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Mortality and Causes of Death in 20th-Century Ukraine

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France Meslé • Jacques Vallin

Mortality and Causes of Death in 20th-Century Ukraine

With contributions from
Vladimir Shkolnikov
Serhii Pyrozhkov
Sergei Adamets

Springer

France Meslé
Institut National d'Études
Démographiques
Bd. Davout 133
75980 Paris Cedex 20
France

Jacques Vallin
Institut National d'Études
Démographiques
Bd. Davout 133
75980 Paris Cedex 20
France

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Foreword

Our first investigations into causes of death in the Soviet period, conducted at the level of the whole USSR,[1] rapidly convinced us that an in-depth analysis of the Soviet health crisis could hardly go forward without distinguishing between the 15 constituent republics of the USSR, even before it broke down into 15 independent countries. That is why, in 1990, we made a decision to collect the data needed to analyse trends in cause-specific mortality in each republic.

This book is the English translation of an updated version of the book originally published in French in 2003,[2] and in Ukrainian in 2006.[3] While original dataset covered the period 1965–2000, this one is expanded to the year 2006 and all analyses, comments and graphs have been updated.

That work about Ukraine, which comes after the publication of a first volume covering Russia,[4] will soon be followed by a third on the Baltic states. The electronic version of the book is accompanied by a package of files that brings together the technical appendices and the statistical tables, (see either at Max Planck Institute for Demographic Research: http://www.demogr.mpg.de/books/drm/009 or at Springer: http://extras.springer.com/).

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[1] Meslé, F., Shkolnikov, V., & Vallin, J. (1992). Mortality by cause in the USSR in 1970–1987: the reconstruction of time series. *European Journal of Demography*, *8*, 281–308. (Also published in French as: *La mortalité par causes en URSS de 1970 à 1987: reconstitution de séries statistiques cohérentes* (34 p). Paris: INED (Dossiers et recherches, No. 35).

[2] Meslé, F., & Vallin, J. (2003). *Mortalité et causes de décès en Ukraine au XXe siècle* (XVI + 396 p). Paris: INED (Les cahiers de l'INED, cahier n° 152, with contributions by Vladimir Shkolnikov, Serhii Pyrozhkov and Serguei Adamets).

[3] Meslé, F., & Vallin, J. (2008). *Смертність та причини смерті в Україні у XX столітті* [*Mortalité et causes de décès en Ukraine au XXe siècle*] (416 p). Kiev: INED et IDSS (with contributions by Vladimir Shkolnikov, Serhii Pyrozhkov and Serguei Adamets).

[4] Meslé, F., Shkolnikov, V.M., Hertrich, V., & Vallin, J. (1996). *Tendances récentes de la mortalité par cause en Russie 1965–1994* (140 p. + 2 floppy disks). Paris: INED/CDEH. (Bilingual French and Russian publication. Données statistiques, No. 2).

As with the earlier volume, this book relies on the results of a project undertaken jointly by the National Institute for Demographic Studies (INED, Paris) and the Centre for Demography and Human Ecology, Moscow, in association with, for the Ukrainian section, the National Institute for International Security Issues in Kiev.

France Meslé, Jacques Vallin, and Vladimir Shkolnikov

Acknowledgements

We would like to thank Anatolii Vishnevskii, Director of the Centre for Demography and Human Ecology, Moscow, and Gérard Calot, Jacques Magaud, Patrick Festy and François Héran, successive Directors of INED, for their encouragement in bringing this long, costly study of Soviet cause-of-death data to fruition. Nor should we omit to mention Alain Blum, Director of Research at INED, who has promoted many collaborative ventures between Russian and French demographers and quickly came to understand the value of bringing the experience that INED has acquired in the area of causes of death to bear on the wealth of completely unpublished Soviet data on this topic.

Our thanks also go to Vladimir Shkolnikov, Serhii Pyrozhkov and Sergei Adamets, not only for their direct contributions to some chapters in this book, but also for their work in assembling the basic data, without which these analyses would not have been possible. From the outset, the whole vast research project on the health crisis in the countries of the former USSR – of which this book forms a part – has relied on patient, laborious data collection, which was made possible in the late 1980s when previously secret archives were opened. Following our first attempt to collect all the archival data relating to causes of death for the whole USSR,[1] in 1991 Vladimir Shkolnikov undertook to draw this material together for each of the 15 Soviet republics for all available years (1959–1990), along with existing population and all-cause mortality data for a longer period. For Ukraine, Serhii Pyrozhkov completed this database by adding the most recent cause-of-death statistics and some archival documents that were not available in Moscow. Finally, Sergei Adamets explored all the Russian, Ukrainian and international literature on Ukraine's eventful demographic history.

[1] Meslé, F., Shkolnikov, V., & Vallin, J. (1992). Mortality by cause in the USSR in 1970–1987: the reconstruction of time series. *European Journal of Demography*, *8*, 281–308. (Also published in French as: *La mortalité par causes en URSS de 1970 à 1987: reconstitution de séries statistiques cohérentes* (34 p). Paris: INED (Dossiers et recherches, No. 35).

We would also like to thank Emelian Rudnitskii, researcher at the Institute of Economics of the National Academy of Sciences of Ukraine, for his valuable collaboration in using the archives to reconstruct population change, and in particular mortality, in Ukraine; Galina Gurova, Goskomstat statistician, for her help in understanding many aspects of Soviet classification and coding practices; Dmitrii Bogoiavlenskii, researcher at the Centre for Demography and Human Ecology, Moscow, for providing us with basic data on mortality by nationality in the republics of the former USSR; Gaiane Safarova, researcher at the St Petersburg Institute for Economics and Mathematics, for her encouragement and advice on estimating the demographic consequences of the crises in Ukraine.

We are also grateful to the whole data capture and verification team, who patiently entered and checked some 2,000 original manuscript tables which were often difficult to decipher: Jeanine Besse, Élodie Brémaud, Anna-Maria Falconi, Selma Hussein, Ernestine Ngondgi, Mokhtaria Tazi and Tatiana Vichnevskaia. We also extend our thanks to Lisa Godek and Éric Lepenven who, during research placements at INED, helped to reconstruct the cause-specific deaths series, as well as to Ludovic Garonne for layout of the statistical appendices.

Special mentions must be also done in the frame of that English version, which is not the direct translation of the French original published in 2003 but an updated one. We thank a lot Ella Libanova, head of the Ukrainian Institute for Demography and Social Sciences, for providing us with data for the years 2001–2006, Sylvia Jasor, research-assistant at INED, for preparing the English version of the technical and statistical appendices (available either at the Max Planck Institute for Demographic Research: http://www.demogr.mpg.de/books/drm/009 or at Springer: http://extras.springer.com/), Karen George, for the translation, and Mathilde Paul for preparing the layout.

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France Meslé and Jacques Vallin

Contents

Chapter 1
General Introduction

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In 1938–1939, just before the Second World War, life expectancy was still only 50.8 years in Ukraine and 43 years in Russia,[1] whereas it had already reached 59.3 years in France and 63.6 in the United States. However, in Japan it was still only 49.

In the few years immediately following the War, Ukraine and Russia – just like Japan – largely caught up with Western Europe and North America, seeing absolutely spectacular changes. In the early 1960s, Ukraine reached the same level as France, even before Japan did, so that by 1965, life expectancy at birth was 71.3 years,[2] compared to 71.1 years in France and 70.3 in Japan (Fig. 1.1). However, from then on everything changed.

In all countries except Japan (which continued to make progress), life expectancy trends during this era were simply marking time. The fight against infectious diseases had just reached its peak of effectiveness, notably through the widespread use of antibiotics. The role of these diseases was so much reduced – most especially in childhood – that, although their decline continued, it could no longer lead to substantial improvements in life expectancy. From now on, it would be diseases of the circulatory system and cancers that occupied first place in mortality, by a long

[1] These estimates for Ukraine and Russia rely on the simple ratio of registered deaths to recorded census population (Adamets and Shkolnikov 1995). We shall see a little later that they slightly over-estimate the real situation, which for Ukraine was very close to 50.0 years (see Table 7, Chap. 2).

[2] However, it is likely that life expectancy in Ukraine is still slightly over-estimated here, in particular because of the definition of infant deaths. This will be discussed below (Chap. 4). We shall also see that the extent of this over-estimation (roughly two-tenths of a year) in no way calls into question the terms of the overall comparison.

F. Meslé (✉) • J. Vallin
Institut National d'Études Démographiques, Bd. Davout 133, 75980 Paris Cedex 20, France
e-mail: mesle@ined.fr; vallin@ined.fr

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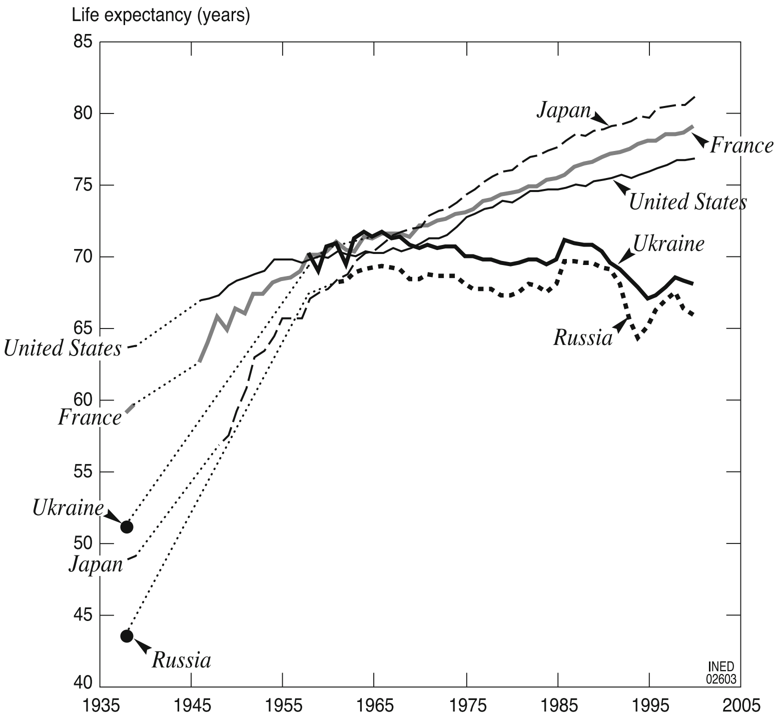

Fig. 1.1 Trends in life expectancy at birth since the late 1930s in Ukraine, Russia, France, the United States and Japan, according to available data before reconstructions for years prior to 1959

way, while economic and social changes led to a rise in aggravating factors such as alcoholism, smoking and road accidents. Therefore any further improvement in mean length of life at this stage required both the rise in these 'man-made' diseases to be stemmed and effective ways to combat diseases of the circulatory system and cancers to be found. This was achieved in France (Meslé and Vallin 1993) and in the United States, like most Western countries (Vallin and Meslé 2004), but not in Ukraine or in Russia. And that is why, from the 1960s, life expectancies diverged radically, returning to sustained growth in France and the United States, regressing in Ukraine and Russia. In the early 1980s, as Jean Bourgeois-Pichat (1985) emphasized, there was a divergence between Eastern bloc countries (Central Europe and the Soviet republics) and other industrialized countries. This divergence has repeatedly been confirmed since then (Meslé 1991; Okólski 1993; Meslé and Hertrich 1997).

Seen from this angle, the comparison with Japan is even more telling (Fig. 1.1). Until the mid-1950s, Japan followed a very similar trend to those of Ukraine and Russia: just before the Second World War, it was lagging far behind Western countries, then in the years that followed, it suddenly caught up with them. But since the mid-1960s, the divergence here has been even greater than the divergence from France or the United States. Japan's spectacular success in moving from victory over infectious diseases to mastery of diseases of the circulatory system stands in striking contrast to the failure of the countries of the former Soviet empire. Ukraine's failure appears even more striking than Russia's, since it contrasts strongly with the fact that, in the second half of the 1960s, Ukraine succeeded in pulling itself up to the same level as France, which was then overtaking Japan and the United States.

In order to better understand the health crisis that Ukraine has experienced since the late 1960s, we needed to analyse age-specific and cause-specific mortality trends. During the 1990s, we gathered annual sex-specific, age-specific and cause-specific death statistics for the former USSR and each of its constituent republics. These data had remained secret for a long time; but as soon as it was possible to gain access to them, INED and the Centre for Demography and Human Ecology (Moscow) undertook a systematic joint project to reconstruct complete, consistent cause-of-death series covering as long a period as possible. As we shall explain later, the work involved in reconstructing this kind of series requires lengthy, meticulous reclassification of data into the same detailed list of causes of death, and can be accomplished only in stages. Although we were able to gather data from 1959 onwards, up to now we have been able to reconstruct consistent series only from 1965, and therefore the results for Ukraine that we give here relate mainly to the period 1965–2006.

But before going into more detail about age-specific and cause-specific mortality trends in Ukraine since the mid-1960s, it is well worth recalling the more distant past, highlighting the serious crises that Ukraine has already had to face, even though they were extremely different in nature from the current crisis.

So the three parts of this book will cover the following themes in turn:

1. long-term trends in life expectancy and the demographic disasters of the past,
2. recent changes in sex-specific and age-specific mortality,
3. cause-specific mortality trends from 1965 onwards.

The last section, based on data that have never been published before, is of course the main part of the book. It includes a systematic comparison of the results obtained for Ukraine with those already published for Russia (Meslé et al. 1996); we shall also use French data as a reference point, as we did for Russia. We have provided tables available on the website of the electronic version (http://www.demogr.mpg.de/books/drm/009 or http://extras.springer.com/), showing numbers and rates of deaths, to allow interested researchers to go into more depth.

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Part I
Long-Term Trends in Life Expectancy and the Consequences of Major Historical Disasters

Introduction to Part I

The earliest available estimate of life expectancy in Ukraine is provided by the 1896–1897 life table, which gave 35.9 years for males and 36.9 for females (Ptukha 1960). At this date, life expectancy in Russia (that is, for the whole Russian Empire) was 30.9 years for males and 33.0 for females, while in France it was 45.4 and 48.7 respectively (Annex II, Table 1, Fig. 1).[1]

The second relatively firm reference point is provided by the life table recalculated from deaths for 1926–1927 and from the January 1927 census (Adamets and Shkolnikov 1995).[2] This produces life expectancy of 42.9 years for males and 46.3 for females. So life expectancy made significant progress over a period of 30 years, as Ukrainian males gained 7 years and females more than 9 years. However, the gap with France hardly changed, at least for males, as their life expectancy in Ukraine at that time was still 8.9 years lower than French male life expectancy (51.8 years), compared to a gap of 9.5 years at the end of the previous century. The gap diminished relatively more for females, however, since life expectancy for Ukrainian females was 9.9 years lower than for French females (56.2 years), compared to a gap of 11.8 years in 1896–1897. On the other hand, Ukraine's advantage over Russia fell significantly (from 5.0 years in 1896–1897 to 3.6 years in 1926–1927 for males and from 3.9 years to 1.5 years for females).

[1] Available at http://www.demogr.mpg.de/books/drm/009 or http://extras.springer.com/.

[2] The official table published by the State Planning Commission's Central Directorate for National Economic Records (Novoselskii and Paevskii 1930) gave 45.4 years for males and 48.8 for females. The estimate made for 1925–1926 by Iurii Korchak-Chepurkovskii (1929) of 43.6 years for males and 46.7 for females still seriously over-estimated life expectancy, despite the correction made for under-registration of infant mortality; so we prefer to stick to the estimate made recently by Adamets and Shkolnikov for 1926–1927, from a critical analysis of the Novoselskii-Paevskii life table.

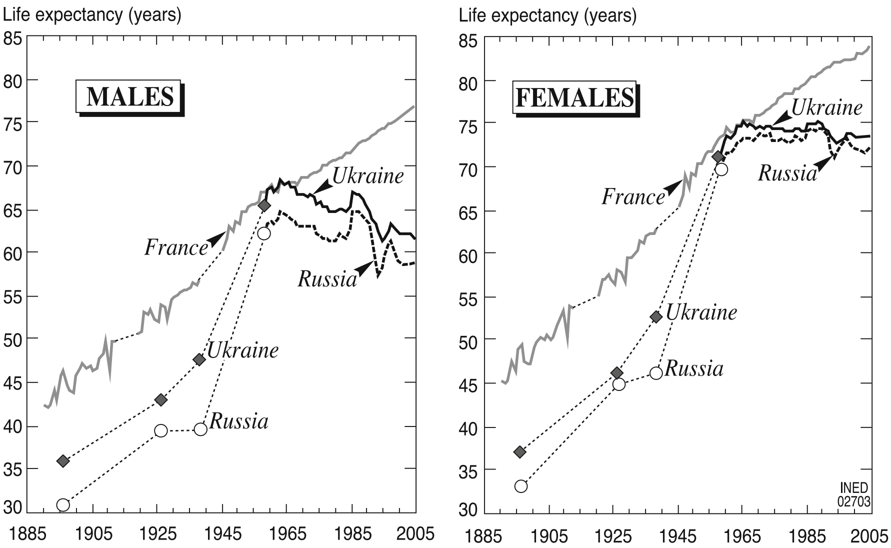

Fig. 1 Life expectancy trends in Ukraine, Russia and France since 1890

The third available reference point is given by the table calculated from relating 1938–1939 deaths to the January 1939 census (Adamets and Shkolnikov 1995) and then corrected for under-registration of deaths (see Chap. 4). In around twelve years, life expectancy in Ukraine took a further leap forward, gaining more than in France, whereas Russia made almost no progress at all. In 1938–1939, Ukrainian life expectancy reached 47.8 years for males and 52.6 for females. The difference from France was now only 8.1 years for males and 9.4 for females, whereas the gap with Russia had more than doubled (8.2 and 6.5 years respectively).

We then have to wait 20 years for a new estimate of life expectancy. In 1958–1959, after correction for under-registration (see Chap. 4), life expectancy in Ukraine (65.6 years for males and 71.6 for females) had almost reached the French level (66.8 and 73.1 years). But this time, the difference from Russia, whose progress was even more spectacular, was considerably reduced, falling from 8.2 to 3.7 for males and from 6.5 to 2.4 for females.

For the years from 1959 onwards, death statistics and annual population estimates by the State Committee for Statistics of the USSR (Goskomstat) enable us to calculate life expectancy for Ukraine and for Russia on an annual basis; in Chap. 4, we shall see how these results have to be corrected in order to take under-registration into account[3] (Fig. 1). The 1960s saw the earlier trend reversed, plunging both

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[3]For Ukraine, Chaps. 2 and 3 of this book will complete these annual series for the years 1927–1958; for Russia, a recent study has enabled us to re-estimate annual trends in life expectancy from 1946 (Meslé et al. 2003). These more complete data are given in the electronic appendices (Annex II, Table 1).

Ukraine and Russia into crisis. In Ukraine, male life expectancy reached its peak at 68.1 years in 1964, while female life expectancy began to stagnate at between 74 and 75 years. Exactly the same applied in Russia, at a slightly lower level. So Ukraine was then situated at almost the same level as France, for both males and females (Fig. 1 and Annex II Table 1 in the Website). At that time, therefore, Ukraine had succeeded in catching up, despite the very rapid acceleration in progress observed in France just after the Second World War. The same did not apply to Russia, particularly for men. Indeed, in 1965 there was still a gap of 1.7 years between Russian females and Ukrainian females and 3.5 years between Russian males and Ukrainian males.

After that, until the early 1980s, the gap between Ukraine and Russia remained more or less constant, fluctuating between 3 and 4 years for males and between 1 and 2 years for females. Ukraine experienced the slow deterioration in health conditions that affected the USSR in that period, at exactly the same pace as Russia did.

The slight but sudden improvement observed in the mid-1980s, strongly linked to Gorbachev's anti-alcohol campaign, was a little greater in Russia than Ukraine, which reduced the latter's advantage: in 1985, this was only 2.6 years for males and 0.8 for females. But paradoxically, the relapse that followed in the late 1980s and early 1990s, after the anti-alcohol measures had fallen into abeyance, was steeper in Ukraine than in Russia. Ukraine's advantage therefore dwindled even more: in 1991, the gap was only 1.3 years for males, while life expectancy for females in Russia was almost equal to that in Ukraine.

In contrast, when the break-up of the USSR and the subsequent economic and social collapse led to an even deeper health crisis, it was Russia that was hardest hit, and the gap opened up again. In 1994, this was 5 years for males, with life expectancy of 62.2 years for Ukrainian males as against only 57.2 for Russians. Among females, the difference was almost 2 years, with life expectancies of 72.8 and 70.9 years respectively.

But the trend took an upward turn again in Russia sooner than in Ukraine; in 1998, the gap between Russian and Ukrainian life expectancies was only 2.1 years for males (61.0 as against 63.1) and 0.8 years for females (72.0 and 73.7 years). Since then, however, the trend has taken a downward turn again and, once more, the phenomenon is more acute in Russia than in Ukraine. In 2000, male life expectancy was only 62.0 years in Ukraine and 58.8 in Russia, while female life expectancy fell to 73.3 and 72.1 years respectively. The gap between the two countries widened again, rising to 3.2 years for males and 1.2 for females. The last available year shows some progress however, more for Russia than for Ukraine and in 2006 the gap between the two countries narrowed again.

So this very turbulent trend in life expectancy over recent decades has seen Ukraine and Russia follow fairly different paths as far as the detail is concerned: each of the two countries has had its own specific experience of the long-term deterioration in health and of the various crises related to the unique post-Soviet political, economic and social circumstances. But despite these differences, the similarity between the two countries is striking, when their trends are viewed next to those of France. Compared to the steep, regular rise in French life expectancy for both males and females, the abrupt fluctuations observed in Ukraine and Russia seem to coincide almost completely (Fig. 1); the differences we have noted between the two countries are merely nuances – and almost insignificant ones. Above all, apart from these circumstantial fluctuations, the persistent deterioration in both countries has distanced them more and more radically from France. In 2006, the difference between Ukraine and France was enormous: over 10 years for females and even 15 years for males – much greater than before the War. This puts Ukraine's advantage over Russia into perspective: it remains very unstable and clearly fragile.

In order to offer a better understanding of this decline in life expectancy, common to all the countries of the former USSR, as well as of the nuances particular to Ukraine's situation, our analysis of long-term trends in the age structure of mortality (Part II) will go into more detail. However, in order to make a better assessment of the trends observed over the course of recent decades, it seems helpful to devote the first part of the book to the terrible demographic consequences of two other major twentieth-century crises in Ukraine: the Great Famine of the 1930s, and the Second World War.

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Like all European countries, in the past Ukraine experienced a turbulent demographic history, punctuated by serious crises that produced varying levels of excess mortality. From the end of the Middle Ages to the early nineteenth century, these crises were closely linked to wars for control of Central Europe, notably between Russia, Lithuania, Poland, Sweden, Turkey and Austria-Hungary. Epidemics, famines, and economic turmoil accompanied these military conflicts and were translated into sudden, exceptional increases in mortality, still in a context where health was insecure. In the nineteenth century, the political situation in the region became much more stable, and Ukraine, although it was part of the Russian Empire, enjoyed better food security than Russia itself; this sheltered it from some of the severe famines that continued to strike Russia throughout the century. However, it did not escape either the cholera epidemics in 1831 and 1848 or the 1849 famine (Adamets 1995, p. 41). Moreover, some ethnic minorities (Crimean Tatars, Jews, Poles, and others) were periodically subject to persecution.

Paradoxically, in the twentieth century, while health improvements were accelerating everywhere in Europe, Ukraine became entangled in major historical crises. It was one of the republics most strongly affected by the serious crises that struck the Soviet Union: civil war from 1917 to 1920, famines in 1921–1923 (notably in southern Ukraine: Adamets 2003), the Great Famine of 1933 following the collectivization of agriculture, the Second World War and the German invasion, the 1947 famine, successive waves of repression and large-scale deportations.

These crises caused violent upheavals in Ukrainian population trends. Various authors have given estimates of four or five million individuals for the population deficit resulting from both excess mortality and the collapse in total fertility that marked the period 1914–1923.[4] According to Roman Serbyn (1986), the famine alone caused between one million and three million deaths. For the crisis of the 1930s, losses have been assessed at between 1 million and 5.5 million.[5] In contrast, no estimate for the Second World War was published before the 1980s, when perestroika led to the archives being opened.

For a long time, the disasters of the Soviet period were a taboo subject, including for scientific research. From 1931 to 1954, no statistics on population change were published. The rare general indicators that did appear were manipulated or even falsified. In particular, the results of the 1937 census were judged 'defective' and rejected; its authors were declared 'enemies of the people' and persecuted; a new census was organized in 1939 but because it confirmed the 1937 one, its results were falsified before being made public (Blum 1994).

With perestroika and free access to the archives, numbers of unpublished documents and statistics that had been entirely hidden from researchers and from the general public were gradually issued. In 1989, an article by Viktor V. Tsaplin gave a first indication of demographic statistics for the 1930s (Tsaplin 1989). A little later, systematic research and publication of the 1937 census results by researchers from Goskomstat and the Institute of History of the Russian Academy of Sciences bore fruit (Zhiromskaia et al. 1996), though only at the pan-USSR level.

Nevertheless, any assessment of the demographic consequences of these Soviet crises is still faced with gaps and imperfections in the available statistics on population change between the 1926, 1939[6] and 1959 censuses. In fact, up to now we have had only indirect and very general estimates of the losses suffered by Ukraine in the course of these troubled periods. However, it seemed to us that by using the newly-opened archives and by making the most of all the existing data, it might be possible to greatly improve these estimates and, in particular, to determine the proportions within the overall losses that related to excess mortality resulting from the crisis and those that pertained to either birth deficit or net outward migration. In particular, by relying on the 1926, 1939 and 1959 censuses, we would be able to retrace total mortality trends during the crisis of the 1930s and the Second World War. So each of these two periods forms the subject of one of the two chapters in Part I of our book.

[4]According to Serhii Pyrozhkov and Arnold L. Perkovskii (1995), the total losses for the period 1914–1923 were estimated at four million by Sergii Ostapenko (1925) and between 4.5 and 5 million by Arsenii P. Khomenko (1927), while, in an official note from 1923, Ukraine's Central Statistical Directorate estimated them at between 5.5 and 7.5 million just for the period 1914–1922 (IIU 1993).

[5]In particular, a 1933 Brussels publication gave various estimates, from 1 to 5.5 million (FEUE 1933); Jacques Benoist-Méchin (1941) gave an estimate of five million for the number who died from hunger and were deported; Hélène Carrère d'Encausse (1972) assessed the number of victims of collectivization at three million, of whom one million died of hunger.

[6]Unfortunately, detailed results from the 1937 census are not available for Ukraine alone. According to Stanislav Kulchytskyi (1995), the total population recorded in the 1937 census would have been 28,388,000.

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Chapter 2
The Crisis of the 1930s

Jacques Vallin, France Meslé, Sergei Adamets, and Serhii Pyrozhkov

From 1935, in a way that now seems almost surreal, Ukraine's UNKhU (Directorate for National Economy and Account) challenged the figures on births and deaths registered between 1930 and 1935. In a note addressed to the leadership of the Republic's Communist Party, presenting them with some figures on annual change in the Ukrainian population between 1926 and 1934 (Table 2.1), Aleksandr Asatkin, Director of the UNKhU of Ukraine, expressed his amazement at the peak in mortality observed in 1933, and attempted to explain it through errors in the registration system (ZAGS), without, of course, ever mentioning the famine that had reached its highest level in that year. However, checks made in 1934-1935[1] on the way ZAGS functioned showed that deaths in the regions most affected by the disaster had in fact been under-registered. Moreover, ZAGS' final results for 1933 were much higher than this 1935 document showed (see N.B. in Table 2.1; see also Annex I, Tables 1 and 2 on the website (http://www.demogr.mpg.de/books/drm/009 or http://extras.springer.com/)). In reality, the presence of famine was clear, but everything was done to conceal it. Monitors from the TsUNKhU (Central Directorate for National Economy and Account), covering the whole USSR, systematically reclassified

[1] The ZAGS Monitoring Commission was created on 20 February 1934 by the Central Committee of the CPSU (Communist Party of the Soviet Union). It was made up of civil servants from the TsUNKhU, the CPSU Monitoring Committee and the Committee for Soviet Control. It probably functioned up to September 1935.

J. Vallin (✉) • F. Meslé
Institut National d'Études Démographiques, Bd. Davout 133,
75980 Paris Cedex 20, France
e-mail: vallin@ined.fr; mesle@ined.fr

S. Adamets
Institut National d'Études Démographiques, Bd. Davout 133, 75980 Paris Cedex 20, France
e-mail: serguei.adamets@sfr.fr

S. Pyrozhkov
Institute for Demography and Social Studies, Bd. Panasa Myrnogo 26, 01011 Kyiv, Ukraine
e-mail: psi@starnet.md

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Table 2.1 Numbers of births and deaths registered in Ukraine in the early 1930s

Event	Year Mean 1926–1929	1930	1931	1932	1933	1934
Births	1,153,125	1,022,952	975,320	782,042	470,685	571,567
Deaths	518,913	538,080	514,744	668,158	1,850,256	483,382
Natural increase	634,212	484,872	460,576	113,884	−1,379,571	88,185

Source: *О состоянии учета населения в УССР* [Population registration in the Ukrainian SSR], TsDAGO Ukraini, fonds 1, series 1, file 2581

N.B. For 1933 and 1934, these data do not correspond to the final results registered by ZAGS, which were much higher in 1933 (564,028 births and 2,103,999 deaths) and slightly lower in 1934 (551,520 births and 462,037 deaths)

deaths initially classified as "from starvation" under either "cause of death unknown" or "from exhaustion".[2]

The fact remains that ZAGS statistics on population change[3] are only a starting point, and should be used cautiously.

Since the opening of the archives, some historians and statisticians have set about estimating population losses attributable to the famines and the waves of turmoil and repression that followed the collectivization of land, relying on statistics published before 1989. Robert Conquest (1988, p. 306) estimated the number of deaths caused by the famine in 1932–1933 at 5 million, whereas Stanislav Kulchytskyi (1995) estimated the losses of the period 1933–1936 at 3.5 million. However, these estimates must be treated with caution, since they rely on extrapolating the growth rate of the 1920s to the 1930s. It is questionable whether the high fertility of the 1920s, which was still reflecting the adjustment of births delayed by war, could have lasted into the 1930s, even without a crisis. In all probability, therefore, these early attempts overestimated the real losses.

A fuller reconstruction of population change for the whole USSR was later published by Goskomstat, the State Committee for Statistics of the USSR (Andreev et al. 1993). In order to reconstruct time series of births and deaths and to produce annual population estimates for the USSR between 1920 and 1959, its authors adjusted the census results for 1926, 1937, 1939 and 1959 and corrected the series of registered births and deaths with the help of population models. However, the hypotheses inherent in the models that enabled them to adjust the data seem to overestimate fertility and mortality (Adamets and Shkolnikov 1995). And in any case, this estimate at the level of the USSR does not give us precise information on losses in Ukraine.

Abandoning the idea of basing their work on registered births and deaths, several authors have attempted to assess Ukraine's losses by relying only on the 1926 and 1939

[2] Document from the Russian State Archive of the Economy, fonds 1562, series 329, file131.

[3] TsUNKhU compiled three forms of statistics on births and deaths: monthly provisional statistics, final annual statistics including late reports, and final statistics adjusted by estimating births and deaths for territories not covered by ZAGS.

census data. Thus, Sergei Maksudov (1989) gives an overall estimate of 4.5 million for the period 1927–1938, without distinguishing between the effect of excess mortality and that of sub-fertility. Serhii Pyrozhkov (1992, 1996), on the other hand, by comparing total cohort numbers from the 1939 census[4] with those that would have arisen from normal mortality[5] and fertility[6] trends, arrives at 5.8 million for the period 1926–1939.

In the context of this book on mortality in Ukraine, it seems to us interesting to attempt a new estimate, endeavouring to distinguish direct losses attributable to increased mortality from indirect losses linked to a fall in fertility. In order to do this, we need to go back to population change statistics, even if this means hypothesizing about under-registration.

2.1 Reconstructing Registered Births and Deaths Series

In point of fact, it is fairly complicated to reconstruct the statistics for registered births and deaths from fragments of information available here and there. Table 2.2 pieces together the jigsaw for the period 1924–1939. From 1924 to 1927, the total numbers of births and deaths by sex were published by the International Statistical Institute (ISI 1929). For the subsequent years, we have to juggle with the archives. Here, taking up the elements highlighted by Sergei Adamets (1995) in his thesis on demographic catastrophes in Soviet Russia, and supplementing them with other data found since then in Moscow or Kiev, we have:

– total numbers of births and deaths for both sexes together, from 1927 to 1932,
– births and deaths by sex and age from 1933 to 1939,
– natural increase by sex from 1928 to 1932,
– births for 1938 and 1939, by mother's age.

In order to reconstruct a complete sex-specific series, we first of all calculated sex-specific births from 1928 to 1932 by applying the mean sex ratio at birth for the periods 1924–1927 and 1933–1936 to total births; we then worked out sex-specific deaths by subtracting the natural increase from births.

Figure 2.1 illustrates annual sex-specific trends in number of deaths. This seems to be a completely plausible picture of the history of Ukrainian mortality between

[4] In his 1996 publication (Pyrozhkov 1996), several typographical errors have crept into the table that gives the population observed in 1939 (Table, Annex 1, p. 1039). It should read: for the total, both sexes, all ages, 30,946,000 (instead of 30,046,000); it should also read, for 15–19 years, both sexes 2,962,000 (instead of 2,062,000); finally, for the female sex, it should read 1,526,000 for 15–19 years (instead of 1,626,000) and 909,000 for 40–44 years (instead of 809,000); there are no errors on the male side, however.

[5] Assessed by interpolating the available life expectancies for 1926–1927 and 1938–1939 and then deducing age-specific probabilities of death from these, using Coale-Demeny (1983) model life tables.

[6] Assessed on the basis of the Coale-Trussell model (1974).

Table 2.2 Annual sex-specific numbers of registered births and deaths, from 1924 to 1939

	Births			Deaths			Natural increase		
Year	Males	Females	Total	Males	Females	Total	Males	Females	Total
1924	601.6	561.3	1,162.9	252.1	232.9	485.0	349.5	328.4	677.9
1925	618.3	578.5	1,196.8	277.9	253.9	531.8	340.4	324.6	665.0
1926	623.2	584.7	1,207.9	273.8	244.9	518.7	349.4	339.8	689.3
1927	611.2	573.2	1,184.4	276.0	246.6	522.6	335.2	326.6	661.7
1928	*589.9*	*549.4*	1,139.3	*264.3*	*231.4*	495.7	325.6	318.0	643.6
1929	*559.8*	*521.2*	1,081.0	*286.0*	*252.7*	538.7	273.8	268.5	542.3
1930	*529.7*	*493.3*	1,023.0	*287.5*	*250.6*	578.1	242.2	242.7	484.9
1931	*505.0*	*470.3*	975.3	*274.1*	*240.6*	514.7	230.9	229.7	460.6
1932	*404.9*	*377.1*	782.0	*368.2*	*300.0*	668.2	36.7	77.1	113.8
1933	294.9	269.1	564.0	1,284.1	819.9	2104.0	–989.2	–550.8	−1,540.0
1934	286.5	265.0	551.5	242.2	219.8	462.0	44.3	45.2	89.5
1935	393.1	366.0	759.1	179.3	162.5	341.9	213.8	203.4	417.2
1936	461.2	431.9	893.1	186.9	172.6	359.5	274.2	259.3	533.5
1937	624.8	589.2	1,214.0	225.9	202.5	428.4	398.9	386.7	785.6
1938	572.9	540.6	1,113.5	224.5	206.3	430.8	348.4	334.3	682.6
1939	552.2	521.4	1,073.5	215.0	197.6	412.6	337.2	323.7	660.9

Sources:

- 1924–1927: ISI 1929;
- 1928–1932: births and deaths, totals for both sexes together: Russian State Archive of the Economy (RGAE), fonds 1562, series 329, file 256, item 30–31;
- 1928–1932: sex-specific natural increase: RGAE, fonds 1562, series 329, file 256, item 45;
- 1933–1938: total sex-specific births and deaths from RGAE, fonds 1562, series 329, files 18, 53, 83, 109, 134, 190;
- 1938: births according to mother's age and deaths by sex and age from RGAE, fonds 1562, series 20, files 120 and 125;
- 1939: births according to mother's age and deaths by sex and age from RGAE, fonds 1562, series 329, files 264 and 267;
- From 1928 to 1932, sex-specific births were calculated by applying mean sex ratio at birth for the periods 1924–1927 and 1933–1936 to total births, then sex-specific deaths were calculated by subtracting natural increase from births (figures in *italics*)

the two World Wars. Firstly, compared to the 28.9 million inhabitants recorded in the 1926 census, the 519,000 deaths for that year give a crude death rate of 18 per thousand that is fully compatible with what we know about the country's state of health at that time. The same applies to the fact that the crude male death rate exceeds the crude female death rate by 20%. In addition, until the major crisis of 1932–1933, sex-specific trends in the number of deaths do not indicate anything particularly abnormal. After the crisis, this number appears to fall slightly compared to 1930–1931 – predictably enough, since the total population was reduced by the impact of the crisis and since the crisis probably selected the most resistant individuals. Finally, on the eve of the Second World War, the total number of deaths, slightly lower than it had been during the 1920s, may reveal the beginnings of a downward trend in mortality. Although there was under-registration of deaths over the course of this period, in all likelihood it was not very significant, except perhaps

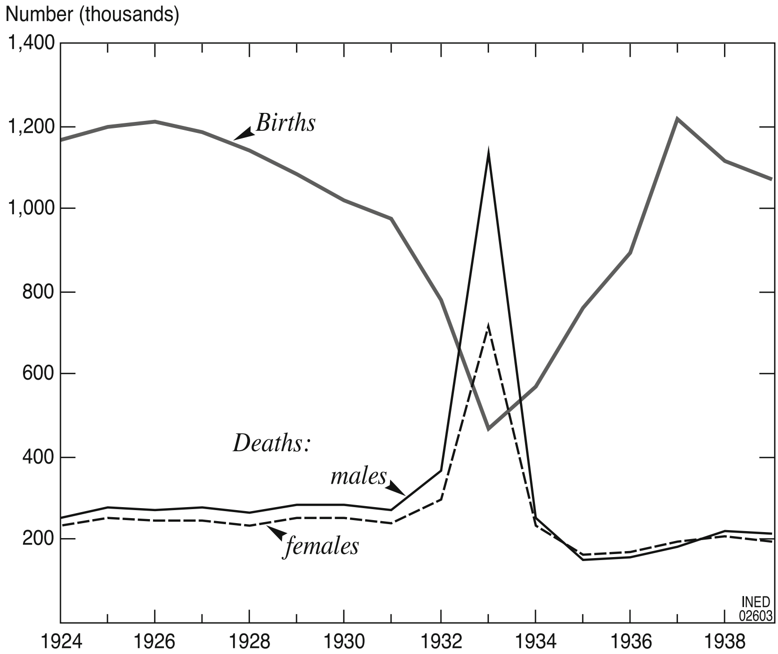

Fig. 2.1 Annual sex-specific trends in numbers of births and deaths, from 1924 to 1939

during the two crisis years where the registration services really seem to have been snowed under – or perhaps manipulated to minimize the extent of the crisis. Therefore it is essentially the extent of this ‘crisis under-registration’ that we have to attempt to assess here. As for the rest, the small corrections already made in measures of mortality around the censuses may represent a satisfactory degree of correction to any under-registration of infant deaths and deaths in old age (see later).

The counterpoint to this is that the trend in numbers of births clearly follows the same logic. With a crude birth rate of 42 per thousand in 1926, it is hard to imagine large under-registration of births; although the number of births declined in the late 1920s, this probably resulted from the onset of a fall in fertility that was characteristic of Eastern Europe in that era. The crisis obviously led to a drastic fall – although one that was less severe than the rise in mortality – followed by a catch-up peak. Situated in 1937, this peak may appear to be a little late, but that can be explained precisely by the gravity of the crisis and the way it threw families into profound disarray. In short, we cannot talk about large structural under-registration of births, any more than of deaths – and probably even somewhat less. The crisis years are more open to debate, but the arguments put forward for deaths cannot work here, since the number of registrations fell markedly and the authorities had no interest in minimising them – in fact, the opposite. Therefore, we shall hypothesise that the number of births registered over the course of this period corresponds well to the reality (apart from under-registration of deaths of young children: see below), while

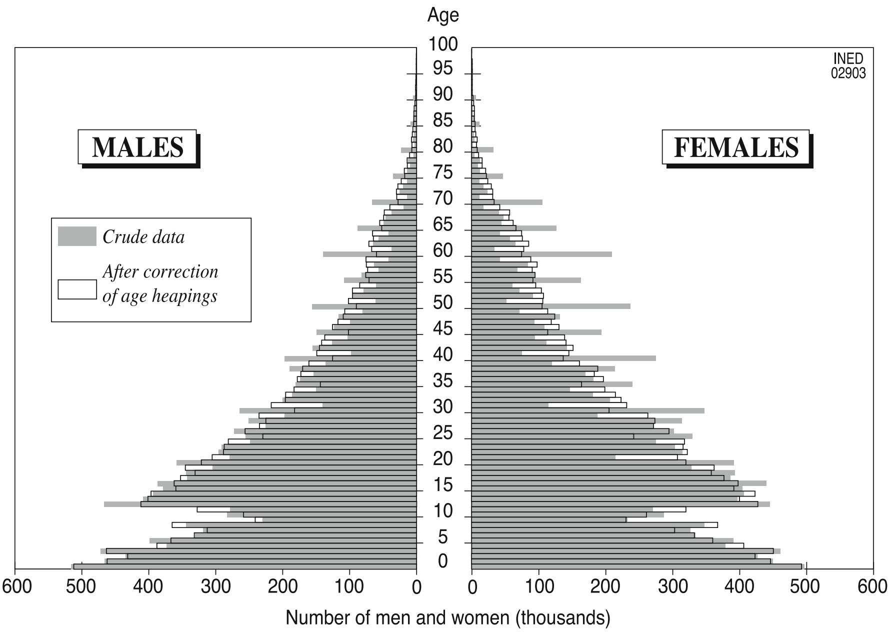

Fig. 2.2 Age pyramid of the Ukrainian population at the census of 17 December 1926 (before and after correction for age heaping)

remembering that, if the number had been higher than this, it would subsequently have led us to under-estimate direct losses from the crisis through excess mortality and to proportionately over-estimate indirect losses through birth deficit.

2.2 Estimating Direct and Indirect Losses

In order to estimate the direct and indirect losses of the 1930s, an attempt can first be made, starting from the 1926 census, to calculate the population that would have been recorded in 1939 if there had been no crisis, and then to judge the extent of the latter by discussing the difference between the expected result and the result actually obtained in 1939 (Goskomstat 1992).

This approach obviously relies, in the first instance, on the accuracy of the results of the two censuses. In fact, this has hardly been challenged by specialists (Adamets et al. 1994; Blum 1994, Blum and Darskii 1999). Although the Kremlin authorities tried on many occasions to manipulate the published results of the censuses, everyone views the statistical literature preserved in the archives, now accessible, as reliable. However, early twentieth-century Soviet censuses, like many others at the time, suffered from some imprecision in declarations of age, which led to classic age heaping (Fig. 2.2). We tried out several ways of correcting the results of the 1926 census (TsSU 1928–1933): a 3-year or a 5-year moving average, and a more sophisticated method already used for Russia (Adamets et al. 1994). Although the results

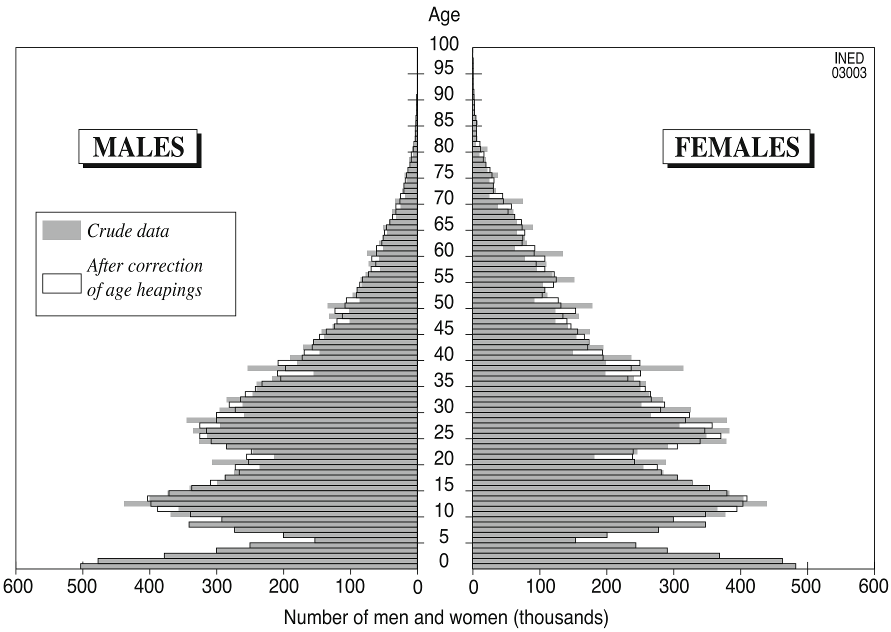

Fig. 2.3 Age pyramid of the Ukrainian population at the census of 17 January 1939 (before and after correction for age heaping)

they gave differed very little, we settled on the method already used for Russia, where the results were slightly more satisfactory.

The population by sex and detailed age in the 1939 census, which could not be found in Ukraine itself, was kindly supplied to us by Evgenii Andreev of Goskomstat in Moscow. Age heaping is much less pronounced than for the 1926 census. We simply smoothed the crude data by using a 3-year moving average, starting from age 10 (Fig. 2.3).

The existing data enabled us to calculate two life tables, for the start and for the end of the period, relying firstly on the 1926 and 1939 censuses and secondly on the death statistics by sex and age available for 1926–1927 and 1938–1939. The calculations had already been done for 1926–1927 (Novosselskii and Paevskii 1930), giving a life expectancy of 45.3 years for males and 48.8 years for females. They were reworked by Sergei Adamets and Vladimir Shkolnikov (1995) in order to take into account under-estimated mortality of people under 1 year old or over 55, bringing life expectancy to 42.9 and 46.3 years respectively. As for the life table calculated for 1938–1939, an in-depth discussion of trends in the quality of registration of infant deaths will be found in Chap. 4; here, its effect is to increase the infant mortality rate observed in 1938–1939 by 5%. We applied the same type of correction to the older age groups as Adamets and Shkolnikov (1995) had done for the 1926–1927 table. We thus obtained a life expectancy at birth of 47.8 years for males and 52.6 years for females in 1938–1939. Figure 2.4 illustrates the comparative probabilities of death from both tables.

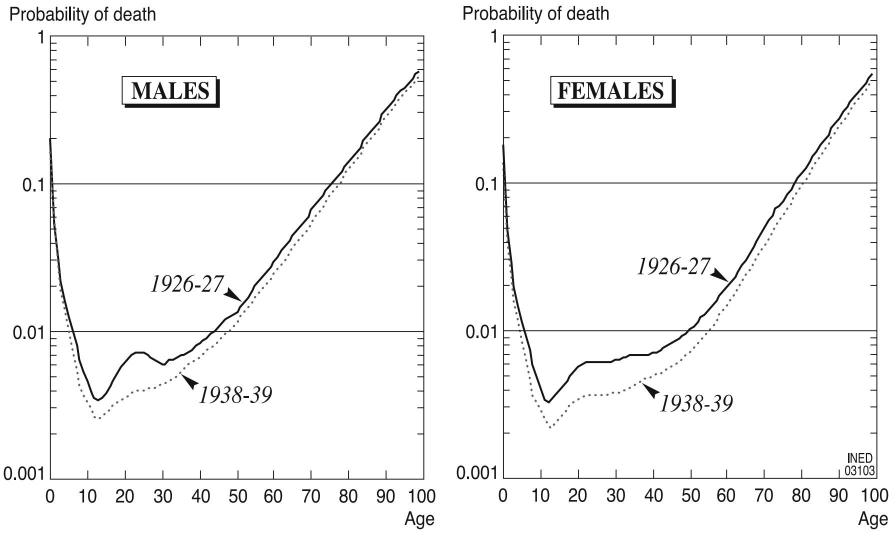

Fig. 2.4 Age-specific probabilities of death in Ukraine, according to life tables for 1926–1927 and for 1938–1939

Using these two points, we interpolated age-specific probabilities of survival for the period 1928–1938.

These probabilities were then applied, year by year from 1927 to 1939, to the birth cohorts involved in the 1926 census, in order to obtain an estimate of survivors of these cohorts, if there had been no crisis, on January 1 of each year from 1928 to 1939.

In order to finalize this projection, it was also necessary to apply these probabilities to births that took place after the 1926 census, and in order to do this, we first had to estimate the total numbers of births that would have occurred without the crisis (Table 2.3). It is not possible to interpolate between the fertility rates observed before and after the crisis. This is because, after correction for under-registration,[7] the pre-crisis general fertility rate (for women aged 15–49) was diminishing significantly, falling from 157 per 1,000 in 1927 to 117 per 1,000 in 1931, but after the crisis it climbed again, to a much higher level than in 1931 (in all probability, over 130 per 1,000 in 1936[8]). This fall in the late 1920s is completely consistent with what happened at that time in neighbouring non-USSR countries (Poland, Czechoslovakia, Romania, Bulgaria). It might therefore be imagined that we could prolong this downward trend in order to estimate the births to be expected if there had been no crisis. However, the rise that followed the crisis cannot be explained solely by a

[7] It is difficult to estimate the rate of coverage of births by ZAGS registration, but at the very least we must increase the registered births by a number equal to the excess infant deaths produced by the correction of infant mortality rates.

[8] If we take the ratio of observed births to the expected population, the general fertility rate rises to 130 per 1,000, but that under-estimates the true situation, since the actual population is obviously lower than the expected population.

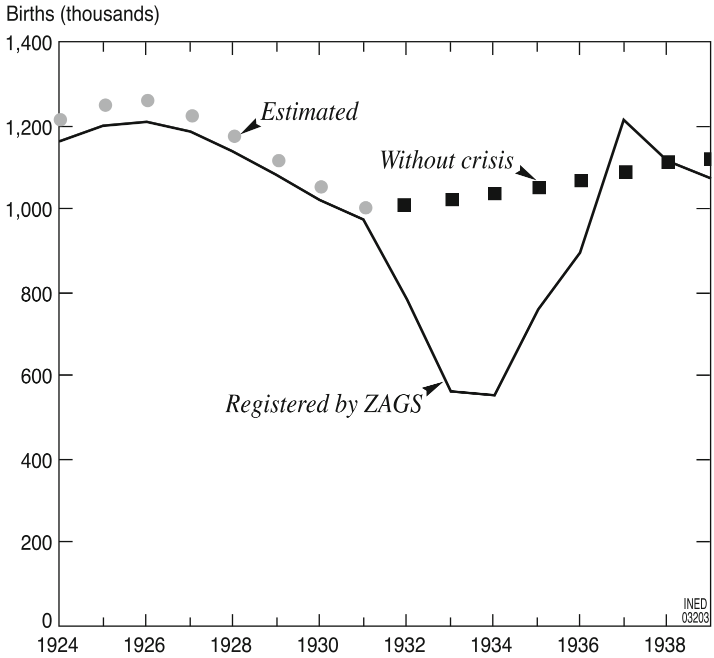

Fig. 2.5 Births registered by ZAGS (1924–1939), estimated pre-crisis births (1924–1931) and births estimated assuming no crisis (1932–1939)

recovery phenomenon. It also relates to the ban on abortion imposed in 1936, a measure which might very well have been taken even without the crisis. It is therefore almost impossible to reinvent non-crisis annual trends in the number of births over this period. Moreover, for us, the most important thing here is to estimate the excess mortality of the crisis and so – whatever our hypothesis about non-crisis fertility – we shall infer the birth deficit from the total losses due to the crisis. Error in the fertility hypothesis will affect only the estimate of the birth deficit and not the estimate of the excess mortality of the crisis. Therefore, here we have deliberately chosen the simplest possible hypothesis in order to estimate births that might have taken place without a crisis: that, throughout the whole period 1932–1939, the general fertility rate remained constant at its 1931 level.

Thus a births series is obtained that combines births registered by ZAGS from 1924 to 1931 (corrected for under-registration) and births estimated for 1932 to 1938 assuming no crisis (Fig. 2.5). The latter show a slight increase, as does the expected population of women aged 15–49.

Our projection was completed by applying non-crisis probabilities of survival to these births; we then finally obtained an *expected 1939 population*, and it just remained to compare this, by age groups, to the population actually observed in the census carried out in that year (Table 2.4). The losses that become apparent from this comparison vary a great deal according to age group. Figure 2.6 illustrates variations in rate of losses by age group and sex. Some of the fluctuations in this rate of losses

Table 2.3 Estimate of births from 1932 to 1939 with no crisis

Year	Registered births	Births corrected for under-registration	Women aged 15–49 observed or estimated[a] at 1 Jan	Estimated actual rate	Rate with no crisis	Women aged 15–49 expected at 1 Jan	Births with no crisis
1924	1,163	1,211					
1925	1,197	1,246					
1926	1,208	1,258					
1927	1,184	1,228	7,692	0.157			
1928	1,139	1,178	7,940	0.146			
1929	1,081	1,115	8,154	0.135			
1930	1,023	1,053	8,399	0.124			
1931	975	1,001	8,532	0.117			
1932	782	801			0.117	8,625	1,009
1933	564	576			0.117	8,668	1,021
1934	552	562			0.117	8,836	1,037
1935	759	770			0.117	8,937	1,050
1936	893	905			0.117	9,070	1,068
1937	1,214	1,227			0.117	9,235	1,088
1938	1,113	1,123			0.117	9,418	1,110
1939	1,074	1,080	8,879		0.117	9,613	1,121
Total 1932–1938		5,964					7,383

[a]For 1927, this is in fact the population recorded in the 12 December 1926 census (corrected for age heaping). For 1939, it is the population recorded in the 17 January census. For 1928–1931, these are the 1 January populations estimated within our projection

Table 2.4 Sex-specific population (in thousands) by age group, as expected without crisis and as actually observed in the 1939 census

	Expected population			Population observed in census			Losses		
Age group	Males	Females	Total	Males	Females	Total	Males	Females	Total
0–4	2,198.2	2,125.0	4,323.2	1,893.9	1,839.0	3,732.9	–304.3	–286.0	–590.3
5–9	1,928.6	1,854.5	3,783.1	1,305.5	1,317.1	2,622.6	–623.1	–537.4	–1,160.5
10–14	2,012.0	1,961.3	3,973.3	1,907.5	1,913.3	3,820.9	–104.5	–47.9	–152.4
15–19	1,671.1	1,665.8	3,336.9	1,417.5	1,577.3	2,994.8	–253.6	–88.5	–342.1
20–24	1,459.1	1,460.6	2,919.7	1,439.0	1,399.0	2,838.0	–20.1	–61.7	–81.7
25–29	1,685.2	1,795.7	3,481.0	1,503.1	1,679.0	3,182.2	–182.1	–116.7	–298.8
30–34	1,419.1	1,495.7	2,914.8	1,293.4	1,410.8	2,704.2	–125.7	–84.9	–210.6
35–39	1,147.1	1,286.9	2,434.0	1,063.1	1,158.2	2,221.3	–83.9	–128.7	–212.6
40–44	930.1	1,063.1	1,993.2	829.1	931.7	1,760.8	–101.1	–131.4	–232.4
45–49	753.5	846.1	1,599.7	604.9	723.4	1,328.3	–148.6	–122.8	–271.4
50–54	630.9	682.1	1,313.0	481.1	619.7	1,100.8	–149.8	–62.3	–212.2
55–59	504.1	546.5	1,050.6	366.3	518.8	885.1	–137.8	–27.7	–165.5
60–64	380.0	450.3	830.3	267.0	418.0	685.0	–113.0	–32.2	–145.3
65–69	268.8	355.6	624.4	183.0	315.4	498.3	–85.9	–40.2	–126.1
70–74	194.5	276.9	471.4	114.0	195.3	309.3	–80.4	–81.7	–162.1
75–79	122.2	174.7	296.9	56.9	108.4	165.3	–65.3	–66.4	–131.7
80–84	50.0	72.3	122.3	19.3	42.9	62.3	–30.6	–29.4	–60.0
85+	18.6	28.9	47.5	8.9	25.2	34.1	–9.7	–3.7	–13.4
Total	17,373.2	18,142.1	35,515.3	14,753.6	16,192.7	30,946.2	–2,619.6	–1,949.4	–4,569.0

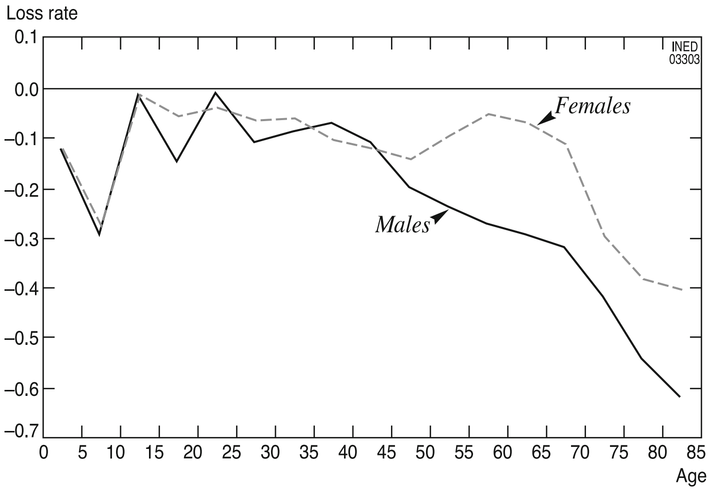

Fig. 2.6 Variation in calculated rate of losses, by age groups and sex

are not very realistic. It is normal for the rate of losses to be lower at 0–4 years than at 5–9 years. The first age group born after the famine was affected only by the birth deficit that continued a little beyond 1932–1933, and perhaps also benefited from post-crisis infant mortality that was lower than the norm. On the other hand, the apparent absence of losses at 10–14 years and the fluctuations beyond 55 years are not very convincing. Estimating on the basis of the difference between total numbers expected and total numbers observed may in reality amplify the effect of age-specific errors (both at the level of total numbers observed in the census and at the level of probabilities of survival). Therefore these results should be viewed with caution, and our subsequent discussion relies only on sex-specific totals and not on age distributions.

Thus we might expect a total of 35.5 million Ukrainians in the 1939 census instead of the 30.9 million actually observed. Therefore, just after the crisis, 4.6 million Ukrainians were missing. So where exactly does this observed difference come from? For the most part, of course, it results from excess mortality combined with birth deficit, both due to the crisis. However, there must be some discussion of the possible role of migration and the robustness of the hypotheses accepted. Finally, an attempt may be made to deduce from all this an estimate of under-registration of crisis deaths by the authorities.

2.2.1 Respective Roles of Lower Fertility and of Excess Mortality Resulting from the Crisis

If we assume that the observed difference is a good measure of the combined effects of excess mortality and sub-fertility, then in order to isolate the effects of these two components, we merely need to re-do the same population projection for 1939,

Table 2.5 Contributions of excess mortality and of birth deficit to overall losses in the 1930s crisis, by sex

Population (observed and expected) and losses	Total numbers (thousands)		
	Males	Females	All
Population			
Observed in the census (1)	14,753	16,193	30,946
Expected, given non-crisis mortality and fertility (2)	17,373	18,142	35,515
Expected, given non-crisis mortality and after correction of registered births (3)	16,833	17,625	34,458
Losses			
Total (2)–(1), of which	2,620	1,949	4,569
Due to forced outward migration (4)	563	367	930
Due to excess mortality (or to voluntary outward migration) resulting from the crisis (3)–(1)–(4)	1,517	1,065	2,582
Due to the birth deficit (2)–(3)	540	517	1,057

replacing the estimated non-crisis births with registered births (corrected for under-registration of infant deaths). This second projection leads to a total of 34.5 million inhabitants in 1939. The difference from the population actually observed in the census – 3.5 million – gives us a measure of the extent of losses attributable to the excess mortality of the crisis and to outward migration. The difference of 1.1 million from the result of the first projection represents the extent of losses due to the birth deficit. This measured effect of the birth deficit is significantly lower than the difference between estimated births and registered births from 1927 to 1938: 12.6 – 11.2 = 1.4 million. This is because, even with normal survival rates, the high infant and child mortality prevalent in that era would have taken a heavy toll on births that, in the event, were prevented by the crisis.

On the birth side, the losses are fairly similar for both sexes. The slightly higher deficit of males (525,000 as against 511,000) relates to the fact that normally more boys are born than girls (about 105 boys per 100 girls) and that at the age reached by the birth cohorts concerned in 1939, excess male mortality had – as yet – only slightly reduced the numerical advantage of boys at birth (Table 2.5).

On the other hand, taken together, losses due to migration and to the excess mortality resulting from the crisis are much greater for males than for females (2.1 million as against 1.4). This difference may relate either to the excess mortality factor or to migration.

2.2.2 *Role of Migration*

Here it is necessary to distinguish between two types of outward migration: forced outward migration, which has been particularly documented, and voluntary flight from the crisis, which is more difficult to assess.

On the one hand, in 1930–1931, according to Viktor Zemskov (1990, 1991a, b), 381,000 families, of whom almost 64,000 originated in Ukraine (i.e. about 300,000 people), were forcibly exiled, mainly to Siberia, the Urals region and the Arctic regions. From 1932 to 1938, a further 470,000 Soviet citizens were subjected to this process. The region of origin of the latter group is not known; but, assuming that the proportion of Ukrainians was the same as before, this would mean an additional 100,000 people being deported from Ukraine in this way during those years. So, in total, for the whole period 1930–1938, about 400,000 Ukrainians were forcibly exiled from their country. It could be estimated that, since this total number relates to whole families, it should be divided half and half between males and females. However, a number of these people must also have been affected by deportations to the gulag,[9] and this would have applied much more to males. Therefore, here we prefer to apply a distribution of 60% females and 40% males, i.e. 240,000 and 160,000 respectively.

To this must be added deportations to the gulag. In 1939, of 1.3 million people observed by the census in camps outside Ukraine, 182,000 were Ukrainians. To these we must add people detained in the Gulag's prisons and penal settlements, who do not figure in these statistics. It is known that, in total, in 1939, 705,000 people of all origins inhabited these prisons and settlements; so, if we use the same proportion of Ukrainians as for the general population of the gulags, this means increasing the earlier figure by 100,000. To this must also be added people who had been freed (275,000) or had escaped (22,000), of whom very few returned to Ukraine.[10] Finally, we must add those who died between their deportation to the gulags and 1939. Viktor Zemskov estimates the number of Ukrainians who died in the camps and settlements between 1934 and 1938 at 45,000. We must then add pre-1934 deaths and deaths that took place in Gulag prisons: these can be estimated at something over 50,000. In total, therefore, the Ukrainian population deported to the gulags can probably be established at around 680,000 people. From this must be subtracted Ukrainians deported to the gulags within Ukraine itself. In 1937, the Ukrainian NKVD recorded 114,000 people in Ukrainian gulags. Taking our bearings from the growth observed in the gulag population throughout the USSR, we can estimate the population of the Ukrainian gulags at 150,000 in 1939. Supposing that almost all these detainees came from Ukraine, the total 1939 population of Ukrainians deported to gulags outside Ukraine must have been in the order of 530,000. Applying the sex distribution observed in the NKVD's census of the gulags in 1937 (76% males and 24% females), we obtain figures of 403,000 males and 127,000 females.

[9] Gulag is an acronym of *Главное Управление ЛАГерей* (Chief Directorate for Camps). Therefore, we could refer to deportations 'by the Gulag'. However, the word 'Gulag' has passed into other languages to designate the camps themselves and so we can also refer to deportations 'to the gulag(s)'. Therefore, when referring to the Directorate, we shall write this word with an initial capital letter, while in the second instance we shall treat it as a common noun.

[10] These estimates start from the total numbers of people freed or escaped, given by Viktor Zemskov (1991a, b), and from the hypothesis that the proportion of Ukrainians among them is the same as in the population of the gulags observed in the 1939 census.

In total, the 1939 Ukrainian population deficit due to forced migration departures from Ukraine can thus be established at 400,000 who were forcibly exiled and 530,000 deported to the gulag, i.e. 930,000, of whom 563,000 were males and 367,000 females (Table 2.5).

It is much harder to assess voluntary moves. According to a TsUNKhU report of 1937,[11] net outward migration rose to 1.3 million people between 1926 and 1936. However, in the absence of reliable migration statistics, this estimate is highly questionable. The numbers obviously cover forced migration, even if this is not stated explicitly. Moreover, they have very probably been exaggerated in order to conceal the excess mortality of the crisis. In fact, true voluntary migration must have been small, since not only did the regime monitor the movements of the population closely (notably with the introduction of passports in towns in 1932), but there was hardly anywhere better to go in the USSR, while fleeing abroad was out of the question. Of course, the famine led some Ukrainians to flee the disaster zone, to Russia and Belorussia (now Belarus) but most of these refugees very quickly had to return to Ukraine, since their illegal migration status (linked to the passport requirement imposed in 1932) prevented them from living and working outside Ukraine. We also know that the policy of industrial development of the Soviet East began in this era, enabling some people to flee both repression and crisis in Ukraine; but the scale of this movement only really increased from the Second World War onwards. So here we have preferred to accept that net voluntary migration was almost nil and to confine ourselves to forced migration alone, while acknowledging that we may thus be under-estimating net outward migration.

In other words, the 3.5 million people mentioned above, who were missing from the 1939 census, must be reduced by the 0.9 million who were forcibly exiled or deported; the remaining 2.6 million are missing because of the excess mortality of the crisis.[12] Ideally, rather than subtracting this crude number from the total losses in order to estimate losses due to the excess mortality of the crisis, we should have re-run the population projection model (as we do in Chap. 3 for the subsequent period), introducing estimates of migrants by age and by calendar year. But here we came up against the total absence of any indication of distributions of migrants by age and by year, and therefore we had to give up on this; it should be borne in mind that, although this no doubt meant we were overestimating the migrants to be subtracted from the total losses, this was working in the opposite direction from our hypothesis that net voluntary migration was almost nil, which may have under-estimated actual net outward migration. In addition, the overall total of crisis deaths does not take into account the fact that the birth cohorts dwindled over time between the crisis and the end of the reference period, which again leads to a tendency to over-estimate the real extent of the excess mortality of the crisis.

[11] Document from the Russian State Archive of the Economy, fonds 1562, series 329, file 200, item 191.

[12] It should also be made clear that people who were deported, once outside Ukraine, also suffered from high excess mortality, which is not taken into account here.

However, given uncertainty about net migration and in view of the already absolutely overwhelming final result that we obtained (as we shall show below, in 1933 males had only 7 years of life expectancy), we abandoned this projection, preferring to remain confident that our estimate of excess mortality is an estimate that is as close as it can be without in any way exaggerating the scale of the crisis.

2.2.3 Estimating Under-Registration of Crisis Deaths

If we compare the 2.6 million deaths resulting from the excess mortality of the crisis with the 1.7 million difference observed between the 7.4 million registered deaths (Table 2.6, Column e) and the 5.7 million deaths to be expected without excess mortality arising from the crisis[13] (Table 2.6, column d), we obtain the total number of deaths that escaped registration (0.9 million). However, some of these are the result of the ordinary under-registration mentioned above, which was taken into account in correcting the 1926–1927 and 1938–1939 life tables that we used to estimate non-crisis mortality by interpolation. The results of this correction – 390,000 deaths – appear in Column f of Table 2.6. So there finally remain 530,000 deaths that escaped registration because of the crisis and the regime's acts of concealment, and these must be distributed between the three crisis years (1932–1934). In order to do this, we applied the distribution observed for registered crisis deaths (Column e minus Column d of Table 2.6). The results are shown in Column g.

Among the 530,000 deaths that escaped registration because of the crisis, there are 331,000 females and 199,000 males. This assumes that crisis under-registration was very much greater for females (24%) than for males (10%). Although this result may appear astonishing, it does not seem to us implausible, especially if the under-registration relates essentially to young children.[14] The hypothesis might certainly also be made that we have previously under-estimated the impact of voluntary migration. However, it would then have to be accepted that the latter had a very different effect depending on sex. There are two possible solutions. We may take the view that it is the rate of under-registration of females that is correct and that the rate for males has been under-estimated. It is then necessary to imagine, for net female migration of nil, very large net inward migration of males (in the order of 300,000 in order to equalize the rates of under-registration of deaths). Or else, in contrast, the view can be taken that it is the rate of under-registration of male deaths

[13] For the specific needs of this comparison, our estimate of 'non-crisis deaths' had to be adapted. In effect, we had to base our reasoning on the deaths that normal mortality would have produced in the actual population resulting from the crisis. In order to do this, we used our forward projection, as if there had been no crisis, from the population observed in the 1926 census – but, in this case, we took the results only as far as 1932. For the years 1934–1938, we made a backward projection from the population observed in the 1939 census. Finally, for the year 1933, the hardest hit by the crisis, we took the mean of these two types of estimate.

[14] It can well be imagined that, for various reasons of an administrative or cultural nature, under-registration of girls' deaths was higher than boys'.

Table 2.6 Registered deaths and expected deaths, from 1927 to 1938

Year	Forward projection from 1926	Backward projection from 1939	Estimate used	Deaths registered in ZAGS	Unregistered deaths without crisis	Unregistered crisis deaths	Corrected deaths	Difference
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(d)–(h)
All								
1927	573		573	523	57		579	–6
1928	575		575	496	52		547	27
1929	563		563	539	47		585	–22
1930	549		549	538	42		580	–31
1931	534		534	515	38		553	–19
1932	503		503	668	32	45	746	–243
1933	457	367	412	2,104	22	457	2,583	–2,172
1934	428	365	365	462	19	26	508	–142
1935	435	381	381	342	20		362	18
1936	455	403	403	360	21		380	23
1937	497	436	436	428	22		450	–14
1938	513	450	450	431	20		451	–0.4
Total			5,743	7,406	392	529	8,325	–2,582
Males								
1927	302		302	276	31		307	–4
1928	304		304	264	28		293	11
1929	298		298	286	26		311	–14
1930	290		290	287	23		311	–20
1931	282		282	274	21		295	–13
1932	265		265	368	18	16	402	–137
1933	241	179	210	1,284	11	171	1,467	–1,257
1934	225	181	181	242	10	10	262	–81
1935	230	191	191	179	10		189	2

(continued)

Table 2.6 (continued)

Year	Forward projection from 1926	Backward projection from 1939	Estimate used	Deaths registered in ZAGS	Unregistered deaths without crisis	Unregistered crisis deaths	Corrected deaths	Difference
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(d)–(h)
1936	241	205	205	187	10		197	8
1937	264	224	224	226	10		236	–12
1938	273	233	233	225	9		234	–1
Total			2,987	4,098	207	198	4,503	–1,516
Females								
1927	270		270	247	26		272	–2
1928	271		271	231	23		255	16
1929	265		265	253	21		274	–8
1930	259		259	251	19		270	–11
1931	252		252	241	17		258	–6
1932	237		237	300	15	29	344	–106
1933	216	188	202	820	11	286	1,117	–915
1934	202	185	185	220	10	16	246	–61
1935	205	189	189	163	10		173	16
1936	214	198	198	173	11		183	14
1937	232	211	211	203	11		214	–3
1938	240	217	217	206	11		217	0.1
Total			2,756	3,308	185	331	3,822	–1,066

that is correct, and it is then necessary to imagine a net outward migration of females in the order of 200,000 to equalize the rates of under-registration of deaths. However, neither of these two hypotheses seems to us to be compelling. This is because both assume a large increase in observed excess male mortality resulting from the crisis; yet excess male mortality was already very high. It can certainly be accepted that men suffered more than women from acts of political violence linked to dekulakization.[15] On the other hand, it is hard to imagine that the famine – the main cause of excess mortality in the crisis – would have carried off more males than females. Therefore, there seemed to us to be no justification for increasing the excess male mortality observed, and we preferred simply to assume nil net voluntary migration for both sexes and an under-registration of crisis deaths greater for females than for males.

2.2.4 Estimating Annual Trends in Life Expectancy from 1926 to 1939

Given these hypotheses on the under-registration of deaths, an attempt may be made to estimate annual trends in life expectancy during the 1920s and 1930s, distinguishing the crisis years from other years.

For the years 1927–1931 and 1935–1938, one could, without great risk of error, ascribe the age distribution of expected deaths to registered deaths (increased for under-registration) and recalculate annual life tables taking into account the annual fluctuations in the number of registered deaths.

On the other hand, doing the same for the three crisis years would carry a risk of serious error, since crisis deaths have a different age structure from ordinary deaths. Fortunately, an age distribution of ZAGS-registered deaths is available for the years 1933 and 1934. Nevertheless, for these 2 years, we have to decide the age distribution of unregistered deaths. Then we should consider what to do with the 1932 deaths, for which no age distribution is available. Let us therefore treat each of these three crisis years separately, starting with 1933 – the year most affected.

1933. An age structure appropriate to crisis deaths can be obtained by subtracting, for each age, expected non-crisis deaths from total ZAGS-registered deaths. Therefore it might be imagined that we could just distribute the unregistered deaths by age, pro rata to the registered crisis deaths. However, the hypothesis underlying such an approach (under-registration independent of age) leads to an absurdity: the absence of excess mortality resulting from the crisis among those under 1 year old. Even if we accept that very young infants still being breast-fed suffered less than other people, it cannot be imagined that infant mortality was unaffected by famine on such a scale. The last case of large-scale famine observed in Europe is that of Finland in 1868. The crude mortality rate in Finland for that year went up to 78 per

[15] Word coined from *kulak* (wealthy peasant), to designate Stalin's policy of destroying this socio-economic group.

thousand, as against 26 per thousand in the early 1860 s (SGF 1907). This situation is, relatively speaking, comparable to the one that interests us, since the crude mortality rate in Ukraine rose to 85.5 per thousand in 1933, whereas without the crisis it would have been only 16.9 per thousand. With a multiple of 3 applying to the crude rate in the Finnish crisis, the corresponding increase in mortality at age under 1 was from 211 per thousand to 336 per thousand – i.e. a rise of 50% (Pitkänen 1993). Since the crude crisis mortality rate in Ukraine was 5 times higher than the rate to be expected without a crisis, it seems to us that mortality among those under 1 year old must have been approximately double non-crisis mortality. Therefore we multiplied the infant mortality rate for 1931 by 2 in order to estimate the 1933 infant mortality rate. By applying this rate to weighted births for 1932 and 1933, we obtained the estimated infant deaths for 1933; then, by subtracting registered deaths from that figure, we arrived at an estimate of unregistered infant deaths. Having subtracted the latter from the total number of unregistered deaths, we were able to distribute the remainder by age pro rata to registered crisis deaths at 1 year and over. However, the reader will perceive that, by doing so, we are very probably under-estimating mortality at 1–4 years. The estimated curve for Ukraine is consistently higher than the Finnish age-specific mortality curve, except for mortality at 1–4 years (Fig. 2.7). Therefore, as with infant mortality, we decided on an a priori increase in mortality at 1–4 years and distributed the remaining deaths proportionately above 5 years of age.[16]

Figure 2.8 illustrates the age-specific impact of the Ukrainian crisis compared to that of the Finnish famine, using, for Ukraine, the ratio of age-specific mortality rates in 1933 to those for 1931 and, for Finland, the ratio of 1868 rates to those for 1861–1865 (Pitkänen 1993). The excess mortality of the crisis seems very much greater in Ukraine than in Finland, but this principally reflects the fact that Finnish non-crisis mortality in the 1860s was very much higher than Ukrainian non-crisis mortality in the 1930s; and this was all the more true for the adolescent age groups that are the first to benefit from health transition. The excess mortality of the crisis observed in Ukraine is thus particularly high around 14 years of age, where the 1933 rate is almost 18 times higher than the 1931 rate.[17] At all ages between 5 and 70 inclusive, the 1933 rates are at least 7 times higher than those for 1931. Finally we should note that, just as in Finland, excess mortality resulting from the crisis reached its maximum in the adult age groups at around 50 years of age.

1934. Since the number of undeclared deaths for 1934 was relatively small (about 10,000), we have restricted ourselves to a very simple hypothesis and have distrib-

[16] The correction made to the infant mortality rate led to an estimated proportion of 44% of deaths at under 1 year of age being ZAGS-registered. We hypothesised that this rate of coverage increased rapidly with age between 1 and 5 years, rising from 55% at age 1 to 84% at age 4. Once the remaining deaths were distributed between the older ages, the rate of coverage at age 5 went up to 98%. It then remained more or less at this level until it reached the oldest old, falling to below 90% again after age 90.

[17] We should clarify that this in no way relates to our correction of under-registration of deaths, since we estimated that there was almost total coverage (98%) at this age.

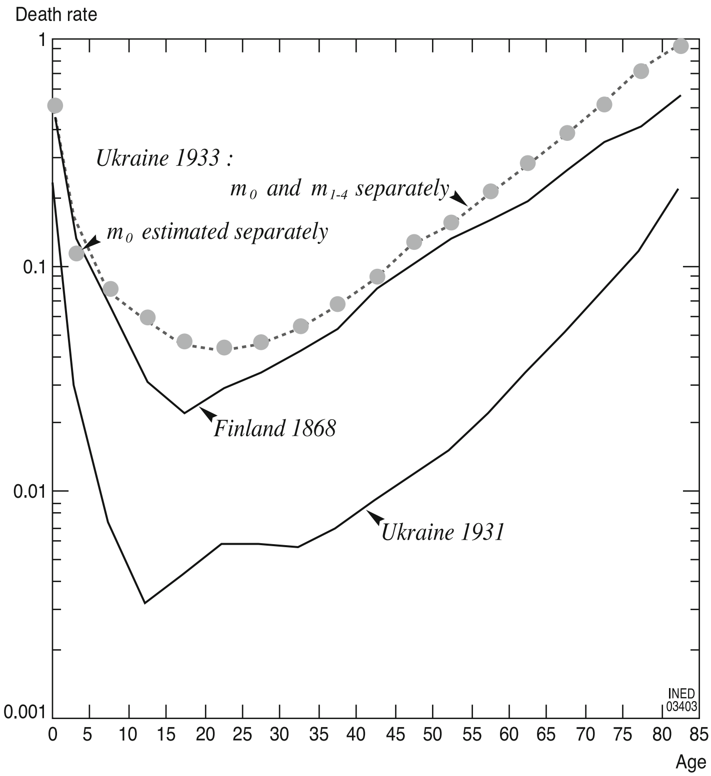

Fig. 2.7 Estimated age-specific male mortality rates in 1933 in Ukraine compared to 1931 rates and to Finland's 1868 rates

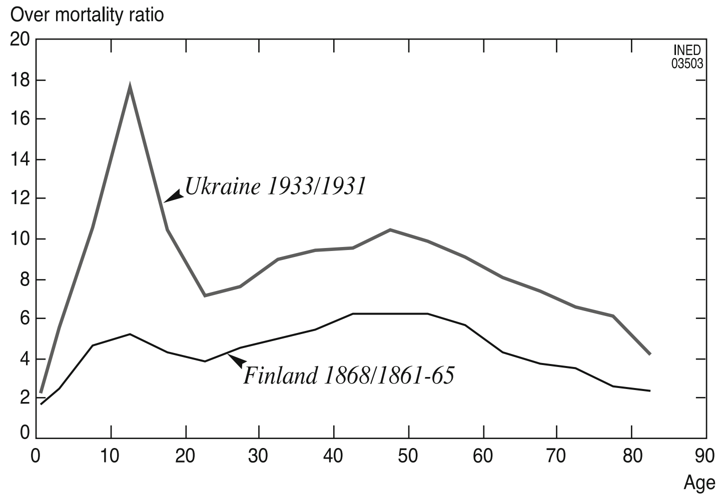

Fig. 2.8 Crisis mortality: excess male mortality, comparing ratio of Ukrainian age-specific 1933 rates to 1931 rates with ratio of Finnish age-specific 1868 rates to 1861–1865 rates

uted them by age pro rata to the distribution obtained for the undeclared 1933 deaths in the previous section.

1932. For 1932, the situation is trickier, since we have no age distribution for registered deaths. Of course, we do have the age distribution of the 503,000 expected non-crisis deaths resulting from our projection calculation. But all the 243,000 crisis deaths, registered or not, have to be distributed by age. We could decide to distribute them like the 1933 crisis deaths, but here we come up against a new difficulty with infant mortality: from 1932 to 1933, the number of births fell by almost half, and so the proportion of crisis deaths at under 1 year old observed in 1933 cannot be applied to 1932. We therefore chose to estimate 1932 infant deaths by maintaining a constant ratio between total excess mortality due to the crisis and excess mortality due to the crisis at under age 1, and this led us to increase non-crisis infant mortality by 33% for boys and 32% for girls. The remaining crisis deaths were distributed by age over 1 year old, on the same basis as 1933 crisis deaths.

