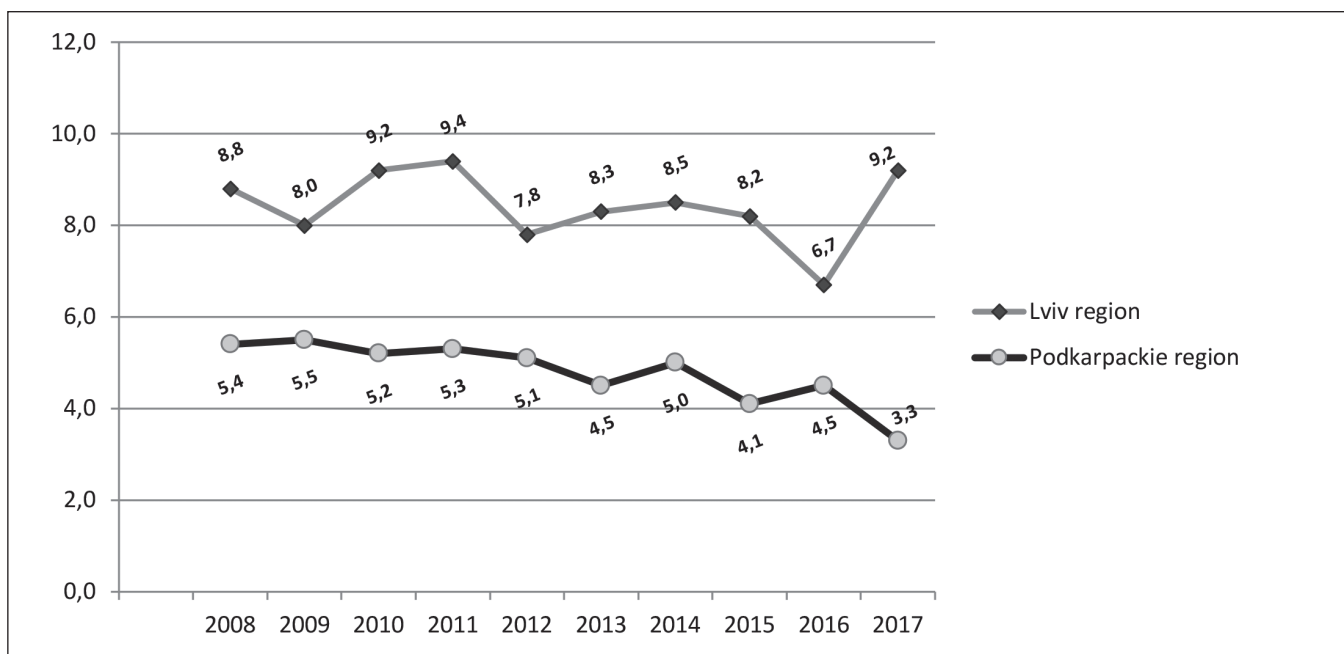


Fig. 3. The dynamics of the infant mortality rate (per 1000 live births) as of 31.12 of the corresponding year in Lviv region and Podkarpackie region for 2008-2017.

region. In the Lviv region, this trend was not so clear due to the small but increasing number of people aged 0-14 years.

The generalized quantitative characteristic of the age structure of the population of regions was established while calculating the demographic load index. He shows, on the basis of preliminary data, that the burden on society by the unproductive population in both regions has increased, but to a lesser extent in the Lviv region

(+4.35% vs. +7.58% in the Podkarpackie region). The growth of demographic burden among the urban population is considerably higher, correspondingly +13.94% and + 25.12%. By contrast, there was a decrease in the countryside. The practical application of this data take place when calculating the expenses necessary for retirement provision, the cost of maintaining children, used in the development of measures for social security and rational use of labor resources.

Table IX. Average life expectancy at birth as of 31.12 the year in Lviv region and Podkarpackie region, for 2008 and 2017

Region/years	Men			Women		
	All	Urban	Rural	All	Urban	Rural
Lviv region 2008/2017	65.0/68.5	66.2/69.5	63.3/67.2	76.5/78.4	76.7/78.9	76.3/77.8
Ratio 2017 to 2008	+5.38%	+4.98%	+6.16%	+2.48%	+2.87%	+1.97%
Podkarpackie region 2008/2017	73.1/75.6	73.6/76.5	72.6/74.9	81.3/83.1	81.1/83.0	81.4/83.1
Ratio 2017 to 2008	+ 3.42%	+3.94%	+3.17%	+2.21%	+2.34%	+2.09%

Table X. Indicators of evaluation of medical and demographic processes for the period from 2008 (31.12.) to 2017 (31.12.) in Lviv region and Podkarpackie region

