A New Estimate of Ukrainian Population Losses during the Crises of the 1930s and 1940s

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Abstract. Ukraine experienced two very acute demographic crises during the Soviet era: the 1933 famine and the Second World War. While different estimates of total losses have been produced previously, we have tried here to distinguish the specific impact of the crises on mortality from their impact on fertility and migration. Taking into account all existing sources of registered data and estimates, a painstaking reconstruction of annual demographic changes has been produced and complete annual life tables have been computed for the years 1926–59. Life expectancy at birth fell to a level as low as 10 years for females and 7 for males in 1933 and plateaued around 25 for females and 15 for males in the period 1941–44.

INTRODUCTION

Paradoxically, while improvements in health accelerated across twentieth century Europe, Ukraine seemed to revive the dramatic crises of the past. Indeed, of all the Republics of the USSR, this country was one of the most severely hit by the series of disasters that struck the Soviet Union: – the 1917–20 civil war, followed by the famine of 1921–23 (especially in Southern Ukraine), the great famine of 1933 after the collectivization of agriculture, World War II and the German invasion, the 1947 famine, successive waves of repression, and the massive deportations of the 1930s and 1940s.

Soviet catastrophes have long been a taboo subject, even for scientific research. From 1931 to 1954 no vital statistics were published at all. The scant global indicators made available were modified, if not falsified. In particular, the results of the 1937 Census, giving a total population much lower than expected, were considered unreliable, and dismissed. Their authors were declared 'enemies of the people' and prosecuted. A new census was organized in 1939 but, as it confirmed the previous one, its results were falsified before publication (Blum 1994).

Perestroïka brought free access to archives. Many unpublished documents and statistics previously kept hidden from researchers and the public were progressively released. In the late 80s, an article by Victor Tsaplin (1989) gave a first statistical view of the demography of the 1930s. One or two years later, the systematic computation and publication of 1937 Census data, undertaken by researchers at Goskomstat and the Russian History Institute of the Russian Academy of Sciences, shed fresh light on

the all-USSR demographic situation (Zhiromskaja et al. 1996). For Ukraine, Serhii Pyrozhkov (1996) published, in the 1990s, initial estimates of the total losses of the 30s and 40s. None of these estimates, however, allow the total population losses to be divided into the parts due to birth deficits, migration flows, and excess mortality during crises.

We therefore embarked on a painstaking effort to reconstitute the different factors responsible for the huge demographic fluctuations that have struck Soviet Ukraine. The fruits of our work were eventually estimates of the annual changes in Ukrainian mortality rates by sex and age during the years 1926 to 1959.

Starting from the Census populations of 1926, 1939, and 1959, as well as from any existing data on births, deaths, and migrations (our sources included official records, studies of under-registration, collations of historical works on voluntary or forced migrations, gulags, and deportation camp statistics), we estimated the three components of the population changes in several steps.

We first made a reconstruction of annual data between 1926 and 1939, including data for the great famine and the political crisis years of the 1930s. We then proceeded to do the same for the years between 1939 and 1959, including World War II and the 1947 famine.

1. ESTIMATING THE VARIOUS LOSSES OF THE 1930S

We first re-estimated total losses by comparing the projection of the initial population, on the basis of assumed fertility and mortality trends with no crisis, to the population registered at the following census. We then repeated the projection using

observed fertility (corrected for under-registration where necessary) to identify the specific effect of birth losses. From this projection, we removed the estimated migration flows by sex and age from all existing sources, and thus inferred the losses attributable to excess mortality during crisis years.

A) Total losses

The first step was to perform a comparison for each birth cohort between the population observed at the 1939 Census and the expected population at the same date according to a projection of the 1926 Census population on the basis of estimated fertility and mortality rates without crisis, and no migration. That entailed making various assumptions, including the assumption that it is possible to rely on the quality of the 1926 and 1939 Censuses. According to different authors, and in spite of the doubts frequently raised about the Soviet data, the census results kept in archives seem to be quite good (Adamets et al. 1994; Blum 1994). Indeed, like many other censuses of the time, these Soviet ones were somewhat affected by age heaping caused by the incompleteness of birth registration in the past. For 1926, we used the type of adjustment already used for Russia (Adamets et al. 1994). For the 1939 Census, which was much less affected, we simply used a three-year moving average (Figure 1). Both the 1926 and 1939 pyramids are severely affected by the birth deficit caused by the 1917–20 civil war, while that of 1939 is even more deeply marked by that of the great famine of 1933. (The population by single year of age produced from the 1939 Census was not available in the Ukranian archives but, thanks to Evgueni Andreev, we finally obtained it from the Moscow Goskomstat.)