Once distributed by age in this way, the unregistered deaths were added to the registered deaths, and age-specific mortality rates were obtained, allowing us to calculate life tables for each of the 3 years by using the ratio of all deaths to the theoretical populations calculated previously (with non-crisis mortality and registered births) minus crisis deaths.[18]

The age-specific probabilities of death that we obtained in this way for the crisis years follow a regular course up to the oldest old age groups (Fig. 2.9). Our estimates are obviously much more uncertain beyond age 90, but that has no influence on the level of life expectancy. The gap between the 1933 curve – and to a lesser extent those of 1932 and 1934 – and the curves for the surrounding years (1931 and 1935) reflects the scale of the crisis.

From 1927 to 1931, life expectancy was almost stable, with a few oscillations, going from 43.3 years to 43.5 for males and from 46.8 to 47.9 for females (Table 2.7 and Fig. 2.10). Then, with the crisis, it fell dramatically, losing almost 9 years in 1932 then another 28 years in 1933. In that year, it was a little over 10.8 years for females – and just 7.3 for males!

This result may appear exaggerated, but we do not think that is the case. Firstly, with rates calculated on the basis of the ratio of age-specific ZAGS-registered deaths alone to our population estimates, we would have obtained 12.2 years' life expectancy for males and 19.5 for females. By correcting the deaths for under-registration, but without differentiating under-registration according to age, we would have obtained

[18] Firstly, we needed population estimates to match to the denominators of the rates; we used the results of the forward projection up to 1 January 1933 and those of the backward projection from 1 January 1934. However, the result for the year 1934 proved implausible at ages over 80, since the total population numbers were much too high in comparison to the estimated deaths. This relates to the fact that the 1939 census greatly overestimated the total number of very aged people, claiming to have observed over 1,000 centenarians – in an era when there were only 200 in France. With backward projection, this over-estimate of the total numbers of the oldest old affects the younger age groups and hinders the calculation of rates. We therefore made a new forward projection up to 1 January 1934, on the basis of estimated mortality for 1932 and 1933, and took a mean between the forward- and backward-projected populations as our denominator for the 1934 rates.

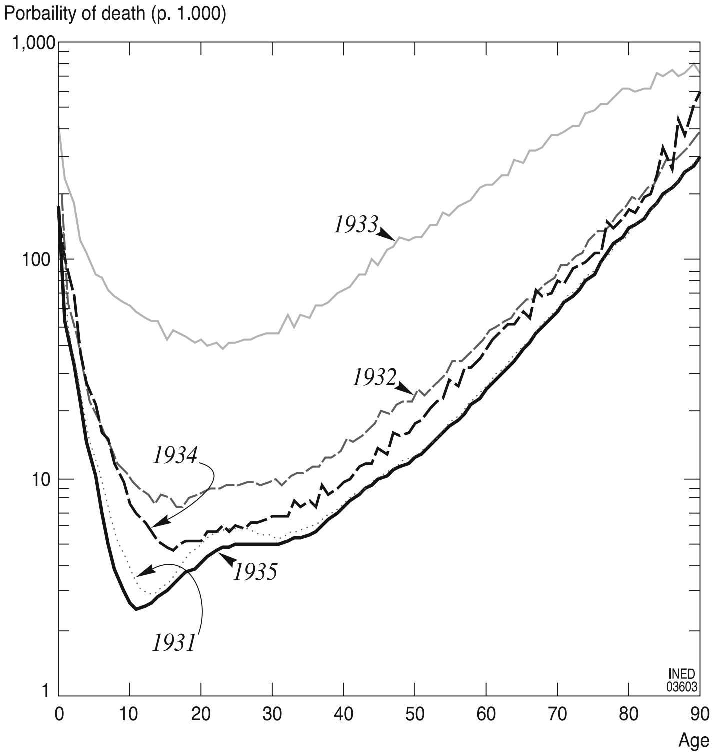

Fig. 2.9 Age-specific male probabilities of death for the crisis years (1932–1934), compared to 1931 and 1935

Table 2.7 Estimate of annual trends in life expectancy from 1927 to 1939

Year	Males	Females
1927	43.3	46.8
1928	44.6	48.7
1929	42.8	46.7
1930	42.5	46.9
1931	43.5	47.9
1932	34.5	39.4
1933	7.3	10.9
1934	37.6	42.1
1935	46.3	52.7
1936	47.6	53.0
1937	46.2	51.9
1938	47.9	52.7
1939	47.7	52.5

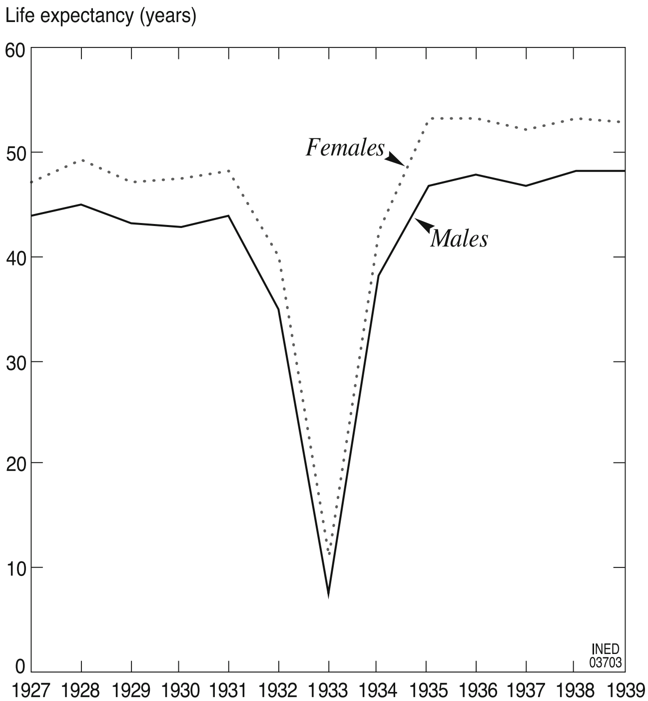

Fig. 2.10 Annual trends in life expectancy at birth between the Wars

10.3 and 14.0 years respectively. By introducing particular corrections to infant and child mortality, as we have, the figures reached are 7.3 and 10.8 years. We have made it clear that these two successive corrections were necessary in order to ensure consistency of data. Secondly, reliance on the estimates given by Evgenii Andreev et al. (1998) for Russia (15.2 years for males and 19.5 years for females) and by the same authors (Andreev et al. 1992; repeated by Alain Blum 1994) for the whole USSR (10.3 years for males and 13.0 for females) might suggest even in advance that life expectancy in Ukraine – which, of all the Republics of the USSR, suffered most from the famine – would be significantly below 10 for males and around 10 for females.

This period life expectancy measures the extent of the immediate circumstances of the crisis. The impact of these circumstances on the survival of each birth cohort is obviously much less, since each one experiences it only at a particular age. If, on the other hand, a crisis like this continued over several decades, it would soon lead to the population disappearing.

Ukrainian life expectancy was still abnormally low in 1934, but on the other hand it reached a high point just after the crisis, in 1935–1936. This is a fairly classic immediate post-crisis situation where, precisely because of the severe reductions of earlier years, mortality is temporarily less than normal. After reaching a significantly lower point in 1937, life expectancy rose again in 1938–1939.

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Chapter 3
The Consequences of the Second World War and the Stalinist Repression

Jacques Vallin, France Meslé, Sergei Adamets, and Serhii Pyrozhkov

In 20 years, from one census to the next, the population of Ukraine went from 30.9 million inhabitants in 1939 (RAN 1992) to 41.9 million in 1959 (TsSU 1962). However, this steep population growth is merely apparent, since it resulted essentially from major changes to the borders of the Republic of Ukraine.

3.1 Estimating the 1939 Population Within Present-Day Borders

3.1.1 Total Population

Firstly, under the German-Soviet (Molotov-Ribbentrop) Pact, Soviet troops occupied south-eastern regions of Poland from September 1939. The population of the territories concerned is known from the 1931 Polish Census (GUSRP 1937): 3.1 million inhabitants for the voivodeship of Lwow, 1.5 million for that of Stanislawow, 1.6 million for Tarnopol and 2.1 million for Volhynia. We also have an estimate, by

J. Vallin (✉) • F. Meslé
Institut National d'Études Démographiques, Bd. Davout 133,
75980 Paris Cedex 20, France
e-mail: vallin@ined.fr; mesle@ined.fr

S. Adamets
Institut National d'Études Démographiques, Bd. Davout 133, 75690 Paris Cedex 20, France
e-mail: serguei.adamets@sfr.fr

S. Pyrozhkov
Institute for Demography and Social Studies, Bd. Panasa Myrnogo 26, 01011 Kyiv, Ukraine
e-mail: psi@starnet.md

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voivodeship, of the population of Poland in 1939 within its 1945 borders (Ledermann 1947). By comparing the population counted in the 1931 Census with the estimated population for 1939, we obtained – for all the Polish voivodeships that did not undergo any territorial changes between 1931 and 1945 – a mean growth rate of about 10%. We can assume that this growth rate was also that of the territories lost by Poland in 1939 and to apply it to the four voivodeships gained by Ukraine. In total these four voivodies would therefore have had a total of 9.1 million inhabitants in 1939. However, part of the voivodeship of Lwow remained Polish, forming the new voivodeship of Rzeszow, whose estimated 1939 population was 2.1 million inhabitants (Ledermann 1947). So the Polish territories annexed by Ukraine in 1939 had 7.0 million inhabitants (Tables 3.1 and 3.2).

Secondly, in 1940, the Romanian border underwent complex readjustment: Ukraine gained Bessarabia and Northern Bukovina from Romania, but in 1940 also the Soviet Republic of Moldavia was created. Separate from Ukraine, it was made up of the former Moldavian Autonomous Republic (more or less to-day Transnistria), which up to then had belonged to Ukraine, and Northern Bessarabia. On 1 July 1939, the population of Bessarabia was estimated at 3.2 million inhabitants and that of Northern Bukovina at around 574,000[1] (ICS 1940). Therefore, Ukraine gained 3.8 million inhabitants from Romania, but the creation of the Republic of Moldavia took away 2.4 million, of whom 599,000 were in pre-1939 Ukrainian territory and 1.8 million in Bessarabia (Tables 3.1 and 3.2).

In addition, in 1945, Subcarpathian Ruthenia (separated from Czechoslovakia and added to Hungary in 1939) was attached to Ukraine (as Zakarpatskaia Province). The population of this province was 725,000 inhabitants at the time of the 1930 Czechoslovak census. By adding 1931–1938 births and subtracting deaths for the same period, we were able to estimate the population of this province at 829,000 inhabitants in 1939.[2] Finally, in 1954, Russia ceded Crimea, which had 1.1 million inhabitants at the time of the 1939 Soviet Census (Tables 3.1 and 3.2), to Ukraine.

So, in 1939, Ukraine within its present-day borders would have had a population 10.3 million higher than it had within its 1939 borders (41.2 million instead of 30.9). This estimate is significantly higher than the 40.5 million given by TsSU (the Central Statistical Directorate) (1962), but, curiously, the latter did not include Subcarpathian Ruthenia in its total (there does not seem to have been an available estimate), and this more or less accounts for the difference.

[1]Northern Bukovina consisted of the provinces of Cernauti (318,000 inhabitants) and Storojinet (186,000) and part of the province of Radauti (total 179,000). Here we have estimated the last at 70,000 inhabitants, since in the following year the Romanian Yearbook gave only some 107,000 for that province (ICS 1940, 1941). The total therefore amounts to 574,000 people.

[2]For 1931–1936, births and deaths come from the Czechoslovak Yearbook for 1938 (OSRT 1938). We assumed the corresponding total numbers for 1937 and 1938 to be equal to the mean of the 4 preceding years. We also took migration out of the province to be negligible.

Table 3.1 Ukraine's acquisitions and losses, from 1939 to 1954

Country and region concerned	Ukraine's acquisitions: Date	Ukraine's acquisitions: Population in 1939 (in thousands)	Ukraine's losses: Date	Ukraine's losses: Population in 1939 (in thousands)
Poland				
Lwow (part)	9-1939	1,140		
Stanislawow	9-1939	1,628		
Tarnopol	9-1939	1,760		
Volhynia	9-1939	2,295		
Total		7,022		
Romania				
Bessarabia	6-1940	3,173		
Northern Bukovina	1942	574		
Total		3,747		
Hungary				
Subcarpathian Ruthenia	1945	829		
Moldavia				
Romanian part			8-1940	1,853
Ukrainian part			8-1940	599
Total				2,452
Russia				
Crimea	1954	1,124		
Total gains and losses		12,722		2,452
Net total (gains – losses)		+ 10,270		

Thus, from 1939 to 1959, the population of Ukraine increased by hardly more than half a million (from 41.2 to 41.9 million). This general stagnation over 20 years was above all a consequence of the Second World War, but it also related to subsequent events, in particular the 1947 famine and the deportations in the 1940s and 1950s. All things considered, growth in the 1950s only just compensated for the exceptional losses resulting from these events.

3.1.2 Distribution by Sex and Age

We have an estimate of the distribution of the population by sex and single year of age in 1939 'in the present-day territory' of Ukraine, discovered in the TsSU archives in Kiev by Serhii Pyrozhkov. The total population is that given by TsSU publications, in particular of the 1959 Census (TsSU 1962). It is therefore very probable that this age distribution relates to TsSU's total population estimate, given above, and we assume that it differs from our own total estimate by 700,000 because Subcarpathian Ruthenia was not taken into account. Assuming that Subcarpathian Ruthenia's age-sex structure does not differ excessively from that of the other territories

Table 3.2 Changes in Ukraine's borders since 1938

From when it joined the Soviet Union to the eve of the Second World War, the Ukrainian Soviet Socialist Republic occupied much less extensive territory than Ukraine does now. It lacked not only Crimea, which was then part of the Russian Soviet Socialist Republic, but also Southern Bessarabia and Northern Bukovina (both part of Romania), and Subcarpathian Ruthenia (a province of Czechoslovakia), as well as Volhynia and Eastern Galicia, which were Polish provinces.

Just after Hitler's invasion of western Poland, in accordance with secret clauses in the German-Soviet Pact of 1939, the Red Army invaded eastern Poland, of which two provinces, Volhynia and Eastern Galicia, were annexed to Ukraine (September 1939). A year later (June 1940), Ukraine also annexed the Romanian provinces of Northern Bukovina and Southern Bessarabia. However, by comparison with its present-day territory, it still lacked Subcarpathian Ruthenia and Crimea.

After the German invasion, Ukraine lost Eastern Galicia, which formed the territory of Lemberg under German protection. Not only were Northern Bukovina and Bessarabia returned to Romania, but the latter also annexed Transnistria. One part of the rest of Ukraine (including Crimea, which was taken from Russia) then formed the Reichskommissariat of Ukraine, with the other part placed directly under German military administration.

(continued)

Table 3.2 (continued)

After the War, the Ukrainian Soviet Socialist Republic not only recovered its 1940 territory but also annexed Subcarpathian Ruthenia, retaking it from Hungary, which had taken it from Czechoslovakia in 1939. However, Ukraine also ceded Crimea back to the Russian Soviet Socialist Republic.

After Stalin's death, Khrushchev, who had been leader of the Communist Party of Ukraine for a long time, brought Crimea back under Ukrainian administration. Despite Russia's attempts to recover the province after the break-up of the USSR, Crimea remains part of independent Ukraine.

annexed by Ukraine in the early 1940s, we distributed the difference in proportion to the age distribution of the population of these territories.[3]

3.2 Estimating Births and Deaths for 1939–1940 and for 1945–1953 Within Present-Day Borders

As is the case for population, commonly published data on births and deaths vary with the changes in borders (Table 3.3). Birth and death statistics within present-day borders began from 1953, since Crimea was included in data for the Ukraine from that year onwards. From 1947 to 1952, statistics covered the whole of the

[3]The age-sex structure of the population of these new territories was obtained by comparing the population in the 1939 census with TsSU's estimate of the 1939 population within 1959 borders. However, we did not include Crimea, for which the 1939 Soviet census gave us the 1939 age-sex structure directly, in this comparison.

Table 3.3 Main datasets used to reconstruct demographic trends between 1939 and 1959

Data	Sources
Populations	
1939 Census population by sex and year of age, Ukraine within 1939 borders (see previous section)	RGAE, fonds 1562, series 336, file 604
Total 1939 population of Ukraine by sex, within 1959 borders (excluding Subcarpathian Ruthenia), estimated by TsSU	TsSU 1962
1939 population of Ukraine by sex and year of age, Ukraine within 1959 borders (minus Subcarpathian Ruthenia), estimated by TsSU[a]	TsSU archives, Kiev
1959 Census population of Ukraine by sex and year of age	Previously unpublished census table, computed using mechanical tabulation
Births	
1939 and 1940 births by sex, Ukraine within 1939 borders (before incorporation of Polish provinces)	RGAE, fonds 1562, series 329, files 262, 396
1939 and 1940 births according to mother's age, Ukraine within 1939 borders (before incorporation of Polish provinces)	RGAE, fonds 1562, series 329, files 264, 399
1945 and 1946 births by sex, Ukraine within 1945 borders after separation of Moldavia (not including Subcarpathian Ruthenia)	RGAE, fonds 1562, series 329, files 1882, 2229
Births from 1947 to 1952 by sex, Ukraine within 1945 borders (including Subcarpathian Ruthenia)	RGAE, fonds 1562, series 329, files 2648, 3157, 3807, 4703, series 33, files 412, 1061
Births from 1953 to 1958 by sex, Ukraine within 1954 borders (after incorporation of Crimea)	RGAE, fonds1562, series 33, files 1695, 2185, 2638, series 27, files 211, 353, 479
Births by sex in Crimea, 1939, 1940 and from 1945 to 1952	RGAE, fonds 1562, series 329, files 262, 396, 1456, 1883, 2229, 2648, 3157, 3807, 4703, series 33, files 412, 1061
Fertility rates for 1939–1959 by mother's age group, calculated from retrospective surveys in 1960 and 1967	Sifman 1974
Deaths	
1939 and 1940 deaths by sex and year of age, Ukraine within 1939 borders (before incorporation of Polish provinces)	RGAE, fonds 1562, series 329, files 267, 400
1945 and 1946 deaths by sex and year of age, Ukraine within 1945 borders after separation of Moldavia (not including Subcarpathian Ruthenia)	RGAE, fonds 1562, series 33, files 2638
Deaths from 1947 to 1952 by sex and year of age, Ukraine within 1945 borders (including Subcarpathian Ruthenia)	RGAE, fonds 1562, series 33, files 2638

(continued)

Table 3.3 (continued)

Data	Sources
Deaths from 1953 to 1958 by sex and year of age, Ukraine within 1954 borders (after incorporation of Crimea)	RGAE, fonds 1562, series 33, files 2638, 2641, series 27, files 217, 359
1952 deaths by sex and year of age, Crimea	RGAE, fonds 1562, series 329, files 1066
Migration	
Immigrants to cities/towns according to (urban or rural) place of departure and emigrants from cities/towns according to (urban or rural) place of arrival by sex and age group(s), 1946–1958	RGAE, fonds 1562, series 20, files 681, 752, 831, 897, 956, 1006, 1049, 1090, series 27, files 38, 131, 250, 392; 524
Total number of urban immigrants and emigrants according to region of arrival or departure (republics other than Ukraine, Ukrainian provinces), 1946–1958[b]	RGAE, fonds 1562, series 20, files 676, 748, 828, 953, 1003, 1047, 1087, series 27, files 36, 129, 248, 389, 522

[a]This distribution by age and sex relates to the 40.5 million inhabitants estimated by TsSU (1962). Unfortunately, we do not have any indication of the way it was obtained

[b]In reality, since this table is so large, we obtained only a copy of the line giving total migration inside Ukraine, which allowed us, by deduction from the above, to find outward migration

present-day territory minus Crimea. In 1945 and 1946, Subcarpathian Ruthenia was also missing. No statistics at all are available for 1941–1944. In 1939 and 1940, they related only to the pre-1939 territory.

3.2.1 Deaths

Death statistics by age throughout all these years include a fairly significant[4] number of deaths at unknown age. We distributed these in proportion to the total numbers of deaths at known ages.

The statistics available for Crimea for the years 1939, 1940 and 1945–1952 give total deaths by sex and deaths at age under 1, also by sex. After having distributed deaths by age at 1 year and over pro rata to the distributions available for Ukraine, we added these data to the Ukraine data.

For all the other territories annexed to Ukraine, no statistics are available to cover the years before they were included in Ukrainian statistics. In order to take this into account in the life tables corresponding to present-day territory, the total numbers were systematically increased by a coefficient corresponding to the ratio between the 1939 population in the present-day territory and the population at the same period excluding the annexed territories. As far as the former Polish and Romanian territories are concerned, this relates only to the years 1939 and 1940. For Subcarpathian Ruthenia, the process also involves the years 1945 and 1946.

[4]The proportion of deaths at unknown age was in the order of 1% in 1939 and 1940; it increased to 1.7% in 1945, only to diminish gradually to less than one per thousand in 1955.

3.2.2 Births

Firstly, we added registered births by sex in Crimea, for all the years 1939–1940 and 1945–1952, to those in Ukraine within its contemporary borders.

Since we had births according to mother's age in the old territory for 1939, we were able to calculate age-specific fertility rates for that year and apply them to the population of the new territory in order to find births within present-day borders. 1940 births in the new territory were then estimated from births registered in the old territory (Ukraine + Crimea) on the basis of the difference observed in 1939.[5] Calculated in this way, registered births in the present-day territory came to 1.40 million in 1939 and 1.18 million in 1940. This drop from 1 year to the next is fairly startling, in the absence of any events that might explain an abrupt fall in fertility. Nor can it be explained by the adjustment of the data to fit the new territory, since the same discrepancy exists between births registered in the old territory. This prompts questions about degradation in the quality of registration of births by ZAGS from 1940 – an issue we shall return to later.

For the years 1945 and 1946, for which births in Subcarpathian Ruthenia alone are missing, we proceeded as for deaths, in proportion to the change in total population.

3.3 A Reconstruction in Two Stages

An initial, very broad, assessment has been published (Pyrozhkov 1996), estimating population losses in Ukraine between 1939 and 1959 at 9.7 million. However, this combines losses due to mortality crises with those attributable to birth deficits and to migration. In order to track trends in life expectancy over this period, it is necessary to reconstruct more fully the different components of population change, as we did in Chap. 2 for the inter-War period.

At the outset, the task is more difficult than for the 1930s, since the period to be covered is much longer and more unsettled, and the data gathered are more disparate. Once the available information on population and natural increase has been reconstructed within present-day borders, two main gaps are left: the total lack of population statistics for 1941–1944 and the partial nature of the data on migration, which focus on urban movements. Moreover, allowance must be made for under-registration of certain events.

If we could have followed the same logic as for the earlier period, we would have started by projecting the 1939 population up to 1959 on the basis of supposedly

[5] As we know the number of births registered in Crimea in 1939 and 1940, here we used, for births in the old territory, births in Ukraine within the borders of that time, plus births in Crimea.

normal fertility and mortality trends, and then compared the results with the total numbers recorded in the 1959 Census in order to obtain an initial general estimate of total losses for the period 1939–1959; we would then have done our best to break this down according to the part played by each of the three components of population change. However, the period of 20 years separating 1939 from 1959 is a long one, and the major events that led to exceptional losses took place only in the first decade. It therefore seems more reasonable to start by using the available standard data for the 1950s to assess a 1949 population by sex and age, and to apply our earlier reasoning only to the decade 1939–1949.

3.4 Estimating 1949 Population by Sex and Age

For the late 1940s and the 1950s, we have complete data on births and deaths and a picture of urban migration. To make a backward projection of estimated populations in the years before the 1959 Census, we had to hypothesize about the quality of registration of these events. As far as migration was concerned, we had to start from existing data in order to reconstruct outward migration statistics by sex and age.

3.4.1 Estimating Under-Registration of Deaths

As we have said before (in Chap. 2), Chap. 4 will include a full discussion of the quality of registration of deaths in 1938–1939 and for the years after 1959. It is apparent from this that corrections must be made to infant mortality on the one hand and to old-age mortality on the other.

In the end, the two corrections made to *infant mortality* consisted of increasing the rate registered in 1938–1939 by 5% and the 1959 rate by 10.6%. In fact, these corrections, which essentially relate to neonatal mortality, are very dependent on the level of total infant mortality. We therefore simply estimated the correction coefficients to be applied to deaths from 1949 to 1958, accepting that they varied according to registered mortality in a linear fashion between the two values adopted for 1938–1939 and 1959 (Table 3.4).

For correction of *old-age* mortality, it seemed to us that the levels of 1958 under-registration estimated in the next chapter for each sex and age over 70 years could also be applied to the whole of the 1950s.

3.4.2 Estimating Outward Migration

For the post-War period, partial statistics for migration flows are available from 1946 onwards. They are based on the use of registers maintained at passport offices, where every holder of a *propiska* [residence permit] was obliged to declare each

Table 3.4 Total numbers of annual infant deaths, corrected to take into account under-registration (1949–1959)

Year	Registered deaths	Registered births	Uncorrected infant mortality rate	Correction coefficient	Estimated deaths at under age 1
1949	70,666	911,641	82.1	1.087	76,814
1950	63,298	844,585	73.0	1.091	69,058
1951	65,841	858,052	77.1	1.089	71,701
1952	62,245	846,434	73.2	1.091	67,909
1953	51,109	795,652	62.9	1.095	55,964
1954	53,215	845,128	64.2	1.095	58,270
1955	45,262	792,696	55.9	1.098	49,698
1956	38,189	822,569	47.0	1.102	42,084
1957	35,997	847,781	42.9	1.103	39,704
1958	32,851	873,483	38.0	1.106	36,333
1959	32,007	880,552	36.4	1.106	35,399

change of main residence. Since only the urban population was subject to this *propiska* regime, inter-urban, rural-urban and urban-rural migration were recorded, but not intra-rural migration.

Two types of tables based on these statistics are available (see Table 3.3). The first gives the distribution of migrants by sex and age, for each year, without distinguishing migration inside Ukraine from external migration. The second distributes the totals for all ages according to places of arrival and departure (regions throughout the USSR, and abroad), and therefore provides a way of separating – at least at this level – internal movements from external movements.[6] Nevertheless, the problem of how to measure migration from rural Ukraine to out of Ukraine (whether to urban or rural destinations) and migration into rural Ukraine from outside Ukraine has still not been solved.

However, since 1950, TsSU's annual estimates of the total population of Ukraine have also been available; it is reasonable to assume that these have taken into account estimated migration from rural Ukraine to towns and cities outside Ukraine and vice versa, since these moves would have been recorded in statistics for other republics. By comparing these annual population estimates to annual natural increases, we were able to recover the overall estimates for external migration used by TsSU (Table 3.5). By deducting the natural increase for the year 1958 from the population on 1 January 1959, we found an excess over the estimated population on 1 January 1958, which represents apparent net migration. The latter differs fairly significantly from recorded migration. Not only are there 549,000 movements in total for the period 1950–1958 (as against 989,000 according to the registers), but the annual differences vary considerably. From 1952 onwards, the difference was large and

[6]In reality, since this table is so large, we obtained only a copy of the line giving total migration inside Ukraine, which allowed us, by deduction from the above, to find outward migration.

Table 3.5 Comparison between recorded and apparent net external migration after comparing annual population estimates to natural increase

Year	Population estimated by TsSU	Births	Deaths	Apparent net migration	Recorded net migration	Difference
1950	36,588	845	315	106	111	–5
1951	37,223	858	328	161	104	58
1952	37,915	846	326	–70	50	–120
1953	38,366	796	327	156	214	–57
1954	38,991	845	319	–247	–43	–203
1955	39,271	793	296	–26	41	–67
1956	39,742	823	293	150	213	–62
1957	40,422	848	305	214	160	54
1958	41,179	873	287	103	141	–38
1959	41,869					
Total		7,526	2,794	549	989	–440

most often negative; but in 1950 and 1951, it was small and positive. Since most of the problem here arises from the fact that registers did not take into account migration between rural areas of Ukraine and outside (whether urban or rural areas), in our backward projection from 1959 to 1949, we chose to use the net migration figures obtained from population estimates up to 1950. For 1949, in the absence of a 1 January population estimate and given the small differences observed in 1950–1951 (Table 3.5), we used recorded net migration as it stood. At the same time, we used statistics drawn from the registers in order to distribute our estimated net external migration by sex and age group, hypothesizing that the age structure of external migration was not radically different from that of total migration.

However, for backward projection, we needed net migration by single year of age. Unfortunately, departure statistics related only to age groups, which themselves varied from one period to another.[7] In breaking down age groups into years of age, given the major disruptive effects of history on the age pyramid, our only choice was to work with migration rates. In order to do this, therefore, we made an initial rough backward projection without migration, adding the age-specific deaths estimated in the section above to the total 1959 Census numbers. We thus obtained an initial estimate of populations by age on 1 January of each year, allowing us to calculate annual net migration rates by age group. These rates by age group were then broken down into age-specific rates, using a polynomial model.[8] Applying these

[7]In 1949 and 1950, movements were grouped in an unusual way under the age of 18 (0, 1–3, 4–7, 8–13, 14–15 and 16–17), by year of age from 18 to 24 and by 5-year age group from 25 to 60, with a final group aged 60 and over. From 1951, they were given by year of age up to 20 and in 5-year age groups from 20 to 60, with a final age group of 60 and over.

[8]If we let the rate at age x be y, it is implied that, within a small age interval, it varies as a function of x according to an equation of the type: $y = ax^2 + bx + c$.

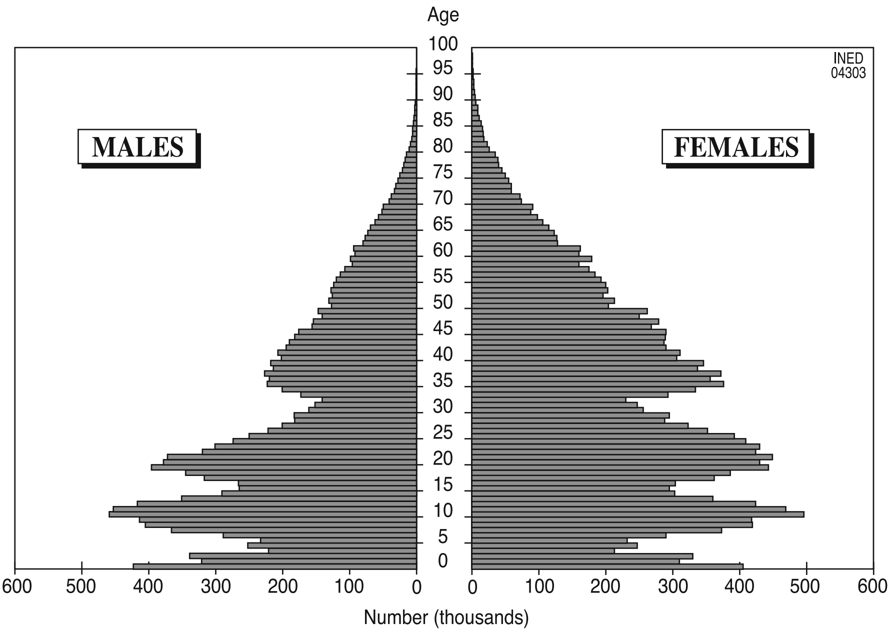

Fig. 3.1 Age pyramid of population of Ukraine on 1 January 1949, by backward projection from 1959 Census

age-specific rates to the previous populations estimated by age, we were able to find a distribution by year of age for each year's net migration, which was then finally adjusted to give totals by age group to match initial amounts of net migration.

3.4.3 Backward Projection of the Population in 1949

Starting from the 15 January 1959 Census population (here assimilated to a 1 January population), it was then very simple to add deaths and subtract net migration, age by age within each cohort, in order to re-estimate the population on each 1 January and in particular on 1 January 1949. At this date, the Ukrainian age pyramid was clearly marked by the consequences of two wars and of the 1933 famine (Fig. 3.1), and these are still evident 10 years later in the pyramid drawn from the 1959 Census (Fig. 3.2).

However, the age distribution obtained in this way suffers from slight anomalies in the sex ratio for younger cohorts, which cannot in any way be explained by these historical events (Fig. 3.3). In all probability, this relates to an under-estimate of post-1949 female migration in our backward projection. We therefore adjusted the sex ratios initially obtained as indicated in Fig. 3.3 and corrected the age-specific female population.

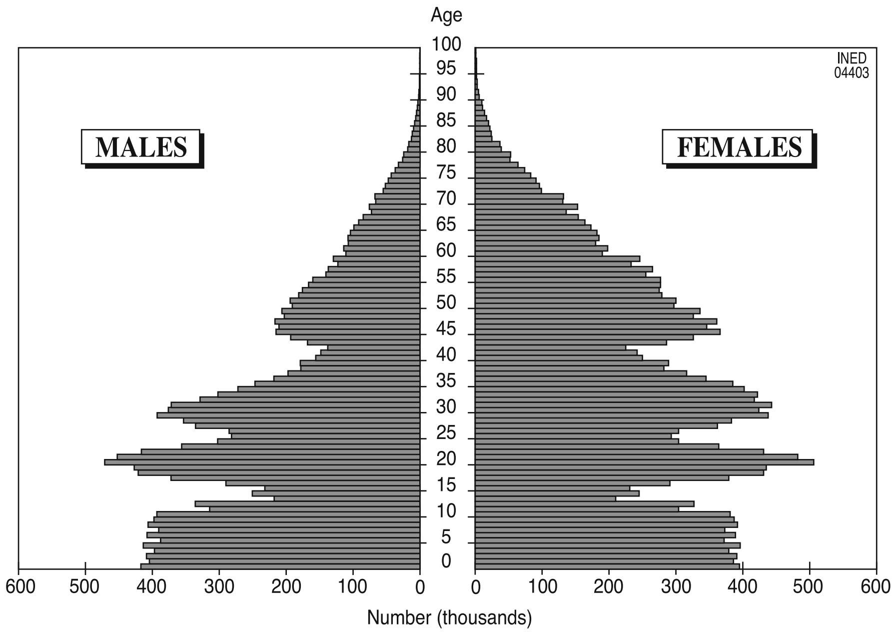

Fig. 3.2 Age pyramid of population of Ukraine, 15 January 1959 Census

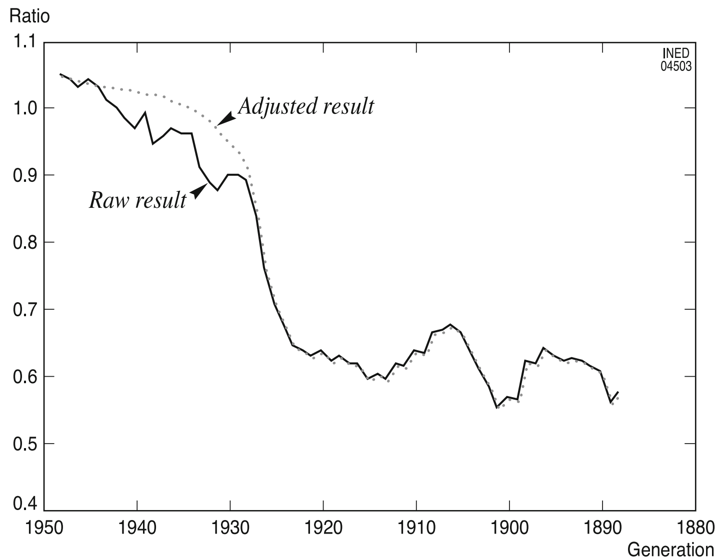

Fig. 3.3 Sex ratio by cohort, resulting from estimated population at 1 January 1949, with adjustment for 1930–1945 cohorts

3.5 Estimating 1939–1949 Losses

As we had done for the 1930s, we first estimated overall losses due to the 1941–1945 war and to the 1947 famine, whether they originated from excess mortality, birth deficit or net outward migration; then we attempted to isolate the losses attributable specifically to excess mortality.

3.5.1 Total Losses

In order to estimate overall losses, all we had to do was compare the population that, with normal fertility and mortality and without migration, Ukraine might have had on 1 January 1949 to the population that we had just backward-projected to the same date.

On the mortality side, we interpolated age-specific and sex-specific probabilities of dying for 1939 and for 1949, hypothesizing that the health situation had returned to normal by 1949. These assessments obviously take into account the corrections for under-registration of deaths mentioned above.

For fertility, results are available from two retrospective surveys carried out in Ukraine in 1960 and in 1967, which enabled us to estimate fertility rates by mother's age group for the preceding 20 years. Then, by simple interpolation between the estimates obtained for 1939 and 1949, an assessment could be made of the fertility that might have been observed from 1940 to 1948 if there had been neither war nor famine and Stalinist repression.

Starting from the population by sex and age on 1 January 1939 (present-day borders), we applied the age-specific and sex-specific probabilities of dying and the age-specific fertility rates for 1939, which enabled us to estimate the expected population by sex and age on 1 January 1940, and thus, by successive iterations, each following year's expected population up to 1 January 1949.

Table 3.6 compares the expected 1949 population by age groups, obtained in this way, to the actual estimated population for the same year. While estimating by backward projection from the 1959 Census gave a total of 35.7 million inhabitants, this initial projection from the 1939 Census gives 48.3 million inhabitants. The difference, 12.6 million, represents an estimate of overall losses due to the crisis.

These 12.6 million people consist of 7.86 million males and 4.73 million females. The deficit is very high for both sexes among the very young (roughly 40%) because of the fall in fertility during the war and the 1947 famine. It is also very high for men of working age because of war losses and deportations (Fig. 3.4). This estimate of overall losses thus combines the effects of excess mortality due to the crisis – which

Table 3.6 One January 1949 population (in thousands) by sex and age groups, expected in the absence of crisis and estimated by backward projection

Age groups	Expected population			Estimated population			Losses		
	Males	Females	Total	Males	Females	Total	Males	Females	Total
0–4	2,556	2,519	5,074	1,528	1,470	2,998	1,028	1,048	2,076
5–9	2,630	2,626	5,256	1,708	1,668	3,376	921	959	1,880
10–14	2,146	2,113	4,259	1,937	1,920	3,857	209	193	402
15–19	1,788	1,806	3,594	1,596	1,669	3,265	192	137	329
20–24	2,426	2,463	4,889	1,661	2,142	3,803	765	321	1,086
25–29	1,911	1,993	3,904	1,043	1,650	2,693	868	343	1,211
30–34	1,644	1,707	3,351	829	1,362	2,192	815	344	1,159
35–39	1,961	2,169	4,130	1,101	1,786	2,886	861	383	1,244
40–44	1,662	1,751	3,412	977	1,484	2,461	685	266	951
45–49	1,299	1,549	2,847	775	1,352	2,127	523	197	720
50–54	965	1,144	2,109	637	1,020	1,657	328	124	452
55–59	733	927	1,660	538	893	1,430	196	34	230
60–64	559	739	1,298	416	701	1,117	143	39	182
65–69	392	644	1,035	290	498	788	102	145	247
70–74	274	430	704	171	318	489	103	112	215
75–79	162	277	440	96	209	305	66	68	134
80–84	78	125	203	39	99	138	39	26	65
85+	38	61	99	22	70	92	16	–9	7
Total	23,224	25,041	48,265	15,365	20,310	35,675	7,859	4,731	12,590

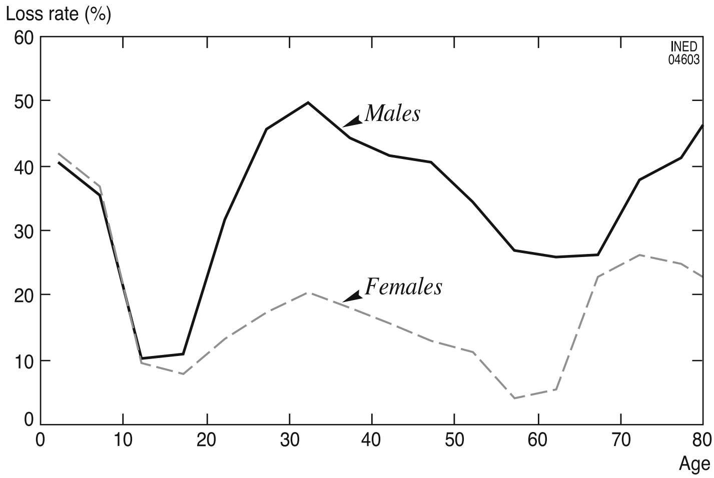

Fig. 3.4 Differences between total numbers expected and total numbers observed in 1949 related to total numbers expected, by age and sex

we are interested in here – with those of the exceptional fall in fertility and of net outward migration, which we must now try to separate out.

3.5.2 *Estimating Population Deficit Due to Fall in Fertility*

In order to isolate the effect attributable specifically to the fall in fertility, we must do our best to repeat the same exercise, comparing the expected population and the actual population by substituting each year's actual births for theoretical births calculated using non-crisis fertility rates. It should then be possible to obtain a new estimate of losses, combining only excess mortality and net outward migration. For 1939–1940 and 1945–1948, we have already estimated (above) real births within present-day borders, from births registered within contemporary borders, using a few simple hypotheses. However, we have expressed reservations about the results for 1940; now we must also form a judgement on under-registration for the years 1945–1948 and, above all, fill in estimates for 1941–1944 – years for which no statistics are available.

3.5.2.1 Assessing Under-Registration of Births from 1945 to 1948

Our backward projection from 1959, continued to the years before 1949,[9] allowed us to estimate the probable trend in this under-registration. Table 3.7 gives, for each year since 1945, the number of births registered by ZAGS (extrapolated to present-day territory) and the births resulting from backward projection. The apparent coverage rate (the ratio of the first group of births to the second) fluctuates fairly strongly at the beginning of the period and rises to an abnormal level – in excess of 1 – at the end of the period (Fig. 3.5).

The rates of more than 1 in 1957 and 1958 can be explained by under-counting of young children in the Census. As for the fluctuations at the start of the period, they are especially marked around 1948 and therefore relate essentially to age heaping (rounding to age 10) in the 1959 Census. We therefore assumed that there was almost complete[10] registration of births in 1958 and that it had improved gradually from about 96% in 1946. On the other hand, for 1945, when registration

[9]In order to do this, we used actual observed mortality (after correction for under-registration) for the years where observations were available (1938–1940 and 1945–1948) and theoretical mortality (i.e. assuming no crisis) for the years where no death statistics were available. In order to take account of under-registration, the process was as explained above. Specifically, the following correction coefficients were used for infant mortality: 1.081 in 1945, 1.084 in 1946, 1.066 in 1947 and 1.090 in 1948.

[10]With the exception, however, of missing births corresponding to the under-registration of infant deaths that will be discussed in Chap. 4. Thus, instead of tending towards 1 in 1958, our estimated coverage rate tended towards 0.996.

Table 3.7 Births registered by ZAGS, backward-projected births from 1959 and accepted births for the period 1946–1958

Year	Births: Registered by ZAGS[a]	Births: Backward- projected from 1959	Coverage rates: Apparent (a/b)	Coverage rates: Estimated	Coverage rates: Accepted births
1945	435,230	502,104	0.87	0.86	506,726
1946	753,493	775,610	0.97	0.96	783,633
1947	712,994	727,406	0.98	0.96	739,346
1948	757,783	862,865	0.88	0.97	783,494
1949	911,641	880,445	1.04	0.97	939,818
1950	844,585	890,939	0.95	0.97	868,144
1951	858,052	854,442	1.00	0.98	879,409
1952	846,434	875,964	0.97	0.98	864,966
1953	795,652	831,550	0.96	0.98	810,696
1954	845,128	873,200	0.97	0.98	858,591
1955	792,696	827,540	0.96	0.99	802,970
1956	822,569	845,507	0.97	0.99	830,795
1957	847,781	832,048	1.02	0.993	853,757
1958	873,483	834,144	1.05	0.996	876,991

[a]For the years 1946–1953, births registered in Crimea have also been added

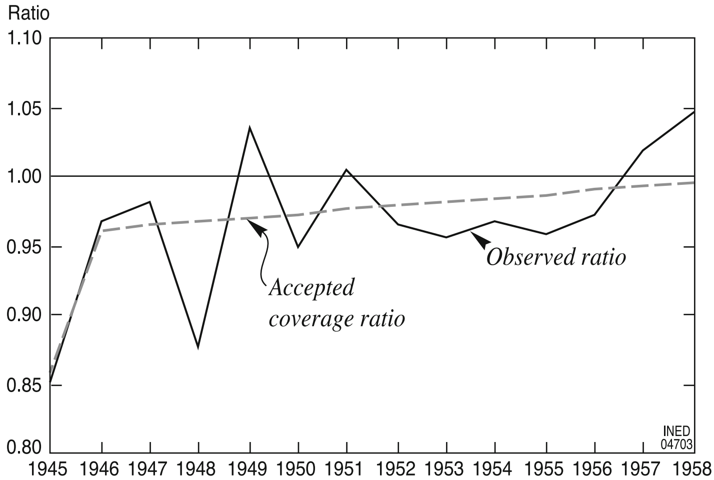

Fig. 3.5 Ratio of backward-projected births to registered births, 1945–1958

was still significantly disrupted by the aftermath of the War, we accepted the apparent coverage rate as real. The last column of Table 3.5 gives the births we finally accepted.

At the same time, this exercise enabled us, as we went along, to correct the irregularities in declared ages at the 1959 Census for the 1946–1951 birth cohorts,

Table 3.8 Correction of 1959 Census numbers for 1946–1951 birth cohorts (total for both sexes)

Birth cohort	Population counted in census	Corrected births	Backward-projected births	Re-estimated population	Adjusted population accepted
1951	763,632	879,409	854,442	785,946	785,842
1950	798,609	868,144	890,939	778,176	778,073
1949	784,347	939,818	880,445	837,239	837,115
1948	773,902	783,494	862,865	702,714	702,627
1947	618,672	739,346	727,406	628,827	628,737
1946	662,282	783,633	775,610	669,132	669,050
Total	4,401,444			4,402,035	4,401,444

which had caused the fluctuations in the ratio of backward-projected births to registered births (Fig. 3.5). At each age, the populations were first re-estimated as follows:

$$P_e(i) = P_r(i) + \left(N_c(i) + N_r(i)\right) * P_r(i) / N_r(i)$$

Where, for each birth cohort i:

P_r is the population recorded in the 1959 Census
P_e is the re-estimated 1959 Census population
N_r is the number of births estimated by backward projection
N_c is the number of births corrected for under-registration

These results were then readjusted to bring their total into line with the Census total (Table 3.8).

3.5.2.2 Re-assessing Births for 1940 and Estimating Births for 1941–1944

For 1940, the number of backward-projected births was lower than the number of observed births (Table 3.9). This is normal, since, between birth and being counted in the 1959 Census, this birth cohort experienced the excess mortality of war, which was not taken into account in our backward projection. However, everything leads us to believe that this difference is lower than it should have been, since the gap was much greater in 1939. Conversely, the latter may actually have been over-estimated, since people born in 1939 were 19 years old at the January 1959 Census and their total number counted in the Census may have been reduced by age heaping (rounding to age 20). In fact, the ratio of observed births to backward-projected births was lower in 1938 than in 1939. However, it remained higher than that for 1940. In order to avoid this age heaping problem, we applied the mean of the ratios obtained for the 3 years 1938–1940 to the year 1939. With the War years over, the ratio between observed births and backward-projected births was under 1.01 in 1945, rather than the 1.08 estimated for 1939. It can be broadly accepted that it would have reduced in a more or less linear way from one birth cohort to the next between 1939 and 1945, and this enabled us to interpolate its values for the years 1940–1944 (Column d, Table 3.9). Finally, accepted births for the missing years

Table 3.9 Non-crisis births, births backward-projected from 1959 and actual births estimated for 1939–1949

Year	Observed births (a)	Backward-projected births (b)	Ratio of observed/backward-projected births (c) = (a)/(b)	Estimate (d)	Accepted births (e) = (b)*(d)
1938	1,468,480[a]	1,338,474	1.097		1,468,480
1939	1,419,038[a]	1,247,109	1.138		1,419,038
1940	1,177,772	1,159,231	1.016	1.067	1,243,165
1941		930,163		1.056	985,325
1942		672,117		1.044	703,141
1943		530,602		1.033	548,323
1944		559,064		1.021	570,957
1945	506,429[a]	502,104	1.009		506,726

[a]Corrected for under-registration (as explained in Chap. 2 for 1938–1939 and produce in the last column of Table 3.7, above, for 1945)

were obtained by applying these coefficients to the backward-projected births (Column e, Table 3.9).

In doing this, we are admitting the hypothesis that the deterioration in registration of births began from 1940 with an under-registration rate of 5% (rather than in 1939 with 1%).

Table 3.10 and Fig. 3.6 compare expected annual trends in births in the absence of crisis with observed births (for present-day territory) and estimated actual births.

The difference between total estimated births and total theoretical births for the period 1939–1948 gives an estimate of the crude birth deficit for Ukraine, resulting from the fall in fertility during this crisis period. However, as it stands, the crude figure of 4.2 million missing births cannot be subtracted from the estimate of overall losses obtained above (12.6 million) in order to deduce losses from mortality and migration, since these births are themselves naturally subject to the risks of death and migration.

If the projection is re-done with the estimated actual births from Table 3.9 for the whole of the period 1939–1948, a new estimate of the expected population in 1949 is obtained – without crisis mortality and without migration. It amounts to 44.7 million instead of the 48.3 million previously estimated, which brings the net effect of the exceptional fall in fertility during the crisis to 3.6 million. It remains to be determined which part of the remaining deficit of 8.8 million people relates to net outward migration and which to the excess mortality of the crisis.

3.5.3 *Estimating Population Deficit Due to Migration*

For the 10 years from 1939 to 1948, ordinary migration statistics drawn from passport registers are available for only 3 years: 1946–1948. However, during the War years and the immediate post-War years, forced migration of various kinds had a

Table 3.10 Annual trends in observed, estimated and expected non-crisis births, from 1938 to 1958

Year	Observed births[a]	Estimated births	Theoretical births
1938	1,453,796	1,468,480	1,468,480
1939	1,404,847	1,419,038	1,419,038
1940	1,177,772	1,243,165	1,371,052
1941		985,325	1,327,280
1942		703,141	1,285,867
1943		548,323	1,249,040
1944		570,957	1,214,222
1945	435,230	506,726	1,182,012
1946	753,493	783,633	1,155,934
1947	712,994	739,346	1,130,581
1948	757,783	783,494	1,103,688
1949	911,641	939,818	1,030,335
1950	844,585	868,144	1,021,300
1951	858,052	879,409	1,010,021
1952	846,434	864,966	996,086
1953	795,652	810,696	973,896
1954	845,128	858,591	947,875
1955	792,696	802,970	918,786
1956	822,569	830,795	912,899
1957	847,781	853,757	917,453
1958	873,483	876,991	929,415
Total 1939–1948		8,283,148	12,438,714
Theoretical births - Estimated births 1939-1948			4,155,566

[a]In present-day territory; not corrected for under-registration

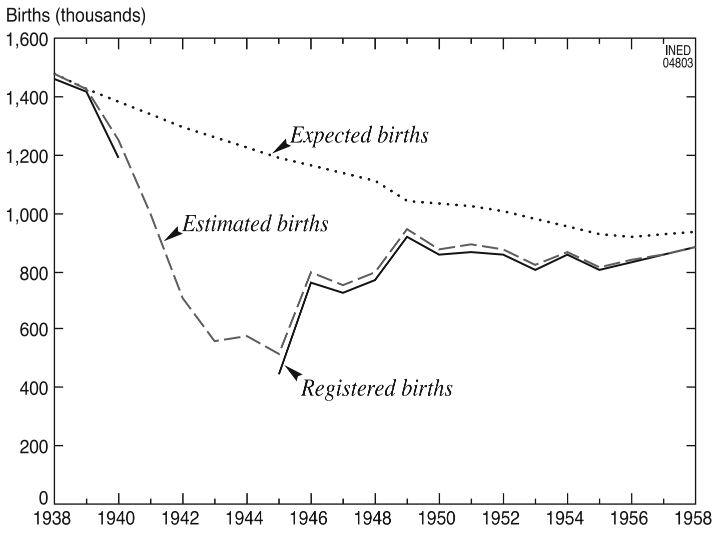

Fig. 3.6 Annual trends in observed, estimated and expected non-crisis births, from 1938 to 1958

strong impact. It can be classified into five categories: (a) exodus, evacuation and voluntary or organized returns, (b) migration flows of Poles and *Volksdeutsch* Germans, (c) forced labour in territories occupied by Germany, followed by repatriation, (d) forced migration (administrative deportation, or *spetsposelenie*) and the return of such deportees, (e) deportation by the Gulag. Let us start with the years 1939–1945, where estimates are the most difficult.

3.5.3.1 Exodus, Evacuation and Voluntary or Organized Returns

The first movements of refugees affected the present-day territory of Ukraine in 1939, with the discriminatory Hungarian policy enforced even before the outbreak of war. The number of Czech and Slovak refugees living in Subcarpathian Ruthenia who were driven out to Bohemia and Slovakia by the Hungarian authorities in 1939 is estimated at 25,000. With the partition of Poland, about 20,000 Jews from Subcarpathian Ruthenia fled to Galicia, which was annexed by Ukraine (Kulischer 1943, pp. 48, 114). Later, in 1942–1943, Eastern Galicia was to receive another 60,000 Jewish refugees from Slovakia (Kulischer 1943, p. 114).

There was also a flow from Romania to Ukraine of Jewish populations who feared Romanian and German persecution. Before June 1941, about 72,000 Romanian Jews headed for the territories newly annexed by Ukraine. This first movement was followed in 1941–1942 by the organized transfer of 185,000 Jews to Ukrainian Transnistria, bordering Bessarabia, under Romanian protectorate from 1941 to 1944.

But the biggest influx of refugees came from the Polish regions annexed by Germany in September 1939. Between September 1939 and June 1941, 300,000 Poles fled to the Polish regions annexed by the USSR (Kulischer 1943). Pro rata to the population of the annexed territories that became part of Ukraine, 180,000 of them can be viewed as coming to Ukraine, with the others settling in Belarus and the Baltic States. In fact, it turned out that these Poles stayed in Ukraine only temporarily, since the Soviet authorities soon carried out deportations to Siberia that impacted just as much on these new refugees as on the Polish settlements established in border territories after the First World War. In total, it is estimated that 225,000 Polish refugees and settlers were deported to Siberia between February 1940 and June 1941.

Exodus and evacuation affecting the Ukrainian population as a whole began with the invasion of the USSR by Germany in June 1941. In total, it is estimated that about 3.5 million people were involved in evacuation or voluntary exodus in that year (IIP 1975, pp. 263–276).

The first refugees began to return on the liberation of Ukraine by the Red Army in 1943–1944. No overall estimate of returns is available – and even less any annual distribution of them. We assumed that 80% of those who were evacuees and refugees at the start of the War (three million people) returned to Ukraine between 1944 and 1946. Taking into account unfolding events, we then assumed that these returns were distributed as roughly 15% for 1944, 50% for 1945 and 35% for 1946.

3.5.3.2 Agreed Exchanges of German or Polish Populations and Volksdeutsch Germans

Under the German-Soviet Pact, Germans in the territories annexed by the Soviet Union were authorized to go and settle in Germany, while Ukrainians, Russians and Belarussians living in the Polish territories annexed by Germany were to go to the USSR.

In fact, very few Poles opted for Soviet citizenship within the framework of the Pact. Only 35,000 were registered in 1940, across the whole USSR (mainly Ukraine and Belarus). On the basis of the proportions of Ukrainian-speaking Poles counted in the 1931 Polish Census, we estimated that about 26,000 of these 35,000 Poles were of Ukrainian origin and therefore settled in Ukraine.

Movement in the opposite direction, of Germans from the USSR, was greater. About 250,000 Germans left Volhynia, Galicia, Bessarabia and Northern Bukovina for Germany from August 1939 to June 1941. Subsequently, with the German occupation of Ukraine, this movement continued, voluntarily or under duress (the *Volksdeutsch* round-up). It grew even more in 1943–1944, as German troops retreated. It is estimated that 325,000 Germans left Ukraine for Germany in 1943 and 1944, of whom about 225,000 were later to be repatriated by the Soviets in 1945–1946. However, the majority of these repatriated Germans were resettled in Siberia or in Central Asia. We do not know in what proportion they returned to Ukraine and, lacking any more precise information, we estimated such returns at a third.

After the war, under the 1944–1945 agreements between the new Poland and the USSR, a large number of Poles were compelled to leave the former Polish territories annexed by Ukraine. Between 1944 and 1946, 787,000 Poles left Ukraine for Poland, of whom 43% were male and 57% female (GUS 1947, p. 80). In exchange, Ukrainians from Poland once more had the possibility of opting for Soviet citizenship, and this time, transfers – probably under compulsion from the Soviet authorities – were on a very much larger scale than in 1940. In total, 518,000 Poles moved to the USSR (GUS 1947), of whom about 480,000 went to Ukraine.

These were not the only transfers arising from intergovernmental agreements. Movements also took place in the context of the 25 June 1945 agreement between the USSR and Czechoslovakia on Subcarpathian Ruthenia. Since no statistics concerning these transfers are available, we have taken into account the total population numbers subject to the agreement: 90,000 Ukrainians living in Czechoslovakia and 33,000 Czechoslovakians living in Subcarpathian Ruthenia.

3.5.3.3 Forced or Voluntary Labour in Territories Occupied by Germany (Ostarbeiter)

Several fairly divergent estimates are available of the number of civilian workers who went to Germany – willingly or otherwise – between 1941 and 1944.

On the one hand, German sources indicate that 2.8 million *Ostarbeiter* were transferred from the Soviet Union to Germany between the start of operations and mid-June 1944 (Polian 1996, p. 117). Pavel Polian includes an additional 100,000 people transferred in the second half of 1944 and thus obtains a total of 2.9 million Soviet workers who left for Germany between 1941 and 1945. He has estimated that 2.3 million of these workers (79%) came from Ukraine. It is probable that this total relates only to pre-war Ukrainian territories. At the very least, it excludes transfers from Galicia, annexed in 1939. This is because, during the War, Galicia was administered by the Government of Lemberg, independent from that of Ukraine. Workers coming from Galicia therefore counted as Polish or of Lemberg origin, not as *Ostarbeiter* – a designation generally reserved for nationals of the USSR within its old borders. German sources enable assessment of the number of Galician workers recruited for labour in Germany at 600,000 (Polian 1996, p. 68). Thus, relying on the data gathered by Polian, the number of workers from the USSR (1945 borders) who moved to the Reich can be calculated at 3.5 million, of whom 2.9 million were Ukrainians.

However, this estimate seems to us excessive. The estimate of the State War Crimes Commission, which assessed the number of Ukrainian workers deported to Germany and Romania at two million (Polian 1996, p. 369) is probably closer to reality.

The final report of the Repatriation Commissions estimated the proportion of Ukrainians among Soviet civilians transferred to Germany at 44%. Moreover, according to Polian (1996, pp. 298 and 307), 1.1 million of the 2.9 million Soviet civilians repatriated from abroad on 1 March 1946 were Ukrainians – slightly under 40%. If we add to these the 1946 and 1947 repatriations, we arrive at a little over 1.2 million people repatriated after the War. However, we must also add *Ostarbeiter* who returned to Ukraine during the German occupation, either because they were judged to be handicapped or incapable of work and so were forced to return by the German authorities, or because they succeeded in escaping in various ways. Polian (1996, p. 68) estimates forced returns between 1942 and 1944 at 150,000 for the whole USSR, but gives no indication of the number of voluntary returns. Relying on German statistics on transfers, deaths and the actual jobs undertaken by *Ostarbeiter* in the German economy, the number of Ukrainian workers who returned to occupied Ukraine can be estimated at 450,000. This would therefore make a total of 1.7 million Ukrainian civilians who returned to Ukraine after the War. Obviously others could have died in Germany or elsewhere, or evaded repatriation. The latter possibility was open, in particular, to those who possessed certain documents – for example, proof of residence in Poland before 1939. Moreover, it is known to be the case that, for the whole USSR, 1.2 million Soviet workers and refugees were never found by the Soviet repatriation services, and the majority of these were considered to be deceased (Polian 1996, p. 72); if we accept the above proportion of 40%, this would mean 480,000 Ukrainians. Finally, 415,000 Ukrainian workers who had moved to Germany were mobilized from there and thus fell outside the repatriation statistics. In total, by adding these 900,000 unrepatriated civilians to the 1.7 million repatriates, we obtain an overall estimate of 2.6 million Ukrainian civilians transferred to Germany. However, this total includes the population transferred under the *Volksdeutsch* scheme (600,000). It therefore seems reasonable to believe that, excluding this category (already mentioned in the previous section), the number of Ukrainian civilians transferred to Germany must have been close to two million. Therefore we think that the State War Crimes Commission's estimate (two million) is closer to reality than the combined total from the sources cited by Polian (2.9 million).

We divided these *Ostarbeiter* by year of departure according to information provided by the German service for recruiting foreign labour: 3% in 1941, 48% in 1942, 30% in 1943 and 19% in 1944.

3.5.3.4 Forced Migration of Ukrainian Populations

Administrative deportations (notably of kulaks), having increased in scale during the 1930s, continued in 1939 and 1940: 133,000 new arrivals were recorded in the camps in 1939, 79,000 in 1940 and 47,000 in 1941 (Zemskov 1990). These statistics relate to the population of the whole USSR, but the proportion that represents Ukrainians can be estimated pro rata to the Ukrainian population in the 1939 Census, i.e. 19%.

Forced population transfers linked to the Second World War must then be added to these pre-War movements. They first affected the Polish population of the annexed territories, involving, according to Viktor Zemskov, about 380,000 people between 1940 and 1941. If we accept that the number of these deportees who were Ukrainians was proportional to the section of the population annexed to Ukraine within the whole taken by the USSR from Poland (60%), deportations of Poles who had become Ukrainians from Volhynia and Eastern Galicia can be estimated at 228,500. In Summer 1941, administrative deportations also involved German communities settled in southern Ukraine and Crimea for two centuries. From 1943, the hunt for collaborators began. It targeted various categories of suspects: repatriated Germans, Crimean ethnic minorities, members of the Organization of Ukrainian Nationalists (OUN), etc. These last three categories are easily identifiable in the deportation statistics kept by the NKVD,[11] which give reason for and year of deportation. To these must finally be added, from 1946, members of the militias (police auxiliaries) and soldiers of the Vlasov army.[12]

Thus, in total, almost a million Ukrainians can be counted as having been forcibly exiled from Ukraine between 1939 and 1947. Table 3.11 summarizes the various forced population movements and their timings.

We distributed the 100,000 Ukrainian nationalists deported between 1944 and 1947 equally across the 4 years. The 83,000 members of the militias and soldiers of the Vlasov army deported in 1945–1947 were distributed as 40,000 in 1945, 21,500 in 1946 and 21,500 in 1947.

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[11] The *Народный комиссариат внутренних дел* [People's Commissariat for Internal Affairs].

[12] The latter category was the object of 283,000 deportations. We have assumed that the proportion of Ukrainians was the same as that observed among prisoners of war (Polian 1996, p. 298), i.e. 29%.

Table 3.11 Forced movements of Ukrainian populations out of Ukraine by the Soviet authorities between 1939 and 1947

Population category	Years of deportation	Number
Poles from annexed Volhynia and Eastern Galicia	1940–1941	228,571
Crimean Germans	1941–1942	52,293
Germans from other regions of Ukraine	1941–1942	83,804
Tatars and other Crimean peoples	1944	228,392
Volksdeutsch	1944–1946	126,106
Ukrainian Nationalists	1944–1947	100,310
Members of the militias and soldiers of the Vlasov army	1945–1947	83,009
Other deportations	1939–1941	48,686
Total	1941–1947	951,171

Sources: IEA 1992 (Institute of Ethnology and Anthropology, Russian Academy of Sciences); Zemskov 1990; Polian 1996

An overwhelming proportion of the kulaks deported before the War were liberated from 1942 onwards: of the 962,000 deported and remaining at 1 April 1942, 810,600 were freed during the War. Thus, on 1 October 1948, there were only 137,881 kulaks still detained outside the gulags (IEA 1992). Since we know that, at the outset, about 16% of deported kulaks came originally from Ukraine (Zemskov 1990), we can estimate the number of kulaks who returned to Ukraine from 1942 onwards at 133,000.

As for most of the wartime deportees – they were freed after Nikita Khrushchev[13] came to power, from the mid-1950s onwards. Their returns are therefore incorporated into standard migration statistics for that period.

3.5.3.5 Deportations to Gulag Camps, Settlements and Prisons

Thanks to the work of Viktor Zemskov (1991a, b, c), which relates to the whole of the USSR, movements into and out of the gulags during the period 1939–1947 can be reconstructed[14] (Table 3.12).

Thus, between 1939 and 1947, about 1.1 million Ukrainians were deported by the Gulag; 620,000 of them were freed, 170,000 died in captivity and 40,000 of them left the system for other reasons (including by escaping).

[13] It was actually Khrushchev who had, on Stalin's orders, conducted the deportation of Ukrainian nationalists!

[14] We know the distribution of Gulag detainees by ethnic origin, at the start of each year from 1940 to 1947. We estimated the proportion of Ukrainians among the detainees by applying the proportion of Ukrainians observed in the 1939 Census to each ethnic group, although we were aware of the risk of under-estimating deportees originating from the territories newly acquired by Ukraine.

Table 3.12 Movements of Ukrainians into and out of Gulag camps, settlements and prisons

Year	Population at start of year	New detainees	Deaths	Freed	Other departures
1939	277,705	44,016	8,958	44,947	1,129
1940	266,687	131,939	9,061	56,385	10,169
1941	323,011	75,315	18,048	107,272	9,475
1942	263,530	78,465	45,448	84,563	554
1943	211,431	53,391	33,691	62,346	3,211
1944	165,574	110,108	15,767	33,545	1,670
1945	224,700	217,504	13,474	88,745	4,802
1946	335,183	169,053	8,968	55,258	4,888
1947	435,123	218,940	18,025	89,011	7,795
1948	539,232				
1939–1947		1,098,731	171,440	622,072	43,692

Source: Zemskov 1991a, p. 11; Zemskov 1991b, p. 12

However, during the German occupation, the new Ukrainian internees were essentially people who had previously been refugees or evacuees, and therefore they are already counted in the estimates made above for these categories of departures from Ukraine. In order to avoid double-counting, we reduced the entries in Table 3.12 for the years 1942–1944 to zero. This reduces the total number of deportations of Ukrainians to the gulags between 1939 and 1947 to 857,000.

On the other hand, once freed, prisoners did not all return to Ukraine immediately. Those who were freed in the early years of the War were first mobilized by the army or redeployed to Siberia with the military industry, and in a lot of cases it was only at the end of the War that their return to Ukraine actually became possible. An estimated 20% never returned: either they died at the front, or they tried to settle in other regions, far from the places where they were known and had been arrested. So we estimated that, of the 254,000 freed in 1941–1943, 203,000 returned to Ukraine – 15% in 1944, 50% in 1945 and 35% in 1946.

3.5.3.6 Summary of Arrivals and Departures for Ukraine in the Period 1939–1947

Table 3.13 summarizes the spread of these different categories of forced or voluntary emigration and return across the period 1939–1947.

In total, 9.4 million people left Ukraine from 1939 to 1947 and 6.5 million returned during the same period, which gives total net outward migration of 2.9 million.

The next step must be to distribute these population movements by sex and age.

3.5.3.7 Distributing 1939–1947 Migration by Sex

The sex ratio of Germans from Bessarabia and Northern Bukovina who moved to Germany before 1941 is known: 46,000 males and 47,000 females arrived from Bessarabia, along with 20,000 males and 22,000 females who had left Northern

Table 3.13 Estimated exceptional migration flows into and out of Ukraine 1939–1947 (today territory, thousands)

Year	Exodus and evacuations	Poles	Germans	Forced labourers or voluntary workers to German territories	Deportations	Gulag	Repatriations	Total
Departures from Ukraine								
1939	25		40		25	44		134
1940			215		103	132		450
1941	3,500			48	278	75		3,901
1942				1,128	7			1,135
1943	267		95	518				880
1944	178	117	230	333	259			1,117
1945		525			155	218		898
1946	33	294			65	169		561
1947					59	219		278
Total	4,003	936	580	2,027	951	857		9,354
Returns								
1939	36	90			2	45		173
1940	36	116			14	56		222
1941	93	27			4			124
1942	123	82		236				441
1943				130				130
1944	431		25	70	18	63	178	785
1945	1,435	319	47		54	191	997	3,043
1946	1,095	165	3		35	126	72	1,496
1947			0		22	89	11	122
Total	3,249	799	75	436	149	570	1,258	6,536

Bukovina (Schechtman 1946, pp. 199–200). We applied the same distribution (49% male, 51% female) to the 120,000 Germans of Polish origin who left territories annexed by Ukraine to go to Germany in 1939–1940.

For the two million Ukrainian workers who left for Germany between 1941 and 1945, we used the same sex distribution as that given by German statistical services for the whole foreign workforce on 15 November 1943. At this date, out of 1.8 million *Ostarbeiter*, 47% were male and 53% female (Polian 1996, p. 111). The sex ratio of repatriates is also known: the 1.1 million Ukrainians repatriated in 1944–1946 consisted of 34% male and 66% female (Polian 1996). The proportion of females among those transferred to Germany was therefore larger on return than on departure. This is primarily due to the filtering that operated in the evacuation camps for repatriates: of the 120,000 people handed over to the NKVD for subsequent deportation, 90% were male and only 10% female. Allowance must also be made for excess male mortality in Germany (including the massacres carried out by the Nazis and then by the NKVD and the Red Army at the end of the War), and for the fact that men were more successful in evading repatriation; women who had families feared repatriation less than being sent to the camps and losing their right to return to Ukraine.

The sex distribution of those deported after the liberation of Ukraine, although not known at departure, was described fairly accurately by the administrations of the places where they were detained. Women formed less than 1% of members of militias, soldiers in the Vlasov army and deported collaborators (Zemskov 1990). Other sex distributions are also known: of deportees from Crimea on 1 January 1949 – 44% male and 56% female (IEA 1992); of Ukrainian nationalists on 15 July 1949 – 36% male and 64% female (Zemskov 1990); of repatriated Germans on 1 January 1953 – 39% male and 61% female (IEA 1992). We assumed that the same proportions pertained at the time of deportation, even though this probably under-estimates the proportion of males.

In 1938, 49% of deported kulaks were male; by 1948, the figure was 45% (Zemskov 1990; IEA 1992). We estimated that this reduction was essentially due to male excess mortality and took the view that the sex distribution of the 150,000 kulaks freed between 1939 and 1948 was the same as that of kulaks detained in 1938: 49% male and 51% female.

The sex distribution of Gulag detainees was assumed to have remained constant with that of detainees on 1 January of the year under consideration. Thus, in total, of the 850,000 newly-detained Ukrainians and the 622,000 freed, 86% were estimated to be male and 14% female.

No sex-specific statistics are available relating to refugees and evacuees from the beginning of the War. We divided the 3.5 million refugees and evacuees by sex according to the proportions of the civilian population on the eve of the War – meaning the projected population at the start of 1941 less the male population mobilized by the army.[15] Thus, the 3.5 million 1941 refugees can be divided into two million females and 1.5 million males. We then estimated that 80% of them (1.7 million females and 1.3 million males) were able to return home between 1944 and 1946.

In the absence of any other source, we estimated that refugees and deportees from the Polish territories annexed by Ukraine were divided by sex in the same way as the 1939 population of the annexed territories (49% male and 51% female). We did the same for the 136,000 Ukrainian Germans deported by the Soviet authorities at the beginning of the War and for the 325,000 Germans evacuated by the Nazis in 1943–1944, relying on the results of the 1939 Census relating to this population.

Table 3.14 gives the annual sex-specific distribution of all these arrivals and departures for the present-day territory of Ukraine. Thus we finally arrive, for the whole period 1939–1947, at a net loss of 1.4 million males and 1.5 million females.

However, as we have already said, we have standard migration statistics from 1946 onwards. Therefore, our estimates for the years 1946 and 1947 can be compared with these results (Table 3.15). In 1946, standard statistics had not long been re-established and their quality was still poor; they significantly under-estimated

[15] In order to estimate the number of men mobilized, we assumed that rates of mobilization varied with age from 60% at 18 years old through 40% at 30–15% at 40, making a total of four million men.

Table 3.14 Estimated exceptional migration flows into and out of Ukraine 1939–1947 (today territory, thousands)

	Departures from Ukraine		Returns		Net flow	
Year	Males	Females	Males	Females	Males	Females
1939	84	50	103	71	19	21
1940	272	179	132	91	−140	−88
1941	1,715	2,187	61	63	−1,654	−2,124
1942	537	597	213	228	−324	−369
1943	399	481	62	69	−337	−413
1944	498	619	375	409	−123	−210
1945	497	401	1,425	1,618	928	1,217
1946	320	241	707	788	387	547
1947	209	69	91	31	−118	−38
Total	4,531	4,823	3,169	3,367	−1,361	−1,456

Table 3.15 Estimated migration for the years 1946–1948 according to standard statistics (in thousands)

	Departures from Ukraine		Returns		Net flow	
Year	Males	Females	Males	Females	Males	Females
1946	152	198	570	545	417	347
1947	192	216	320	274	128	58
1948	174	182	300	248	126	66

migration linked to the War. Our estimate is therefore probably closer to reality. On the other hand, the breakdown by categories on which we relied becomes less and less effective as migration resumes a normal course and as voluntary migration flows – for which standard statistics are better able to account – increase in scale again. That is why, in our general assessment of 1939–1948 migration flows, we used both our estimates for the years 1939–1946 and the results of standard statistics for 1947 and 1948 (Table 3.16).

In total, for the period that interests us here (1939–1948), the crude figures for net outward migration were 1.0 million for males and 1.3 for females, 2.3 million in total, which must now be distributed by age.

3.5.3.8 Age Distribution of Migration Flows

When distributing population movements by sex, we were able to rely on certain specific reference points; however, there is only a very small amount of information on the age of migrants in the period 1939–1945. We had to try to choose different models of distribution, corresponding as far as possible to the characteristics of each category of migrants (Table 3.17).

Table 3.16 Estimated migration finally used for the years 1939–1948 (in thousands)

	Departures from Ukraine		Returns		Net flow	
Year	Males	Females	Males	Females	Males	Females
1939	84	50	103	71	19	21
1940	272	179	132	91	–140	–88
1941	1,715	2,187	61	63	–1,654	–2,124
1942	537	597	213	228	–324	–369
1943	399	481	62	69	–337	–413
1944	498	619	375	409	–123	–210
1945	497	401	1,425	1,618	928	1 217
1946	320	241	707	788	387	547
1947	192	216	320	274	128	58
1948	174	182	300	248	126	66
Total	4,688	5,153	3,698	3,859	–990	–1,295

Table 3.17 Distribution of migration flows by year of age, 1939–1946: models used

Categories	Reference age structure
Refugees	Projected population at start of year (1941: for males, civilian population only)
Poles	Population of new territories annexed in 1939–1940
Germans	Projected population at start of year
Ostarbeiter	Arrivals in 1946 (0 for ages 0–17)
Administrative deportees	Projected population at start of year
Gulag	Arrivals in 1946 (0 for ages 0–17)
Repatriations	Arrivals in 1946 (0 for ages 0–17)

Thus, transfers of German populations and administrative deportations of Ukrainians were distributed by age in proportion to the total projected Ukrainian population at the start of the year concerned. The same type of distribution was applied to refugees, with the exception of departures of males during the year 1941, to which we applied the age structure of just the male civilian population (in order to take mobilization into account). Migration of Poles was distributed pro rata to the population of the territories annexed in 1939. *Ostarbeiter*, repatriates and Gulag detainees were distributed pro rata to 1946 migration flows.

However, we qualified these reference models to some extent. Thus we assumed that there were no children under 18 years of age among Ostarbeiter, repatriates or Gulag detainees.

These estimates of migration flows and of their sex and age distributions enabled us to calculate sex-specific net migration for each of the birth cohorts present in 1939 or born between 1939 and 1949. Most of the cohorts born before 1920 (adults in 1939), both male and female, manifested net outward migration during the period 1939–1948. Most of the female adult cohorts lost 7–8% of their total number from 1939 just because of migration, and this rate reached as much as 10% for the cohorts

Table 3.18 Components of overall losses during the crisis years 1939–1948: proportions due to crisis mortality, birth deficit and migration, by sex

	Total numbers (in thousands)		
Population and losses	Males	Females	All
Population			
– backward-projected to 1949 (1)	15,365	20,310	35,675
– expected without any crises (2)	23,224	25,041	48,265
– expected, using non-crisis mortality and reconstructed births (3)	21,471	23,277	44,748
– expected, using non-crisis mortality, reconstructed births and migration out of Ukraine (4)	20,632	22,123	42,755
Losses			
– totals (2)–(1)	7,859	4,731	12,590
– due to birth deficit (2)–(3)	1,753	1,764	3,517
– due to outward migration (3)–(4)	839	1,154	1,993
– due to excess mortality (4)–(1)	5,267	1,813	7,080
Of which, for mortality:			
(a) during the War, 1941–1945	5,041	1,663	6,704
(b) pre- and post-War, 1939–1940 and 1946–1948	226	150	376

born between 1914 and 1918. Net migration for males looks slightly different, since the cohorts mobilized by the army had little involvement in the departures of the early War years. Thus, the 1905–1926 birth cohorts lost less than 5% of their total number to migration. In contrast, the cohorts less affected by mobilization lost far more to migration: the most affected was the 1890 cohort, which lost 15% of its total number to migration.

3.5.4 Losses Due to Excess Mortality Resulting from the Crisis

As we have already noted in regard to births, the crude total of losses to migration (2.3 million) cannot be subtracted directly from the overall losses resulting from migration and from crisis mortality, since migrants are themselves subject to mortality and fertility. Therefore the projection must be repeated again, using the estimated data for migration flows by birth cohort. We finally arrive at Table 3.18, which summarizes the different components of total losses for the period 1939–1948. Given the process we used, these results were obviously obtained by sex and by cohort.

Using this approach, therefore, the net effect of the excess mortality of the crisis can finally be estimated at 7.1 million dead between 1939 and 1949, of whom 5.3 million were male and 1.8 million female. However, as with migration and births,

Table 3.19 Annual distribution of deaths due to the excess mortality of the crisis, 1941–1948

	Males		Females	
Year	Thousands	Distribution 1941–1945 (%)	Thousands	Distribution 1941–1945 (%)
1941	1,591	30	242	14
1942	1,596	30	491	29
1943	1,057	20	622	38
1944	755	14	191	11
1945	341	06	135	8
1946	33		16	
1947	174		122	
1948	20		12	
Sub-total 1941–1945	5,339	100	1,682	100
Total	5,567		1,831	

this net effect is lower than the crude effect of mortality operating alone: when an expected population and an observed population are compared, the absolute difference diminishes as we move further away from the disruptive event. In order to come closer to reality, we had to attempt to work on shorter periods. To start with, we can distinguish between the pre- and post-War years (1939–1940 and 1946–1948), for which a reliable record of deaths is available (once corrections for infant mortality and old-age mortality, already mentioned, are taken into account), and the War years (1941–1945), for which mortality has to be reconstructed. If the 376,000 excess deaths – estimated by comparing ZAGS-registered deaths (after correction) with theoretical deaths (i.e. assuming no crisis) for the pre-and post-War years – are deducted from the 7.1 million deaths for the period 1939–1948, estimated net losses due to the excess mortality of the years 1941–1945 amounts to 6.7 million deaths. This number must first, for each cohort, be distributed across the 5 years under consideration, and then readjusted in order to find the crude number of deaths attributable to excess mortality.

Distribution between calendar years for males was made pro rata to recorded military losses (including deaths of prisoners of war) and for females according to the intensity of disruption caused by hostilities and political repression.

In order to readjust the estimated numbers of deaths, we weighted the deaths for each birth cohort and for each calendar year by the inverse of the theoretical probability of survival between the year under consideration and 1949. Reconstructed in this way, deaths for the period 1941–1945 then amounted to 7 million instead of the 6.7 million initially estimated. Table 3.19 shows their annual distribution.

Finally, total losses in Ukraine for the period 1939–1948 were as follows:

– birth deficit: 4.1 million;
– net outward migration: 2.3 million;
– excess mortality due to the crisis: 7.4 million.

