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Research Article

Mortality in Central and Eastern Europe: long-term trends and recent upturns

France Meslé

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Max Planck Institute for Demographic Research

International Union for the Scientific Study of Population

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Research Article

Mortality in Central and Eastern Europe: long-term trends and recent upturns

France Meslé[1]

Abstract

While, during several decades, unfavourable trends in mortality were quite similar in Central Europe and in the former USSR, in the most recent years, these two parts of Europe are diverging. In most Central European countries, life expectancy is now increasing mainly thanks to a decline in cardiovascular mortality. Conversely, cardiovascular mortality is still increasing in Russia and Ukraine and its negative impact is reinforced by a worsening of violent deaths and infectious mortality. The situation of Baltic countries is still uncertain but it is not impossible that these countries soon resume with sustainable progress in life expectancy.

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1. Introduction

After World War II, health improved dramatically across Europe with the spread of antibiotics and the large-scale use of immunisation. Progress was greatest where life expectancy was lowest. Southern European countries, like Italy and Greece, as well as central and eastern European countries, like Russia and Romania, which had lagged far behind in the 40s almost caught up the most advanced northern or western countries (Vallin and Meslé, 2001). In the mid-60s, all European countries had completed the second stage of the epidemiologic transition as defined by Omran (1971) and had eradicated infectious mortality, especially among young children. They were entering the third stage of man-made and degenerative diseases. In point of fact, mortality from circulatory diseases, traffic accidents and alcohol abuse was stagnating or increasing almost everywhere at that time. In the West, however, the relative slackening of progress did not last, and by no later than the early 70s, life expectancy was again on the rise, due both to a reversal of trends in man-made diseases and an accelerated decrease in circulatory diseases. The gains achieved in the West did not spread to central and eastern Europe. To the contrary, life expectancy in all eastern European countries began to plateau or even decrease, especially for males. This huge gap between two parts of Europe continued to widen for three decades, resulting in a yawning divide by the mid-90s. It was due not only to trends in life expectancy levels, but also major changes in age structure and cause-of-death structure (Meslé *et al.*, 1996).

In a recent paper dealing with a comparative analysis of mortality trends in Europe, a hierarchical analysis (Note 1) was performed on life tables of 28 European countries for the years 1965 and 1995 (Meslé and Vallin, 2002). It illustrates very clearly how, in health terms, Europe was divided into two blocks within the space of thirty years (Figure 1). In 1965, the hierarchical analysis distinguishes sets of countries, but there is no clear variance between two broad groups. Eastern European countries are scattered among other countries. Thirty years on, the picture is quite different and a double divide is clearly visible. One reflects the split between eastern and western countries which form two blocks very far-removed from one another. But within eastern European countries, there is also a clear gap between countries of the former USSR and those of central Europe (Note 2). Trends in these two parts of Europe had been very comparable up to the mid-80s, but more recently, wide country-to-country variations have appeared.

Following a general picture of mortality trends in these different countries since the mid-60s, an attempt will be made to see what determinants may explain the recent reversal observed in central Europe. The third section will be devoted to the specific case of the European Republics of the former USSR (Baltic countries, Russia, Ukraine)

where after decades of very similar mortality trends, life expectancies at birth seem to be moving apart.

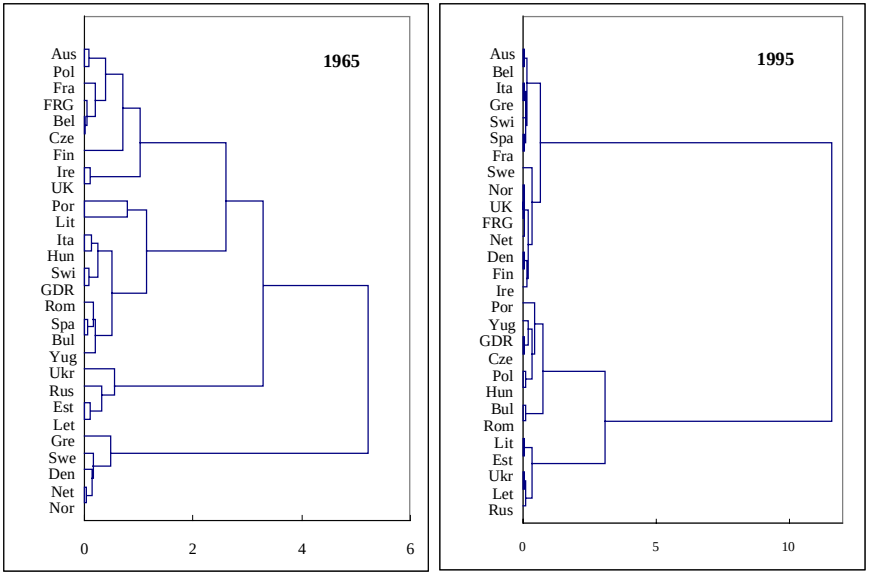

Figure 1: *Dendrograms resulting from the hierarchical analysis of male age-specific death probabilities in 28 European countries, in 1965 and 1995. Source: Meslé and Vallin, 2002*

2. The end of unfavourable trends?

Prior to the mid-80s, general life expectancy trends were highly comparable in all eastern and central European countries (Figure 2). Nowhere were they good, but the acuity of the situation differed by country and sex. The worst case was that of males in the republics of the former USSR, where in the five republics represented here (Estonia, Latvia, Lithuania, Russia and Ukraine), a fall from 1.5 to 3 years occurred in male life expectancy between 1965 and 1984. For females, the decrease was less pronounced but nevertheless there for Russia, Ukraine and Latvia, while life expectancy was stagnating in Estonia and increasing but slowly in Lithuania. In the central European countries,

Hungarian and Bulgarian males registered the worse results with a decrease of 1.6 and 0.8 years respectively, while life expectancy was stagnating for males in the other four countries (Czech Republic, Poland, Romania and Slovakia) and only slowly increasing for females region-wide.

From the mid-80s, a sharp distinction appeared between the republics of the former USSR on one side and central European countries on the other. In the former, trends in life expectancy became very chaotic while remaining very similar. After a period of improvement in the wake of the anti-alcoholism campaign launched by Gorbachev in 1985 just after coming to power, life expectancy slowly declined as the campaign effects faded. The deterioration accelerated sharply in 1993-1994 (or 1995 for Ukraine) as all countries entered the severe economic crisis following the sudden change to a market economy. After the initial shock, life expectancy began rising again, but until very recently, it was impossible to say whether this was a simple recovery after a very sharp decline or the first stage of a more fundamental improvement. As data for 1999 and 2000 are now available, it appears that for Russia and Ukraine, at least, the upturn was short-lived and life expectancy is sinking again, whereas in the Baltic countries, a continuing rise suggests that they are entering a new stage of progress.

