

Rural population in Ukraine: assessing reality, looking for revitalization

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Abstract

The rural population in Ukraine has declined dramatically since 1989. Today, Ukraine's rural areas suffer from depopulation and out-migration as well as from the low fertility, high mortality, and declining life expectancy of residents, which are the obvious indications of a demographic crisis. To reverse these negative demographic trends, governmental policies should be directed at improving economic and social well-being in rural areas. This study attempts to describe and analyze the major trends and regional variations in Ukraine's rural population decline, to bring into focus the problems of rural areas that are affected by the demographic crisis, and to provide recommendations for the rural development policy-makers that would help revitalize rural areas.

Keywords: Ukraine, demographic crisis, rural population, rural development policy, rural life

Introduction

Throughout history, urbanization has been a powerful force drawing people to the cities in search of a better life and economic opportunities. As a result, rural populations in many developed countries have declined. Ukraine is no exception to this phenomenon. According to historical data from the State Committee of Statistics of Ukraine, Ukraine's rural population started its decline as early as 1913, whereas its urban population was growing steadily until 1993 (Derzhavnyi Komitet Statyky Ukrayini, 2001). What makes Ukraine different from other countries with shrinking rural populations is its deteriorating population quality. The quality of a population is defined by the health, life expectancy, education level and mortality of the economically active

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population (15–59 years old). The decrease in the rural population has become a continuous phenomenon (Figure 1) and, in the mid 1990s, resulted in a deep demographic crisis in Ukraine’s rural areas (LIBANOVA, E. *et al.* 2007).

The signs of demographic crisis are depopulation, aging, and decreasing life expectancy as well as the low fertility and rate of marriage, worsening health conditions, and deteriorating quality of education of rural dwellers accompanied by a net out-migration of the young and physically active population. The demographic crisis in rural areas has been a crucial component of the profound socio-economic crisis in Ukraine that occurred after the collapse of the Soviet Union in 1991.

This study attempts to describe and analyze the major trends and regional variations in Ukraine’s rural population decline, to bring into focus the problems of rural areas that are affected by the demographic crisis, and to provide recommendations for the rural development policy-makers that would help revitalize rural areas. The data used in this analysis come from Ukraine’s State Committee of Statistics yearbooks. The yearbooks provide demographic data at the country level and at the level of the administrative region (oblast) based on the population censuses of 1979, 1989 and 2001.

The data at the rayon (administrative entities within oblasts) level were obtained from the regional (oblast) yearbooks from 2003 to 2010 and Ukrainian Population Census website (<http://www.ukrcensus.gov.ua>). The

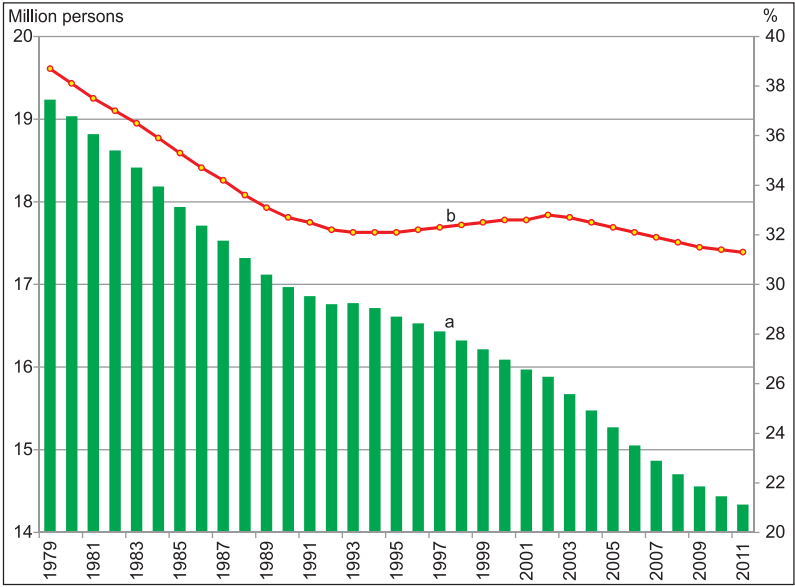


Fig. 1. Decline of the rural population in Ukraine. – a = total rural population; b = proportion of rural population, %

rayon level data allow for the analysis of spatial variations of rural population trends within the regions (oblasts) of Ukraine. For the comparison with the European region, the data provided by Eurostat, World Health Organization, and United Nations Population Division were used.

To understand the structural changes occurring and the spatial variation within Ukraine, it should be examined total population decline over time and the role of rural populations played in this trend.

Demographic crisis and its facets

Total population decline

Ukraine's population has been declining dramatically since the country began the transition from a centrally planned to a market economy. The total population loss between 1989 (the last pre-transition population census) and 2011 constitutes 5.9 million people or 11.5 per cent of the total population (Derzhavnyi Komitet Statyky Ukrayini, 2011). This considerable decrease was caused by declining fertility, increasing mortality, and significant net out-migration, and it was exacerbated by the socio-economic crisis that occurred in Ukraine following the collapse of the Soviet Union in 1991. In 1992, Ukraine's population reached its peak of 52.2 million and its steady decline started. The term "demographic crisis" was first used in Ukraine in 1985 by the Ukrainian demographer STESHENKO, V. (Demographic Dictionary, 1985). Since the 1990s, this term has been widely used to characterize the demographic situation in Ukraine.

Ukraine's population is predominantly urban (over 68 per cent) and thus the decrease of total population is largely attributed to the decrease in urban dwellers. However, the rural population decline started long before the transition of the 1990s and demonstrated a slightly higher rate of decline than the urban population. According to Ukraine's State Committee of Statistics (2011), the first signs of depopulation in rural areas were observed as early as 1979, which is thirteen years earlier than in urban areas (*Figure 2*).

The situation had worsened by the beginning of the 1990s, when rural populations suffered from unemployment, critical aging, worsening health conditions, and a deteriorated social infrastructure brought on by the economic crisis associated with the transition to a market economy.

Ukraine versus Europe

In Europe, decreasing population is not a unique phenomenon. Most Central and Eastern European countries have experienced depopulation and negative

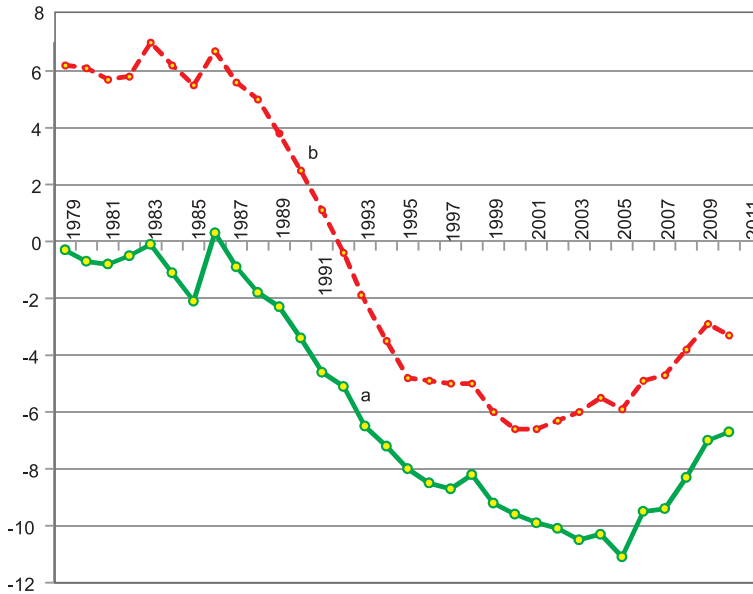


Fig. 2. Natural increase of population in rural (a) and urban (b) areas of Ukraine (per 1,000)

total population change. Some countries in Western and Southern Europe are also experiencing negative demographic trends (*Table 1*). However, even in a European context, Ukraine demonstrates an unprecedented negative natural increase and total population change, producing a population loss of 5.4 million in the last twenty years and one of the world's highest annual rates of population decline, reaching -0.65 per cent in 2008.

The recent population loss is larger than the total populations of some European countries such as Ireland (4.7 million), Latvia (2.2 million), Lithuania (3.5 million), Norway (4.7 million), and Moldova (3.6 million). Another demographic indicator that makes Ukraine different from the majority of European countries is life expectancy. While in some European countries population is decreasing, life expectancy of Europeans on the whole is increasing, indicating improvements in quality of life. Ukraine's total life expectancy is the second lowest in Europe (68.1 years in 2007) after the Russian Federation (67.7 in 2007). Life expectancy of rural dwellers is even lower (67.2 in 2007). The economic crisis of the 1990s revealed weaknesses of the centrally planned economic system dominant during the Soviet era and showed the necessity of a transition to a market economy. The transition period was painful for both the economy and the population, producing unemployment, increasing mortality among the economically active population, and worsening social problems that had been hidden during the Soviet era. Life expectancy has become an indicator of instability and uncertainty in Ukraine.