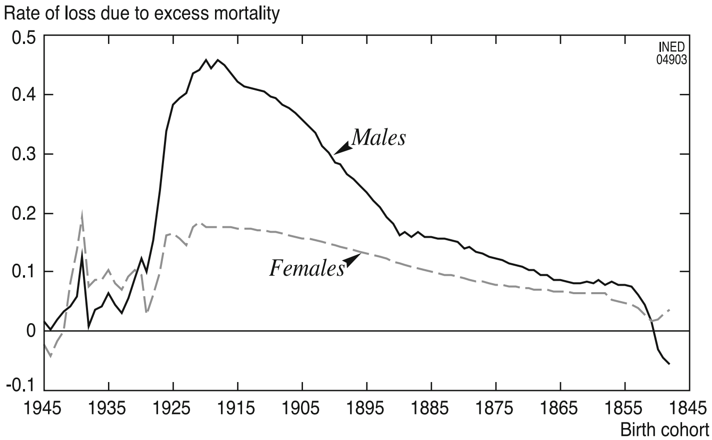

Fig. 3.7 Rate of loss due to excess mortality between 1939 and 1949, by cohort

This gives a total of 13.8 million losses, instead of the 12.6 million estimated at the outset by comparing expected and observed 1949 populations.

But we should now return to the topic of mortality. Figure 3.7 gives the sex-specific cohort distribution of rates of losses due solely to the excess mortality of the crisis, observed during the period 1939–1948.

The excess mortality that struck males during this period was appalling. From this alone, some birth cohorts lost almost half their total number: each of the cohorts born between 1910 and 1920 (aged between 20 and 30 at the start of the War) lost over 40% of its total 1939 number. More generally, the excess mortality of the crisis took more than 20% of the total of all cohorts of males born between 1892 and 1928 and over 10% of all those born between 1869 and 1930. Females, markedly less affected by military operations and political repression, obviously experienced lower excess mortality. Even so, it was in the order of 10% or more of all females of working age.

3.6 Annual Trends in Life Expectancy Between 1939 and 1959

Finally, on the basis of these estimates, life tables for each of the years 1939–1948 can be reconstructed and linked to the series of life tables that can be computed directly from standard data (corrected for under-registration) for the years 1949–1959 and from backward projection of the population. Figure 3.8 illustrates age-specific trends in probabilities of dying over the War years, compared to the situations at the start and end of the period (1939 and 1959).

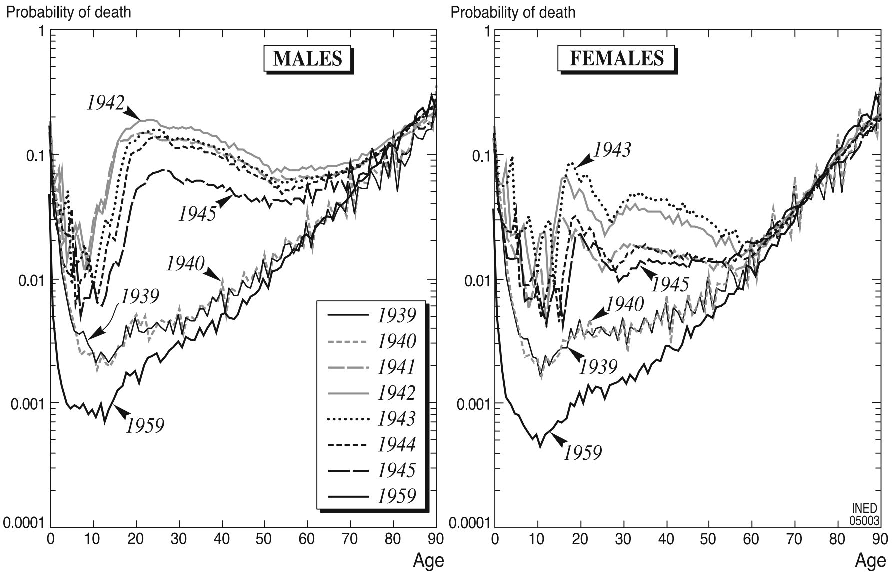

Fig. 3.8 Age-specific probabilities of dying, estimated for the years 1941–1945 as compared to 1939–1940 and to 1959, by sex

Adult male mortality seems particularly high between the ages of 20 and 60. The most deadly year was 1942, but 1941, 1943 and 1944 were hardly any better. 1945 was also a year of very severe male mortality, although it was clearly falling by then. Women also suffered exceptionally at these ages, but in a slightly more diverse way both in terms of age and calendar year. Adult female mortality seems to have been particularly high around the age of 20 and reached a second peak at about 35. However, it might be questioned whether this corresponds to reality or results from the hypotheses we used in distributing migration and crisis deaths. Similarly, and somewhat differently from what we observed for men, the years 1942 and 1943 were significantly more devastating for females than 1941 and 1944, which came closer to the 1945 level. This difference is more plausible than the age peaks we observed: men experienced the full force of military operations, while women suffered more from the civilian consequences of occupation and repression.

These life tables show that life expectancy, which was close to 50 for males and 55 for females on the eve of the War, fell abruptly to less than 14 years for males and less than 21 for females in the bleakest years (Table 3.20 and Fig. 3.9). It rose again in 1945 and especially in 1946, when it was already markedly higher than the pre-War level (51 for males and 59 for females). However, with the 1947 famine, it fell again to 40 for males and 50 for females. From 1948 to 1959, the upward trend was re-established as regular, so that by 1959, male life expectancy had reached 65.2 and female, 71.1.

Table 3.20 Life expectancy at birth, 1939–1959

Year	Males	Females	Year	Males	Females
1939	47.7	52.5	1950	59.0	66.3
1940	47.4	52.4	1951	59.0	65.5
1941	13.6	36.3	1952	59.9	66.2
1942	13.7	25.4	1953	60.7	66.8
1943	15.9	20.6	1954	61.7	67.4
1944	18.4	39.5	1955	63.5	69.3
1945	26.9	44.2	1956	64.4	70.2
1946	51.2	59.4	1957	64.4	70.3
1947	40.3	50.2	1958	66.2	72.2
1948	53.8	62.0	1959	65.2	71.1
1949	56.8	64.5			

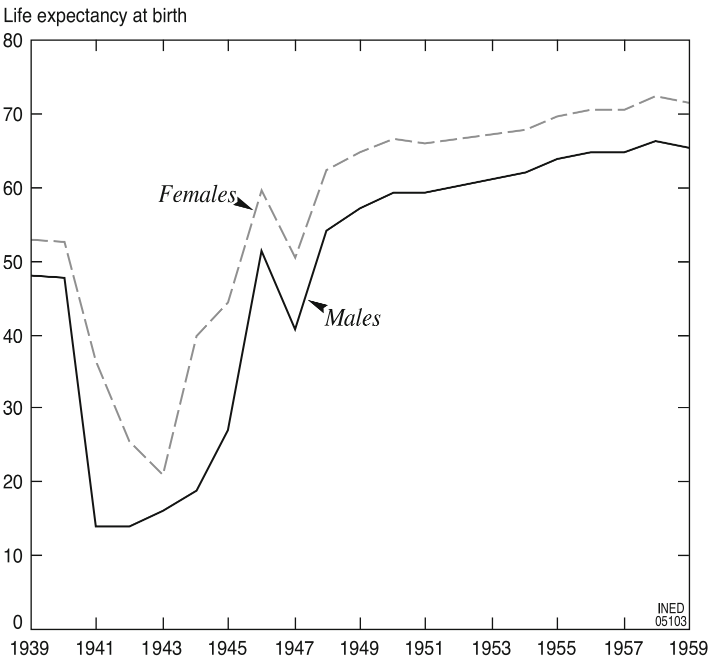

Fig. 3.9 Trends in life expectancy at birth, 1939–1959, by sex

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Part II
Eighty Years of Trends in Sex-Specific and Age-Specific Mortality

Introduction to Part II

The age structure of mortality in Ukraine has changed profoundly since the late 1920s. It has followed a very different path from that taken in Western European countries and, in contrast, very close to that of the other countries of the former USSR. In presenting this age structure, we shall take up the comparisons with France and Russia that we used in previous Introductions to emphasize the distinctive nature of life expectancy trends in Ukraine (Chap. 5). But it is imperative that we first discuss the quality of registration of deaths in Ukraine in some depth, and this will lead to an attempt to correct the historical series (Chap. 4).[1] Two short chapters will then look at two specific issues that may throw additional light on the reasons for Ukrainian mortality trends: an analysis of the differences in age-specific mortality between Ukrainians and Russians, according to whether they live in Ukraine or in Russia (Chap. 6), followed by a discussion of the extent of possible cohort effects (Chap. 7).

[1] Annex II, available at the Website (http://www.demogr.mpg.de/books/drm/009 or http://extras.springer.com/), gives the complete series of annual estimates by year of age from 1927 to 2000, for each of the four main functions of the complete annual life tables: probabilities of dying, number of survivors, number of deaths, life expectancies.

Chapter 4
Is Mortality Under-Estimated?

France Meslé, Jacques Vallin, and Vladimir Shkolnikov

Before assessing changes in age- and sex-specific patterns of mortality in Ukraine, we have to decide what line to take towards shortcomings, often mentioned in the literature, in recording deaths. In order to judge the quality of registration of deaths, reference is generally made to age-specific model life tables. Just as for Russia (Shkolnikov et al. 1995a), the specific nature of mortality in Ukraine in the adult age groups makes the use of these models tricky, if not futile. However, we must take into consideration the criticisms often made of the quality of mortality data for the very young as well as for the old.

4.1 Infant Mortality

Several problems with infant mortality in the Soviet Union have been reported (Anderson and Silver 1986; Blum and Monnier 1989; Velkoff and Miller 1995), and we should begin by discussing how they relate to the real Ukrainian situation.

F. Meslé (✉) • J. Vallin
Institut National d'Études Démographiques, Bd. Davout 133,
75980 Paris Cedex 20, France
e-mail: mesle@ined.fr; vallin@ined.fr

V. Shkolnikov
Max Planck Institute for Demographic Research, Konrad Zuse Strasse 1,
18057 Rostock, Germany
e-mail: shkolnikov@demogr.mpg.de

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4.1.1 The Boundaries of Deaths Under the Age of 1

A first problem that is sometimes mentioned (Blum and Monnier 1989; Ksenofontova 1994) relates to errors in classifying deaths under 1 year by age. In fact, this problem essentially concerns the Central Asian Republics and the Caucasus, and even some regions of Russia. It may perhaps have played some role in the European part of the USSR (and therefore in Ukraine) before the War (see Fig. 5.4, Chap. 5), but its consequences there were probably marginal considering the over-arching problem of under-registration of infant mortality.

4.1.2 The 1974 Change

A second problem involves the change which, as Barbara Anderson and Brian Silver (1986) explain, was introduced into the registration system in 1974 and, they claim, produced an increase in the number of recorded infant deaths.[1] A jump in the statistical series of several republics in the USSR can indeed be observed around 1974, but it is not systematic. The issue had already been mentioned by Petukhov and Nikolaev (1981, cited in an unpublished document by Carlson and Bernstam and taken up by Velkoff and Miller, 1995). But for them, this growth in infant mortality – which was actually spread over several years – was due, at least in part, to a change in health care strategy adopted in the mid-1960s, when the provision of midwives and paediatric beds to health care units in villages with less than 700 inhabitants (90% of the Soviet rural population in 1970) was cut, as they were not considered to be financially viable. This was followed, according to Carlson and Bernstam, by a significant increase in infant mortality in rural areas. But what about the particular country that concerns us?

In Ukraine, the increase in infant mortality extended over the period 1971–1976, without any abrupt discontinuity in 1974. On the other hand, if a more precise distinction is drawn between the different components of infant mortality (age and cause), an unexpected jump can be observed between 1973 and 1974 – firstly, for mortality in the first month of life (Fig. 4.1) and secondly, for diseases of early infancy (Fig. 4.2); both cases contrast with a regular rise in the rest of infant mortality over 5 or 6 years from the beginning of the 1970s. Therefore it seems likely that for Ukraine, this phenomenon of a real rise in post-neonatal mortality is combined with a phenomenon that is smaller in scale but more specific, since it may correspond to a change in the definition of live births, stillbirths and infant deaths.

Let us assume here that this unexpected jump – specific to the given age or to causes where infant mortality may indeed be very sensitive to changes in definition – is due to new instructions issued for the registration of deaths. We can then attempt

[1] In 1971, TsSU (the Central Statistical Directorate) decided to record numbers of perinatal deaths and, in 1974, a perinatal death certificate was brought into use.

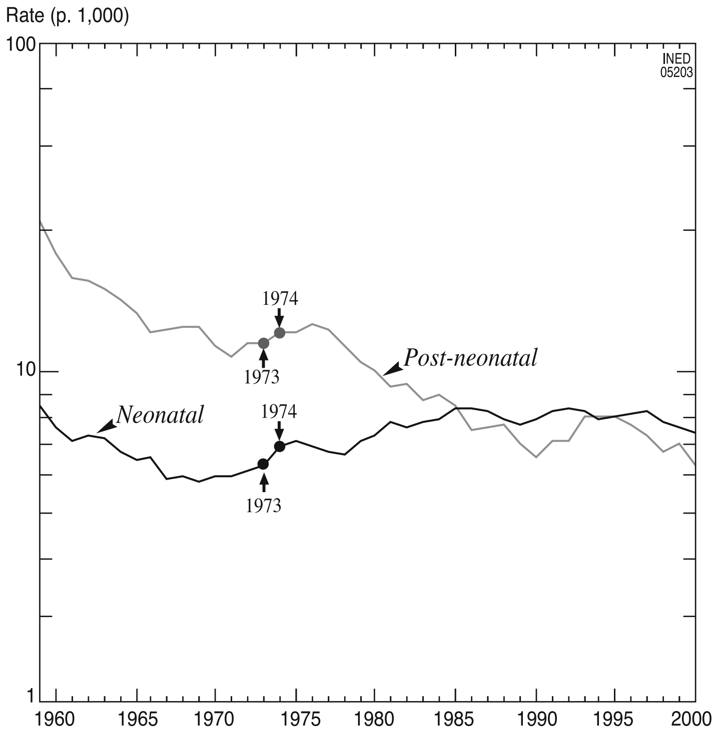

Fig. 4.1 Trends in neonatal and post-neonatal mortality in Ukraine from 1959 to 2000

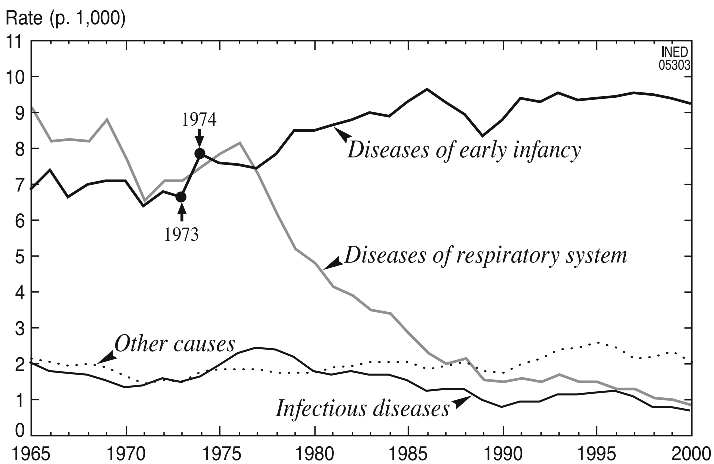

Fig. 4.2 Trends in main causes of infant mortality in Ukraine from 1965 to 2000

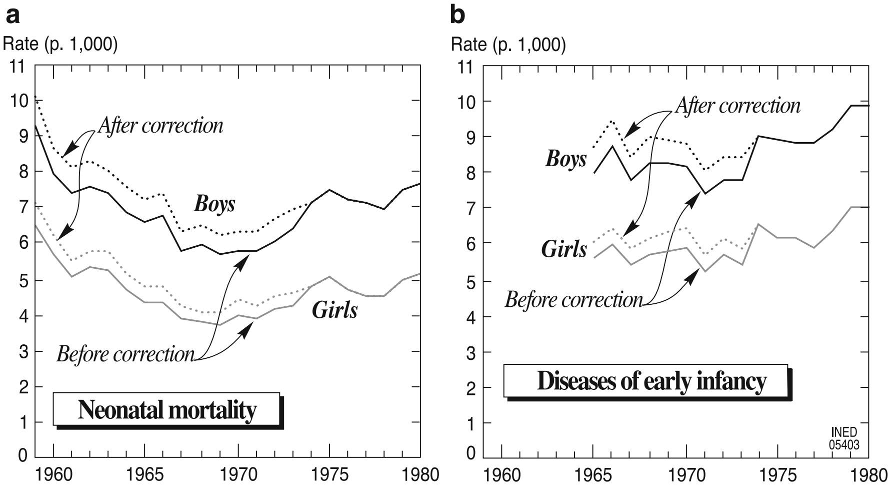

Fig. 4.3 Trends for 1965–1980 in (**a**) neonatal mortality rate and (**b**) rate of infant mortality from diseases of early infancy, before and after correction for the change in registration practice introduced in 1974

to correct the recorded series for the years before 1974, increasing them by a fraction that allows us to bring the 1973 rate in line with the observed trend. We did this, separately for each sex, first for neonatal mortality[2] (Fig. 4.3a), then for mortality from diseases of early infancy[3] (Fig. 4.3b).

Once neonatal mortality (or mortality from diseases of early infancy) corrected in this way has been added to post-neonatal mortality (or mortality from other causes), we obtain the corrected series of infant mortality rates for the years before 1974. Whatever the method (age or cause), the result is fairly similar. Table 4.1 gives the ratios that are finally obtained between the corrected rate and the recorded rate. As we shall see later (Chap. 9), for diseases of early infancy this correction could be made only from 1965[4] while for neonatal mortality we were able to go back to 1959. At the same time, it seems to us more logical to refer, for the correction we are making, to neonatal deaths rather than to deaths from diseases of early infancy, which may run beyond the neonatal period and, at the same time, do not necessarily cover the whole of the early neonatal mortality that is at issue here.

[2] Mortality at 0–27 days.

[3] Mortality from the following causes (the figures in brackets indicate the relevant item numbers in the Soviet classification): congenital anomalies of heart (147), other congenital anomalies (145, 146 and 148–150), birth trauma (151), intrauterine hypoxia and birth asphyxia (152), congenital pneumonia and foetal aspiration (153), other newborn respiratory conditions (154), other perinatal conditions (155–157).

[4] At this stage, we have not yet analysed the move from the 1952 to the 1965 cause-of-death Classification, and therefore we cannot correctly link the 1959–1964 series of deaths from diseases of early infancy with the post-1965 series.

Table 4.1 Correction coefficients for infant mortality, obtained by both approaches (age and cause of death)

	Basis of calculation			
	Deaths from 0 to 27 days		Diseases of early infancy	
Year	Boys	Girls	Boys	Girls
1959	1.021	1.020		
1960	1.023	1.021		
1961	1.024	1.021		
1962	1.025	1.023		
1963	1.025	1.023		
1964	1.026	1.023		
1965	1.027	1.023	1.025	1.022
1966	1.029	1.026	1.027	1.024
1967	1.026	1.023	1.024	1.022
1968	1.026	1.022	1.024	1.021
1969	1.025	1.023	1.023	1.021
1970	1.028	1.026	1.026	1.024
1971	1.030	1.027	1.028	1.025
1972	1.029	1.026	1.027	1.024
1973	1.030	1.027	1.027	1.025

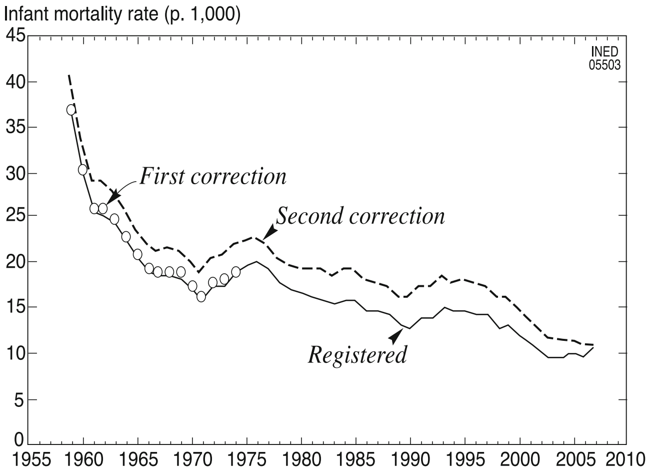

Fig. 4.4 Trends in recorded infant mortality rate and infant mortality rate corrected to take account of 1974 change and 2005–2007 adoption of WHO definition of live birth

Therefore, in the end we chose to correct infant mortality rates by relying on the sets of coefficients calculated from neonatal mortality. The result is illustrated by the 'first correction' in Fig. 4.4, for both sexes. For 1938–1939, when the recorded infant mortality rate was much higher – in the order of 140 per thousand – the effect of this correction must obviously be much smaller, and we arbitrarily used a coefficient of 1.01.

4.1.3 Disparity Between Soviet and WHO Rules

The third problem, which again concerns the definition of live birth, relates to the whole period under study here. The definition in force in the USSR at the time was more restrictive than that of the WHO: children born either before 28 weeks' gestation or weighing less than 1,000 g or measuring less than 35 cm long were never counted as live births or infant deaths if they died during the course of their first week of life, but only as stillborn. Under the WHO rules, it is sufficient for a child who dies to have presented any sign of life whatsoever for both its birth and its death to be registered as such. This most certainly gave rise to under-estimation of neonatal mortality.

Soon after their independence, the Baltic States adopted the WHO definition – Latvia and Lithuania from 1991, and Estonia in 1992 (Estonian Medical Statistics Bureau et al. 1993). This was immediately followed by a clear discontinuity in the regularity of the corresponding statistical series. Thus, in the case of these republics, it was possible to attribute an estimated 50% increase in early neonatal mortality (at 0–6 days) to the change in definition (Shkolnikov et al. 1995a).

A definition close to that advocated by the WHO was also introduced in Russia, in January 1993. However, although this change coincided with a significant increase in infant mortality in 1993, the latter essentially related to post-neonatal mortality and not very much to neonatal mortality, which leads one to think that it was more due to the economic and social crisis – then hitting Russia hard – than to the change in definition of live birth, which did not produce the same effect at all as in the Baltic States. According to Evgenii Andreev (1995), the early neonatal mortality rate in fact went from 9.0 per thousand in 1992 to 9.7 in 1993, while the total infant mortality rate went from 18.0 to 19.9 per thousand. In fact, a December 1992 circular required register offices to continue to view as live births only infants weighing over 1,000 g at birth. Therefore the only difference from the pre-1993 situation was that it was no longer necessary for the length of gestation to be over 28 weeks or for the infant to measure more than 35 cm. Consequently it is probable that, from this point of view, infant mortality continues to be under-estimated in Russia.

In Ukraine, it was only in 2007 that the WHO definition was officially adopted, but on reading recently observed trends, it seems clear that an initial improvement in registration was associated with the introduction of the 10th Revision of the International Classification of Diseases (ICD-10) in 2005 (Fig. 4.4, registered rates). In order to come closer to the reality of infant mortality in Ukraine, therefore, a second correction must be made to all the pre-2007 data, but in two stages in order to take into account the 2005 improvement.[5] For the whole period before 2005, we are now in a position to state that the correction made for the French edition of this book, published in 2003,

[5] When updating our data set it was possible to get cause-of-death data until 2006 only. It was possible to get infant mortality data until 2007, which made possible correction here discussed for the years 2006 and before.

has already given us a result that is completely in line with the corrections suggested by the changes observed in 2005 and 2007. We then hypothesized that something similar would be observed in Ukraine to what was seen in the Baltic States when those countries adopted the WHO rules: a 50% increase in early neonatal mortality (death at 0–6 days). It would have been ideal to be able to apply the Baltic correction coefficient directly to rates of early neonatal mortality in Ukraine, but unfortunately we did not have any information about the latter. On the other hand, we were able to attempt an overall correction of the neonatal mortality rate (death at 0–27 days)[6] by relying on the Russian figures: according to Andreev (1995), the proportion of early neonatal mortality there was 81% (9.0/11.1). We therefore increased Ukrainian neonatal mortality rates for the whole period 1959–1995 by 40% (50% x 0.81) and added the post-neonatal mortality rates to these corrected rates, thus obtaining corrected infant mortality rates up to 2000. We have continued the same reasoning up to 2004 in order to bring the 'second correction' illustrated in Fig. 4.4 up to that date; and, in order to complete this corrected series by linking it to the year 2007, we have increased the 2005 and 2006 neonatal mortality rate pro rata to the jump observed between 2006 and 2007. This correction finally led us to increase the infant mortality rate by 13% in 2005 and 2006 and by roughly 20% in the years 1990–2004; but, when we went further back in time, the increase diminished in scale because the proportion of neonatal mortality was reduced by larger post-neonatal mortality: in the early 1960s, it was only 10%. In linking the 1938–1939 life table in the preceding chapter to this correction, we were not able to use Ukrainian neonatal mortality – which we do not know – but took as our reference the age structure of urban infant mortality in Russia[7]. Moreover, it is clear that at the level of infant mortality in Ukraine then (144 per thousand in uncorrected data), the proportion of early neonatal mortality within neonatal mortality must have been much lower than it is today. Going by the French data from the beginning of the century (Bunle 1954), we estimated it at 50%. So, after corrections, we obtain an infant mortality rate of 153 per thousand, which is an increase of 6.3%. Where the 1926–1927 table was concerned, we used results already corrected in the course of an in-depth study of data from the time (Adamets and Shkolnikov 1995), which led to a corrected rate of 217 per 1,000, an increase of 3.1% over the 210 per 1,000 registered.

4.1.4 Other Causes of Under-Registration

Setting aside these specific problems, it can be agreed that there was a recognizable general improvement in registration of infant deaths over the course of the 1960s and 1970s throughout the USSR. However, it seems to us that this phenomenon,

[6] Available cause-of-death distributions for infants aged under 1 year in fact differentiate deaths at 0–27 days.

[7] Statistical Report No. 5, RGAE, fonds 15, series 329, file 269.

Table 4.2 Consequences for life expectancy at birth of the two corrections made to infant mortality rates, from 1958–1959 to 2000

	Males		Females	
Year	Before correction	After correction	Before correction	After correction
1958–1959	66.2	65.9	72.8	72.5
1965	67.8	67.5	74.7	74.5
1970	66.5	66.2	74.4	74.2
1975	65.5	65.3	74.2	74.0
1980	64.6	64.4	74.1	73.8
1985	65.2	65.0	74.0	73.8
1990	65.6	65.4	74.9	74.7
1995	61.3	61.1	72.5	72.4
2000	62.2	62.0	73.6	73.3
2001	62.3	62.1	73.6	73.5
2002	62.1	62.0	73.7	73.5
2003	62.3	62.1	73.5	73.4
2004	62.0	61.9	73.6	73.5
2005	61.5	61.4	73.4	73.3
2006	62.3	62.2	73.8	73.7

See, in Annex II, Table 1, on the website (http://www.demogr.mpg.de/books/drm/009 or http://extras.springer.com/), the full annual breakdown

N.B. For 1958–1959, 'life expectancy before correction' as used here was obtained by recalculating a full life table from total population numbers and total deaths by year of age. It is slightly different from the one published by Goskomstat (which gave 66.1 years for males and 72.4 years for females) and from the one published by Korchak-Chepurkovskii (1996)

which had a strong impact on Central Asia and perhaps, to a lesser extent, the Caucasus and certain parts of Russia, was much less strong in the European regions of the USSR. In the absence of any precise information on this topic, here we assume that – with the above corrections – infant death statistics for Ukraine are complete.

In the end, the two corrections used for infant mortality reduce life expectancy at birth by about two-tenths of a year until the 2000s, and then by just under half that in 2005 and 2006 (Table 4.2).

4.2 Old-Age Mortality

From 1959, age-specific mortality rates can be calculated by comparing registered deaths to Goskomstat's annual age-specific population estimates. So we were able to construct complete life tables for the years 1959–1964 and link the results of these to the results of the series that had previously been calculated from death statistics and Goskomstat's annual age-specific population estimates (see Chap. 7). For 1958, we had already made an estimate based on registered deaths compared to a population estimate obtained by retropolation (see Chap. 3); so, even though no registered deaths were available for that year, we made another estimate by comparing the age-specific probabilities of dying from the official 1958–1959 table and the table calculated for 1959.[8] The results of these two estimates were very close. Here we chose to apply our reasoning on the quality of recording old-age mortality – which is the second problem often mentioned in regard to Soviet data – to the second estimate.

Anderson and Silver (1989a, 1990) proposed to increase probabilities of dying over the age of 60, taking mortality in the middle age groups as a reference. Given the particularly high level of adult mortality in Ukraine, such a correction here would lead to an over-estimate of old-age mortality. We prefer to rely, as we did for Russia (Shkolnikov et al. 1995a), on entering the model life tables using the level of Ukrainian infant mortality to decide on the corrections to be made – even if, given the earlier corrections needed to infant mortality, this solution is not entirely satisfactory.

Table 4.3 compares the observed values of life expectancy at age 70 to those given by each of the four families in Coale and Demeny (1983) corresponding to infant mortality observed in Ukraine.[9] We can see that from 1965 the observed value is always lower than the mean value of life expectancy at 70 in the model life tables from the four families. It seems to us that this is consistent with the fact – already emphasized – that, from the mid-1960s, in both Ukraine and Russia, adult mortality rose to levels much higher than the norm. It is in no way astonishing that this anomaly continues to be visible here among the old.

On the other hand, before 1965, observed life expectancy seems to have over-estimated the real situation, especially among females. In 1958, observed life expectancy at age 70 among males was 1 year higher than the mean of the model life tables used for reference. In 1960, the difference was still 0.3 years, but then it disappeared. Among females, this gap was larger (2 years in 1958) and persisted for longer (up to 1964). Therefore it seems helpful to correct mortality after age 70 up to 1960 for males and 1964 for females.

A correction is also required for the 1926–1927 and 1938–1939 tables. However, as we have indicated in earlier chapters, these tables have already been corrected for under-estimation of old-age mortality; so we accepted them here as they stood (Adamets and Shkolnikov 1995).[10]

Life expectancy resulting from the two successive corrections (infant mortality and old-age mortality) is given in Table 4.4 for the period 1958–1965 (Table 4.2 has already given the continuation for the years when only infant mortality had to be corrected). The correction in old-age mortality is significant for males up to 1960

[8] We estimated the age-specific probabilities of dying for 1958 by applying to the 1958–1959 probabilities of dying a ratio such that the mean for 1958 and 1959 again produced the 1958–1959 probability.

[9] By interpolating the values given by the model tables.

[10] For the 1938–1939 table, Sergei Adamets and Vladimir Shkolnikov made no corrections to infant mortality, but did correct old-age mortality.

Table 4.3 Life expectancy at age 70 (e^{70}): observed values and values in Coale-Demeny model life tables corresponding to the same level of infant mortality (m^0)

Year	Estimated m_0 (per 1000)	Observed e_{70}	Values of e^{70} in models North	South	East	West	Mean	Mean difference
Males								
1958–1959	45.7	11.1	11.1	11.5	9.8	9.8	10.6	–0.5
1958	44.4	11.6	11.1	11.6	9.9	9.8	10.6	–1.0
1959	45.6	10.6	11.1	11.5	9.8	9.8	10.6	0.0
1960	37.1	11.2	11.4	12.1	10.1	10.0	10.9	–0.3
1961	32.3	11.1	11.5	12.5	10.2	10.2	11.1	0.0
1962	32.3	10.4	11.5	12.5	10.2	10.2	11.1	0.7
1963	31.1	10.8	11.6	12.6	10.3	10.2	11.2	0.4
1964	28.9	11.1	11.8	12.7	10.4	10.4	11.3	0.2
1965	25.7	10.7	12.0	12.8	10.5	10.5	11.5	0.8
1970	22.2	9.9	12.3	(12.8)	10.7	10.7	11.6	1.7
1975	24.8	9.8	12.0	(12.8)	10.6	10.5	11.5	1.7
1980	21.8	9.6	12.3	(12.8)	10.7	10.7	11.6	2.0
1985	20.8	9.4	12.4	(12.8)	10.8	10.8	11.7	2.3
1990	17.4	9.9	12.7	(12.8)	11.0	11.0	11.9	2.0
1995	19.2	9.1	12.6	(12.8)	10.9	10.9	11.8	2.7
Females								
1958–1959	36.3	13.2	11.9	13.6	11.0	10.9	11.8	–1.4
1958	35.6	13.8	11.9	13.6	11.0	10.9	11.8	–2.0
1959	35.1	12.5	11.9	13.7	11.0	10.9	11.9	–0.7
1960	29.4	13.2	12.1	14.3	11.3	11.1	12.2	–1.0
1961	25.0	13.1	12.3	14.8	11.6	11.3	12.5	–0.6
1962	25.0	12.4	12.3	14.8	11.6	11.3	12.5	0.1
1963	24.1	13.0	12.4	14.8	11.7	11.4	12.6	–0.4
1964	22.0	13.4	12.6	14.8	11.8	11.5	12.7	–0.7
1965	19.3	12.9	12.8	14.8	12.1	11.7	12.9	0.0
1970	17.0	12.4	13.1	(14.8)	12.3	11.8	13.0	0.6
1975	18.6	12.3	12.9	(14.8)	12.1	11.7	12.9	0.6
1980	15.8	12.0	13.2	(14.8)	12.4	11.9	13.1	1.1
1985	15.8	11.8	13.2	(14.8)	12.4	11.9	13.1	1.3
1990	13.1	12.3	13.5	(14.8)	12.7	12.2	13.3	1.0
1995	14.7	11.5	13.3	(14.8)	12.5	12.0	13.2	1.7

and for females up to 1965. The maximum change is 0.6 years for males and 1.3 years for females in the late 1950s. The effect of the second correction fluctuates between 0.1 and 0.2 years from 1965 for both sexes.

The corrections do not call into question the general trend in life expectancy at birth described by the crude data (Fig. 4.5). Progress simply proved a little more rapid between 1958–1959 and 1965, and the decline slowed slightly between 1965 and 1980. This confirms that there really was a deterioration in the state of health of males and a stagnation in that of females.

As our reconstruction of cause-of-death series here will start in 1965, no correction of cause-of-death figures is needed for the old. As for infant mortality, we shall

Table 4.4 Life expectancy at birth: combined results of the two corrections made to infant mortality rates and to life expectancy at age 70 (e^{70})

Year	Male e_0			Female e_0		
		After correction			After correction	
	Observed	of infant mortality rate	of infant mortality rate and of e_{70}	Observed	of infant mortality rate	of infant mortality rate and of e_{70}
1958–1959	66.2	65.9	65.6	72.8	72.5	71.6
1958	66.8	66.5	66.2	73.5	73.2	72.2
1959	65.7	65.4	65.2	72.1	71.9	71.1
1960	67.3	67.0	66.9	73.8	73.5	72.8
1961	67.6	67.3	67.3	74.1	73.9	73.3
1962	67.0	66.8	66.8	73.5	73.3	73.0
1963	67.6	67.3	67.3	74.2	74.0	73.6
1964	68.4	68.1	68.1	75.1	74.9	74.4
1965	67.8	67.5	67.6	74.7	74.6	74.5

The result given here for 1958 is slightly different from that in Table 3.20, Chap. 3. This is because it relies on the estimate that we made from the official life table for 1958–1959 and our calculations of probabilities of dying for 1959, whereas the result in Chap. 3 relied on registered deaths and a population estimate obtained by retropolation

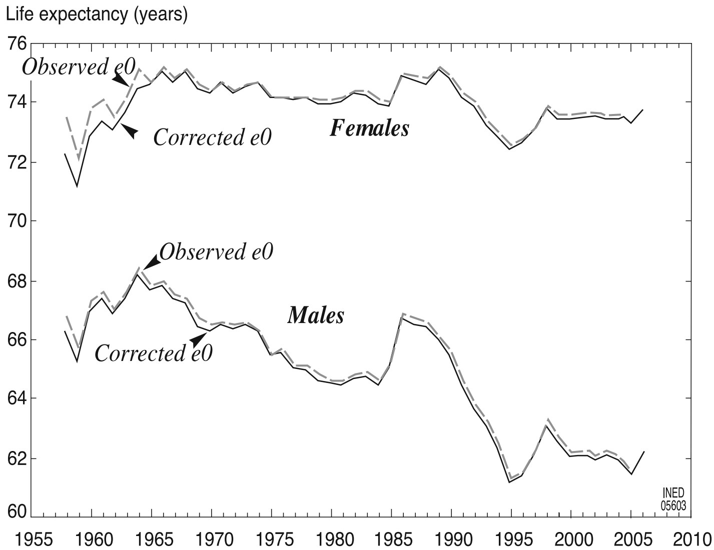

Fig. 4.5 Trends in life expectancy at birth before and after correction

divide the unregistered deaths derived from our corrections among causes of death in early infancy, pro rata to registered deaths. And having done so, we can now make use of these corrections at the two ends of life in our assessment of age-specific mortality trends and the proportions of different age groups in long-term life expectancy trends.

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Chapter 5
Eighty Years of Sex-Specific and Age-Specific Mortality Trends

France Meslé, Jacques Vallin, and Vladimir Shkolnikov

In Chaps. 2 and 3, we reconstructed annual sex-specific and age-specific mortality trends from the second quarter of the twentieth century, which had been seriously disrupted by the crises of the 1930s and 1940s; in Chap. 4, we were able to correct the standard estimates for the second half of the century, taking into account under-registration of deaths. From now on, therefore, we can work with a continuous series of life tables for each of the years 1927–2006 (see the complete time series in Annex II on the Website (http://www.demogr.mpg.de/books/drm/009 or http://extras.springer.com/) for the main functions of these life tables).[1] Figure 5.1 provides an overview, tracing annual trends in life expectancy at birth for each sex over the course of the past 80 years.

In the Chaps. 2 and 3, our emphasis was above all on the extent of exceptional losses due to the two major crises of the past; here, however, we shall highlight long-term age-specific mortality trends, focusing in particular on the gradual change in age-specific mortality and the influence of mortality trends in each age group on the trend in life expectancy at birth.

[1]For the most recent period, life tables have been published each year by the Ukrainian Statistical Institute (see, for example, DKSU 2001, pp. 72–73), but they are biennial and not corrected for under-registration of infant deaths. Annual tables have been published by Anatoli Stephanoviskii (2001) for 1989–2006, but these too are not corrected for under-registration of deaths.

F. Meslé (✉) • J. Vallin
Institut National d'Études Démographiques, Bd. Davout 133,
75980 Paris Cedex 20, France
e-mail: mesle@ined.fr; vallin@ined.fr

V. Shkolnikov
Max Planck Institute for Demographic Research, Konrad Zuse Strasse 1,
18057 Rostock, Germany
e-mail: shkolnikov@demogr.mpg.de

F. Meslé and J. Vallin, *Mortality and Causes of Death in 20th-Century Ukraine*,
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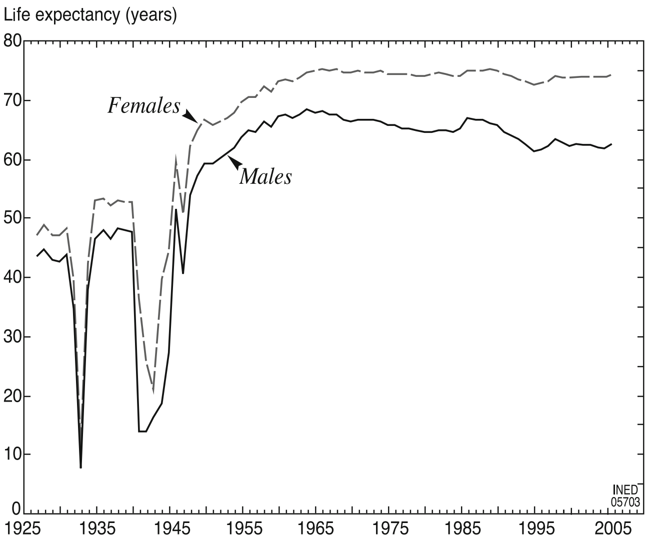

Fig. 5.1 Annual trends in life expectancy at birth, 1927–2006, by sex

5.1 A Distinctive Trend in the Pattern of Age-Specific Mortality

Figure 5.2 illustrates trends in the age-sex structure of mortality since the 1920s. So that it will be easier to read, for earlier years it uses only the three biennial life tables calculated around the 1926, 1939 and 1959 censuses[2] (corrected for under-registration – see Chaps. 2 and 4) and, for recent years, annual tables following one another at 10-year intervals – 1965, 1975, 1985 and 1995 (although the 2005 table has been replaced by the most recent one, calculated for 2006).

Despite the dramatic crises of the 1930s and 1940s, from 1926–1927 to 1958–1959, mortality declined in a very classic way in all age groups. In line with the conventional pattern, this reduction was especially strong among children and, in particular, adolescents (10–14 years, where the curve falls steeply to its lowest point), still significant for young adults and then limited in old age. No exception to this general downward trend can be found: all age groups benefited from it.

From the 1960s, the picture was entirely different. As early as the period 1958–1959 to 1965, although the downward trend continued among the very young, no more headway was made at all beyond age 35 for men and age 45 for women: from these ages, the two mortality curves meet. This was the start of an increasingly unfavourable

[2]Since the 1926 census took place in December, the life table relates to the years 1926 and 1927. In contrast, the 1939 and 1959 censuses took place at the beginning of January, so the life tables relate to the years 1938–1939 and 1958–1959.

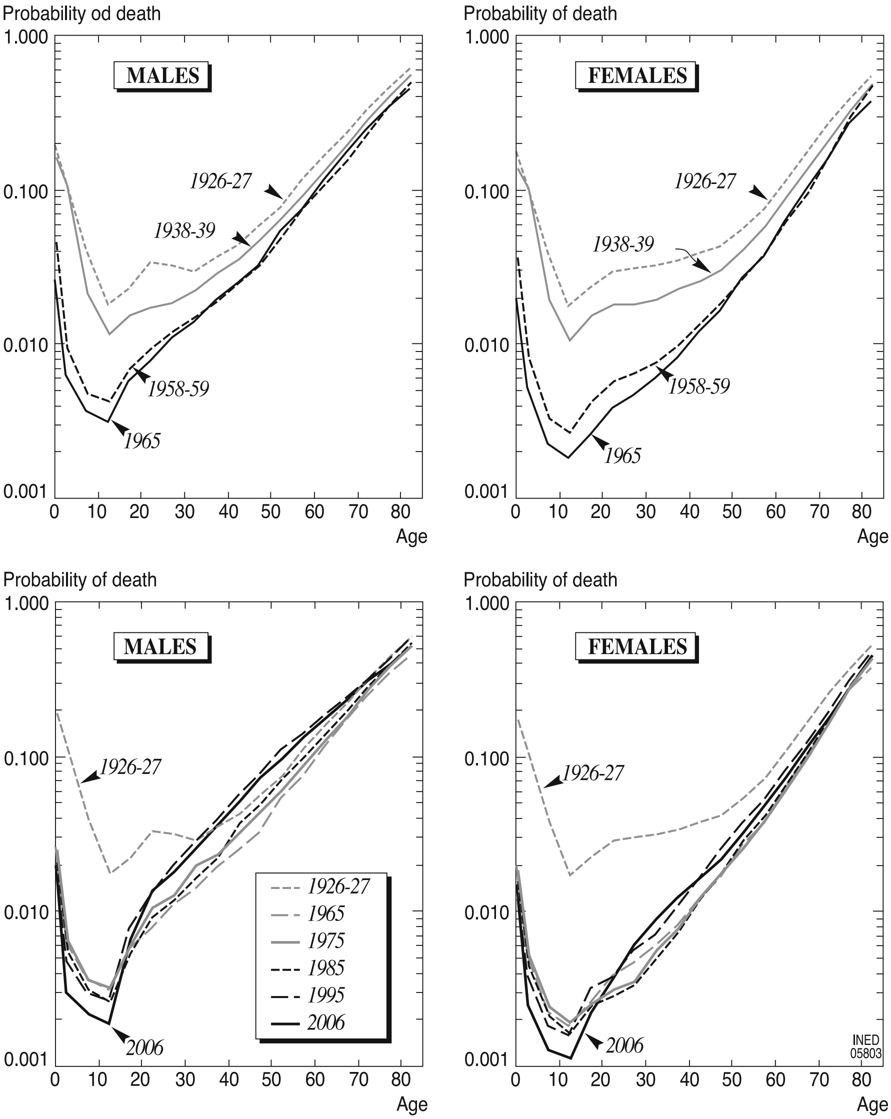

Fig. 5.2 Change in age-specific probabilities of dying, from 1926–1927 to 2006

trend, in which, firstly, improvements among the very young slowed down and, secondly and more especially, an upward mortality trend was established on a lasting basis among adult males. Among females, the rise in adult mortality has appeared only in the most recent period, but this follows 20 years of stagnation.

Among men, the outcome is striking: from the ages of 35 to 75, probabilities of dying were higher in 1995 than they had been before the Second World War.

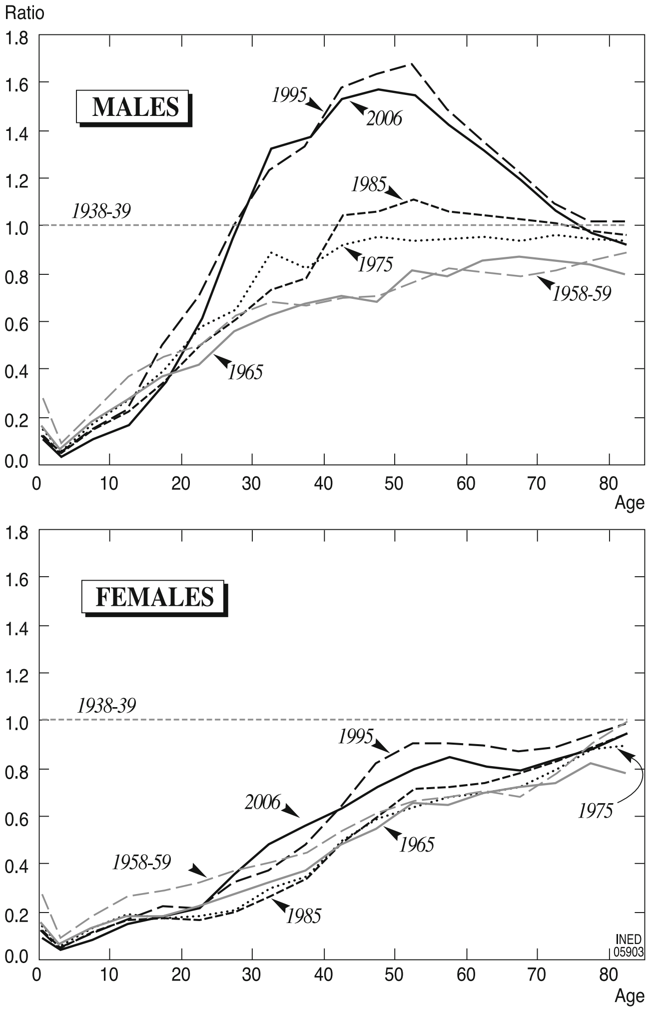

Fig. 5.3 Age-specific probabilities of dying from various life tables, compared to those from the 1938–1939 table

Between the ages of 40 and 55, they exceeded the 1938–1939 level by 60–70% and were even far above the 1926–1927 level.

In the last decade, deformation of the age structure of mortality has been further accentuated, with a rapid fall among the very young (aged between 1 and 15) contrasting with total stagnation in the adult age groups and even deterioration among women aged 25–40.

Figure 5.3 clarifies the extent of this phenomenon by comparing the observed age-specific probabilities of dying in these different periods with those from the

1938–1939 table. Among males, it can be seen that the deterioration in adult survival that became more permanently established from 1965 onwards has worsened dramatically in recent years. In 1985, probabilities of dying beyond the age of 40 came into line with and even slightly overtook 1938–1939 levels, but from 1985 to 1995 they saw a sudden, unprecedented rise, bringing them to the percentages mentioned above. By 2006, the situation was hardly any better.

On the female side, this two-phase trend is encountered in another form; in this case, a long period of stagnation was followed by an abrupt deterioration between 1985 and 1995. The curve drawn for 2006 shows that there has been a much greater relative improvement than for males, with the current situation lying more or less halfway between the 1985 and 1995 curves.

The exceptional nature of this trend in mortality in Ukraine seems even clearer when we compare it to that of Western European countries. So, for males, Fig. 5.4a compares Ukrainian probabilities of dying in these different eras to French probabilities of dying calculated for the same dates.

In 1938–1939, the level of mortality among the very young in Ukraine was much higher than in France (twice as high under 1 year old, and a full 4½ times higher at ages 1–4[3]), but over the age of 20 it was consistently lower than in France. In 1995, on the other hand, while the difference in infant mortality between the two countries had hardly changed, the probabilities of dying were higher in Ukraine than in France for all age groups, and the gap between the two countries was particularly wide between the ages of 30 and 60. Here too, it can be seen that this unfavourable trend in adult mortality in Ukraine gradually became established from 1965 onwards, but worsened dramatically after 1985. This deterioration has continued in the last decade, though mainly to the detriment of men aged 25–45. At ages 30–35, excess mortality in Ukraine has increased more in the last 10 years than in the previous 40 years. But basically this deterioration is relative: the gap has widened much more because of improvements in France than because of negative trends in Ukraine.

Conversely, comparison with Russia shows clearly that the age structure of Ukrainian mortality has followed a trend very similar to and concomitant with that of Russian mortality (Fig. 5.4b). Certainly, the situation in Ukraine, which seemed terrible in the earlier comparison with France, here looks slightly more favourable, but that in no way prevents identical phenomena from coming into play, since – whatever the period – the gap between Ukrainian and Russian risks remains more or less the same and hardly varies with age. The highly characteristic feature of deteriorating adult mortality, which we have already highlighted for Russia (Meslé et al. 1996, pp. 14–15), is reproduced line for line in Ukraine.

[3] In reality, perhaps this contrast between infant mortality and mortality at ages 1–4 is exaggerated, since it may be that some infants who died towards the end of their first year of age were classified in the 1–4 age group instead of the group under 1 year old (see Chap. 4).

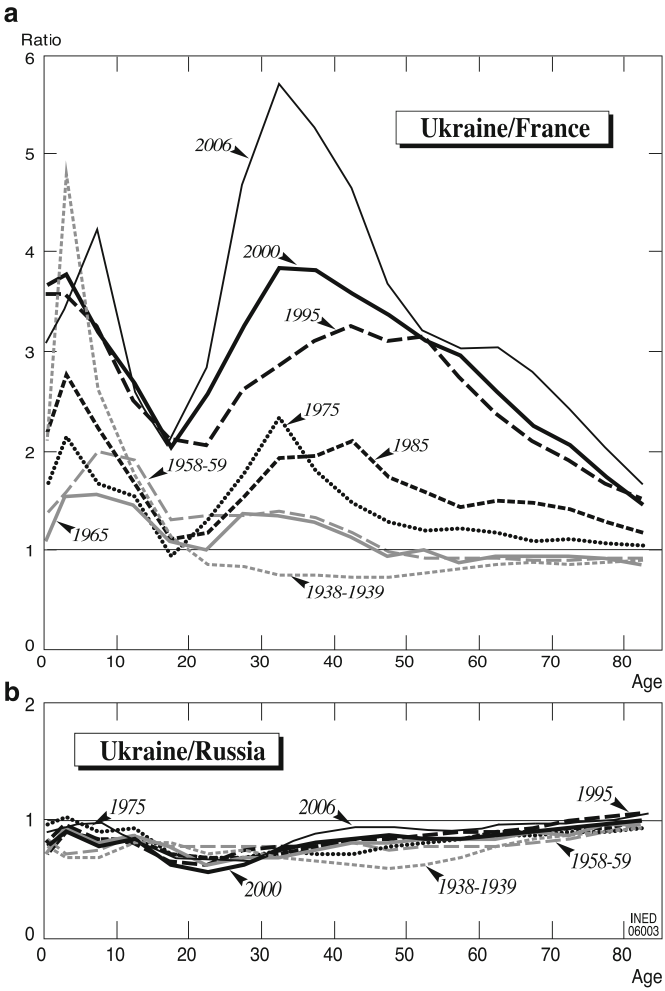

Fig. 5.4 Age-specific male probabilities of dying in Ukraine, from various life tables, compared to (**a**) French probabilities of dying and (**b**) Russian probabilities of dying observed in the same era

5.2 The Influence of Various Age Groups on Changes in Life Expectancy

Using, *inter alia*, the results of the estimates made in Chaps. 2 and 3, Figs. 5.5 and 5.6 trace annual trends in 5-year probabilities of dying from the mid-1920s. However, in order to make the figures more legible, the crisis years (1932–1934 and 1941–1947) are not shown here. This makes it much easier to judge the continuity of trends in the absence of crisis. These two figures highlight the striking contrast

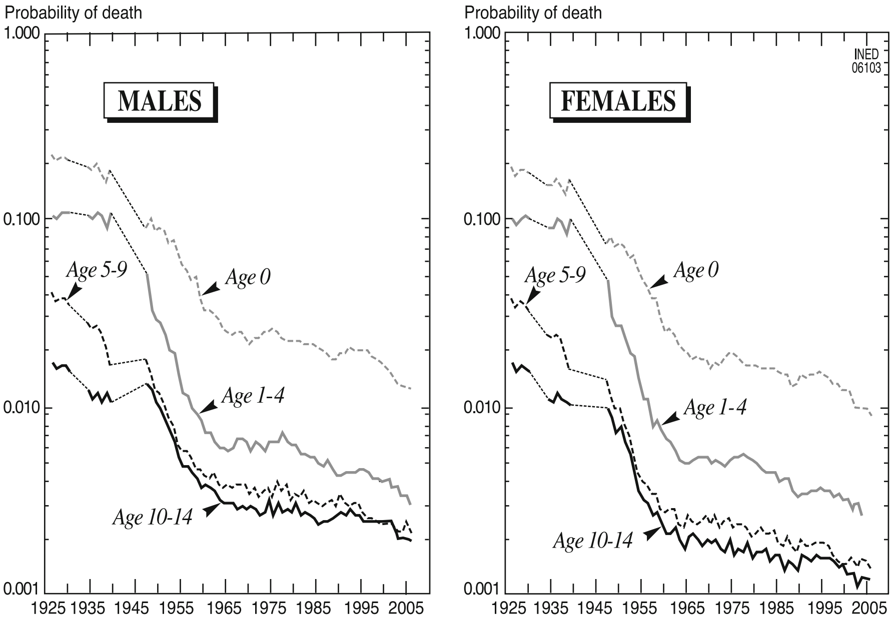

Fig. 5.5 1927–2006 trends in probabilities of dying for the first four age groups (0, 1–4, 5–9 and 10–14 years of age), from abbreviated life tables

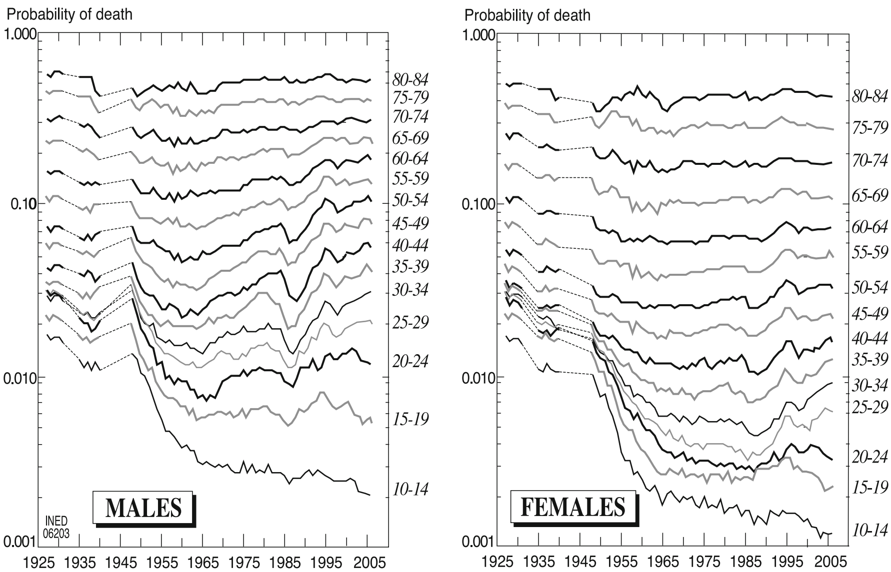

Fig. 5.6 1927–2006 sex-specific trends in 5-year probabilities of dying beyond age 10

between the period running from the pre-War years to the mid-1960s, which – if we disregard the crisis years – shows a very rapid overall reduction in mortality, and the subsequent period, which, when mortality was not actually rising, was marked by stagnation.

The most recent period has been marked by stronger differences in trends between age groups: for children under 10 years of age, the downward trend in mortality has accelerated; the long period of stagnation for young people aged 10–25 has come to an end; however, mortality has increased in all the adult age groups.

In order to clarify the role played in life expectancy by these mortality trends at different ages, we created five large age groups, merging the 5-year groups whose trends, as shown in Figs. 5.5 and 5.6, were most alike. The first group brings together children from 0 to 14 years of age. This is because, at all these ages, the dominant factor was the rapid decline in mortality between 1938–1939 and 1965. Their subsequent course was fairly monotonous, and almost stagnant until it accelerated again recently (Fig. 5.5). The second group covers young people and adults from 15 to 34 years of age; they have also enjoyed a fairly large fall in mortality since the pre-War period, but in recent years have experienced somewhat marked fluctuations (Fig. 5.6). The third group is made up of adults aged 35–54: these are the people who bore the full brunt of the deterioration in the 1960s and 1970s, as well as of the major fluctuation in the 1980s. With the fourth group, aged 55–69, we are dealing with age bands that also experienced a strong post-1965 decline, but were less affected by the 1980s fluctuation. Finally, the fifth group, which brings together people over 70 years of age, is characterized by the most monotonous trends of the whole period.

Next we shall endeavour to measure the respective roles of these five large age groups (0–14, 15–34, 35–54, 55–69, 70 and over), firstly in the life expectancy gains of the *anni mirabiles*[4] (1938/1939–1965) and losses of the *anni horribiles* (1965–2006), and secondly in the gender gap in life expectancy and its trends; we shall again make use of comparisons with France and Russia.[5] The breakpoint in 1965 marks the change from a period of major improvements in health to a period of persistent crisis.

[4]However, these gains should obviously not lead us to forget the terrible crisis with which this period began, with the Second World War and the Stalinist repression (Chap. 3). The rise in life expectancy over the course of this period is nothing short of remarkable.

[5]The problems of under-registration of deaths that led us to correct Ukrainian infant mortality over the whole period and old-age mortality up to 1964 also arise in relation to Russia (Shkolnikov et al. 1995a, b). In our book on Russia (Meslé et al. 1996), we made several hypotheses about the extent of under-registration, but abandoned the idea of making any corrections, since these would have had hardly any influence on cause-specific mortality trends from 1965 to 1995. Having embarked on an exploration of the past in order to enhance our analysis for Ukraine, it was essential to correct the crude data; then, in order to ensure overall consistency, we extended our corrections to the whole period under study. In order to make these corrected Ukrainian data comparable to the Russian data, here we have applied the same corrections to Russia.

5.2.1 *Life Expectancy Gains (1938/1939–1965) and Losses (1965–2006)*

Between 1938–1939 and 1965, life expectancy in Ukraine rose from 48.0 to 67.6 years for men and from 52.9 to 74.6 years for women. What role did mortality trends in the different age groups play in this gain of 19.6 years for men and 21.7 years for women? Several writers have proposed methods that allow a gap in life expectancy to be broken down according to age-specific mortality differences (Andreev 1982; Pollard 1982, 1990; Pressat 1985); all of them give extremely similar results. The results that follow were obtained by applying Andreev's method.

During this period, the very large gains in life expectancy obtained in Ukraine were entirely thanks to the fall in child mortality. The reduction in mortality at 0–14 years alone explains 15.4 years' improvement for males (Fig. 5.7a) and 14.9 years for females (Fig. 5.7c), representing 79% and 69% of the total gain for the respective sexes. Although the dominant role of the fall in mortality in these age groups was a little less pronounced among females, that is because in this period there was also a fairly significant reduction in female adult mortality, notably between the ages of 15 and 34, resulting from reduced fertility and improved childbirth conditions and delivery outcomes. This is also the factor that led to females enjoying greater longevity than males. But, overall, for both sexes, increased longevity was really due mainly to the fall in infant and child mortality.

What happened in Russia in the same period was entirely comparable (Fig. 5.7a, c). Of course, in starting from a slightly lower level of life expectancy, Russia made even more progress than Ukraine, with mean length of life rising from 39.6 years in 1938–1939 to 64.0 in 1965 for males and from 46.1 to 73.3 years for females – an increase of 24.4 and 27.2 years respectively (as against 19.6 and 21.7 in Ukraine). But the role of the fall in child mortality was just as dominant: 76% for males and 70% for females (so in Russia too, the place of other age groups was a little more significant for females than for males).

Things in this regard were completely different in France (Fig. 5.7a, c). Firstly, advances in life expectancy were much smaller. French males, who already had a life expectancy of 56.2 years in 1938–1939, saw an increase of only 11.6 years by 1965, as against 19.6 years for Ukrainian males; while females, starting from 62.3 years, gained only 12.8 years, as against 21.7 for Ukrainian females. This was the period when the countries of Eastern Europe, in particular Russia and Ukraine, made great strides in catching up on Western Europe. Secondly, French life expectancy gains were much less dominated by a fall in mortality at ages 0–14. With gains of 5.0 years for males and 4.5 for females, the fall in mortality at these ages was responsible for only 43% and 35% of the respective total increases in life expectancy. For both males and females, the decline in mortality between the ages of 15 and 54 produced more additional years of life than the fall in child mortality. Moreover, for French females, the increasing role of the downward trend in mortality in older age groups is already apparent during this era: it was responsible for 1.8 years of additional life expectancy at ages 55–69 and for another 2 years at age

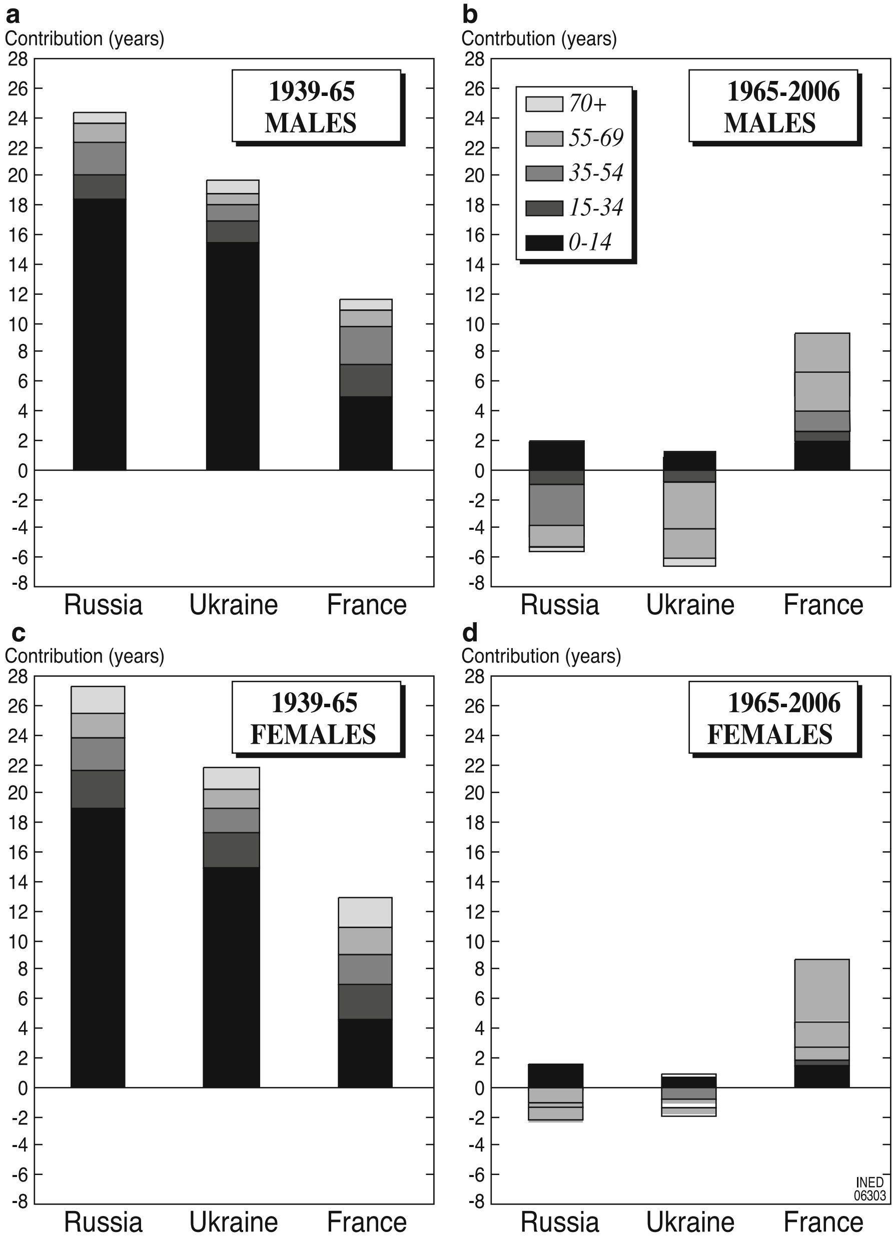

Fig. 5.7 Influence on life expectancy trends of variations in mortality between different age groups

70 and over, representing a full 30% of overall gains (as against only 13% among Ukrainian females).

The contrast between Ukraine and Russia, on the one hand, and France, on the other, is even more striking when we look at the second period, 1965–2006, which was characterized by a reduction in life expectancy in the first two countries at a time when advances were still being made in France (Fig. 5.7b and d). During this period, Ukrainian males lost 5.4 years and Ukrainian females, 0.9 years. The trend in mortality at ages under 15 was still the sole source of life expectancy gains, but was extremely limited: over a 40-year period, falls here produced gains of only 1.2 years for males and 1.0 years for females. In all the other age groups, increased mortality led to loss of years of life. The phenomenon was very marked among males, notably aged between 35 and 70. This increase led to their losing 3.1 years of life expectancy at 35–54 years of age, and another 1.9 years at 55–69 years of age; these two age groups alone explained 92% of the total reduction in male life expectancy. Among females, the losses, which were smaller, were divided between mature adults and the old. During this period, trends observed in Ukraine were more unfavourable than those in Russia, where gains from the downward trend in mortality at ages under 15 were higher and losses due to the increase in adult mortality, slightly lower. On the other hand, both countries stand in stark contrast to France, where not only did life expectancy continue to grow, but the fall in adult mortality, and above all in mortality at ages over 70, played an increasingly overwhelming part (47% of the 8.9 years gained by females).

5.2.2 Age Groups and the Gender Gap in Life Expectancy

On the eve of the Second World War, the gender gap in life expectancy was significantly narrower in Ukraine (4.9 years) than the observed difference in France (6.2) and in Russia (6.5). After that, this gap widened in all three countries, but more rapidly in Ukraine and more rapidly still in Russia (Fig. 5.8). In 1965, with a gap of 7.0 years, Ukraine was at more or less the same level as France (7.3), while Russia had already reached 9.3 years. This trend subsequently became even more pronounced: in 2006, there was a gap of 6.9 years in France, compared to 11.5 years in Ukraine and 12.9 in Russia.

In order to assess the roles of the different age groups in these gender gaps in life expectancy, we again used Evgenii Andreev's method of breaking them down (Fig. 5.8).

Infant and child mortality, which had played a major role before the Second World War – especially in Russia and Ukraine, but to a lesser extent also in France – was already playing only a marginal one by 1965, and had almost negligible influence by 2006. The way in which the influence of child mortality on the gender gap was eclipsed was almost identical in all three countries; the only difference was in the time-lag relating to the tempo of the reduction in infant mortality in each case.

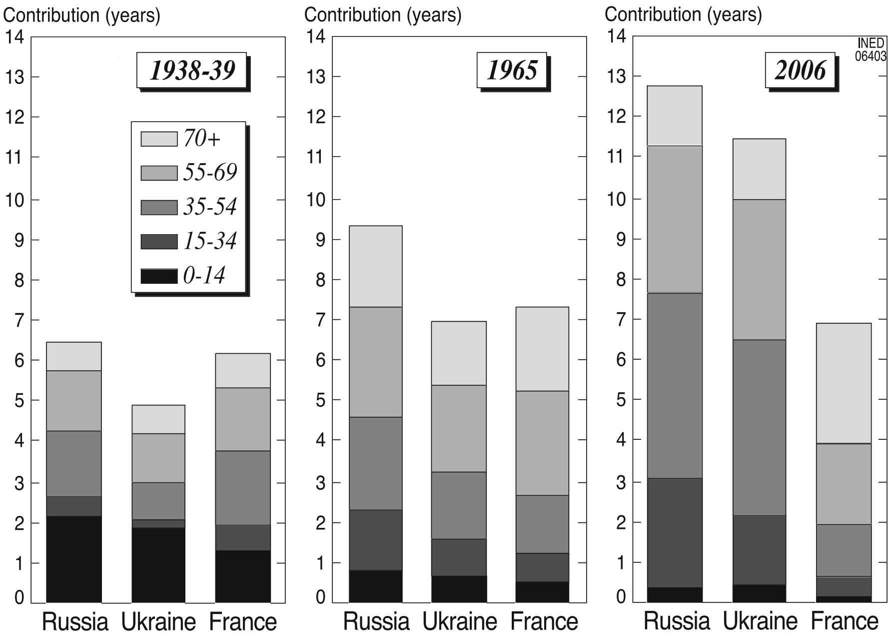

Fig. 5.8 Influence on the gender gap in life expectancy of differences between sex-specific mortality in various age groups

Up to 1965, in all three countries, it was more or less the same age groups that eclipsed infant mortality in this way; they even made the gender gap worse, with the 55–69 age group in particular playing a major role. This was because, during this period, female mortality in this age group declined much more quickly than male mortality.

On the other hand, after 1965, the gender gap developed in different ways and depended on very different factors (Fig. 5.8). In Ukraine, as in Russia,[6] the gap widened dramatically under the impact of the increase in mortality in adult age groups, which was much greater for men than for women. So, in 2006, 4.4 years of the gender gap of 11.5 years in Ukraine were due to the difference in mortality at 35–54 years of age, and 3.5 years to the difference in mortality at 55–69. These two age groups alone explain 68% of the total gap, while in 1965 they explained only 54% (3.8 years out of 7.0). In 2006, the same two age groups explained 64% of the gender gap in Russia (8.3 years, out of 12.9), while in 1965 they explained only 54% (5 years out of 9.3). In France, in contrast, the gender gap in life expectancy stopped increasing in the 1980s and started to decline significantly from the 1990s (Meslé 2004). In 2006, it was only 6.9 years – slightly less than in 1965 (7.3).

[6]For Russia, this point is developed more fully in Meslé and Vallin (1998).

However, the age groups that contribute the most to this have changed: in 1965, it was people aged 55–69 who created most of the gap (2.6 years out of 7.3), while in 2006 it was those aged over 70 (3.0 years out of 6.9).

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Chapter 6
Ukrainians and Russians in Ukraine and in Russia

Vladimir Shkolnikov

In the 1989 census, the population of Ukraine included 22% ethnic Russians, which prompted us to ask: is this strong Russian presence in Ukraine a reason for the relatively small difference observed between Ukraine and Russia in age-specific patterns of mortality?

Available statistics enable us to give a partial response to this question, since ethnicity is shown both on death certificates and in census reports, and Goskomstat has produced some tables and analyses based on that information. However, for at least two reasons, the data must be treated with caution.

Firstly, under the Soviet regime, in both Russia and Ukraine, ethnicity was really only established at the age of 16, with the issue of the passport that every citizen of the USSR received at that age.[1] Because of this, the ethnicity of minor children, especially those of mixed-ethnicity parentage, remained legally undetermined before that age, and declarations made for children under 16 might not have corresponded to the ethnicity that was eventually chosen. Most often, where death occurred at a young age, ethnicity was recorded on the basis of a simple declaration by the parents; sometimes the mother's ethnicity was even attributed automatically (especially for deaths at under 1 year of age), while the most frequent choice when the passport was issued tended to be the father's ethnicity. This accounts for the fact that mortality rates by ethnicity are subject to fluctuations at the threshold of 16 years of age. It therefore seems more reasonable to limit our analysis here to ages over 20.

More generally, census declarations made by a person in question him(her)self might sometimes not accord with the ethnicity shown in the passport, whereas more

[1]Since 1995 in Ukraine and since 2002 in Russia, ethnicity has no longer been shown in new passports.

V. Shkolnikov (✉)
Max Planck Institute for Demographic Research, Konrad Zuse Strasse 1,
18057 Rostock, Germany
e-mail: shkolnikov@demogr.mpg.de

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Table 6.1 Life expectancy at age 20 by sex and ethnicity in Russia and in Ukraine, 1988–1989

Ethnicity	Country of residence: Ukraine (a)	Country of residence: Russia (b)	Difference in life expectancy *(a) – (b)*
Men			
All	48.32	46.82	*1.50*
Ukrainians (1)	48.49	48.75	*−0.26*
Russians (2)	47.99	46.69	*1.30*
(1) – (2)	*0.50*	*2.06*	
Women			
All	56.62	56.26	*0.36*
Ukrainians (3)	56.64	56.00	*0.64*
Russians (4)	56.59	56.26	*0.33*
(3) – (4)	*0.05*	*−0.26*	

systematic use was made of passports at the time of death, to verify the declared ethnicity. This obviously entails the risk of bias in the calculation of mortality rates by ethnic group, since the numerator and the denominator may be inconsistently defined. However, for the last years of the Soviet regime, this risk of bias should not be too great where Russians and Ukrainians are concerned. It seems that in the late 1980s under the soviet regime there was hardly any advantage for either side to declare a ethnicity different from the one shown in the passport.

From 1959, Goskomstat (named Rosstat in present) systematically calculated mortality rates by sex, age and ethnicity for periods of 2 years around each population census. Here we shall use the calculations made for the period 1988–1989, which rely on the 1989 census.

In this census, 73% of the population of Ukraine declared themselves to be Ukrainian and 22% Russian. In Russia, Russians represented 82% of the population and Ukrainians only 3%. Table 6.1 gives sex-specific values for life expectancy at age 20 in Russia and in Ukraine, for both Russians and Ukrainians.

Taking all ethnic groups together, the difference in life expectancy at age 20 between Ukraine and Russia is, as we already know, greater for men than for women: 1.5 years and 0.4 year respectively. Here we can see not only that, in both countries, the differences between people of Russian and Ukrainian ethnicities are greater for men than for women, but also that this male-female contrast is much more pronounced in Russia than in Ukraine. In Ukraine, the difference in male life expectancy at the age of 20 is 0.5 years in favour of Ukrainians, as against only 0.05 years for females. In Russia, it is 2.1 years for men, still in favour of Ukrainians, but the reverse is true for women (0.3 years in favour of Russians). In reality, there are two superimposed phenomena here: firstly, excess mortality among Russians essentially involves males but, secondly, it is much less marked in Ukraine, because the advantage of Ukrainians who live in Russia over their compatriots who remain in Ukraine is smaller than that of Russians living in Ukraine over Russians living in Russia. Whether this is the effect of selection or of a difference in quality of life between the two countries is not something we are in a position to address here.

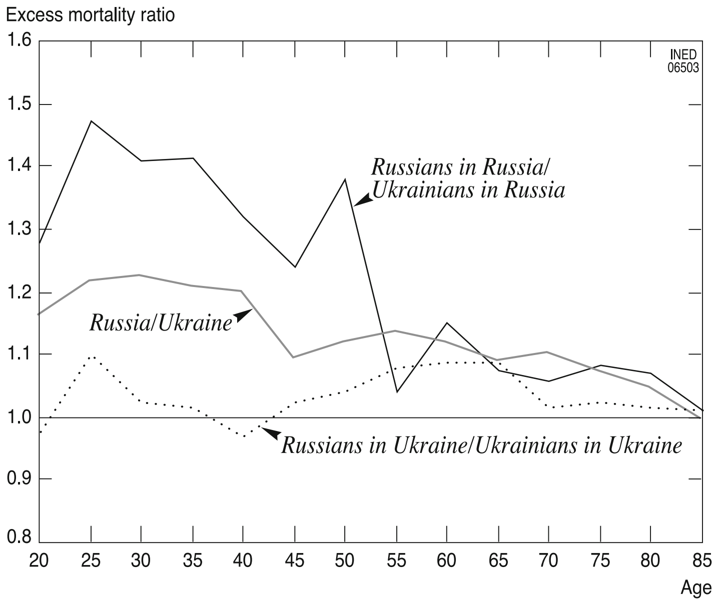

Fig. 6.1 Age-specific male mortality rate ratios: Russians living in Russia compared to Ukrainians living in Russia and Russians living in Ukraine compared to Ukrainians living in Ukraine, Russia compared to Ukraine (total male populations), 1988–1989

As the difference in mortality between Russians and Ukrainians is above all a male phenomenon, the rest of our analysis will focus on males.

Since, whether they live in Russia or in Ukraine, Russians have lower life expectancy than Ukrainians, the question we asked at the outset could be answered in the affirmative: there is a risk that the proportion of 22% Russians in the population of Ukraine is minimizing the differences in life expectancy observed between the two countries. However, the reality is more complex. Firstly, the difference between the two nationalities is much smaller in Ukraine (0.5 years) than in Russia (2.1 years); secondly, if we look specifically at Ukraine, this difference of 0.5 years represents just a third of the total difference (1.5 years) between the two countries. Therefore, relatively speaking, it must be playing only a secondary role in the comparison between total male populations of Ukraine and Russia.

In addition, the effects of these differences are very uneven in respect to age. Figure 6.1 presents the age-specific ratios of Russian to Ukrainian male mortality rates, firstly in Russia and secondly in Ukraine, by comparison with the same mortality ratios for the whole of Russia to the whole of Ukraine.

As is to be expected, the difference between the two ethnic groups is much more pronounced in Russia than in Ukraine. But in fact this contrast is restricted to young adults; over 50 years of age, it diminishes abruptly. This observation is all the more important because it is known that these young adults occupy a significant position in the particular age structure of mortality in the countries of the former USSR, where violence and alcoholism make a high impact on mortality of death among young adults. Yet, although this particular phenomenon clearly exists in Ukraine,

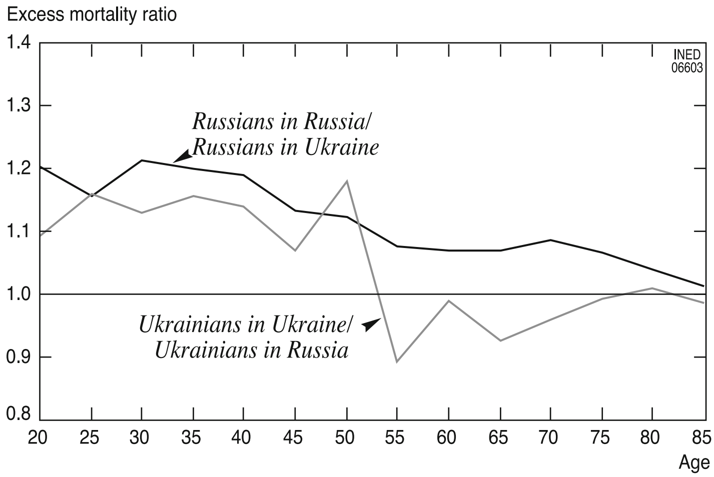

Fig. 6.2 Age-specific mortality rate ratios: Russians living in Russia compared to Russians living in Ukraine, Ukrainians living in Ukraine compared to Ukrainians living in Russia

here we see that it cannot be significantly related to the presence of a large minority of Russians, since it is precisely in these age groups in Ukraine that excess mortality of Russians over Ukrainians is almost negligible. It is clearly apparent that, among people living in Ukraine, the behaviour of Russians in regard to these harmful practices is hardly any different from that of Ukrainians. In fact, although the excess mortality of Russians slightly diminishes the overall difference in life expectancy between Ukraine and Russia, this is almost exclusively because of the over-50 age groups, where diseases of the circulatory system predominate. And obviously, the phenomenon cannot be other than modest in scale.

Thus, ethnicity (Russian or Ukrainian) is not, in Ukraine, a highly distinguishing factor in the area of mortality. In order to ascertain whether living outside one's country of ethnicity has any impact on mortality, we juxtaposed age-specific excess mortality of Russians living in Russia compared to Russians living in Ukraine and of Ukrainians living in Ukraine compared to Ukrainians living in Russia (Fig. 6.2).