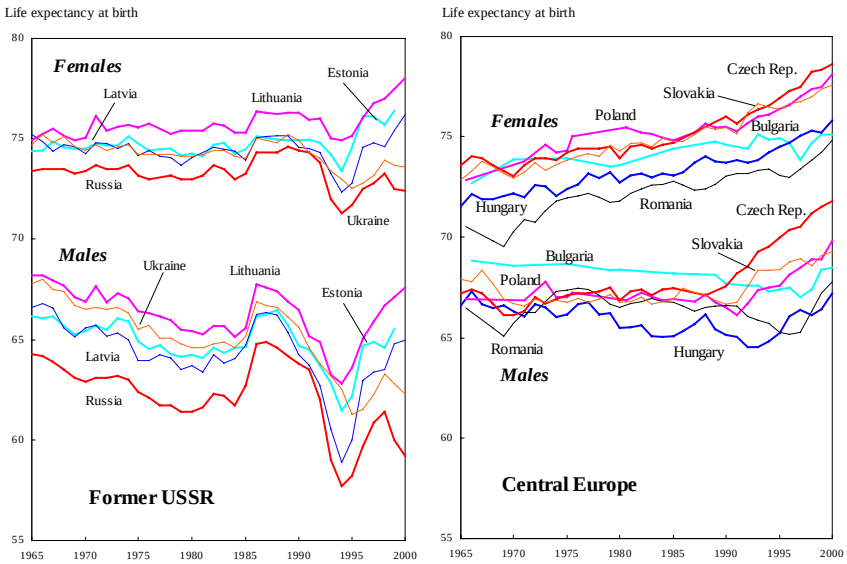

Figure 2: *Sex-specific trends in life expectancy in central European countries and republics of the former USSR since 1965.*

In central Europe, the situation now appears more favourable as one country after another has resumed its health progress. As early as 1988, trends in the Czech Republic reversed and life expectancy increased very rapidly. Likewise Poland and Slovakia in 1992, and Hungary in 1993. In Bulgaria and Romania, on the other hand, the health situation continued to worsen up to the late 90s. However, fresh progress has been made in both countries, since 1997. It is too early to say whether this recent improvement is a firm pointer to having entered long-term progress, but these recent trends are encouraging.

As the long-term trends were everywhere more unfavourable to men than to women, the upturn is more spectacular for male than female life expectancy. But females are also making gains, with a clear acceleration of the rate of increase in life expectancy of late.

Returning to the wide split that developed in Europe in recent decades, Figure 3 compares trends in life expectancy in Hungary, where trends were especially unfavourable, and the Czech Republic, the first country where progress returned, to French trend levels in absolute and relative terms.

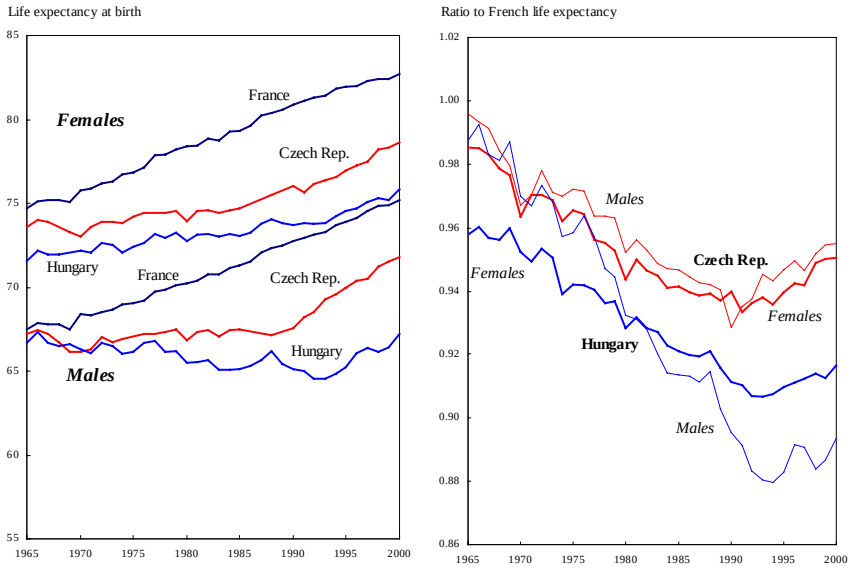

Figure 3: *Sex-specific trends in life expectancy in Hungary and the Czech Republic compared to France in absolute and relative terms*

For both males and females, and for the Czech Republic and Hungary alike, the divergence is spectacular. In 1965, life expectancy differentials between France and the Czech Republic were 0.3 years for males and 1.1 years for females. By 2000, the differentials had widened to 3.4 and 4.1 years, respectively. The divergence is even more impressive for Hungary: from 0.9 to 8.0 years for males and from 3.2 to 6.9 years for females. The differential was even greater just before trends reversed in both central European countries. As shown in the second part of Figure 3, the gap was widest at the end of the 80s for the Czech Republic (4.2 for males and 4.9 for females) and in the mid-90s for Hungary (8.8 for males and 7.6 for females). Since then, it has narrowed, reflecting more rapid life expectancy gains in both countries which have allowed them to make up for some of the lost time.

The unfavourable long-term trends in eastern and central Europe have already been extensively studied (Bourgeois-Pichat, 1985; Meslé, 1991; Okolski, 1993; Meslé and Hertrich, 1997). The wide fluctuations in life expectancy which have occurred in the republics of the former USSR since 1985 have also been widely discussed in the literature (Shkolnikov and Nemtsov, 1997; Leon *et al.*, 1997; Shkolnikov *et al.*, 1998; Gavrilova *et al.*, 2001, 2002). In the next two sections, dealing with central European countries and the republics of the former USSR, respectively, the main features of these trends will be summarized and a particular focus will be put on the most recent trends in an effort to determine whether the recent improvement observed in most countries reflects a real reversal of long-term trends and what are the determinants of the continuing decline in Russia and Ukraine. The analysis will be limited to male trends which, as shown above, are more pronounced than female trends.

3. Central Europe: towards a sustainable improvement

To gain a better insight into recent trends in male life expectancy in central European countries, we systematically compared age- and cause-specific changes in mortality before and after the upturn. Consequently, the reference year varies from one to another country: 1988 for the Czech Republic, 1991 for Poland, 1992 for Slovakia, 1993 for Hungary, 1997 for Bulgaria and Slovenia.

A) Changes in mortality age structure.

In the six central European countries, the period of decline is characterised by a sharp distortion of the mortality age structure with a significant increase at adult ages, between 25 and 65 (Figure 4).

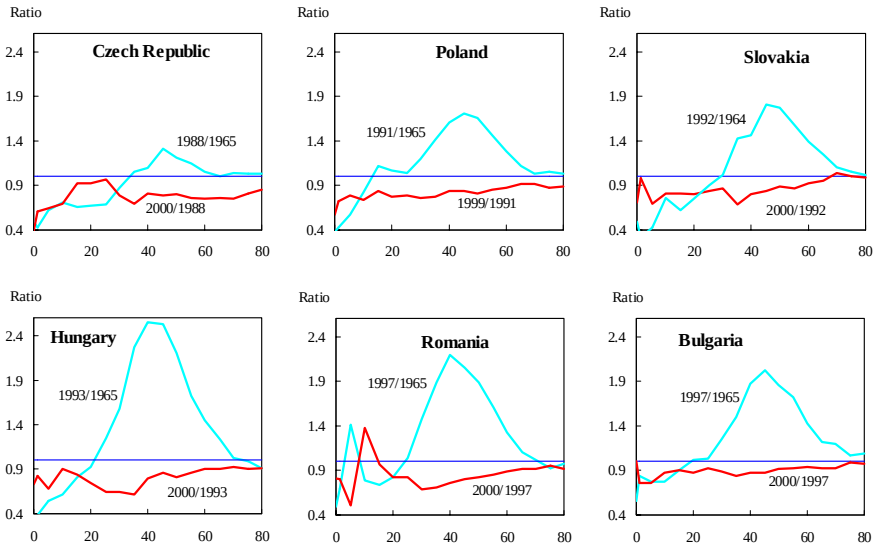

Figure 4: *Changes in mortality age structure during a period of deterioration and a period of improvement in six countries of central Europe. Males*

In Hungary, where the trend was most pronounced, the male death rate at age 40 was multiplied by 2.5 and the range of the ages concerned by the deterioration was very wide, from age 20 to age 70, between 1965 and 1993. By contrast, the Czech Republic was much less badly affected : from 1965 to 1988, mortality rates only increased between ages 35 and 65, and the maximum increase at age 45 is only 30%. The mortality rise at adult ages contrasts with a relative stagnation at old ages and a decline at young ages. Infant mortality decreased everywhere during this first period. Trends were also favourable for child mortality, except in Romania.