By the end of the 1990s, the negative demographic trends in rural areas were revealed by researchers studying Central and Eastern European countries during their transition to a market economy. It has been shown that, under socialism, rural-urban migration was caused by the prospect of an improved

Table 1 Selected demographic indicators of European countries, 2007

Country	Natural change	Net migration	Total change	Life expectancy at birth*, year	Total fertility rate**
	per 1000 inhabitants				
EU member states					
Belgium	1.9	5.9	7.7	79.7	1.81
Bulgaria	-4.9	-0.2	-5.1	73.0	1.42
Czech Republic	1.0	8.1	9.1	77.2	1.44
Denmark	1.6	3.7	5.3	78.7	1.85
Germany	-1.7	0.6	-1.1	80.2	1.39
Estonia	-1.2	0.1	-1.1	74.2	1.64
Ireland	9.8	14.7	24.5	77.6	1.91
Greece	0.2	3.7	3.9	80.1	1.38
Spain	2.4	15.6	18.0	81.0	1.38
France	4.6	1.1	5.7	81.3	1.98
Italy	-0.1	8.3	8.2	81.0	1.34
Cyprus	4.0	16.3	20.2	80.0	1.39
Latvia	-4.3	-0.3	-4.6	71.4	1.42
Lithuania	-3.9	-1.6	-5.5	72.0	1.35
Luxembourg	3.4	12.5	15.9	80.2	1.61
Hungary	-3.5	1.4	-2.1	73.9	1.32
Malta	1.9	4.9	6.8	80.0	1.30
The Netherlands	2.9	-0.1	2.8	80.4	1.71
Austria	0.2	3.8	4.0	80.4	1.38
Poland	0.3	-0.5	-0.3	75.5	1.27
Portugal	-0.1	1.8	1.7	79.2	1.30
Romania	-1.7	0.0	-1.7	73.3	1.29
Slovenia	0.7	7.0	7.7	79.0	1.37
Slovakia	0.1	1.3	1.4	74.8	1.25
Finland	1.8	2.6	4.4	79.8	1.83
Sweden	1.7	5.9	7.6	81.2	1.85
United Kingdom	3.2	2.9	6.1	79.7	1.85
EU candidate countries					
Croatia	-2.6	1.3	-1.3	76.0	1.38
TFYR of Macedonia	1.5	0.1	1.6	73.8	1.41
Turkey	12.8	..	12.8	74.3	2.17
EFTA countries					
Iceland	8.4	13.0	21.4	81.8	2.07
Norway	3.5	8.4	11.9	80.7	1.90
Switzerland	1.8	9.2	11.0	82.1	1.45

Table 1 Continued

Country	Natural change	Net migration	Total change	Life expectancy at birth*, year	Total fertility rate**
	per 1000 inhabitants				
Other European countries					
Albania	5.9	-0.4	5.5	72.6	1.33
Andorra	7.3	16.1	23.3	81.7	1.17
Armenia	4.1	-1.9	2.2	69.9	1.30
Azerbaijan	11.5	-0.1	11.4	67.9	2.30
Belarus	-3.0	0.5	-2.5	70.0	1.29
Bosnia and Herzegovina	-0.2	..	-0.1	75.4	1.18
Georgia	1.8	-4.7	-2.9	71.6	1.45
Moldova	-1.4	-0.9	-2.4	68.4	1.22
Montenegro	3.0	1.2	4.1	74.1	1.65
Russian Federation	-3.3	1.8	-1.5	67.8	1.41
San Marino	2.2	11.7	13.9	82.9	1.24
Serbia	-4.7	1.5	-3.2	73.7	1.43
Ukraine	-6.2	0.4	-5.8	67.6	1.3

* In 2008. ** Children per woman. .. = no data

Source: Eurostat, 2007; World Health Organization (Life tables, 2008)

standard of living available in urban areas compared to the lack of incentives under collectivization in rural settlements (DRAGONA, V. and TURNOCK, D. 2000; GORZ, B. and KUREK, W. 2000). The transition to a market economy caused rural de-industrialization and diminishing of rural services that increased migration from rural to urban areas throughout Central and Eastern Europe during 1990–1995. In order to cope with unemployment resulting from de-industrialization and land privatization, an increasing number of rural dwellers were confined to farming, which made rural areas mono-functional and left the population without employment prospects in non-agricultural sectors (REY, V. and BACHVAROV, M. 1998).

BOROWICZ, R. (1996) noted that there has been a negative effect of depopulation and out-migration on rural communities in Central and Eastern Europe. Bulgaria, for instance, experienced rapid urbanization between 1946 and 1993, when the share of urban population increased from 25 per cent to 63 per cent. This urbanization resulted in severe depopulation in rural areas, where the population age structure was irreversibly shifted by the decreasing number of women of reproductive age, producing a decreasing birth rate (REY, V. and BACHVAROV, M. 1998). These findings indicate that, in terms of declining rural population, Ukraine shares similar features with other European countries. What makes Ukraine unique is the scale of this decline and the deteriorating quality of life in rural areas that can be considered both a cause and a consequence of this trend.

There is a significant gap in publications, especially in English-speaking world, devoted to population decline in rural areas of Ukraine. In 1989 KHOMEA, A.U. published the first paper in English devoted to Ukraine's rural depopulation. He introduced rayon level analysis of demographic situation in rural areas.

Since then only few publications in English devoted to rural depopulation in Ukraine appeared. However, majority of authors use oblast' as a unit of demographic analysis (ROWLAND, R.H. 2004; PANTYLEY, I.V. 2009), which does not reveal spatial variations on a local level. The last decade demonstrates an increasing interest to the phenomenon of rural population change in Ukraine.

Two publications came out in 2008. An atlas about Ukraine in English issued by Geographical Research Institute of HAS (KOCIS, K. *et al.* 2008), and the article by KARÁCSONYI, D. (2009) was published in German. As to the research conducted by Ukrainian scholars, a work of BARANOVSKY, M.O. (2009) on depressed territories in Ukraine is a significant contribution to the study of rural population change.

Table 2 presents data from the United Nations Demographic Yearbooks that emphasize the change in size of rural population in selected Eastern European countries between 1989 and 2006. Among the ten countries presented in Table 2, six countries lost rural population between 1989 and 2006. Ukraine's loss constitutes 2.2 million people, which is a significant reduction compared to the other countries.

Table 2. Change in rural population in selected European countries, 1989–2006

Country	1989		2006		Change in rural population, 1989–2006	
	Rural population, 1,000 persons	Rural rate, % of total	Rural population 1,000 persons	Rural rate, % of total	1,000 persons	%
Albania	2,052	64.5	1,622	51.5	-431	-21.0
Bulgaria	2,938	32.7	2,271	29.5	-668	-22.7
Czech Rep.	2,189 ¹	21.1 ¹	2,713	26.4	524	23.9
Hungary	3,934	37.1	3,322	33.0	-612	-15.6
Moldova	2,129 ²	58.3 ²	2,104	58.7	-25	-1.2
Poland	14,594	38.6	14,732	38.6	138	0.9
Romania	10,840	44.8	9,670	44.8	-1,169	-10.8
Slovakia	2,188 ¹	41.3	2,401	44.5	214	9.8
Slovenia	987 ¹	49.4 ¹	1,046	52.1	58.3	5.9
Ukraine	17,113	33.1	14,900	31.8	-2,213	-12.9

¹1990; ²1997. Source: United Nations Demographic Yearbooks (1989, 2006).

Demographic trends in rural areas of Ukraine

Rural areas in Ukraine have traditionally been associated with backwardness and underdevelopment. However, the problems of rural areas have been neglected by the government since World War Two. Most of the governmental policies were focused on urban areas that were transformed into economically and socially attractive places to live. The post-war period became an era of rural-urban migration, resulting in rapid urban growth that started during the 1950s and has continued into the present. A typical rural migrant of the 1950s and 1960s was a young high-school graduate who used any means to get to a city and become established there.

Many young people who grew up in rural areas were attracted to cities by the prospect of obtaining higher education or to work at factories and plants and benefit from the amenities of urban life that were not available in their home towns and villages. Only few of them returned to the rural areas after getting their degrees.

It was considered less prestigious to develop a career in non-urban settlements. Migration to the cities became popular and was encouraged by the mass media. The most popular movies, for instance, were about young, motivated people who became successful after they left their homes in rural areas and moved to the cities.

According to Ukraine's State Committee of Statistics, the proportion of rural inhabitants in the total population decreased by 15.6 per cent between 1939 and 1959 and by 34.8 per cent between 1959 and 2007. The total number of rural residents declined by 4.67 million between 1979 and 2009, including 2.3 million since the collapse of the Soviet Union (Derzhavniy Komitet Statyky Ukrayini, 2009) (*Table 3*).

The period of decline between 1979 and 2009 can be divided into two sub-periods. These sub-periods differ in the importance of the *components* of population decline: *migration* and *depopulation* (natural decrease). The first sub-period is the time between 1979 and 1990, when net out-migration was the biggest contributor to the rural population decline (*Figure 3, Table 3*).

Table 3. Components of rural population decline

Time period	Total change in rural population	Natural increase	Net migration
	in 1,000 persons		
1979–1990	-2,411	-243	-1,962
1991–2009	-2,303	-2,191 ¹	157 ¹
1979–2009	-4,678	-2,434 ²	-1,805 ²

¹1991–2006; ²1979–2006. *Source:* State Committee of Statistics of Ukraine, 2009

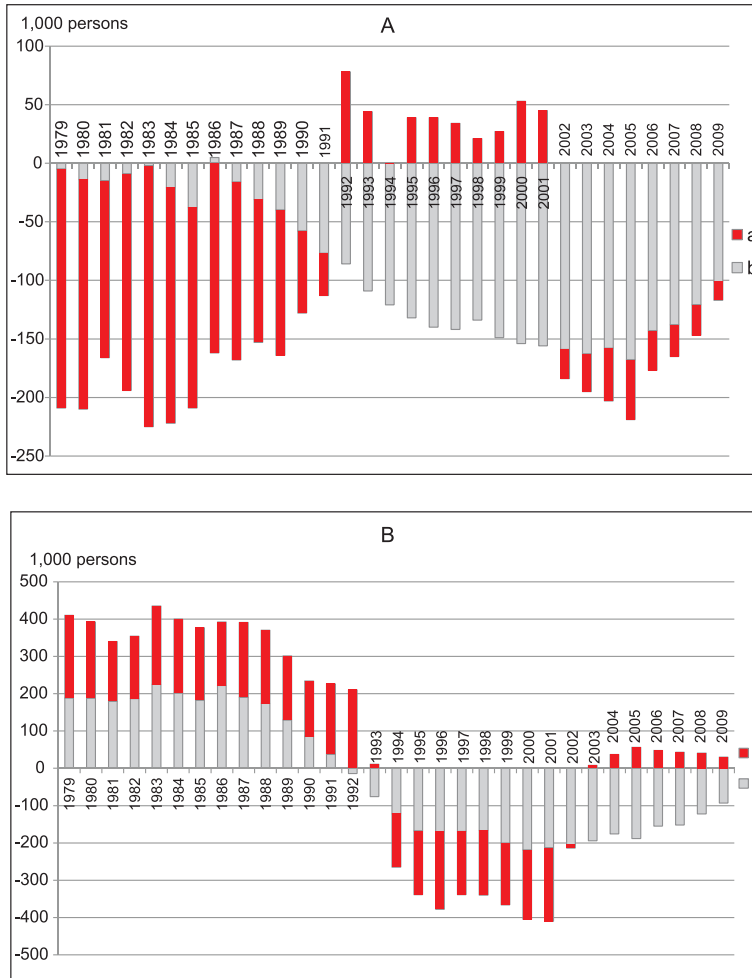


Fig 3. Components of rural (A) and urban (B) population change in Ukraine between 1979 and 2009. – a = net migration; b = natural increase

This time is called “the great escape” because the majority of the young and economically active population moved out of rural settlements. The second sub-period (1991–2009) was characterized by a high degree of depopulation that became the major component of the total rural population decline during these years. The process of depopulation in rural areas became visible in 1979, when deaths exceeded births and produced a negative natural increase of -0.3 per 1,000 persons. Since 1979, the natural increase of rural population reached a positive value of 0.3 per 1,000 only once (in 1986) and has never been positive again (figures 2 and 4).