In both cases, it is clearly apparent that, for each ethnicity, there is an advantage in living outside one's own country, at least for young adults. For Russians, it is easy to understand why there is a certain advantage to living in Ukraine rather than in Russia: life expectancy is higher in Ukraine. On the other hand, this explanation does not hold good for Ukrainians, as they derive an advantage from living in Russia; this may be seen in the fact that the observed difference in life expectancy is smaller for Ukrainians than for Russians in the younger age groups but larger in the older age groups. However, the difference does exist in the younger age groups and so it requires another explanation. It is probably due to two factors. On the one hand, a large proportion of Ukrainians living in Russia and of Russians living in Ukraine are immigrants. Almost all studies on the subject show that migration selects individuals according to their state of health. Migrants are therefore, on average, in better health than the population they have left, and it is natural that their mortality should be lower. But on the other hand, Ukrainians living in Russia, just like Russians living in Ukraine, have a different socio-economic status from the average status across their whole population of origin. In particular, they are more likely to live in urban areas and they have a higher standard of education.

According to the 1989 census, 87% of Russians living in Ukraine lived in urban areas, as against 73% of Russians in Russia. Similarly, 79% of Ukrainians living in Russia lived in urban areas, as against 61% of Ukrainians in Ukraine. In both Ukraine and Russia, life tables based on place of residence show that urban dwellers have higher life expectancy than those living in countryside. In 1989, this gap was 1.3 years in Russia and 1.7 years in Ukraine.

As far as education is concerned, the 1989 census shows that, although the proportions of men with higher education were more or less the same in Russia and Ukraine, they differed a great deal for both Russians and Ukrainians according to the country where they lived: 39% of Ukrainians living in Russia had higher education, as against 29% of Ukrainians who lived in Ukraine, and 38% of Russians living in Ukraine had higher education, as against 30% of Russians who lived in Russia. Consequently, if we look only at Ukrainians in Ukraine, the national average falls to 29%.[2] As with place of residence, there is significant variation in mortality according to standard of education. In 1989, the temporary life expectancy of men aged 20–69 who held a university degree or a full secondary-school diploma was 4 years higher than that of those who had a basic secondary or primary education (Shkolnikov et al. 1998). Nevertheless, as we have already seen (Fig. 6.1), even in Ukraine, Russians – despite being more highly educated and more likely to live in urban areas – have slightly higher mortality than Ukrainians.

However, this small excess mortality of Russians who live in Ukraine, as compared to Ukrainians, is not necessarily due to any specific feature of the Russian population. It probably bears very little relation to lifestyles or to eating habits; there is no proof of any major differences in these respects that could explain the gap between the two nationalities. On the other hand, we should note that two-thirds of the Russian male population live in the Donetsk-Dnieper region (as against only 40% of Ukrainian males), and that this region contains a concentration of mines, coal processing facilities, large chemical complexes and major iron and steel works. Pollution here is the highest in Ukraine, and this is the region with the lowest life expectancy in the country.

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[2]The situation in Russia is somewhat different, because of the low number of Ukrainians and the presence of other nationalities with very different socio-cultural profiles: for Russians living in Russia, the proportion is 31%, slightly above the national average.

Chapter 7
Health Crises and Cohort Mortality

Vladimir Shkolnikov

Two sorts of relationships can exist between trends in a population's health and trends in the mortality of successive birth cohorts. Firstly, in a period of long-term health improvements, the different cohorts see gradual benefits from this progress; but each new cohort benefits from it more, since it enjoys it sooner and therefore for a longer part of its life. This results from a general decline in mortality as health improves, viewed in terms of cohort. We wondered what happens, from one cohort to another, in a country that is in the contrasting situation of having experienced a decline in health over a long period – like Ukraine. What impact had the deterioration observed since 1965 on cohort mortality? But conversely, we also wondered whether the particular history of certain cohorts, notably those most severely affected by the Great Famine of the 1930s or by the Second World War, leads to these cohorts being distinguished nowadays by poorer health and higher mortality from younger or older cohorts.

7.1 The Outcome of Thirty Years' Deterioration in Health for Birth Cohorts in Ukraine

At the time this chapter was written, the only available data on Ukrainian mortality by year of age and calendar year dated from 1959 onwards.[1] Therefore successive cohorts can be followed only through sections of their lives over about 30 years, and

[1] Editors' Note: it is only very recently that we have been able to gain access to detailed data enabling us to calculate complete life tables for the years before 1959. We could not correct all the chapters to reflect these new data without excessively delaying publication of the book. This was particularly true for this chapter, which relies on fairly long, complex calculations.

V. Shkolnikov (✉)
Max Planck Institute for Demographic Research, Konrad Zuse Strasse 1,
18057 Rostock, Germany
e-mail: shkolnikov@demogr.mpg.de

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Demographic Research Monographs, DOI 10.1007/978-94-007-2433-4_7,

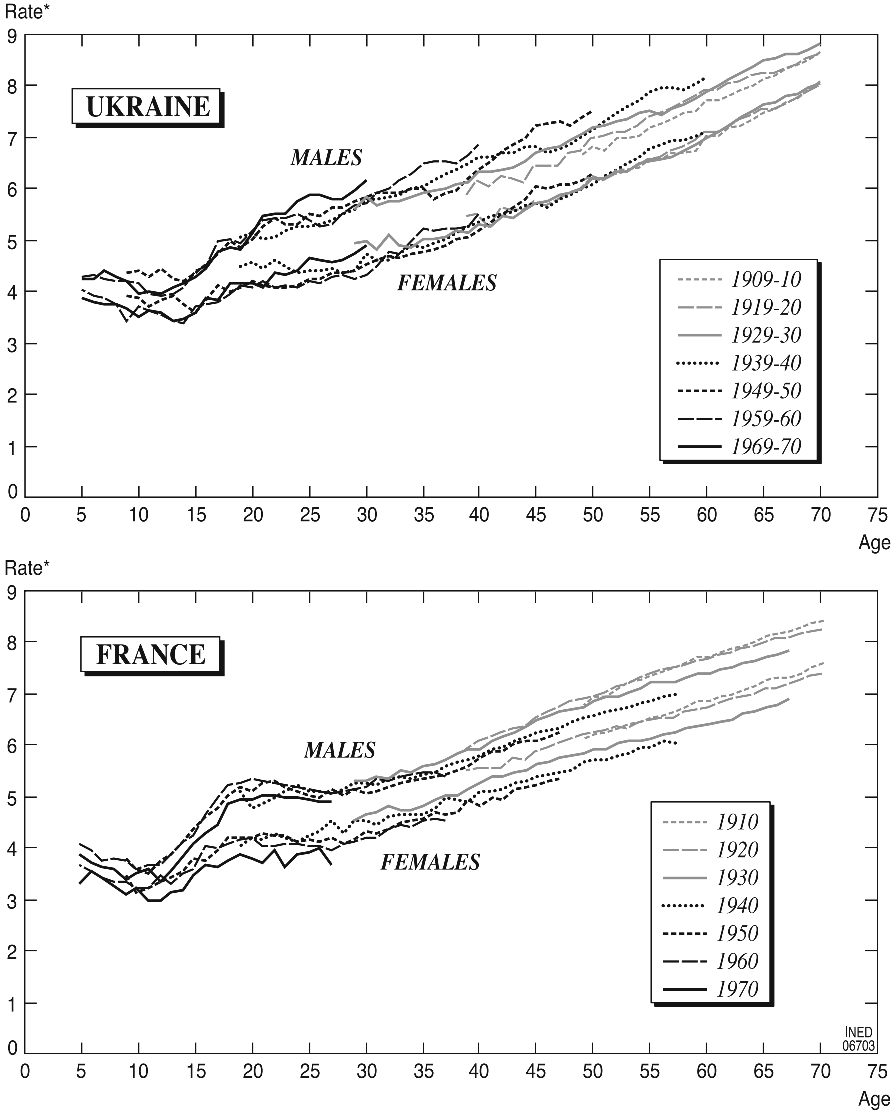

Fig. 7.1 Age-specific mortality rates of Ukrainian and French cohorts 10 years apart. * The mortality rate *m* is represented by Ln(100,000**m*)

these sections obviously occur at different ages in different cohorts. So there is fairly limited scope for comparisons between cohorts at the same age. However, for the age bands that they have in common, it is possible to observe the gaps between cohorts, using a single figure showing age-specific mortality rates in successive cohorts (upper panel of Fig. 7.1).

To make the Figure more readable, only one cohort in ten has been shown; this places further restrictions on the comparison but makes it easier to reveal the differences. In order to compare this picture of cohort mortality in Ukraine to the situation observed in France, we have also strictly limited the French data represented to the same age brackets[2] (lower panel of Fig. 7.1) as those that were available for Ukraine.

In France, from one 10-year period to the next, successive cohorts have experienced lower and lower mortality at the same age. So, in the whole of the age band that they have in common (ages 30–55), the 1940 cohort consistently lies below the 1930 cohort. The same goes for the 1930 cohort compared to the 1920 cohort (ages 50–65) – and so on. This obviously relates to the fact that the most recent cohorts were younger when they started to benefit from various health improvements, while the older cohorts experienced these only at a later age. And in the oldest age groups, the phenomenon is much more pronounced among females because, by the time they reach these ages, they have benefited more from health improvements than males have. In contrast, among the young, the situation is much less regular; for certain cohorts, the reverse is even true, especially among males, because road accidents dominate youth-age mortality, and so the latter rose with the increase in such accidents during the 1960s and 1970s.

In Ukraine, for all those aged over 15, mortality increased among males and stagnated among females over the course of the 30 years under consideration. Among Ukrainian males of the same age, mortality increases from one cohort to another, which is the reverse of the phenomenon that typifies the French adult cohorts. All the female Ukrainian cohorts seem to experience about the same mortality.

Thus, Ukraine's long period of deterioration in health led to new cohorts of males being subjected to increasingly high levels of mortality; at the same time, it prevented the younger female cohorts from improving their situation by comparison with that of their older sisters.

In the context of these general trends, Fig. 7.1 also traces the large fluctuation linked to the anti-alcohol campaign and to the swing away from it, with the latter exacerbated by the economic crisis. Here we can see very clearly that this is a typical example of how the impact of circumstantial phenomena increases with age, as one cohort's trajectory succeeds another.

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[2]However, it should be noted that, for France, the mortality rates are available by cohort in the strict sense – i.e. they are calculated by year of birth and year of age (relating to two calendar years) – while, for Ukraine, rates are available only by year of age and calendar year (relating to two neighbouring cohorts). Because of this, the Ukraine figure represents the average situations of pairs of adjacent cohorts, while the France figure identifies cohorts strictly. This may pose problems if two successive cohorts are born at a time when there has been an abrupt change in the birth rate – for example, with the appearance of a birth deficit linked to the general mobilization for the First World War (Caselli et al. 2001, pp. 105–109).

7.2 The Long-Term Effects of Earlier Traumas

Beyond this general phenomenon, is it reasonable to believe that certain aspects of the overall deterioration in health observed since the mid-1960s are, for some cohorts, linked to the long-term effects of an earlier event that had a severe impact on them. This issue is especially relevant here because Ukraine, as we saw in Chaps. 2 and 3, has been through some very serious crises, notably the famine of the 1930s and the Second World War. These crises hit certain age groups harder than others, and so some cohorts experienced greater after-effects, which could have led to their higher mortality rates even in recent decades. Various writers studying a number of other countries have observed that the First World War and other major events had long-term effects on the later survival of the cohorts most affected (Vallin 1973; Horiuchi 1983; Wilmoth et al. 1989; Caselli 1990; Rychtaríková et al. 1994). With regard more specifically to Ukraine, first Barbara Anderson and Brian Silver (1989), then Frans Willekens and Sergei Scherbov (1992) put forward the hypothesis that cohorts born during the Second World War or the 1950s have had abnormally high mortality in recent years. However, the series on which their analyses relied were too short and fragmentary to provide a definitive view on this point.

The most classic approach to answering this type of question is provided by APC[3] methods (Hobcraft et al. 1982; Wilmoth 2001), in the following form:

$$ln(M_{ijk}) = a_i + b_j + c_k + e_{ijk}$$

where:

M_{ijk} is the central death rate for age i, year j and cohort k,
a_i is the age effect,
b_j, the period effect,
c_k, the cohort effect,
e_{ijk}, stochastic error.

Using the least squares method, age, period and cohort effects are estimated as the linear regression coefficients of the logarithms of mortality rates over dummy variables representing years of age, calendar years and years of birth.[4] The age, cohort and period effects are additive and independent, which means that the age effects are the same for all calendar years and the cohort effects are the same for all ages.

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[3]For 'Age, Period, Cohort'.

[4]For example, for the year 1970, the corresponding dummy variable is 1 for all the observations in this year and 0 for all the others.

We applied this model to the Ukrainian data for the period 1965–2001[5]; however, we excluded mortality at ages 0–4 and over 65 from consideration, so that we would be basing our judgement only on the most reliable age-specific data.[6] The number of observations obviously varies according to the cohort concerned. The 1899–1900 cohort provides a single mortality rate, the rate at age 64 in 1965. The next cohort appears twice, in 1965 and 1966, at ages 63 and 64 respectively. In this way, the number of observations rises to 37 in the 1934–1935 cohort. Each of the 1934–1935 to 1959–1960 cohorts is the object of 37 observations, sequentially shifted with age. Then the number of cohort observations declines gradually from the 1959–1960 cohort to the 1994–1995 cohort, which in turn provides only a single observation, at age 5.

The age of 5, the year 1965 and the 1919–1920 cohort were taken as reference points. The age-period-cohort effects were measured in terms of deviation from these reference levels. The calculations were carried out using STATA software. The correlation coefficient R^2 between the observed and the estimated rates was very high, in the order of 0.998 for each of the two sexes.

In order to make a comparison with France, the same model was applied to the French data for the same period[7] and the same age ranges.

Figures 7.2–7.4 show the effects of age, period and cohort calculated for each sex in the two countries. The age effects (Fig. 7.2) come as no surprise. Mortality here follows its classic laws, growing more or less exponentially with age from 30 onwards, but also with a downward trend among the very young (ages under 10) and a local elevation around the age of 20. The difference between Ukraine and France lies in the concavity of the French curves in the young adult age groups, which contrasts with an earlier exponential rise in Ukraine.

The period effects (Fig. 7.3) are certainly also the expected ones, showing a very clear contrast between the downward trend in French mortality (which, following a period of stagnation in the 1960s, has been constant since the early 1970s) and long-term deterioration in mortality of Ukrainian males and stagnation in mortality of Ukrainian females. In Ukraine, we can also see very clearly the large fluctuation following the anti-alcohol campaign of 1985 and the political and economic transition in the early 1990s.

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[5] In fact, revealing cohort effects requires great precision in measuring age-specific rates. Although age-specific mortality rates are available from 1959, the years 1959–1964 were excluded from our analysis because of the quality of population estimates for those years. We knew that 1959 census population counts by year of age were so imprecise. This suggests that errors in the age-specific rates may disrupt the cohort analysis, and it was only from the 1964 microcensus onwards that annual age-specific population estimates enabled us to calculate mortality rates that were usable here.

[6] There was a risk that improved registration of deaths at these ages (see Chap. 4) might distort the analysis.

[7] In fact, for France, this period covers the years from 1965 to 1997.

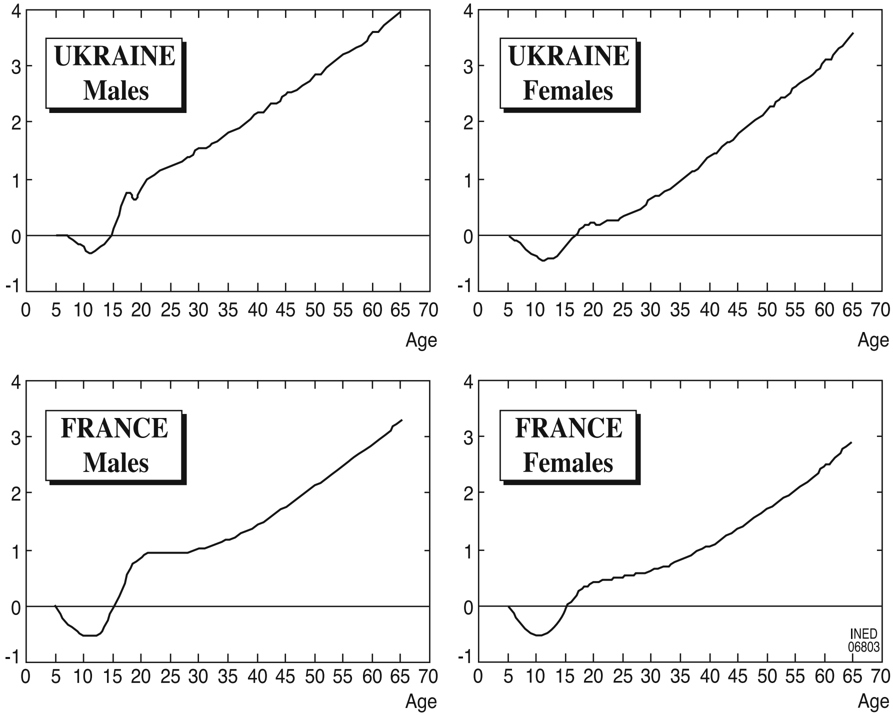

Fig. 7.2 Sex-specific age effects estimated by the APC model, Ukraine and France (1965–1995)

The results in terms of cohort effects (Fig. 7.4) are more difficult to interpret. In Ukraine, they never seriously differ from the reference level, and therefore, where they exist, they play only a minor role compared to age and period effects. Moreover, the estimates fluctuate quite substantially, leading us to fear that the parameter intended to represent stochastic error has failed to absorb much fluctuation. This absence of any notable effect does not necessarily mean that there is no cohort effect. Rather, it indicates that, if the effect exists, the fact that we are attempting to observe it in a limited set of observations prevents us from detecting it.

Better still, the French example clearly shows at what point the application of the APC model to truncated cohort data may become misleading. We should first of all note that short-term fluctuations are much smaller in the French case, probably because the data are of better quality (in particular, the population estimates by year of age, which serve as denominators for the rates); this confirms our view that the Ukrainian fluctuations are random ones. On the other hand, Fig. 7.4 seems to show that in France, notably among males, the mortality of cohorts born in the 1960s is significantly greater than that of the cohorts on either side. In fact, this is deceptive.

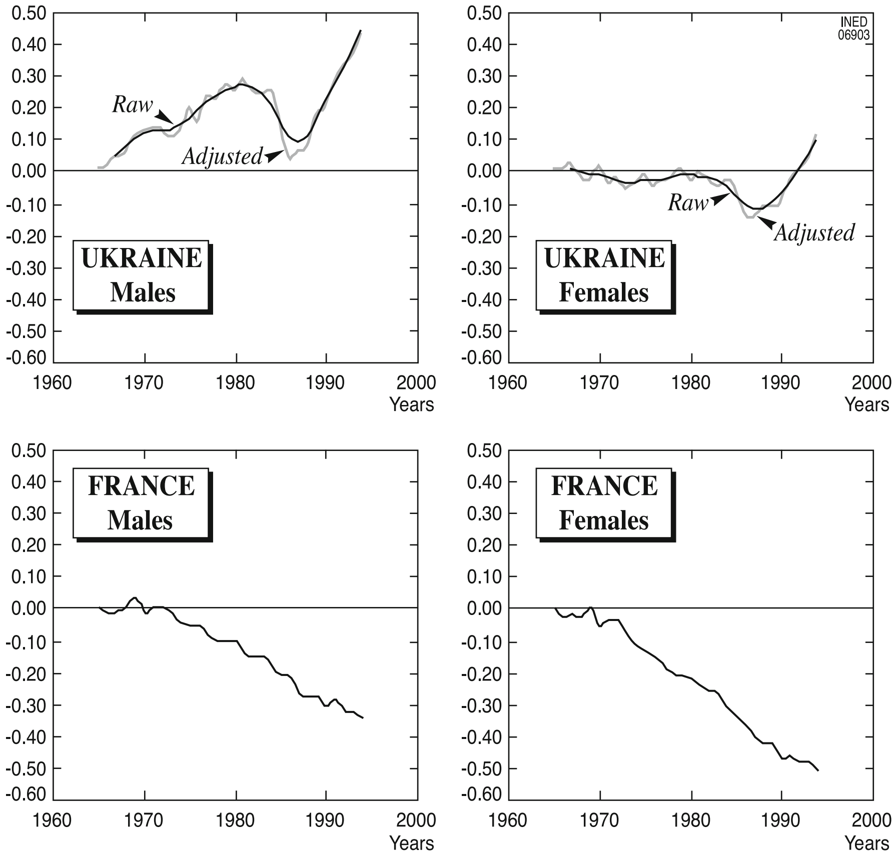

Fig. 7.3 Sex-specific period effects estimated by the APC model, Ukraine and France (1965–1995)

The 1960s cohorts reached the age of 20 at the time when mortality from road accidents among young people of this age reached its peak, having increased steadily since the Second World War. They are also the same cohorts that reached the age of about 30 at the time when, in its turn, mortality from AIDS reached its maximum level. In both cases, earlier and later these cohorts actually enjoyed more favourable mortality levels. This makes it clear that the detected effects – may be at least partially false because of a lack of observations on mortality at older ages cannot be observed. In reality, there was a chain of circumstances here that led to the same group of cohorts suffering the consequences of two successive events separated by the same distance in time as the gap between their target ages. When the APC model highlights a result like this so clearly, it is because, for the cohorts concerned, the analysis is limited to the young adult age groups particularly affected by these two setbacks.

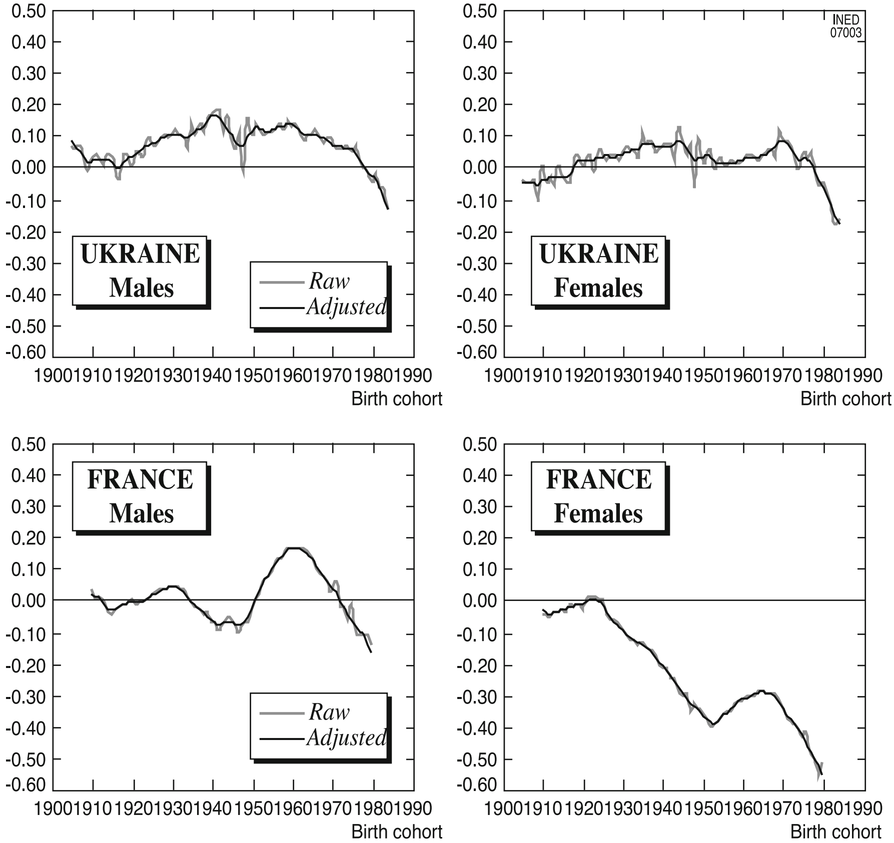

Fig. 7.4 Sex-specific cohort effects estimated by the APC model, Ukraine and France (1965–1995)

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Part III
Cause-Specific Mortality Trends from 1965

Introduction to Part III

After devoting Part I to historical reconstructions, in Part II we analysed the major trends in age-specific mortality from the inter-War period onwards. Apart from the major crises of the past, the most striking aspect of the recent history of mortality trends in Ukraine is the reversal observed in that country in the mid-1960s, as in all countries of the former USSR; it is to this major event that the INED research project on *the health crisis in the countries of the former USSR* is mainly devoted. An analysis of cause-specific mortality trends is vital to a better understanding of this spectacular "exception" to the health transition theory (Caselli et al. 2002), and Part III is devoted to this analysis.

Unfortunately, its historical range is limited by the nature of the available data. We were able to gain access to cause-specific death statistics from 1959 onwards. However, as we shall see in Chap. 9, the use of these data requires consistency to be imposed on time series that have been broken by changes in cause-of-death classification. In the process of reconstructing series of causes with constant definitions, each change in classification requires lengthy, sensitive comparisons between the two successive classifications, both from the point of view of the medical content of the items used and from the point of view of changes in their statistical content over time. At the time of writing this book, this task has been performed for only the last three changes in classification (in 1970, 1981 and 1988) and therefore we are able to analyse cause-specific mortality trends only from 1965, the first year covered by the earliest of the classifications concerned. In order to take advantage of the information contained in the 1959–1964 data, it would have been necessary to deal with the transition between the 1952 classification and the 1965 one; not only was this more complex than the later transitions, but we would also have had to work with very partial data, for just a fraction of the period covered by the 1952 classification. We therefore decided not to do this in the context of the present study.

In the next five chapters, we shall first describe the Soviet system of recording deaths and causes of death and then discuss the quality of data collected in this way (Chap. 8). Next we shall present the methods that enabled us to reconstruct time series of deaths by cause from 1965 onwards, in line with the medical definitions of the most recent detailed list (Chap. 9). We shall then be able to use these series to give an overview of general trends in mortality by cause (Chap. 10), to measure the impact of these trends in major groups of causes on life expectancy trends (Chap. 11) and, finally, to analyse in depth detailed cause-specific trends within five large age groups, marking the principal stages in life (Chap. 12).

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Chapter 8
Data Collection, Data Quality and the History of Cause-of-Death Classification

Vladimir Shkolnikov, France Meslé, and Jacques Vallin

Until 1996, when INED published its work on trends in causes of death in Russia (Meslé et al. 1996), there had been no overall study of cause-specific mortality for the Soviet Union as a whole or for any of its constituent republics. Yet at least since the 1920s, all the republics had had a modern system for registering causes of death, and the information gathered had been subject to routine statistical use at least since the 1950s. The first reason for the gap in the literature was of course that, before perestroika, these data were not published systematically and, from 1974, had even been kept secret. A second reason was probably that researchers were often questioning the data quality; however, no serious study has ever proved this. On the contrary, it seems to us that all these data offer a very rich resource for anyone attempting to track and understand cause-specific mortality trends in the countries of the former USSR – in our case, in Ukraine. Even so, a great deal of effort was required to trace, collect and computerize the various archived data deposits.

This chapter will start with a brief description of the registration system and a quick summary of the difficulties we encountered and the data collection methods we used. We shall then review the results of some studies that enabled us to assess the quality of the data.

V. Shkolnikov (✉)
Max Planck Institute for Demographic Research, Konrad Zuse Strasse 1,
18057 Rostock, Germany
e-mail: shkolnikov@demogr.mpg.de

F. Meslé • J. Vallin
Institut National d'Études Démographiques, Bd. Davout 133,
75980 Paris Cedex 20, France
e-mail: mesle@ined.fr; vallin@ined.fr

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8.1 The Registration and Coding System

The history of cause-of-death statistics in Ukraine is a relatively short one. It was only in 1925 that a system for registering cause of death on a regular basis was instituted throughout Ukraine (and across the USSR). The first Soviet Classification of Causes of Death, drawn up in 1922 and officially adopted in 1924 (Sadvokasova 1955), was quite close to the 1920 International Classification of Diseases (ICD).

However, full registration of causes of death was still not achieved, because doctors alone were empowered to write death certificates (Bystrova 1965), and some places – notably rural areas[1] – had very few doctors. It was only in towns that the system functioned properly, covering less than half the population of Ukraine. The situation improved from 1958, when the Ministry of Health and the TsSU (Central Statistical Directorate of the Soviet Union) decided to authorize another category of medical worker, the *feldsher*,[2] to make out a death certificate when there was no doctor. In 1959, 15% of death certificates in rural areas were completed by a *feldsher*. The proportion then decreased steadily throughout the 1960s and 1970s, falling to 5% or 6% in the mid-1980s.

Since most of the data we processed were compiled under the Soviet regime, we shall start by describing the system of registration and coding in force during that era. We shall go on to show that the change in political regime has not as yet called this system into question.

8.1.1 The Soviet System of Registering and Coding Causes of Death

After a death, the deceased's relatives must obtain a medical certificate of cause of death from the responsible institution (hospital, *poliklinika* [district clinic] or *sudebno-meditsinskaia expertiza* [Forensic Medical Examiner's Office]) and take it to the district register office (ZAGS). They exchange it for a civil death certificate that serves as both a burial permit and a legal document for inheritance purposes. ZAGS then sends the medical death certificate to the regional office of statistics (for the *Oblast* [province] or similar administrative area[3]).

As in most countries, the medical death certificate distinguishes three levels of causes: the underlying (principal or primary) cause, the immediate cause and contributory (associated or secondary) causes. Statistical tables are based on the

[1] The archives contain no record of deaths by cause for rural areas before the early 1950s.

[2] Within the Soviet health system, someone with an intermediate qualification, between a midwife and a doctor.

[3] Such as Autonomous Republic or Autonomous Territory.

Table 8.1 Cause-of-death Classifications in the USSR since the Second World War

Period	Title	Number of items	Age groups used
1955–1964	1952 classification (Soviet classification of causes of death, 3rd revision)	116	0, 1, 2, 3–4, 5–6, 7–13, 14–15, 16–17, 18–19, 20–24, 25–29, 30–39, 40–49, 50–59, 60–69, 70 and over
1965–1969	1965 classification (based on ICD-7)	210+13[a]	0, 1, 2, 3, 4, 5–9, 10–14, …, 80-84, 85 and over
1970–1980	1970 Classification (based on ICD-8)	185+10[a]	0, 1, 2, 3, 4, 5–9, 10–14, …, 80-84, 85 and over
1981–1987	1981 classification (based on ICD-9)	185+10[a]	0, 1, 2, 3, 4, 5–9, 10–14, …, 80–84, 85 and over
Since 1988[b]	1981 classification, adapted for deaths from injury and poisoning (based on ICD-9)	175+10[a]	0, 1, 2, 3, 4, 5–9, 10–14, …, 80–84, 85 and over

[a]For classifying deaths from injury and poisoning according to nature of injury
[b]The 1988 revision was modified in the 1990s in order to identify previously non-existent causes (like AIDS) or causes that had not been recorded singly (such as hunger)

underlying cause. In Ukraine, regional offices of statistics are responsible for coding the cause of death, and each one produces an annual table ('Form No. 5') giving the number of deaths by sex, age group and cause. These regional tables are then sent to be processed and totalled up centrally for the whole of Ukraine (as was the case for the other Soviet republics) by Goskomstat of Ukraine; until 1991, they were then processed at the level of the whole Soviet Union by Goskomstat of the USSR. These tables are the main source of the mortality data used in our study.

The USSR never adopted the World Health Organization's *International Classification of Diseases, Injuries and Causes of Death*, but used its own classification, with a detailed list that, from 1965, included about 200 items. From the foundation of the Soviet state, seven different versions of this classification were used in succession, five of them after the Second World War. Table 8.1 gives an overview of the latter.

The Ministry of Health and Goskomstat have had joint responsibility for modifications[4] to the certificate of cause of death and to the rules on declaration and coding, as well as for successive revisions of the Classification. Goskomstat entirely computerized its processing of mortality data in 1988; until then, cross-tabulations had been produced manually.

Four of these successive versions were in use between 1965 and the Independence of Ukraine: the 1965, 1970, 1981 an d 1988 Revisions. A detailed description of these is to be found in Annex III on the Website (http://www.demogr.mpg.de/books/drm/009 or http://extras.springer.com/).

[4] To our knowledge, new directives were introduced at least eight times – in 1954, 1964, 1966, 1980, 1984, 1986, 1989 and 1992.

Three particular features of the Soviet system for declaring and recording cause of death are worth emphasizing.

1. The Soviet Classification has always differed significantly from the ICD definitions, although they were brought somewhat closer together from 1965 onwards. In particular, the number of Soviet items is far smaller than the number of ICD items: 210 items in 1965–1969, as against over 2,000 in ICD-7; from 1970, 185 instead of almost 3,000 in ICD-8 and then over 5,000 in ICD-9 (WHO 1977, 1978). Goskomstat produced a special document with a table showing correspondences between the 1981 Soviet Classification and ICD-9 (Goskomstat 1981).
2. Up to 1988, some items in the Soviet Classification did not appear in the ordinary annual tables of statistics ('Form No. 5'): these causes (cholera, plague, suicide, homicide and occupational accidents) were concealed for political reasons. In order to ensure consistent "All causes" totals, the deaths attributed to these 'hidden' causes were added to the "Ill-defined causes of death". In fact, the hidden causes were also accounted for separately in a special, top-secret table ('Form No. 5b'), which we were finally able to consult for the years 1963–1982 and 1984–1987 – though not for 1983. However, we were able to subject that year to an indirect estimate from the data available for the whole USSR and from the special category reserved for deaths from injury and poisoning.[5] There is no mystery as to why the Soviet authorities kept these causes secret: in 1970, for example, the standardized male mortality rate from homicide in the Soviet Union was almost eight times the European average. The authorities were concerned to keep such information, which was viewed as politically dangerous, out of reach of both inside and outside observers.
3. The coding system is decentralized. Therefore, despite all the instructions, newsletters and directives issued by the Ministry of Health and Goskomstat, there is

[5] At the end of our preliminary investigations in Moscow, we still had a problem with these hidden causes: for 1983 and 1984, data were available only for the whole USSR, not by individual republic. However, it was still possible to find the number of 'hidden deaths from injury and poisoning' for each republic – and therefore, here, for Ukraine – by subtracting officially acknowledged deaths from injury and poisoning from all deaths from injury and poisoning. The ordinary tables classify deaths from injury and poisoning twice, once according to the external cause of death and once according to nature of injury. All deaths from injury and poisoning, whatever their cause, are classified according to the nature of the injury, and the relevant table clearly shows the total number of deaths from injury and poisoning – including those relating to hidden causes. After using this approach to find the total number of hidden deaths from injury and poisoning, we distributed them for each republic in proportion to the structure of external causes of death for the whole USSR. In the end, the only remaining hidden deaths for these 2 years were deaths from plague and cholera, classified under 'Ill-defined causes of death'; but by that period these two causes had become insignificant. In fact, we managed to find Ukraine's 1984 statistics for hidden causes in Ukraine itself. Therefore, 1983 is the only year for which indirect estimates are used here.

some risk of regional differences in coding practices. Cause-of-death coding by regional offices of statistics is not checked or corrected at the national level. In fact, analysis of the data by republic suggests that some instructions were applied at different dates or using different methods. However, we can reasonably hope for less heterogeneity within each republic than between republics.

8.1.2 Little Change Since Independence

As far as we have been able to find out, independence for Ukraine does not seem to have led to any significant amendments in the system for collecting information on causes of death, still in force from the Soviet period until 2004. In particular, the last Soviet classification of causes of death remained in use for 15 years ahead. Apart from the very specific changes brought into effect in the 1990s, already mentioned in Table 8.1, the Soviet detailed list of causes of death remained in force throughout the whole period covered by this study. Ukraine was late adopting the International Classification of Diseases, contrary to the Baltic States and Russia. It has been done in 2005 only and only on the basis of a simplified list of 258 groups of ICD-10 items, that we shall call "2005 Ukrainian classification". Results of that change are too recent to give us the means to deal with its statistical effect definitely in the framework of that book, but we shall refer to data as they are, as far as possible to complete series used in the following chapters until 2006.

8.2 The Available Data

Very little data on causes of death was published in the Soviet period. For the 1960s and early 1970s, some overall figures on mortality from cancer and diseases of the circulatory system[6] for the whole Soviet Union were published in the journal *Vestnik statistiki*, in the *Narodnoe Khoziaistvo SSSR* statistical annuals and in the 1973 demographic yearbook *Naselenie SSSR* (TSSU 1975).

The situation became even worse between 1974 and 1987, after the Soviet Government decided to ban any publication on mortality and causes of death, since unfavourable trends in this area had become a taboo subject.

It was only in 1987–1988 that perestroika and glasnost opened up a completely new era in statistics and that cause-of-death data were published systematically for the first time. But at first these gave only age-specific mortality rates for very broad groupings of causes (infectious diseases, neoplasms, diseases of the circulatory system, respiratory diseases, injury and poisoning). Since then, current

[6] Mortality rates by sex and age for 1966–1967, 1968–1969 and 1969–1970; for 1973, crude rates only.

data have become more easily accessible and more widely used, though no retrospective picture has been available before the publication of the French version of that book, in 2003.

In order to be able to analyse long-term cause-of-death series in sufficient detail, we mainly had to use the original handwritten returns produced by Goskomstat, which became accessible in 1988 when the archives were opened.

However, for the years 1971, 1976 and 1980–1990, we obtained a copy of the computerized files from the Data-Processing Centre of the Ministry of Health of the Russian Federation, giving numbers of deaths by sex, age, cause and republic. For the post-1990 years, we obtained paper copies or computer files (depending on the year in question), up to and including 2006.

For the other years (1959–1970, 1972–1975 and 1977–1979), we gained access to the original tables, kept in the Russian State Archive of the Economy.[7] It was no small task to determine whether certain tables existed (notably for 'hidden' causes), to locate them, to photograph thousands of original manuscript sheets (bound in heavy registers that could not be taken away) and, finally, to key in all the data.

8.3 Data Quality[8]

All countries face the issue of validity and comparability in recording causes of death. These depend very much on the quality of diagnoses, on the system for registering and coding causes, on the training given in medical schools, and on practitioners' habits and priorities.

During the Soviet period, three major surveys looked at the quality of registration of causes of death. They were all conducted in similar ways. A certain number of medical death certificates was collected in each region chosen. Next, experienced doctors checked the quality of diagnosis and coding, by comparing the underlying cause of death declared on the certificate both to the true diagnosis, which could be established from the medical file and the post-mortem report, and to the item under which it was finally coded. None of these surveys related directly to Ukraine, but they allow us to lift a corner of the veil over the quality of observations made in the Soviet Union, and therefore in Ukraine.

[7] Russian State Archive of the Economy (RGAE), fonds 1562, series 27 (files 833, 1023, 1187, 1328, 1464, 2632, 2638, 2655–2658, 5873, 5874, 5881, 9742, 9743, 9752, 9753), series 33 (files 980, 1361, 1700, 6627, 6984, 7320, 7652, 7933), series 34°C (files 174, 356, 529, 701, 882), series 44 (files 2625, 2655–2658), series 45 (files 2368, 2369, 5873, 5874, 5881, 9742, 9743, 9752, 9753), series 46 (files 1587, 1588, 1595, 1596), series 47 (files 1430, 1431, 1438, 1439), series 48 (files 1289, 1290, 1299, 1300), series 49 (files 1859–1860, 1869–1871), series 50 (files 1758, 1759, 1768–1770), series 55 (files 1908, 1909), series 56 (files 1936, 1937, 1947, 1948).

[8] This section covers essentially the same ground as a text about the quality of cause-of-death data in Russia, already published by INED (Meslé et al., 1996).

The first survey related to death certificates was completed in central Russia (Tula, Novomoskovsk, Tambov, Michurinsk) in the early 1960s (Bystrova 1965). The second one dealt with a sample of 1979 certificates from different regions of Russia (Bednyi et al. 1980, 1981). The last one involved certificates completed in Belorussia (now Belarus) and in Turkmenistan in 1981–1982 (Ovcharov and Bystrova 1982). The results of these surveys taken together might have provided some very interesting data. Unfortunately, the description of the material used is very cursory: not even the total number of deaths studied in each survey is shown, and there are no data on age or sex. In Bednyi's survey, there is no mention of which regions provided the certificates used.

Despite their serious inadequacies, these surveys gave us important indications. They offer two types of results (Tables 8.2 and 8.3).

Table 8.2 gives the percentage of errors in medical diagnoses and in coding. The total percentage of diagnostic errors varies from 6.6% (Minsk, 1981–1982) to 12.7% (Russia, 1979), while the percentage of coding errors varies from 4.1% (Minsk, 1981–1982) to 17.7% (Tula, etc., 1960). For most causes of death, there is a higher proportion of errors in coding than in diagnosis. For cancer (neoplasms) and for injury and poisoning, the number of errors is small; it is much higher for hypertensive, cerebrovascular and ischaemic heart diseases, respiratory diseases and digestive diseases.

Table 8.3 gives the final differences observed between real cause and registered cause after the two types of errors quantified in Table 8.2 have been combined. In many cases, each type of error cancels out the other.

The table shows some over-registration of deaths from cerebrovascular disease, coronary atherosclerosis, atherosclerotic cardiosclerosis and respiratory diseases and, in contrast, under-registration of deaths from cancer, hypertensive diseases and myocardial infarction. In fact, without knowing the absolute numbers, we cannot check whether these opposed trends offset each other within the given sample. In order to test the validity of the observations, we applied the set of coefficients from Table 8.3 to cause-specific death statistics for Russia (1960 and 1979), Belorussia (1981–1982) and Turkmenistan (1981–1982). There was little difference between the total numbers of 'All causes' deaths before and after correction; so we were able to place some confidence in the results of these surveys.

These surveys do not confirm the widely-held view that mortality from diseases of the circulatory system was overestimated in the USSR. There are indeed fairly large errors for the various diseases that make up this group, but they offset one other, so that in the end the total percentage error is modest. Furthermore, only the first study indicates slight over-registration of mortality from diseases of the circulatory system; the other two show under-registration of 2–3%.

These findings contradict the point of view – defended by Iuri Belenkov et al. (1987), among others – that there was substantial over-registration of deaths from causes related to the circulatory system, especially among old people. The data available from these surveys did not allow a more precise analysis of differences by age. Given the overall results (Table 8.3), if circulatory diseases in the older age groups were really over-estimated, there would be an accompanying under-estimate

Table 8.2 Percentage of errors in diagnosing and coding causes of death, according to three Soviet surveys. Table taken from Meslé et al., 1996

	Survey							
	(1)		(2)		(3)		(3)	
	Tula, Novomoskovsk Tambov, Michurinsk		Unspecified regions of Russia		Minsk (Belorussia – now Belarus)		Ashkhabad (now Ashgabat – Turkmenistan)	
Cause of death	Diagnosis	Coding	Diagnosis	Coding	Diagnosis	Coding	Diagnosis	Coding
Infectious diseases	**–**	**–**	***10.5***	***14.0***	***23.2***	***5.6***	***16.3***	***14.3***
Tuberculosis	1.8	4.1	–	–	–	–	–	–
Neoplasms	***3.8***	***6.1***	***4.6***	***0.8***	***3.9***	***3.0***	***4.9***	***18.1***
Digestive organs	4.0	3.9	–	–	–	–	–	–
Respiratory organs	3.0	2.2	–	–	–	–	–	–
Female genital organs	0.0	5.2	–	–	–	–	–	–
Breast		0.0	3.9	–	–	–	–	–
Leukaemia	4.1	7.6	–	–	–	–	–	–
Circulatory diseases	***14.7***	***25.1***	***17.0***	***26.4***	***3.3***	***7.6***	***20.5***	***8.8***
Rheumatism	7.5	10.6	32.4	1.4	–	–	–	–
Hypertension	11.6	25.7	5.4	40.0	–	–	–	–
Ischaemic diseases	–	–	24.9	21.4	–	–	–	–
Cerebrovascular diseases	16.5	30.6	6.6	18.3	–	–	–	–
Respiratory diseases	***13.0***	***22.8***	***24.5***	***24.6***	***11.8***	***7.8***	***10.2***	***15.8***
Digestive diseases	***12.8***	***21.1***	***29.7***	***5.9***	***12.8***	***3.7***	***22.1***	***13.0***
Genitourinary diseases	***14.6***	***14.6***	**–**	**–**	***7.3***	***11.8***	***8.0***	***37.5***
Congenital anomalies	***12.5***	***5.0***	**–**	**–**	***2.2***	***7.7***	***16.7***	***40.0***
Injury and poisoning	***3.3***	***8.9***	***0.0***	***3.7***	***1.4***	***3.1***	***4.9***	***23.3***
Total	***10.8***	***17.7***	***12.7***	***17.2***	***6.6***	***4.1***	***9.0***	***10.1***

(1) Bystrova (1965)
(2) Bednyi et al. (1980, 1981)
(3) Ovcharov and Bystrova (1982)

Table 8.3 Over-estimated or under-estimated causes of death, according to three Soviet surveys. Number of deaths classified in a given category per 100 deaths actually falling into that category. Table taken from Meslé et al., 1996

	Survey			
	(1)	(2)	(3)	(3)
Cause of death	Tula, Novomoskovsk Tambov, Michurinsk	Unspecified regions of Russia	Minsk (Belorussia – now Belarus)	Ashkhabad (now Ashgabat – Turkmenistan)
Infectious diseases	**–**	–	***96.3***	***84.4***
Tuberculosis	100.0	–	–	–
Neoplasms	***96.3***	**–**	***95.5***	***96.4***
Stomach	96.8	–	–	–
Oesophagus	100.0	–	–	–
Respiratory organs	99.2	–	–	–
Female genital organs	94.3	–	–	–
Breast	75.0	–	–	–
Circulatory diseases	***102.3***	***97.2***	***98.8***	***96.9***
Rheumatism	96.1	95.8	–	–
Hypertension	71.2	60.0	–	–
Ischaemic heart disease	–	96.0	–	–
Coronary atherosclerosis	106.6	103.8	–	–
Myocardial infarction	86.5	92.2	–	–
Cardiosclerosis	133.5	–	–	–
Cerebrovascular diseases	135.3	114.9	–	–
Respiratory diseases	***111.3***	**–**	***117.2***	***111.7***
Digestive diseases	***88.5***	**–**	***95.4***	***114.7***
Genitourinary diseases	***100.0***	**–**	***101.2***	***88.0***
Congenital anomalies	***100.0***	**–**	***100.0***	***66.7***
Injury and poisoning	***99.5***	**–**	***98.6***	***94.2***

(1) Bystrova (1965)
(2) Bednyi et al. (1980, 1981)
(3) Ovcharov and Bystrova (1982)

at other ages. In the absence of any other indications, we felt it prudent not to transfer any deaths from circulatory causes into the other major nosological categories. On the other hand, some redistribution of deaths between the different circulatory items might be helpful – for example, from the seemingly over-estimated cerebrovascular to the under-estimated hypertensive diseases. However, the unfavourable trends in mortality from circulatory diseases in Ukraine (like in Russia and other European republics of the former USSR) reflect a real deterioration much more than any increased over-estimation.

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Chapter 9
Reconstructing Series of Deaths by Cause with Constant Definitions

France Meslé and Jacques Vallin

In all countries, the study of long-term cause-specific mortality trends is hampered by discontinuities that distort statistical series as a result of periodic revisions to the classification of causes of death. In very rare cases, when an office responsible for cause-of-death statistics has produced classifications for one or two transition years under two different revisions (as in England and Wales when the Eighth Revision of the International Classification of Diseases (ICD-8) was replaced by the Ninth Revision (ICD-9); see Meslé and Vallin 1993), observed transition coefficients can be used to reassign deaths classified under the old revision to the various items of the new revision. Unfortunately, in most cases, no such double classification is available, and a way has to be found to estimate the transition coefficients *ex post*.

This study took a method that we had developed for France in order to reconstruct continuous cause-specific time series of deaths, classified according to the Detailed List of ICD-9 since 1925 (Meslé and Vallin 1996; Vallin and Meslé 1988, 1998), and applied it to the Soviet Union as a whole and then to its 15 constituent republics. The first step in this method was to reconstruct time series for the Soviet Union for 1970–1987 (Meslé et al. 1992), using data compiled under the 1970 and 1981 Soviet Classifications, and then to process the data for each republic. The study next reconstructed continuous series for Russia, starting in 1965 (Shkolnikov et al. 1995a; Meslé et al. 1996) and working with data recorded under three consecutive revisions of the Soviet classification. This exercise showed that the results obtained for the Soviet Union as a whole could not be transposed directly to Russia: they made a useful starting-point, but were inadequate in a number of ways. Although the instructions for data collection and coding were the same everywhere, not only did their application vary in practice according to local interpretations, but patterns

F. Meslé (✉) • J. Vallin
Institut National d'Études Démographiques, Bd. Davout 133,
75980 Paris Cedex 20, France
e-mail: mesle@ined.fr; vallin@ined.fr

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of disease also differed sharply from one republic to another, and this had differing impacts on particular changes to the detailed list and on data collection methods.

Differences between Russia and Ukraine might be expected to be fairly minor. In fact, there are considerable differences between the two republics. Once again, although the results obtained for Russia were a valuable starting-point, they had to be systematically verified and adjusted in many ways for Ukraine.

After a brief description of the method used to reclassify causes of death, we shall highlight the main points where the Russian exercise had to be adjusted for the specific Ukrainian context. This fundamental stage, which reduced the statistical discontinuities caused by changes to the detailed list, was still not enough to produce series with perfectly constant definitions, because, in addition to revisions to the classification, there are explicit or implicit changes to data collection and coding practices that also create statistical distortions. These distortions must be reduced before cause-specific mortality trends can be analysed, and such amendments are usually particular to each republic.

9.1 The Reclassification Method as Applied to Russia

Our reclassification method for each transition from one Classification to the next has three main stages: constructing bridge tables, defining fundamental associations of items with constant contents, and calculating transition coefficients.

9.1.1 Bridge Tables

The first stage consists of creating two symmetrical tables that show correspondences between the two classifications. The first table lists, for each item in the old classification, all the items in the new classification that have one or more diseases in common with it. Symmetrically, the second table lists, for each item in the new classification, all the items in the old classification that correspond partly or fully to it. We had only the title of each item on the Soviet list to indicate its medical contents, since there are no more details about the precise medical conditions included in each item.[1] However, the two tables already established for the Soviet Union and

[1] In contrast, in ICD-9, for example, the content of the 5,600 items is described in detail in the analytical list. Further, an alphabetical index containing more than 60,000 terms and expressions makes it possible to assign every medical condition precisely to a single item (WHO 1977, 1978). However, Galina Gurova, statistician in charge of cause-of-death classifications at Goskomstat, provided us with two tables that summarize the 1965 items partly or fully included in each 1970 item, as well as the corresponding list of three-digit codes from ICD-8. For the transition from the 1970 Classification to the 1981 Classification, a similar – though less complete – document was published by Goskomstat (1981). These gave us our second table and provided us with the information necessary to create our first table.

Russia can be applied to Ukraine. At this stage, only the medical content of the cause-of-death items as indicated is considered, and the two initial tables rely entirely on the Soviet classifications and not on their possible applications in the different republics.

9.1.2 Fundamental Associations of Items

These two bridge tables are next used to define *fundamental associations of items*, which contain all the old and new items that are strictly necessary for the medical conditions within a given association to be exactly the same in both the old and the new classifications (that is, no elements are missing). A fundamental association is first established on the basis of the theoretical definitions of items, then its statistical consistency is checked by analysing the annual numbers of deaths corresponding to each association (before and after revision). At the first stage of the project, annual numbers of deaths for each association were examined for the Soviet Union from 1970 to 1987 in order to detect any abnormal discontinuity in the series during the transition from 1980 to 1981, the year the new classification was introduced (Meslé et al. 1992). Next, Russia was treated separately for a longer period, and the series of deaths from 1965 to 1980 were checked, using Russian data, in order to detect any discontinuity during the transition from 1969 to 1970 (Meslé et al. 1996). Both for the 1981 revision in the Soviet Union and the 1970 revision in Russia, changes in the detailed lists caused far more statistical disruption than might be suggested by a simple comparison of the names of the items in the two consecutive Classifications. Each new revision was accompanied by changes in coding practices, independent of the theoretical definitions of the items. This meant that we had to find the actual definitions used and correct the associations accordingly, while ensuring statistical consistency. With respect to the revision for the Soviet Union from the 1970 to the 1981 Classification, 137 fundamental associations of items were established, matching 137 groups of the 185 items from the first Classification one-to-one with 137 groups of the 185 items from the second Classification. Similarly, 132 fundamental associations of items were established for Russia for the transition between the 1965 and the 1970 Classifications.

Of course, not all these associations are of the same kind. Some – fortunately, most – are extremely simple, matching a single item from the new revision with a single item from the old one. That was the case for 91 of the 132 fundamental associations established for Russia between the 1965 and 1970 revisions. Other associations are also very simple, either straightforward amalgamations (where several items from the first classification merge into a single item in the second classification) or straightforward subdivisions (where one item from the first classification is simply subdivided into several new items in the second). In Russia, these two categories contained 10 and 6 associations respectively. In fact, in the case of Russia, only 25 fundamental associations were genuinely complex, reflecting inter-item exchanges between several items in each of the 1965 and 1970 revisions (Meslé et al. 1996, Annex IV).

Once the statistical continuity of each fundamental association is ensured, at least in terms of the total number of deaths, the next stage involves calculating the transition coefficients that make it possible to move from the items on the old detailed list to those on the new one.

9.1.3 Transition Coefficients

At this third stage, unless something has been wrongly assessed at the previous stages, any statistical discontinuity in a series of deaths attributed to one item must be resolved within the fundamental association to which that item belongs. The associations thus provide a framework within which *transition coefficients* can be calculated for each item. These coefficients are then used to redistribute the deaths classified under the old revision among the items in the new revision.

Determining the coefficients involves two steps. An initial set of coefficients is estimated by logical deduction, analysing the content of the associations. The result is then throughly checked statistically and the necessary corrections made in order to reach the final set of transition coefficients. This exercise was performed first for the Soviet Union for the period 1970–1987 (Meslé et al. 1992), then for Russia for the period 1965–1980 (Meslé et al. 1996).

9.1.3.1 Initial Estimate of Coefficients

In the case of simple associations, the coefficient is automatically 100%, i.e. all the deaths recorded under the old item are transferred to the new item. The same process applies to amalgamations of items, since the total number of deaths from each of the old items concerned is assigned to the single new item. In the case of a subdivision, the process is not much more complex, since the deaths recorded under a single item in the old classification are divided among the relevant items in the second classification, according to the number of deaths observed for each of the new items in the year when it was introduced. For example, in the case of Russia, within Association 90 (Meslé et al. 1996, Annex IV), 36.3% of the deaths recorded under the old Item 143 – *cholecystitis and cholangitis* – were assigned to the new Item 126 – *calculus of gallbladder* – and 63.7% were assigned to the new Item 127 – *cholecystitis and cholangitis, without mention of calculus*.

The exercise becomes trickier when complex associations are tackled. In many cases, the coefficients can be calculated almost automatically, assuming a proportional distribution of deaths. An example of this during the transition from the 1965 revision to the 1970 revision in Russia was Association 83, which groups items relating to digestive ulcers (Table 9.1).

We had 1970 deaths distributed across the 1970 items and 1969 deaths distributed across the 1965 items. This enabled us to estimate the number of deaths for 1970 that would have been attributed to each of the 1965 items, assuming that the

Table 9.1 *Ex post* reconstruction for Russia of the classification of deaths under Association 83 in both the 1965 and the 1970 classifications

1970 Items	1965 Items 133	134	Total deaths in 1970
115	3,026		3,026
116		1,083	1,083
117	84	15	99
Estimated deaths in 1970	3,110	1,098	4,208
Observed deaths in 1969	2,718	960	3,678

respective proportions of these items within the associations did not change between 1969 and 1970. The total deaths recorded in 1970 were simply reassigned according to the proportions observed in 1969. In our example, this method was used to attribute 3,110 of the 4,208 deaths in Association 83 to Item 133 – *gastric ulcer* – and 1,098 of them to Item 134 – *duodenal ulcer*. The other cells in the table could then be filled in. Cells for which there were no links between items, according to the description of the association, could be eliminated immediately. These cells are the shaded ones in Table 9.1. In this fairly simple case, the deaths in the other cells could be re-distributed automatically. The 3,026 deaths classified under Item 115 in 1970 could only be recorded in the cell where that item intersects with Item 133. Similarly, the 1,083 deaths under Item 116 were transferred to the corresponding cell for Item 134. Two subtractions were all that was then needed to fill the two other empty cells.

The transition coefficients could then be deduced directly from Table 9.1: 3,026/3,110, i.e. 97.3% of deaths under old Item 133 are to be assigned to new Item 115 – *gastric ulcer* – and 84/3,110, i.e. 2.7%, to new Item 117 – *peptic ulcer, site unspecified*. Similarly, 98.6% and 1.4% of the deaths recorded under old Item 134 will be transferred to new Items 116 – *duodenal ulcer* – and 117 respectively.

However, this operation is not automatic for all associations, where some additional assumptions must be made. An example of this, during the transition between the 1965 and 1970 revisions in Russia, is Association 109, which groups some causes of infant mortality (Table 9.2).

Using the method described in the paragraph above, we were able to fill in the cell that matches old Item 175 with new Item 153. But for the four other cells, there was no obvious reassignment. The 3,640 deaths estimated for Item 173 in 1970 were redistributed among Items 150 and 151 according to the proportions of those deaths recorded in 1970. We were then able to use Table 9.2a to obtain the transition coefficients in Table 9.2b.

By applying these transition coefficients to the deaths classified under the first classification, we can reclassify them under the second one; and by linking these data to the data from the following period, we obtain a series of causes of death with constant definitions for the whole period covered by the two consecutive classifications.

Table 9.2 *Ex post* reconstruction for Russia of the classification of deaths under Association 109 in both the 1965 and the 1970 classifications, followed by transition coefficients

	1965 Items		
1970 Items	173	175	Total deaths in 1970
(a) Deaths			
150	3,018	433	3,451
151	622	89	711
153		4,118	4,118
Estimated deaths in 1970	3,640	4,640	8,280
Observed deaths in 1969	3,539	4,512	8,051
(b) Transition coefficients			
150	82.9	9.3	
151	17.1	1.9	
153		88.8	
Total	100.0	100.0	

Experience shows, however, that not all the statistical distortions have been resolved at this stage, because this initial estimate of transition coefficients, based on an analysis of the internal consistency of each association, is not always satisfactory. The series of deaths corresponding to certain items are still subject to distortion at the point of revision, so some changes to the initial coefficients are required, in some cases to include age-specific adjustments.

9.1.3.2 Checking Time Series and Determining Final Coefficients

For each item, the statistical continuity of the series must be checked by age group after the transition coefficients have been applied. In most cases, the result is satisfactory and does not show any suspicious discontinuity at the point when the revised detailed list came into force. In some cases, however, discontinuities that cannot be explained solely by the change in classification persist, and some transition coefficients must be revised. In many cases, this can be done without regard to age; however, for items comprising diseases whose proportions vary strongly with age, coefficients sometimes need to be age-adjusted. In addition, some differentiation by age may turn out be necessary in certain cases where the problem had already apparently been resolved in terms of numbers of deaths at all ages. Russia, which reports high numbers of annual deaths, lent itself particularly well to age-specific refinements, some examples of which have already been published (Meslé et al. 1996). In the end, for Russia, 17 of the 210 items in the 1965 Classification were distributed differently by age between the items of the 1970 Classification (Meslé et al. 1996, Annex V-1). At the next transition, from the 1970 to the 1981 Classification, 24 of the 185 items were distributed differently by age between the 1981 items (Meslé et al. 1996, Annex V-2).

9.1.4 *Reconstructing Time Series over Periods That Encompass Several Revisions*

To process the periods governed by more than two consecutive revisions, the method described above must firstly be applied to the first pair of classifications in order to reassign the recorded deaths to the items of the second and obtain continuous time series for the whole period covered by those two classifications. The same method can then be applied to the second and third classifications, in order to reassign all the deaths already processed under the third, and so on, until all the deaths from the period under review have been reclassified according to the most recent revision. This exercise was performed in order to reconstruct cause-of-death series in France for the entire period 1925–1996, governed by seven successive revisions of the ICD, to bring them into line with the 5,600 items of ICD-9 (Vallin and Meslé 1988, 1998). In the case of the countries of the former USSR, the exercise concerns a smaller number of revisions[2] and less detailed lists of items, but the principle is the same.

9.2 Adjusting the Russian Transition Coefficients to Ukraine

Although we found that the coefficients estimated for the Soviet Union for the transition from the 1970 Classification to the 1981 Classification were not directly applicable to Russia (Meslé et al. 1996), we hoped that the Russian coefficients would be applicable to Ukraine, given the close cultural proximity between those two republics. Therefore, initially we applied the Russian coefficients directly to the Ukrainian data. In most cases, the results were perfectly acceptable. However, for some time series, fairly significant discontinuities appeared during one or other of the transitions, so these had to be processed specifically for Ukraine. In a decentralized cause-of-death coding system, cultural proximity proved insufficient to guarantee uniform interpretation of the changes.

9.2.1 *Smooth Transposition*

For the transition from the 1965 Classification to the 1970 Classification, we were able to reassign 183 of the 210 items in the first to the 1970 items without difficulty, by applying the Russian transition coefficients directly to Ukraine (Table 9.3, 2nd column). The same proved to true for 166 of the 185 items in the 1970 Classification during the transition to the 1981 Classification (Table 9.3, 3rd column).

[2] The first study, of the Soviet Union as a whole, (Meslé et al. 1992) covered only two revisions. The publication on Russia (Meslé et al. 1996) covered three, as does this study on Ukraine. Work in progress on the Baltic States covers four Soviet revisions plus ICD-9 and ICD-10 (recently adopted in those countries).

Table 9.3 Number of items in the initial classification for which the Russian transition coefficients had to be adjusted for Ukraine

Changes adopted	Initial classification 1965	1970
No change	183	166
Change not affecting the content of the fundamental association concerned	15	17
Change affecting the content of the fundamental association concerned	12	2
Total	210	185

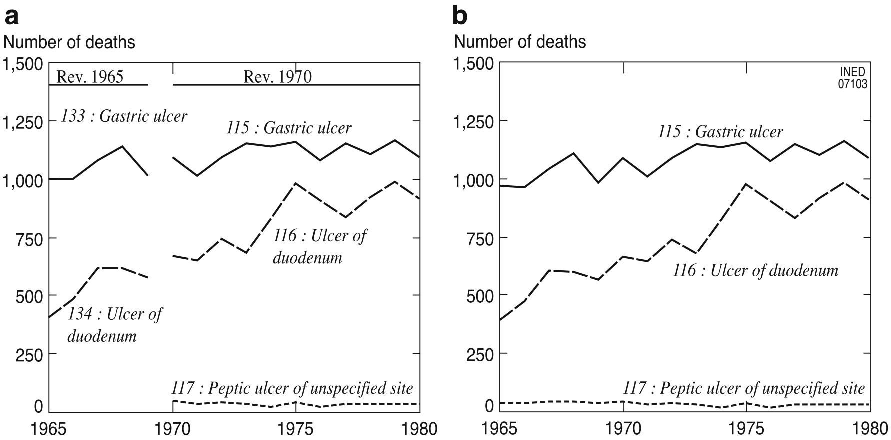

Fig. 9.1 Reconstructing Ukrainian time series using Russian coefficients. Digestive ulcers, 1965 and 1970 classifications. (**a**) before reconstruction; (**b**) after reconstruction

For example, Fig. 9.1 illustrates the transition from the 1965 Classification to the 1970 Classification for the items in Association 78 (Annex IV-1 on the Website (http://www.demogr.mpg.de/books/drm/009 or http://extras.springer.com/)). That association shows that Item 117 – *peptic ulcer, site unspecified* – in the 1970 Classification contained some of the deaths previously classified under Item 133 – *gastric ulcer* – and Item 134 – *duodenal ulcer* – in the 1965 Classification. Graph a in Fig. 9.1 shows the trend for the 1965 items before 1970 and for the 1970 items after 1970. Graph b shows that direct application of the Russian coefficients is sufficient to reconstruct the time series for Ukraine without any major discontinuity during the transition.

Figure 9.2 shows that the transition from the 1965 to the 1970 Classification for the items in Association 103, relating to congenital anomalies (Annex IV-1 on the Website), was similarly smooth. Item 151 – *other congenital anomalies of circulatory system* – in the 1970 Classification picked up some deaths previously classified under Item 173 – *congenital anomalies of heart* – and under Item 175 – *birth trauma* – in the 1965 Classification. Once again, direct application of the Russian coefficients is sufficient to reconstruct the time series for Ukraine without major discontinuities at the point of revision.

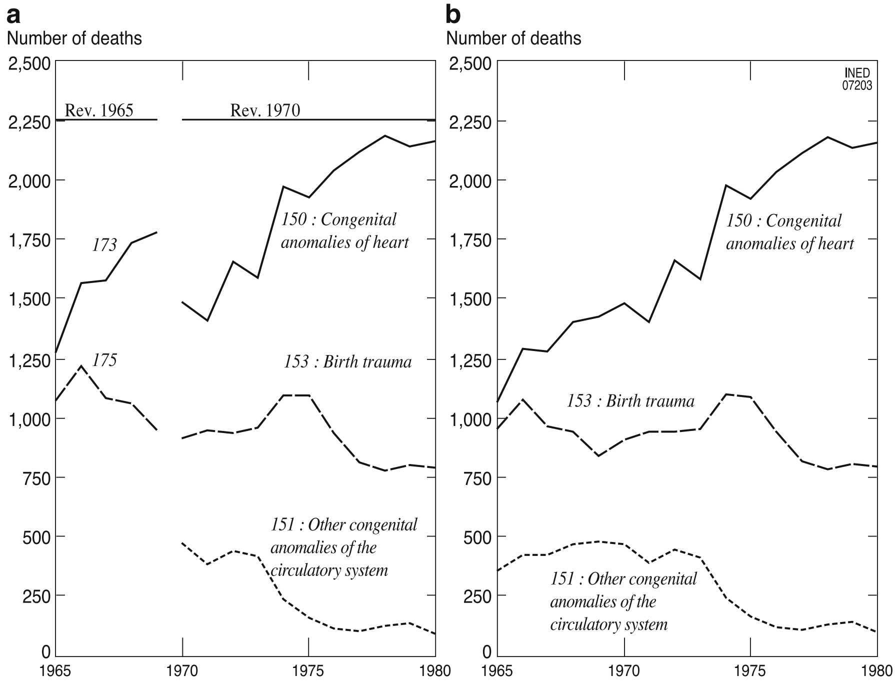

Fig. 9.2 Reconstructing Ukrainian time series using Russian coefficients. Congenital anomalies, 1965 and 1970 classifications. (**a**) before reconstruction; (**b**) after reconstruction

Figure 9.3 shows an example of the successful direct application of Russian coefficients to Ukrainian data for the transition from the 1970 Classification to the 1981 Classification. This is Association 80, relating to acute pneumonia (Annex IV-2 on the Website). Item 105 – *viral pneumonia* – and Item 107 – *other acute pneumonia* – in the 1970 Classification transfer mostly to the items with the same numbers and titles in the 1981 Classification, but also to the newly-created Item 153 – *congenital pneumonia and aspiration pneumonia*. In this case, the Russian coefficients fit Ukraine perfectly. Moreover, this operation leads to the disappearance, as if by magic, of the curious fluctuation in *viral pneumonia* in the 1970s. This is because the transition coefficients used here vary with age, separating out children under 1 year of age, who are treated differently in the two consecutive revisions. Consequently, the striking fluctuation in Item 105 is offset by the variation in Item 107, which was less dramatic but involved higher numbers. It is worth noting, however, that even after the time series have been reconstructed, a strong fluctuation in *other acute pneumonia* persists between 1985 and 1993. This can be attributed to a very real trend in alcoholism, related to the recent history of the former Soviet republics, which will be discussed below.

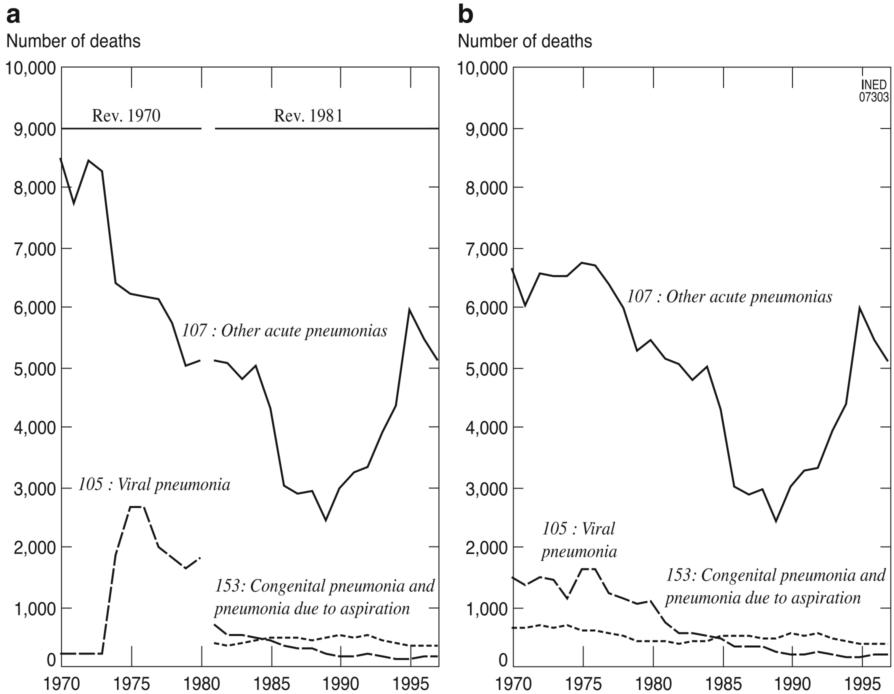

Fig. 9.3 Reconstructing Ukrainian time series using Russian coefficients. Acute pneumonia, 1970 and 1981 classifications. (**a**) before reconstruction; (**b**) after reconstruction

9.2.2 Determining Coefficients Specific to Ukraine

In contrast, the Russian coefficients had to be modified in 27 cases out of 210 for the transition from the 1965 Classification to the 1970 Classification and in 19 cases out of 185 for the transition from 1970 to 1981 (Table 9.3). These modifications were of different kinds. Table 9.3 distinguishes between modifications that do not alter the overall content of the fundamental association of items concerned and those that redefined the fundamental association.

9.2.2.1 Modifications That Do Not Alter Fundamental Associations of Items

Most modifications related only to the value of the coefficients and did not alter the target items. This was the case for 15 items in the 1965 revision and 17 items in the 1970 revision. Most of these modifications concerned coefficients that varied with age, sometimes redefining the age groups used. But in all these cases, the transition coefficients were only adjusted within the fundamental association of items used to calculate the Russian coefficients.

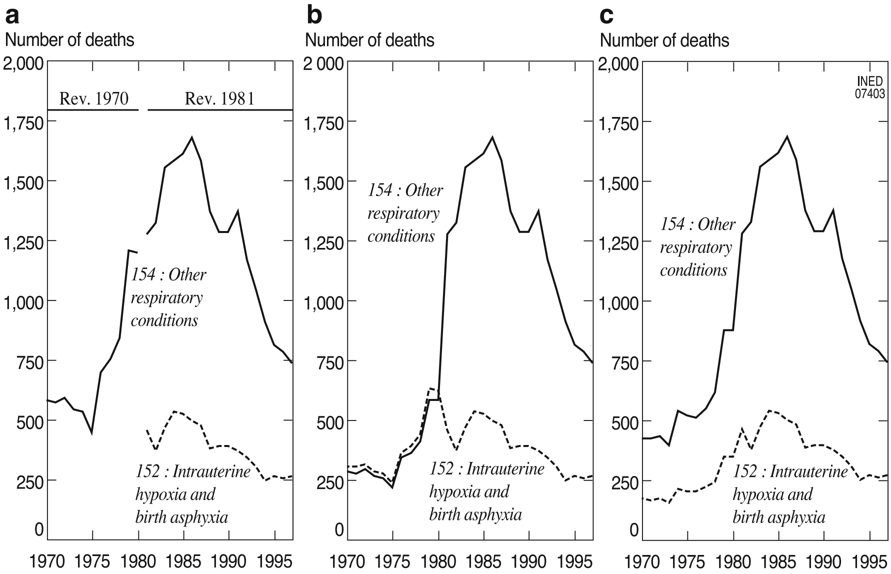

Fig. 9.4 Reconstructing Ukrainian time series using Russian coefficients (**b**) and coefficients adjusted for Ukraine (**c**). Respiratory conditions of newborn, 1970 and 1981 Classifications. Graph **a** gives trends before reconstruction

A simple example is illustrated (Fig. 9.4) by Association 112, comprising several respiratory conditions of newborn infants (Annex IV-2 on the Website), in the transition from the 1970 to the 1981 Classification. This very simple association reflects the subdivision of Item 154 – *postnatal asphyxia and atelectasis* – from 1970 into two items in the 1981 Classification: Item 152 – *intrauterine hypoxia and birth asphyxia* – and Item 154 – *other respiratory conditions* (Graph a in Fig. 9.4). In this case, direct application of the Russian coefficients gave an unsatisfactory result (Graph b in Fig. 9.4). In order to refine the final result, the transition coefficients were modified slightly (Graph c in Fig. 9.4). The increase in respiratory conditions of newborn infants can be attributed to the considerable improvement in diagnosis of neonatal conditions in the 1970s and 1980s. However, this change in diagnostic and reporting practices is likely to have varied significantly between Soviet republics, even between two as similar as Ukraine and Russia. The coefficients for these items were therefore modified for the transition from the 1970 Classification to the 1981 Classification.

9.2.2.2 Modifications That Alter Fundamental Associations of Items

In a few cases, adjusting the Russian coefficients to Ukraine required more changes, in that we had to modify the list of target items to which the contents of the source

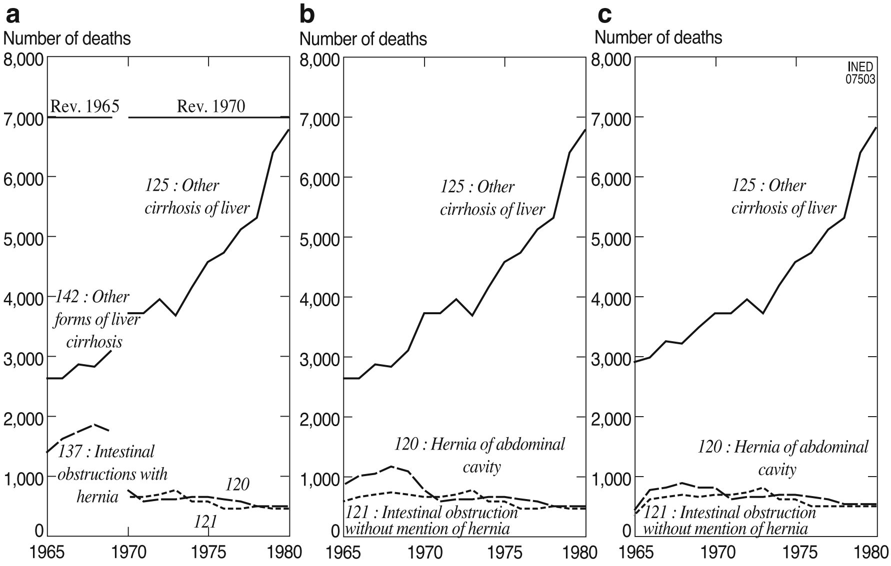

Fig. 9.5 Reconstructing Ukrainian time series using Russian coefficients (**b**) and coefficients adjusted for Ukraine (**c**). Intestinal obstruction and cirrhosis of liver, 1965 and 1970 Classifications. Graph **a** gives trends before reconstruction

item were to be reassigned. This applied to 12 source items in the 1965 Classification and two in the 1970 Classification. Theoretically, this type of change could have occurred even within a single association. In fact, in all cases, it had to be done hand in hand with modifying the association defined for Russia. In some cases, the change was a simplification: where certain target items had been removed, we had to split a Russian association into two simpler Ukrainian associations. In other cases, the opposite modification applied: when new target items had been identified, two Russian associations had to be merged into a single, more complex Ukrainian association.

Figure 9.5 illustrates this type of modification with a simple case, where two Russian associations (one of which was very straightforward) were merged, in order to better reflect the situation in Ukraine. This produced Ukrainian Association 81 for the transition from the 1965 Classification to the 1970 Classification. For Russia, Item 125 in the 1965 Classification – *other cirrhosis of liver* – was clearly an exact match for Item 142 of the same name in the 1970 Classification. The two items therefore formed a simple association. In the case of Ukraine, this association was severely unbalanced; so we thought it would be helpful to merge it with another association, reversely unbalanced, matching Item 137 in the 1965 Classification – *intestinal obstruction with hernia* – with Items 120 – *inguinal hernia and other hernia of abdominal cavity with obstruction* – and 121 – *intestinal obstruction without mention of hernia* – in the 1970 Classification. The result obtained by applying the

Russian transition coefficients directly was unsatisfactory (Graph b in Fig. 9.5), whereas the adjustment made specifically for Ukraine achieved better continuity in the series at the time of the change to the detailed list.

These adjustments of Russian associations for Ukraine, the results of which are shown in Annex IV (on the Website),[3] were performed after – not before – the Russian coefficients were modified; therefore we are providing that document only for general interest. Since our aim was to achieve a satisfactory result quickly and easily by capitalizing on the Russian exercise and the cultural proximity of the two republics, after some thought, we decided to dispense with the long, complex approach that had allowed us to establish transition coefficients for Russia based on fundamental associations. It should be borne in mind that the Russian coefficients for the transition from the 1970 Classification to the 1981 Classification themselves merely represented an adjustment of the USSR coefficients to Russia.

9.3 Beyond Revision: Other Changes in Coding Practices

In all countries, in addition to periodic revisions of the official classification, new instructions issued to certifying doctors or coders may destroy the continuity of the statistical series for some items. For instance, since ICD-9 was adopted in France in 1979, the country has seen a large number of abnormal fluctuations in cause-of-death series for various years (Meslé and Vallin 1996; Vallin and Meslé 1998). One of the most common examples is *disseminated malignant neoplasm*, where the number of deaths shot up from 3 in 1981 to more than 3,000 in 1982. Similarly, in England and Wales, the 1984 decision to adhere more strictly to WHO rules on underlying cause led to an instant reduction in the number of deaths classified under items such as *pulmonary embolism and heart failure*, which had previously both been wrongly viewed as underlying causes (OPCS 1985; Meslé 1995).

This type of problem also affects data from the Soviet republics, specifically Ukraine. We had already noted that, even after we resolved discontinuities arising from changes in the classification, a number of dramatic variations persisted in the reconstructed series for the Soviet Union as a whole – and this was even more true for Russia, where we had looked at data over a longer period. We had attempted to reduce these variations (Meslé et al. 1996), and would obviously also have to do so for Ukraine, which, as might be expected, differed significantly from Russia. This exercise is outlined in Sect. 9.3.1 below. The subsequent sections discuss the measures taken for Ukraine and for Russia in order to deal with the removal of occupational accident items from the Soviet classification in 1988 (Sect. 9.3.2) and trends in deaths from senility and ill-defined causes (Sect. 9.3.3).

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[3] Owing to changes during the process of establishing transition coefficients, when Russian fundamental associations were merged or subdivided, we arrived at a slightly different number of associations for Ukraine. For the transition from the 1965 to the 1970 Classification, there are 124 Ukrainian associations as against 132 for Russia. For the 1970/1981 transition, there are 138 associations for Ukraine, to Russia's 137.

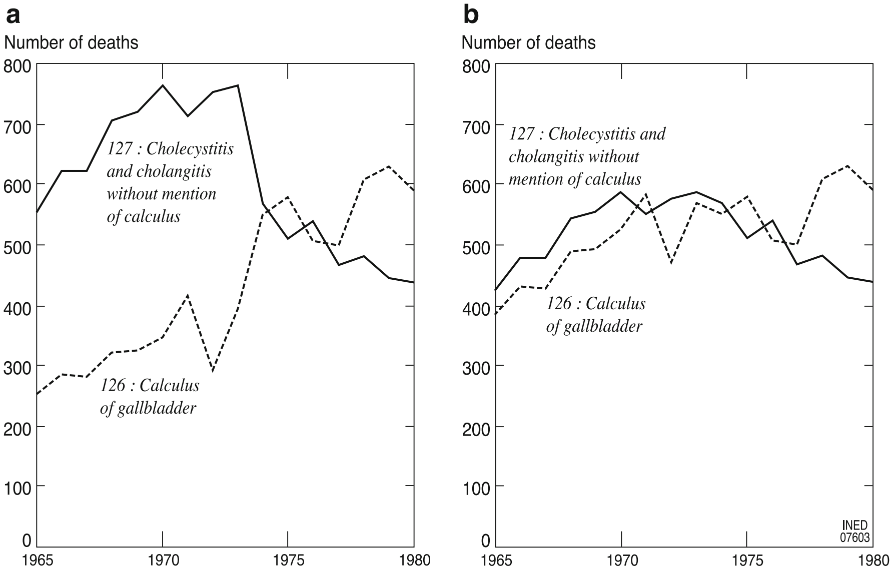

Fig. 9.6 Number of deaths classified under items 126 and 127 in 1970 Classification, before (**a**) and after (**b**) correction

9.3.1 Ex Post Corrections of Some Time Series

These corrections were performed at two levels. Firstly, alignment of the 1965–1969 data with the 1970–1980 data, achieved by reclassifying the 1965–1969 data set according to the 1970 Classification, had revealed anomalies for years other than the transition year, before and, especially, after the revision. Secondly, alignment of these combined data with the 1981–1997 data, achieved by reclassifying the 1965–1980 data set under the 1981 Classification, had revealed other anomalies in the period 1981–1997.