The changes in death rates which occurred since the upturn in all these countries are more equally distributed among all ages. In all countries, progress is made at almost all ages. Obviously, this progress covers very different time spans and it is hard to draw a direct comparison between the Czech Republic, where life expectancy has now been advancing for 12 years, and Romania or Bulgaria, where improvements occurred only in the three most recent years. That said, the changes are quite similarly shaped, notwithstanding the odd noteworthy exception to this regular pattern : no decrease in mortality around 20 in the Czech Republic, a sharper improvement around age 30 in Hungary and Romania, greater gains in the Czech Republic over age 70.

These specificities aside, the new stage that these different countries are entering one after the other appears to be one of a general improvement in health at all ages, and is no longer concentrated in a specific stage of life as was the case for the worsening at specifically adult ages.

B) The impact of circulatory diseases

All these changes in mortality age structure depend on trends in causes of death. To study cause-of-death trends, we extracted data from the WHO mortality database (Note 3), where statistics of deaths by cause and by 5-year age groups are available for the entire period 1965-2000 (or 1999) for Bulgaria, Hungary and Poland, since 1969 for Romania, since 1988 for the Czech Republic and since 1992 for Slovakia. The comparison of cause-specific mortality over a long time-frame comes up against the problem of changes in classification of causes of death. From 1965 to 2000, 4 different classifications were in use from ICD7 to ICD10. To ensure consistency between ICD7, ICD8 and ICD9, we used series of deaths by cause reclassified into ICD9 which were reconstructed for a previous study (Hertrich and Meslé, 1998). For the transition between ICD9 and ICD10, we defined broad groups of causes for which the medical content seems to be unchanged between the two revisions (Table 1). Age- and sex-specific mortality rates were computed for each broad group of causes after proportional redistribution of ill-defined causes.

Table 1: *Items corresponding to broad groups of causes in ICD9 and ICD10*

Cause of death	ICD9 List B	ICD10 Detailed list	ICD10 Russian abridged list	1988 Soviet Classification
Infectious diseases	B01-B07	A000-B99	1-55	1-44
Neoplasm	B08-B17	C000-D484	56-89	45-67
Circulatory diseases	B25-B30	I00-I99	115-147	84-102
Heart diseases	*B25-B28*	*I00-I528*	*115-132*	*84-97*
Other circulatory diseases (incl. stroke)	*B29-B30*	*I600-I99*	*133-147*	*98-102*
Diseases of the respiratory system	B31-B32	J00-J998	148-164	103-114
Diseases of the digestive system	B33-B34	K000-K938	165-179	115-127
Other diseases	B18-B24, B50-B45	D500-H959, L00-Q999	90-114, 180-225, 227	68-83, 128-157
Violent deaths	B47-B56	V01-Y98	239-255	160-175
TOTAL	B01-B56	A000-R99, V01-Y98	1-228, 239-255	1-175

As for changes in mortality age patterns, we divided the period 1965-2000 into two sub-periods which were different for each country and corresponded to the decrease and increase of life expectancy at birth, respectively. For each sub-period, we calculated the

contributions by age groups of seven groups of causes to changes in life expectancy (Note 4). The total contributions are highly dependent on the total number of years in each period, which are quite different from one country to another. To compare these contributions, we divided the total gains or losses of life expectancy by the number of years in the period. Figures 5 and 6 (Note 5) give the mean annual contribution for each age group and each cause.

As expected from the previous section on age pattern changes, the decrease in life expectancy was closely correlated to the rise in mortality at working ages while, everywhere, progress in infant mortality checked the decline (left panel of graphs in Figure 5). In Poland and Bulgaria, mortality from circulatory diseases was the main cause of health decline at adult ages. In Hungary and Romania, in addition to the important role played by these diseases, other causes of death, like cancer and digestive diseases contributed significantly to the life expectancy decrease.

Table 2: *Contributions of seven groups of causes to overall changes in male life expectancy at birth during different sub-periods in 4 central European countries.*

	Infectious diseases	Cancer	Circulatory diseases	Respiratory diseases	Digestive diseases	Other diseases	Violent deaths	Total
Hungary								
1965-1993	0.40	-1.19	-1.25	0.61	-1.33	1.07	-0.56	-2.24
1993-2000	0.05	0.01	1.07	0.23	0.38	0.38	0.51	2.63
Poland								
1965-1991	1.14	-0.75	-2.11	1.34	0.20	0.57	-0.88	-0.50
1991-1999	0.07	0.02	1.59	0.06	-0.09	0.52	0.51	2.68
Bulgaria								
1965-1997	0.25	-0.22	-3.74	1.37	-0.19	0.06	-0.15	-2.62
1997-1999	0.00	0.04	0.67	0.26	0.12	0.08	0.08	1.26
Romania								
1969-1997	0.48	-0.35	-1.58	1.81	-0.33	0.34	-0.26	0.12
1997-2000	0.04	-0.01	1.02	0.40	0.28	0.46	0.39	2.57
Czech Rep.								
1988-2000	0.02	0.44	1.97	0.21	0.14	0.77	0.03	3.58
Slovakia								
1992-2000	0.00	-0.04	0.41	0.31	0.08	0.34	0.41	1.50