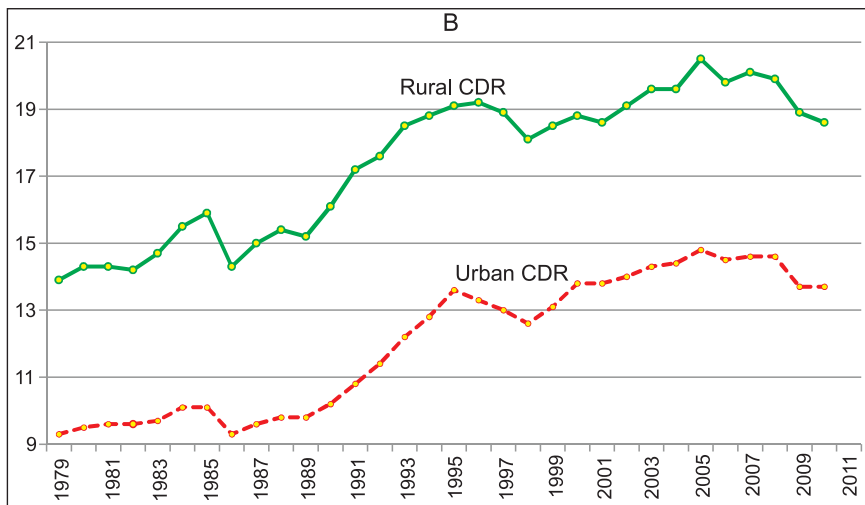
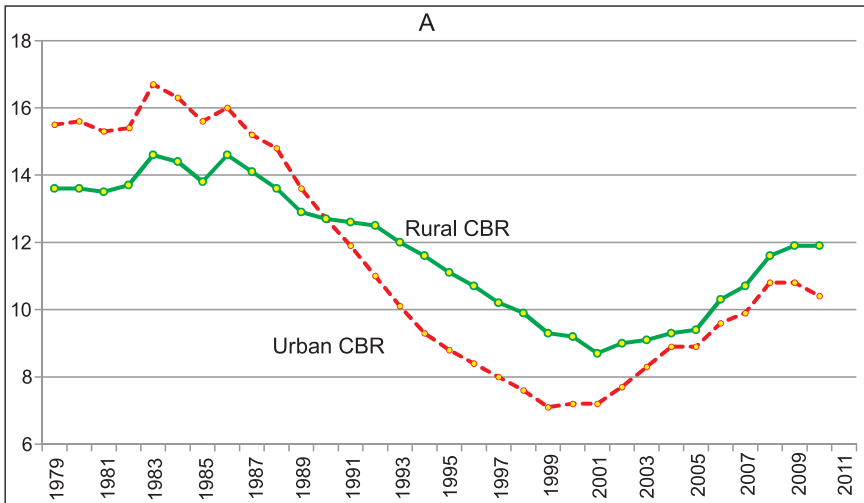


Fig 4. Changes in rural and urban crude birth rates (CBR) (A), and crude death rates (CDR) (B) in Ukraine between 1979 and 2009 (per 1,000)

The direction of migration flow reversed during this period. Beginning in 1992, in-migration outnumbered out-migration. The net in-migration in rural areas was primarily caused by the return of those rural residents who migrated to the cities prior to the economic crisis of the 1990s, but were forced to come back to the rural areas due to limited employment opportunities in urban settlements. Another category of in-migrants was ethnic Ukrainians

that returned from nearby regions following the collapse of the Soviet Union. However, this process did not last long. In 2002, there was a shift from in- to out-migration and an increase in rural depopulation (*Figure 3 A*). Although the process of depopulation in urban areas started much later than in rural settlements (*figures 2 and 3 B*), it follows the same trend of growth and contributes the most to the decline in urban population.

Fertility, mortality, and life expectancy

In the early 1990s, Eastern European countries shifted toward very low fertility (CALDWELL, J. and SCHINDLMAYR, T. 2003; FREJKA, T. *et al.* 2008). This shift was determined by the collapse of state socialism and associated with societal transformations. Although the value of family as a societal institution remains high, other forms of partnership relationships are becoming common among young people (LIBANOVA, E. *et al.* 2007). These new forms of partnership often assume new patterns of childbearing, such as the postponement of first and second births and childlessness. The economic crisis of the 1990s is arguably another cause of declining fertility. In this case, fear of losing a job prevents women from childbearing. However, KOHLER, H. and KOHLER, I. (2002) demonstrated in Russia that economic crisis and uncertainty in the labour market were correlated with increased fertility. One theory for this shift is that, within a limited and uncertain job market, unemployed women are more likely to bear a child, judging that it would take long until employment opportunities reappear.

Ukraine's fertility declined substantially in the 20th century. The total fertility rate fell from 5.2 in the 1920s to 1.9 in 1988–1989. Since 1991, the total fertility rate in Ukraine has been declining dramatically and reached 1.1 in 2000 (STESHENKO, V. 2000). Along with Armenia and the Czech Republic, Ukraine's total fertility rate is the lowest in the world (CALDWELL, J. and SCHINDLMAYR, T. 2003). STESHENKO stated that the major factors that caused the decline in fertility are worsening living standards, an ecological situation exacerbated by the Chernobyl disaster, and social discomfort brought on by worries and insecure feelings about the future. Although the last decades of 20th century demonstrated a significant decline in birth rates in rural areas of Ukraine, this decline has not been as dramatic as in urban areas (*Figure 4*). Initially higher than the rural birth rate, the urban birth rate started its rapid decline during the 1990s, and reached its lowest values of 7.1 – 7.2 per 1,000 people in 1999–2000. In 1979, 2,603 children were born in rural areas. In 1998, less than twenty years later, the number of births dropped to 1,605 (LIBANOVA, E. *et al.* 2007).

There are two peaks of increased births in both urban and rural areas during the 1980s. These peaks seem to have been short-term responses to a

governmental policy directed at increased fertility that was adopted in 1982. At that time, mothers were granted a paid three-year maternity leave with the guarantee that their jobs would be available upon return. The positive effect of this demographic policy was offset by the economic crisis of the 1990s. 2001 became the year with the lowest fertility in Ukraine's rural areas. The number of births in that year dropped to 1,393, which was a 5.3 per cent decline from the previous year. The period of 1989–2001 is characterized by a loss of 36.7 per cent of the rural population compared to a 49.6 per cent loss in urban areas. The lower rates of decline in rural areas can be explained by causes such as traditional values and lifestyle, mentality and cultural roots of rural dwellers compared to their urban counterparts and by the socio-economic factors that affect urban and rural childbearing decisions differently. Such factors include educational level, income, and housing conditions that vary between urban and rural areas (LIBANOVA, E. *et al.* 2007). When the economic crisis of the 1990s hit Ukraine, the urban dwellers became more vulnerable, facing severe crisis conditions. Unemployment was higher in the cities than in rural areas. Many people were desperate to find a job and affordable housing, whereas in rural areas it was easier to survive relying on private subsistence economies.

Mortality of rural and urban populations has been following the same trend of increase since the 1970s (*Figure 4, B*). However, the crude death rate (CDR) has always been higher in rural areas owing to the intense aging of the population and generally lower quality of life. Rural out-migration is a typical behavior of young people. This process shifts the rural population age structure toward older population groups. In 2006, the rural population CDR was 19.8, while in urban settlements it was only 14.5 (*Figure 4, B*).

Although rural depopulation is typical for many European countries, Ukraine's depopulation is much higher compared to the European region. It is characterized by the higher mortality rates in the elderly cohorts. While it is possible to compare crude death rates for Ukraine and the European region, it is more informative to analyze the data that are adjusted for differences in age structure of the populations of these regions (WEEKS, J. 2008). To demonstrate the fact that Ukraine's rural population mortality is higher than in the population of the European region, the age-specific mortality rates³ by sex were calculated for three cohorts: 40–44, 50–54 and 65–69 years old. Then the age-specific mortality rates were applied to a standard European population (as estimated by the World Health Organization). As a result, the age-standardized mortality rates⁴ by sex were obtained for the European region, Ukraine as a whole, and Ukraine's rural population (*Table 4*).

³ Number of deaths in a year of people of a particular age group divided by the average number of people of that age in the population.

⁴ Age-specific mortality rates adjusted to a standard European population.

Table 4. Age-specific and age-standardized mortality rates by sex for selected cohorts in Europe and in Ukraine, 2008

Region	Age-specific mortality rates (deaths per 1,000 persons)						Age-standardized mortality rates (deaths per 1,000 of standard population)					
	40-44 years		50-54 years		65-69 years		40-44 years		50-54 years		65-69 years	
	male	female	male	female	male	female	male	female	male	female	male	female
Europe (total)	4.45	1.73	10.56	4.29	27.83	13.95	5.23	1.89	10.28	4.37	30.71	19.37
Ukraine (whole)	12.05	3.49	22.05	7.02	48.54	20.45	11.35	3.40	21.88	6.5	41.23	17.7
Ukraine (rural)	12.51	3.5	24.7	7.6	50.34	21.68	13.10	3.11	23.7	6.7	63.5	39.8

Source: Author's calculations based on the data provided by the UN Population Division, 2008; World Population Prospects, 2008; and the State Committee of Statistics of Ukraine, 2008.

The results in *Table 4* show that in Ukraine mortality rates are higher than the European average for both men and women, and rural mortality rates in Ukraine are highest of all. In fact, mortality rates among Ukraine's men are much higher than among women. Considering the importance of the health care system responsible for sanitary conditions, it is worth mentioning that many people who live in rural areas have limited access to health care facilities. Only 2 per cent of rural settlements have local hospitals. In order to see a doctor, people sometimes have to travel to a distant facility, which is often impossible because of limited transportation. It is typical for rural dwellers to avoid visits to the doctor until a serious condition occurs. Low income is another factor that postpones doctor's appointments for rural residents. Often, people cannot afford to see a specialist because of the high price of a medical examination. Such situations make preventive medicine unaffordable for many people and may in part explain high mortality rates in rural settlements.