9.3.1.1 After Reclassification According to the 1970 Classification

After the reconstruction of 1965–1980 series according to the 1970 Classification, a first round of corrections was made. Table 9.4 provides an overview of these changes.

For example, the number of deaths attributed to Item 127 – *cholecystitis and cholangitis, without mention of calculus* – fell dramatically in 1974, while there was a symmetrical increase for Item 126 – *calculus of gallbladder* (Fig. 9.6a). In order to remove this dual anomaly, which probably arose from a change in the coding instructions for certain diseases of the biliary tract, for the years 1965–1973 we assigned between 12% and 25% (depending on age) of deaths classified under Item 127 to Item 126 (Fig. 9.6b). This type of new instruction on how to interpret the detailed list appears to be highly dependent on the local context. Item 127 also

Table 9.4 Percentage of deaths transferred ex post from one item in the 1970 Classification to one or two other items

			Proportions (%)										
Old item	New item	Age	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
41	45	All ages					40						
65	64	Age 0–9						10					
		Age 35–59	35										
67	48	Age 60–74	45										
		Age 75+	40										
		Age 75–79					15						
75	74	Age 80–84					25						
		Age 85+					70						
		Age 0–74						55					
88	98	Age 75–79						84					
		Age 80+						89					
89	98	Age 0–69						20					
		Age 70+						40					
94	95	Age 50–54						45					
96	93	All ages	20										
97	93	All ages	55										
		Age 0–54	15										
		Age 55–59	10										
		Age 60–64	6										
100	86	Age 65–74	4										
		Age 75–79	2.5										
		Age 80–84	2										
		Age 85+	1.5										
		Age 60–64	5	5	5								
		Age 65–69	15	5	5								

(continued)

Table 9.4 (continued)

			Proportions (%)										
Old item	New item	Age	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
100	93	Age 70–74	15	5	10								
		Age 75–79	25	10	10								
		Age 80+	30	15	10								
		Age 0–54	35										
		Age 55–59	35	15									
		Age 60–64	35	15									
100	98	Age 65–69	30	15									
		Age 70–74	30	15	5								
		Age 75–79	27.5	15	5								
		Age 80–84	20	15	5								
		Age 85+	20	20	5								
		Age 55–59	5	5	5								
		Age 60–64	10	10	10								
100	99	Age 65–79	15	15	10								
		Age 80–84	18	15	10								
		Age 85+	20.5	15	10								
		Age 55–64						60					
		Age 65–69						25					
102	99	Age 70–74						35					
		Age 75–84						40					
		Age 85+						45					
107	105	Age 0–59					28						
		Age 60+					15						

110	113	All ages		68			
114	113	All ages		68			
120	121	All ages			10	17	
		Age 0–79	25				
127	126	Age 80–84	15				
		Age 85+	12				
151	149	All ages	65				55
157	154	All ages					45

needed to be corrected for the same years for Russia, but in the opposite direction, since the number of deaths classified under that item suddenly increased in 1974. The counterbalance we had found for Russia was Item 128 – *other diseases of liver and biliary tract* – which, for Ukraine, was not in the least anomalous.

In some cases, the anomaly relates to the revision year itself. In 1970, when a new classification was adopted, an initial interpretation of the new rules prompted transfers of deaths, which were called into question in subsequent years. According to the above method, the years 1965–1969 should have been aligned with the 1970 Classification at the previous stage, and the years 1965–1970 corrected *ex post*. But in these few cases, it seemed preferable first to align the period 1965–1969 with the trend observed after 1971, then to reduce the peak or trough observed in 1970. Figure 9.7 gives the example of Item 110 – *peritonsillar abscess* – and Item 114 – *other diseases of respiratory system* – for which, after reconstructing the time series, we observed a peak in 1970. To bring down this peak, clearly caused by conflicting instructions from 1 year to the next, these two items were linked to Item 113 – *chronic forms of pneumonia and bronchiectasis* – which at first sight had not required any particular correction, but in fact showed a slight deficit in 1970 and in any case included many more deaths than the other two items. In Fig. 9.7b, the first two series are corrected while the 1970 deficit in the third series is slightly reduced.

This example shows how the interpretation of the classification can vary from one republic to another. In the case of Russia, the three items above did not require any ex post correction, whereas Items 133 – *infections of kidney* – and 134 – *calculus of urinary tract* – which we have used in the past to illustrate the case (Meslé et al. 1996), did not show any anomaly in Ukraine.

A total of 33 items were corrected *ex post* in this way. For 25 of them, the correction involved age adjustment (Table 9.4). For Russia, only 22 items had had to be corrected *ex post*, of which just 6 involved age adjustment.

9.3.1.2 After Reclassification According to the 1981 Classification

After the deaths recorded for 1965–1980 had been reclassified under the 1981 Classification, the next stage was to make another set of corrections; this involved only three items for Ukraine (Table 9.5), although it had involved 11 for Russia.

9.3.2 Discontinuation of Occupational Accident Items in 1988

Although it was not fully revised, the 1981 Classification was amended in 1988 with respect to accidental causes of death. Until that date, every accidental cause of death, with one or two exceptions, was divided into two items, in order to distinguish occupational accidents from non-occupational accidents.[4]

[4] The ten items for occupational accidents were 'hidden causes' (see Chap. 8). In order to produce statistics on these items to use here, we had to retrieve tables that had been kept secret for many years, separately from the basic tables.

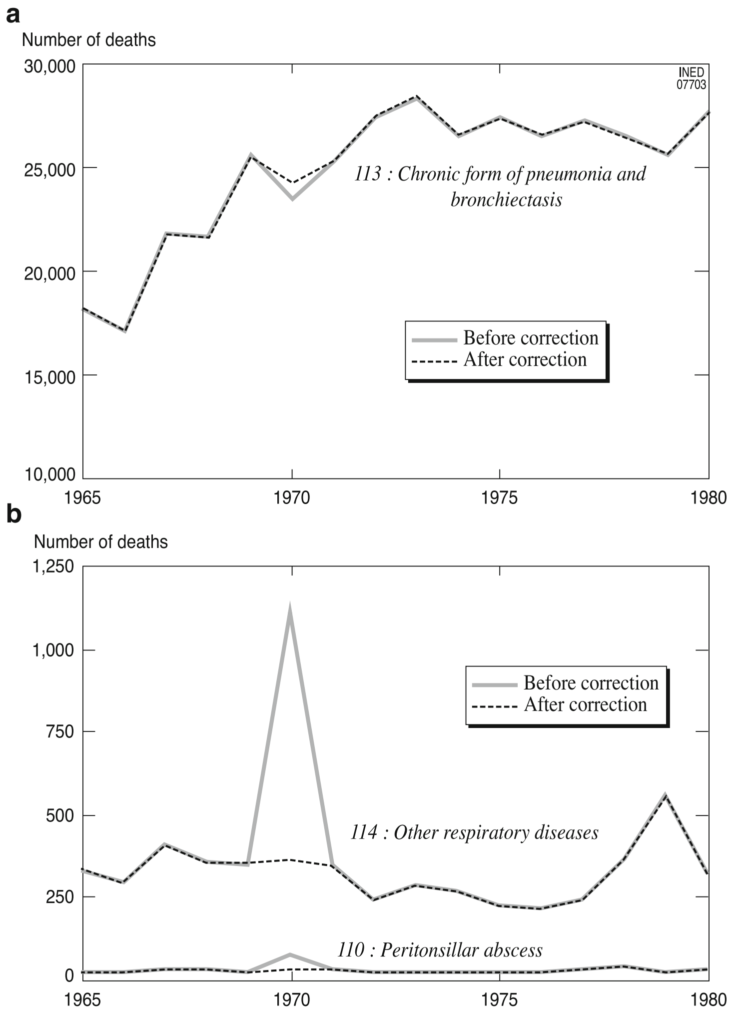

Fig. 9.7 Number of deaths classified under items 133 and 134 in 1970 Classification, before (**a**) and after correction (**b**)

This distinction was abandoned in 1988, and all accidental deaths with a specific cause were classified under a single item. Consequently, Items 160–185, previously concerned with deaths from injury and poisoning, were renumbered sequentially from 160 to 175. The list of these new items is contained in Annex III-3b (on the Website).

This amendment compelled us to perform one final reclassification operation. In most cases, the new item created in 1988 was a simple merger of the two items from the 1981 classification. In one case, however, an item had to be subdivided: deaths

Table 9.5 Percentage of deaths exchanged *ex post* between an item in the 1981 revision and another item

			Proportions (%)			
Old item	New item	Age	1965–1986	1987	1988	1989
98	100	Age 55+	10	5		
		Age 0–64				15
		Age 65–69				20
98	99	Age 70–74				30
		Age 75–79				40
		Age 80–84				60
		Age 85+				
		Age 60–64	3			
		Age 65–69	8	3		
99	100	Age 70–74	10	5		
		Age 75–84	20	10		
		Age 85+	25	15		

classified under Item 162 – *motor vehicle traffic accident*, occupational – were redistributed among the new Items 160 – *motor vehicle traffic accident* – and 161 – *motor vehicle traffic accident involving collision with pedestrian*.

A supplementary list of fundamental associations of items is provided in Annex IV-3 (on the Website) for this mini-revision of 1988. It is the same as the list already provided for Russia (Meslé et al. 1996).

The analyses in subsequent chapters and the basic results detailed in Annexes VI–VIII (deaths) and X–XII (rates), given on the Website, are based on the current version of the Classification, which does not distinguish occupational accidents. However, we thought the reader might find it helpful to have information on the distribution of deaths from injury and poisoning in the initial version of the 1981 Classification (which distinguishes occupational accidents) for the period 1965–1987 (Annex IX on the Website).

9.3.3 Senility and Ill-Defined Causes of Death

In the late 1980s, there was a specific change in the coding instructions relating to deaths reported as due to senility or to an ill-defined cause, which previously had been very rare.

In Spring 1989, the Soviet Health Minister, Evgeni Chazov, who at the same time was also head of a cardiology unit, issued a new directive that radically altered diagnosis of deaths of people aged over 80 from cardiovascular diseases and diagnosis of sudden cardiac death at younger ages.

The new instructions recommended that any death occurring after age 80 be registered as due to senility, unless the person's medical history or an autopsy report

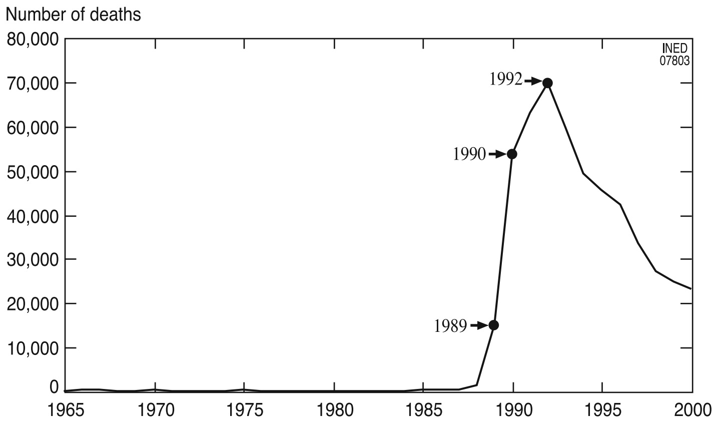

Fig. 9.8 Ukraine: annual trends in number of deaths classified as senility

made it possible to diagnose a precise cause of death or mentioned death from injury, poisoning or another external cause. As soon as the directive was issued, the number of deaths classified under *senility* rose dramatically. In Russia, the number of such deaths, which had never exceeded 300 before 1989, suddenly leapt to over 20,000 in 1990 and almost 45,000 in 1992 (representing 2.5% of all deaths). At the same time, the number of deaths of people aged over 80 classified as due to certain diseases (particularly *atherosclerotic cardiosclerosis*) fell.

The change had still greater impact in Ukraine (Fig. 9.8), where the reform was adopted even before it was officially launched throughout the Soviet Union. The number of deaths classified under *senility*, which had never exceeded 400 before 1988, rose to 1,300 in that year, before shooting up to 15,000 in 1989, 53,000 in 1991 and 70,000 in 1992 – even though total deaths in Ukraine (697,000 in 1992) are far lower than in Russia. This means that in 1992, the proportion of deaths classified under *senility* reached 10%! After 1992, as in Russia, the general rush to classify deaths as due to senility fell off, and the number of deaths classified under that item decreased. In Ukraine, they fell to 33,000 by 1997 and 23,000 in 2000. Nevertheless, the importance that the item acquired in the 1990s completely altered the trend in ill-defined causes of death.

Moreover, with respect to deaths before the age of 80, the directive prohibited registration of acute cardiovascular disease unless the diagnosis was confirmed by an autopsy report. This probably accounts for much of the rise in deaths from ill-defined causes (apart from senility) during the 1990s. In particular, many deaths previously coded as *sudden cardiac death* began to be registered as due to an ill-defined cause.

In the case of Russia, our hypothesis was that, despite all this, these practices should not excessively distort analysis of the structure or trends of cause-specific mortality, as long as deaths classified under ill-defined causes (including senility) were redistributed among the other items. Simple proportional redistribution seemed sufficient to achieve this. Before 1989, numbers of deaths from ill-defined causes were so low that this rough redistribution method was more than adequate; and for the period after 1989, in light of all we have just said, the same method – which tends to favour the major causes of death, particularly diseases of the circulatory system – was good enough. However, in the next chapter we shall show that, because of the scale of this phenomenon in Ukraine, we had to re-think our strategy there.

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Chapter 10
General Trends in Mortality by Cause

France Meslé and Jacques Vallin

At the end of the reconstruction described in the previous chapter, we had sex-specific and age-specific deaths by cause, classified under the 177 items of the 1981 Soviet Classification, as amended in 1988, for every year from 1965 to 2004 – 4 years in addition to those initially described in the French edition of this book (Meslé and Vallin 2003). Two further years, 2005 and 2006, had to be added, since cause-of-death statistics for Ukraine were also available for these. However, from 2005, Ukraine adopted the tenth Revision of the International Classification of Diseases, at least in an abridged form with 240 items. Therefore, in order to make these 2 years consistent with the earlier ones, we would have had to reclassify the whole 1965–2004 series into the 240 ICD-10 items. Of course, a mere 2 years' experience of the new classification was not enough to allow us to apply the method we used in the previous chapter in reconstructing the 1965–2004 series: the period covered by the new classification was too short to guarantee the validity of transition coefficients. Therefore we preferred to confine ourselves to provisional guarantees of more basic consistency for the groups of causes that had been used in analysing the results presented in the French edition, updated here for the English one. Consequently, Annex VI (on the Website (http://www.demogr.mpg.de/books/drm/009 or http://extras.springer.com/)), which gives the annual sex-specific trend in the total number of deaths for each of the 177 items in the Soviet Classification, and Annex VIII, which gives the annual trend by 5-year age group (one table by sex and by item), relate only to the period 1965–2004; but they are supplemented by Annex VIIIa, which give the same trends for the years 2005 and 2006, for the 240 items defined

F. Meslé (✉) • J. Vallin
Institut National d'Études Démographiques, Bd. Davout 133,
75980 Paris Cedex 20, France
e-mail: mesle@ined.fr; vallin@ined.fr

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according to ICD-10. It is from this set of results that cause-specific trends in mortality in Ukraine will be analysed in the following chapters. For comparative purposes, these trends will be systematically set against those in France and in Russia. The choice of these two countries is not accidental. Firstly, since this work on Ukraine is situated within the framework of an overarching project that is looking at all the republics of the former USSR in turn,[1] it seemed to us essential to take the largest republic, Russia, as the reference point each time. Secondly, a point of comparison with Western countries was required and, from this angle, the work we had already done on causes of death in France offered the best guarantees of comparability. For Russia, we used the data already published (Meslé et al. 1996), supplemented for the years 1995–2005 (shortly available in the form of a database on the INED web site[2]). For France, we took the much more detailed data derived from the reconstruction of homogeneous series in ICD-9 – which we have established elsewhere (Vallin and Meslé 1988, 1998) and regularly update on the INED web site[3] – and reclassified them into the 177 Soviet Classification items.

In order to analyse these data, our first task is to decide how to handle deaths from unknown or ill-defined causes (Sect. 10.1). We shall then give an overview of annual trends in standardized mortality rates by major groups of causes, comparing Ukraine to Russia and France (Sect. 10.2).

10.1 Distributing Deaths from Ill-Defined Causes

Traditionally, until the 1990s, very few deaths in the Soviet Union were classified under the items reserved for deaths from unknown or ill-defined causes. This was because strict instructions were issued that, in almost all cases, one cause should be identified as responsible for the death recorded. The view might therefore be taken that the question of ill-defined causes – which is so important for the interpretation of results in many cases (Ledermann 1955; Vallin and Meslé 1988) – was not an issue here. However, as we saw in the previous chapter, in the countries of the former USSR, the situation has changed completely since 1989, and even more so in Ukraine than in Russia. So, whether we were intending to interpret trends peculiar to Ukraine or to compare trends there to those in France or in Russia, we first had to re-distribute deaths from ill-defined causes; failing this, our results would not be comparable over either time or space.

[1] The results for Russia have already been published (Meslé et al. 1996). A book on the three Baltic states is now at the editing stage. Data for the countries of the Caucasus is currently being analysed.

[2] www.ined.fr

[3] http://www.ined.fr/fr/ressources_documentation/donnees_detaillees/causes_de_deces_depuis_1925

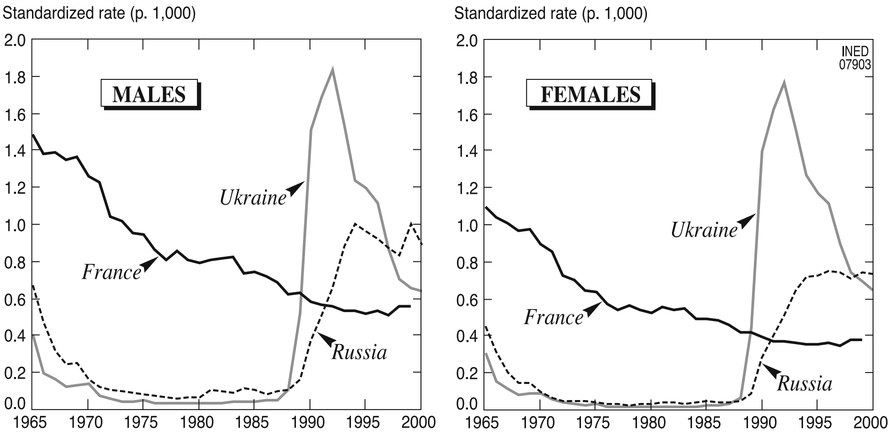

Fig. 10.1 Trends in standardized mortality rates from unknown or ill-defined causes since 1965 in Ukraine, Russia and France

10.1.1 A Phenomenon That Varies Over Time and Space

There were two items in the Soviet classifications covering ill-defined causes of death (in the 1981 Classification, these were Items 158 – *senility* – and 159 – *unknown and ill-defined causes*). Figure 10.1 tracks post-1965 trends in the standardized mortality rate[4] for both items in all three countries. In France, the rate for these causes, which has never been insignificant, diminished fairly regularly over the whole period, as records gradually became more accurate. By contrast, as we have already mentioned at Chap. 9, while the mortality rates for these items in Ukraine and in Russia were formerly more or less negligible, during the 1990s they saw a steep rise, an outcome of the new coding instructions issued in 1989.

For France, in the context of reconstructing long-term series starting from the 1920s – when the proportion of deaths from ill-defined causes was very large (over 30%) – we had to distribute these deaths on the basis of a statistical analysis of the correlations between this proportion and the proportions of deaths from the various specified causes (Ledermann 1955; Vallin and Meslé 1988). For Russia, we confined ourselves to a simple proportional distribution (Meslé et al. 1996). This was because, before 1989, the numbers of deaths from ill-defined causes were so low that a rough redistribution method was easily adequate; and after 1989, the same method, which tends to favour the largest causes of death (particularly diseases of the circulatory system) seemed good enough, since we know that these were the items drastically reduced by the artificial effects of the 1989 directives. However,

[4] Calculated on the basis of the WHO's 1992 European population figures.

there might be some doubt as far as Ukraine is concerned, because these directives had a much bigger effect there than in Russia (meaning that 10% of total deaths were classified under Items 158 and 159, as against 2.5% in Russia).

10.1.2 Disadvantages of Strictly Proportional Distribution

As the 1989 instructions related primarily to coding old-age deaths, the steep rise in deaths from ill-defined causes was itself specific to these ages; and since the proportional distribution of deaths was made inside each age group, the overall results of the correction varied from one cause to another according to its age profile. The outcome was that this proportional distribution of deaths from ill-defined causes may seem to give relatively satisfactory results at the overall level, even in the case of Ukraine. However, since our ambition here was also to provide age-specific results, we had to take into account the effects of the proportional distribution across the age groups.

In order to form a judgement about this, we compared annual trends in mortality rates for the most sensitive age groups (80–84; 85 and over) by major groups of causes before and after proportional distribution of deaths from ill-defined causes. Although the results for the various groups of circulatory diseases may appear acceptable, this is not the case at all for most other groups of causes. The results for neoplasms are particularly unacceptable: we can hardly assume that cancer mortality rates – which up to then had stagnated or risen slightly according to age – suddenly soared in the early 1990s in the 80-plus age groups, only to fall again, almost as steeply, a few years later (Fig. 10.2). Yet any correction one would like to make here seems to be too glaring a distortion of the initial information.

Figure 10.2 shows that the cancer mortality rate in the 80–84 age group, observed before distributing deaths from ill-defined causes, is lower than the rate in the 70–74 age group, and it may certainly be reasonable to see this as symptomatic of under-declaration of cancer among the oldest old. Furthermore, that is the hypothesis that we accepted in an earlier article (Shkolnikov et al. 1999). Consequently, it might be assumed that the adjustment made by proportional distribution of deaths from ill-defined causes in this age group gives the true value for the cancer mortality rate in the early 1990s. However, even if we accept this relatively bold hypothesis, a distribution made in this way would completely distort the view obtained of trends in mortality from cancer, because it in no way tackles assumed under-estimation for earlier years and represents an increasingly incomplete way of dealing with under-estimation in the most recent years.

10.1.3 Distribution Method Adopted

From one point of view, therefore, the 1989 instructions were not entirely without foundation; it is highly probable that the past desire to identify one specific cause

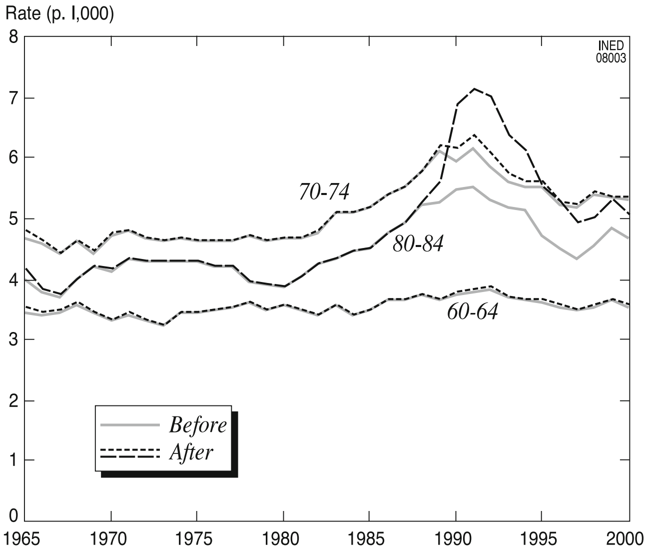

Fig. 10.2 Trends in female cancer mortality rates for three age groups in Ukraine, before and after distributing deaths from ill-defined causes, where all deaths from ill-defined causes are distributed proportionally

for every death at all costs had contributed to pseudo-causes such as "sudden cardiac death" or "heart failure" – without any other indication – being classified as circulatory, whereas they should have been classified under the ill-defined causes item. In other words, it is probable that mortality from diseases of the circulatory system was being over-estimated in Soviet statistics up to 1989. However, the few investigations that have been carried out into the quality of recording (Chap. 8) show that this over-estimation cannot have been very large. It is highly implausible that it could have affected even 10% of deaths, as the consequences of the 1989 reform in Ukraine might lead one to believe. Moreover, there is no reason to think that 80 would represent a significant age boundary for this type of error. The fact that specific instructions were given for the 80-plus age group reveals a fad for the concept of senility rather than a real desire to tackle the problem of diagnosing circulatory causes of death. Finally, supposing that the 1989 instructions did bring a real improvement, we would be faced not with one issue, but with two: distributing the deaths from ill-defined causes that have recently burst onto the statistical scene, and estimating the proportion of deaths that should have been classified under other items but, until then, were attributed to diseases of the circulatory system. Although we could assume that the number of deaths classified under the ill-defined causes items since 1989–1990 has provided a correct estimate of the proportion of deaths formerly classified wrongly under circulatory items, we would nevertheless not be able to readjust earlier series. For example, allocating a certain percentage of pre-1989 deaths from diseases of the circulatory system to neoplasms would retrospectively

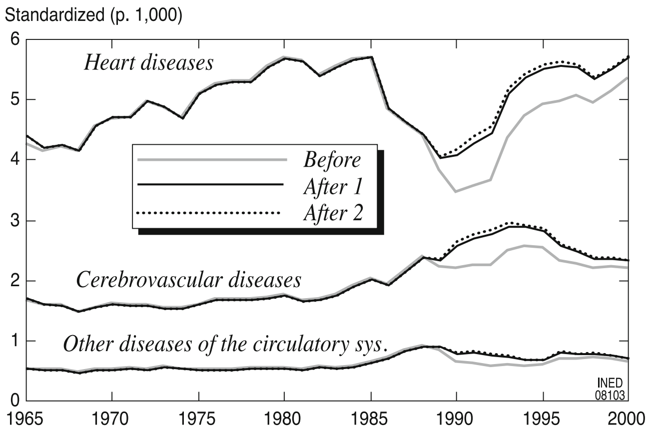

Fig. 10.3 Trends in the standardized mortality rate for three groups of circulatory diseases in Ukraine, before and after distributing deaths from ill-defined causes. Female (1, completely proportional distribution; 2, distribution of senility limited to circulatory items after 1988)

inject fluctuations that were actually peculiar to circulatory mortality, thus falsely distorting the remarkable regularity of trends in cancer mortality.

For all these reasons, we preferred to correct the effects of the 1989 reform in such a way as to restore series of causes with constant definitions according to the old Soviet procedure, even though this meant retaining – at this stage – the probable overestimation of mortality from diseases of the circulatory system, which would then need to be taken into account in interpreting the results. At least then we would be sure we were dealing with a phenomenon that was more or less constant over time.

In order to achieve this, we decided to distribute the deaths classified under Item 158 – senility – differently from those under Item 159 – ill-defined causes of death. For the latter, which was relatively little affected by the 1989 reform, we distributed the contents proportionally between all other items (except, of course, Item 158). In contrast, for senility, we limited completely proportional distribution to the years before the reform (1965–1987),[5] whereas for subsequent years (1988–2006), we distributed the contents of the item proportionally between only the circulatory items (Items 84–102).

While this enabled us to avoid distorting trends in other causes of deaths, in fact we only marginally altered the result for circulatory diseases. Figure 10.3 provides evidence of this by comparing, for the three major groups of circulatory causes, standardized mortality rates before distribution and after distribution according to the two different methods. The final distribution (between the post-1988 circulatory

[5] As we saw in the previous chapter, this change in practice started in Ukraine even before the reform was officially launched throughout the USSR.

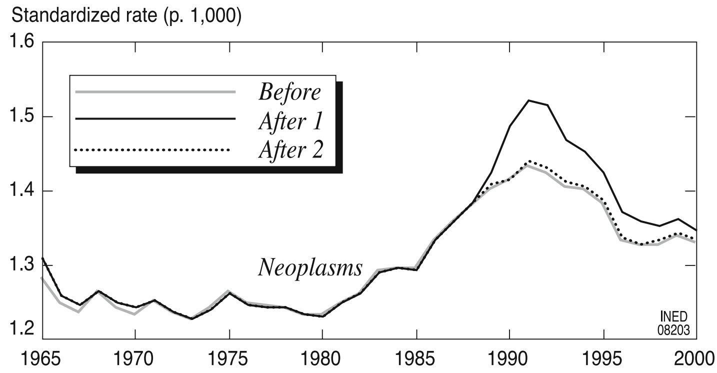

Fig. 10.4 Trends in the standardized mortality rate from neoplasms in Ukraine, before and after distributing deaths from ill-defined causes. Female (1, completely proportional distribution, 2, distribution of senility limited to circulatory items after 1988)

items alone) gave a result that differed very little from the completely proportional distribution, which, in contrast, substantially increased the rates for the 1990s.

Conversely, Fig. 10.4 illustrates the relatively light touch that we adopted in correcting standardized cancer mortality rates, where completely proportional distribution would have dramatically altered the trend.

Therefore the distribution method adopted for Ukraine differs from the one that we used the first time round for Russia (Meslé et al. 1996). As we have already said, in the case of Russia – where the consequences of the 1989 reform were much less marked – completely proportional distribution did not lead to excessively serious consequences; however, here we decided to carry out a new distribution of Russian deaths from *senility*, in line with the one adopted for Ukraine, in order to be sure that our subsequent comparisons would be absolutely consistent. For France, on the other hand, since the proportion of deaths from ill-defined causes was low and displayed a regular trend over the whole period studied here, we confined ourselves to a single proportional distribution.

10.2 Trends in Standardized Mortality Rates by Major Groups of Causes, 1965–2006

Sex-specific standardized mortality rates[6] after distributing deaths from ill-defined causes are provided in Annex X (on the Website), for each of the 177 items[7] in the 1981 Soviet Classification as amended in 1988. In this chapter, we shall confine our analysis to the results for 7 major groups of causes, defined in Table 10.1, leaving

[6] The reference population is the WHO's 1992 population for Europe, with the sexes combined.

[7] Except Items 158 and 159, which are reserved for ill-defined causes.

Table 10.1 Soviet classification organized into seven major groups, with their approximate correspondences to ICD-9 items

Groups	1965–2004 deaths: Soviet classification items (1981/88 classification)	1965–2004 deaths: ICD-9 items	2005 and 2006 deaths: Ukrainian classification items (adopted in 2005)	2005 and 2006 deaths: ICD-10 items
1 Infectious and parasitic diseases	1–44	001–139	3–57	A00–B99
2 Neoplasms	45–67	140–239	59–104	C00–D48
3 Diseases of the circulatory system	84–102	390–459	133–156	I00–I99
4 Diseases of the respiratory system	103–114	460–519	158–173	J00–J99
5 Diseases of the digestive system	115–127	520–579	175–189	K04–K92
6 Other diseases	68–83, 128–157	240–389, 580–779	106–131, 190–236, 239	D50–H83, L00–Q89, R95
7 Injury and poisoning	160–175	800–999	242–258	V01–Y89

the more detailed analysis of each group of pathologies to Chap. 12. For these major groups, annual trends in standardized mortality rates and in rates by age group will be found in Annex XI on the Website.[8]

After a general presentation of mortality trends observed in Ukraine for the major groups of causes (Section 10.2.1), we shall compare these trends with those observed in Russia and in France (Section 10.2.2).

10.2.1 Annual Trends in Standardized Mortality Rates by Groups of Causes

A preliminary representation of cause-specific mortality trends in Ukraine is given in Fig. 10.5. This graph, like all subsequent ones tracing cause-specific mortality trends (with any exceptions duly indicated), is constructed on the basis of a semi-logarithmic scale, in order to account for the rate of change (whatever the level reached) and also to allow observed trends for causes of very different sizes to be read simultaneously. In order to enable comparisons between them, all these graphs are systematically constructed on the same scale.

The proportion of diseases of the circulatory system is overwhelming for both sexes. Among males, this category accounts for between 50% and 60% – depending on the period – of the standardized mortality rate for all causes. Among females, there is a still greater proportion (since other causes account for less) and this has

[8] However, it should be noted that these Annexes distinguish nine major groups of causes, not seven, by subdividing the very large group of diseases of the circulatory system into three.

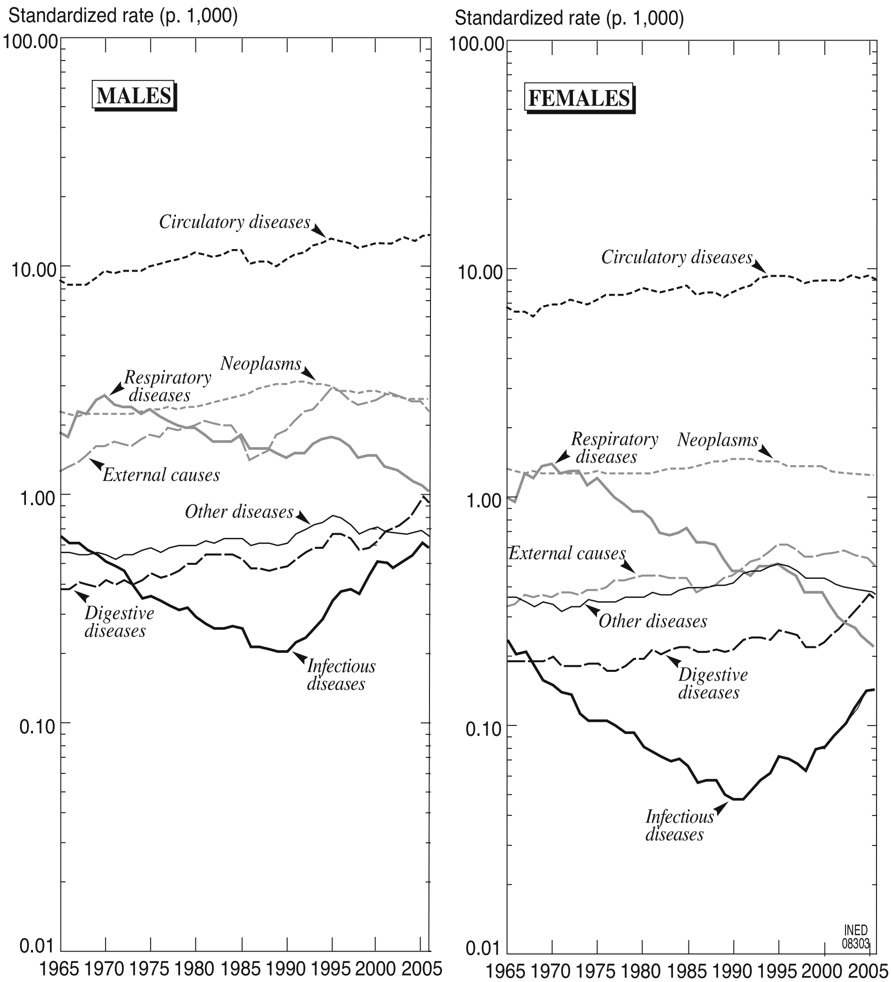

Fig. 10.5 Annual trends in the standardized mortality rate for seven major groups of causes, 1965–2006, by sex

never fallen below 63%; it even reached 75% in 2006. Thus it is obvious that the trend in mortality from diseases of the circulatory system governs trends in mortality from all causes.

Neoplasms occupied second place for almost the whole period under study, even though in the late 1960s they were slightly outstripped by diseases of the respiratory system, while more recently, among males, deaths from injury and poisoning have reached a par with cancers. Among females, cancer mortality, with almost 11% of total mortality, has been far ahead of all other non-circulatory causes since the late 1960s. Among males, cancer mortality, with 12% of total mortality, was – as we have just said – more or less equal with deaths from injury and poisoning.

Mortality from respiratory diseases, still very substantial in the late 1960s, has declined markedly since then, despite a significant fresh upsurge among males in the mid-1990s. Nowadays, it occupies no more than fourth place among males (practically equal with diseases of the digestive system, which themselves have greatly increased) and fifth place among females.

The fall in mortality from infections was even more spectacular until the late 1980s. However, from 1990 onwards, this type of mortality increased steeply again and, after faltering in 1997–1998, the rise has recently become more marked. One might wonder whether this is not due to the impact of AIDS. In 2006, male mortality from infections returned almost to its 1965 level, and female mortality from infections to that of the early 1970s.

Mortality from digestive diseases increased regularly throughout the whole period, to the point where it reached the same level as mortality from respiratory diseases for males and went far beyond it for females.

Finally, mortality from all other diseases increased regularly until the mid-1990s, after which it stabilized among males and dropped significantly among females.

Of all these groups of causes, it is deaths from injury and poisoning that best reflect the large fluctuation in life expectancy observed since 1985 (see Chap. 5). As we shall see in detail in the following chapters, in the Soviet system of cause-of-death registration, this group contained most of the deaths from alcoholism, since the system habitually categorized most such deaths as accidental poisonings and, in contrast, made little use of the items specific to alcoholism. Here, however, strong – though somewhat smaller – fluctuations also appear on the curve for diseases of the circulatory system and on the curve for diseases of the digestive system. In both cases, alcohol consumption plays a major role. However, it is far from the only factor in these fluctuations; as we shall see more specifically in Chap. 11, the difficulties linked to the end of Communism and to the transition to a market economy also weighed heavily on trends in causes of death during the 1990s.

10.2.2 Comparisons with Russia and France

10.2.2.1 The Rise in Diseases of the Circulatory System

It is not just the case that diseases of the circulatory system occupy a dominant position in the pathologies of Ukrainians; these diseases have also been on the increase since the mid-1960s, with the large fluctuation in the 1980s and 1990s doing nothing to reverse this strong trend. This expansion in diseases of the circulatory system is a phenomenon very largely shared with the other European republics of the former USSR, among them notably Russia (Meslé et al. 1996; Shkolnikov et al. 2002) and the Baltic states (Hertrich and Meslé 1999), as well as with some former Communist countries in Central Europe (Meslé and Hertrich 1997; Vallin and Meslé 2001). Figure 10.6 shows how the situations in Russia and Ukraine met, in terms of both level and trend: the curves for the two countries are almost exactly on top of each other.

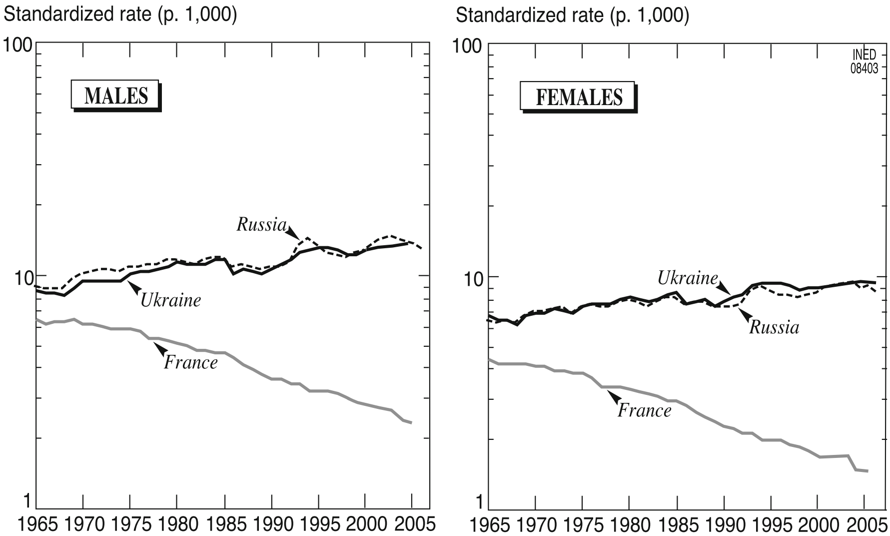

Fig. 10.6 Annual trends in standardized mortality rate from diseases of the circulatory system in Ukraine, Russia (1965–2006) and France (1965–2005)

At the same time, the contrast with France is absolutely striking; there, mortality from diseases of the circulatory system fell rapidly across the whole period – a decline that even accelerated from the 1980s onwards.[9] It is particularly striking to note that, in this area, Russia and Ukraine have followed extremely close paths, even since the break-up of the USSR. However, we should note that the fluctuations have been more marked in Russia than in Ukraine; we shall return to this point later.

Given the dominant position of these conditions in the Ukrainian and Russian disease pictures, this unfavourable trend in mortality from diseases of the circulatory system obviously represents the crux of the grave health crisis experienced by these countries since the mid-1960s (Meslé et al. 1998) and, more generally, of the spectacular divergence observed over the same period between Eastern and Western European countries (Bourgeois-Pichat 1985; Caselli et al. 2002; Vallin and Meslé 2001; Meslé and Vallin 2002).

However alike they are, the Ukrainian and Russian situations nevertheless include some interesting differences, particularly as far as recent years of observation are concerned (see Fig. 10.7, which focuses on the detail of the last two decades from Fig. 10.6, at the arithmetic scale). When Gorbachev's anti-alcohol campaign was

[9] We know that mortality from diseases of the circulatory system is particularly low in France compared to other Western countries, in particular to the United Kingdom and to the Nordic countries. However, if the United Kingdom had been taken as a point of comparison in Figure 10.6, a curve exactly parallel to that of France would have been obtained, though at a higher level; but it would have started at exactly the same point as the curves for Ukraine and Russia, so that the impression of divergence would have been all the more striking (Caselli et al. 2002, p.33, Figure 15).

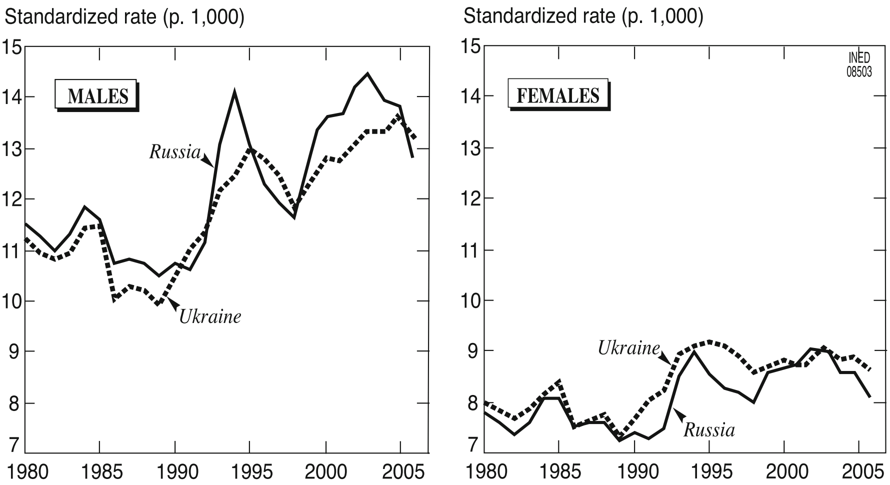

Fig. 10.7 Close-up of recent trends (1980–2006) in standardized mortality rate from diseases of the circulatory system in Ukraine and Russia (arithmetic scale)

launched in 1985, Ukraine and Russia both saw significant concomitant reductions in mortality from diseases of the circulatory system; however, the fresh rise that followed was slower in coming to Russia but also steeper there, particularly among males. In Ukraine, the fresh upsurge in male mortality manifested itself from 1990 onwards, and rose until 1995 without any break. In Russia, on the other hand, mortality from diseases of the circulatory system only started to rise again in 1992; this movement went into reverse from 1995, but in the meantime had jumped much more steeply than in Ukraine: the standardized rate increased by 33% in 3 years as opposed to 32% in 6 years. Conversely, the reduction in this type of mortality since the last reversal of the trend has been more marked in Russia than in Ukraine. In other words, although Gorbachev's anti-alcohol campaign seems to have had very similar effects on mortality from diseases of the circulatory system in both countries, the renewed rise in this mortality does not seem to have been only due to the relaxation of those measures: as we shall see below, this took place earlier than the rise observed here in Ukraine. Perhaps it was due more to a deterioration in the economic and social situation following the break-up of the USSR and the end of Communism, which might have occurred earlier in Ukraine – and perhaps the very fact that this deterioration came a little later in Russia helped to make it steeper.

After improving in the years 1996–1998, mortality from diseases of the circulatory system (like total mortality) rose very strongly again in Russia, reaching a higher maximum in 2003 than it had in 1994, before declining again from 2004 onwards. In this case, too, the fresh rise was a little less steep in Ukraine, but continued until 2005; it was only in 2006 that a new fall was observed there. But in the

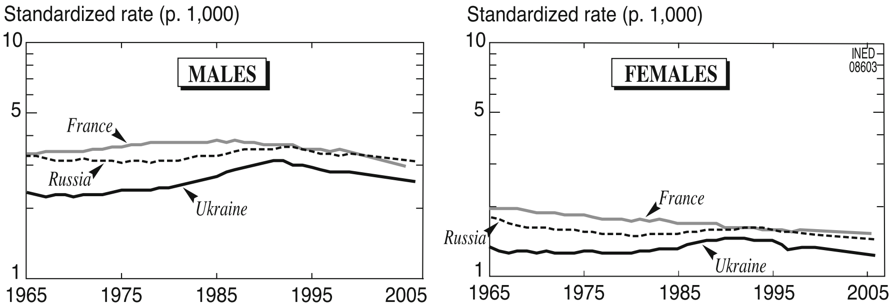

Fig. 10.8 Annual trends in standardized mortality rate from neoplasms in Ukraine, Russia (1965–2006) and France (1965–2005)

end, in both countries, the 2006 level of mortality from diseases of the circulatory system remained close to its 1998 maximum (a little below for Russia, a little above for Ukraine).

10.2.2.2 Trend Reversal in Likely Underestimated Mortality from Cancer

In both Ukraine and Russia, observed mortality from cancer grew slowly and regularly until about 1990 (Fig. 10.8). After that it diminished slightly; this time, the fall was more obvious in Ukraine than in Russia. Throughout the whole period, its level was significantly lower in Ukraine than in Russia, although the gap closed in the 1980s. But what is astonishing here is the comparison with France, where mortality from cancer, while following a fairly similar pathway, was significantly higher, especially for females, until the early 1990s. The gap between France and Ukraine was particularly large, and this applied to both sexes. Certainly cancer mortality in France was a little higher than average for males by comparison with other Western countries, and notably with northern ones, but for females the reverse was true. Here we encounter again the question of a likely under-estimate of mortality from cancer in the countries of the former USSR, and perhaps particularly in Ukraine; this will become even more acutely visible in our age-specific analyses.

The other very striking element illustrated by Fig. 10.8 is the total absence of any link between recent trends in mortality from cancer and the large fluctuation of the 1980s and 1990s. In all countries, this mortality is generally not very sensitive to immediate circumstances. Here we can see that it has been completely insensitive to the immediate political, economic and social circumstances in the countries of the former USSR – even though these circumstances are very particular and very pronounced.

On the other hand, we must ask whether the slight increase in mortality from cancers observed in the second half of the 1980s was not due, at least in part, to the

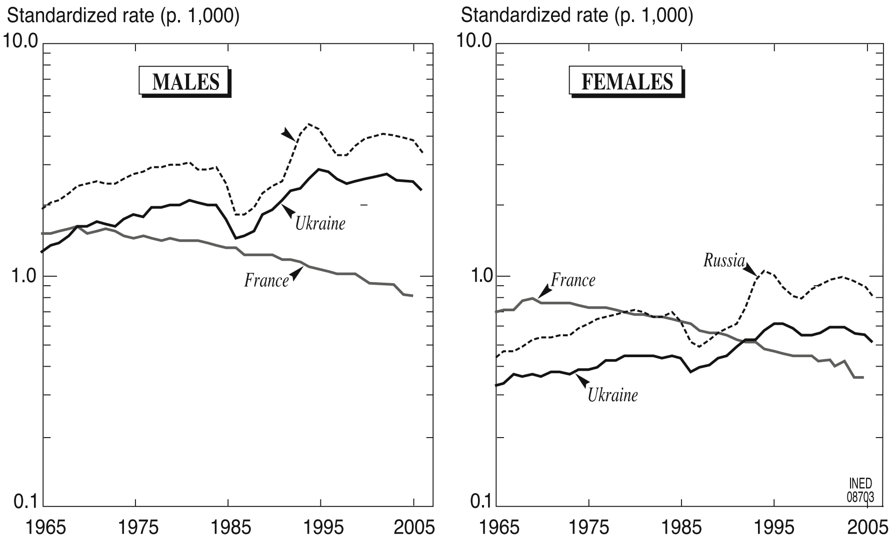

Fig. 10.9 Annual trends in standardized mortality rate from injury and poisoning in Ukraine, Russia (1965–2006) and France (1965–2005)

consequences of the Chernobyl disaster. We may suspect not, firstly because this trend had already got under way before 1986, the year of the explosion at the nuclear reactor, and secondly because it clearly went into reverse from the early 1990s. We shall return to this question in our more detailed examination of the different forms of cancers (Chap. 12).

10.2.2.3 Chaotic Trends in Deaths from Injury and Poisoning

The picture of mortality from injury and poisoning is completely different: this is the group of causes that is by far the most sensitive to the large fluctuation characteristic of countries of the former USSR. Here again, as with diseases of the circulatory system, there is a strong similarity between Ukraine and Russia, which both contrast radically with France (Fig. 10.9). Whereas mortality from injury and poisoning declined constantly in France from the early 1970s onwards, it became very much worse in Ukraine and in Russia. At the start of the period, mortality from injury and poisoning was substantially higher among females in France than in Ukraine or in Russia, while for males it was at a similar level as in these two countries; however, this was because of the much larger place occupied by traffic accidents in France at this time. After that, the rise of alcoholism in the USSR (and its decline in France, as well as the reduction in road accident mortality) totally reversed these situations. The major fluctuation in the 1980s and 1990s did nothing to challenge this unfavourable trend in either Ukraine or Russia. In both countries and for both sexes, the standardized mortality rate from injury and poisoning was much higher in 2006 than it had been in the early 1980s. The general trend certainly remained the same as that of the two previous decades, at least until the turn of the twenty-first century. Since 2001, however, it may have become pertinent to ask whether a real reversal of the trend has been in sight, as there has been a fairly pronounced decline over 5 years' observation. Nevertheless, it is still a little too early to make definitive conclusion.

In both countries, the launch of Gorbachev's anti-alcohol campaign brought a pronounced fall in mortality from injury and poisoning. In 2 years, from 1984 to 1986, the standardized male rate fell by over 40% in Ukraine and by almost 60% in Russia. There was also a large reduction on the female side (20% in Ukraine and 40% in Russia). In the countries of the former USSR, the relationship between alcohol consumption and deaths from injury and poisoning is a very close one, as, for example, a study of Russia (Meslé et al. 1994) has clearly shown. On the one hand, as we have already indicated, Soviet practice in cause-of-death coding was to classify most deaths that were directly due to alcoholism as accidental poisonings. But on the other hand, whether they involve traffic accidents, domestic accidents, homicides or even suicides, violent deaths very often occur under the influence of alcohol. It is not surprising that in countries where the traditional pattern of alcohol consumption is to drink large quantities of strong alcohol at irregular intervals ('binge-drinking'), drastic measures can have such an obvious effect when applied suddenly. Nor is it surprising that when the measures taken were relaxed, mortality from injury and poisoning rose again almost immediately. Here it can be clearly seen that the increase – and therefore the relaxation of the measures – was very premature. Mortality from injury and poisoning had risen in Ukraine from 1988, and this too was perfectly consistent with what happened in Russia. However, the two trends started to diverge in 1992. In Ukraine the rise in mortality from injury and poisoning marked time, whereas in Russia it gathered pace, among females as well as males. The more severe impact on Russia of the economic and social crisis, caused by its more abrupt transition to a market economy, can again be seen here. But here too, Russia seems to have overcome this new difficulty more rapidly, and the gap between the two countries, which became much wider in 1992–1993, fell back to its usual level in subsequent years.

As with diseases of the circulatory system, there was a substantial rise in the following years, and in fact the end of the crisis led to a resumption of long-term trends, at least until the turn of the century.

10.2.2.4 The Particular Case of Digestive Diseases

As far as diseases of the digestive system are concerned, the comparison between France and the two countries of the former USSR serves rather to highlight a particular feature of France. Just as in Ukraine and Russia, alcoholism occupies a larger place in French mortality than in most industrial countries, but it manifests itself very differently there: arising mainly from high but regular consumption of

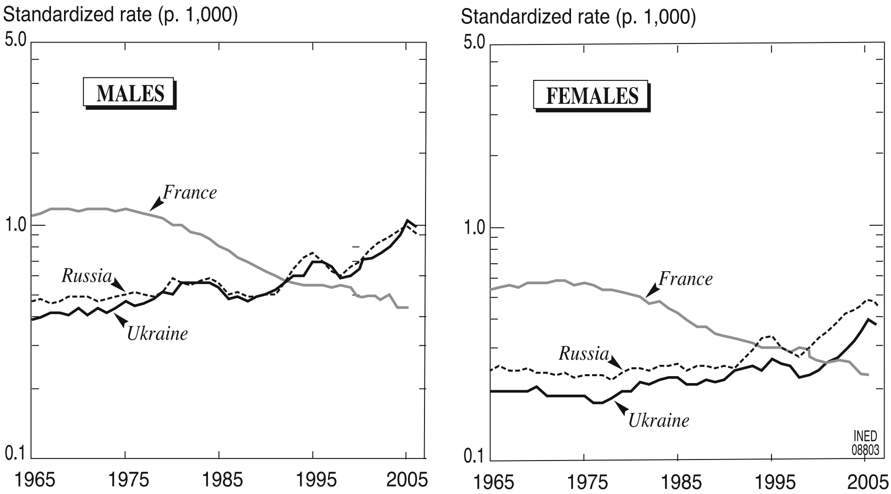

Fig. 10.10 Annual trends in standardized mortality rate from diseases of the digestive system in Ukraine, Russia (1965–2006) and France (1965–2005)

low-alcohol beverages, it is expressed more through chronic conditions (in particular cirrhosis of the liver), which dominated mortality from diseases of the digestive system fairly heavily throughout this period. Thus, in the late 1960s, mortality from digestive diseases was much higher in France than in Ukraine or in Russia, both for females and for males (Fig. 10.10). However, with the large-scale reduction in alcoholism from the 1960s onwards, the three countries had reached a similar level by the early 1990s.

Even though the role of alcohol was smaller in Ukraine and in Russia than in France, it became more apparent when the 1985 anti-alcohol campaign reduced mortality from diseases of the digestive system in 1985–1986, and again when the economic and social crisis caused this mortality to rise once more (especially in Russia) in the early 1990s. We note here the same differences between Ukraine and Russia as for deaths from injury and poisoning.

The new deterioration observed in 1999 and 2000 was also just as substantial as for deaths from injury and poisoning, and in this case it has continued until the most recent years – even the slight reduction in 2006 does not yet justify talk of the beginnings of a reversal in the trend.

10.2.2.5 The Fall in Mortality from Infections Thrown Completely into Reverse

From 1965 until the late 1980s, mortality from infections in Ukraine fell radically (as it also did in Russia) to the point where, during those years, for males, it came into line with the level observed in France; for females, it even fell sharply below

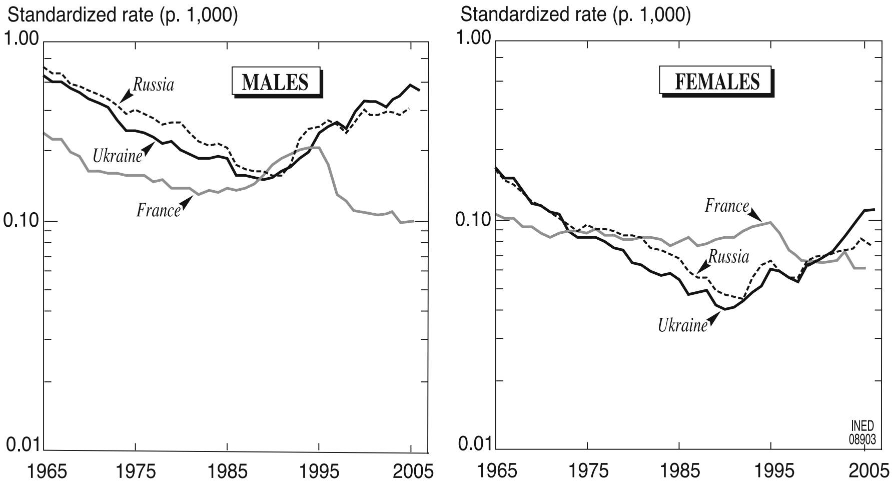

Fig. 10.11 Annual trends in standardized mortality rate from infectious diseases in Ukraine, Russia (1965–2006) and France (1965–2005)

the French level (Fig. 10.11). However, this remarkable downward movement in mortality from infections was thrown completely into reverse in both countries in the early 1990s. And, once again, it can be noted that the turning-point came a little later in Russia than in Ukraine, though the rise was much steeper. Therefore, although, of course, the economic and social crisis linked to the fall of the Communist regime was the cause, we can once again see that Ukraine entered this crisis a little earlier, but also less abruptly, than Russia.

Obviously one must wonder to what extent this fresh rise in mortality from infections could be linked, directly or indirectly, to AIDS, which, as we know, is the main explanation for the upsurge observed in France, notably among males, in the second half of the 1980s and the early 1990s (Prioux 1996). This is a question that we shall be able to answer precisely only in view of the more detailed cause-specific analysis to which Chap. 12 will be devoted.

Diseases of the respiratory system (Fig. 10.12), most of which are infectious, followed a downward trend throughout almost the whole period in all three countries. (The reality of the apparent rise observed in Ukraine at the very start of the period is suspect, since it should probably be linked to the opposite movement observed for mortality from “other diseases”, described in the next section.) The major difference from the previous group of infectious diseases is the large annual fluctuations. These are obviously due to the fact that the only major modern epidemic disease (influenza) is classified (in both the Soviet Classification and the ICD) under respiratory diseases, rather than under infectious diseases.

Throughout the whole period for males and up to the mid-1980s for females, mortality from diseases of the respiratory system was much higher in Ukraine and in Russia than in France. Indeed, the fact that the trends for females met in the late 1990s relates more to the stagnation (or even slight increase) observed over two decades in France than to a more rapid improvement in the countries of the former USSR.

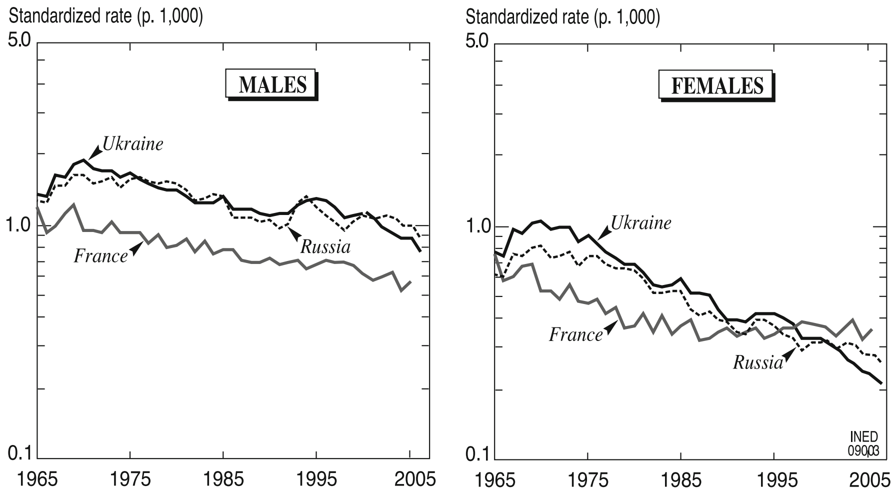

Fig. 10.12 Annual trends in standardized mortality rate from diseases of the respiratory system in Ukraine, Russia (1965–2006) and France (1965–2005)

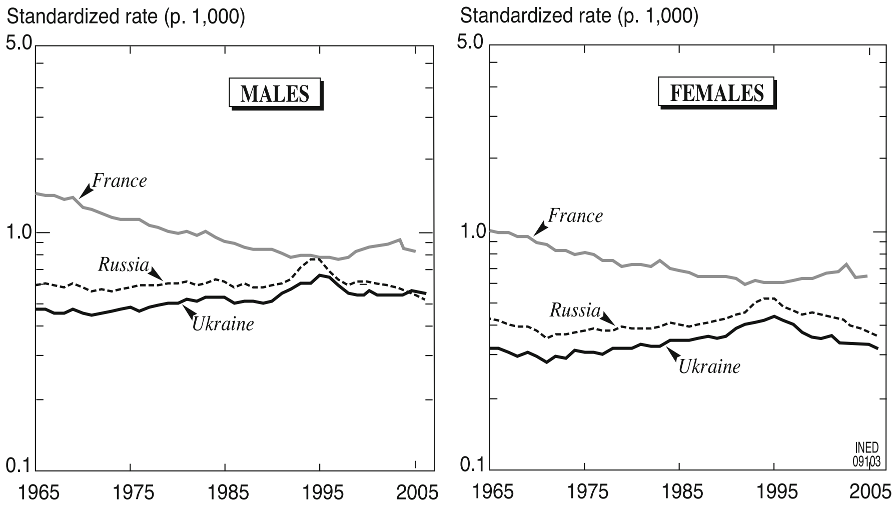

Fig. 10.13 Annual trends in standardized mortality rate from other diseases in Ukraine, Russia (1965–2006) and France (1965–2005)

However, although the downward trend in mortality from respiratory diseases there was clearly slower in the second half of the 1990s, it was, in contrast, faster in Ukraine, notably among females. This is one of the rare manifestations of recent divergence between Ukraine and Russia.

10.2.2.6 Mortality from Other Causes

For the record and for the sake of completeness, Fig. 10.13 tracks trends in the standardized mortality rate in the three countries for all causes other than those already mentioned above. What is essentially a two-stage trend can be noted here. Firstly, this residual mortality increased constantly in Ukraine and in Russia until the mid-1990s (the fall observed for females at the start of the period was probably artificial, symmetrical with the apparent rise in mortality from respiratory diseases noted above), while in France it followed a strong downward trend. Consequently, whereas in the 1960s mortality from these causes was much lower in Ukraine and Russia than in France, by the mid-1990s the gap was no longer very large (and even, with Russia, non-existent). But, in a second phase, this gap widened again, because near-stagnation in France was then set against a significant reduction in Ukraine and in Russia.

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We shall go into more detail about causes of death in the final chapter of this book, but first of all Chap. 11 will allow us to assess the weights of these major groups of causes in comparative trends in life expectancy in Ukraine, in Russia and in France.

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Chapter 11
Impact of Major Groups of Causes on Life Expectancy Trends

France Meslé, Jacques Vallin, and Serhii Pyrozhkov

Here we shall start by assessing the impact of each major group of causes on the overall change in life expectancy[1] observed between 1965 and 2006. However, this overview conceals trends that contrast somewhat over time because of fluctuations in life expectancy. Therefore we should go on to examine the sequential cumulation of annual gains and losses that lead to this overall result. Finally, mortality trends do not carry the same weight in life expectancy in all age groups, though in different ways for different causes. The chapter will conclude with a general survey of this issue.

11.1 Breakdown of Change in Life Expectancy Between 1965 and 2006

From 1965 to 2006, life expectancy for Ukrainian males fell from 67.6 to 62.2 years, representing a total loss of 5.4 years, while Ukrainian females lost 0.9 years' life expectancy, going from 74.6 to 73.7 years. In Russia, over the same period, males lost 3.9 years and females 0.3 (Table 11.1). In contrast, a gain of 9.7 years for males and 9.4 years for females was observed in France. However, as 2006 cause-of-death statistics are not yet available for France, the analyses that follow will end a year

[1] Using, as before, Evgeni Andreev's method (1982).

F. Meslé (✉) • J. Vallin
Institut National d'Études Démographiques, Bd. Davout 133,
75980 Paris Cedex 20, France
e-mail: mesle@ined.fr; vallin@ined.fr

S. Pyrozhkov
Institute for Demography and Social Studies, Bd. Panasa Myrnogo 26,
01011 Kyiv, Ukraine
e-mail: psi@starnet.md

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Demographic Research Monographs, DOI 10.1007/978-94-007-2433-4_11,

Table 11.1 Contributions of seven major groups of causes to gains or losses in life expectancy at birth between 1965 and 2006 in Ukraine and Russia, and between 1965 and 2005 in France

	Males			Females		
Groups of causes	Ukraine	Russia	France	Ukraine	Russia	France
Life expectancy in 2006 (2005 for France)	62.2	60.1	76.9	73.7	72.1	83.8
Life expectancy in 1965	67.6	64.0	67.5	74.6	73.7	74.7
Gains or losses						
Infectious diseases	–0.09	0.25	0.37	0.17	0.32	0.19
Neoplasms	–0.15	0.36	0.46	0.12	0.48	0.84
Diseases of the circulatory system	–3.59	–3.25	3.59	–1.74	–1.61	4.18
Diseases of the respiratory system	0.96	0.68	0.85	1.21	0.96	0.88
Diseases of the digestive system	–0.76	–0.42	0.85	–0.36	–0.30	0.59
Other diseases	–0.19	0.52	1.96	0.04	0.59	1.69
Deaths from injury and poisoning	–1.59	–1.99	1.32	–0.38	–0.72	0.73
Total	–5.41	–3.85	9.42	–0.92	–0.29	9.11

earlier for that country, and we shall have to confine ourselves to arguments based on the life expectancy gains made between 1965 and 2005 (9.4 years for males and 9.1 years for females). Nevertheless, the differences are so great that the comparison remains entirely relevant.

Despite this radical divergence in life expectancies between France and the two countries of the former USSR, two groups of causes have contributed to the rise almost everywhere. Firstly, although the trend in mortality from infectious diseases had an almost neutral impact on Ukrainian male life expectancy (–0.09 years), its decline significantly increased the life expectancy of Russian males (+ 0.25) and, even more so, French males (+ 0.37); while on the female side, the fall in mortality from infectious diseases meant almost as great a gain for Ukrainian females (0.17 years) as for French females, but a much more substantial one for Russian females (0.32 years) (Table 11.1 and Fig. 11.1). But secondly, and above all, the reduction in diseases of the respiratory system meant a gain of almost one full year's life expectancy for Ukrainian males and 0.7 years for Russian males (almost as much as for French males – 0.9 years), and more still for females: 1.2 years for Ukrainian females and 1.0 for Russian females, both more than for French females (0.9)

In addition, for females, the reduction in two other groups of causes had favourable effects on life expectancy in Ukraine and in Russia, even though gains there were much smaller than in France. These were declines in deaths from neoplasms, which led to a gain of 0.1 years for Ukrainian females and 0.5 for Russians, as against 0.8 for French females, and in deaths from "other diseases", which meant a very small gain for Ukrainian females (0.04), but a much larger one for Russians (0.6), as against 1.7 years for French females.

On the other hand, trends in mortality from the three remaining major groups of causes (diseases of the circulatory system, diseases of the digestive system and deaths from injury and poisoning) inflicted heavy losses in both Ukraine and Russia,

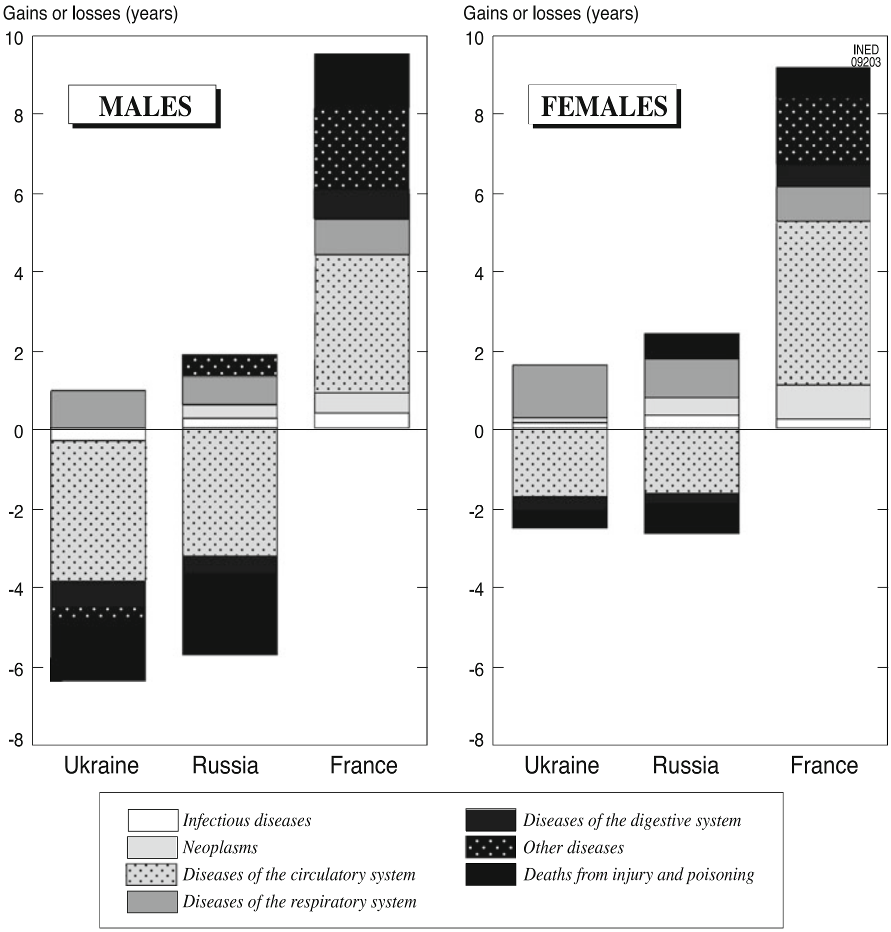

Fig. 11.1 Contributions of seven major groups of causes to gains or losses in life expectancy at birth from 1965 until 2006 in Ukraine and Russia, and until 2005 in France

whereas they led to large gains in France. The most glaringly obvious contrast relates to diseases of the circulatory system. Trends in mortality from this group of causes alone meant the loss of 3.6 years' life expectancy for Ukrainian males and 3.3 for Russian males, whereas they led to a gain of 3.6 years for French males. The situation was little different for females: although Ukrainian females and Russian females lost less (−1.7 and –1.6 years respectively), French females gained more (+4.2 years). So, in total, the gap between Ukraine and France in trends in mortality from diseases of the circulatory system widened by 7.2 years for males and 5.9 years for females (and the gap between Russia and France increased almost as much, by 6.9 years for males and 5.8 years for females).

For males, the second major factor in the divergence between Ukraine or Russia and France was, as one might expect, that of deaths from injury and poisoning, where contrasting trends meant the loss of 1.6 years' life expectancy for Ukrainian males and 2.0 for Russian males but a gain of 1.3 years for French males. Among females, the trend in deaths from injury and poisoning produced hardly any greater effect than the trend in diseases of the digestive system in Ukraine, where, for these two groups of causes, the divergence resulted more from improvements in France (+0.7 for deaths from injury and poisoning, +0.6 for diseases of the digestive system) than from losses for Ukrainian females (−0.4 for each of these two groups of causes). However, Russian females were more affected than Ukrainian females by losses due to deaths from injury and poisoning (−0.7 years, which was almost the same as the gain made by French females from the reduction in such deaths there). In total, for males, the gap between trends in deaths from injury and poisoning in France and Ukraine widened by 2.9 years, less than it did between France and Russia (3.2); the same was also true, at a lower level, for females (1.1 years in Ukraine, 1.3 years in Russia). Trends in diseases of the digestive system contributed to this gap by 1.7 years for Ukrainian males, 1.3 for Russian males, 1.0 for Ukrainian females and 0.9 for Russian females.

So, although over the whole period 1965–2006, net losses in life expectancy in Ukraine (5.4 years for males, 0.9 for females) were much higher than those in Russia (3.9 and 0.3 respectively), this was essentially because, in total, Ukraine lost a little more than Russia through the effects of diseases of the circulatory and respiratory systems, while cancers and "other diseases" had negative effects in Ukraine and positive ones in Russia. Whereas in Russia almost all the losses just came down to the effects of diseases of the circulatory system and deaths from injury and poisoning, there were other causes that played a negative role in Ukraine (even though, in contrast, some of these played a positive role in Russia). As for the total gap between Ukrainian males and French males (14.8 years), this was much more due to French gains (+9.4) than to Ukrainian losses (−5.4); and this is even more true for the gap between Russian males and French males. The phenomenon is even more glaring for females: 90% of Ukraine's total 10-year gap is explained by the advance in French life expectancy, while 97% of Russia's gap (9.4 years) is explained by the French advance.

11.2 Cumulative Impact

However, this overview of the period 1965–2006 does not take into account the fluctuations observed since the 1980s, which have had a heavy influence on losses in life expectancy. By cumulating losses and gains since 1965, we can better appreciate the way in which, year on year, they have led to the results that we have just outlined. However, depending on the starting-point chosen, the view obtained can be very different. In order to take this into account, we shall first explain the cumulation from 1965 and then make a second analysis, limited to the data from the most recent period.

11.2.1 Since 1965

In the three figures that follow (Figs. 11.2, 11.3, and 11.4), we can see how gains or losses in life expectancy gradually accumulated over the course of time from 1965 (up to 2006 for Ukraine and Russia, up to 2005 for France). Each of these figures traces the history of one of the three countries, distinguishing between the sexes. In order to draw these figures, we calculated, for each calendar year, the contributions of different groups of causes to the change in life expectancy by comparison with the preceding year. Then, for each group of causes, we cumulated these annual contributions from 1965 to 2006 (2005 for France). Finally, in order to illustrate the results satisfactorily, we cumulated the causes producing the losses and the causes producing the gains separately at each stage in summing the years gained or lost.

In Ukraine, gains in life expectancy due to the reduction in infectious diseases took place mainly at the start of the period, up to about the mid-1970s. After that date, they added nothing more to the cumulated total and even, from the early 1990s, gave way to regressive movements that sequentially and drastically reduced the benefits of the past until, by the end of the period, these had been totally cancelled out. Gains in life expectancy due to the reduction in respiratory diseases are much more recent, since at the start of the period (up to around the late 1970s) the trend in this group of causes was even such as to produce losses. From the early 1980s, these losses were wiped out, and the cumulated total eventually became positive, reaching a maximum with Gorbachev's anti-alcohol campaign. But this beneficial trend was thrown somewhat into reverse, at least for males, in the following years, because of the fresh upsurge in diseases of the respiratory system over the course of the 1990s, and it did not recover until the 2000s.