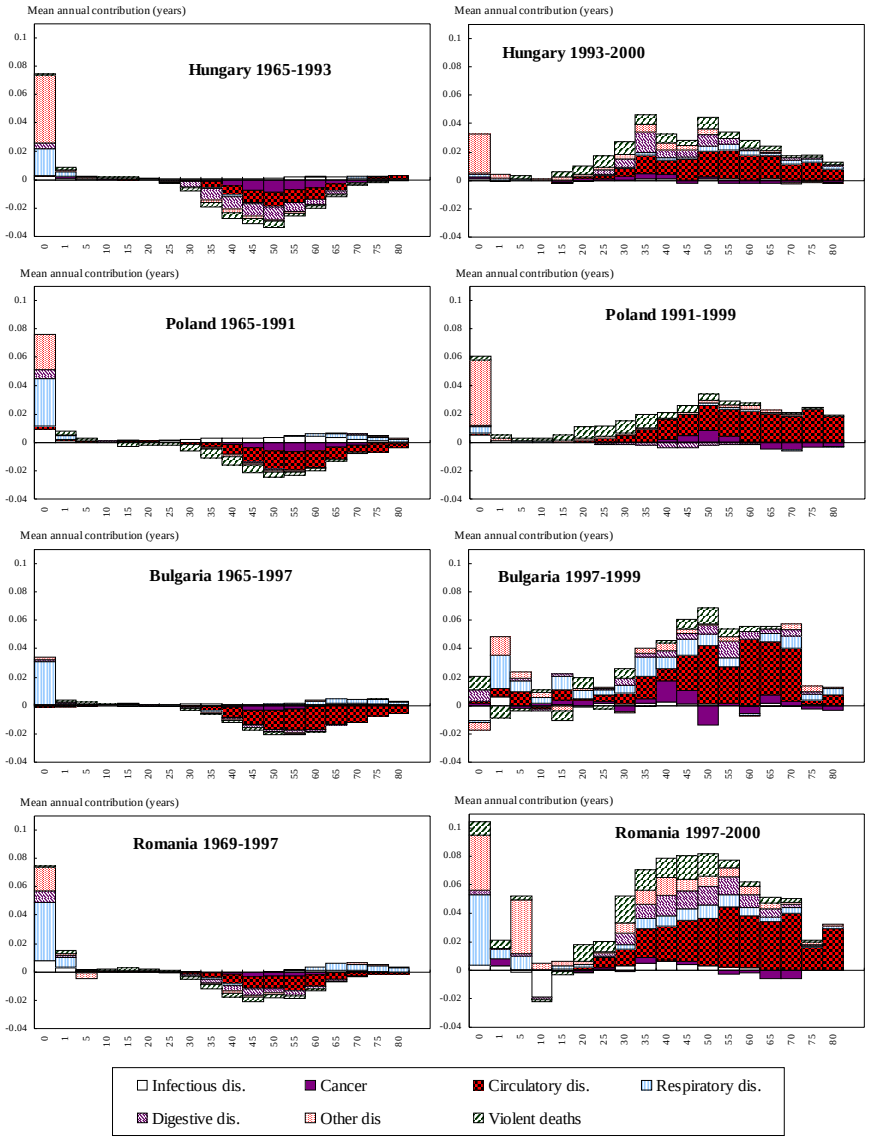

Figure 5: *Contributions by age groups of seven groups of causes to overall changes in life expectancy at birth for two periods (decline and improvement) in 4 central European countries. Males*

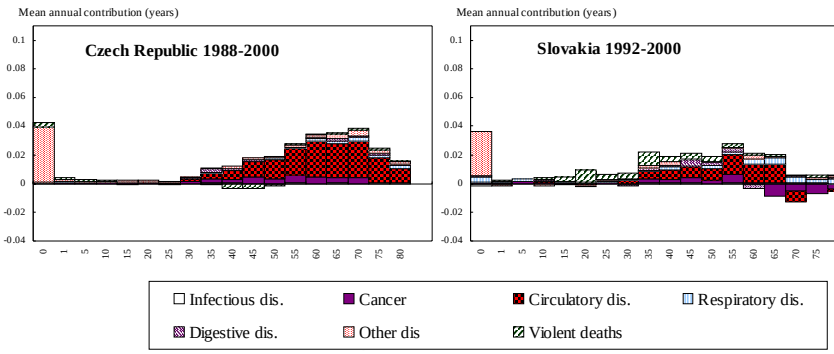

Figure 6: *Contributions by age groups of seven groups of causes to recent increases in life expectancy at birth in Slovakia and the Czech Republic. Males*

Looking at the period of improvement (Figure 6 and right panel of graphs in Figure 5), it comes as no surprise to see that mortality from circulatory diseases is the main determinant of the upturn in life expectancy. This is particularly marked for the Czech Republic and Poland where gains in mortality from this cause account respectively for 55 and 59% of the total. In Hungary and Slovakia, gains are more diversified. In Hungary, in particular, mortality from digestive diseases plays an important role as it had previously done in the earlier period but it is now a positive one. The results for Bulgaria and Romania appear much more erratic. In both countries, in fact, progress is very recent and the sub-periods considered very short (1997-1999 in Bulgaria, 1997-2000 in Romania). Compared to the other countries, the mean annual contributions are more important and concern almost all age groups and all causes of death, with once again a significant impact from the decrease in circulatory diseases. It is, however, too early to say for certain whether the gains will be long-term in these countries.

The impact of trends in mortality from circulatory diseases on the trend of life expectancy at birth is, however, undeniable in all these central European countries. The simultaneity of the trends reversal in life expectancy and in standardised mortality rates (Note 6) by circulatory diseases is striking (Figure 7). After rising sharply for many years, mortality from circulatory diseases has started to decline everywhere at precisely the same point when life expectancy began to lengthen. This favourable trend has brought levels of cardiovascular mortality to below 1965 levels in Hungary and in Poland and probably in the Czech Republic, for which pre-1985 data are not available in the WHO database. The situation is still less favourable in Bulgaria and Romania,

however, where a spectacular reversal has occurred since 1997. In Slovakia, the series is too short to really reveal definite trends.

While circulatory diseases are clearly the most prominent contributors to recent trends in life expectancy in central Europe, the analysis of contributions of causes of death reveal that, in some countries at least, a decline in other diseases has been partly responsible for the progress. Figure 8 displays annual trends of standardised mortality rates by six other groups of causes as well as for two sub-groups of circulatory diseases in the four countries for which sufficient long-term series are available.

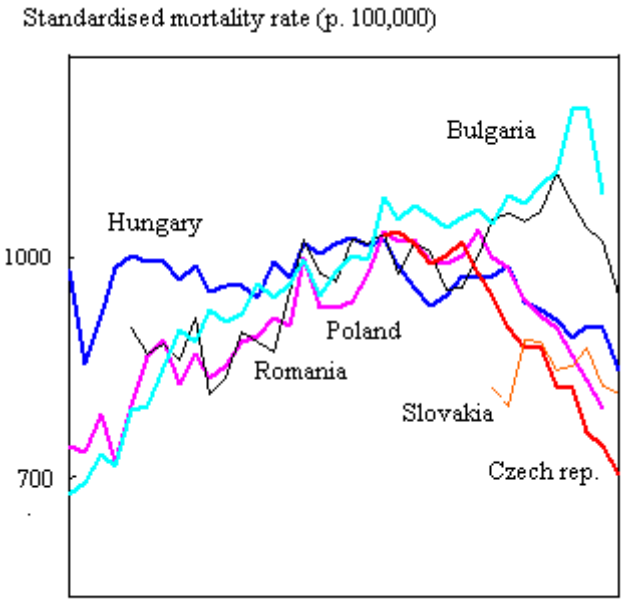

Figure 7: *Annual trends in standardised mortality rate from circulatory diseases in central European countries. Males*

Circulatory diseases are the primary cause of death in all four countries, but they are much more predominant in Bulgaria and Romania than in Hungary and Poland where cancer is becoming increasingly important. In the latter two countries, cancer mortality has been rising steadily and more rapidly than cardiovascular mortality throughout the period. Most recently, furthermore, trends in circulatory diseases have reversed in favour of a growing importance of cancer. Among circulatory diseases, the decrease is

particularly pronounced for the group of cerebrovascular diseases (stroke) and other circulatory diseases, while trends in heart disease are less clear-cut. After circulatory diseases and cancer, violent deaths are the main causes of death in Poland and Hungary. In the latter, mortality from digestive diseases is almost as high as violent deaths, reflecting a very steep period-long increase which even accelerated in the 80s. This growth came to a halt in the early 90s and the following decrease contributed to the progress of life expectancy, concurrently with the fall in violent deaths.