STESHENKO pointed out that the public health system declined during the economic crisis, worsening population health conditions. Since 1970, deaths from respiratory troubles, digestive and infectious diseases decreased, but sharp increases occurred in cardiovascular, cancer, accidents and poisoning, and other causes of death (*Table 5*).

Life expectancy is one of the indicators that determine quality of life. In Ukraine, increased mortality is reflected in declining life expectancy. In 2006, the difference between female and male life expectancy was 11.6 years. The lower life

Table 5. Causes of death and life expectancy at birth in rural areas of Ukraine, 1970-2001

Indicators	1970	1980	1990	2001
Life expectancy at birth (in years)	70.34	69.24 ¹	70.21 ²	67.33
Mortality by causes of death (per 10,000 person):				
Cardiovascular disease	564.4	907.6	834.7	1,088.3
Cancer	114.8	139.7	207.4	197.6
Accidents and poisoning	84.2	121.7	126.4	157.4
Respiratory disease	184.0	163.5	127.4	109.2
Digestive system disease	22.6	28.0	32.7	39.0
Infectious disease	29.8	18.6	14.4	24.2
Other causes	41.5	38.9	267.3	247.2

¹1979; ²1989. *Source:* Compiled by authors using data from the State Committee of Statistics of Ukraine and Center of Medical Statistics of the Ministry of Health of Ukraine.

expectancy for males may be the result of the entrenched habits that dominate the lifestyle of rural Ukrainian men, such as excessive alcohol consumption (LEVCHUK, N. 2009) and heavy smoking. Ukraine's indicators of life expectancy, along with the crude birth and death rates, are remarkably negative in comparison with some Central European countries (Table 6).

Table 6. Crude birth rate, crude death rate, and life expectancy indicators: Ukraine versus selected European countries

Country	Crude birth rate		Crude death rate		Life expectancy in years			
	1989	2006	1989	2006	1989		2006	
					male	female	male	female
Albania	26.8	14.0 ¹	5.9	6.7	69.6	73.5	72.5	77.3
Bulgaria	11.4	8.3	18.2	20.7	68.3	74.7	69.1	76.3
Czech Rep.	13.6 ²	10.1	14.3 ²	10.5	67.7 ²	75.2 ²	73.4	79.7
Hungary	13.9 ³	9.9	16.3 ³	13.9	65.4	73.7	69.0	77.4
Moldova	..	11.4	..	14.0	64.6	72.2
Poland	18.0 ³	10.6	10.6 ⁴	10.0	67.1	75.6	70.4	79.0
Romania	17.8	10.3	13.7	14.7	66.5	72.4	68.7	75.8
Slovakia	..	10.6	..	11.3	66.7	75.5	70.4	78.2
Slovenia	..	9.8	..	9.7	69.9	77.9	74.8	81.9
<i>Ukraine</i>	12.7	10.2	16.1 ⁴	19.8	68.6	74.4	61.7	73.3

¹2004; ²Czechoslovakia, ³1988, ⁴1987, .. no data. *Source:* Eurostat, World Health Organization

Population aging

In all Central and Eastern European countries, the rural population is getting older (REY, V. and BACHVAROV, M. 1998), and Ukraine is no exception. Among the various measures of population aging (SANDERSON, W. and SCHEBROV, S.

2005), Edward Rosset's (1964) method is used in Ukraine. According to this method, if 18 per cent or more of the population is 60 years or older, the society is considered to have a very high level of population aging. In rural areas of Ukraine, the level of population aging is very high and is significantly higher than in urban areas. According to the State Committee of Statistics, the proportion of population in the oldest age group (60 years old and above) was 20.3 per cent in 1979, 24.2 per cent in 1989, and 24.1 per cent in 2007. In urban areas this proportion was 12.7 per cent, 14.9 per cent, and 18.5 per cent in the corresponding years (Derzhavniy Komitet Statystyky Ukrayini, 2009).

The major issue emerging from the population aging is the increasing dependency ratio⁵. In rural areas, the aged dependency ratio has been higher than the youth dependency ratio since 1979, whereas in urban settlements this pattern first occurred only in 2000 (Figure 5).

In Ukraine and other post-Soviet countries, it is typical to consider population in post-productive age as a burden for the working-age population. However, in countries with well-developed market relationships, people of

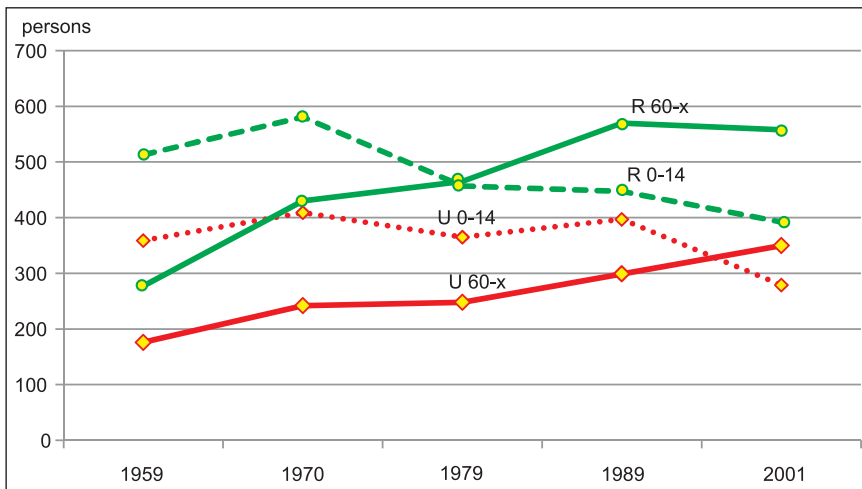


Fig. 5. Rural and urban youth and aged dependency ratios between 1959 and 2001. – U_{0-14} = number of urban residents aged 0–14 per 1,000 urban residents aged 15–59; U_{60-x} = number of urban residents aged 60 and older per 1,000 urban residents aged 15–59; R_{0-14} = number of rural residents aged 0–14 per 1,000 rural residents aged 15–59; R_{60-x} = number of rural residents aged 60 and older per 1,000 rural residents aged 15–59

⁵ Dependency ratio is a ratio of those not in the labor force and those in the labour force. Dependency ratio can be decomposed into youth dependency ratio: a ratio of population aged 0–14 years old and population aged 15–59 years old, and aged dependency ratio: a ratio of population aged 60 years old and above and population aged 15–59 years old.

post-productive age live on retirement savings earned during their productive age and do not become a burden for younger cohorts.

It is a sign of societal maturity when elderly people live long and active lives with a high level of material well-being. In rural Ukraine, the population aging is primarily the result of intensive out-migration of the economically active population to the cities. The failed reforms of transition affected the so called “state retirement fund” in Ukraine and produced a shortage of pension money in the state budget. This negative process echoes even now, in the post-transition period, and brings financial tension into the lives of Ukrainian pensioners. If, instead, people in older cohorts were considered human resource or human capital, then the whole society could work toward improving the material and social conditions of the elderly population. However, this transition to the new societal values requires changes in governmental social policies and a significant budgetary influx.

Spatial differences in rural demographic trends

The east-west socio-economic dichotomy in Ukraine is a well-known phenomenon (SKRYZHEVSKA, Y. 2008). The line Uman’–Kharkiv (*Figure 6*) is not only a divide between eastern and western Ukraine, but also between urban and rural Ukraine (KARÁCSONYI, D. 2009).

As *Figure 6* suggests, the rural population distribution is uneven, displaying high concentrations of rural residents in western and central regions and lower concentrations in eastern regions. Western Ukraine is dominated by agriculture and forestry, and the eastern part is known for its industrial specialization (mining, heavy industries). During the economic crisis of the 1990s, Eastern Ukraine experienced the most dramatic decline in population and quality of life compared to other regions. A similar pattern has been observed in terms of rural population decline. The analysis in this paper involves 669 administrative units (*rayons*) aggregated into 501 rayon-level units.⁶ During the period from 2004 to 2010, there were only 33 administrative units (out of 501) with increasing rural population, and most of them were located in western Ukraine (*Figure 7*). Further analysis suggests that the increase in population was achieved as a result of a positive natural increase of the rural population in only 5 of these 33 units. All of them are located in western Ukraine (*Figure 8*).

Throughout history, western Ukraine was an area of diverse ethnic composition, which affected the traditional lifestyle of the population. Family as a social institution has a greater value in western areas compared to the

⁶ 501 rayon-level units were created by aggregation of selected cities of oblast’ subordination with surrounding rayons.