Overall, we know that all the other groups of causes contributed to the reduction in life expectancy among males. Here we can see that the cumulative effects over time have always been negative, even though most of them fluctuated strongly in the 1980s and 1990s. Cancer has played a somewhat different role from the other groups of causes, in so far as the trend in its cumulative effect was very regular, reaching a maximum in the early 1990s and at least seeming to have regressed slightly since then because of an observed reduction in mortality from cancer. The development over time of the cumulative effects of worsening mortality from diseases of the circulatory system has been spectacular. It also fluctuated strongly as a result of the anti-alcohol campaign and then the 1992–1994 socio-economic crisis, but here we see that neither Gorbachev's post-1985 anti-alcohol campaign nor (in fact, even less) the post-1994 recovery from crisis was able to wipe out the earlier losses, far from it. The effect of deaths from injury and poisoning has been just as spectacular, but more subject to the vagaries of the last two decades than the effect of diseases of the circulatory system. In 1986, in particular, the negative effects that had accumulated before the anti-alcohol campaign were almost entirely wiped out. In 1988, the reduction in cumulative losses from external causes was also more significant than for diseases of the circulatory system, even though the outcome remained very negative. Compared to the drastic reduction in male life expectancy brought about by

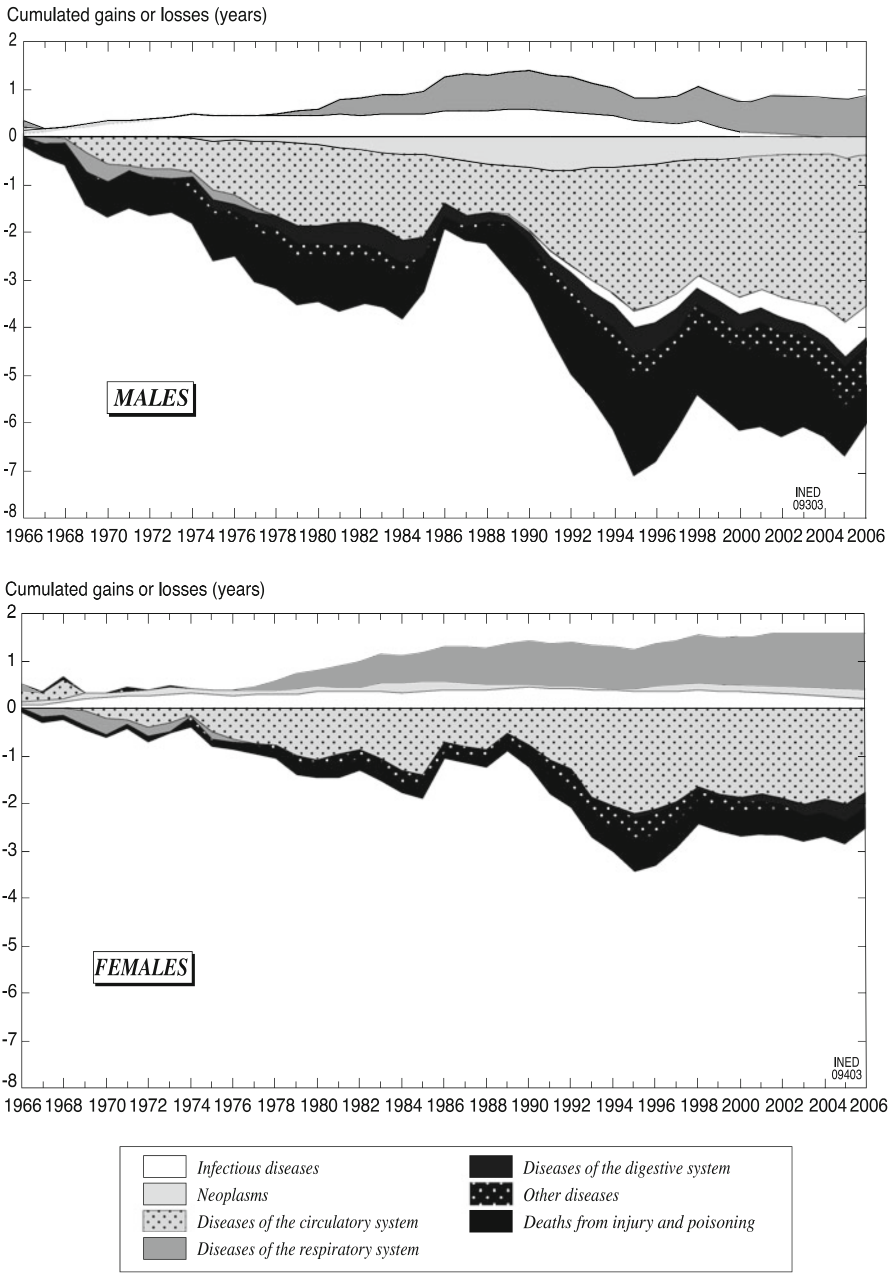

Fig. 11.2 Seven major groups of causes: cumulated contributions to annual gains or losses in life expectancy at birth, from 1965 to 2006, in Ukraine

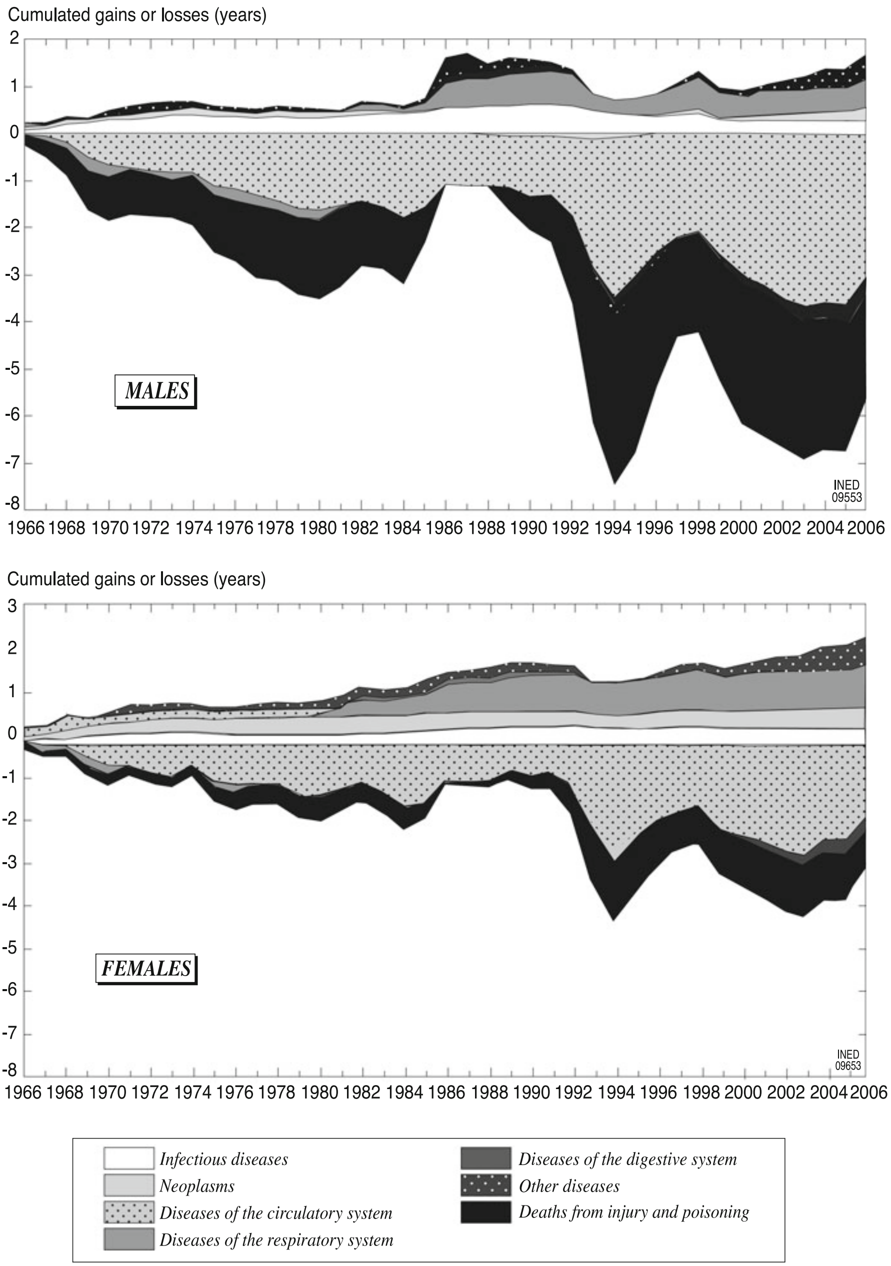

Fig. 11.3 Seven major groups of causes: cumulated contributions to annual gains or losses in life expectancy at birth, from 1965 to 2006, in Russia

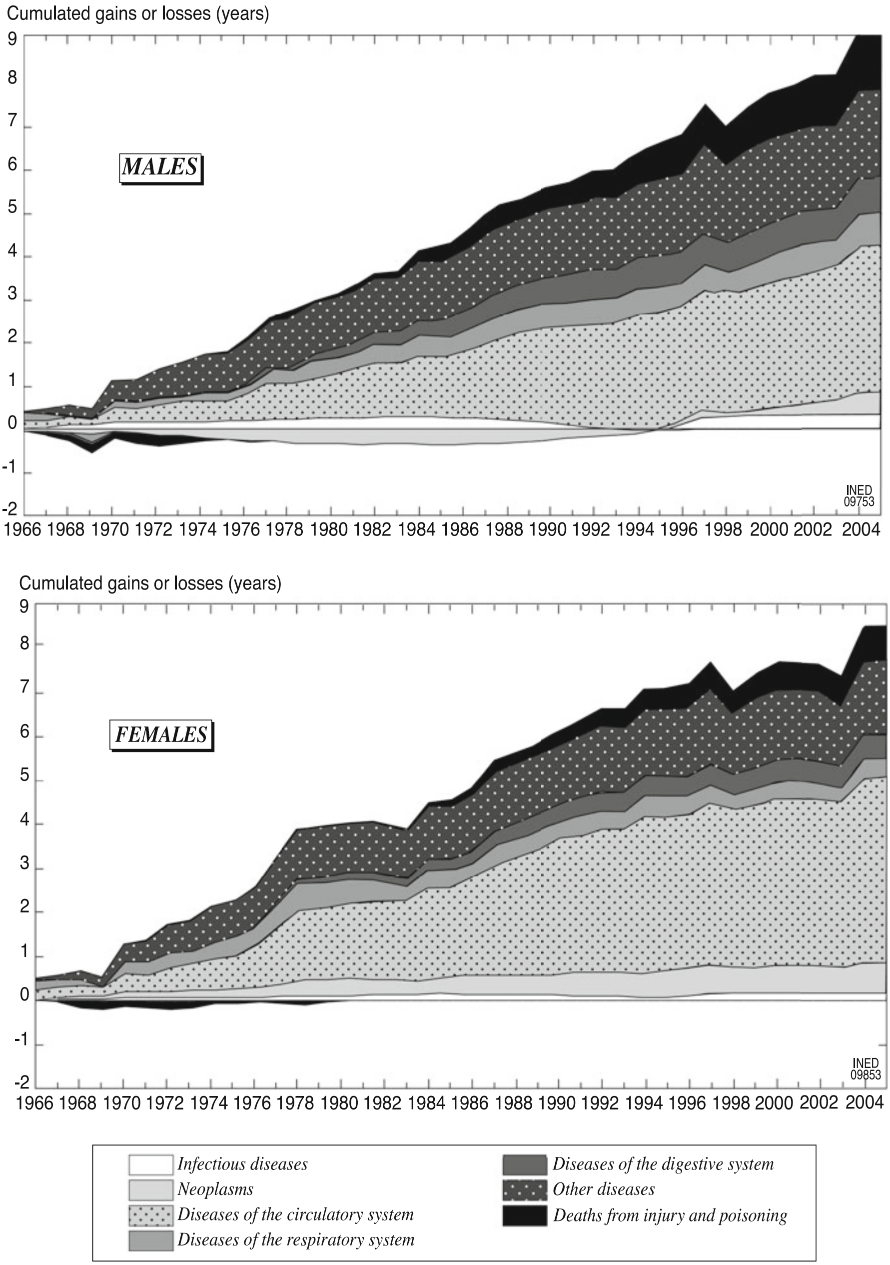

Fig. 11.4 Seven major groups of causes: cumulated contributions to annual gains or losses in life expectancy at birth, from 1965 to 2005, in France

these two major factors, the effects of diseases of the digestive system and of "other diseases" seem fairly marginal. However, in contrast to the situation that we will see for Russia, they were far from negligible. It must also be noted that the anti-alcohol campaign cancelled out almost all the earlier cumulative effects for digestive diseases (as it did for deaths from injury and poisoning), whereas it had much less influence on other diseases.

The principal contrast between males and females here stems from the fact that mortality from diseases of the circulatory system was very broadly, throughout the whole period, the dominant factor in accumulated losses in female life expectancy. This was mainly because alcoholism was less significant, which explains why the cumulative losses appear much less sensitive than male losses to the fluctuations of the last two decades.

The trend in cumulated losses in life expectancy observed in Russia is fairly comparable to the Ukraine trend (Fig. 11.3). In fact, it is only in very recent years that cause-specific mortality in Russia has moved fairly sharply away from the Ukrainian pattern, under the impact of very recent improvements from which Ukraine has not benefited. As for the rest, what is most notable is the much more acute nature of the fluctuations in the 1980s and 1990s. The effects of both Gorbachev's anti-alcohol campaign and the 1992–1994 economic and social crisis were much more marked there. This was in large part due to the fact that the place occupied by deaths from injury and poisoning in the structure of mortality in Russia is bigger than the one it occupies in mortality in Ukraine; however, it also relates to the fact that the particular effect of the two events was much more incisive in Russia than in Ukraine. Firstly, the 1985 anti-alcohol campaign not only led to the total obliteration of losses for women, but, as far as men were concerned, went even beyond that: it created a cumulative positive effect of deaths from injury and poisoning for some years. Secondly, the 1992–1994 crisis was so harsh that it drastically reduced (far more than in Ukraine) the favourable effects that had previously accumulated, while increasing the toll of negative effects more abruptly. Conversely, the effect of the end of the crisis was itself more sudden.

Unlike the picture we have seen for Ukraine, the effects of diseases of the digestive system in Russia were almost nil until the 2000s, and those of "other diseases" were even somewhat positive (an advantage that has become particularly pronounced over very recent years). Since the beginning, the dominant influence of diseases of the circulatory system and deaths from injury and poisoning in the decline in life expectancy has been constantly more overwhelming in Russia than in Ukraine, especially during the period of serious decline. And it may very well be that the impression of a reversal in the situation, suggested by the years 2004–2006, is once again only spurious good news.

With Fig. 11.4, which gives the equivalent pattern for France (up to and including 2005), we see just how far, throughout this period, Ukraine (like Russia) followed a radically opposite path to that of Western countries. In France, almost every cause had a positive impact on life expectancy throughout the whole period. Only neoplasms for males and deaths from injury and poisoning for both sexes had a negative impact for a certain period of time, although we should also make it clear that the negative impact of deaths from injury and poisoning was visible only at the start of the period and, from the 1970s, gave way to a fairly significant cumulative positive effect. It was also from this period onwards that the reduction in mortality from diseases of the digestive system (including cirrhosis of the liver) contributed very significantly to the increase in life expectancy. As far as male mortality from neoplasms was concerned, its decline from the 1980s onwards completely cancelled out the earlier cumulative losses. Thus, deaths from injury and poisoning, cirrhosis of the liver, malignant lung cancer in males and so on, together constitute a major source of divergence between Ukraine or Russia and France, since France, unlike the other two countries, succeeded not only in stemming the rise in these 'man-made' diseases but also in obtaining a large reduction in them, with positive consequences for life expectancy. But, of course, the chief source of divergence relates to the trend in diseases of the circulatory system, which, in contrast to what has happened in Ukraine and in Russia, has continuously produced massive life expectancy gains in France. While France, like most Western countries, managed to achieve a stunning revolution in its circulatory disease situation, Ukraine, like Russia, was mired in the long-term crisis that had begun in the 1960s. Finally, we should also note the constant large decline in mortality from "other diseases" in France. The years of life gained in this way relate to a fairly piecemeal combination of favourable factors, of which the two main elements were the decline in infant mortality from causes other than infections, which led to a gain of almost 1 year's life expectancy for both sexes, and the general improvement in health of people aged over 60.

11.2.2 Since 1984

This representation of the cumulative effects of cause-specific mortality trends on life expectancy obviously depends a great deal on the date from which the sum is calculated and on the length of the period observed. In order to give a better account of the trends specific to the major fluctuations of the 1980s and 1990s, we made a cumulation for Russia and Ukraine, limited to the years 1984–2006 (Fig. 11.5).

This new representation enables us to illustrate much more clearly the mirror effects that were successively produced by the anti-alcohol campaign and the 1992–1994 socio-economic crisis. The symmetry observed between the causes involved in improving life expectancy after 1984 and those involved in the subsequent deterioration is particularly obvious for males. Apart from diseases of the respiratory system, whose cumulative effect remained constantly positive throughout the whole period, there was a first phase in both Ukraine and Russia (1985–1990) when deaths from injury and poisoning and from diseases of the circulatory system were the primary large-scale contributors to a rise in life expectancy under the impact of the anti-alcohol campaign. There was then a gradual reversal of these gains as the campaign was relaxed, followed by a second phase in which, under the impact of the economic and social crisis, deaths from injury and poisoning and from diseases of the circulatory system led to losses that were dramatically higher than the gains of

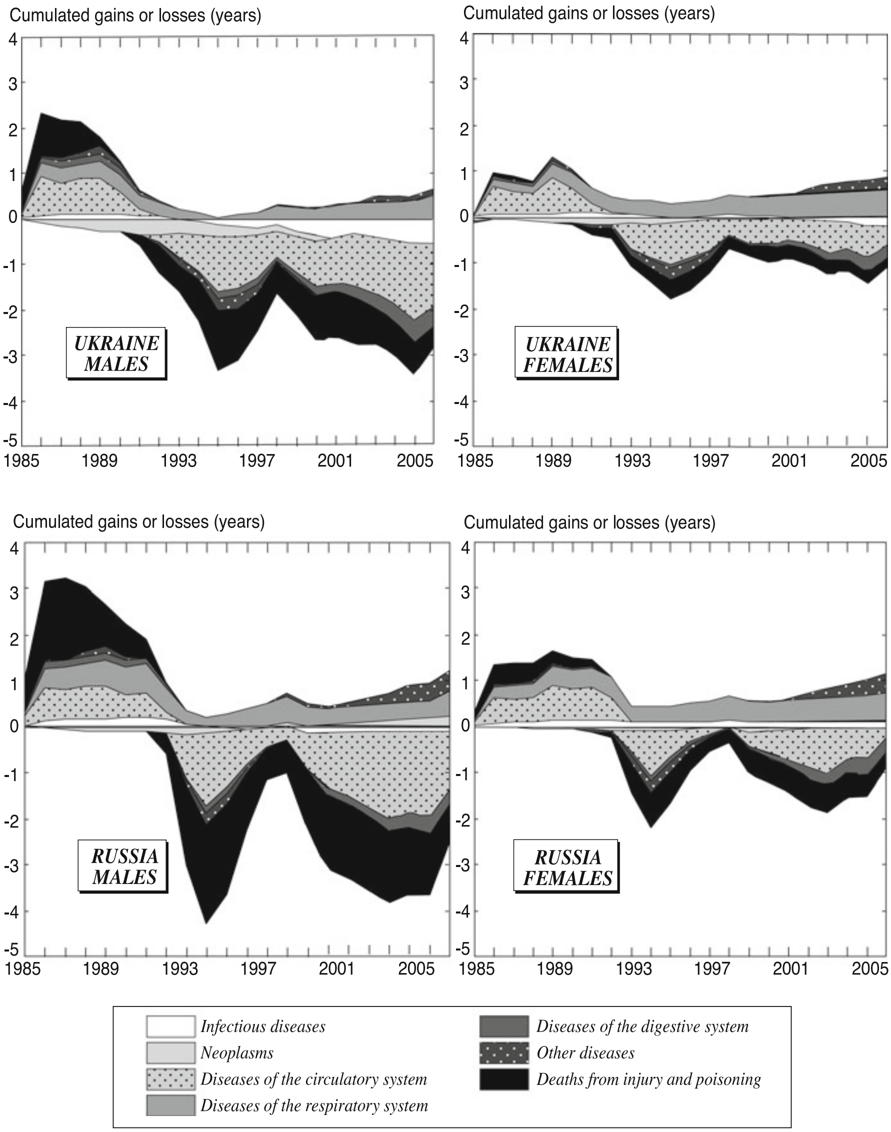

Fig. 11.5 Seven major groups of causes: cumulated contributions to annual gains or losses in life expectancy at birth, from 1984 to 2006 in Ukraine and in Russia

the preceding period; in turn, the end of the crisis cancelled out part of these losses. However, we should note that, all things considered, the situation reached in 1998 was much more unfavourable than the 1984 situation. The end of the crisis did not cancel out all the losses accumulated during the crisis. Or rather, to be more precise, the two major impacts of the immediate circumstances of the anti-alcohol campaign and the 1992–1994 crisis did not alter the trend towards long-term decline, since, in the final analysis, life expectancy ended at a lower level than at the starting-point. Are we seeing the same trend with the relapse of the years 1999–2005 (1999–2003 in Russia)? In fact, the onset of this relapse (in 1999–2000) was more abrupt than the pre-1984 trend had been on average, and therefore it was also attributable to the immediate circumstances. This might have been partly a case of the emergence of AIDS, especially in Ukraine, where we see that infectious diseases had a much stronger negative impact in those 2 years; but it also related, especially in Russia, to the very strong fresh upsurge in deaths from injury and poisoning and from diseases of the circulatory system. But the fact remains that decline in the years 2001–2005 (2001–2003 in Russia) again came fairly close to the slower pre-1984 rate of long-term decline. In Ukraine, however, 2006 marked a return to improvement, although it is obviously much too soon to view this as the long-awaited, sustainable reversal of a trend. Even for Russia, where an improvement has emerged since 2003, it would be unwise to assert this.

In any case, Fig. 11.5 confirms that the two main differences between Ukraine and Russia are, firstly, that the fluctuations observed since the mid-1980s have been much more acute in Russia, although more dominated by diseases of the circulatory system and deaths from injury and poisoning than in Ukraine, and, secondly, that this was the case even during the 1992–1994 economic and social crisis, when the impact of other causes, though not insignificant, was less in Russia than in Ukraine. On the other hand, it is too soon to say whether the greater improvement observed in very recent years in Russia is or is not the starting-point of a considerable divergence between the two countries.

11.3 Life Expectancy and Cause-Specific Mortality by Age

Cross-analysis by cause and age will enable us to learn more about the nature of gains and losses in life expectancy. After a quick glance at the whole period 1965–2006, we shall analyse the recent fluctuations in more detail.

11.3.1 Analysis of Overall Losses for the Period 1965–2006

Figure 11.6 breaks down the gains and losses in life expectancy observed in Ukraine and Russia for the whole period 1965–2006, according to age and group of causes, and the results are compared with those observed in France for the period 1965–2005 (Annex XIII on the Website (http://www.demogr.mpg.de/books/drm/009 or http://extras.springer.com/)).

The Ukrainian and Russian patterns are obviously very similar, especially when they are contrasted with the French one, as here. In both Ukraine and Russia, all the groups of causes (apart from infectious and respiratory diseases) contributed to losses in life expectancy at almost all ages over 15, but the heaviest losses, especially for males, were from diseases of the circulatory system in adults aged between 35 and 75 and deaths from injury and poisoning (largely related to alcohol) among slightly younger adults (from 20 to 60 years of age). In contrast, French life expectancy gains were mainly in the older age groups, and this was the case not only because of the reduction in mortality from diseases of the circulatory system but also thanks to the significant decline in all other causes (with the exception of cancer in males).

For females, as we know, Ukrainian and Russian losses were much smaller, but they contrast with the much higher gains in France. We should note here that the Ukrainian and Russian losses almost exclusively related to the rise in diseases of the circulatory system, especially in old age. The contrast with France could not be more striking.

On the other hand, as in France, the fall in infant mortality had a major positive impact on life expectancy in the countries of the former USSR. But in Ukraine and Russia, this fall related especially to the favourable trend in respiratory diseases, while in France it was almost only "other diseases" that were involved. This difference reveals the stage of development in infant mortality: while in Ukraine and Russia improvements still related mainly to the reduction in post-neonatal mortality (dominated by infectious and respiratory diseases), in France they related almost entirely to neonatal mortality ("conditions originating in the perinatal period" in particular).

11.3.2 Analysis of Recent Fluctuations

In order to obtain a good understanding of the role played by age- and cause-specific mortality in recent trends in life expectancy, and in particular to clarify the differences observed between Ukraine and Russia, three major events must be analysed separately:

- 1984–1992: the anti-alcohol campaign and its reversal,
- 1992–1998: the 1992–1994 economic and social crisis and the post-crisis period,
- 1998–2006: the recent relapse.

These three phases, as we have already seen, followed slightly different timings in Ukraine and in Russia. In Ukraine, the abrupt rise in life expectancy linked to the 1985 anti-alcohol campaign reached its peak sooner (in 1986) than in Russia (1987). In contrast, the fall linked to the crisis that followed the break-up of the USSR and the transition to a market economy lasted much longer in Ukraine, where the lowest point was observed in 1995, instead of 1994 as in Russia. This is why, for the first two phases (Figs. 11.7 and 11.9), we have distinguished here between slightly different periods for Ukraine and Russia (Annex XIV on the Website), in order to better account for each country's specific features. On the other hand, in both countries the best post-crisis year was 1998, and the third phase relates to the same period in both cases (1998–2006).

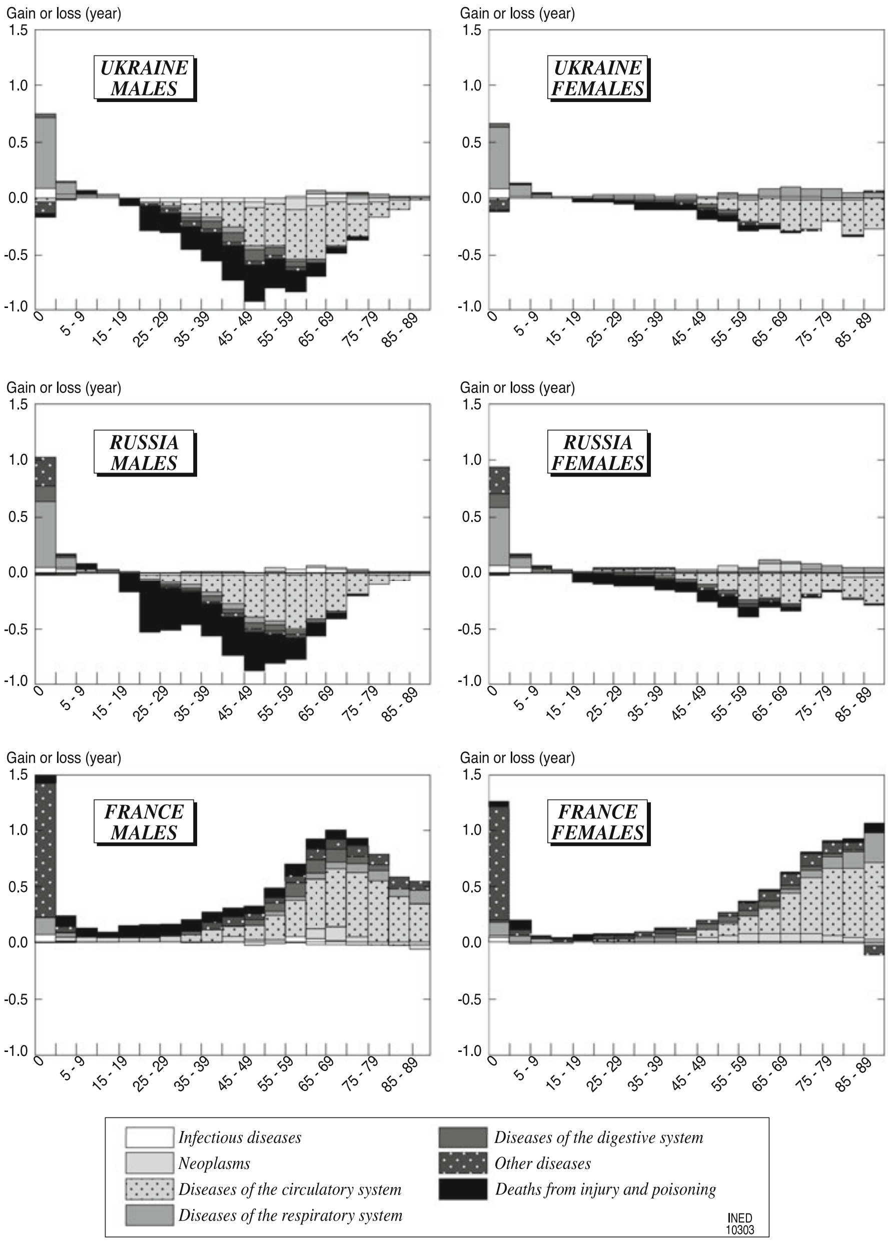

Fig. 11.6 Contributions of mortality trends by age and major group of causes to gains and losses in life expectancy at birth between 1965 and 2006 in Ukraine and Russia and between 1965 and 2005 in France

11.3.2.1 The Anti-alcohol Campaign and Its Reversal (1984–1992)

Firstly, the gain in life expectancy in Ukraine (1984–1986) and in Russia (1984–1987) was mainly due to the reduction in deaths from injury and poisoning among young adults (25–60), directly linked, as we know, to the decline in alcoholism (Shkolnikov and Nemtsov 1997) and, incidentally, to the decline in diseases of the circulatory system, which was closely related to the reduction in alcohol consumption. In this connection we should mention that the campaign involved a reduction in the state-controlled production and sale of alcohol, an increase in the price of alcoholic drinks, a restriction on private distilling, and the development of specialized medical services. However, all these measures were just a flash in the pan, since they were quickly abandoned. We can see that they were probably less draconian in Ukraine than in Russia: if the gains they brought about in Ukraine (Fig. 11.7) were smaller, this is above all because the effect of the decline in deaths from injury and poisoning was much less among younger adults (aged up to 50), while, in contrast, the fall in mortality from diseases of the circulatory system had a little more impact there.

The second change (the fall in life expectancy observed in Ukraine from 1986 to 1992 and in Russia from 1987 to 1992) fitted a pattern of age- and cause-specific losses that was highly symmetrical to that of the gains in the preceding period. This is because it was dominated by the re-emerging of deaths from injury and poisoning among young adults, reinforced by an increase in mortality from diseases of the circulatory system after anti-alcohol campaign was abandoned. Here again, the effect of mortality from injury and poisoning among young adults was much more pronounced in Russia than in Ukraine, while in contrast, the effect of diseases of the circulatory system in the older adult age groups was more pronounced in Ukraine than in Russia. So the effects of Gorbachev's anti-alcohol campaign, like the effects of the subsequent relaxation of the measures, differed significantly between Ukraine and Russia. Yet these differences in no way result from our use of a different timing division here. It might be thought that the greater effect of deaths from injury and poisoning in Russia in the first period is due at least in part to the fact that this period was longer in Russia (3 years) than in Ukraine (2 years). But this is not the case: not only was the reverse recorded for diseases of the circulatory system over the same period, but also (and especially) the negative effect of deaths from injury and poisoning during the second period (which in this instance was shorter in Russia) was greater in Russia than in Ukraine. In fact, the timing difference is itself a consequence of the different repercussions in Ukraine and in Russia of the immediate health situation linked to the anti-alcohol campaign.

This first large fluctuation, resulting from the anti-alcohol campaign, did much less to disrupt female mortality than male. Figure 11.8, constructed on the same scale as Fig. 11.7, provides a striking illustration of this. Even though the same upheavals as for males can still be observed leading in the same direction for females, they result in only modest effects. The anti-alcohol policy also had consequences for females, but these were much smaller and somewhat different in nature, since they were almost entirely concentrated on diseases of the circulatory system. It did not seem to be helpful to compare the Ukrainian results to the Russian results, which are very little different.

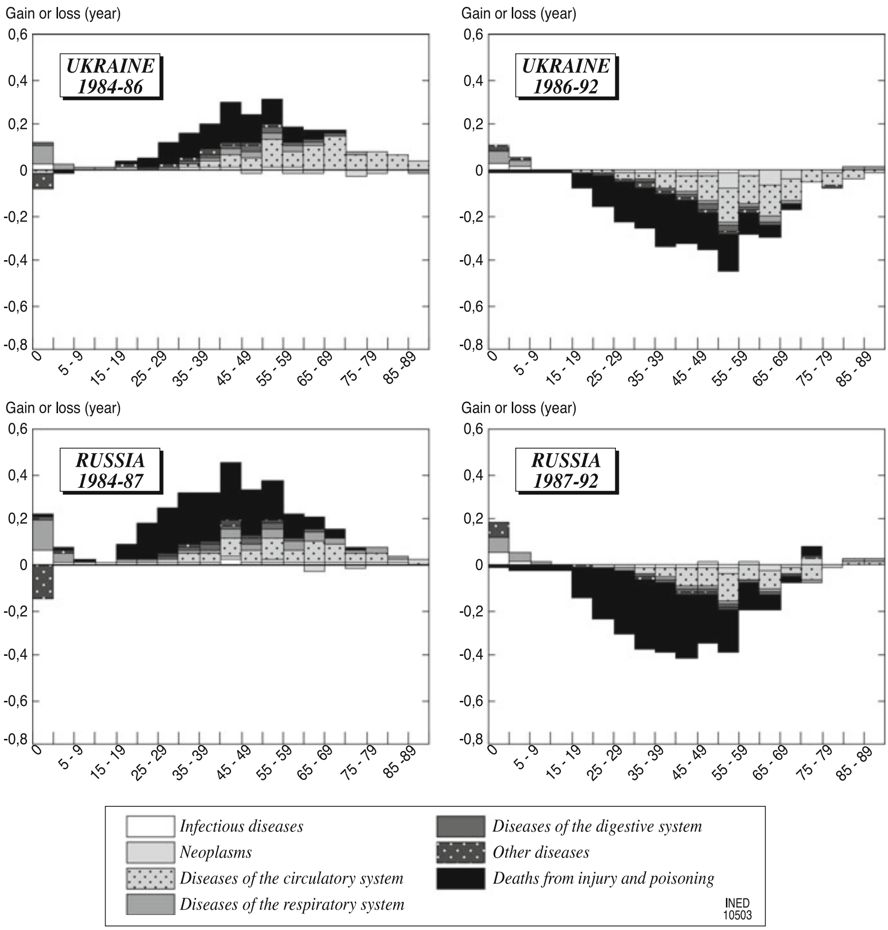

Fig. 11.7 Contributions of mortality trends by age and major group of causes to fluctuations in male life expectancy in Ukraine and Russia between 1984 and 1992

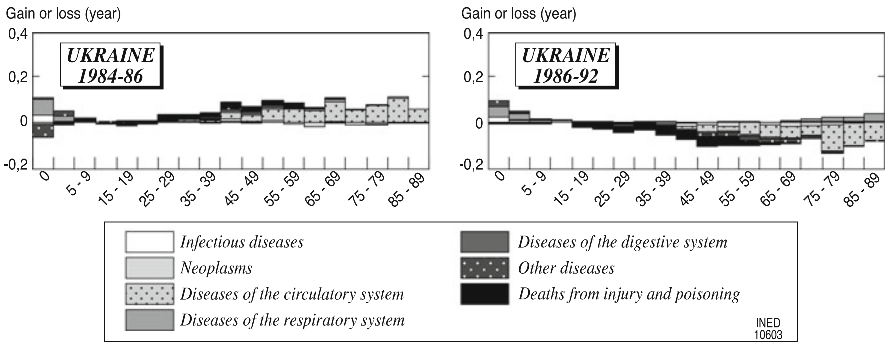

Fig. 11.8 Contributions of mortality trends by age and major group of causes to fluctuations in female life expectancy in Ukraine between 1984 and 1992

11.3.2.2 The Economic and Social Crisis and the Recovery (1992–1998)

The period that followed saw the decline in life expectancy continue, but with a clearly different dynamic in causes of death – one which contradicts the thesis sometimes put forward that the entire fall in life expectancy in the 1990s can be explained by a simple 'counterselection' phenomenon (Avdeev et al. 1997; Vishnevskii 2000). According to this thesis, by leading to an abrupt decline in mortality, the anti-alcohol campaign delayed the deaths of weaker-than-average individuals who would otherwise have died. Therefore the population's average state of health deteriorated and, naturally, mortality increased in the years that followed. A cause-specific examination of deaths refutes this thesis in two ways. If it were correct, the rise in mortality immediately following the end of the anti-alcohol campaign should have resulted from all kinds of causes to which the lives previously saved were more vulnerable. Yet, as we have just seen, this rise was entirely linked to alcohol-related causes (just like the fall in mortality during the campaign). In contrast, from 1992, although mortality had already returned to its pre-campaign level, the continued rise in mortality resulted from a very different range of causes. From this point of view, a comparison of the right-hand section of Fig. 11.7 with the left-hand section of Fig. 11.9 speaks volumes. Of course, as always in mortality trends for these countries, the major role played by diseases of the circulatory system and deaths from injury and poisoning in the adult age groups is clearly apparent; but these causes did not act alone (all the other groups of causes helped to aggravate the situation) and the losses in life expectancy have an older age profile, even though the fall in infant and child mortality that was also visible in the preceding period gave way to a rise. Far from this new rise in mortality (several years after the end of the anti-alcohol campaign) being attributable to the deaths of vulnerable individuals temporarily saved by the campaign, we believe that it relates to a new factor: the economic and social crisis which, at that time, dealt a heavy blow to populations suddenly subjected to the perverse effects of the transition to a market economy.

This crisis had a very violent impact, as is shown by most of the economic and social indicators brought together in Table 11.2. Although economic growth (measured, for example, in terms of annual change in GNP) was negative throughout almost the whole decade (becoming positive again only in 2000), the recession was particularly severe in 1993, 1994 and 1995. In one single year, 1994, GNP fell by 23%, to only half its 1990 level (1st graph, Fig. 11.10). This drastic recession in the real economy took place in the context of hyperinflation that reached its most savage in 1993 with a rate of 10,000%! This peak in inflation was so high that it makes the rates of over 100% yet to come at the end of the decade (2nd graph, Fig. 11.10) look almost negligible. We could give more, similar indicators to account for the gravity of the crisis (Table 11.2). But it seems to us that the two we have chosen here sum up the situation fairly well in themselves: firstly, with the fall in GNP, the whole of the average wealth of the country was savagely undermined. But hyperinflation, which was more savage still, meant that the most economically vulnerable section of the population was particularly severely hit by the consequences of this general impoverishment, since these were people without any capital to escape the depreciation in the currency.

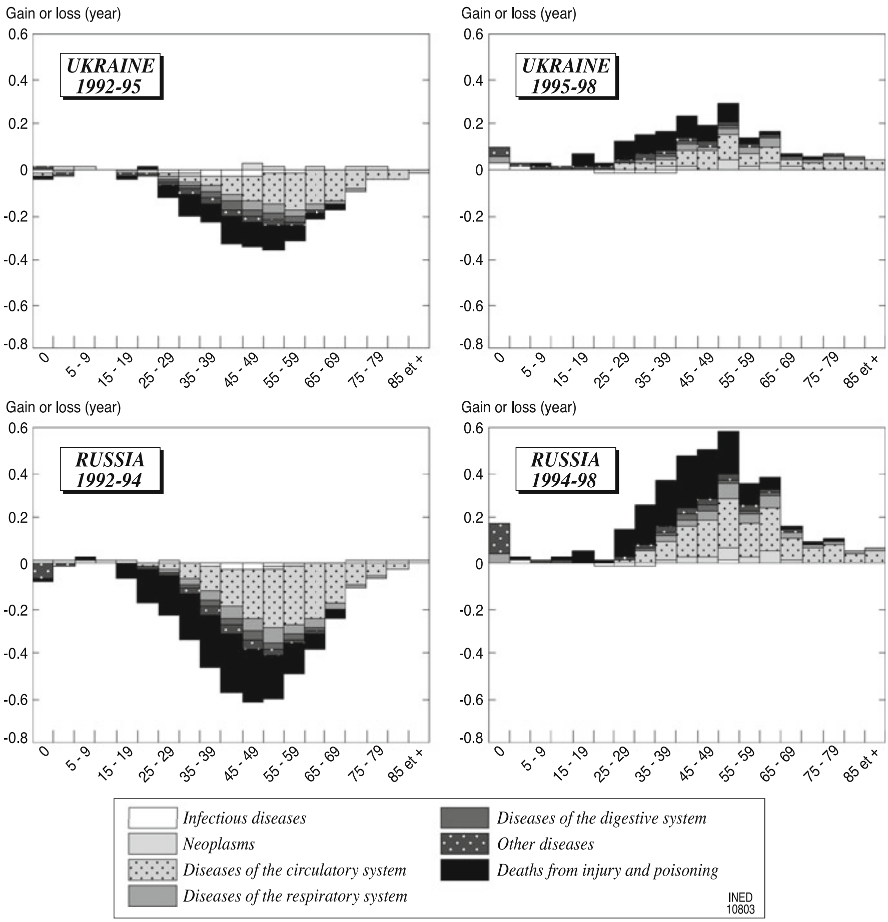

Fig. 11.9 Contributions of mortality trends by age and major group of causes to fluctuations in male life expectancy in Ukraine and Russia between 1992 and 1998

Given the sad state of the health services, it is hard to imagine that such a crisis would not have consequences for chances of survival; it is also easy to understand why the further fall in life expectancy following the abandonment of the anti-alcohol campaign accelerated in the early 1990s until it reached a much lower level than that of the pre-campaign period, in fact, a lower level than would have resulted from extrapolation of the early 1980s' trends.

After 1995, economic decline continued for a few more years, but at a very reduced pace, just as hyperinflation at 10,000% very quickly gave way to much less outrageous rates. Fairly quickly too, after the crisis had passed, the populations involved found the resources to adapt to circumstances, doing more to safeguard their chances of survival. So life expectancy was able to start rising again.

Table 11.2 Trends in various economic and social indicators since 1990

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Real GNP												
Annual change		91.3	90.1	85.8	77.1	87.8	90.0	97.0	98.1	99.8	105.9	109.1
Base 100 index in 1990	100	91.3	82.26	70.5802	54.4173	47.7784	43.0006	41.7106	40.9181	40.8362	43.2456	47.1809
Real price index												
Annual change in consumer price index		390	2,100	10,256	501	282	140	110	120	119	126	106
Base 100 index in 1990	100	390	8,190	839,966	4,208,232	11,854,589	16,560,860	18,233,507	21,880,209	26,081,209	32,810,160	34,811,580
Real output (base 100 in 1990)												
Industrial production index	100	95	94	92	73	88	95	100	99	104	113	114
of which consumer goods	100	90	86	79	71	78	78	83	95	101	118	111
Agricultural production index	100	90	95	105	87	100	94	102	94	97	114	114
Real incomes												
Annual change			711	563	860	1,018	829	1,063	984	920	1,099	1,090
Base 100 index in 1991		100	71.1	40.0	34.4	35.0	29.1	30.9	30.4	28.0	30.7	33.5
Average real wages												
Annual change				59.9	84.8	110.6	96.6	96.6	96.2	91.1	99.1	119.3
Base 100 index in 1992			100	59.9	50.8	56.2	54.3	52.4	50.4	45.9	45.5	54.3

Source: Office of the President of Ukraine (2002)

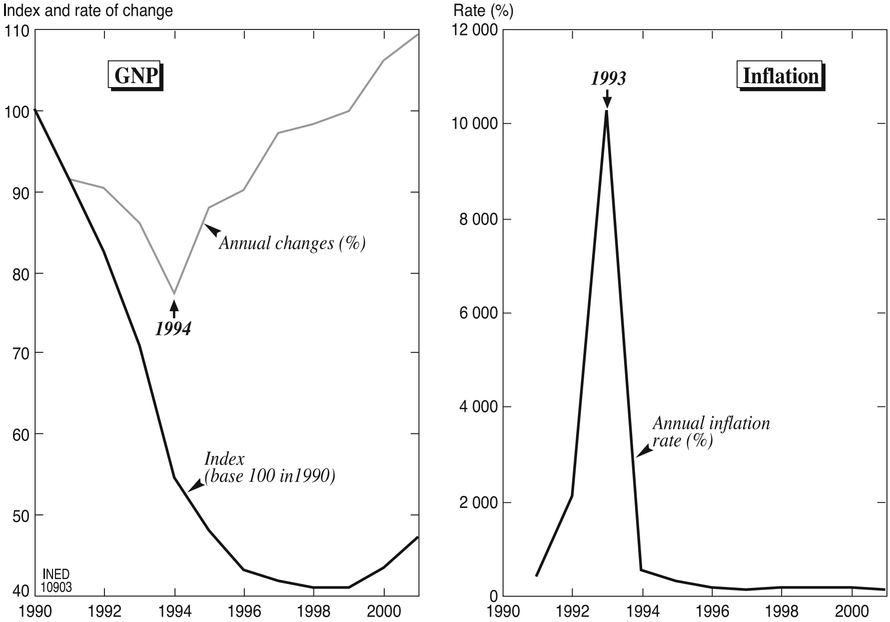

Fig. 11.10 Annual trends in gross national product (GNP) and in consumer price inflation rate throughout the 1990s

The same causes produced the same effects in both Russia and Ukraine, but, here too, there are nuances that are sometimes significant. Whereas for Russia, age- and cause-specific patterns this time appear almost perfectly symmetrical between the crisis period (1992–1994) and the post-crisis period (1994–1998), things were completely different in Ukraine. At first, of course, Ukraine experienced losses of the same kind as those that were prevalent in Russia, characterized by the visible effect of a fresh upsurge in almost all causes of death in the adult age groups and by just as large a place for diseases of the circulatory system as for deaths from injury and poisoning (a contrast with the preceding period). However, the losses in Ukraine were much smaller (even though the reference period is longer) and the role of deaths from injury and poisoning there was relatively less significant. But above all, during the period that followed, Russian gains were much larger than Ukrainian gains and much more concentrated in the adult age groups. In fact, although the crisis in Ukraine was less severe, in 1998 Ukraine showed no more signs of recovery than Russia did. Or, to be more exact, as we have already emphasized above, the end of the crisis left both countries in a more unfavourable state of health than they had been before the anti-alcohol campaign (the benefits of which, as we have seen, had already been lost before the 1992–1994 crisis). Nevertheless, the fact remains that Ukraine's crisis experience was different from Russia's and, since the difference was even more marked than the one observed for the previous fluctuation, this may be attributable to the break-up of the USSR, which meant that the two countries introduced significantly different policies using different methods.

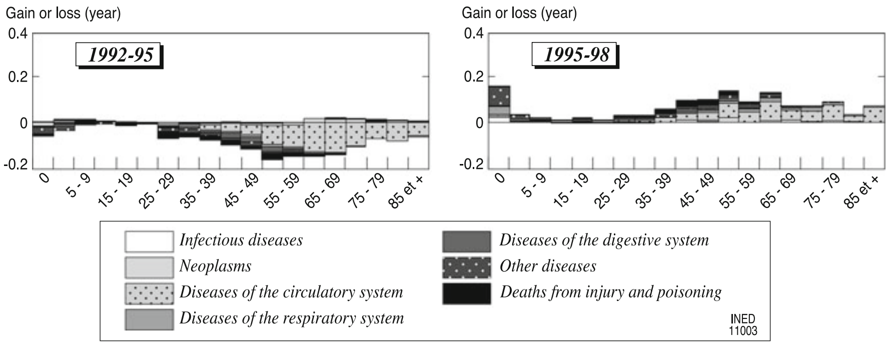

Fig. 11.11 Contributions of mortality trends by age and major group of causes to fluctuations in female life expectancy in Ukraine between 1992 and 1998

Like the previous large fluctuation, this second one, linked to the 1992–1994 crisis, did much less to disrupt female mortality than male (Fig. 11.11). The sharp movements observed for males produced only modest effects for females, even though still in the same direction. Here too, the really dominant impact was that of diseases of the circulatory system alone, with the effect of deaths from injury and poisoning being only secondary in importance (like the other groups of causes).

11.3.2.3 The Recent Relapse (1998–2006)

Although the relapse observed after 1998 was much more severe in Russia than in Ukraine, it was also shorter in duration there, since, as we have seen above, there was a significant improvement in Russia from 2003 onwards, whereas it was not until 2006 that Ukraine recorded a much fainter improvement. Consequently, the comparison made here between 1998 and 2006 losses in life expectancy relates to an overall reduction of the same size in both countries. But the factors involved were significantly different. Certainly, as always, diseases of the circulatory system played the main role in both cases (Fig. 11.12). However, in Ukraine, their impact was not only smaller, but also affected only the oldest age groups on a relatively large scale, whereas in Russia they had an equally strong effect on all adult age groups. A second difference was that whereas trends in deaths by injury and poisoning in Ukraine led only to gains in life expectancy, in the young adult age groups, in Russia they brought about major losses in all adult age groups. On the other hand, they also played a positive role for young people, in particular aged 20–24, with higher gains than those made in Ukraine – so much so that Fig. 11.12 shows, for Russia, an absolutely astonishing pattern of age-specific gains and losses in life expectancy, with a sharp discontinuity at the age of 25. Before the age of 25, mortality trends (almost exclusively thanks to the reduction in causes of infant death and in external causes of death) led to major gains in life expectancy and practically no losses. In contrast, after the age of 25, the worsening situation in nearly all major causes of death (with the exception

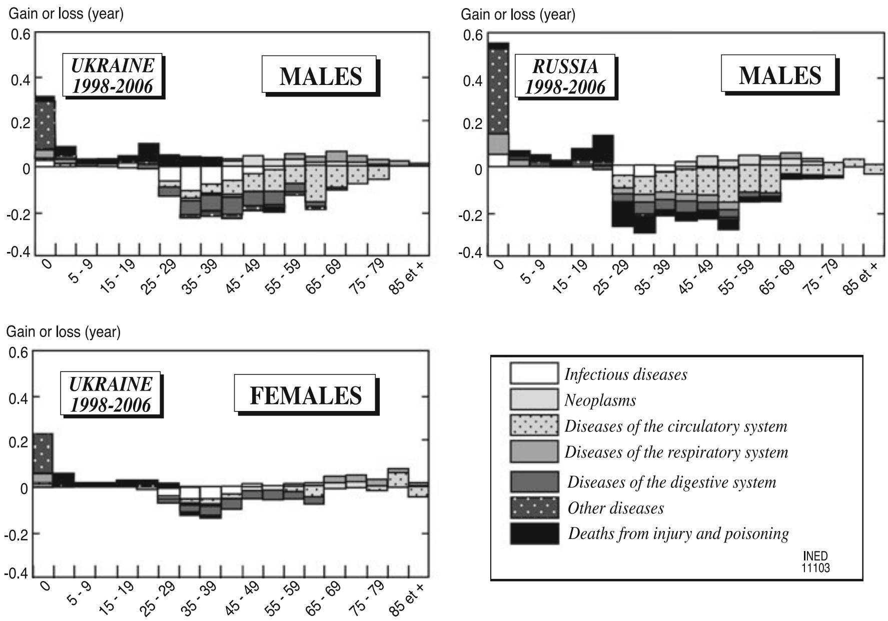

Fig. 11.12 Contributions of mortality trends by age and major group of causes to the changes in male life expectancy in Ukraine and Russia between 1998 and 2006

of cancers) led to heavy losses in life expectancy. This discontinuity is very marked in Russia; although it also appears in Ukraine, it is much less obtrusive there. Moreover, in Ukraine it owes nothing to deaths from injury and poisoning, but is much more linked than in Russia to the dramatic rise in infectious diseases (including AIDS) among young adults. This obviously strengthens the hypothesis that the emergence of AIDS could be at the origin of this fresh upsurge – an issue that we shall take up again in the following chapter.

As before, the trends were much less marked for females than for males (Fig. 11.12), but the female picture was no longer dominated by diseases of the circulatory system, since infectious diseases and diseases of the digestive system had come to play the main role there.

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Chapter 12
Mortality Trends by Age Group and Detailed Causes of Death

France Meslé and Jacques Vallin

Reconstructing cause-of-death series at the most detailed level of the Soviet Classification will enable us to make a more in-depth analysis of the diseases involved in trends across the major groups of causes that we have been studying.

Annex XII (on the Website http://www.demogr.mpg.de/books/drm/009 or http://extras.springer.com/) gives the rates by 5-year age groups (after redistributing deaths from ill-defined causes) for each of the 175 items in the 1981 Soviet Classification[1] (the list of these items, with their equivalents in the 9th Revision of the International Classification of Diseases, is to be found in Annex III-3). Each section of this chapter will examine the detailed causes that are the most significant in one age group. For convenience in presentation, we shall limit ourselves to five large groups, chosen according to specific features that we have previously observed, either of total mortality or of mortality from the major groups of causes. As a result, we shall distinguish mortality among newborns (under 1 year old) from that of children (aged 1–14), young adults (15–39), the middle-aged (40–64) and the old (65 and over). For each large age group, we shall start by giving an overview of mortality trends, using the same major groups of causes as in previous chapters, and then go into more detail about each one. The detailed data given will vary from one age group to another, according to the disease pattern in the given age group using groups of causes specific to the age that will be explained as we go along.

[1] As amended in 1988 for deaths from injury and poisoning.

F. Meslé (✉) • J.Vallin
Institut National d'Études Démographiques, Bd. Davout 133, 75980 Paris Cedex 20, France
e-mail: mesle@ined.fr; vallin@ined.fr

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12.1 Causes of Death at Under 1 Year Old

When we look at the major groups of causes used in the previous chapters, infant mortality[2] appears to be dominated by "Other diseases" (Fig. 12.1), which is obviously not very illuminating. Even so, at this level, it is also important to point out the major role played by diseases of the respiratory system at the beginning of the period and their significant reduction since 1975. Third place is occupied by infectious diseases: we see here that they were the main cause of the fresh rise in infant mortality in the early 1970s, which alarmed Western writers at the time (Feshbach 1982) and drove the Soviets to cease publishing any mortality statistics from 1974 onwards.

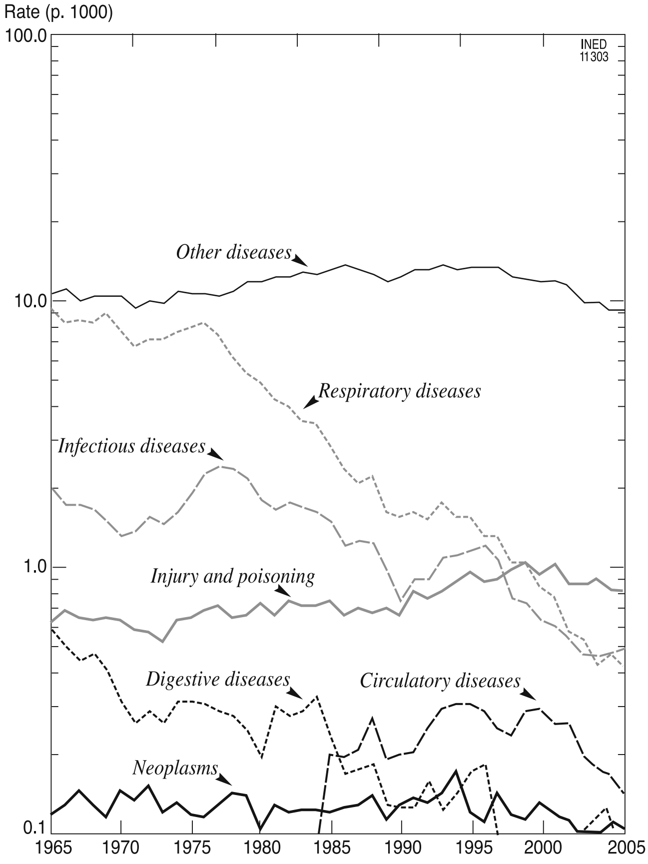

Fig. 12.1 1965–2006 trends in infant mortality rates by major groups of causes

[2]For simplicity's sake, here we shall use the term 'infant mortality' to refer to mortality rates at under 1 year of age, calculated using the ratio of deaths at under 1 year of age to the population aged under 1, not to births (as in the conventional infant mortality rate).

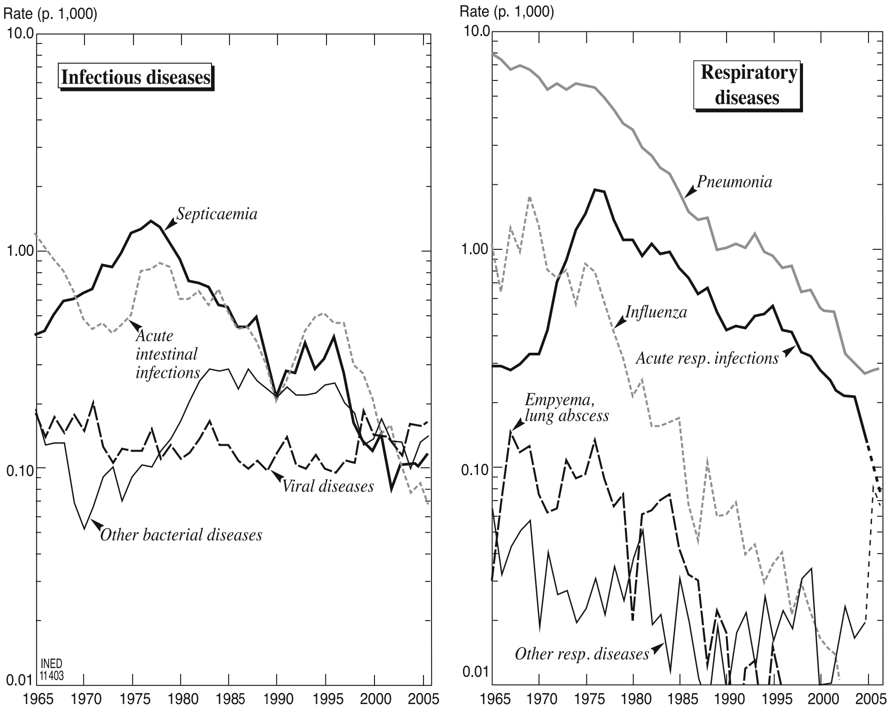

Fig. 12.2 1965–2006 trends in infant mortality rates for the main infectious and respiratory diseases

However, we can see that, since that date, mortality from infections has diminished at almost the same rate as mortality from diseases of the respiratory system. On the other hand, it rose again fairly strongly with the economic and social crisis in the early 1990s, although it has fallen markedly again since 1997. The crisis also seems to have initiated a significant rise in mortality from accidents at this very young age, and this continued into the early 2000s, though it has declined since then. The other major groups of causes have played only a secondary role. So here it seems helpful to give more precise details not only of the "Other diseases" group but also of infectious diseases, diseases of the respiratory system and accidents (Table 12.1 shown at the end of the Section 12.1).

12.1.1 Infectious and Respiratory Diseases

Among infectious diseases of early infancy, septicaemia and acute intestinal infections have by far the greatest impact on mortality (Fig. 12.2). We should note at the outset that the curve tracing trends in acute intestinal infections is probably somewhat suspect at the transition from 1973 to 1974. It will be remembered (from Chap. 4) that 1974 was marked by a change in practice that considerably improved recording of neonatal mortality, and that this led us to correct the infant mortality rates observed in previous years. In terms of causes of death, we accounted for this correction under “diseases of early infancy”. Here we can see that we would probably be able to refine this by attributing part of it to acute intestinal infectious diseases. With that reservation, it remains the case that the rise in mortality from infections observed in the first half of the 1970s appears to have resulted from the fairly chance conjunction between a halt in the fall in mortality from acute intestinal infections and a continuation of the rise already observed earlier for septicaemia. Conversely, the new upsurge observed in the early 1990s clearly resulted from an abrupt reversal for these two main items in the infectious diseases group, both sensitive to the economic and social crisis. Once the effect of the crisis had been overcome in the late 1990s, these two conditions took a very sharp downward turn again. So by the end of the period, they had reached the same level as “other bacterial diseases” and viral diseases. This convergent trend has applied to bacterial diseases since 1990; it has become the case for viral diseases only much more recently, since mortality due to these infections has increased sharply in recent years, after stagnating at a lower level for a long time. This increase provides evidence of the emergence of AIDS among young children.

Mortality from diseases of the respiratory system is dominated by pneumonia (Fig. 12.2). So this cause of death, in deep decline over the whole period, sets the general tone for the fall in infant mortality from diseases of the respiratory system. However, two short periods of stagnation (even, in the second instance, a new upsurge) can be noted, corresponding to the two crises already mentioned in relation to infectious diseases: the early 1970s and the early 1990s. A new halt in the decline, observed in 2005–2006, appears as a dotted line on the graph in Fig. 12.2, since it is unlikely that it reflects reality: it much more probably relates to the fact that, on moving from the Soviet Classification to the 10th Revision of the International Classification (ICD-10), which came into effect in 2005, we were able to make only a fairly crude link between cause-of-death series. This meant that statistical discontinuities almost disappeared from the major groups of causes, but did not always do so at the level of detailed items. In this graph and in all subsequent ones, we have generally used dotted lines to show cases where the 2005–2006 data suffer from this type of problem.

Influenza mortality has also been in rapid decline since the late 1960s, but was much less sensitive to the two crises mentioned above: it fluctuated completely independently, with the onset of each epidemic. The case of “other acute respiratory infections”[3] is less clear. Although they have followed almost exactly the same course as pneumonia since the mid-1970s, they had already been marked by an abrupt rise in the early 1970s. Admittedly, one might be tempted to assimilate this partly with the rise in infectious diseases already mentioned; but it seems to us much more likely

[3]The Soviet Classification does not allow a detailed breakdown of this group of diseases, but in countries where details are available, it is clearly dominated by acute bronchitis.

Fig. 12.3 Trends in infant mortality since 1965: main groups included in "Other diseases" in Fig. 12.1

to result from a change in coding practice to the detriment of certain forms of pneumonia, notably bronchopneumonia. In addition, for 2005–2006, it seems fairly obvious that the introduction of ICD-10 led to data being swapped between the items that correspond to these conditions and the items that cover, firstly, "other diseases of the respiratory system" and, secondly, various forms of pneumonia.

12.1.2 Other Diseases

The dominant position occupied by "Other diseases" in Fig. 12.1 justifies further exploring the contents of this disparate group here. In fact, it is mainly made up of two specific subgroups: "congenital anomalies" and "conditions originating in the perinatal period" (Fig. 12.3).

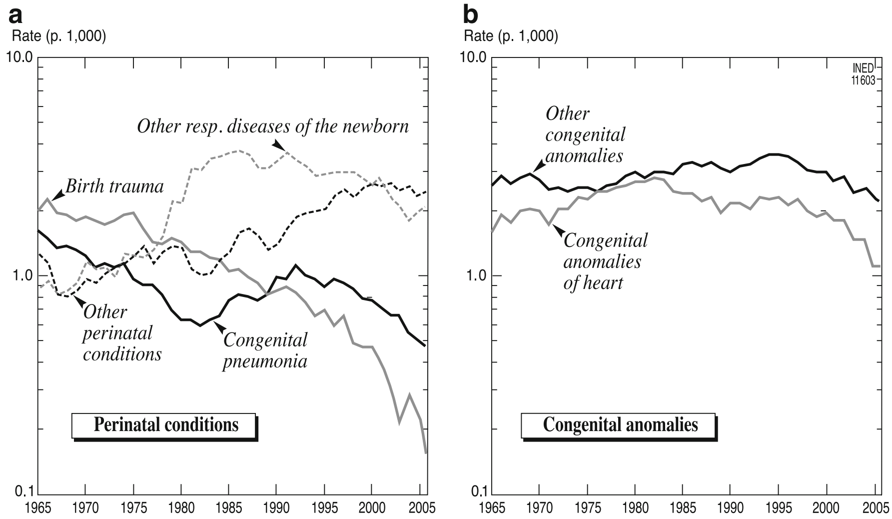

Fig. 12.4 Trends in infant mortality from conditions originating in the perinatal period and from congenital anomalies since 1965

Mortality from perinatal conditions showed a slight but regular increase until the mid-1980s, after which it oscillated for about 15 years and then, just before the turn of the millennium, started to go down slowly. Mortality from congenital anomalies also seems to have increased at the start of the period, but it began to stagnate sooner (from the early 1980s). Like conditions originating in the perinatal period, it has more or less declined since the late 1990s. The third group, diseases of the nervous system, which has diminished slightly over the long term (if we disregard the early 1990s), is responsible for only a tenth the amount of mortality when compared to either of the previous two groups. Mortality from endocrine diseases increased very strongly up to the early 1990s, to the point where it met the rate for diseases of the nervous system, subsequently following a similar course; however, it remains very marginal in itself.

If we go into more detail about conditions originating in the perinatal period (Fig. 12.4a), we see that their overall near-stability is due to the conjunction between a significant fall in mortality from birth trauma (reinforced at the start of the period by a significant fall in mortality from congenital pneumonia) and a fairly pronounced increase in mortality from both “other respiratory conditions of newborn” and “other conditions originating in the perinatal period”.

Similarly, the near-stability of mortality from congenital anomalies (Fig. 12.4b) until the mid-1990s reflects the combination of a significant drop in the main group of anomalies, cardiac anomalies, with an increase in all other anomalies.

Fig. 12.5 Trends in infant mortality from injury and poisoning since 1965 (N.B. accidental inhalation cannot be shown separately for 2005–2006, since that year was subject to ICD-10)

12.1.3 Deaths from Injury and Poisoning

The main external cause of death from injury and poisoning among newborns (Fig. 12.5) is accidental inhalation of a foreign body, which increased slightly but steadily, especially in the 1990s. Second place is occupied by suspicious deaths (homicide and 'injury undetermined whether accidentally or purposely inflicted'), which rose fairly steeply from the 1970s to the late 1990s, but have declined since then. In contrast, the group bringing together other deaths from injury and poisoning was very stable over the whole period.

12.2 Causes of Death in Children Aged from 1 to 14

In order to follow cause-of-death trends by large age groups, in this section, as in those that follow, we use standardized rates obtained from weighting the 5-year-age-group rates by the WHO standard European population (1992). While we felt that distinction by sex was completely superfluous for children under 1 year old, for this age group, and the following ones, we shall present the results broken down by sex. As far as children aged 1–14 are concerned, it is true that trends in mortality

Table 12.1 Causes of infant mortality: groups of items used (with corresponding ICD-9 items) and trends in mortality rate between 1965 and 2006

Groups used	1995 Soviet classification	ICD (9th revision)	2005 Ukrainian classification	Rate per 1,000 (both sexes)	
Infectious and parasitic diseases	**1 to 44, 206**	**001 to 139**	**3 to 57**	**1.98**	**0.49**
Acute intestinal infectious diseases	1 to 8	001 to 009	3 to 10	1.17	0.07
Septicaemia	25	038	29	0.40	0.11
Other bacterial diseases	9 to 24, 26, 43	010 to 037, 039 to 041, 137	11 to 28, 30 to 36, 56	0.18	0.14
Viral diseases	27 to 32, 206	042 to 079	37 to 47	0.18	0.16
Other infectious and parasitic diseases	33 to 42, 44	080 to 136, 138, 139	48 to 55, 57	0.05	0.01
Neoplasms	**45 to 67**	**140 to 239**	**59 to 104**	**0.12**	**0.10**
Diseases of the circulatory system	**84 to 102**	**390 to 459**	**133 to 156**	**0.01**	**0.14**
Diseases of the respiratory system	**103 to 114**	**460 to 519**	**158 to 173**	**9.12**	**0.41**
Acute respiratory infections	103	460 to 466	158	0.28	0.07[a]
Influenza	104	487	159	1.03	0.01
Pneumonia	105 to 107	480 to 486	160 to 163	7.71	0.28[a]
Empyema, abscess of lung and mediastinum	112	510, 513	172	0.03	0.00
Other diseases of respiratory system	108 to 111, 113, 114	470 to 478, 490 to 508, 511, 512, 514 to 519	164 to 171, 173	0.06	0.06[a]
Diseases of the digestive system	**115 to 127**	**520 to 579**	**175 to 189**	**0.58**	**0.06**
Other diseases	**68 to 83, 128 to 157**	**240 to 389, 580 to 779**	**106 to 108, 110 to 113, 115 to 118, 120 to 128, 130, 131, 190, 192 to 195, 197 to 205, 207 to 215, 217 to 226, 228 to 236, 239**	**10.53**	**9.44**
Endocrine diseases	68 to 72	240 to 289	106 to 108, 110 to 113	0.06	0.23
Diseases of the nervous system and mental disorders	73 to 83	290 to 389	115 to 118	0.67	0.28
Congenital anomalies *including:*	145 to 150	740 to 759	228 to 236	4.07	4.38
Anomalies of heart	*147*	*745, 746*	*230*	*1.54*	*1.09*
Others	*145, 146, 148 to 150*	*740 to 744, 747 to 759*	*228 to 229, 231 to 236*	*2.52*	*2.20*

Conditions originating in the perinatal period *including:*	151 to 157	760 to 779	217 to 226	5.64	5.18
Birth trauma	*151*	*767*	*217*	*1.94*	*0.14*
Congenital pneumonia	*153*	*770.0, 770.1*	*220*	*1.58*	*0.48*
Other respiratory conditions of newborn	*152, 154*	*768, 769, 770.2 to 770.9*	*218, 219, 221*	*0.87*	*2.11*
Other conditions originating in the perinatal period	*155 to 157*	*760 to 766, 771 to 779*	*222 to 226*	*1.26*	*2.45*
Other diseases	128 to 144	580 to 739	120 to 128, 130, 131, 190, 192 to 195, 197 to 205, 207 to 215, 239	0.10	0.45[a]
Deaths from injury and poisoning	**160 to 176**	**800 to 999**	**242 to 258**	**0.61**	**0.80**
Accidental inhalation of a foreign body	169	911 to 915		0.32	0.52[b]
Homicide; injury undetermined whether accidentally or purposely inflicted	174, 175	960 to 989	254, 255	0.08	0.15
Other accidents	160 to 168, 170 to 173, 176	800 to 910, 916 to 959, 990 to 999	242 to 253, 256 to 258	0.20	0.21[b]
Total for all causes	**1 to 176, 206**	**001 to 999**	**3 to 57, 59 to 104, 106 to 108, 110 to 113, 115 to 118, 120 to 128, 130, 131, 133 to 156, 158 to 173, 175 to 189, 190, 192 to 195, 197 to 205, 207 to 215, 217 to 226, 228 to 236, 239, 242 to 258**	**22.94**	**11.43**

[a]These rates doubtful, as consistency could not be ensured in the transition from the previous Classification
[b]Given for 2004, since the last revision of the list produced no corresponding category in 2005 and 2006

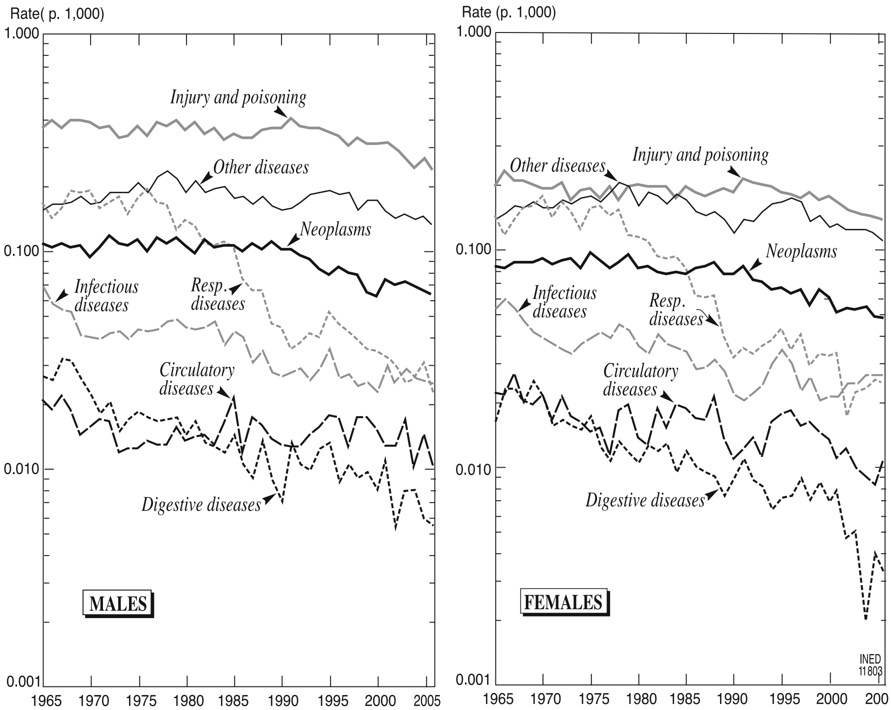

Fig. 12.6 Trends in standardized mortality rates at ages 1–14 by major groups of causes since 1965

by major groups of causes (Fig. 12.6) remain fairly similar for both sexes, but they do include one notable difference: deaths from injury and poisoning are much more frequent among boys than among girls. Among boys, such external causes of death represent by far the leading cause of death at this age. They remained very stable from the 1960s to the 1990s, and it was only in the latter decade that they began to decline somewhat. Therefore they appear to be broadly independent of the major fluctuations in mortality over the last two decades.

Apart from the "Other diseases" group, which again, as for infant mortality, plays an important overall role here, neoplasms and diseases of the respiratory system occupy second and third places respectively in mortality among children aged 1–14. However, the significance of their respective roles has reversed over time: with mortality from neoplasms remaining more or less stable until 1990, the reduction in mortality from diseases of the respiratory system, which was very rapid in the 1970s and 1980s, has brought neoplasms to the fore (despite the fact that cancer mortality has gone into decline over the last decade). However, the sizeable fall in mortality from diseases of the respiratory system took place within a fairly limited period between the late 1970s and the late 1980s. After rising again during the 1992–1994 economic and social crisis, in recent years the trend has taken a fresh downward turn.

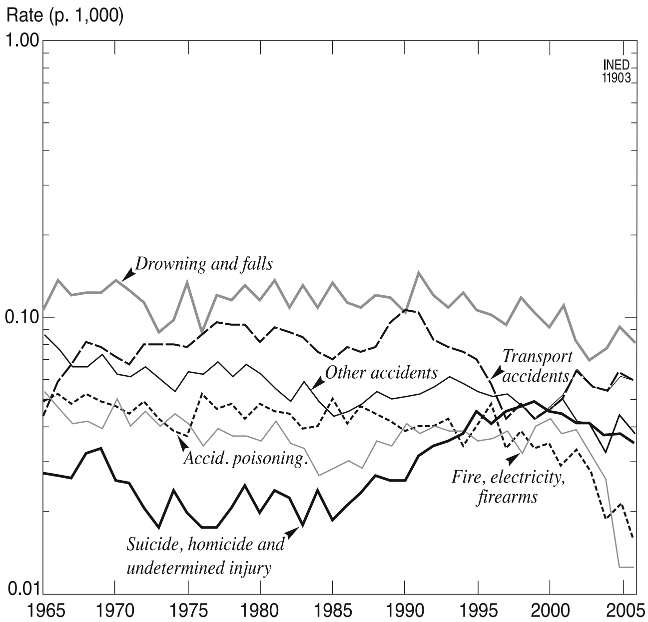

Fig. 12.7 Trends in standardized male mortality rates at ages 1–14: deaths from injury and poisoning since 1965

The other groups of causes have fallen much more, even though nowadays, with the reduction in diseases of the respiratory system, there is a much bigger gap between mortality from infections and mortality from respiratory diseases than there was in the past.

Here, therefore, apart from looking briefly at the "Other diseases" group, we shall go into detail about only the three largest groups: deaths from injury and poisoning, neoplasms, diseases of the respiratory system (Table 12.2 shown at the end of the Section 12.2).

12.2.1 Deaths from Injury and Poisoning

Among children and adolescents, mortality from injury and poisoning results from various external causes that play almost equal parts; these mainly fall into the category of domestic accidents, broadly defined (Fig. 12.7). In this group, falling and, in particular, drowning come top. Next come transport accidents, to which children fall victim above all as pedestrians, then accidental poisoning and, finally, accidents caused by fire, electric current or firearm. Despite small annual fluctuations, these different causes were relatively stable until the late 1990s, and they seem to have been fairly insensitive to the two major fluctuations in the 1980s and 1990s. On the other hand, a marked fall can be seen for some causes (notably accidental poisoning and fire) in the 2000s. Traffic accidents also saw a net reduction in the 1990s, but have risen again since then.

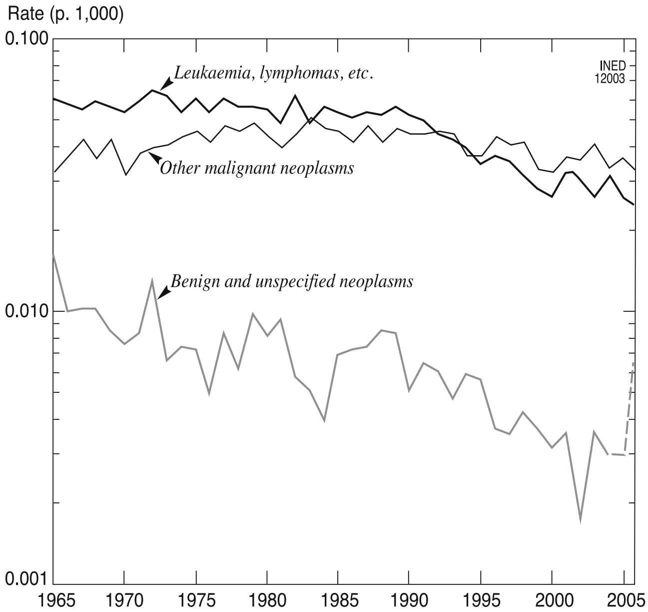

Fig. 12.8 Trends in standardized male mortality rates for neoplasms at ages 1–14 since 1965

Although they remained at the bottom until the mid-1990s, suicide and homicide have not had an insignificant role. These two factors have played almost equal parts in the mortality of children and adolescents. Here we have grouped them together with deaths from injuries where it is undetermined whether they were accidentally or purposely inflicted, which are much less numerous. All have increased significantly since the mid-1980s, but this rise, very regular over more than 15 years, appears to have been completely independent of the immediate circumstances of the 1992–1994 crisis. This type of mortality, which seems to have reached its highest level in the late 1990s, is now in slight decline.

All these causes of death from injury and poisoning are markedly greater for boys than for girls, but the trends they follow do not differ much by sex, which is why we have limited Fig. 12.7 to males. For the same reasons, in the following sections we shall examine only male mortality.

12.2.2 Neoplasms

Cancer deaths of children and adolescents have been to a very great extent dominated by neoplasms of lymphatic and haematopoietic tissue, i.e. leukaemia and lymphomas. For a long time, these even caused higher mortality at these ages than all other malignant neoplasms taken together (Fig. 12.8).

They fell slowly over the whole period, and this fall accelerated remarkably from the late 1980s onwards, perhaps linked to more effective treatments becoming more widely available. In any case, in this age group, trends in mortality from these neoplasms (which are particularly sensitive to incidents of exposure to atomic radiation) seem not to have been marked at all by the Chernobyl disaster. On the contrary, it was just 4 or 5 years after the reactor explosion that mortality from leukaemia and lymphomas started to fall. One might almost imagine that the disaster had an inverse effect: by attracting attention to this type of condition, with resultant Western cooperation, perhaps in the end it has allowed Ukraine to benefit from better treatments in recent years.

As for mortality from benign and unspecified neoplasms, this is very marginal.

12.2.3 Diseases of the Respiratory System

Like infant mortality, mortality among those aged 1–14 from diseases of the respiratory system is dominated by three types of disease: pneumonia, acute respiratory infections and influenza (Fig. 12.9).

Mortality from pneumonia, by far the largest cause in this group, saw a deep decline in the 1970s and 1980s. However, this fall temporarily gave way to a fairly sharp, short rise during the 1992–1994 crisis, before recovering once the crisis had passed. (The abrupt rise in 2005 should not be taken into account, since this was certainly due to a statistical discontinuity resulting from the transition to ICD-10.) Trends in mortality from acute respiratory infections have run fairly much parallel to pneumonia since the late 1970s, with the same sensitivity to the 1992–1994 crisis, which here too interrupted a rapid decline. However, as we have already emphasized in regard to early infancy, mortality from acute respiratory infections was marked by a very dramatic rise in the early 1970s. Once again, in some years this probably resulted from deaths formerly attributed to certain forms of pneumonia (notably bronchopneumonia) being shifted to the item for acute respiratory infections (which is unique in the Soviet Classification) within a few years. If we add together mortality rates from pneumonia and acute respiratory infections (the lighter curve in Fig. 12.9), we obtain a much more realistic outline of the trends: after having stagnated or even slightly increased until the mid-1970s, male mortality from diseases of the respiratory system at ages 1–14 largely went into deep decline until almost 1990.

As for influenza, at these ages it has followed exactly the same pattern as for infant mortality. It remains highly epidemic, but the resulting mortality fell steeply until the early 1990s.

Finally, all these respiratory conditions, although in deep overall decline, played a part in the upsurge in mortality linked to the 1992–1994 economic and social crisis. With this crisis past, they have all recommenced their downward trend in recent years.

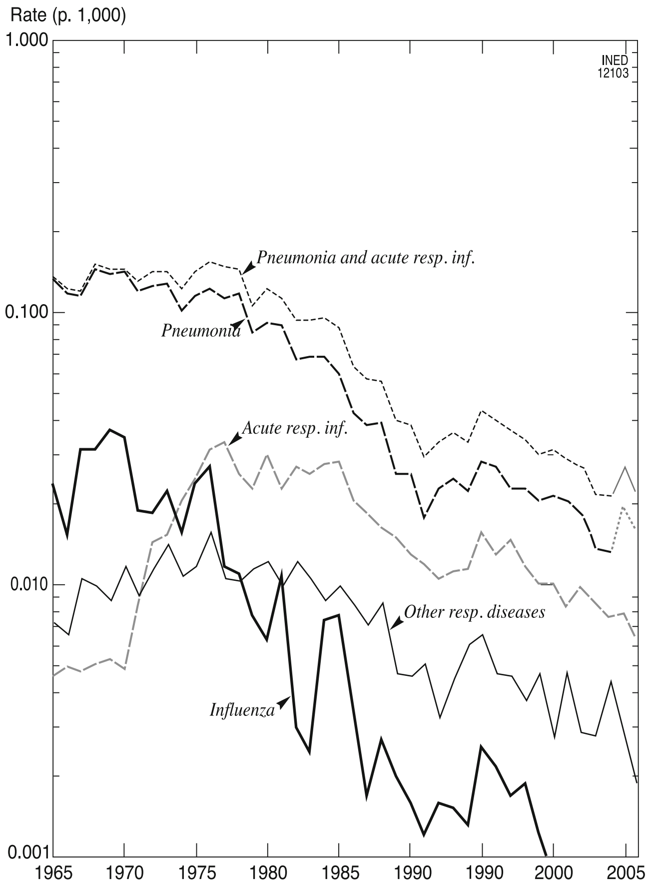

Fig. 12.9 Trends in standardized male mortality rates for diseases of the respiratory system at ages 1–14 since 1965

12.2.4 Other Diseases

As was the case in early infancy, congenital anomalies occupy first (or nearly first) place in mortality from all "other diseases", but this time they are almost equal to diseases of the nervous system, rather than to conditions originating in the perinatal period, which are obviously no longer relevant at this age (Fig. 12.10).

Mortality from endocrine diseases, in third place, comes far behind. We should note a significant increase in mortality from endocrine diseases and, until approximately the late 1990s, in mortality from diseases of the nervous system, while mortality from congenital anomalies stagnated somewhat. None of these diseases seems to have been affected by the major fluctuations in the 1980s and 1990s.