In Bulgaria and Romania, all causes of death, except cancer, decreased in the recent years of improvement. This bears out the impression given by the analysis of cause contributions to life expectancy gains. This progress probably reflects an all-round improvement in health following on from a period of particularly severe health problems linked to the socio-economic crisis that these countries went through following the fall of the iron curtain. The increase in mortality from infectious diseases which occurred between 1985 and 1995 bears witness to this health crisis which is probably quite similar to that observed in the countries of the former USSR (see below). The coming years will tell whether the recent recovery will continue, leading on to a new phase of progress.

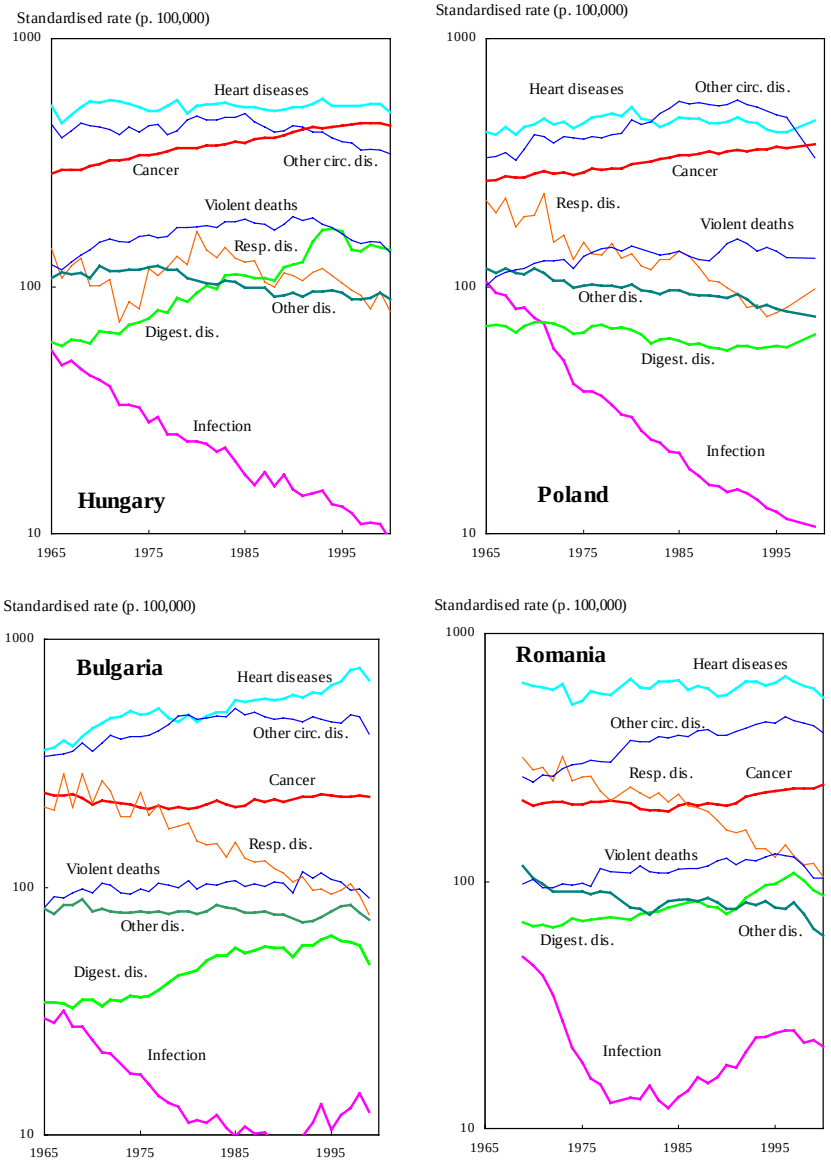

Figure 8: *Annual trends in standardised mortality rates for 8 broad groups of causes in four central European countries. Males*

4. Former Soviet Union: Russia and Ukraine still lag far behind

While recent trends in the health situation in most central European countries are quite favourable, the outlook for countries of the former USSR - at least for the two most populous European republics, Russia and the Ukraine – is much bleaker.

A) The persistent rise of adult mortality

As already emphasized in the first section of the paper, no clear pattern has been discernible in life expectancy trends in the European republics of the former USSR since 1985. The determinants of the wide fluctuations which occurred in all these countries between 1985 and 1997 have already been widely discussed and will not be considered further here. As this very troubled period seems to be drawing to a close, the issue now is, disregarding the fluctuations, to assess general mortality trends to try and single out possible changes which might help predict future trends.

Just as for central European countries, two sub-periods will be considered here for the republics of the former USSR: 1965-1984 and 1984-2000. The year 1984 was chosen as being the last year before the onset of the fluctuations. Figure 9 displays the ratio between 1984 and 1965 death rates by age groups and the ratio between the 2000 (or 1999 for Estonia) and 1984 death rates.

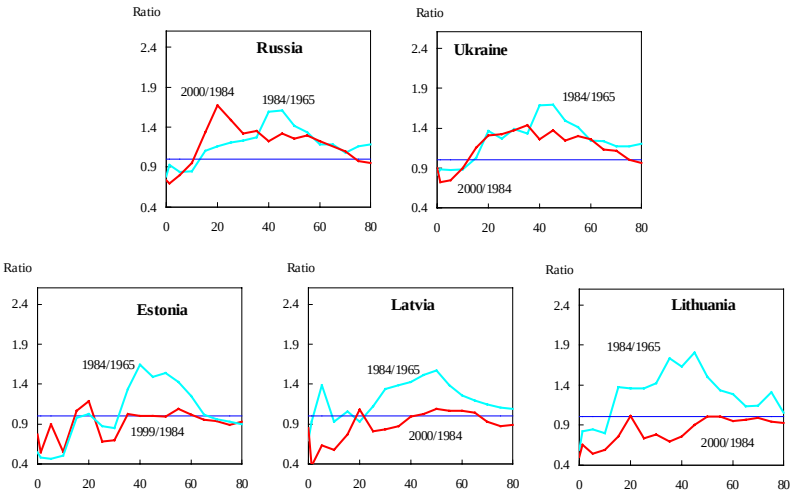

Figure 9: *Changes in mortality age structure over two periods (1965-1984 and 1984-2000) in five countries of the former USSR. Males*

In the first period, from 1965 to 1984, the increase in mortality is particularly pronounced at adult ages, as in central Europe. In the five countries, death rates around age 40 increased by 40 or 50% while infant mortality decreased and mortality at old ages remained relatively stable or rose slightly. Unlike the central European countries, the second period was marked by a continued decline in Russia and Ukraine, and a stabilised situation in the Baltic countries. In Estonia and Latvia, infant mortality continued to decline, but death rates remained virtually unchanged at adult ages other than for a slight decrease in mortality around age 30. In Lithuania, the progress at adult ages is more perceptible and concerns a wider range of ages (from 25 to 45). The halt in the decline in the Baltic countries and the beginnings of progress at some ages give hope that these countries, like the central European countries, may be close to entering a new stage of sustainable improvement. Russia and Ukraine, by contrast, give no signs of improvement, and mortality at adult ages has continued to increase with a singular rise in mortality at young adult ages (around 20) in Russia.