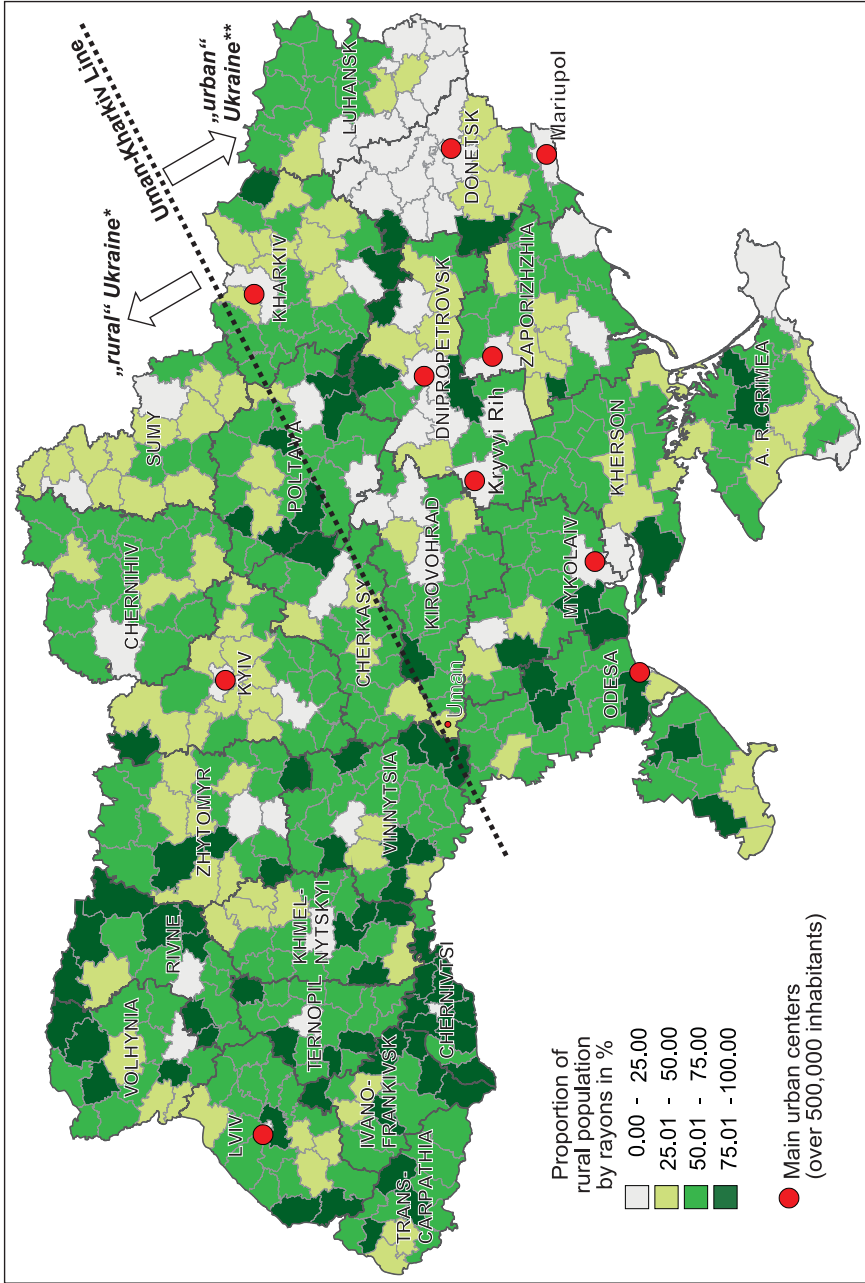


Fig. 6. Spatial distribution of rural and urban population in Ukraine, 2010. *Rate of rural population is 44% (65% of total rural population of Ukraine). **Rate of rural population is 22% (35% of total rural population of Ukraine)

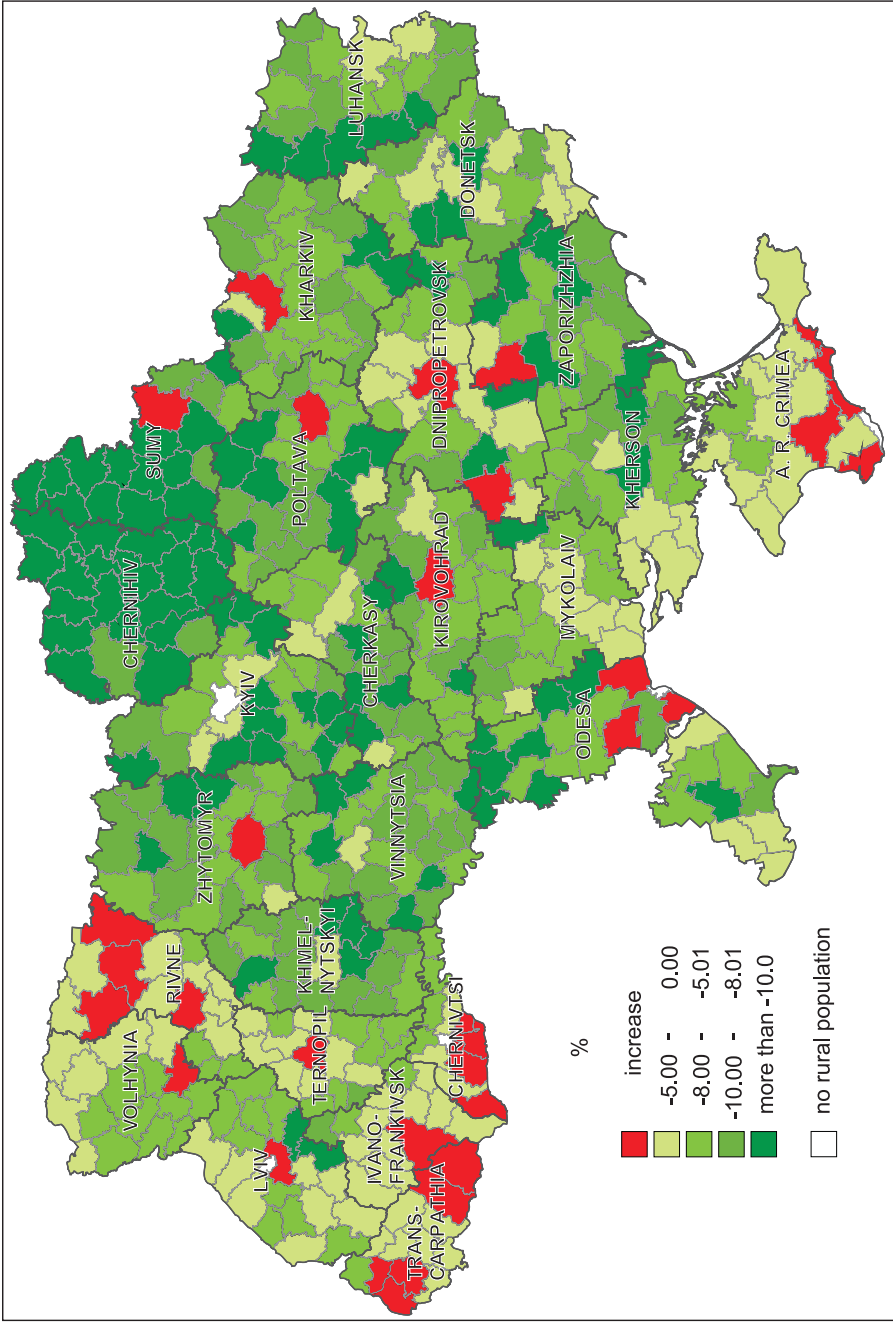


Fig. 7. Rural population change by rayons between 2004 and 2010, %

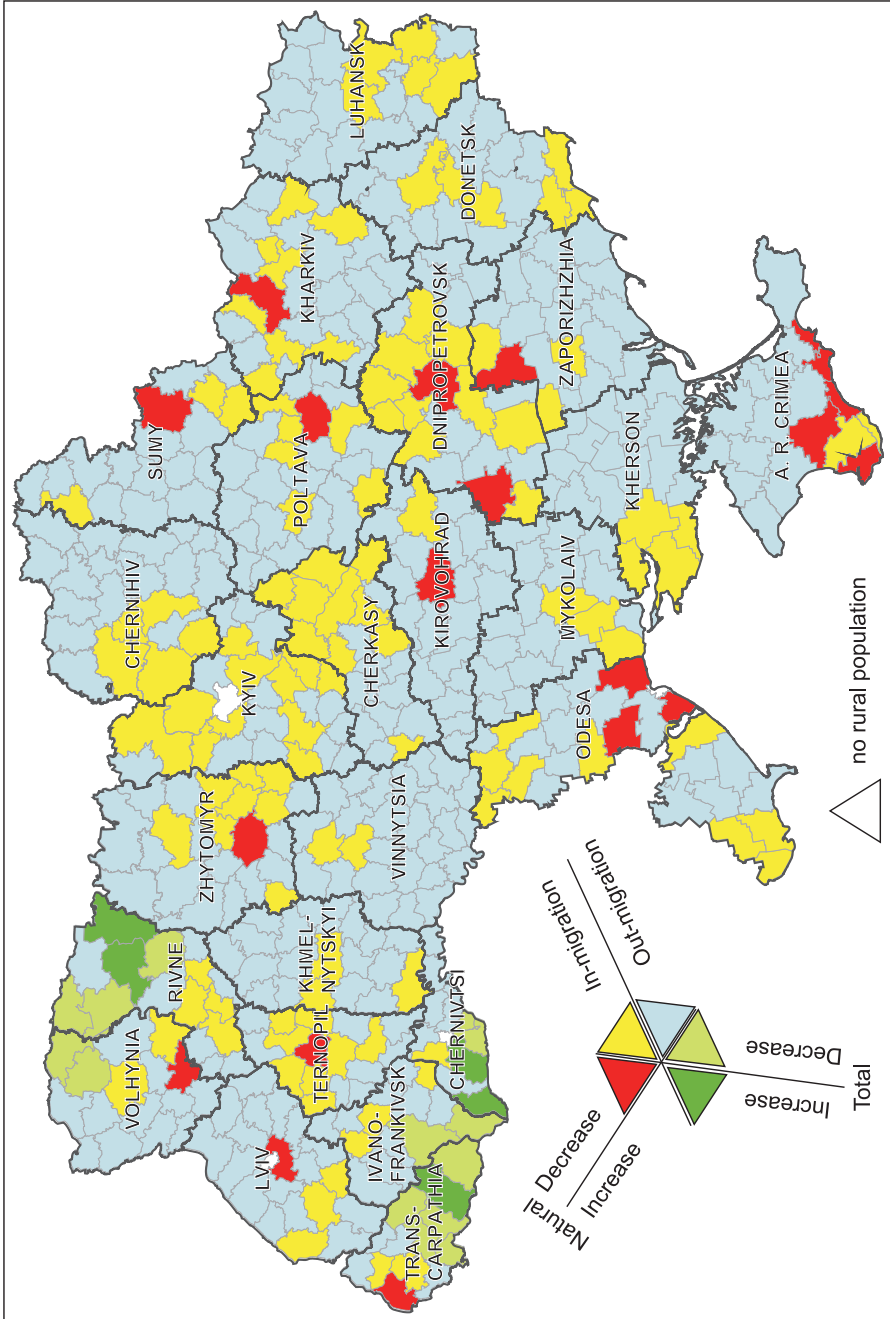


Fig. 8. Types of rural population change by rayons between 2003 and 2009

eastern areas of Ukraine. It is traditional for western Ukrainians to have large families. The rate of divorce in western Ukraine is lower than the average in Ukraine and the rate of marriage is higher (LIBANOVA, E. *et al.* 2007). These facts explain the higher-than-average (11.9 in 2009) birth rates in rural western regions (*Figure 9*). As *Figure 8* suggests, rural population also increased around major urban centers. Although these rayons demonstrated negative natural increase, they experienced in-migration triggered by the pull factors of the major urban settlements (NEFEDOVA, T.G. 2006).