Table 12.2 Causes of death at ages 1–14: groups of items used (with corresponding ICD-9 items) and trends in mortality rate between 1965 and 2006

Groups used	1995 Soviet classification	ICD (9th revision)	2005 Ukrainian classification	Rate per 1,000			
				Male		Female	
				1965	2006	1965	2006
Infectious and parasitic diseases	**1 to 44, 206**	**001 to 139**	**3 to 57**	**0.07**	**0.02**	**0.05**	**0.03**
Neoplasms	**45 to 67**	**140 to 239**	**59 to 104**	**0.11**	**0.06**	**0.08**	**0.05**
Leukaemia and lymphomas	65, 66	200 to 208	99 to 103	0.06	0.02	0.04	0.02
Other malignant neoplasms	45 to 64	140 to 199	59 to 98	0.03	0.03	0.03	0.03
Benign and unspecified neoplasms	67	210 to 239	104	0.02	*0.01	0.01	*0.00
Diseases of the circulatory system	**84 to 102**	**390 to 459**	**133 to 156**	**0.02**	**0.01**	**0.02**	**0.01**
Diseases of the respiratory system	**103 to 114**	**460 to 519**	**158 to 173**	**0.16**	**0.02**	**0.14**	**0.02**
Acute respiratory infections	103	460 to 466	158	0.00	0.01	0.00	0.00
Influenza	104	487	159	0.02	0.00	0.02	0.00
Pneumonia	105 to 107	480 to 486	160 to 163	0.13	*0.01	0.11	*0.02
Other diseases of respiratory system	108 to 114	470 to 478, 490 to 519	164 to 173	0.01	0.00	0.01	0.00
Diseases of the digestive system	**115 to 127**	**520 to 579**	**175 to 189**	**0.03**	**0.01**	**0.02**	**0.00**
Other diseases	**68 to 83, 128 to 157**	**240 to 389, 580**	**106 to 108, 110 to 113, 115 to 118, 120 to 128, 130, 131, 190, 192 to 195, 197 to 205, 207 to 215, 217 to 226, 228 to 236, 239**	**0.16**	**0.13**	**0.14**	**0.11**
Endocrine diseases	68 to 72	240 to 289	106 to 108, 110 to 113	0.01	0.01	0.01	0.01
Diseases of the nervous system and mental disorders	73 to 83	290 to 389	115 to 118, 120 to 128, 130, 131	0.07	0.05	0.06	0.04
Congenital anomalies	145 to 150	740 to 759	228 to 236	0.06	0.06	0.05	0.06
Other diseases	128 to 144, 151 to 157	580 to 739, 760 to 779	190 to 195, 197 to 205, 207 to 215, 217 to 226, 239	0.02	*0.00	0.01	*0.00

(continued)

Table 12.2 (continued)

Groups used	1995 Soviet classification	ICD (9th revision)	2005 Ukrainian classification	Rate per 1,000 Male 1965	Male 2006	Female 1965	Female 2006
Deaths from injury and poisoning	**160 to 176**	**800 to 999**	**242 to 258**	**0.36**	**0.24**	**0.19**	**0.13**
Transport accidents	160 to 162	800 to 848	242 to 248	0.04	0.06	0.02	0.03
Drowning and falls 166, 168	880 to 888, 910	249 to 250	0.10	0.08	0.04	0.03	
Accidental poisoning	163, 164	850 to 869	252	0.05	0.02	0.04	0.02
Accidents caused by fire, electric current or firearm	167, 170, 171	890 to 899, 922, 925	251	0.05	0.01	0.03	0.01
Suicide, homicide, injury undetermined whether accidentally or purposely inflicted	173 to 175	950 to 989	253 to 255	0.03	0.03	0.01	0.02
Other accidents	165, 169, 172, 176	870 to 879, 900 to 909, 911 to 921, 923, 924, 926 to 949, 990 to 999	256 to 258	0.09	0.04	0.04	0.02
Total for all causes	**1 to 176, 206**	**001 to 999**	**3 to 57, 59 to 104, 106 to 108, 110 to 113, 115 to 118, 120 to 128, 130, 131, 133 to 156, 158 to 173, 175 to 189, 190, 192 to 195, 197 to 205, 207 to 215, 217 to 226, 228 to 236, 239, 242 to 258**	**0.90**	**0.49**	**0.64**	**0.43**

For 2006, rates preceded by an asterisk are doubtful, since consistency could not be guaranteed in the transition from the previous Classification

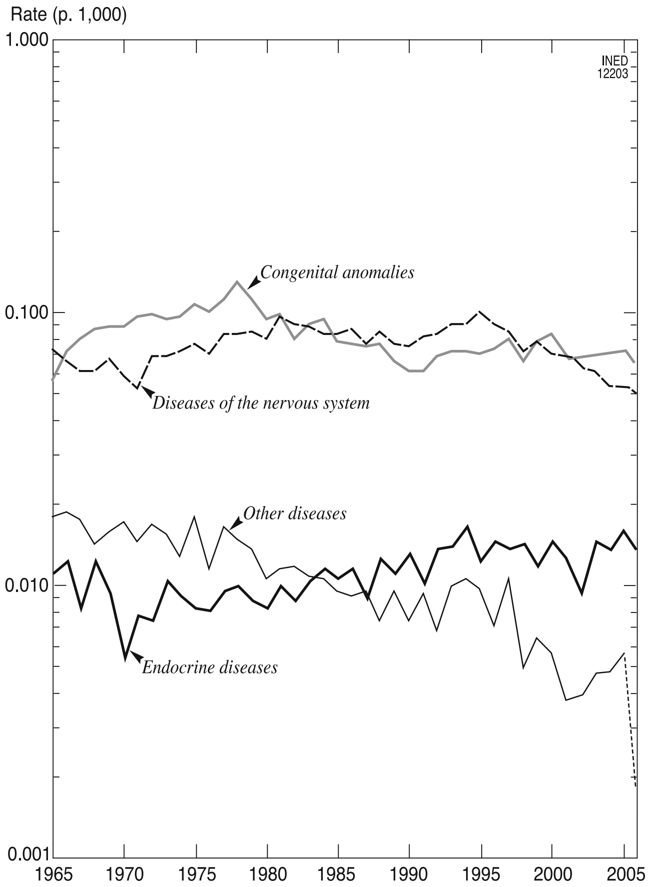

Fig. 12.10 Trends in standardized male mortality rates for other diseases at ages 1–14 since 1965

12.3 Causes of Death in Young Adults Aged from 15 to 39

Mortality in young adults aged 15–39 presents at least three characteristics that are markedly more pronounced than they are in the other age groups: there is a particularly large difference between the sexes; this mortality was highly sensitive to the major fluctuations in the 1980s and 1990s; among males, the pattern of diseases is hugely dominated by deaths from injury and poisoning (Fig. 12.11).

At this age, throughout the whole period studied here, four to five times as many males died from such injuries and poisoning as from diseases of the circulatory system and, when it comes to any other major group of causes of death, the gap is even wider. Among females, the dominance of deaths from injury and poisoning is less spectacular; nevertheless, this group of causes still comes at the top (Table 12.3 shown at the end of the Section 12.3).

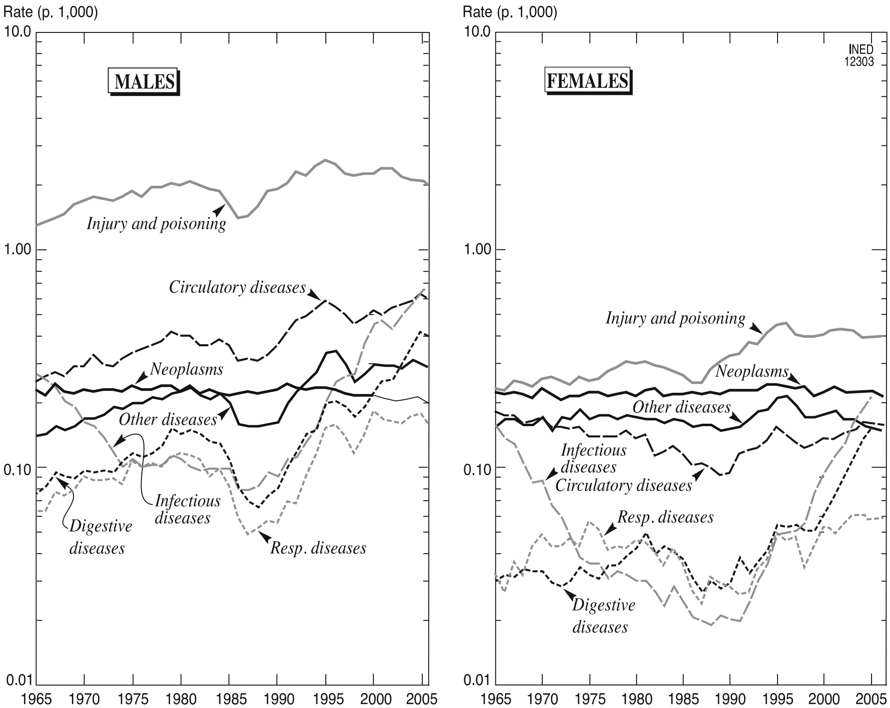

Fig. 12.11 Trends in standardized mortality rates for major groups of causes at ages 15–39 since 1965

Especially for males, but also for females, the major fluctuations in the last two decades have left a very strong mark on trends in mortality from each major group of causes, with the sole exception of neoplasms. The anti-alcohol campaign led to a sharp decline in mortality, not only from injury and poisoning (as we know, the Soviet practice was to include excessive alcohol consumption in this group) and diseases of the digestive system (which include cirrhosis of the liver), but also from diseases of the circulatory system, diseases of the respiratory system and even infectious diseases and all "other diseases". Conversely, in the late 1980s, with the relaxation of the anti-alcohol measures, all these causes took an upward turn again.

All groups of causes except neoplasms reacted just as much to the 1992–1995 economic and social crisis. However, this time it was diseases of the digestive system, diseases of the respiratory system and infectious diseases that reacted most sharply, although there was also a strong rise in diseases of the circulatory system and all other diseases. The rise in deaths from injury and poisoning was a little smaller, particularly among males, but this is explained – as we shall see below – by the fact that, although the crisis increased the other risks of external causes of death, it reduced automobile use (incomes were lower and there were petrol shortages) and thus mortality from road traffic accidents.

For all these causes, once the effects of the crisis had been overcome, mortality began to decline fairly rapidly; but then it very quickly took an upward turn again. As 1999 turned to 2000, this very clear fresh upsurge became particularly marked and, as far as infectious diseases are concerned, it has continued up to the present day – a phenomenon that may be directly or indirectly linked to AIDS penetrating the young adult age group. However, the phenomenon is almost the same for diseases of the digestive system, which a priori are less linked to AIDS.

In contrast to all the other curves in Fig. 12.11, which bear the very strong stamp of these major fluctuations, the absolutely fixed position of neoplasms is spectacular and confirms the very particular nature of this group of causes of death, which is utterly impervious to events in society.

Cancer is also an exception to the final salient feature of mortality among young adults, the extraordinary excess male mortality. Neoplasms are the only group of causes for which near-equality between the sexes can be observed over the whole period. For all other causes, the difference between the sexes is very large, at least in the most recent period. It is at its highest for deaths from injury and poisoning, which led to mortality six times greater among males than among females over almost the whole period. For most of the other groups of causes, excess male mortality has increased since 1965. This increase has been particularly spectacular for infectious diseases, diseases of the circulatory system and “other causes”, all of which, in 1965, led to only a small amount of excess male mortality and even to some excess female mortality. Nowadays, for all these groups of causes, male mortality is three to five times higher than female mortality.

Given the respective proportions of these different groups of causes, it seems helpful to go into more detail about deaths from injury and poisoning, diseases of the circulatory system, neoplasms and the “other diseases” group. We shall also analyse a little more closely the impact of AIDS on the new rise in infectious and respiratory diseases.

12.3.1 Deaths from Injury and Poisoning

The major fluctuations in the 1980s and 1990s did not affect all external causes of death in the same way. Figure 12.12 brings together the main types of deaths from injury and poisoning according to their trend patterns.

Among males, the 1985 anti-alcohol campaign led to a marked decline in suicide, accidental poisoning, homicide and deaths resulting from ‘injury undetermined whether accidentally or purposely inflicted’, all causes which, we know, are directly or indirectly linked to alcohol consumption (first box in Fig. 12.12). Although it is smaller, the reduction is equally clear for transport accidents, drowning and falls. In other words, the anti-alcohol campaign led to a decline in all the major causes of death from injury and poisoning. Conversely, the relaxation of those measures

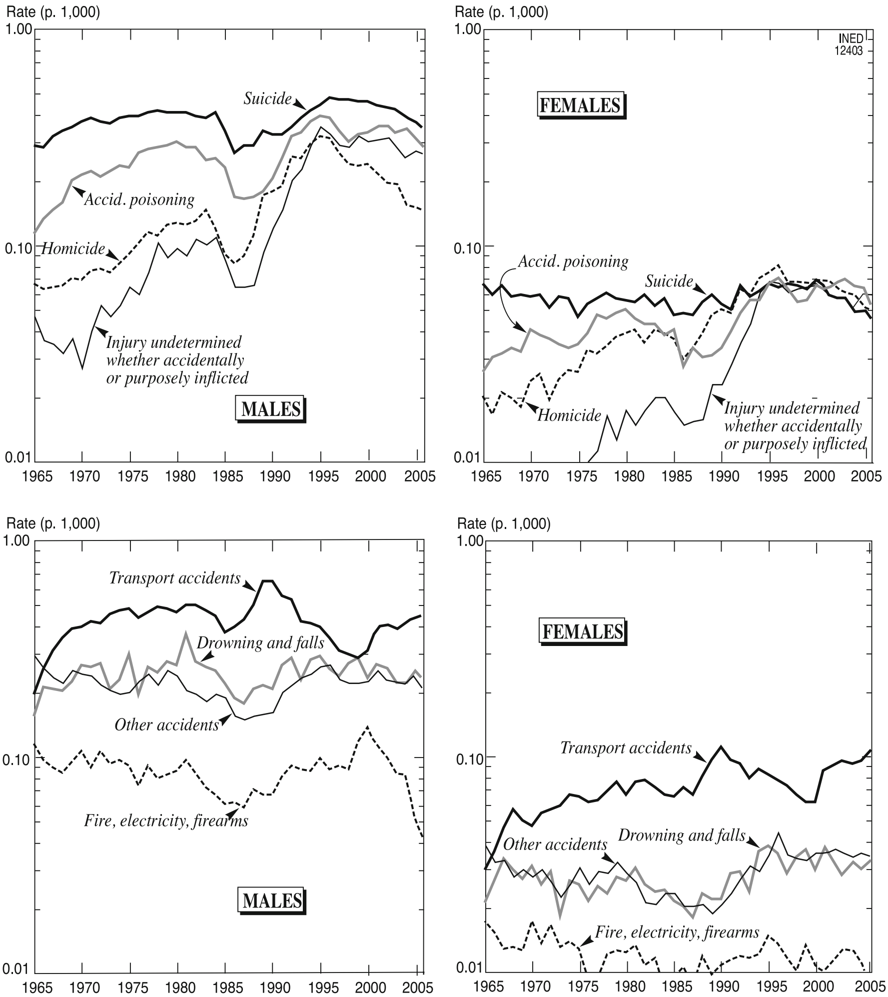

Fig. 12.12 Trends in standardized mortality rates at ages 15–39 since 1965: deaths from injury and poisoning

was followed by a fresh upsurge in the same causes, with more slight differences, however. This fresh rise was, in particular, more rapid for homicide and transport accidents than for the other causes; but, above all, it is notable that by 1990–1991 the mortality rate for transport accidents was clearly higher than it had been before the anti-alcohol campaign. It is reasonable to think, therefore, that this upsurge in mortality from injury and poisoning was not only due to the resumption in alcohol consumption, but probably also related to the 1989–1990 political regime change. After police controls slackened, entirely new opportunities to exercise individual freedoms served to exacerbate some risks, such as those associated with crime and

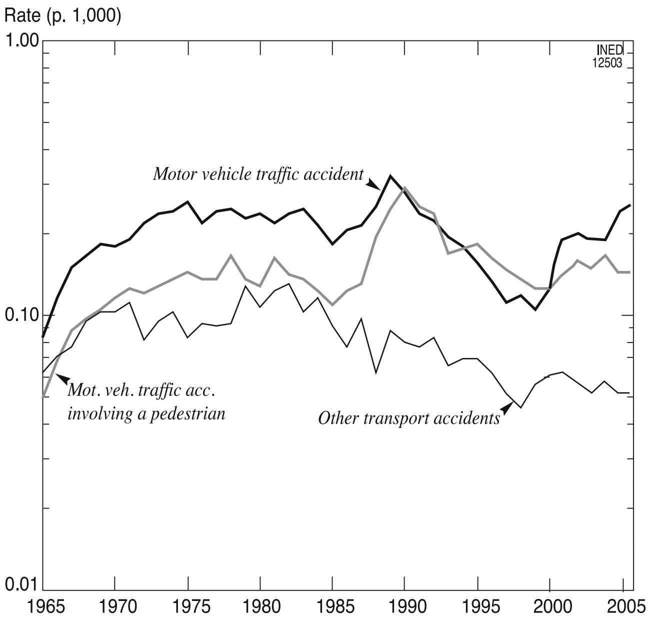

Fig. 12.13 Trends in standardized male mortality rates for transport accidents at ages 15–39 since 1965

with road traffic. It should also not be forgotten that the number of cars on the roads increased greatly during the late 1980s.

On the other hand, although the 1992–1994 economic and social crisis brought external causes of death such as accidental poisoning, homicide, suicide or 'injury undetermined whether accidentally or purposely inflicted' to a peak, it had the reverse effect on mortality from transport accidents, since road traffic was reduced (notably by fuel shortages). Not only is mortality from transport accidents dominated by road traffic accidents, but in fact it is solely the latter that have been sensitive to recent fluctuations, with mortality reaching a peak in 1989–1990 in particular, following a period of rapid growth in automobile purchases and road traffic (Fig. 12.13). Then, during the economic and social crisis and the fuel shortages, road deaths declined strongly, both for vehicle occupants and for pedestrians. In contrast, as Fig. 12.13 shows, trends in mortality from other transport accidents are independent of political and social events: they have been in regular decline since the early 1980s.

The effect of the anti-alcohol campaign is much less visible for females than for males. On the other hand, the rise in road deaths in the late 1980s and the upsurge in different forms of mortality from injury and poisoning during the economic and social crisis were just as marked and although, in total, these forms of mortality increased for females more than for males, that is because the reduction in road deaths was of relatively little benefit to them.

12.3.2 Diseases of the Circulatory System

As with deaths from injury and poisoning, the different components of mortality from diseases of the circulatory system have been represented in Fig. 12.14 according to how sensitive their trends were to the fluctuations in the 1980s and 1990s. So we see that rheumatic heart diseases, acute myocardial infarction and, perhaps to a lesser extent, cerebrovascular disease and “other diseases of the circulatory system” (Boxes 3 and 4 in Fig. 12.14) very largely escaped these fluctuations.

Mortality from rheumatic heart diseases saw a dizzying fall over the whole period, as much for males as for females. It is true that this group of pathologies is largely infectious in origin, which explains its decline over the course of the 1970s, but here we can also see that this trend did not go into reverse during the 1990s crisis, probably because the processes involved act over the long term and because the mortality observed in this age group during the 1980s related to infections contracted during childhood.

The case of acute myocardial infarction is more difficult to explain. It is quite surprising that, in a general context of rising mortality from diseases of the circulatory system and in an era when one would expect progress in identifying ischaemic diseases, mortality from myocardial infarction increased only very slightly over the whole period. But it is even more surprising that here this type of mortality seems to have been totally insensitive to abrupt changes in alcohol consumption; yet, according to the literature, binge-drinking spirits (like vodka in Ukraine) can cause acute cardiac events (Britton et al. 1998). In contrast, the impact of the anti-alcohol campaign on cardiosclerosis, “other forms of ischaemic heart disease” and “other forms of heart disease” is very visible: all these pathologies have risen very significantly (Boxes 1 and 2, Fig. 12.14). They were also very much affected by the 1992–1994 economic and social crisis, with observed mortality culminating around 1995 in higher rates than their general trends would have led us to anticipate. Finally, they increased strongly again as 1999 gave way to 2000 (whereas circulatory disease in general fell more and more rapidly); and this rise has even continued up to the present day for “other forms of heart disease”. For all these reasons, it seems to us that “acute myocardial infarction” here covers only part of the mortality linked to that condition, since there is a probably a preference for classifying most instances (in particular, cardiac events aggravated by alcohol) under one of the three other major items relating to heart disease.

Male mortality from cerebrovascular disease or from “other diseases of the circulatory system” reached a low point in 1986, but here the link with the anti-alcohol campaign is less clear, since this low level resulted from a fall that had been under way since the very early 1980s. This mortality has risen again since the early 1990s, but here too the relationship with the violent impact of the 1992–1994 crisis is less obvious.

The trends observed in female mortality are less pronounced, except for rheumatic heart diseases, where the long run decline is even stronger than it is for males.

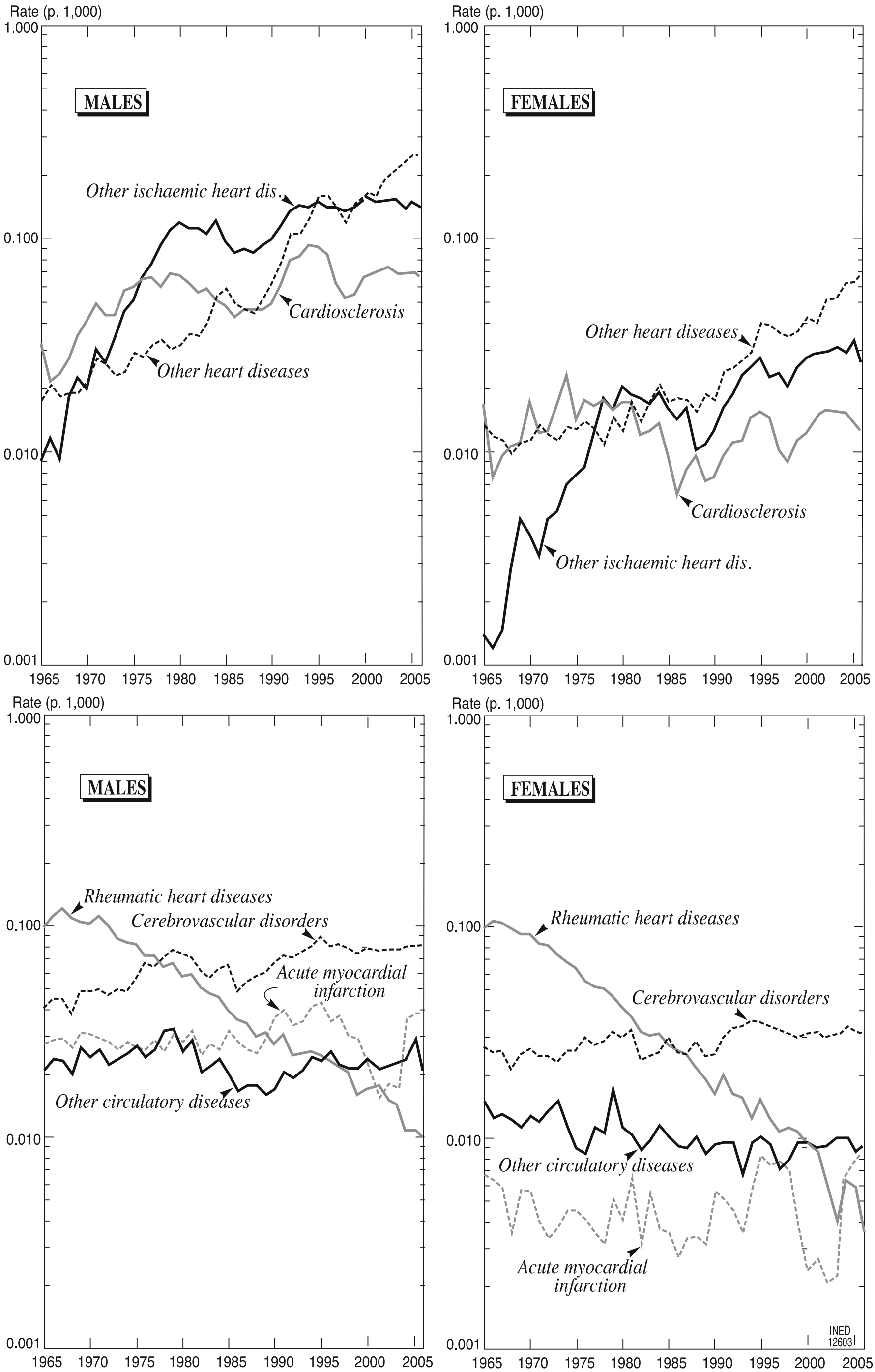

Fig. 12.14 Trends in standardized mortality rates for diseases of the circulatory system at ages 15–39 since 1965

12.3.3 Neoplasms

The complete stagnation of mortality from neoplasms at ages 15–39, emphasized at the beginning of this section, in fact resulted from somewhat contrasting movements relating to the different forms of neoplasms. In Fig. 12.15, we show the main neoplasms according to increases, falls or stagnation in the mortality that they have caused since 1965. In no case, however, can any link be observed with the major overall fluctuations in the 1980s and 1990s, and this confirms that trends in mortality from neoplasms are independent of immediate political and social circumstances.

On the male side, mortality increased for "neoplasms of the bones, cartilage and skin", for "neoplasms of the nose, mouth, pharynx and oesophagus" and for "other malignant neoplasms". On the female side, neoplasms of the breast and of the uterus must be added to these three groups. When compared to trends observed in other countries, these are fairly classic, with the exception of the trend in mortality from cancer of the uterus. This type of mortality is declining in most industrial countries, thanks to the lower prevalence of genital infections and to early screening for neoplasms of the cervix. In fact, it also declined in Ukraine up to the late 1970s, but has increased very regularly since then, which leads us to presume that gynaecological monitoring has become somewhat more lax. The fall in mortality from "neoplasms of the nose, mouth, pharynx and oesophagus" observed since the early 1990s may also seem astonishing, since we know that this mortality is sensitive to co-occurring alcohol and tobacco use, and there is nothing to indicate that these are declining in Ukraine. Finally, we should stress that the late 1990s saw an onset of decline in mortality from breast cancer. Although this trend cannot be attributed to any change in coding practices, it is completely original, since at that early point in time there was scarcely any other country where this mortality was known to be declining. In fact, this fall has not continued since then, which makes it all the more suspicious.

In contrast to these growing areas of neoplasms, there are two groups that are declining for both males and females: malignant neoplasms of the stomach, and benign and unspecified neoplasms. Here too, we find the classic trends that can be observed in most industrial countries. However, the reduction in mortality from neoplasms of the stomach, which is the main source of improvements in cancer mortality in this period, is less marked in Ukraine than in Western countries, as we shall see when we look at the next age group.

Among the cancers responsible for a constant level of mortality throughout the whole period, we find neoplasms of lymphatic and haematopoietic tissue; we should note that, even at this age, they still constitute the main cause of cancer mortality in men, while for women they are equal with breast cancer. Contrary to what we saw in the younger age groups for these same neoplasms, this stagnation in mortality was accompanied, for males, by a small but visible rise from 1988 to 1989, followed by a near-return to the earlier level in 1993. Since this is the group that consists of young people of working age, it probably bears the stamp of excess mortality among men who took part in the Chernobyl reactor recovery and clean-up

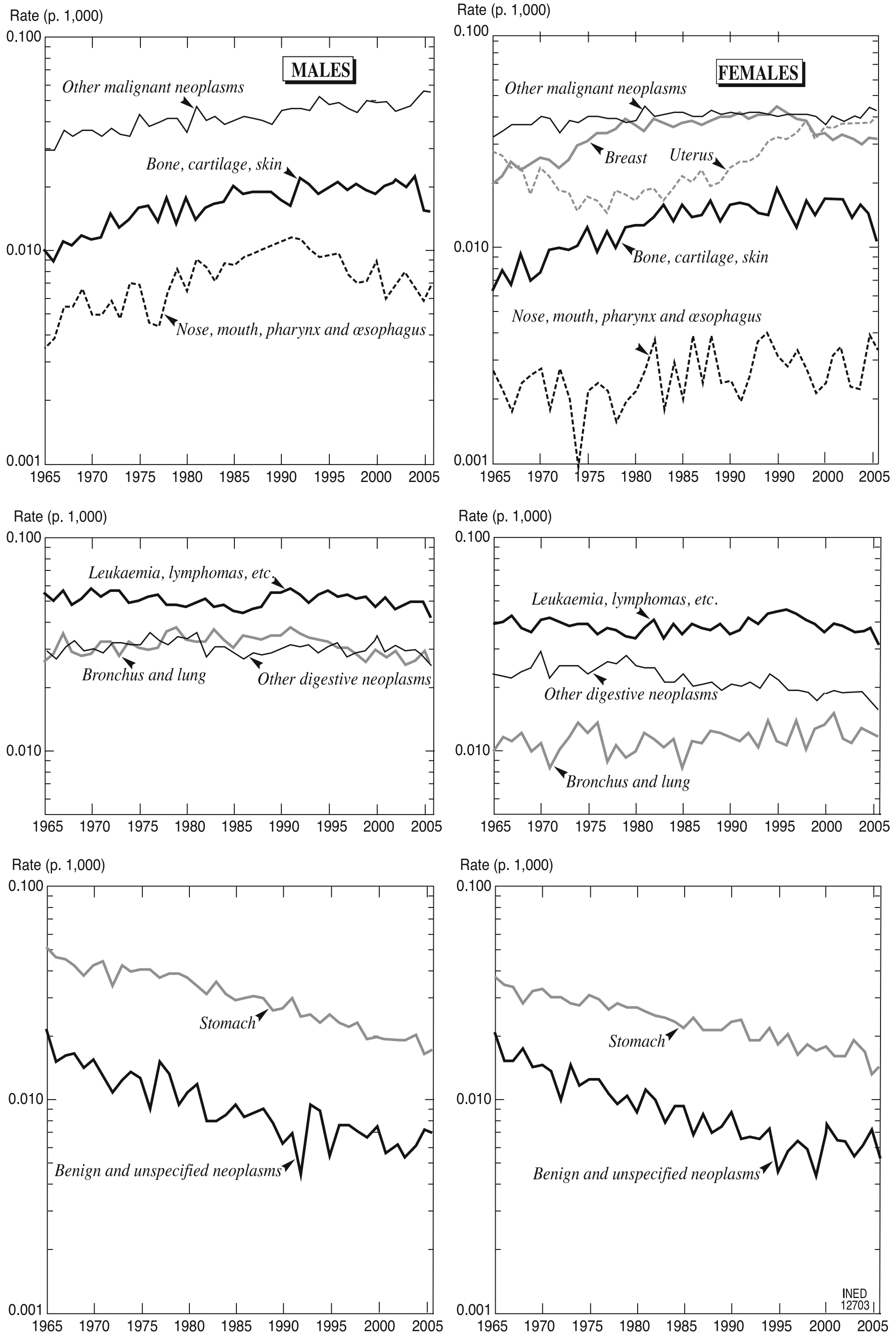

Fig. 12.15 Trends in standardized mortality rates for neoplasms at ages 15–39 since 1965

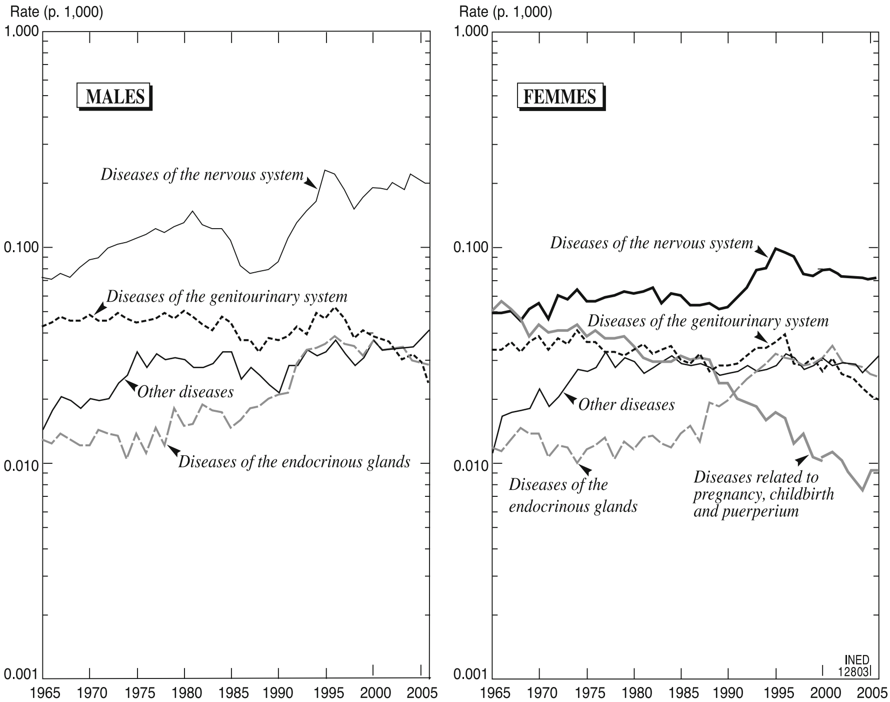

Fig. 12.16 Trends in standardized mortality rates for other diseases at ages 15–39 since 1965

work[4] (Lakiza-Sachuk et al. 1994), assuming an average of 3–5 years' survival for the most seriously affected people. However, we were astonished to see that among women, who played a smaller part in the work than men, the rise in these cancers was greater and came later, but was also more clearly followed by a decline. Are we to conclude from this that women were more sensitive than men, yet their survival time was longer?

Mortality from other malignant neoplasms of the digestive organs (mainly liver and intestines) and mortality from neoplasms of the respiratory organs have both been equally stagnant over the long term. This is because, at this age, cancer of the bronchus and lung is not yet strongly dependent on trends in tobacco consumption.

12.3.4 Other Diseases

Among conditions in the "other diseases" group, first place for both males and females is occupied by diseases of the nervous system (Fig. 12.16). We can also see here that,

[4]Out of a total of 600,000 people (known as "liquidators"), about 350,000 Ukrainians took part in the clean-up work at the damaged power station, of whom almost half were conscripted soldiers.

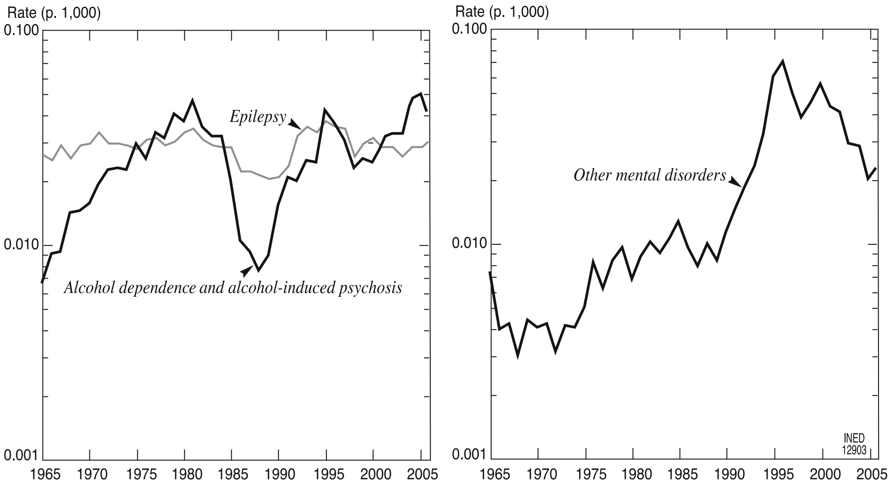

Fig. 12.17 Trends in standardized mortality rates for certain diseases of the nervous system at ages 15–39 since 1965

in males, mortality from this group of causes was very sensitive to the fluctuations in the 1980s and 1990s. Not only did it plummet down in 1986–1987 with the anti-alcohol campaign, but it soared again with the 1992–1994 economic and social crisis.

Among diseases of the nervous system, three conditions have contributed to this strong sensitivity to recent fluctuations, though in different ways (Fig. 12.17). Firstly, as might be expected, mortality from alcohol dependence syndrome and alcohol-induced psychosis responded to the anti-alcohol campaign with a spectacular fall, rapidly followed by an equally spectacular rise when the restrictive measures were relaxed. However, this rise does not seem to have been unduly exacerbated by the 1992–1994 economic and social crisis. On the other hand, mortality from "other mental disorders", whose earlier increase had hardly been disturbed by the anti-alcohol campaign, rocketed under the effect of the economic and social crisis. In a much more limited way, mortality from epilepsy (relatively stable over the long term) noticeably diminished with the anti-alcohol campaign; but its subsequent, somewhat delayed rise seems to have been linked more to the crisis than to the relaxation of that campaign. In contrast, all the other diseases of the nervous system that have some importance in terms of mortality remained insensitive to political and social events.

As far as other groups of conditions belonging to the "other diseases" category are concerned, we should just note here the relative stability of diseases of the genito-urinary system, the rise in endocrine diseases in the late 1990s and, among females, the reduction in complications of pregnancy and childbirth. Whereas in 1965 the latter were equal with diseases of the nervous system, nowadays they are responsible for only a tenth as much mortality. This elimination of maternal mortality is certainly linked to the general decline in the danger of infections, but the fall in the birth rate must also have played a role, especially as it has accelerated recently.

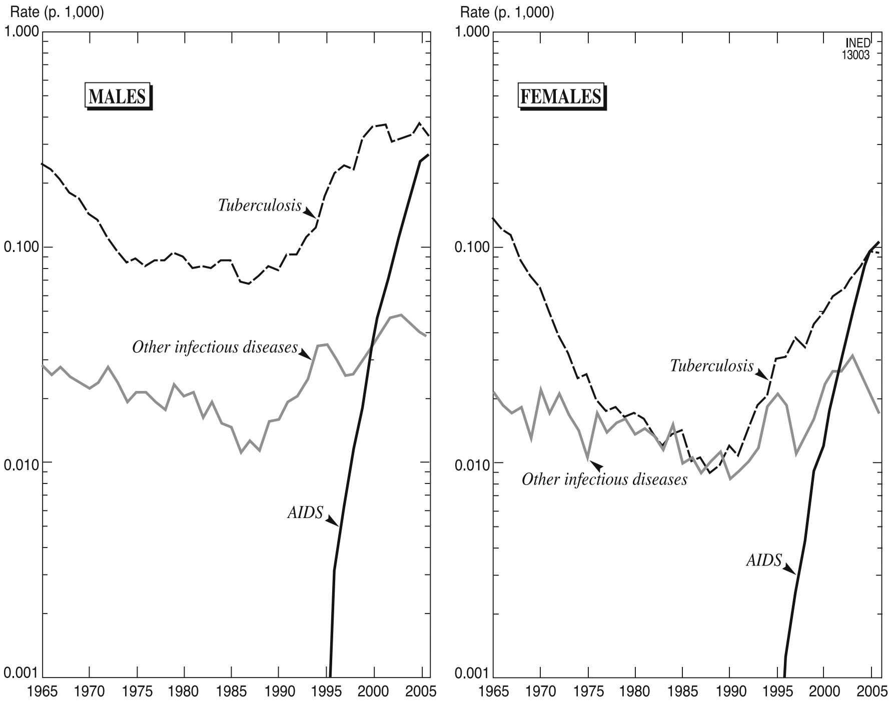

Fig. 12.18 Trends in standardized mortality rates for tuberculosis, AIDS and other infectious diseases at ages 15–39 since 1965

12.3.5 Infectious Diseases and AIDS

In Ukraine, mortality from infections – at least as regards items that the Soviet Classification (like the ICD) placed in this category – was very largely dominated by tuberculosis throughout almost the whole period we studied. In 1965, among Ukrainian males in the 15–39 age group, this disease alone caused over eight times as much mortality as might be attributed to all other infectious diseases together (Fig. 12.18; Table 12.3); and in 2000, despite the sudden emergence of AIDS, this ratio was still almost 4–1. But since then, in just a few years, AIDS mortality has almost reached the same level as mortality from tuberculosis. This is all the more overwhelming because mortality from tuberculosis, in very strong decline until about 1975, had stopped falling in the 1980s before suddenly taking off again on an upward trajectory that was actually an effect of AIDS.

Among women, the initial predominance of tuberculosis was less; then the disease declined more and for longer, to the point where mortality due to "other infectious diseases" played an equal role with it for 20 years (1975–1995). But then mortality from AIDS burst onto the scene and significantly overtook mortality from "other

Table 12.3 Causes of death at ages 15–39: groups of items used (with corresponding ICD-9 items) and trends in mortality rate between 1965 and 2006

Groups used	1995 Soviet classification	ICD (9th revision)	2005 Ukrainian classification	Rate per 1,000 Male 1965	Male 2006	Female 1965	Female 2006
Infectious and parasitic diseases	**1 to 44, 206**	**001 to 139**	**3 to 57**	**0.27**	**0.63**	**0.16**	**0.21**
Tuberculosis	9 to 13, 43	010 to 018, 137	11 to 17, 56	0.24	0.33	0.14	0.09
AIDS	206	42 to 44	46	0.00	0.26	0.00	0.10
Other infectious diseases	1 to 8, 14 to 42, 44	001 to 009, 020 to 41, 45 to 138, 139	3 to 10, 18 to 45, 47 to 55, 57	0.03	0.04	0.02	0.02
Neoplasms	**45 to 67**	**140 to 239**	**59 to 104**	**0.22**	**0.19**	**0.22**	**0.21**
Malignant neoplasms of the nose, mouth, pharynx and oesophagus	45, 46	140 to 150	59 to 62	0.00	0.01	0.00	0.00
Malignant neoplasm of stomach	47	151	63	0.05	0.02	0.04	0.01
Other malignant neoplasms of digestive organs	48 to 51	152 to 159	64 to 72	0.03	0.02	0.02	0.01
Malignant neoplasms of respiratory organs	52 to 54	160 to 165	73 to 75	0.03	0.02	0.01	0.01
Malignant neoplasm of bones, cartilage and skin	55, 56	170 to 173	76 to 78	0.01	*0.01	0.01	*0.01
Malignant neoplasm of breast	57	174, 175	80	0.00	0.00	0.02	0.03
Malignant neoplasm of uterus	58, 59	179 to 182	81 to 83			0.03	0.04
Leukaemia and lymphomas	65, 66	200 to 208	99 to 103	0.05	0.04	0.04	0.03
Other malignant neoplasms	60 to 64	183 to 199	79 to 84, 98	0.03	0.06	0.03	0.05
Benign and unspecified neoplasms	67	210 to 239	104	0.02	0.01	0.02	0.01
Diseases of the circulatory system	**84 to 102**	**390 to 459**	**133 to 156**	**0.24**	**0.58**	**0.18**	**0.16**
Rheumatic heart diseases	84, 85	390 to 398	133, 134	0.10	0.01	0.10	0.00
Acute myocardial infarction	90, 91	410	139, 140	0.03	0.04	0.01	0.01
Atherosclerotic cardiosclerosis	92, 93	414.0	142	0.03	0.06	0.02	0.01
Other forms of ischaemic heart disease	94, 95	411 to 413, 414.1 to 414.9	141, 143	0.01	0.14	0.00	0.03

(continued)

Table 12.3 (continued)

Groups used	1995 Soviet classification	ICD (9th revision)	2005 Ukrainian classification	Rate per 1,000			
				Male		Female	
				1965	2006	1965	2006
Other forms of heart disease	96, 97	415 to 429	135 to 138, 144 to 146	0.02	0.23	0.01	0.07
Cerebrovascular disease	98, 99	430 to 438	147 to 151	0.04	0.08	0.03	0.03
Other diseases of circulatory system	86 to 89, 100 to 102	401 to 405, 440 to 459	152 to 156	0.02	0.02	0.01	0.01
Diseases of the respiratory system	**103 to 114**	**460 to 519**	**158 to 173**	**0.06**	**0.16**	**0.03**	**0.06**
Diseases of the digestive system	**115 to 127**	**520 to 579**	**175 to 189**	**0.08**	**0.39**	**0.03**	**0.15**
Other diseases	**68 to 83, 128 to 157**	**240 to 389, 580 to 779**	**106 to 108, 110 to 113, 115 to 118, 120 to 128, 130, 131, 190, 192 to 195, 197 to 205, 207 to 215, 217 to 226, 228 to 236, 239**	**0.14**	**0.28**	**0.15**	**0.15**
Endocrine diseases	68 to 72	240 to 289	106 to 108, 110 to 113	0.01	0.03	0.01	0.02
Diseases of the nervous system and mental disorders *including:*	73 to 83	290 to 389	115 to 131	0.07	0.20	0.05	0.07
Alcohol dependence syndrome and alcohol-induced psychosis	*73, 75*	*291, 303*	*115*	*0.01*	*0.04*	*0.00*	*0.01*
Other mental disorders	*74, 76, 77*	*290, 292 to 302, 304 to 319*	*116 to 118*	*0.01*	*0.02*	*0.01*	*0.01*
Epilepsy	*81*	*345*	*125*	*0.03*	*0.03*	*0.02*	*0.01*
Others	*78 to 80, 82, 83*	*320 to 344,346 to 389*	*120 to 124, 126 to 131*	*0.03*	*0.11*	*0.02*	*0.04*
Diseases of the genitourinary system	128 to 134	580 to 629	197 to 205	0.04	0.02	0.03	0.02
Complications of pregnancy, childbirth and the puerperium	135 to 141	630 to 676	207 to 215	0.00	0.00	0.05	0.01
Other diseases	142 to 157	680 to 779	190, 192 to 195, 217 to 226, 228 to 236, 239	0.01	0.04	0.01	0.03
Deaths from injury and poisoning	**160 to 176**	**800 to 999**	**242 to 258**	**1.26**	**1.96**	**0.22**	**0.38**
Transport accidents *including:*	160 to 162	800 to 848	242 to 248	0.19	0.45	0.03	0.11

Motor vehicle traffic accidents	*160*	*810 to 813, 815 to 825*	*243 to 245*	*0.08*	*0.25*	*0.01*	*0.06*
Motor vehicle traffic accident involving collision with pedestrian	*161*	*814*	*242*	*0.05*	*0.14*	*0.01*	*0.04*
Other transport accidents	*162*	*800 to 807, 826 to 848*	*246 to 248*	*0.06*	*0.05*	*0.01*	*0.01*
Drowning and falls	166, 168	880 to 888, 910	249, 250	0.15	0.22	0.02	0.03
Accidental poisoning	163, 164	850 to 869	252	0.11	0.28	0.03	0.05
Accidents caused by fire, electric current or firearm	167, 170, 171	890 to 899, 922, 925	251	0.11	0.04	0.02	0.01
Suicide	173	950 to 959	253	0.29	0.36	0.07	0.05
Homicide	174	960 to 978	254	0.07	0.14	0.02	0.05
Death from injury undetermined whether accidentally or purposely inflicted	175	980 to 989	255	0.05	0.27	0.01	0.06
Other accidents	165, 169, 172, 176	870 to 879, 900 to 909, 911 to 921, 923, 924, 926 to 949, 990 to 999	256 to 258	0.29	0.20	0.04	0.03
Total for all causes	**1 to 176, 206**	**001 to 999**	**3 to 57, 59 to 104, 106 to 108, 110 to 113, 115 to 118, 120 to 128, 130, 131, 133 to 156, 158 to 173, 175 to 189, 190, 192 to 195, 197 to 205, 207 to 215, 217 to 226, 228 to 236, 239, 242 to 258**	**2.27**	**4.19**	**0.99**	**1.31**

For 2006, rates preceded by an asterisk are doubtful, since consistency could not be guaranteed in the transition from the previous Classification infectious diseases"; it has even exceeded mortality from tuberculosis, which took a sharp upward turn again, probably partly due to the effect of AIDS.

This very sharp rise in mortality from infections (whether from tuberculosis or other infections) can be observed from the late 1980s among males and the early 1990s among females and was intensified by the very sudden emergence of AIDS; it is certainly the most striking phenomenon in trends in mortality from infections among young adults. One might think, of course, that the link between the rise in infectious diseases and the economic and social crisis is significant (whereas the link with alcoholism is very small), but the period of this new rise extended beyond the crisis itself. The fresh upsurge in tuberculosis and in other infections (apart from AIDS) began (for males in particular) well before the transition to a market economy and extended beyond 1995: while other causes of excess mortality due to the crisis retreated, these two rises merely paused just after the crisis, before picking up again even more vigorously over recent years. Of course, a fairly significant part of the recent dramatic rise in mortality from tuberculosis is attributable to the AIDS epidemic, since tuberculosis is one of the main opportunistic diseases in HIV infection; but the same cannot be said of other infectious diseases, which rose even more in 1999–2000. Moreover, we can hardly imagine that the jump of 0.2 points (from 0.2 to 0.4 per thousand) in the standardized mortality rate from tuberculosis at ages 15–39 between 1998 and 2000 results mainly from AIDS, which on its own is worth only 0.04 points. So, far from being entirely explained by AIDS, the fresh rise in mortality from tuberculosis (and from infectious diseases more generally) is evidence of a deterioration in living conditions and in public health in the broadest sense of the term. This deterioration is in turn linked to the weakening of policies that, in the past, had made the Soviet regime fairly effective in the field of infectious diseases, as well as to developing social insecurity, affecting a growing section of the population.

12.4 Causes of Death in Adults Aged from 40 to 64

In contrast to young adults (aged 15–39), middle-aged adults died above all from diseases of the circulatory system, not from injury and poisoning (Fig. 12.19). Mortality from diseases of the circulatory system increased strongly, particularly among males, yet was also very sensitive to the political and social events of the 1980s and 1990s. The fresh upsurge between 1999 and 2005 looks very much like a return to the long-term trend of the years 1965–1985, and so it is still too soon to say whether the latter has been thrown into reverse by the reduction observed in 2006. Although it was dominant, mortality from diseases of the circulatory system was followed fairly closely by mortality from cancers, in both males and females. The latter more or less increased for males until the early 1990s, while remaining stable for females. However, we should note that, for males, the 1990s were marked by a slight decline that echoes the findings already made for the previous age group.

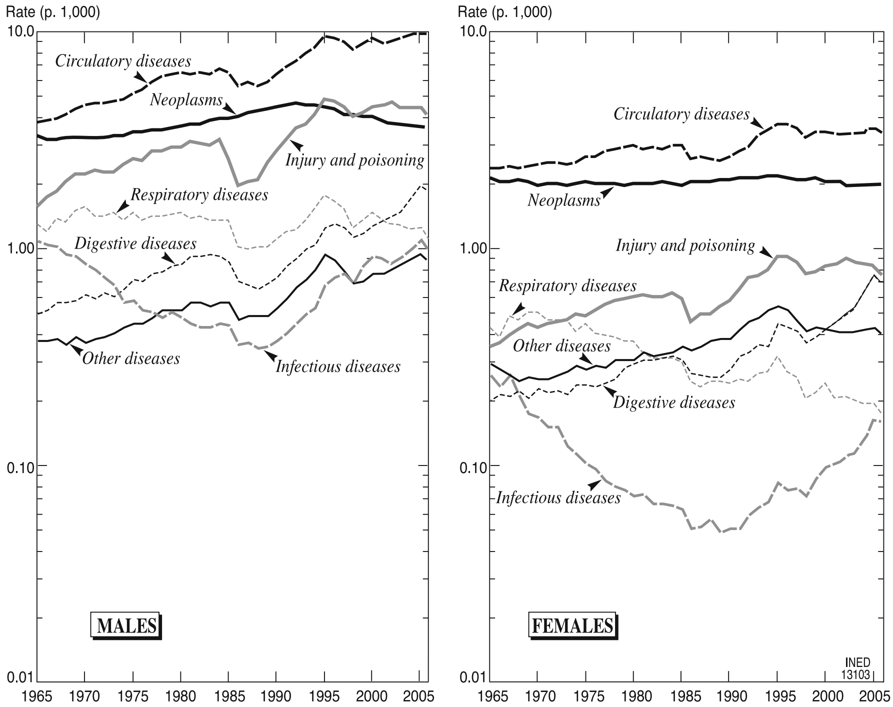

Fig. 12.19 Trends in standardized mortality rates by major groups of causes at ages 40–64, 1965–2006

With deaths from injury and poisoning, which are in third position, we see one of the key differences between the sexes: for each major group of causes, there were fewer female deaths than male, but the gap was particularly wide for deaths from injury and poisoning. Consequently, we can say that male mortality, especially in the recent period, has been dominated by three major groups of causes, since deaths from injury and poisoning now play an equal role with cancers, whereas among females they remain very far behind cancers. At the same time, as in the other age groups, all deaths from injury and poisoning increased over almost the whole period and were very sensitive to the major fluctuations in the 1980s and 1990s. Here too, the fresh increase between 1999 and 2002 continued the trend in a straight line from the rise that began in the 1970s. However, it is reasonable, more than for diseases of the circulatory system, to ask whether the stagnation of the years 2003–2005, followed by a significant decline in 2006, marks the beginning of a reversal in this trend, though, again, it is much too soon to come to a decision.

Although all the other groups of causes played only a secondary role, in this age group they involved levels of mortality that are not insignificant, and therefore they merit more detailed examination. We should note here that mortality from diseases of the respiratory system, in significant decline among females, hardly moved for males, other than when it reacted fairly strongly to political and social events.

As in the preceding age group, mortality from infections, after declining a great deal for both sexes (especially females), has been rising since the late 1980s. This rise was accelerated by the 1992–1994 crisis; the end of the crisis offset it for only a short time, and it has taken an upward turn again in recent years.

Finally, we should note that mortality from diseases of the digestive system and mortality from "other diseases" increased strongly for both sexes, but was much more sensitive to the 1980s and 1990s fluctuations among males than among females. Here again, the recent fresh upsurge (1999–2005) has been very sharp among males; among females, only diseases of the digestive system have shown a marked rise, and "other causes" seem to have stabilized (see Table 12.4 shown at the end of the Section 12.4).

12.4.1 Diseases of the Circulatory System

Among diseases of the circulatory system, four groups of diseases where mortality increased strongly for both sexes can be contrasted with three others that declined slightly (Fig. 12.20). In particular, mortality increased in the three dominant groups: cardiosclerosis, cerebrovascular disease and "other forms of ischaemic heart disease".

The very strong increase in mortality from "other forms of ischaemic heart disease" observed in the 1960s and 1970s for both males and females is very probably exaggerated. All studies show that the boundary between acute myocardial infarction and other forms of ischaemic heart disease is far from clear, and that it is generally impossible to maintain this distinction when making international comparisons or monitoring long-term trends (Meslé and Vallin 1993b; Meslé 1995). It seems to us that here Ukraine offers a new example of this difficulty in assessing mortality, so that it is certainly more reasonable to combine these two groups and merely note that, apart from a distinct slowdown in the early 1980s, together they led to a relatively regular rise in mortality over the whole period (Fig. 12.21). Even once these two groups of circulatory conditions have been combined, the Soviet Classification item "atherosclerotic cardiosclerosis" (called 'cardiosclerosis' here, for simplicity) remained the main cause of death from diseases of the circulatory system in the 40–64 age group (in women, equal with cerebrovascular disease). Strictly speaking, cardiosclerosis is a particular type of ischaemic heart disease. However, it is obvious that the Soviet statistical practice was to place far more conditions under this item than just ischaemic heart disease. We have already emphasized that, in Russia, just these two relevant items in the Soviet classification[5] covered half or three quarters of deaths from heart diseases, all ages combined (Meslé et al. 1996). In Ukraine in 2006, the proportion was 70% for males and 80% for females, and absolutely

[5]The Soviet classification distinguishes between atherosclerotic cardiosclerosis "with hypertension" (Item 92) and "without hypertension" (Item 93), a distinction that is not particularly significant, and one which we discarded from our analysis at the outset.

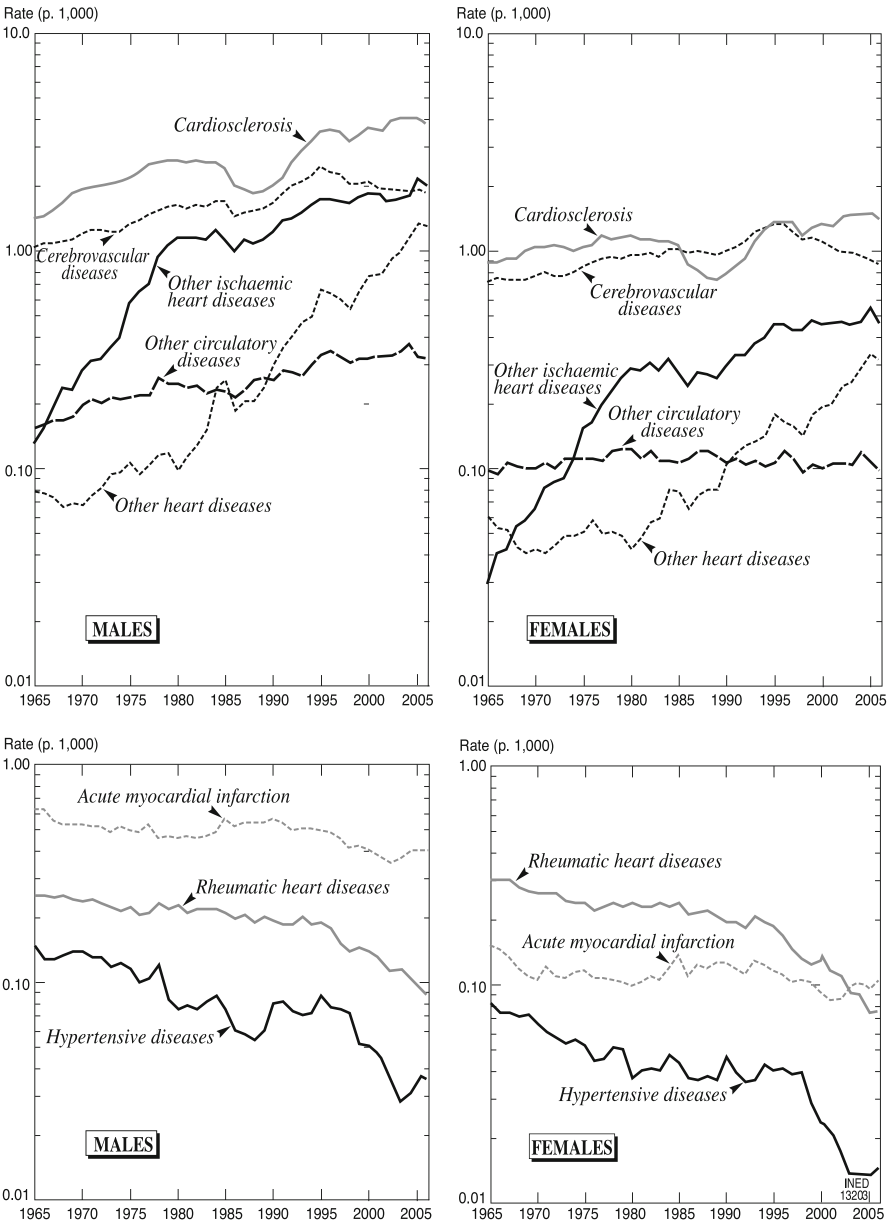

Fig. 12.20 Trends in standardized mortality rates for diseases of the circulatory system at ages 40–64, 1965–2006

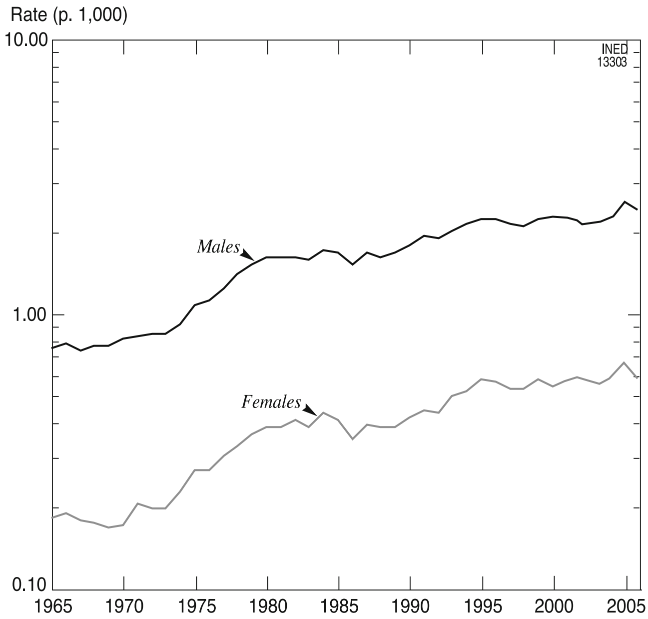

Fig. 12.21 Trends in standardized mortality rates for ischaemic heart disease (excluding cardiosclerosis) at ages 40–64, 1965–2006

analogous proportions are to be found in the other countries of the former USSR. In contrast, in France, less than 5% of cardiac deaths are classified under the corresponding ICD heading, 'coronary atherosclerosis' (Item 414.0 in ICD-9).

In fact, a very large part of the deaths attributed to cardiosclerosis probably relate to wrongly-identified circulatory disease. The proportionately very small role played by the "other forms of heart disease" group supports this hypothesis. Not only is this already apparent from Fig. 12.20 for this age group, but it is even more obvious when we consider all-age mortality: in 2006, all "other forms of heart disease"[6] covered only 5% of total male deaths from heart disease in Ukraine and 3% of female, as against 25% and 60% respectively in France.[7]

In the case of Ukraine, therefore, and more generally in the countries of the former USSR, mortality from cardiosclerosis covers many causes of death other than ischaemic heart disease and probably serves mainly as a catch-all category for ill-defined heart diseases. At the same time, for both males and females aged 40–64, this mortality did increase throughout the whole period and was very sensitive to political and social events in the 1980s and 1990s and to the fresh rise in 1999–2000 (Fig. 12.20). Furthermore, it seems to be almost solely through this category that

[6]Here two items from the Soviet Classification are combined: "unspecified disorders of pericardium, mitral and aortic valves" (Item 96) and "other heart diseases" (Item 97).

[7]In 1996.

these events made a strong mark on overall mortality from diseases of the circulatory system (Fig. 12.19).

Cerebrovascular diseases, which are the second largest cause of death from diseases of the circulatory system, and in females even equal cardiosclerosis, were also marked by a large rise from 1965 onwards, at least until 1995. However, they were hardly affected at all by either the anti-alcohol campaign or the economic and social crisis of the 1990s, and since 1995 they have been conspicuous by their fairly pronounced decline, especially among females; and this time, it seems we can confirm this as a true reversal of the unfavourable trend in earlier decades.

Mortality from rheumatic heart diseases, which occupy a much lower position than the other groups of circulatory conditions already mentioned, has fallen regularly over the whole period. However, we should note that, at this age, the decline in these conditions has been much less rapid than that observed among young adults (Fig. 12.14).

12.4.2 Neoplasms

The 40–64 age group is the one where the relative importance of neoplasms is greatest, since in the preceding age group mortality is much more dominated by deaths from injury and poisoning and in the next one, by diseases of the circulatory system. Therefore here we should focus in a little more detail on trends in mortality from neoplasms, according to their various sites.

Figure 12.22 traces mortality trends for those neoplasms that we know are most closely linked to tobacco and alcohol consumption. The difference between males and females is, in this case, so great that it has been possible to present both sexes in the same figure. Neoplasms of the respiratory organs, which occupy by far the largest place, have led to ten times as much mortality among males as among females, and nowadays there is an even larger gap for neoplasms of the nose, mouth, pharynx and oesophagus. Another difference between males and females relates to the fact that a certain stability among females contrasted with a strong upward trend for males, at least until the early 1990s.

Among males, mortality from malignant neoplasms of the respiratory organs showed a strong rise until the late 1980s, but then stabilized and even began to decline in the mid-1990s. The rising phase corresponded, as it does everywhere, to increased tobacco consumption (Doll and Peto 1981). The latter was in part linked to the rise in Soviet living standards during the Brezhnev years; this resulted from growth in economic output based on industrialization, which caused pollution that in turn also contributed to the rise in neoplasms of the respiratory organs (Hill et al. 1997). Conversely, the economic recession in the late 1980s and then, finally, the major crisis triggered by the transition to a market economy reduced industrial pollution emissions and altered tobacco consumption habits (through price increases and the wider availability of less harmful imported tobacco products). We can also hypothesize that the decline in mortality from malignant neoplasms of the respiratory

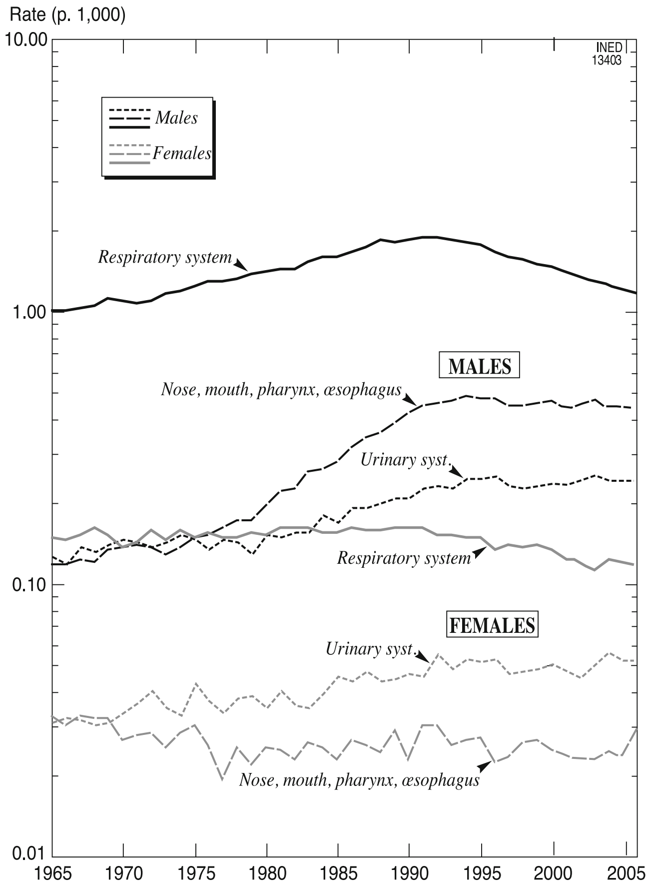

Fig. 12.22 Trends in standardized mortality rates for neoplasms linked to smoking and to alcoholism, ages 40–64, 1965–2006

organs is explained at least in part by the explosion in mortality from other causes resulting from the 1992–1995 economic and social crisis; this carried off a growing number of people suffering from cancer before they had time to die from the disease (Shkolnikov et al. 1999).

The rise in mortality from "malignant neoplasms of the nose, mouth, pharynx and oesophagus" was even greater than that in mortality from respiratory neoplasms, but in the mid-1990s this too gave way to a slight decline. It is known that cancer of the oesophagus is strongly linked to alcohol consumption and that cancer of the lip, oral cavity and pharynx is particularly associated with co-occurring alcohol and tobacco use (Tuyns 1982; Mahboubi and Sayed 1982; Wynder and Bross 1961; Austin 1982). That being the case, it may seem astonishing that at the time of Gorbachev's anti-alcohol campaign, trends in mortality from this group of causes did not deviate from their course at all. In fact, this particular consequence of alcoholism involves a long latent period, and the effects of immediate factors are both deferred and diluted over time. Therefore, it is in no way possible to ascribe the fall in mortality

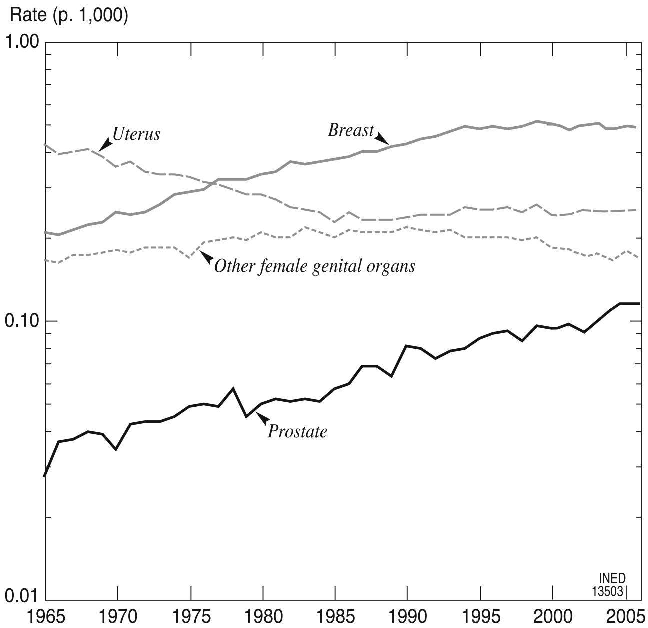

Fig. 12.23 Trends in standardized mortality rates for neoplasms of breast and of genitourinary organs at ages 40–64, 1965–2006

that has begun recently to the deferred benefits of the anti-alcohol campaign, since reaction times vary a great deal from one individual to another. On the other hand, this recent reduction can probably be likened to the situation we have described for respiratory neoplasms, since the neoplasms of lip, oral cavity and pharynx that dominate this group are also dependent on atmospheric pollution and tobacco consumption. However, the slight improvement that followed the 1992–1994 crisis did not continue, and the mortality rate has been stagnant since the early 2000s.

The Soviet Classification did not distinguish between different types of malignant neoplasms of urinary organs. However, a good number of these are cancers of the bladder, which are also known to be influenced by tobacco consumption (The Surgeon General 1982; Rosenberg 1987). The slow increase in male mortality observed for all urinary cancers accelerated from the 1980s onwards. However, since trends in the distribution of this mortality, notably between kidney cancer and bladder cancer, are unknown, it is impossible to track tobacco consumption trends clearly here.

Figure 12.23 brings together the various cancers linked to reproductive functions: breast, uterus or other genital organs for females, prostate for males.

For this age group (more than for the preceding one) we observed the same contrast in Ukraine as in most industrial countries, between a significant fall in mortality from cancer of the uterus and an increase in mortality from breast cancer. However, following on from what we recorded above for the preceding age group, we find that the fall in mortality from cancer of the uterus came to a halt from the second half of the 1980s onwards, reinforcing the idea we have already put forward,

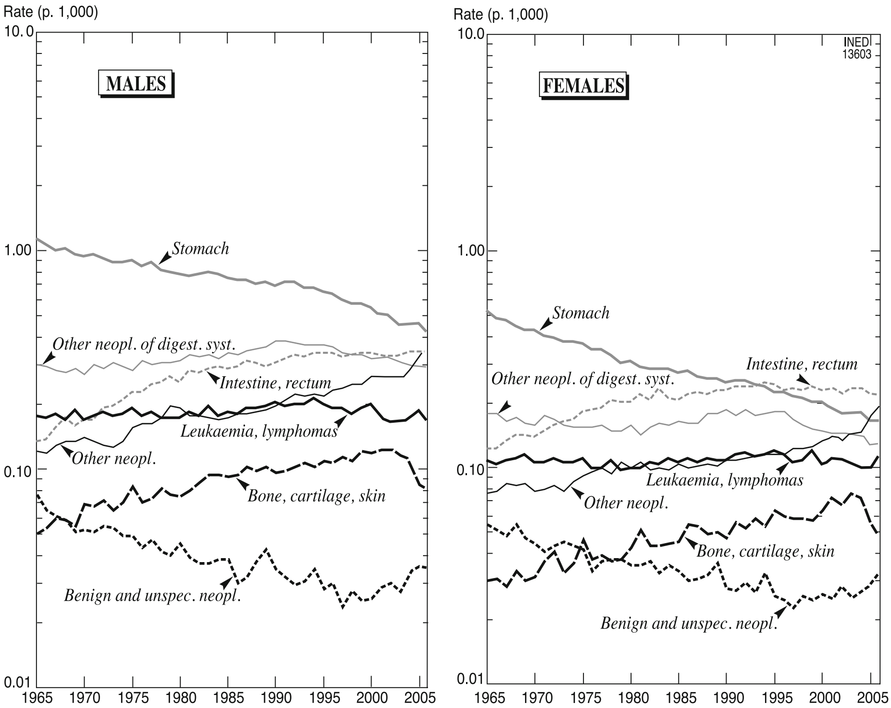

Fig. 12.24 Trends in standardized mortality rates for neoplasms at other sites, ages 40–64, 1965–2006

that gynaecological monitoring became somewhat more lax. Conversely, the slowdown in the rise in mortality from breast cancer that we saw among younger women from the 1980s onwards gives way here to a persistent increase until the mid-1990s, and then to stagnation in the most recent years. We know that the incidence of breast cancer is increasing in all industrial countries (Coleman et al. 1993) but that over recent decades, there has been a slowing, and in recent years even a halt, in the rise in mortality, thanks to early screening and improved treatments. In Ukraine, as in the other former countries of the Soviet Union, these kinds of advances have not been sufficiently widespread to alter the course of mortality from breast cancer.

At these ages, mortality from prostate cancer still occupies only a fairly modest place. However, we should note that it increased strongly over the whole period.

Among the other sites of malignant neoplasms (Fig. 12.24), we find the same classic opposition in Ukraine as in other industrial countries, between the fall in mortality from stomach cancer and the rise in mortality from cancer of the intestine. This contrast is even stronger than in most Western countries, since the increase in mortality from cancer of the intestine was greater in Ukraine. Among females, trends have been such that in the late 1990s, mortality from malignant neoplasms of the stomach was overtaken by mortality from cancer of the intestine. Among males, these two types of mortality have not yet completely aligned, but were on their way

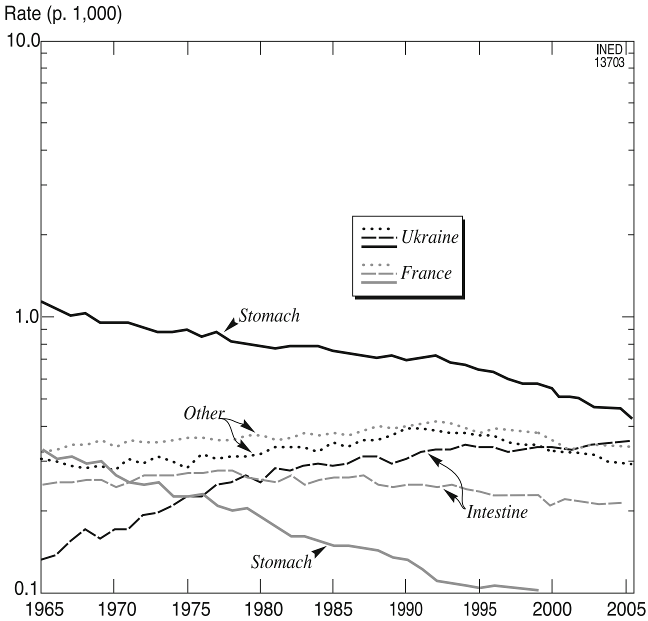

Fig. 12.25 Trends in standardized male mortality rates for neoplasms of digestive organs, Ukraine and France, ages 40–64, since 1965

to doing so in 2006. It may be supposed that, in Ukraine as elsewhere, the fall in mortality from stomach cancer is mainly due to changes in diet and cooking methods: the increased proportion of dairy products and raw foods, and the reduction in salt-pickling and charcoal-grilling (McBean and Speckmann 1982). Yet eating habits are also the main source of the increase in mortality from cancer of the intestine, which represents a fairly large proportion of the rest of this group.

However, even though trends in the structure of digestive cancers observed in Ukraine are very similar to those in other industrial countries, mortality rates are much higher than in Western countries. The contrast with France is particularly marked, as Fig. 12.25 shows for males.

Firstly, mortality from stomach cancer is much lower in France than in Ukraine, and the gap has only widened since 1965: the standardized mortality rate for the 40–64 age group, which was three times higher in Ukraine than in France in 1965, is today more than five times higher. Secondly, over the same period, mortality from cancer of the intestine has remained stable in France while it has increased strongly in Ukraine; this makes it higher nowadays in Ukraine than in France, whereas in 1965 the reverse was observed. In short, it cannot be said that this relative deterioration for cancers of the stomach and of the intestine in Ukraine is balanced by a movement in the opposite direction for other neoplasms of the digestive organs, since the mortality attributable to the latter has remained more or less equal between the two countries over the whole period.

What is more, leukaemia and lymphomas, which even at this age occupy a fairly significant place in mortality from cancer, remained almost stable over the whole period. Contrary to what we may have observed among males in the previous age group, here the Chernobyl disaster does not seem to have had any influence on mortality from these neoplasms.

Mortality from malignant neoplasms of bone, cartilage and skin, which is on the rise, and mortality from benign or unspecified neoplasms, which is declining, play only a secondary part.

12.4.3 Deaths from Injury and Poisoning

Mortality from injury and poisoning increased among males for all causes, but in fairly different ways; in particular, there were wide variations in sensitivity to political and social events (Fig. 12.26). So that it will be easier to read, the first part of Fig. 12.26 highlights just the four categories of such deaths that reacted very strongly to both Gorbachev's anti-alcohol campaign and the economic and social crisis that followed the break-up of the USSR and the transition to a market economy: accidental alcohol poisoning, homicide, 'injury undetermined whether accidentally or purposely inflicted' and "other accidents".

In 2 years, from 1984 to 1986, the anti-alcohol campaign led to a decline of almost 50% in male mortality from alcohol poisoning, homicide and 'injury undetermined whether accidentally or purposely inflicted', and to a decline of almost 40% in male mortality in the "other accidents" group; but the second part of Fig. 12.26 shows that other causes were also sensitive to the anti-alcohol campaign, such as suicide and the 'drowning and falls' category, which fell by more than 40%, or transport accidents (−28%) and accidental poisoning by other substances (−25%).

However, after the anti-alcohol measures were relaxed, mortality from these external causes did not rise any higher than predicted by the previous trend. On the other hand, the causes singled out in the first part of Fig. 12.26 went up to a much higher level. This was particularly the case for homicide, where the rate was three times higher in 1995 than in 1984, and even more so for 'injury undetermined whether accidentally or purposely inflicted', which in 1995 led to mortality four times higher than in 1984. This explosion in such 'undetermined' injuries, more dramatic than the rise in all clearly identified forms of injury, certainly resulted from the crumbling of the social fabric; this not only increased the risk of violence but also led to a deterioration in knowledge of these causes, since so many more people were found dead with no witness to the event.

In contrast, at this age we again find the fall in mortality from transport accidents already mentioned in relation to young adults. As we suggested above, this decline was very probably due to the reduction in automobile traffic resulting from fuel shortages.

For all the causes shown at the top of Fig. 12.26, those that were sensitive to political and social events in the 1980s and 1990s, we should also note a fresh upsurge from 1999 onwards, after the improvement that had at first followed the economic and social crisis. However, for homicide this new rise was very short (1999–2000), and although the other causes sustained it a little longer (1999–2004),

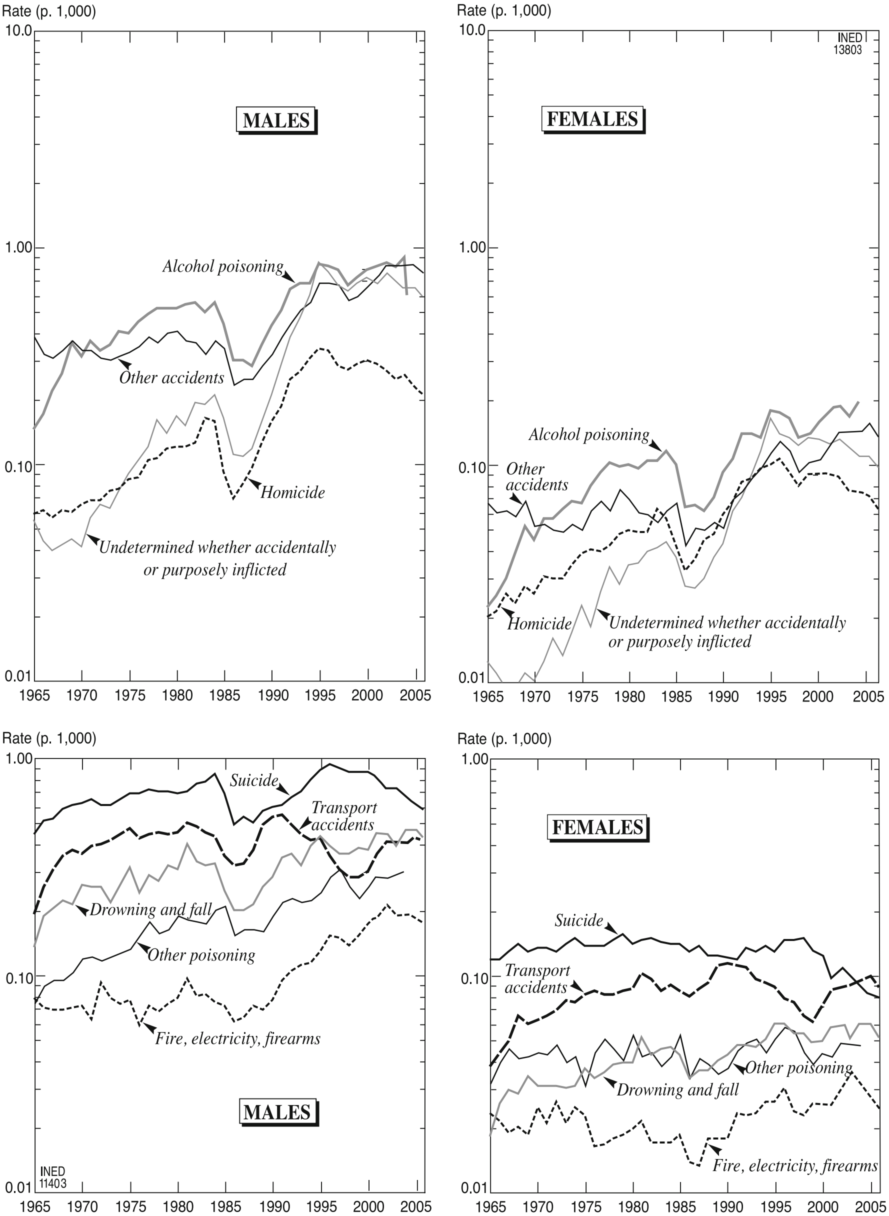

Fig. 12.26 Trends in standardized mortality rates at ages 40–64 since 1965: deaths from injury and poisoning (N.B. The "alcohol poisoning" and "poisoning by other substances" series are not shown beyond 2004 because since 2005, Ukrainian statistics have no longer distinguished alcohol poisoning from poisoning by other substances)

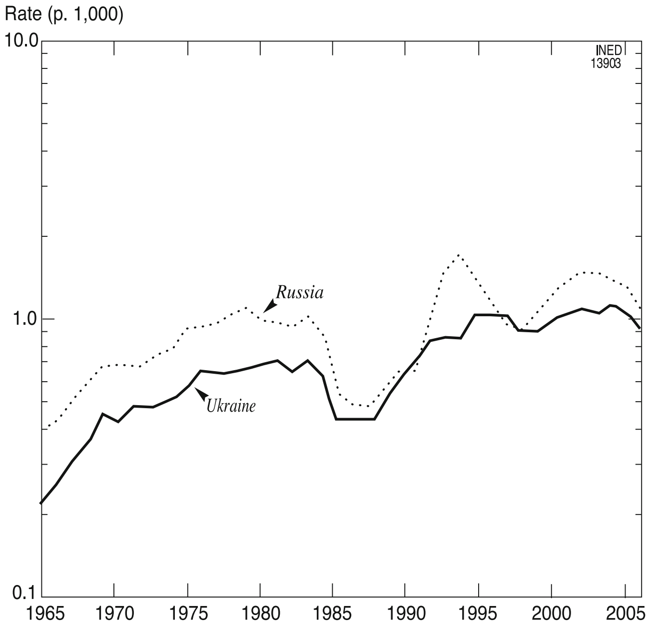

Fig. 12.27 Trends in standardized male mortality rates for accidental poisoning at ages 40–64, Ukraine and Russia, since 1965

in most recent years they have all seen a new decline. Among the causes shown at the bottom of Fig. 12.26, which had been less systematically sensitive to earlier events, only three were affected by a fresh upsurge at the turn of 1999/2000 (transport accidents; poisoning by substances other than alcohol; fire, electricity and firearms) but, by the end of the period, transport accidents represented the only category still on the rise.