B) Circulatory diseases and violent deaths

As a result of a joint INED/CDEH (Moscow) project on mortality by cause in the countries of the former USSR, continuous deaths–by-cause series are available for the five countries examined here since 1965 (see Meslé *et al.*, 1996; Hertrich and Meslé, 2001, Meslé and Vallin, 2003). Continuous deaths-by-cause series, reclassified into the 1988 Soviet Classification, are available up to 1998 in Russia and 2000 in Ukraine. They were consolidated into 7 broad groups of causes as shown in Table 1. An abridged version of ICD10 has been in use since 1999 in Russia, and a comparable grouping has been performed for these years (see Table 1). For the three Baltic countries, continuous deaths-by-cause series according to ICD9 have been reconstructed for the entire period covered by Soviet classifications or by ICD9: 1965-1996 for Estonia, 1965-1995 for Latvia, 1965-1997 for Lithuania (Note 7). Each country transitioned to ICD10 at a different point in time. We used both ICD9 and ICD10 groupings already defined in section II for central European countries (Table 1). Contributions to life expectancy changes were calculated according to Andreev's method (1982) and Figures 10 and 11 display mean annual contributions by age and cause for the two periods 1965-1984 and 1984-2000 (1999 in Estonia).

In Russia and Ukraine, the two periods are marked by an increase in mortality at all adult ages. From 1965 to 1984, men lost respectively 2.7 and 3.2 years of life expectancy and a further 2.5 and 2.4 years from 1984 to 2000 (Table 3). During the first period, the highest losses occurred between ages 40 and 60 while, in the second they are more equally distributed across all adult ages (Figure 10). In Russia particularly, the maximum loss occurred at ages 20-24. Regardless of the period, two groups of causes,

circulatory diseases and violent deaths, account for the lion's share of the losses. The negative impact of violent deaths even increased in Russia in the latter period, and the increase in these explains the major worsening in health at young adult ages. From 1965 to 1984, the decline in infectious disease mortality was still having a positive impact on life expectancy, but from 1984 to 2000, that role went into reverse and infectious diseases had a significant impact on the decrease in life expectancy, especially in Ukraine (– 0.4 years).

Russia and Ukraine are clearly not yet on the road to sustainable progress. In fact, the health situation will actually worsen for a wide range of ages and causes.

Table 3: *Contributions of 7 groups of causes to changes in male life expectancy at birth during the periods 1965-1984 and 1984-2000 in 5 countries of the former USSR.*

	Infection	Cancer	Circulatory diseases	Respiratory diseases	Digestive diseases	Other diseases	Violent deaths	Total
Russia								
1965-1984	0.39	0.01	-1.80	0.14	-0.02	0.05	-1.42	-2.65
1984-2000	-0.15	0.09	-1.24	0.29	-0.12	0.02	-1.44	-2.55
Ukraine								
1965-1984	0.53	-0.34	-2.03	0.45	-0.21	-0.34	-1.28	-3.23
1984-2000	-0.38	-0.02	-1.11	0.18	-0.19	-0.07	-0.82	-2.40
Estonia								
1965-1984	0.55	-0.27	-1.22	0.07	-0.18	0.03	-0.76	-1.77
1984-1999	-0.09	0.21	0.94	0.12	-0.02	0.38	-0.25	1.30
Latvia								
1965-1984	0.51	-0.27	-1.68	0.03	-0.05	-0.10	-1.01	-2.57
1984-2000	-0.01	0.05	0.58	0.37	-0.10	0.02	-0.01	0.90
Lithuania								
1965-1984	0.70	-0.41	-2.29	1.01	-0.03	-0.44	-1.87	-3.33
1984-2000	0.02	-0.18	1.03	0.55	-0.06	0.80	0.33	2.49

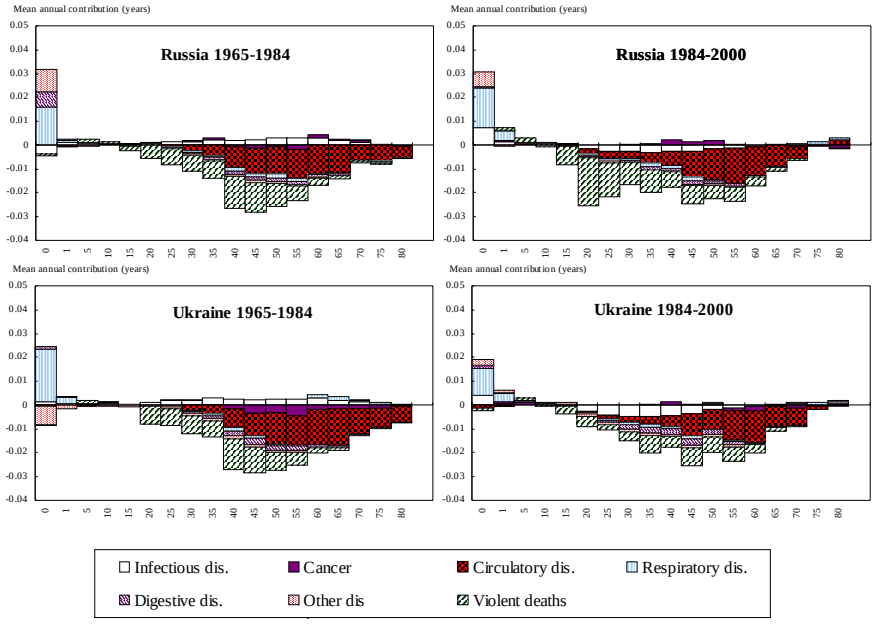

Figure 10: *Contributions by age groups of seven groups of causes to overall changes in life expectancy at birth for two periods (1965-1984 and 1984-2000) in Russia and Ukraine. Males*

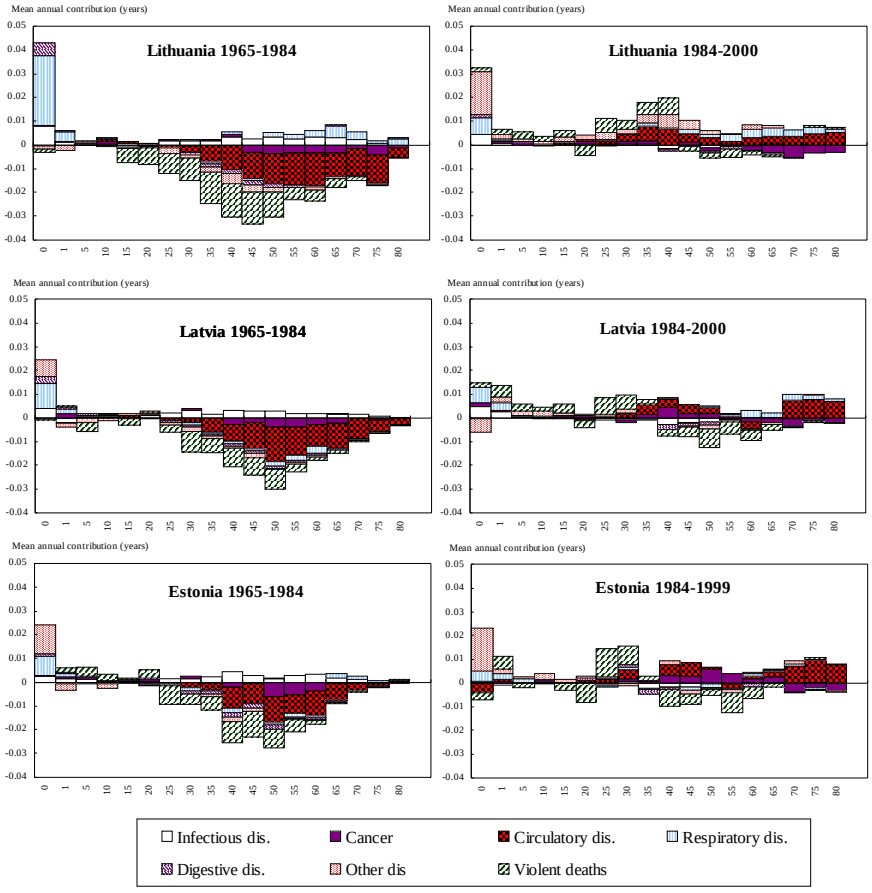

Figure 11: *Contributions by age groups of seven groups of causes to overall changes in life expectancy at birth for two periods (1965-1984 and 1984-2000 or 1984-2000) in the Baltic countries. Males*