The higher-than-average birth rates are also observed in Crimea. The high birth rate may be related to the traditional lifestyle of the Crimean Tatars, the ethnic group that was exiled from Crimea after World War II and were only allowed to return by the Gorbachev administration in the 1980s (SHAMSHUR, O. 1998 p. 31). Another area where the rural population birth rate is higher than average is southern Ukraine, particularly the Odesa region. This area is another ethnically diverse region, where the traditional lifestyle of the residents is responsible for childbearing patterns. The rest of the rural areas of Ukraine experienced lower-than-average birth rates.

After 2001, the birth rates in majority of rural areas have increased (*Figure 10*). This increase can be attributed in part to the demographic policy change that occurred in the early 2000s. According to the new policy, families with children were provided monetary benefits in the form of governmental payments following the births of first, second, and third child. In spatial aspect, the highest increase of crude birth rates occurred in western Ukraine and some suburban regions of central and eastern Ukraine, where it has been already higher compared to other regions.

Mortality in rural areas is especially high in northern and central regions, where the crude death rate reached 35 in 2009 when the average for rural Ukraine was 18.9 (*Figure 11*). In a majority of industrial eastern regions, the crude death rate indicators also exceed the average level. Some authors (MARPLES, D. 1996; VARGO, G.J. 2000) ascribe the high level of mortality in northern Ukraine to the disastrous consequences of the Chernobyl nuclear accident. However, it is worth mentioning that the rural population of these areas is dominated by elderly cohorts (60 and older). For Ukraine's rural population, the average proportion of residents over 60 is 26.8 per cent. In the northern and central regions of Ukraine, this indicator reaches 29.4 per cent in the Zhytomyr region, 30.8 per cent in the Kyiv region (excluding the City of Kyiv), and 38.1 per cent in the Chernihiv region, which produces higher-than-average crude death rates.

It is obvious that demographic component is an important part of the east-west dichotomy in Ukraine. The population change processes are driven by the differences in the traditional lifestyles and economic backgrounds of the population in these regions. The existence of such dichotomy suggests

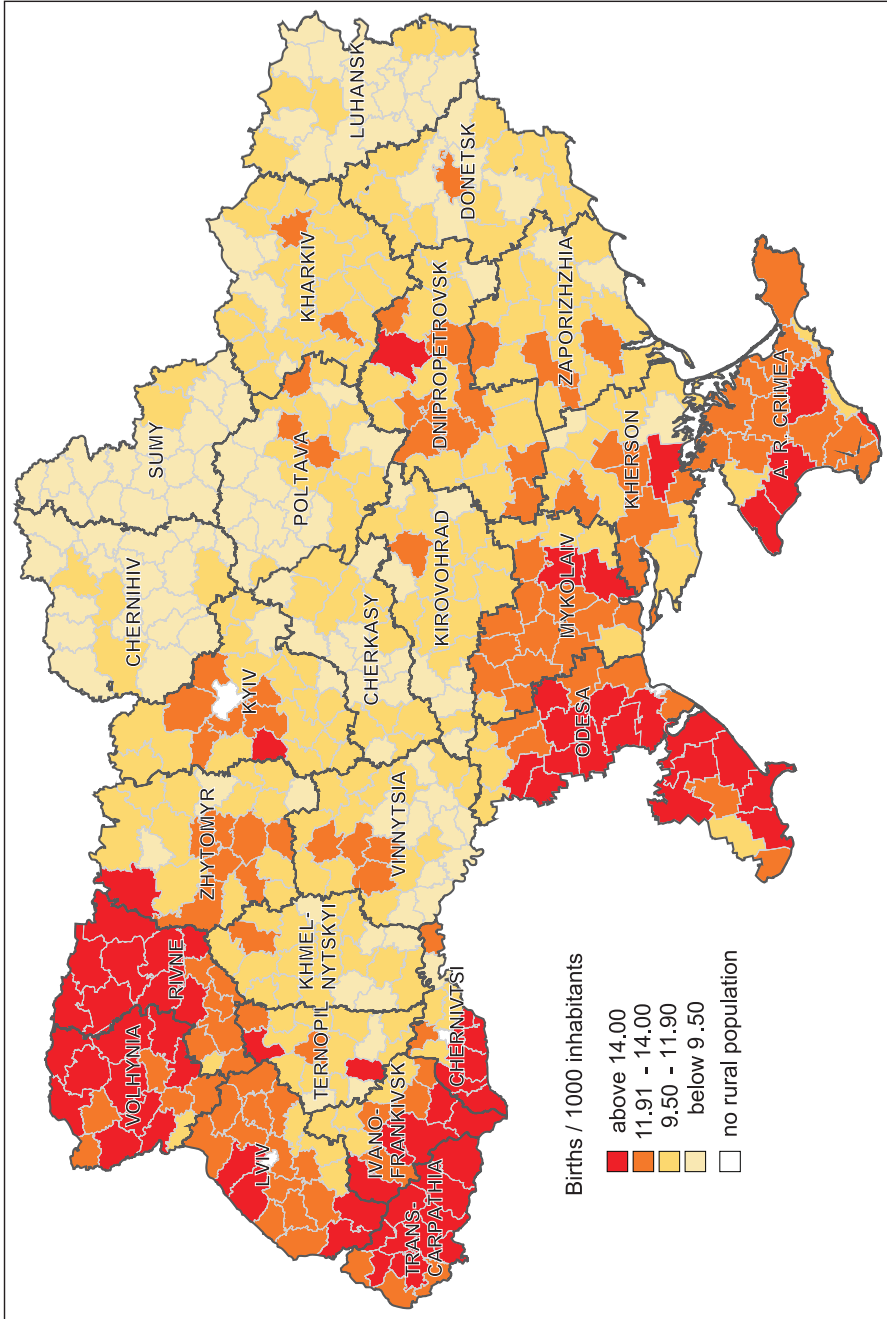


Fig. 9. Crude birth rate of the rural population by rayons, 2009

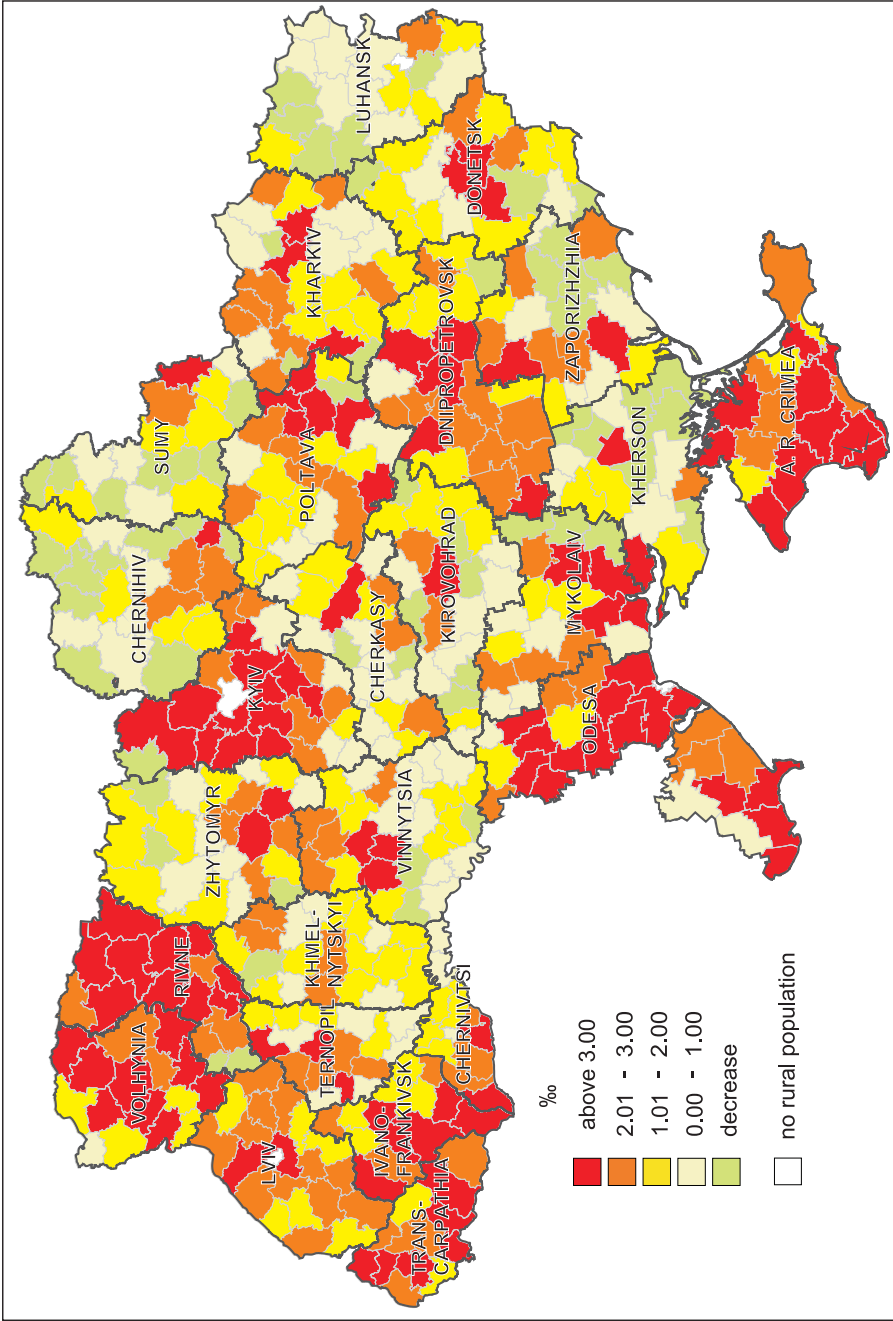


Fig. 10. Change of crude birth rate of the rural population between 2003 and 2009