For some of these causes of death from injury and poisoning, it may be worth comparing the situation in Ukraine with that in Russia or even France. The case of accidental poisoning (Fig. 12.27) offers very comparable patterns in trends for Ukraine and Russia[8] (unfortunately, the comparison cannot be extended to France because of the very specific Soviet way of classifying deaths from excess alcohol consumption). However, although they were extremely similar, the fluctuations were much more pronounced in Russia than in Ukraine. The fall that followed the anti-alcohol campaign was much greater in Russia than in Ukraine. So, although traditionally this type of mortality was higher in Russia, the two countries drew level during the period 1986–1991. Conversely, the fresh upsurge observed in the early 1990s was much sharper in Russia, clearly reflecting the difference between the tempo of the

[8]Here we group together all types of accidental poisoning, whether they are due to alcohol or not, in order to be able to carry the comparison as far as 2006, despite the fact that since 2005 Ukrainian statistics have no longer distinguished alcohol poisoning from other poisoning. In fact, the part played by "accidental poisoning by other substances" is too small (barely 25% in 2004) to have a significant influence on overall trends, which are entirely dominated by alcohol poisoning.

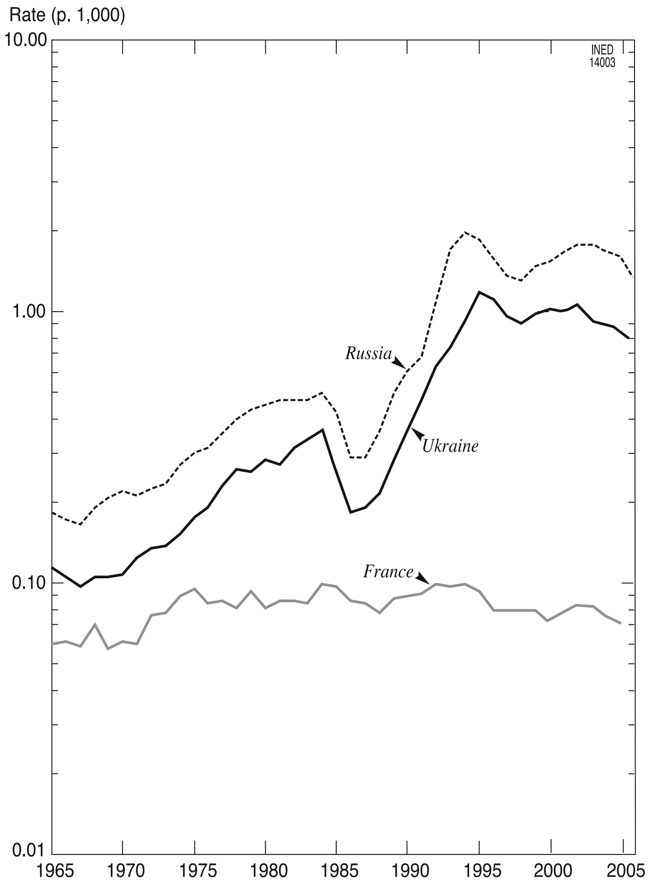

Fig. 12.28 Trends in standardized male mortality rates for homicide or injury undetermined whether accidentally or purposely inflicted, ages 40–64, Ukraine, Russia and France, since 1965

economic and social crisis in Russia and in Ukraine. Once the crisis had passed, the two countries came into line again, but the increase in 1999 and 2003 was much greater in Russia, and this distanced them once more. In both countries, however, the most recent years have been marked by a clear decline, which has again brought them closer together, since it was a little later in Ukraine than in Russia. So Ukraine and Russia have clearly undergone the same fluctuations in mortality from poisoning; but these fits and starts were much more violent in Russia than in Ukraine, where the mortality rate has been similar to Russia's only in the latter's most favourable periods.

The close similarity in the patterns observed in Fig. 12.26 for homicide and for 'injury undetermined whether accidentally or purposely inflicted' led us to group these two items together in order to compare Russia, Ukraine and France from this point of view. This time, Ukraine and Russia are exactly alike: not only are the same fluctuation curves to be found in both countries, but they are the same size (Fig. 12.28). On the other hand, mortality in Ukraine has been constantly lower than

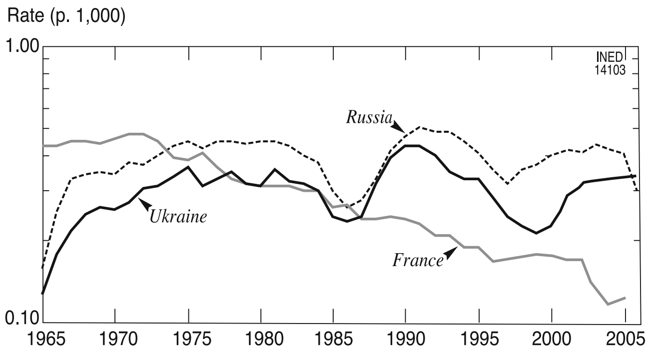

Fig. 12.29 Trends in standardized male mortality rates for road traffic accidents, Ukraine, Russia and France, ages 40–64, since 1965

in Russia (in the order of 40–50%). The comparison with France, where mortality from homicide and 'undetermined' injury is very stable, shows how much Russia and Ukraine, like the other European countries of the former USSR, suffer from crime and also how far this situation has deteriorated: in 1965, mortality from this group of causes in Ukraine was double that in France, while in Russia it was three times greater, but in 2005 it was 12 times greater in Ukraine than in France and 23 times greater in Russia!

Things are very different in regard to road traffic accidents, which, until the recent period, have caused at least as much mortality in France as in Ukraine and Russia (Fig. 12.29). However, because road deaths have been in constant decline in France since the early 1970s, the gap has widened to the disadvantage of the other two countries, despite recent fluctuations. The 1985 anti-alcohol campaign put the three countries on the same level, but with the relaxation of those measures, Ukraine and Russia reached much higher road death rates than France, and the traffic reduction linked to the crisis was not enough to entirely close the gap. From 1998, road deaths started to rise again in Russia; they did so in Ukraine only from 2000 onwards, but even more sharply; and, because Ukraine did not benefit from the clear decline observed in Russia in 2005–2006, it reached a mortality rate from road traffic accidents in 2006 that was even slightly higher than the Russian one. In 2005, the latest year available for France, Ukrainian and Russian road deaths were almost three times greater than French ones. However, we should note that this comparison is very strongly biased against France, since automobile traffic is much heavier in France than in Ukraine or Russia: a comparison in terms of deaths per kilometre travelled would reveal an even more glaring contrast.

All these comments about mortality from injury and poisoning among males also apply to this type of mortality among females, but with one slight yet significant difference: trends were a little less unfavourable and fluctuations practically absent from the causes grouped together in the second part of Fig. 12.26 (suicide, transport accidents, drowning and falls, etc.).

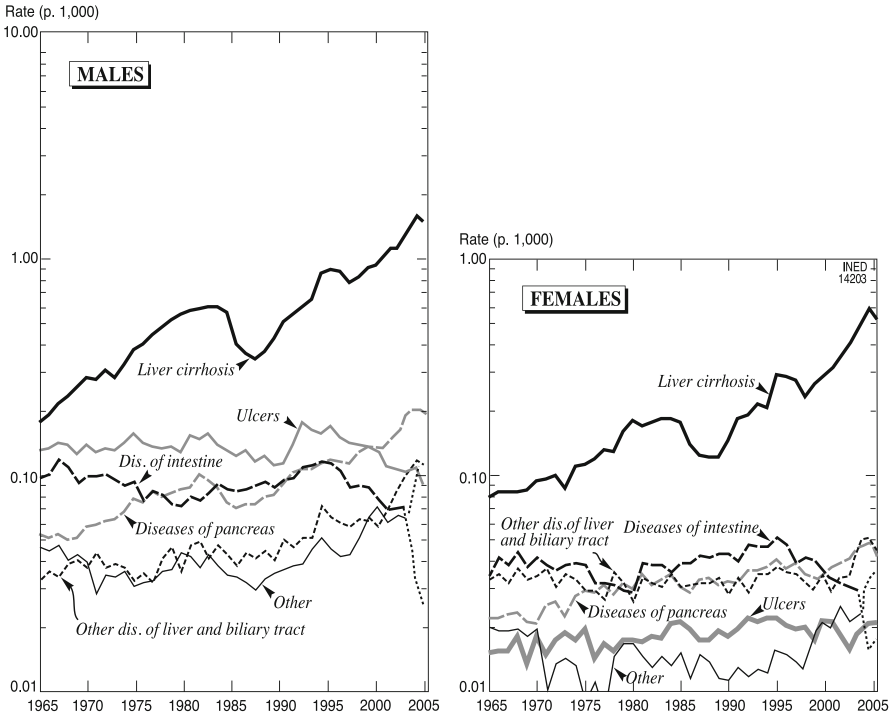

Fig. 12.30 Trends in standardized mortality rates for diseases of the digestive system, ages 40–64, since 1965

12.4.4 Diseases of the Digestive System

Although the pathological consequences of alcoholism in Ukraine, as in the other countries of the former USSR, mainly take the form of acute alcohol-induced crises, and the deaths that ensue are for the most part classified under the item for alcohol poisoning, nevertheless mortality from cirrhosis of the liver occupies a significant place. In this adult age group, it represents by far the most common cause of death from digestive diseases (Fig. 12.30). In addition, it has increased very strongly over recent decades, almost as much as mortality from alcohol poisoning, and (which might be surprising, since cirrhosis of the liver is a condition that develops much more slowly than acute alcoholism) it underwent equally large fluctuations in the 1980s and 1990s. However, we have already noticed this sensitivity of cirrhosis to political events, even in a country like France, where it occupies a significant place in adult male mortality (Vallin and Meslé 1988). In particular, it declined abruptly there in 1958–1959, following a sharp increase in the price of wine (Meslé and Vallin 1993a). Although cirrhosis is indeed a slow-developing disease, mortality from cirrhosis at a given point in time also depends on the

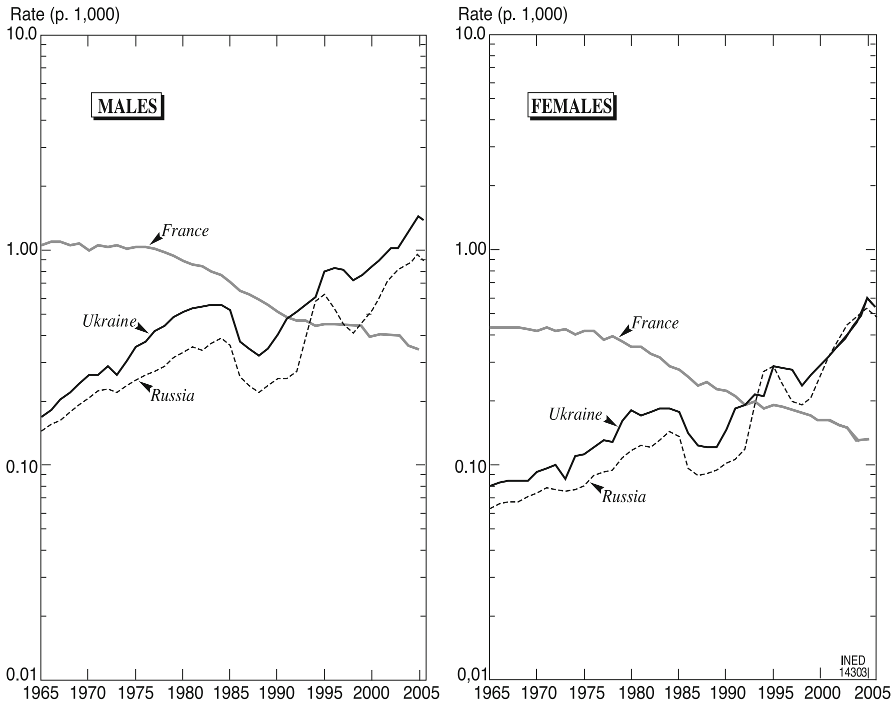

Fig. 12.31 Trends in standardized mortality rates for cirrhosis of the liver, Ukraine, Russia and France, ages 40–64, since 1965

quantity of alcohol recently ingested, and if there is a strong decline in alcohol consumption, a large proportion of the potential deaths from cirrhosis of the liver will be delayed. This is why Gorbachev's anti-alcohol campaign led to as great a decline in mortality from cirrhosis as in mortality from alcohol poisoning. Similarly, when alcohol consumption rose again, mortality from cirrhosis climbed rapidly once more.

Even so, until recently mortality from cirrhosis was not as significant as in France, where it is the main cause of alcohol-induced mortality. In 1965, the standardized male mortality rate from this cause at ages 40–64 was six times higher in France than in Ukraine (Fig. 12.31). However, the rise of alcoholism in Ukraine and its decline in France have reversed this situation in just a few decades. In 2005, mortality from cirrhosis of the liver was more than four times higher in Ukraine than in France. Finally, comparison with Russia shows that although their paths are almost precisely parallel (same long-term increase, same sensitivity to political events), male mortality from cirrhosis in Ukraine has been constantly higher than it has in Russia, whereas we saw the reverse for mortality from alcohol poisoning. This should probably be seen in relation to noticeably different alcohol consumption habits in the two countries: binge-drinking spirits (vodka) probably plays a smaller role in Ukraine than in Russia, while the habit of regularly consuming less strong alcohol in the form of wine or beer is more prevalent in Ukraine.

The trends in mortality from cirrhosis of the liver and the comparisons made with France and Russia apply just as much to females as to males (Fig. 12.31), except that mortality is much lower in females and, for them, there is hardly any difference between Ukraine and Russia.

Among the other diseases of the digestive system, it is stomach ulcers that come second in terms of mortality, but a fairly long way behind cirrhosis; and this is even more the case nowadays, because this cause of death has increased much less over recent decades. However, the sudden increase in male mortality from stomach ulcers that accompanied the 1992 economic and social crisis must be noted, even though this cause of death had remained completely insensitive to the fluctuations associated with the anti-alcohol campaign. This provides additional evidence of the way disease patterns differed between the fluctuation in the 1980s and the one in the 1990s. This phenomenon cannot be seen among females, but males are known to be more sensitive to stomach ulcers, notably in their psychosomatic forms.

Mortality from diseases of the intestines was fairly stable throughout the period, while mortality from diseases of the pancreas tended to increase for both sexes. Other diseases of the digestive system played only a small part in adult mortality in Ukraine.

12.4.5 Infectious Diseases and Diseases of the Respiratory System

As we have already emphasized in relation to the previous age group, in Ukraine mortality that is classified as infectious is very largely dominated by tuberculosis. Among Ukrainian males, this disease alone caused over ten times as much mortality as was attributed to all other infectious diseases (Fig. 12.32). Among females, it was less predominant, and the gap closed somewhat as mortality from tuberculosis fell faster than mortality from other infectious diseases. All the same, in 1965 female mortality from tuberculosis was five times higher than from other infectious diseases, and nowadays it is still three times higher.

The very sharp rise in mortality from tuberculosis observed since the late 1980s in males and since the early 1990s in females cannot be ascribed to AIDS, even less than in the 15–39 age group. Not only has its tempo been very different, but adult mortality from AIDS is almost entirely concentrated in that previous age group. Even though the fresh upsurge in tuberculosis was accentuated by the economic and social crisis, the latter is simply not sufficient to explain either its extent or its continuous nature. It resulted more from a profound transformation in society, with growing marginalization of the most deprived section of the population, than from a deterioration in immediate living conditions.

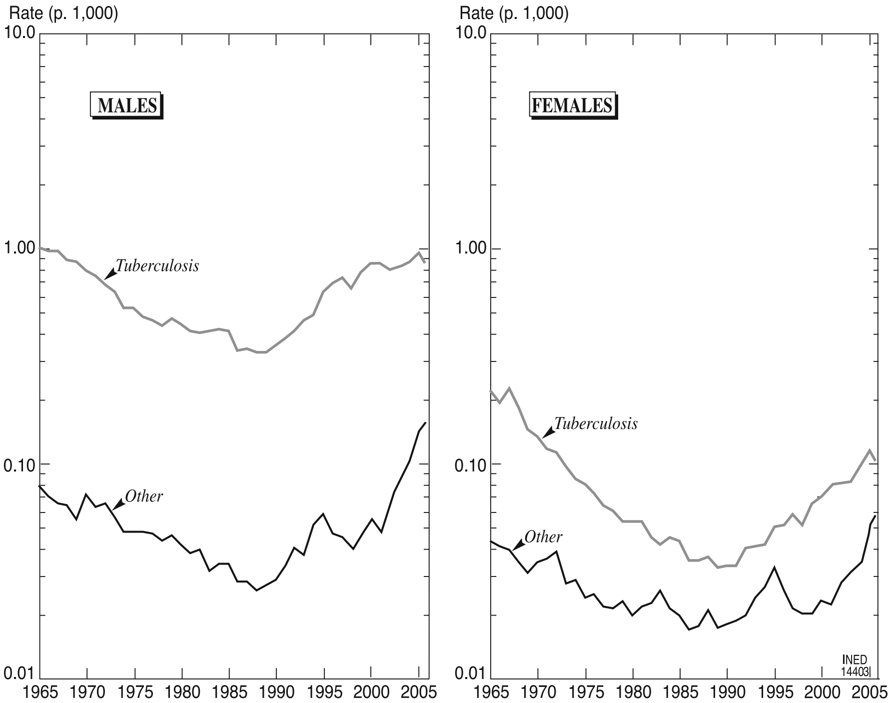

Fig. 12.32 Trends in standardized mortality rates for infectious diseases, ages 40–64, since 1965

As we know, not all infectious diseases are grouped together in the category that bears this name. Of the other chapters in the Classification, 'Diseases of the respiratory system' is probably the one that includes most infectious diseases. On the other hand, in the 40–64 age group, the main causes of respiratory mortality fall more under the category of chronic conditions than under acute infections. In Ukraine, the foreground in this category is occupied jointly by chronic bronchitis and pulmonary congestion (Fig. 12.33). However, since 1965, trends in mortality from these two groups of conditions have been very different.

Until the early 1980s, mortality from pulmonary congestion, which was very stable, was the highest; however, it fell abruptly between 1982 and 1990 (to almost a tenth) and then again between 1995 and 2004, following the 1993–1994 crisis, and nowadays it plays only a marginal role (the rate is 100 times lower than in 1965). Conversely, mortality from bronchitis increased abruptly between 1982 and 1985. There is certainly an artificial element to these movements in opposite directions, because, in the first half of the 1980s, diagnostic and coding practices probably to some extent abandoned pulmonary congestion in favour of chronic bronchitis. However, this simple shift in definition does not explain everything, since the fall in mortality from pulmonary congestion continued long after the steep rise in chronic bronchitis. Moreover, in the 1970s, while pulmonary congestion was very stable, chronic bronchitis went into decline, without any clear explanation. This decline probably

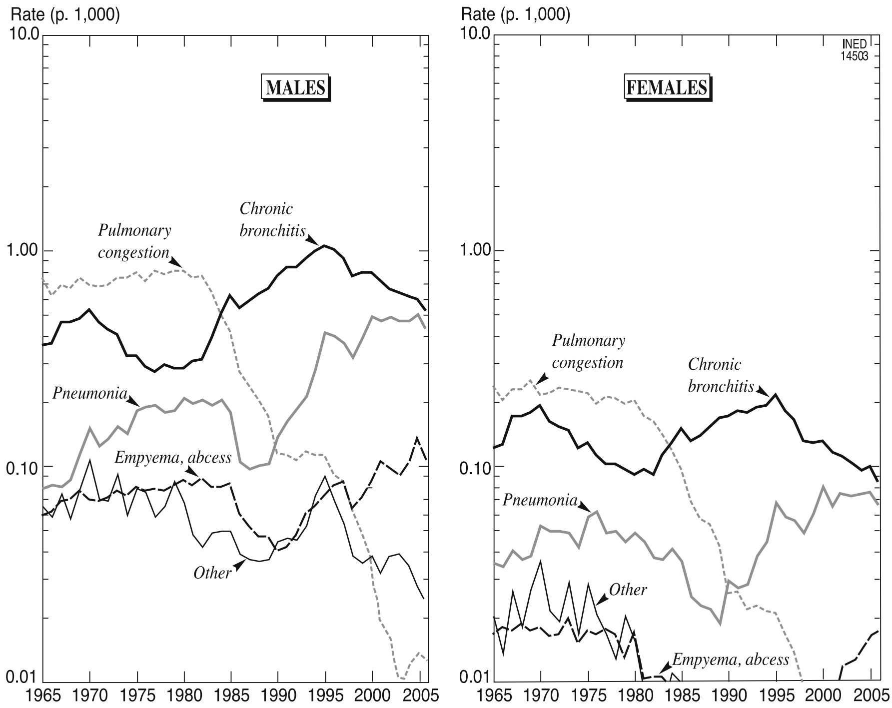

Fig. 12.33 Trends in standardized mortality rates for diseases of the respiratory system, ages 40–64, since 1965

results from other, more complex transfers between pulmonary congestion and items other than chronic bronchitis; but the available data does not really allow us to specify which ones.

Mortality from pneumonia is a classic example of a cause of death that reacted strongly to the great ‘health events’ in the 1980s and 1990s. It first of all declined very sharply under the impact of the anti-alcohol campaign, then, on relaxation of the prohibition measures, went back up fairly rapidly to its earlier level. But this fresh upsurge accelerated abruptly with the 1992–1994 economic and social crisis, and it also picked up again after the short period of decline that followed the latter. So, with a path very similar to that taken by tuberculosis, pneumonia behaved more like an acute infectious disease than a chronic one.

The other diseases of the respiratory system played a smaller role.

12.4.6 Other Diseases

Of all other diseases, only diseases of the nervous system, diseases of the genitourinary system and endocrine diseases played an appreciable role in the mortality of adults aged 40–64 (Fig. 12.34).

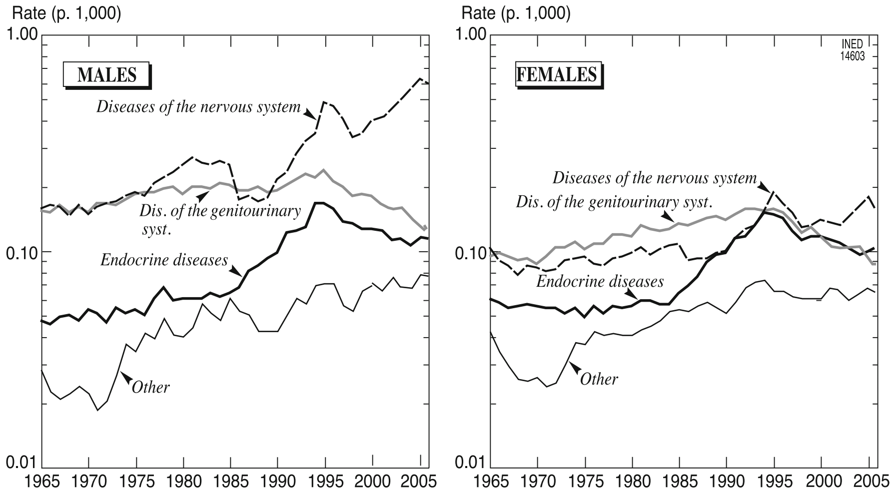

Fig. 12.34 Trends in standardized mortality rates for other diseases, ages 40–64, since 1965

Mortality from diseases of the nervous system, as we have already seen in relation to young adults in the previous section, increased strongly and also proved very sensitive to both Gorbachev's anti-alcohol campaign and the 1992–1995 economic and social crisis, as well as to the new rise at the turn of the century; this continued until 2004, reaching a much higher level than in the 1993–1994 crisis. We could go into more detail about this category of causes of death, but we would merely be repeating what we have already said about young adults in the 15–39 age group (Fig. 12.17): naturally, the anti-alcohol campaign and its abandonment had the greatest impact on mortality from alcohol dependence syndrome, which was hardly influenced at all by the social and economic crisis, whereas mortality from other mental disorders, insensitive to the anti-alcohol campaign, rose abruptly with the crisis.

So it seems more helpful to give details here about the second largest group of causes, diseases of the genitourinary system. In this category, in contrast, mortality trends have not been influenced at all by political and social events, instead showing a slight but very regular increase over the whole period (Fig. 12.34).

In fact, this relative stability combines stagnation followed by a steady decrease in the largest component of the group – mortality from nephritis – with a strong increase in mortality from kidney infections, which, by the end of its trajectory, was much closer to mortality from nephritis and, in females, even reached the same level (Fig. 12.35).

All the other causes of death in this group, including hyperplasia of the prostate in males, play only a secondary role in mortality at this age.

Table 12.4 Causes of death at ages 40–64: groups of items used (with corresponding ICD-9 items) and trends in mortality rate between 1965 and 2006

Groups used	1995 Soviet Classification	ICD (9th Revision)	2005 Ukrainian Classification	Rate per 1000 Male 1965	Male 2006	Female 1965	Female 2006
Infectious and parasitic diseases	**1 to 44, 206**	**001 to 139**	**3 to 57**	**1.08**	**0.98**	**0.26**	**0.16**
Tuberculosis	9 to 13, 43	010 to 018, 137	11 to 17, 56	1.00	0.82	0.22	0.10
Other infectious and parasitic diseases	1 to 8, 14 to 42, 44, 206	001 to 009, 020 to 138, 139	3 to 10, 18 to 55, 57	0.08	0.16	0.04	0.06
Neoplasms	**45 to 67**	**140 to 239**	**59 to 104**	**3.23**	**3.63**	**2.08**	**1.97**
Malignant neoplasms of the nose, mouth, pharynx and oesophagus	45, 46	140 to 150	59 to 62	0.12	0.43	0.03	0.03
Malignant neoplasm of stomach	47	151	63	1.12	0.42	0.52	0.16
Malignant neoplasms of intestine and of rectum	48 to 50	152 to 154	64 to 67	0.13	0.35	0.12	0.21
Other malignant neoplasms of digestive organs	51	155 to 159	68 to 72	0.30	0.29	0.18	0.12
Malignant neoplasm of respiratory organs	52 to 54	160 to 165	73 to 75	1.00	1.18	0.15	0.12
Malignant neoplasm of bones, cartilage and skin	55, 56	170 to 173	76 to 78	0.05	*0.08	0.03	*0.05
Malignant neoplasm of breast	57	174, 175	80	0.00	0.01	0.20	0.49
Malignant neoplasm of uterus	58, 59	179 to 182	81 to 83			0.42	0.25
Malignant neoplasms of other female genital organs	60	183, 184	84 to 86			0.16	0.17
Malignant neoplasm of prostate	61	185	87	0.03	0.11		
Malignant neoplasm of urinary organs	63	188, 189	89 to 91	0.13	0.24	0.03	0.05
Leukaemia and lymphomas	65, 66	200 to 208	99 to 103	0.17	0.16	0.11	0.11
Other malignant neoplasms	62 and 64	186, 187, 190 to 199	79, 88, 92 to 98	0.12	*0.34	0.08	*0.19
Benign and unspecified neoplasms	67	210 to 239	104	0.08	0.04	0.05	0.03
Diseases of the circulatory system	**84 to 102**	**390 to 459**	**133 to 156**	**3.76**	**9.79**	**2.30**	**3.33**
Rheumatic heart diseases	84, 85	390 to 398	133, 134	0.25	0.09	0.30	0.07
Hypertensive disease	86 to 89	401 to 405	135 to 138	0.15	0.04	0.08	0.01

(continued)

Table 12.4 (continued)

Groups used	1995 Soviet Classification	ICD (9th Revision)	2005 Ukrainian Classification	Rate per 1000 Male 1965	Male 2006	Female 1965	Female 2006
Acute myocardial infarction	90, 91	410	139, 140	0.61	0.40	0.15	0.10
Atherosclerotic cardiosclerosis	92, 93	414.0	142	1.38	3.86	0.86	1.40
Other forms of ischaemic heart disease	94, 95	411 to 413, 414.1 to 414.9	141, 143	0.13	1.94	0.03	0.47
Other forms of heart disease	96, 97	415 to 429	144 to 146	0.08	1.29	0.06	0.30
Cerebrovascular disease	98, 99	430 to 438	147 to 151	1.01	1.85	0.71	0.87
Other diseases of circulatory system	100 to 102	440 to 459	152 to 156	0.15	0.33	0.10	0.10
Diseases of the respiratory system	**103 to 114**	**460 to 519**	**158 to 173**	**1.29**	**1.06**	**0.42**	**0.17**
Pneumonia 105 to 107	480 to 486	160 to 163	0.08	0.41	0.04	0.07	
Chronic bronchitis, emphysema, asthma, etc.	108, 109, 110	490 to 492	165 to 169	0.36	0.51	0.12	0.08
Empyema, abscess of lung and mediastinum	112	510, 513	172	0.06	0.10	0.02	0.02
Pulmonary congestion	113	514, 515	171	0.73	0.01	0.23	0.00
Other diseases of respiratory system	103, 104, 111 and 114	460 to 478, 487, 500 to 508, 511, 512, 516 to 519	158, 159, 164, 170, 173	0.06	0.02	0.02	0.00
Diseases of the digestive system	**115 to 127**	**520 to 579**	**175 to 189**	**0.51**	**1.85**	**0.20**	**0.68**
Ulcer of stomach and duodenum	115, 116	531 to 533	175 to 177	0.12	0.08	0.01	0.02
Diseases of intestines	118 to 121	540 to 543, 550 to 553, 555 to 558, 560	179 to 182	0.09	*0.02	0.03	*0.02
Cirrhosis of liver	122, 123	571.0 to 571.3, 571.5, 571.6	183, 184	0.16	1.36	0.08	0.52
Other diseases of liver and of biliary tract	124, 125	570, 571.4, 571.8 to 573, 575.2 to 576	185 to 187	0.03	0.10	0.03	0.04

Disease of pancreas	126	577	188	0.05	0.18	0.02	0.04
Other	117, 127	520 to 530, 534 to 537, 562 to 569, 578, 579	178, 189	0.04	*0.11	0.02	*0.04
Other diseases	**68 to 83, 128 to 157**	**240 to 389, 580 to 779**	**106 to 108, 110 to 113, 115 to 118, 120 to 128, 130, 131, 190, 192 to 195, 197 to 205, 207 to 215, 217 to 226, 228 to 236, 239**	**0.38**	**0.88**	**0.30**	**0.40**
Endocrine diseases	68 to 72	240 to 289	106 to 108, 110 to 113	0.05	0.11	0.06	0.10
Diseases of the nervous system and mental disorders	73 to 83	290 to 389	115 to 118, 120 to 128, 130, 131	0.15	0.58	0.10	0.16
Diseases of the genitourinary system *including*:	128 to 134	580 to 629	197 to 205	0.15	0.12	0.09	0.09
nephritis and glomerulonephritis	*128, 129*	*580 to 589*	*197 to 199*	*0.10*	*0.04*	*0.06*	*0.02*
infections of kidney	*130*	*590*	*200, 201*	*0.02*	*0.05*	*0.01*	*0.04*
hyperplasia of prostate	*133*	*600*	*204*	*0.01*	*0.01*		
other	*131, 132, 134*	*591 to 599, 601 to 629*	*202, 203, 205*	*0.02*	*0.03*	*0.02*	*0.02*
Other diseases	135 to 141, 142 to 157	630 to 676, 680 to 779	190, 192 to 195, 207 to 215, 217 to 226, 228 to 236, 239	0.03	0.08	0.04	0.07
Deaths from injury and poisoning	**160 to 176**	**800 to 999**	**242 to 258**	**1.55**	**4.03**	**0.35**	**0.74**
Transport accidents	160 to 162	800 to 848	242 to 248	0.19	0.41	0.04	0.09
Drowning and falls	166, 168	880 to 888, 910	249, 250	0.13	0.42	0.02	0.05
Accidental alcohol poisoning	163	850 to 869	252	0.14	**0.88	0.02	**0.20
Accidental poisoning by other substances	164	850 to 869		0.07	**0.29	0.03	**0.05
Accidents caused by fire, electric current or firearm	167, 170, 171	890 to 899, 922, 925	251	0.08	0.17	0.02	0.03

(continued)

Table 12.4 (continued)

Groups used	1995 Soviet Classification	ICD (9th Revision)	2005 Ukrainian Classification	Rate per 1000 Male 1965	Male 2006	Female 1965	Female 2006
Suicide	173	950 to 959	253	0.44	0.56	0.12	0.08
Homicide	174	960 to 978	254	0.06	0.21	0.02	0.06
Death from injury undetermined whether accidentally or purposely inflicted	175	980 to 989	255	0.05	0.59	0.01	0.10
Other accidents	165, 169, 172, 176	870 to 879, 900 to 909, 911 to 921, 923, 924, 926 to 949, 990 to 999	256 to 258	0.38	0.74	0.07	0.13
Total for all causes	**1 to 176, 206**	**001 to 999**	**3 to 57, 59 to 104, 106 to 108, 110 to 113, 115 to 118, 120 to 128, 130, 131, 133 to 156, 158 to 173, 175 to 189, 190, 192 to 195, 197 to 205, 207 to 215, 217 to 226, 228 to 236, 239, 242 to 258**	**11.79**	**22.24**	**5.91**	**7.45**

* These rates doubtful, as consistency could not be ensured in the transition from the previous Classification

** Given for 2004, since the last revision of the list produced no corresponding category in 2005 and 2006

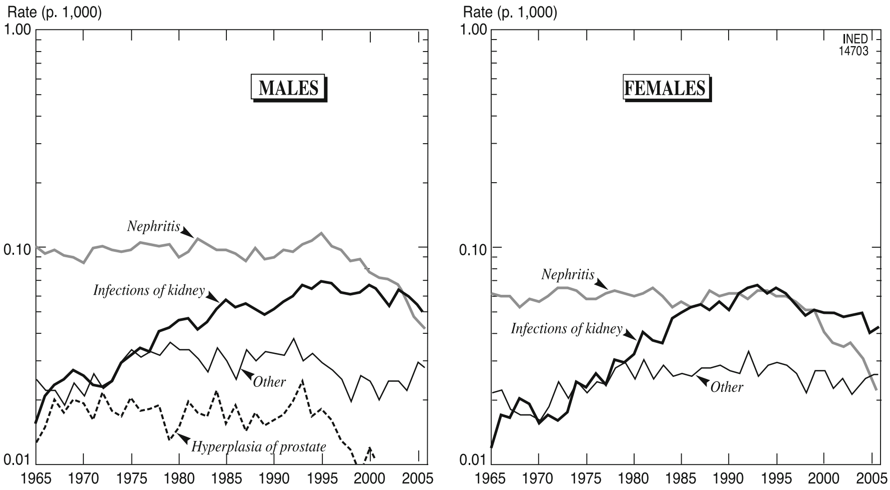

Fig. 12.35 Trends in standardized mortality rates for diseases of the genitourinary system, ages 40–64, since 1965

12.5 Causes of Death at 65 Years of Age and over

Even more than for adults aged 40–64, diseases of the circulatory system dominate mortality among people aged 65 and over, and this is equally the case for males and females (Fig. 12.36). On average, over the whole period 1965–2006, mortality from diseases of the circulatory system in males aged 65 and over was around eight times higher than mortality from cancer or mortality from diseases of the respiratory system – and nearly ten times higher in females.

Although this phenomenon is nothing new, it has tended to be accentuated by the increase in mortality from diseases of the circulatory system. However, the increase in this age group was much more modest than the increase we saw in the previous age group. It was also much less marked by the fluctuations in the 1980s and 1990s, since the main type of mortality among the old clearly appears to have been fairly insensitive to political and social events.

Two groups of causes that are close in size but show contrasting trends occupy second place in mortality among elderly people: diseases of the respiratory system and neoplasms. In the 1970s, diseases of the respiratory system were clearly in second place, before neoplasms (Fig. 12.36). However, deaths from respiratory disease have declined a great deal since then, especially among females, so that in recent years they have very largely ceded second place to mortality from cancer, which has remained relatively stable (increasing very slightly between 1965 and 2000 for males; stable for females).

In 1965, these two groups of conditions – each of which caused mortality one tenth that of mortality from diseases of the circulatory system – were followed by three other groups, also equal in size, each of which caused one tenth of the

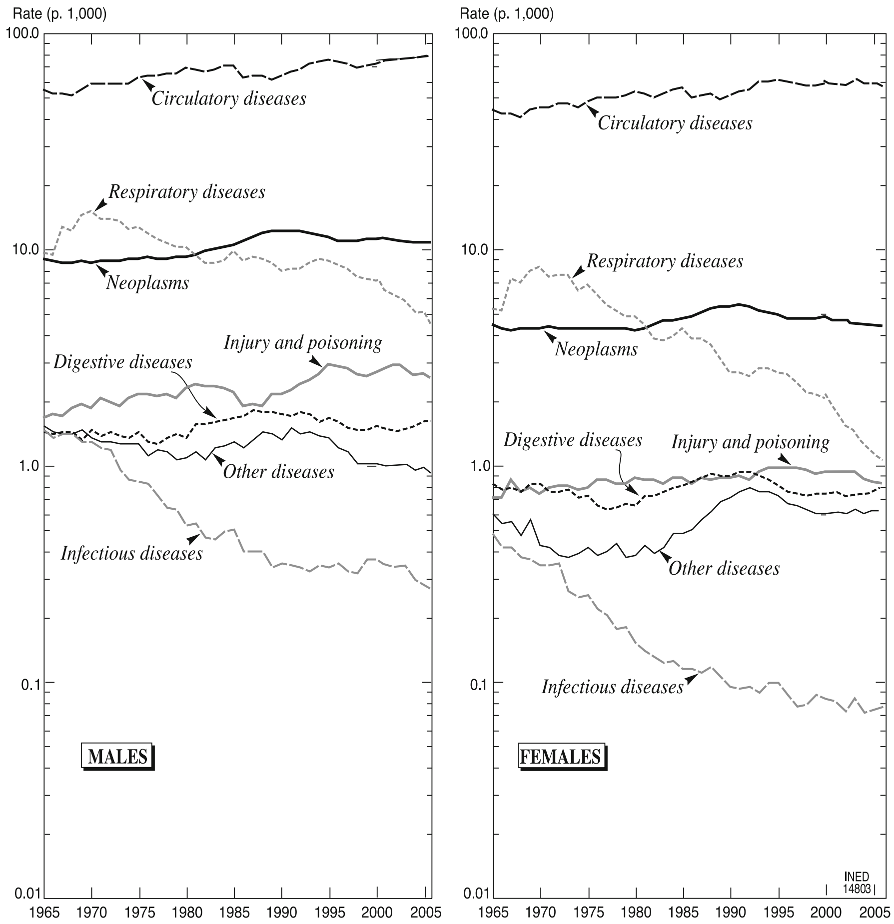

Fig. 12.36 Trends in standardized mortality rates by major groups of causes, age 65 and over, since 1965

mortality again (that is, equivalent to only 1% of the mortality resulting from diseases of the circulatory system): deaths from injury and poisoning, diseases of the digestive system and infectious diseases. Finally, all other causes form a fourth group of the same size. However, over just a few decades, these groups of causes followed divergent trends: deaths from injury and poisoning increased, diseases of the digestive system remained almost stable (as roughly did the group "other diseases") and infectious diseases declined strongly.

As before, here we shall examine the main components of each major group of causes, starting with the largest, diseases of the circulatory system (see Table 12.5 shown at the end of the Section 12.5).

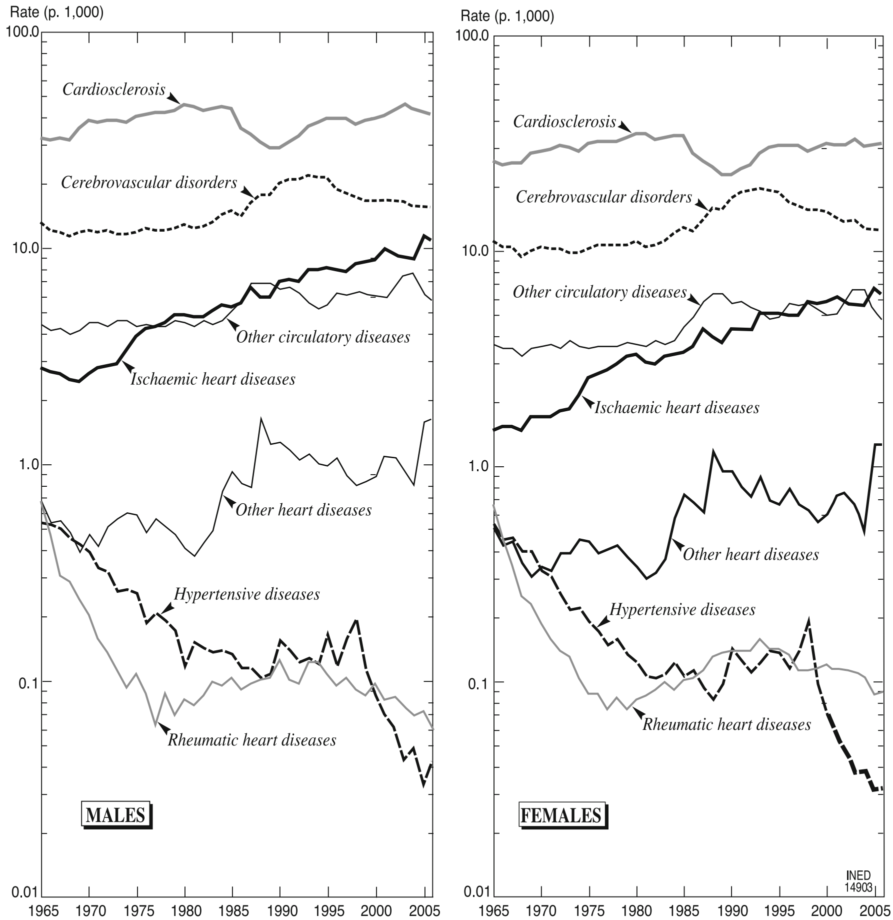

Fig. 12.37 Trends in standardized mortality rates for diseases of the circulatory system, age 65 and over, since 1965

12.5.1 Mortality from Diseases of the Circulatory System

Among people aged 65 and over, mortality from diseases of the circulatory system was, even more than in the preceding age group, dominated by cardiosclerosis. However, this reflects the fact that diagnosis becomes less precise as people age, rather than any real difference in the disease pattern. As in the 40–64 age group, trends in mortality from cardiosclerosis were quite sensitive to trends in alcohol consumption (Fig. 12.37), but in contrast, the economic and social crisis of the 1990s had hardly any influence on them.

Conversely, mortality from cerebrovascular disease, which had remained stable at this age until the mid-1980s, did not decline at all with the anti-alcohol campaign, but increased noticeably at the turn of the 1990s.

In the light of our explanation in relation to the previous age group, Fig. 12.37 shows acute myocardial infarction grouped with other forms of ischaemic heart disease; however, mortality from this group of conditions is in only third position here, much further behind mortality from cerebrovascular disease than mortality from other ischaemic heart diseases alone was in the previous age group (Fig. 12.20). In fact, any attempt to use the Soviet Classification to evaluate the true impact of ischaemic heart disease and its trends seems even more futile here than in all the other age groups, since mortality from cardiosclerosis creates such a strong bias in the available data on myocardial infarction or other forms of ischaemic heart disease.

Mortality from rheumatic heart diseases is obviously very small (in relative values) at this age. Trends in this mortality differ from those we observed in the earlier age groups. Whereas we observed a very rapid fall in this type of mortality among young adults over the whole period, the reduction in the 40–64 age group was, in contrast, very slow. At ages 65 and over, from the late 1970s onwards, the fall gave way to an increase: this may simply have been a matter of improved diagnosis of heart valve conditions.

"Other diseases of the circulatory system" occupied a relatively significant place in this age group, and so the contents of this category merit a little more investigation. In reality, it was a rag-bag of conditions, entirely dominated by diseases of arteries, arterioles and capillaries. For the most part, deaths classified under this item were from atherosclerosis, whose progression with age is well-known.

12.5.2 Diseases of the Respiratory System and Infectious Diseases

Behind diseases of the circulatory system, two groups of conditions vie for second place in mortality at ages 65 and over: diseases of the respiratory system and cancers. At the start of the period, it was diseases of the respiratory system that were in the lead, though since the early 1980s it has been cancer. Therefore we shall begin by talking here about diseases of the respiratory system, while also considering infectious diseases, with which they have numerous points in common.

As in the previous age group, this category is dominated by the interaction of pulmonary congestion and chronic bronchitis, with the first occupying the foreground at the outset but declining steeply in the 1980s and 1990s, while mortality from bronchitis maintained its level (and even increased among males) during the 1980s (Fig. 12.38).

Far below these conditions, we find pneumonia, asthma and "other diseases of the respiratory system", all fairly close together. Trends in these have followed a somewhat downward path over the whole period, especially among females. In the previous age group, mortality from pneumonia was observed to be very sensitive to both alcohol consumption and the economic and social crisis of the 1990s. Among elderly people, however, it responded very little, though a slight fall, especially among males, can be observed at the time of the anti-alcohol campaign. The abrupt rise in

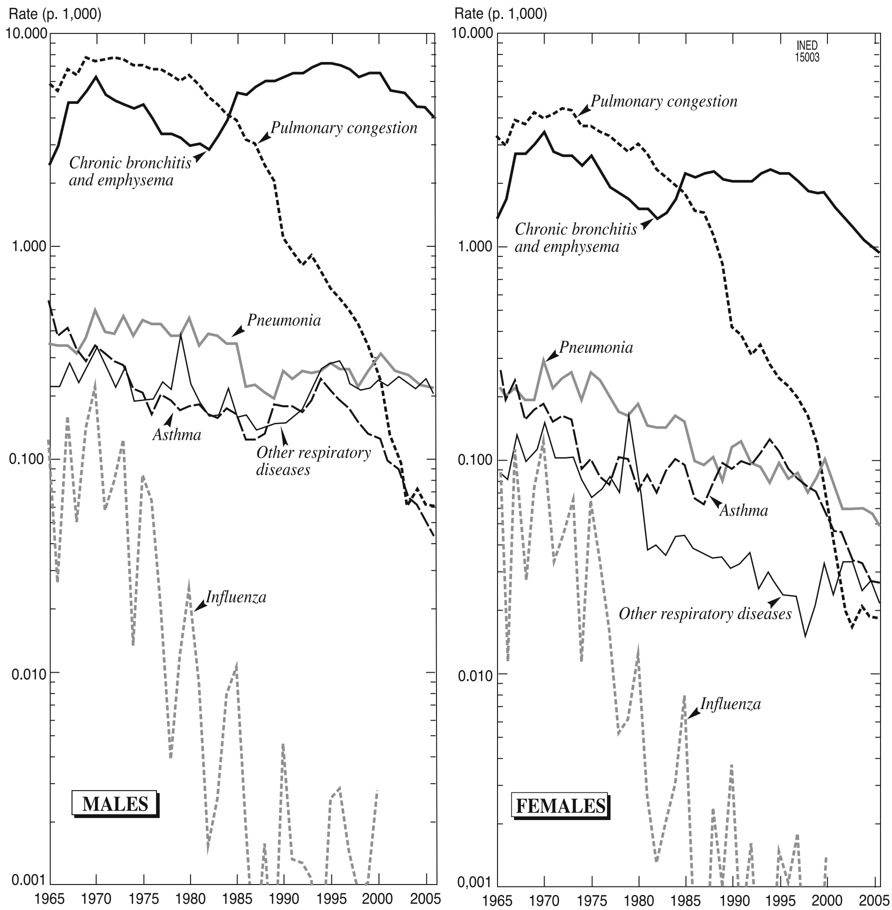

Fig. 12.38 Trends in standardized mortality rates for respiratory diseases, age 65 and over, since 1965

mortality from "other diseases of the respiratory system" observed in females in 1999 is certainly a construct linked to a change in coding practice, and a symmetrical effect is found on the curve for pulmonary congestion. This phenomenon is less visible among males, where "other diseases of the respiratory system" has different components.

Influenza, which at the start of the period occupied a fairly significant position in this age group, clearly demonstrates in Fig. 12.38 the strong fluctuations linked to its epidemic nature, before disappearing almost entirely from the picture at the end of the period. As everywhere in the world, this near-disappearance is closely linked to the widespread use of polyvalent vaccines from the 1970s onwards.

As in the previous age group, the infectious diseases category is very largely dominated by tuberculosis, which, at this age again, occupies a significant position in mortality in Ukraine (Fig. 12.39). In contrast, and in the reverse of the situation

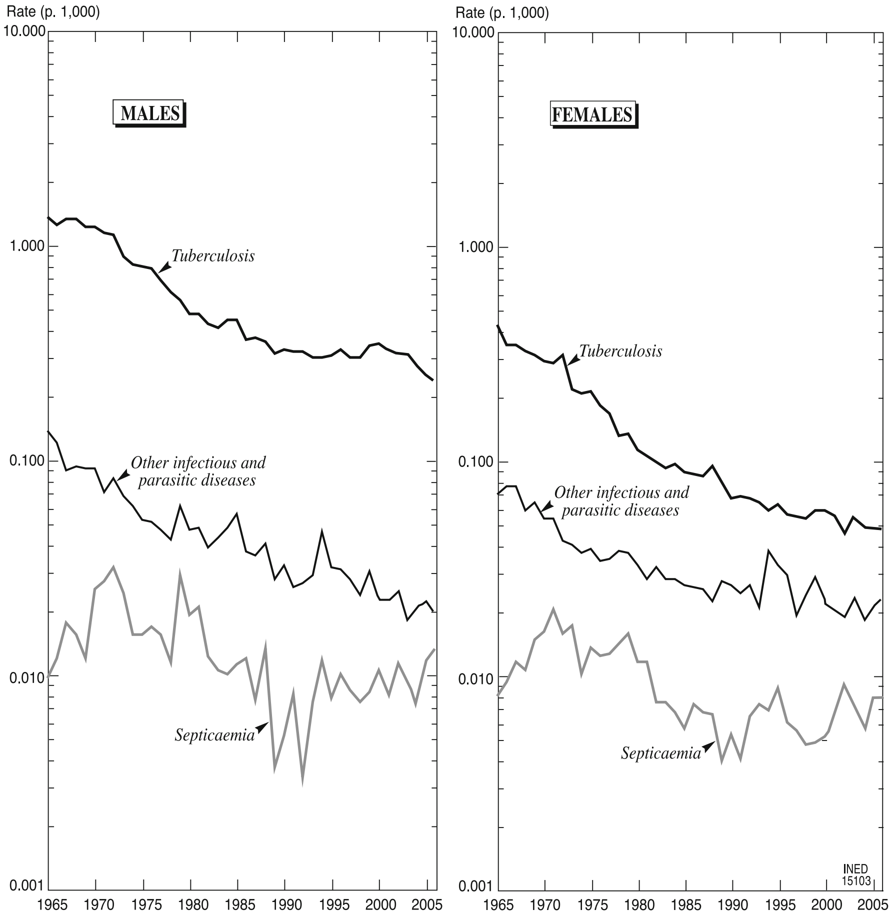

Fig. 12.39 Trends in standardized mortality rates for infectious diseases, age 65 and over, since 1965

at 40–64 years of age, the fall in mortality from tuberculosis was not followed by a fresh upsurge from the end of the 1980s onwards. It merely came to a halt in males and slowed down in females. As for pneumonia, here we see that the economic and social crisis in the 1990s did not have the impact on mortality among elderly people that one might imagine.

12.5.3 Cancers

Once again, here we can see that the great stability in mortality from cancers (compared to the other major groups of causes, Fig. 12.36) resulted from a combination of contrasting trends in different forms of cancer (Figs. 12.40 and 12.41).

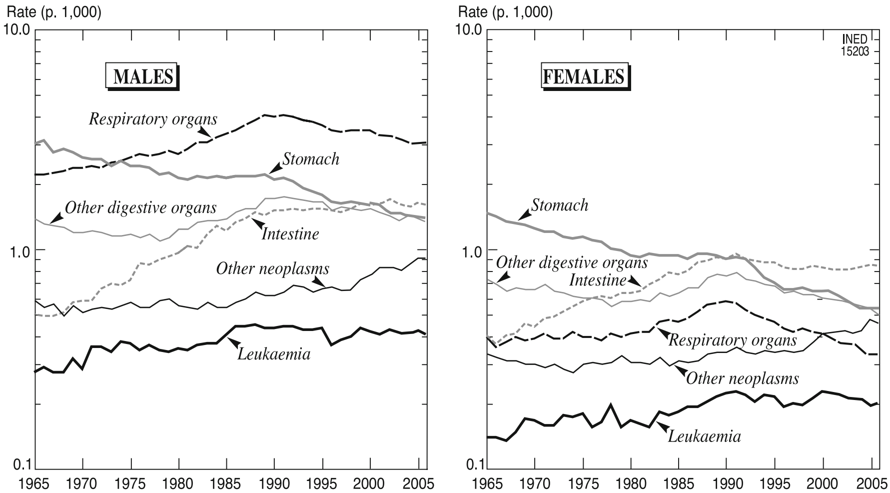

Fig. 12.40 Trends in standardized mortality rates for cancer (excluding breast and genitourinary cancers), age 65 and over, since 1965

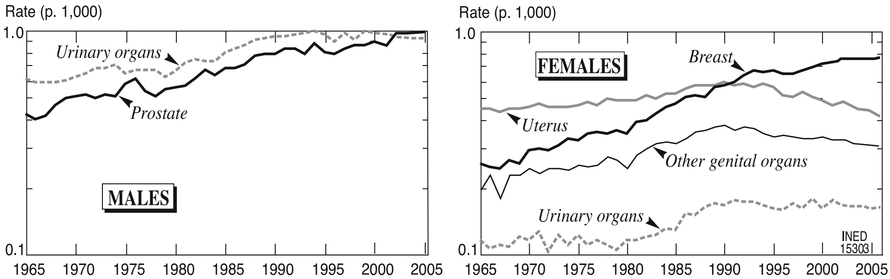

Fig. 12.41 Trends in standardized mortality rates for breast and genitourinary cancers, age 65 and over, since 1965

Firstly, at least among males, a fall in mortality from stomach cancer contrasted with rises in respiratory cancers and cancers of the intestine. Among females, since mortality from cancer of the respiratory organs took more of a downward turn than for males, the contrast is especially between stomach cancer and intestinal cancer. Since 1990 for females and 2000 for males, mortality from cancer of the intestine has exceeded mortality from stomach cancer. These two are the most notable digestive cancers: lying somewhere between them, all other cancers of the digestive organs have changed much less, but have tended to decline in recent decades; in the end, for both sexes, they have followed a trajectory very close to that of stomach cancers.

Since the early 1990s, there has also been a fall in mortality from respiratory cancer in this age group, even as the fall in mortality from stomach cancer has accelerated markedly, notably among females. In regard to the decline in mortality from respiratory cancers in the previous age group, we have already mentioned the reduction in risks linked to industrial pollution and to tobacco consumption, as the country's industrial fabric decayed and cigarette prices rose. We have also mentioned the effect of competition between cancer and the soaring mortality from other causes due to the crisis (Shkolnikov et al. 1999). This second explanation may come more to the fore here, if we take the view that lung cancer and stomach cancer had the greatest effect on the socially disadvantaged populations that were vulnerable to the crisis.

As in the 40–64 age group, mortality from prostate cancer among males aged 65 and above increased over the whole period. Mortality from cancer of the urinary organs also constantly increased until the mid-1990s, when it seems to have hit a ceiling. Nowadays, prostate cancer causes more deaths among males than all other genitourinary cancers (Fig. 12.41).

The strong contrast observed in the 40–64 age group between breast cancer and cancer of the uterus is found again in females aged 65 and over, albeit in a slightly different form. On the one hand, although mortality from breast cancer clearly increased between 1965 and 1990, it then stagnated somewhat; on the other hand, mortality from cancer of the uterus really only declined from the early 1990s, and before then it had even increased slightly. The divergence has always been and remains marked, even though the two trajectories crossed in the early 1990s. In 1965, mortality from cancer of the uterus was almost double mortality from breast cancer. In 2006, the reverse was true.

12.5.4 Deaths from Injury and Poisoning

After diseases of the respiratory system and cancers, two other major groups of conditions vie for fourth place in mortality: deaths from injury and poisoning and diseases of the digestive system (Fig. 12.36).

In order to facilitate comparison with the previous age group, in Fig. 12.42 we have represented the same groups of causes in the same way as those in Fig. 12.26.

Among the groups of causes identified in the 40–64 age group as being the most sensitive to both alcohol consumption trends and the economic and social crisis, the only one found here, at age 65 and over, that might really match this twofold criterion is the category of injuries where it cannot be determined whether they have been accidentally or purposely inflicted. Alcohol poisoning and homicide are still very closely linked to alcohol consumption, at least among males, but in this age group they appear to have been much less sensitive to the crisis in the 1990s. Homicide of females even appears to have been insensitive to changes in alcohol consumption. As for "other accidents", they were not strongly influenced by either alcohol consumption or the crisis.

The same goes for all the other groups of deaths from injury and poisoning shown in the second part of Fig. 12.42, with the exception of transport accidents, a category that was marked by the anti-alcohol campaign. In particular, it is astonishing that suicide, which is in fact by far the major external cause of death from injury and poisoning in males aged 65 and over, appears to be so insensitive to alcohol consumption.

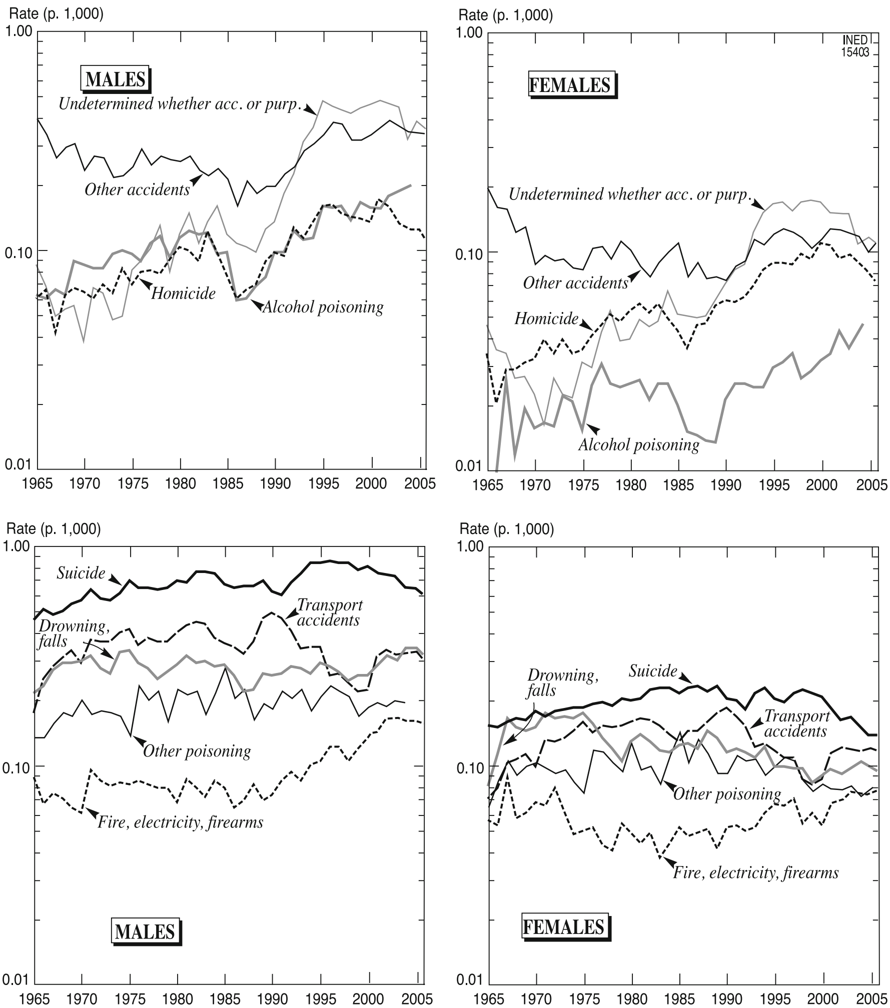

Fig. 12.42 Trends in standardized mortality rates: deaths from injury and poisoning, age 65 and over, since 1965

Finally, we should note that, at this age, the category "drowning and falls", which, in the earlier age groups, was largely dominated by drowning, is here divided equally between its two components and what is more, both show very monotonous trends.

12.5.5 Diseases of the Digestive System

Cirrhosis of the liver, while it remains the primary digestive cause of death in males, dominates this category much less than in the previous age group (Fig. 12.43). It has

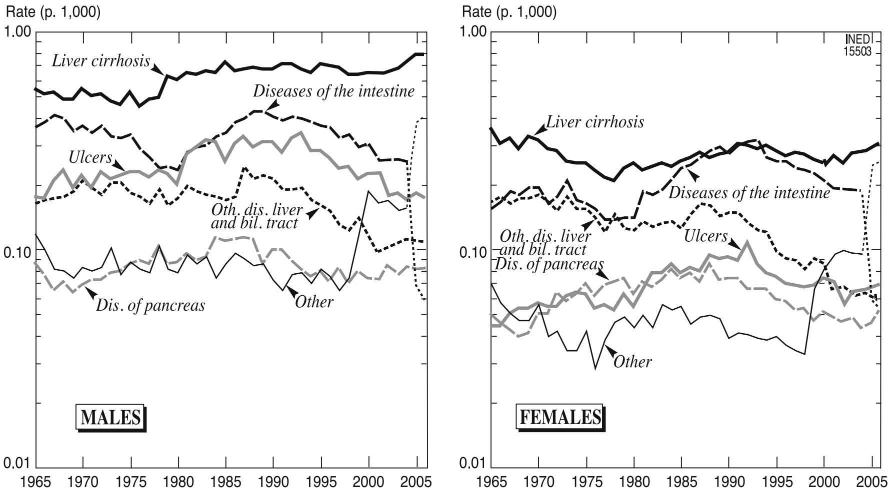

Fig. 12.43 Trends in standardized mortality rates for diseases of the digestive system, age 65 and over, since 1965

also followed very different trends: mortality from this cause has been relatively stagnant, as well as totally insensitive to trends in alcohol consumption, in total contradiction to the trends shown in Fig. 12.30.

On the other hand, diseases of the intestines were more important in elderly people, reaching second place for males and even drawing equal with cirrhosis of the liver for females.

As in the 40–64 age group, stomach ulcers occupied a significant position among males, and mortality from this cause has tended to increase for both sexes. However, at this age we do not find the male sensitivity to the crisis in the 1990s that we observed in the 40–64 age group.

12.5.6 Other Diseases

As in the previous age group, of all the "other diseases", only diseases of the genitourinary system, diseases of the nervous system and endocrine diseases played any significant role in mortality among the elderly (Fig. 12.44). Diseases of the genitourinary system were largely dominant among males up to the early 1990s, before declining strongly to the point where, at the end of the period, they were almost level with the other two groups. Among females, mortality rates from these three groups of conditions were situated fairly close together over the whole period.

Among genitourinary diseases, as one might imagine, hyperplasia of the prostate was dominant among males, at least up to the mid-1990s (Fig. 12.45). From then on, mortality from this condition started to decline steeply, to the point where it has now

Table 12.5 Causes of death at age 65 and over: groups of items used (with corresponding ICD-9 items) and trends in mortality rate between 1965 and 2006

Groups used	1995 Soviet Classification	ICD (9th Revision)	2005 Ukrainian Classification	Rate per 1000			
				Male		Female	
				1965	2006	1965	2006
Infectious and parasitic diseases	**1 to 44, 206**	**001 to 139**	**3 to 57**	**1.49**	**0.27**	**0.49**	**0.08**
Tuberculosis	9 to 13, 43	010 to 018, 137	11 to 17, 56	1.34	0.24	0.42	0.04
Septicaemia	25	038	29	0.01	0.01	0.01	0.01
Other infectious and parasitic diseases	1 to 8, 14 to 24, 26 to 42, 44, 206	001 to 009, 020 to 037, 039 to 138, 139	3 to 10, 18 to 28, 30 to 55, 57	0.14	0.02	0.07	0.02
Neoplasms	**45 to 67**	**140 to 239**	**59 to 104**	**8.91**	**11.48**	**4.46**	**4.40**
Malignant neoplasm of stomach	47	151	63	2.99	1.35	1.44	0.53
Malignant neoplasms of intestine and of rectum	48 to 50	152 to 154	64 to 67	0.50	1.57	0.40	0.81
Other malignant neoplasms of digestive organs	45, 46, 51	140 to 150, 155 to 159	68 to 72	1.39	1.30	0.73	0.49
Malignant neoplasm of respiratory organs	52 to 54	160 to 165	73 to 75	2.15	2.98	0.39	0.32
Malignant neoplasm of breast	57	174, 175	80	0.01	0.02	0.25	0.74
Malignant neoplasm of uterus	58, 59	179 to 182	81 to 83			0.45	0.40
Malignant neoplasms of other female genital organs	60	183, 184	84 to 86			0.20	0.30
Malignant neoplasm of prostate	61	185	87	0.42	1.05		
Malignant neoplasm of urinary organs	63	188, 189	89 to 91	0.61	0.91	0.12	0.16
Leukaemia and lymphomas	65, 66	200 to 208	99 to 103	0.27	0.41	0.14	0.20
Other neoplasms	55, 56, 62, 64, 67	170 to 173, 186, 187, 190 to 199, 210 to 239	59 to 62, 76 to 79, 92 to 98, 104	0.59	0.89	0.34	0.45

(continued)

Table 12.5 (continued)

Groups used	1995 Soviet Classification	ICD (9th Revision)	2005 Ukrainian Classification	Rate per 1000			
				Male		Female	
				1965	2006	1965	2006
Diseases of the circulatory system	**84 to 102**	**390 to 459**	**133 to 156**	**53.87**	**75.15**	**43.75**	**56.65**
Rheumatic heart diseases	84, 85	390 to 398	133, 134	0.67	0.06	0.66	0.09
Hypertensive disease	86 to 89	401 to 405	135 to 138	0.54	0.04	0.54	0.03
Atherosclerotic cardiosclerosis	92, 93	414.0	139, 140	31.73	41.75	25.89	31.33
Other forms of ischaemic heart disease	90, 91, 94, 95	410 to 413, 414.1 to 414.9	142	2.76	10.72	1.43	6.38
Other forms of heart disease	96, 97	415 to 429	141, 143	0.67	*1.60	0.52	*1.21
Cerebrovascular disease	98, 99	430 to 438	144 to 146	13.00	15.32	11.01	12.69
Other diseases of circulatory system	86 to 89, 100 to 102	440 to 459	147 to 151	4.50	5.66	3.69	4.92
Diseases of the respiratory system	**103 to 114**	**460 to 519**	**158 to 173**	**9.54**	**4.38**	**5.29**	**1.03**
Influenza	104	487	159	0.12	0.00	0.09	0.00
Pneumonia	105 to 107	480 to 486	160 to 163	0.35	0.21	0.22	0.05
Chronic bronchitis and emphysema	108, 110	490 to 492	165 to 166, 168, 169	2.44	3.88	1.34	0.91
Asthma	109	493	167	0.55	0.04	0.27	0.03
Pulmonary congestion	113	514, 515	171	5.82	0.06	3.25	0.02
Other diseases of respiratory system	103, 111, 112 and 114	460 to 478, 500 to 508, 510 to 513, 516 to 519	158, 164, 170, 172, 173	0.27	0.19	0.12	0.02
Diseases of the digestive system	**115 to 127**	**520 to 579**	**175 to 189**	**1.44**	**1.60**	**0.84**	**0.79**
Ulcer of stomach and duodenum	115, 116	531 to 533	175 to 177	0.17	0.17	0.04	0.07
Diseases of intestines	118 to 121	540 to 543, 550 to 553, 555 to 558, 560	179 to 182	0.36	*0.05	0.15	*0.05
Cirrhosis of liver	122, 123	571.0 to 571.3, 571.5, 571.6	183, 184	0.54	0.78	0.36	0.30

Other diseases of liver and of biliary tract	124, 125	570, 571.4, 571.8 to 573, 575.2 to 576	185 to 187	0.16	0.10	0.17	0.06
Diseases of pancreas	126	577	188	0.09	0.08	0.05	0.05
Other	117, 127	520 to 530, 534 to 537, 562 to 562 to 569, 578, 579 569, 578, 579	178, 189	0.12	*0.41	0.07	*0.25
Other diseases	**68 to 83, 128 to 157**	**240 to 389, 580 to 779**	**106 to 108, 110 to 113, 115 to 118, 120 to 128, 130, 131, 190, 192 to 195, 197 to 205, 207 to 215, 217 to 226, 228 to 236, 239**	**1.55**	**0.90**	**0.61**	**0.60**
Endocrine diseases	68 to 72	240 to 289	106 to 108, 110 to 113	0.11	0.18	0.13	0.20
Diseases of the nervous system and mental disorders	73 to 83	290 to 389	115 to 118, 120 to 128, 130, 131	0.42	0.31	0.28	0.18
Diseases of the genitourinary system including:	128 to 134	580 to 629	197 to 205	0.94	0.36	0.14	0.15
nephritis and glomerulonephritis	*128, 129*	*580 to 589*	*197 to 199*	*0.17*	*0.02*	*0.09*	*0.02*
infections of kidney	*130*	*590*	*200, 201*	*0.08*	*0.16*	*0.02*	*0.10*
hyperplasia of prostate	*133*	*600*	*204*	*0.57*	*0.11*		
other	*131, 132, 134*	*591 to 599, 601 to 629*	*202, 203, 205*	*0.13*	*0.07*	*0.02*	*0.04*
Other diseases	135 to 141, 142 to 157	630 to 676, 680 to 779	190, 192 to 195, 207 to 215, 217 to 226, 228 to 236, 239	0.08	0.06	0.06	0.07
Deaths from injury and poisoning	**160 to 176**	**800 to 999**	**242 to 258**	**1.66**	**2.47**	**0.70**	**0.80**
Transport accidents	160 to 162	800 to 848	242 to 248	0.17	0.31	0.07	0.12
Drowning and falls	166, 168	880 to 888, 910	249, 250	0.21	0.31	0.08	0.09
Accidental alcohol poisoning	163	850 to 869	252	0.06	**0.19	0.01	**0.04

(continued)

Table 12.5 (continued)

Groups used	1995 Soviet Classification	ICD (9th Revision)	2005 Ukrainian Classification	Rate per 1000 Male 1965	Male 2006	Female 1965	Female 2006
Accidental poisoning by other substances	164	850 to 869		0.13	**0.19	0.06	**0.07
Accidents caused by fire, electric current or firearm	167, 170, 171	890 to 899, 922, 925	251	0.09	0.15	0.06	0.08
Suicide	173	950 to 959	253	0.46	0.59	0.15	0.14
Homicide	174	960 to 978	254	0.06	0.11	0.03	0.07
Death from injury undetermined whether accidentally or purposely inflicted	175	980 to 989	255	0.09	0.35	0.05	0.11
Other accidents	165, 169, 172, 176	870 to 879, 900 to 909, 911 to 921, 923, 924, 926 to 949, 990 to 999	256 to 258	0.40	0.33	0.20	0.11
Total for all causes	**1 to 176, 206**	**001 to 999**	**3 to 57, 59 to 104, 106 to 108, 110 to 113, 115 to 118, 120 to 128, 130, 131, 133 to 156, 158 to 173, 175 to 189, 190, 192 to 195, 197, to 205, 207 to 215, 217 to 226, 228 to 236, 239, 242 to 258**	**78.47**	**95.24**	**56.14**	**64.35**

* These rates doubtful, as consistency could not be ensured in the transition from the previous Classification
** Given for 2004, since the last revision of the list produced no corresponding category in 2005 and 2006

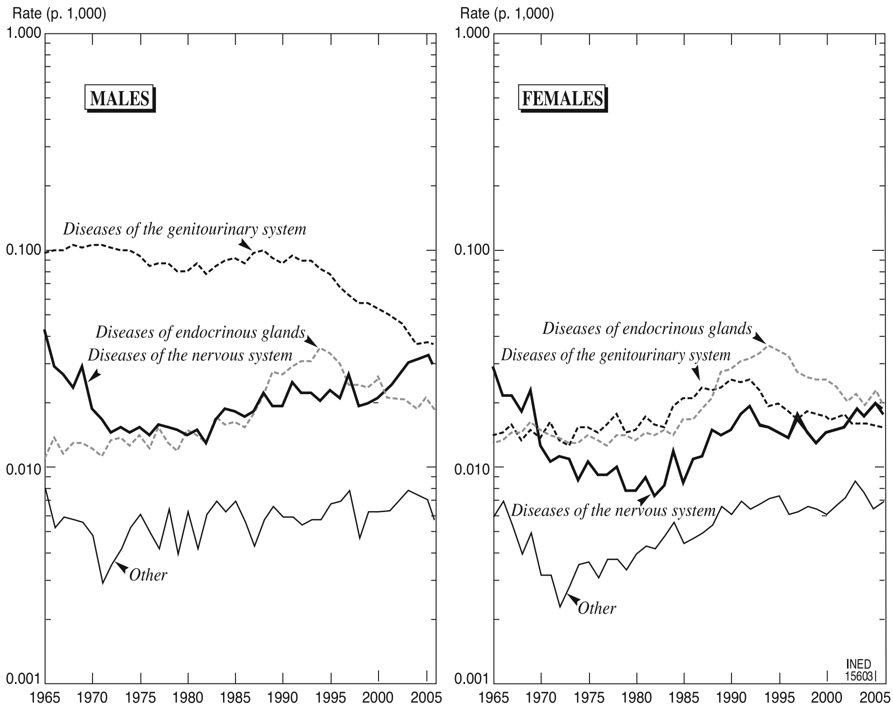

Fig. 12.44 Trends in standardized mortality rates for other diseases, age 65 and over, since 1965

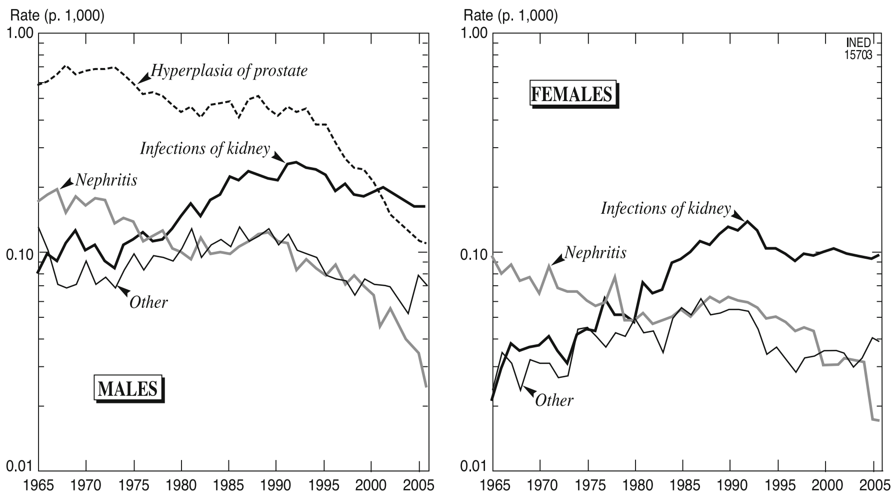

Fig. 12.45 Trends in standardized mortality rates for diseases of the genitourinary system, age 65 and over, since 1965

been overtaken by kidney infections, which increased a great deal until the mid-1990s. Among females, mortality from kidney infections, which also increased greatly over the same period, is nowadays by far the largest component of this group.

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Chapter 13
Conclusion

France Meslé and Jacques Vallin

Over the course of the twentieth century, Ukraine was confronted with two very different types of major health crises. Firstly, in the 1930s and 1940s it experienced very heavy losses as a result of famine, war and political turmoil. The immediate consequences of these appalling setbacks were so severe that life expectancy at birth in some years fell to unimaginably low levels: in 1933, at the height of the Great Famine, 11 years for females and just 7 years for males. Yet, each time, these large-scale crises remained very circumstantial in nature, like those of the more remote past. Once the crisis had ended, health trends followed their previous course again and, in the twentieth century, mortality declined steeply. In contrast, from the mid-1960s onwards, a new type of crisis arose, bringing a lasting reversal of past trends: the increase in life expectancy for females came to a complete halt, and male life expectancy declined strongly year on year.

As we have seen, the major fluctuations of the 1980s and 1990s were merely additional manifestations around this new, generally unfavourable trend, since they were entirely due firstly to the anti-alcohol campaign and then to the abrupt transition to a market economy. On the other hand, the new reduction in life expectancy noted over the very last years of the century indicates that – despite the confusion resulting from these fluctuations – the long-term trend remains a deteriorating one.

Our cause-of-death analysis in the third part of the book amply demonstrates the dominant role played in this long-term deterioration by alcoholism, diseases of the circulatory system and deaths from injury and poisoning. In reality, Ukraine, like the other countries of the former USSR, has been as yet incapable of moving beyond control of infectious diseases. As far as the latter are concerned, in three decades Ukraine succeeded in completely catching up with Northern Europe and Western

F. Meslé (✉) • J. Vallin
Institut National d'Études Démographiques, Bd. Davout 133, 75980 Paris Cedex 20, France
e-mail: mesle@ined.fr; vallin@ined.fr

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Europe, which it had lagged behind since the beginning of the century; in doing so, it was following exactly the epidemiologic transition pattern put forward by Abdel Omran (1971). But from the mid-1960s, it seems to have continued to conform to this pattern, whereas Western countries were contradicting Omran's theory. At the end of the 1960s, he thought that health improvements would hit two major barriers. Firstly, the dramatic fall in infectious diseases placed degenerative diseases (mainly cancer and diseases of the circulatory system) squarely in the foreground, and any reduction in these in the near future seemed improbable. Secondly, a certain number of perverse effects resulted from economic development and social changes, leading to the rise of what Abdel Omran called "man-made diseases": alcoholism, smoking, road traffic accidents, etc. But, contrary to this theory, from the late 1960s Western countries entered a period in which they not only brought 'man-made' diseases under control but also reduced diseases of the circulatory system and even some cancers, thus creating a new transition phase that was totally absent from Omran's theory. We believe it is preferable to refer to this as "the second stage of the health transition" (Vallin 1993; Meslé and Vallin 2000; Vallin and Meslé 2004) – rather than as a "fourth stage of the epidemiologic transition", as Jay Olshansky and Brian Ault (1986) do; and it is this new stage that Ukraine, like its neighbours in the former USSR, has as yet been unable to embark upon.

The new stage requires – much more than the previous one, in fact – a health strategy based not only on technological progress and its dissemination (as was the case with vaccines or antibiotics) but also on populations themselves taking responsibility for their health, notably through behavioural changes – for example, in the area of food or in monitoring risk factors. Quite obviously, Soviet society, which was hypercentralized and had almost completely quashed the spirit of initiative, was not prepared to adopt this type of strategy, and this probably explains the crisis in the Soviet health system from the mid-1960s onwards, at a time when Ukraine no longer had any cause to envy Western countries their victory over infectious diseases. One might expect that, with the fall of the Soviet empire and the transition to a market economy, health policies would start to move in this direction and that life expectancy trends would take an upward turn, at least after a certain length of time.

This is certainly what happened in several Central European countries, though it is true that they had seen a less severe long-term decline. In the Czech Republic and Poland from the early 1990s, then in Hungary and Slovakia from the middle of the same decade, life expectancy started to rise again (Vallin and Meslé 2001). And, at least in Poland and the Czech Republic, this revival derived very significantly from the reduction in mortality from diseases of the circulatory system, which heralded a new era of lasting improvements (Meslé and Hertrich 1997; Meslé 2004). Within the countries of the former USSR itself, it seems that the Baltic states might have recently entered a similar phase (Hertrich and Meslé 1999; Meslé 2004). On the other hand, no such pattern is as yet on the horizon in Ukraine, and even less in Russia (Meslé et al. 1998). Both these countries obviously still face a major challenge for the future: will they continue to see life expectancy decline, or will they finally succeed in starting to improve again by creating not only an environment in which new ways of combating ‘man-made’ and chronic diseases will be able to develop, but also the behavioural changes required for these to succeed?

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