As already stressed earlier, the outlook for the Baltic countries is arguably brighter. From 1965 to 1984, life expectancy in the three countries declined for the self-same reasons as in Russia and Ukraine: increased mortality at adult ages mainly due to the rise in mortality from circulatory diseases and violent deaths (Table 3 and Figure 11). But from 1984 to 2000 (1999 for Estonia), the trends appear more favourable, as for Bulgaria and Romania in central Europe. Progress is most notable in Lithuania, where

life expectancy at birth increased by 2.5 years, but also present in Estonia (+1.3) and Latvia (+0.9). Most of this progress is attributable to circulatory diseases, while violent deaths are still contributing to the decrease in life expectancy (at least at some ages). Overall, current changes in these countries appear quite haphazard for ages and causes alike. But they do appear to have halted the long-term decline affecting the republics of the former USSR since the mid-60s. Like Bulgaria and Romania, they may not be too far off embarking on a phase of effective improvement.

Russia and Ukraine, by contrast, are still in the midst of a serious health crisis which is hitting young adults hardest. In Russia all forms of violent deaths are rising dramatically at ages 15-29 (Figure 12). This group of causes has been the most affected by the wide fluctuations of the last fifteen years. Gorbachev's anti-alcoholism campaign produced a decline in mortality for the four main components of violent deaths, but particularly for accidental poisoning (which includes alcohol poisoning) and suicide. The increase in the wake of the economic crisis of 1992-93 was due more to homicide and a resurgence in accidental poisoning. The improvement observed between 1994 and 1998 was mainly linked to a decline in mortality from homicide and road traffic accidents, but most recently violent deaths of all kinds have begun to rise again with a particular surge in accidental poisoning. This is very probably due to a fresh rise in alcohol consumption among young cohorts and makes the short-term outlook very uncertain.

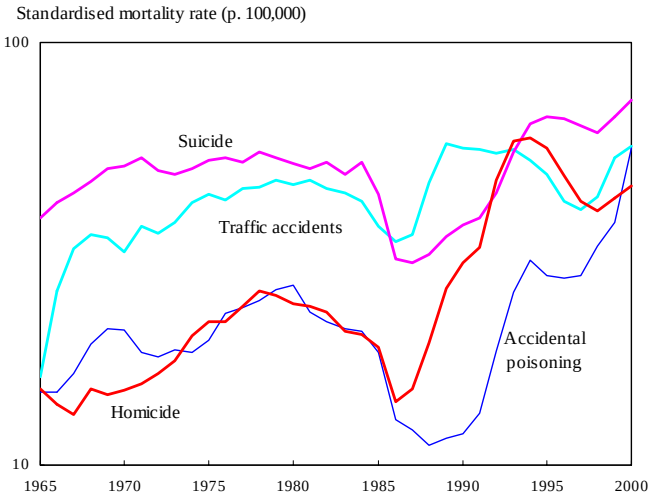

Figure 12: *Annual trends in standardised mortality rates at age 15-29 for main causes of violent deaths in Russia. Males*

Another emerging health problem in the two countries is the rising incidence of infectious disease mortality. Figure 13 shows the trends in standardised death rates at age 30-44 for the main infectious conditions in Ukraine. Infectious disease mortality is overwhelmingly attributable to tuberculosis. TB mortality accounts for 90% of total infectious disease mortality at this age and it is because of the reverse in the downtrend in the 90s that infection is now contributing to the decline in life expectancy. It may be that a proportion of deaths registered as due to tuberculosis should be attributed to AIDS, which also rose sharply in the 90s, as shown in Figure 13 by trends in mortality from viral diseases, in which AIDS is included. But the recent increase in mortality from tuberculosis, like that of accidental poisoning observed in Russia, chiefly reflects the acute social crisis that has been besetting Russia and Ukraine for ten years and which has produced a sharp rise in the numbers of vulnerable individuals.

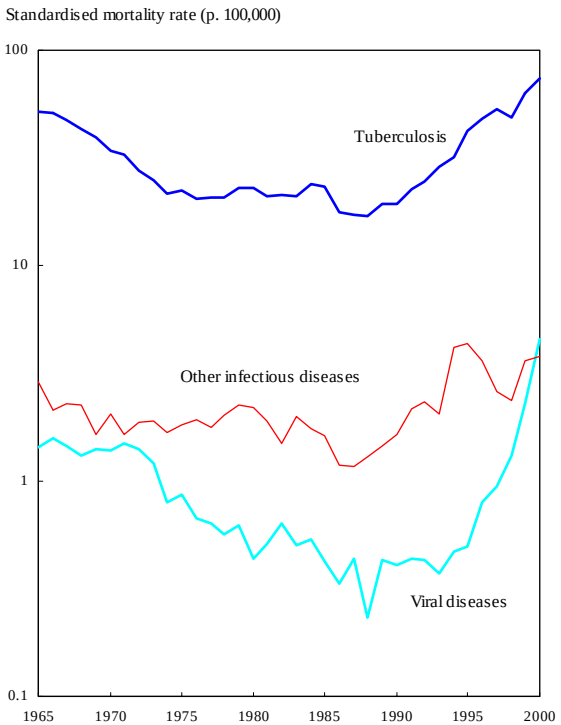

Figure 13: *Annual trends in standardised mortality rates at age 30-44 for the main infectious diseases in Ukraine. Males*

5. Conclusion

Adverse but quite similar mortality trends in central Europe and the former USSR long contributed to widening the gap between these countries and the rest of Europe. The divergence was mainly due to very different trends in mortality from circulatory diseases. After successfully tackling infectious diseases, industrialised countries had to look for ways of reducing degenerative diseases, and especially circulatory diseases, which were the main factors of mortality. In Western countries, health policies that combined preventative measures with new developments in treatments gradually vanquished these diseases, and their mortality declined substantially. Eastern European countries, by contrast, failed to reverse the increase in circulatory disease mortality which largely contributed to the stagnation or even the decrease of life expectancy (Meslé, 1991; Okolski, 1993).

Since the mid-80s, however, mortality trends have developed very differently in central Europe and the former USSR. Between the late 80s and the late 90s, one central European country after another has reversed long-term negative trends and - in the Czech Republic, Slovakia, Hungary and Poland, at least - progress seems well under way, particularly due to a marked decline in mortality from circulatory diseases. Favourable trends which were observed in western Europe as long ago as the early 1970s have now spread to the countries of central Europe. It is still difficult to assess the main determinants of such a reversal. The progress probably results from the combination of several factors, such as changes in diets, the growth of systematic prevention and screening, the spread of new forms of treatment, and cardiac surgery.