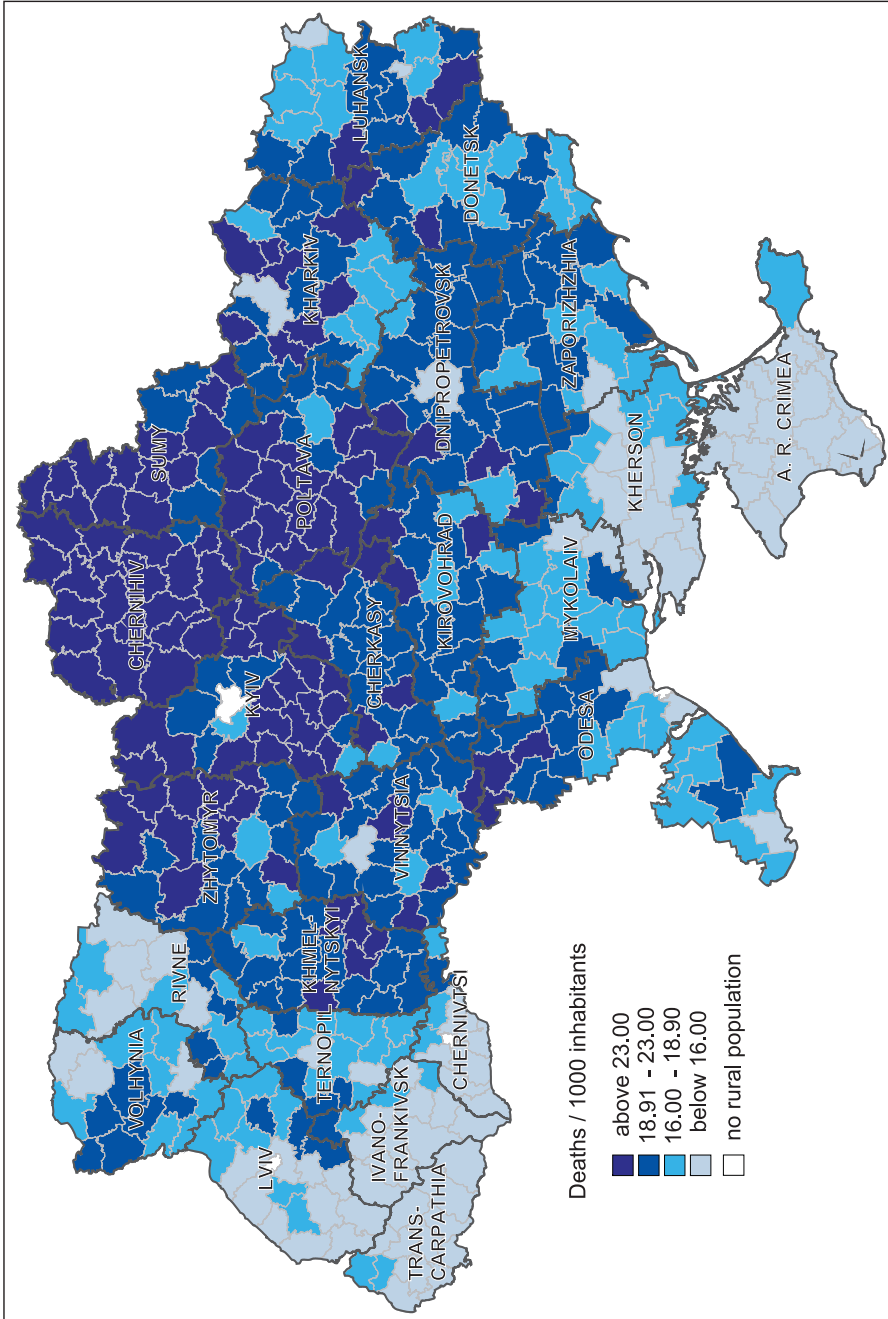


Fig. 11. Crude death rate of the rural population by rayons, 2009

that, when targeting demographic improvements on the country level, policy-makers should take into account local differences and cultural specificities in Ukraine's regions.

The results of demographic analysis presented in the first two sections of this article reveal clear indications of a deep demographic crisis in rural areas of Ukraine. The negative demographic trends are homogeneous across the country with some exceptions in the regions with diverse ethnic composition that demonstrate slightly positive demographic tendencies. It is hard to say whether this demographic situation caused economic and social decline, or vice versa. The reality is that the problems of rural areas in Ukraine exist and they have been neglected by the government for more than half of a century. The array of these problems goes far beyond just the demographic decline. Rural economies have been declining as well. Transition to market economy has brought restructuring and the land privatization reform into the rural economies led to economic uncertainties, unemployment, and out-migration of young population and deterioration of social institutions in rural areas. Despite the weak attempts of the policy-makers to initiate programs directed at improvements of rural areas, most of these programs had only a short-term effect and did not produce significant positive change. The next two sections reveal the realities and challenges of every-day life in rural areas in Ukraine and provide suggestions for revitalization of rural economies and societies as a whole.

Realities of rural life

The first and foremost problem of rural areas in Ukraine is the mono-functional nature of rural economies resulting from its socialist past and the economic restructuring of the 1990s. During the Soviet era, rural employment was provided almost entirely by the collective and state farms. Although the majority of rural residents were employed on these farms, there was a small proportion of rural industrial and service workers who worked at small plants and factories, branches of big enterprises located in the nearby cities. This pattern was typical for not only Central and Eastern European countries (REY, V. and BACHVAROV, M. 1998), but also the countries of the former Soviet Union such as Ukraine. When the restructuring of the 1990s started, many of the city-based enterprises shut down their rural branches, producing growing unemployment in rural areas.

Another element of economic restructuring was land privatization. Collective land ownership was eliminated and turned into private land ownership. This element of a market economy was new and unknown to the rural people and produced a high degree of uncertainty among former employees

of the collective farms. Due to their lack of experience and material resources, many rural residents leased their land parcels to the newly emerged farmers, usually managers of the former collective farms. This type of relationship is still widely practiced in rural Ukraine. The renter pays the landowner a share of crop that is used by the landowner in his household or sold at the market. Usually, these relationships do not generate sufficient income for leasers, who have to search for salaried jobs or survive by subsistence living. According to the data provided by the State Committee of Statistics in the Odesa region, between 2000 and 2008 the number of workers employed in agriculture in Ukraine decreased by 72 per cent (Derzhavniy Komitet Statystyky Ukrayini, 2007, 2009). The highest reduction of agricultural workers was in western and southern regions. One might assume that the eliminated agricultural jobs were replaced by industrial and service jobs, diversifying rural mono-functionality. But unfortunately, in the case of Ukraine, this reduction did not spur an increase in non-agricultural activities. Instead, those people who were dismissed from agricultural jobs as a result of economic restructuring and land privatization found sources of income either in the cities or in other countries or, sometimes, just remained unemployed.

Growing unemployment, in turn, generated a new flow of job seeking out-migrants from the rural areas to the cities. In 2005, one million rural residents worked in urban areas, which is 28.5 per cent of the employed rural population. Currently, the most common income-generating activity in rural areas is private agriculture, which accounts for 43 per cent of the employed rural population (LIBANOVA, E. *et al.* 2007). The majority of employed rural residents (55 per cent) belong to professions that do not require special knowledge or professional qualification. Unsurprisingly, agriculture wages are about half as much as the average in Ukraine's manufacturing sector. This system produces low incentive for young people to return to rural areas after completing their education. There is a significant difference between the sources of household income in rural and urban areas. On average, one third of rural household income is generated by salary. The rest is comprised of pensions that come from the state budget and income from selling agricultural goods produced by small private economies. For urban households, the share of salary in household income constitutes 50 per cent. Taking into account the significant aging of the rural population, pensions as a major income source will remain important in the future. Supporting these pensions will require additional governmental funds and thoughtful governmental policies.

Deep economic crisis, along with the long-running ineffective process of restructuring in the agricultural sector, ruined social infrastructure in rural areas. According to research by the Institute for Rural Development (OSTASHKO, T. 2006), 71 per cent of rural settlements do not have preschools, 41 per cent do not have places for cultural and leisure activities, and 98 per cent do not

have hospitals. This situation is not favorable for demographic improvements. Governmental policies should be directed at identifying internal and external investments to support rural social infrastructure. Special attention should be given to creating a network of socio-cultural establishments in rural areas that would become the foundation for the recruitment and retention of youth in the agricultural sector and rural businesses.

Another problem of rural areas is poor housing conditions. Although the majority of rural dwellers own homes, the quality of these homes is unsatisfactory. Often, rural houses lack running water or sewer and are in need of repair. The majority of low-income families live in houses without adequate heating and water supply. Only a few rural settlements are connected to the sewer lines.

The system of social security inherited by Ukraine from its socialist past became inadequate under the pressures of the 1990s. Pensions paid from the state budget are the major sources of income for the majority of rural residents because of the aging nature of the rural population. The low social standards adopted by the government make pension payments small and inadequate to face the growing prices of consumer goods. These decreasing pension payments put the buying potential of rural elderly people at the lowest level and increases poverty in rural areas. Although the number of people who lived in poverty in Ukraine decreased during 1999–2006, the rural poverty level did not decrease during that time and still remains higher than in urban areas.

The problems of Ukraine's rural areas described in this section require the immediate attention of governmental bodies and policy-makers. If development policies are directed at the improvement of economic and social dimensions in rural areas, the demographic crisis could be overcome and economic and social climate improved.

Suggestions for revitalization

Ukraine's countryside suffered severely during the economic crisis of the 1990s and is currently in need of a consistent demographic and economic development policy that would help to revitalize population and economy of rural Ukraine. It is important that governmental authorities recognize that rural development requires serious consideration and a new approach that combines traditional focus on agriculture with non-agricultural components of rural life. The depressed rural territories should be perceived as complex systems where all components such as population, economy and infrastructure are mutually connected and play important roles in the system functionality rather than exist independently.

It has been observed lately that governmental actions often target only one specific component of rural territories. For instance, in the recent years, government has been increasing pensions for selected groups of elderly population claiming that these actions will improve quality of life of these people. What is happening in reality is that in the economic crisis of transition and restructuring, rural societies are hit the most, and these small infusions of money do not solve the problem of backwardness and underdevelopment. The problems still persist in health care, education, financial institutions, and job markets in rural areas. This demographic analysis provides evidence that policy changes could help overcome negative tendencies in rural territories and bring improvements in the economic and social climate of rural areas.