Indexes	Lviv region	Podkarpackie region
1 Amount and location of the population	The decline is a greater extent, in the countryside, and the female population	Insignificant growth in all territories, the lowest in rural women
2 The age structure of the population	The increase in persons aged 65 and older among urban settlements and the decrease among rural inhabitants	The pronounced increase in persons in the age group of 65 and older
3 Demographic burden	401.35: insignificant growth	107.58: growth, especially among the urban population
4 Average age of the population	40.52 years: slight growth in urban settlements and declines in rural areas	41.49 years: growth
5 Fertility and total fertility rate	9.90‰ (1.392): a sharp decline, from 2015, a decline in the total coefficient	10.34‰ (1.372): decreased, since 2016, the total factor has started to grow
6 Population Replay Rate	0.666: narrowed	0.665: narrowed
7 Mortality of the population	12.67‰: reduced among rural population	9.08‰: increased, a greater extent in urban settlements
8 Mortality of infants	9.2 per 1000: high	3.3 per 1000: decreased
9 The main cause of mortality	Pathology of the circulatory system (790.5 per 100 thousand), more than 60% of all deaths	Pathology of the circulatory system (391.9 per 100 thousand), up to half of all deaths
10 Average life expectancy	68.5 for men, 78.4 for women: growth, with the prevalence among the male population of the countryside	75.6 for men, 83.1 for women: insignificant growth

Another indicator that characterizes the age structure of the population is its average age. In the reporting period, the average age of the urban population of the Podkarpackie region was the highest (42.37 years) and for the 10 years since 2008 it has actually grown the most among this population cohort (+5.57%). A decrease in the average age was found in a group of residents of the rural area of the Lviv region (-2.76%). In this cohort of the inhabitants of the region in 2017, the lowest average age of the population (40,38 years) was found, and in general, the average age of the inhabitants of the Lviv region was lower than in all groups of inhabitants of the Podkarpackie region.

The result of the action of social forces and laws in specific conditions is characterized by such an indicator as birth rate. What are the peculiarities of fertility found in the two adjacent regions? The birth rate in the Lviv region in 2008 exceeded that in the Podkarpackie

region, including both urban settlements and rural areas. However, as of 01.01.2018, the birth rate has decreased both in the Lviv region and Podkarpackie region. The decline in fertility was more clear in the Lviv region (by 12.39%, in the Podkarpackie region - by 2.27%), which led to a lower level of indicators in general and in urban settlements than in the Podkarpackie region.

The coefficient of total fertility is valuable for performing an interterritorial comparison, allowing to rate the level of fertility in one or another country with one number, the size of which does not depend on the influence of the age structure. We have found that the total fertility rate in 2008-2017 was higher in Lviv region during all the period. However, the dynamics of its change since 2014 in the Lviv region is negative, and in the Podkarpackie region since 2016, the growth of the total fertility rate began to increase, and it became the highest for the entire study period (2017 - 1,372).

The assessment of the state of reproduction of the population gives a similar indicator. The calculation of this indicator shows that Lviv region, considering all the fluctuations of its values in 2017, has its lowest level (0.666). At the same time, in Podkarpackie region in 2017, its value was set to be the highest for 10 years (0.665). Since over the entire period, the reproduction rate of the population on average per woman was lower than 1, respectively, it established its narrowed character in both regions, indicating an excess of deaths over births.

Considering positive changes in mortality rates of the population of the Lviv region in general and a decrease in the mortality rate among the inhabitants of the countryside, the mortality rate in Lviv region exceeds that in the Podkarpackie region by 1.4 times, according to 2017 year data. In this case, the mortality rate of the infants this year in Lviv region exceeded that in Podkarpackie Voivodeship by 2.79 times.

The main class of diseases that caused the death of the population in both regions was the pathology of the circulatory system. It included 60%+ of all deaths in the Lviv region and from 43 to 54% (depending on the year) in the Podkarpackie region. The excess in Lviv region was set higher by 1.30 times and the highest was in 2017 (1.45 times).

An important indicator of the characterization of medical-demographic processes and the integral assessment of health state is such an indicator as the average life expectancy. The life expectancy of the female population in both regions is higher than the male life expectancy. However, in Podkarpackie region, both women and men live longer. Comparison over the past 10 years has shown the increase in life expectancy in both regions. It was more clear among the male population of the Lviv region in general (+5.38%), as well as among urban residents (+4.98%) and in rural areas (+6.16%). Extension of the average life expectancy among women in both regions did not exceed 3.0%.

CONCLUSIONS

A comparative analysis of medical and demographic processes in the two neighboring regions of neighboring countries was conducted, considering their geographical proximity, showed a significant difference in the dynamics of changes in the correlation between the size of the territories and the population (Table X).

In both territories overall population aging takes place, illustrated by indicators such as the age structure of the population, the level of demographic load and the average age of the population. Data on population reproduction in both regions are narrowed, indicating the prevalence of mortality over births. However, the birth rate in Podkarpackie region is higher, and the mortality rate is lower than in Lviv region, including those caused by the main factor - the pathology of the circulatory system. As a result, the average life expectancy in the Podkarpackie region is higher and has a tendency for further growth. At

the same time, the average life expectancy in the Lviv region is also increasing, due to the positive trend towards a decrease in the overall mortality rate, but is offset by lower birth rates and high levels of population mortality and infant mortality, especially caused by pathologies of the circulatory system.

Thus, the analysis of the 10 indicators we have selected allows us to assess the medical and demographic situation in society and direct the community's actions to stimulate fertility and reduce mortality and prolong the average life expectancy.

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2. Medico-social determinants of health of rural population and life expectancy, 2018-2023 years.

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According to the order of the Authorship.

Conflict of interest:

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