At the same time, countries of the former USSR have experienced very marked fluctuations in mortality, related to the social and economic traumas which these countries have undergone over the past fifteen years. After an initial increase in life expectancy following the anti-alcoholism campaign launched by Gorbachev in 1985, mortality began to rise again as the effects of the campaigns dwindled. The increase accelerated dramatically in 1993-1994 when all these countries entered a harsh economic crisis linked to the sudden transition to a market economy. The crisis resulted in a complete dismantling of public services, including the health system, at a time when people were suffering food shortages and psychological stress (Shkolnikov *et al.*, 1998; Gavrilova *et al.*, 2001). Up to the mid-1990s, the trends were completely parallel in all the European republics of the former USSR. However, more recently, they have begun to diverge. While the crisis may be bottoming-out in the Baltic countries, and mortality trends could soon begin to mirror those of central European countries, Russia and Ukraine, which are experiencing a fresh rise in mortality from infectious diseases, circulatory diseases and violence, have not yet managed to ride out the crisis. Furthermore, the health crisis has become particularly acute among young people, who

are the main victims of violence and infectious diseases. This new development makes the future for these countries very uncertain.

Notes

1. The hierarchical analysis, using SPAD (*Système pour l'analyse des données*) software (Lebart *et al.*, 1999), was performed on the probability logarithms after a principal components analysis which made it possible to reduce the noise by limiting the final analysis to the axes that are most explanatory of the variance, in other words the first 10 axes.
2. In this paper, all former communist European countries, outside the former USSR are grouped together under the expression "central Europe".
3. WHO, *Mortality data*, http://www.who.int/whosis
4. The contributions were computed according to Andreev's method (Andreev, 1982), using software developed by Vladimir Shkolnikov. This method is quite comparable to those proposed by Pollard (1982), Arriaga (1984) and Pressat (1985).
5. Because of data availability in the WHO database, the first sub-period starts in 1969 for Romania while for the Czech Republic and Slovakia it was only possible to consider the second sub-period.
6. On the basis of the standard European population proposed by WHO (1992)
7. Although data are available since the mid-50s for the three countries, they were not used for this paper.

References

ANDREEV Evgueni, 1982. – Metod komponent v analize prodolzhitelnosti zhizni, *Vestnik Statistiki*, n° 3, p. 42-47.

ARRIAGA Eduardo A., 1984. – Measuring and explaining the change in life expectancies, *Demography*, vol. 21, n° 1, p. 83-96.

BOURGEOIS-PICHAT Jean, 1985. – Recent chances in mortality in industrialized countries, *in:* Jacques VALLIN and Alan LOPEZ (ed.), *Health policy, social policy, and mortality prospects*, p. 507-539. – Liège, Ordina Éditions, 557 p.

GAVRILOVA Natalia S., EVDOKUSHKINA Galina N., SEMYONOVA Victoria G. and GAVRILOV Leonid A., 2001. – *Economic crises, stress and mortality in Russia.* – Chicago, Center on Aging, University of Chicago, 28 p. (Paper presented at the 2001 PAA meeting, Washington).

GAVRILOVA Natalia S., SEMYONOVA Victoria G. and EVDOKUSHKINA Galina N., 2002. – *Mortality crisis in Russia: new health threats.* – Chicago, Center on Aging, University of Chicago, 29 p. (Paper presented at the 2002 PAA meeting, Atlanta).

HERTRICH Véronique and MESLÉ France, 1998. – Mortalité et politiques socio-économiques: le cas de 4 pays d'Europe centrale et orientale , *in: Morbidité, mortalité: problèmes de mesure, facteurs d'évolution, essai de prospective. Colloque international de Sinaia (2-6 septembre 1996)*, p. 395-412. – Paris, AIDELF, 737 p.

HERTRICH Véronique and MESLÉ France, 2000. – *Analysing long term trends in mortality by cause. The case of the Baltic countries.* – Paris, INED. (Communication présentée au séminaire "Population Development and Emerging Requirements for Data Comparability: Focus on Baltic and Caucasian Region", Tallinn, 2-4 novembre 2000).

LEBART L., MORINEAU A., LAMBERT T. and PLEUVRET P., 1999. – *SPAD. Manuel de référence.* – Montreuil, CISIA-CECESTA.

LEON David A., CHENET Laurent, SHKOLNIKOV Vladimir M., ZAKHAROV Sergei, SHAPIRO Judith, RAKHMANOVA Galina, VASSIN Sergei and MCKEE Martin, 1997. – Huge variation in Russian mortality rates 1984-94: artefact, alcohol, or what ?, *The Lancet*, vol. 350, August 9, p. 383-388.

MESLÉ France, 1991. – La mortalité dans les pays d'Europe de l'Est, *Population*, vol. 46, n° 3, p. 599-650.

MESLÉ France and HERTRICH Véronique, 1997. – Évolution de la mortalité en Europe: la divergence s'accentue entre l'Est et l'Ouest, *in: Congrès international de la population. Beijing 1997*. p. 479-508. – Liège, UIESP, 1532 p.

MESLÉ France, SHKOLNIKOV Vladimir, HERTRICH Véronique and VALLIN Jacques, 1996. – *Tendances récentes de la mortalité par cause en Russie, 1965-1994*. – Paris, INED, 140 p. + 2 disquettes. (Données statistiques n°2).

MESLÉ France and VALLIN Jacques, 2002. – Mortality in Europe: the Divergence Between East and West, *Population-E*, vol. 57, n° 1, p. 157-198.

MESLÉ France and VALLIN Jacques, 2003. – *Mortalité et causes de décès en Ukraine au XXe siècle*. – Paris, INED, 396 p. (Cahier n° 152, with contributions of Vladimir Shkolnikov, Serhii Pyrozhkov and Serguei Adamets).

OKOLSKI Marek, 1993. – East-West mortality differentials, *in:* Alain BLUM and Jean-Louis RALLU (ed.), *Démographie européenne. II. Dynamiques démographiques*, p. 165-189. – Paris, John Libbey/INED

OMRAN Abdel R., 1971. – The epidemiologic transition: a theory of the epidemiology of population change, *Milbank Memorial Fund Quarterly*, vol. 49, n° 4, p. 509-538.

POLLARD John H., 1982. – The expectation of life and its relationship to mortality, *Journal of the Institute of Actuaries*, vol. 109, 2e partie, n° 442, p. 225-240.

PRESSAT Roland, 1985. – Contribution des écarts de mortalité par âge à la différence des vies moyennes, *Population*, vol. 40, n° 4-5, p. 766-770.

SHKOLNIKOV Vladimir, CORNIA Giovanni, LEON David and Meslé France, 1998. – Causes of the Russian mortality crisis: evidence and interpretations, *World Development*, vol. 26, n° 11, p. 1995-2011.

SHKOLNIKOV Vladimir and NEMTSOV Alexander, 1997. – The anti-alcohol campaign and variations in Russian mortality, *in:* Jose Luis BOBADILLA, Christine A. COSTELLO and Faith MITCHELL (eds), *Premature death in the New Independent States*, p. 239-261. – Washington D.C, National Academy Press, 404 p.

VALLIN Jacques and MESLÉ France, 2001. – Trends in mortality in Europe since 1950: age-, sex- and cause-specific mortality, *in: Trends in mortality and differential mortality*, p. 31-186. – Strasbourg, Council of Europe Publishing, 334 p. (Population Studies n° 36).

WHO, 1992. – *Annuaire de statistiques sanitaires mondiales*. – Genève, OMS