Policy suggestions for rural areas in Ukraine

In order to create economically attractive rural areas in Ukraine, it is important to diversify the economy by creating opportunities for industrial and service jobs in rural settlements. This can be achieved by encouraging *entrepreneurship*, especially in small and medium- size business. Many rural residents complain that they would like to start their own businesses in rural area, but the bureaucratic procedure they have to go through is too complicated and time consuming. Additionally, many rural dwellers lack knowledge in tax and financial legislation, which also keeps them away from becoming entrepreneurs.

The following measures would be beneficial in supporting small and medium entrepreneurship in the non-agricultural sector: (a) elimination of bureaucracy in the process of business registration; (b) creation of educational opportunities for those rural residents who would like to start their own business; (c) improvements in tax legislation and provision of tax incentives for small and medium-size business owners in rural areas; and (d) availability of micro loans for rural entrepreneurs. There is a significant demand for consumer services such as retail, transportation and private early childhood educational establishments that can be satisfied by increasing number of rural entrepreneurs. In the industrial sector and construction, new jobs may become available as a result of private investment in the non-agricultural rural sector. So far, private investors have been cautious in their investment decisions in rural areas.

There are many uncertainties and instabilities in the legislation that control the investment process, which reduce volume of private investment in rural Ukraine. To overcome this barrier, investment attractiveness of rural areas should be improved. Such improvement cannot be achieved in a short time. It involves improvements in *rural infrastructure* such as construction of new highways, gas pipelines, improved water supply, as well as promotion

of information technologies and innovations. For those who would like to improve their business in the agricultural sector, creation of agricultural co-operatives that would serve agro-business would be beneficial.

There is a need for locally tailored rural development policies that would take into account local diversity of individual rural areas. Many Ukrainian villages, especially in the western part of the country, possess valuable natural and agro resources such as intact forests, rivers, and fertile soils of the river valleys. In these areas, rural tourism should be considered as another element of rural development. Tourism as an economic sector creates jobs and positively contributes to rural communities. It stimulates renewal of villages and makes them better places to live and visit as well as encourages preservation of cultural heritage. With the development of rural tourism, the other associated businesses such as hospitality and sustainable agricultural practices come to life and produce benefits to local communities.

In order to create and implement rural development programs based on a new approach, a new generation of rural leaders should be raised. These leaders should come from the rural areas and be well aware of the challenges of every-day rural life. They have to be well-educated in the field of rural development and capable in adjusting their policies according to the changing nature of local conditions. Ability to use innovative approaches in rural development policy, establish partnership with state agencies and NGOs and govern transparently is essential qualities of new generation of rural leaders.

Such changes could help counter the negative stereotype of rural life and could result in gradual improvements in rural areas. Until new policies are implemented, the rural areas are likely to remain unattractive to young people, which will deepen the demographic crisis.

Conclusion

Demographic data for Ukraine clearly demonstrate a serious decline in both the quantity and quality of rural population. The combined effects of negative natural increase, negative migration rates, high and increasing mortality rates, reduced life expectancy, and aging population have put Ukraine's rural areas in a difficult situation that will need attention soon to avoid further decline. The current demographic, social, and economic situation in rural Ukraine suggests that depopulation will continue as a result of further out-migration and high mortality. This could result in a shrinking of rural settlements and populations that are increasingly elderly and therefore more dependent. The trend toward subsistence agriculture and unemployment will continue to reduce tax revenue for rural municipalities, and cause further decline in supports for infrastructure and social programs. To break this vicious cycle, Ukraine needs

to direct policy toward improving the economic attractiveness of rural areas for entrepreneurs in both agricultural and non-agricultural enterprises. This could include formation of agricultural cooperatives, educational training for rural leaders, identification and development of rural tourism opportunities, and adaptation of rural policies to the regional differences within the country.

A new economic program for rural Ukraine would benefit from including both agricultural and non-agricultural activities to create employment opportunities that might help retain younger people and could reverse the flow of migrants. Such a revitalized rural economy would improve living standards and market support for rural business development and could help reverse the steady demographic decline that Ukraine has experienced since the outset of the transition to market economy.

REFERENCES

- BARANOVSKY, M.O. 2009. *Naukovi zasady suspilno-geografichnoho vivchennja silskih depressivnih teritorij Ukrainy*. (Scientific principles of human geographical development of depressive rural spaces in Ukraine). Kyiv, National Taras Shevchenko University, 394 p.
- BOROWICZ, R. 1996. Rural unemployment: Specific traits. *Eastern European Countryside* 2. 17–27.
- CALDWELL, J. and SCHINDLMAYR, T. 2003. Explanations of the fertility crisis in modern societies: A search of commonalities. *Population Studies* 57. (3): 241–263.
- Demographicheskij Slovar. (Demographic Dictionary), 1985. Moscow. (in Russian).
- Derzhavniy Komitet Statystyky Ukrainy. (State Committee of Statistics of Ukraine), 2001. Statystychniy schorichnyk Ukrainy za 2000 rik (Statistical yearbook of Ukraine for 2000), Kyiv, Ukraine, Tekhnika.
- Derzhavniy Komitet Statystyky Ukrainy. (State Committee of Statistics of Ukraine), 2007. Statystychniy schorichnyk Ukrainy za 2006 rik (Statistical yearbook of Ukraine for 2006), Kyiv, Ukraine, Tekhnika.
- Derzhavniy Komitet Statystyky Ukrainy. (State Committee of Statistics of Ukraine), 2009. Statystychniy schorichnyk Ukrainy za 2008 rik (Statistical yearbook of Ukraine for 2008), Kyiv, Ukraine, Tekhnika.
- DRAGONA, V. and TURNOCK, D. 2000. Policies for rural Eastern Europe in transition: The case of Slovakia. *GeoJournal* 50. 235–247.
- FREJKA, T., SOBOTKA, T., HOEM, J.M. and TOULEMONT, L. 2008. Summary and general conclusions: Childbearing trends and policies in Europe. *Demographic Research* 19. (2): 5–14.
- GORZ, B. and KUREK, W. 2000. The population of the Polish countryside: Demography and living conditions. *GeoJournal* 50. 101–104.
- KARÁCSONYI, D. 2009. Ein Versuch der Typologie der ländlichen Räume in der Ukraine (Experiment for Typology of Rural Spaces in Ukraine). *Europa Regional* 1. 34–50.
- KHOMRA, A.U. 1989. Rural depopulation trends in the Ukrainian SSR: The delimitation and spatial differentiation. In *The process of depopulation of rural areas in Central and Eastern Europe*. Eds. STASIAK, A. and MIRÓWSKI, W. Warsaw, Polish Academy of Sciences, Institute of Geography and Spatial Organization, 173–182.

- KOCSIS, K., RUDENKO, L. and SCHWEITZER, F. (eds.) 2008. *Ukraine in Maps*. Budapest, Geographical Research Institute, Hungarian Academy of Sciences, 000 p.
- KOHLER, H. and KOHLER, I. 2002. Fertility decline in Russia in the early and mid 1990s: The role of economic uncertainty and labor market crisis. *European Journal of Population* 18. 233–262..
- LEVCHUK, N. 2009. *Alcohol and mortality in Ukraine*. Max Planck Institute for Demographic Research. Working paper. (available at <http://www.demogr.mpg.de/>) (accessed on April 28, 2010).
- LIBANOVA, E., KURYLO, O., MAKAROVA, O., STESHENKO, V. and CHERENKO, L. 2007. *Naseleinnia Ukraini: Socialno-demographichni problem Ukrainського sela* (Population of Ukraine: Social and Demographic Problems of Rural Areas). Kyiv, Institute for Demography and Social Studies at the NAS of Ukraine. (in Ukrainian).
- MARPLES, D. 1996. The Chernobyl disaster: its effect on Belarus and Ukraine. In *Long road to recovery: community responses to industrial disaster*. Ed. MITCHEL, J. Tokyo–New York–Paris, The United Nations University Press.
- NEFEDOVA, T. G. 2006. Goroda kak organizatori selskoy mesnosity. (Cities as organizers of rural spaces) *Nauka v Rossii* 4. 9–34.
- OSTASHKO, T. 2006. *Stan i perspektyvi ukrainського sela* (Present and future of Ukrainian rural areas). Kyiv, Institute for Rural Development. (in Ukrainian).
- PANTLEY, V. 2009. Demographic situation of rural population in Ukraine in the period of intensive socio-economic transformation. *European Countryside* 1. 34–52.
- REY, V. and BACHVAROV, M. 1998. Rural settlements in transition – agricultural and countryside crisis in Central-Eastern Europe. *GeoJournal* 44. 345 – 353.
- ROSSET, E. 1964. *Aging process of population*. Oxford, Pergamon Press.
- ROWLAND, R. H. 2004. National and regional population trends in Ukraine: Results from the most recent census. *Eurasian Geography and Economics* 45. (7): 491–514.
- SANDERSON, W. and SCHERBOV, S. 2005. Average remaining lifetimes can increase as human populations age. *Nature* 435. (7043): 811–813.
- SHAMSHUR, O. 1998. *Migration Situation in Ukraine: International Cooperation Related Aspects*. Migration, 29–30–31. The Former Soviet Union. Berlin, Berliner Institut für Vergleichende Sozialforschung, 29–44.
- SKRYZHEVSKA, Y. 2008. *Regional inequalities in Ukraine: Causes, consequences, policy implications*, VDM.
- STESHENKO, V. 2000. Demographic situation in Ukraine in the transition period. In *New Demographic Faces of Europe*. Eds. KUČERA, T., KUCEROVÁ, O., OPARA, O. and SCHAICH, E. Berlin, Springer Verlag, 347–369.
- STESHENKO, V. 2001. *Demographichna kriza v Ukraini. (Demographic crisis in Ukraine)*. Kyiv: Institute for Demography and Social Studies at the NAS of Ukraine. (in Ukrainian).
- VARGO, G.J. 2000. *The Chernobyl Accident: A comprehensive Risk Assessment*. Columbus and Richland, Battelle Press.
- WEEKS, J. 2008. *Population: An Introduction to Concepts and Issues*. 10th Edition. Belmont, Wadsworth Publishing Co. CA.
- European Commission. Eurostat. Accessed September 28, 2011. <<http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/>>.
- World Health Organization. Accessed September 28, 2011. <<http://www.who.int/research/en/>>