To estimate mortality in the absence of crisis, we interpolated age-specific and sex-specific rates between the periods 1926–27 and 1938–39, assuming that in normal times mortality would have decreased evenly over the period. For 1926–27, we used the life table already calculated by S. Novosselskij and V. Paevskij (1930), as corrected by Serguei Adamets and Vladimir Shkolnikov (1995), to account for under-registration of deaths at early and late ages. For 1938–39, no complete life table was available. We therefore calculated age-specific death rates from the census population and the registered deaths of 1938–39. To allow for under-registration of deaths, we corrected infant mortality rates and mortality at old ages. For infant mortality, we increased the rate by five per cent to take into account both the systematic omission of neonatal deaths owing to the definition of 'live birth' in use at

the time and deficiencies in the coverage of the registration system. The problems are not specific to the 1930s and have been dealt with elsewhere (Meslé and Vallin forthcoming, chapter 3). For older ages, a procedure of adjustment according to model life tables similar to that used by Adamets and Shkolnikov (1995) for 1926–27 was applied. The results showed that Ukrainian life expectancy at birth increased from 42.9 years for males and 46.3 for females in 1926–27 to 47.8 and 52.6 respectively in 1938–39. By applying interpolated age-specific death rates to the 1926–27 population by sex and age, we obtained expected numbers of people surviving in 1939, for each cohort. It then remained to apply the corresponding mortality rates to the children born during the period, after calculating births.

In calculating expected births for the years 1926–38 assuming no crisis, it is not possible simply to interpolate fertility rates between 1926–27 and 1938–39. Indeed, it is clear from the statistics that, after correction for under-registration, fertility rates were declining steadily before the crisis but rose again after the crisis to much higher levels than those of 1931. The corrected global fertility rate (ages 15–49) declined from 157 per 1000 in 1927 to 117 in 1931, but after the crisis, in 1936, it was 130. The decrease observed in the 1920s is quite comparable to what happened not only in other ex-USSR republics but also in neighbouring countries such as Poland, Czechoslovakia, Romania and Bulgaria. We could have concluded, therefore, that, in the absence of crisis, such a trend would have continued. However, the sharp rise which followed the crisis cannot be explained simply as a recovery effect. It is also due to a change in population policy, including the 1936 ban on abortion, a decision which might have been taken even without the crisis. We therefore chose to keep fertility constant at its 1931 levels until 1938. To determine the numbers of births during the years 1932–38, we used estimates of the number of women at ages 15–49 obtained by reconstitution of the 1939 population by age on the basis of the interpolated mortality rates. We then applied to the births of the years 1926–38 the expected mortality rates to complete the estimation of the expected 1939 population without crisis.

In total, in the absence of crisis, the 1939 population would have been 35.5 million inhabitants instead of the 30.9 million observed at the 1939 Census. In other words, some 4.6 million people were missing. This gap gives a rough estimate of the net effects of exceptionally lower fertility and higher mortality during the crisis, but also of migration. This result is very consistent with the figure of 4.5 million found earlier by Serguei

Figure 1. Ukraine age pyramids at the 1926 and 1939 Censuses, before and after correction for age heaping
Source: Censuses of 1926 and 1939

Maksudov (1989). But it is somewhat lower than an estimate made by Serhii Pyrozhkov (1996), according to which as many as 5.8 million were missing for the period 1926–39. The main reason for the difference is probably the fact that the latter study used model fertility curves to estimate births instead of using expected births based as much as possible on actual observations. This procedure is likely to have resulted in an over-estimate of the effect of the crisis on fertility. The intention of avoiding this problem was one of our main reasons for trying to estimate the three components of the total losses.

B) *Effect of birth losses*

We know from the statistics of the time the total numbers of births registered from 1928 to 1932 and

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Table 1. *Contribution of crisis mortality and fertility to total Ukrainian losses during the 1930s, by sex*

Observed and expected population and losses	Numbers (thousand)		
	Males	Females	Total
Population			
Observed at the 1939 Census (1)	14753	16193	30946
Expected given mortality and fertility without crisis (2)	17373	18142	35515
Expected given mortality without crisis and after correction of registered births (3)	16833	17625	34458
Losses			
Total (2) – (1), of which	2620	1949	4569
Due to forced out-migration (4)	563	367	930
Due to crisis mortality (or to voluntary net out-migration) (3) – (1) – (4)	1516	1066	2582
Due to the birth deficit (2) – (3)	540	517	1057

Source: Calculations based on Censuses of 1926 and 1939, registered births and deaths, and migration data from various sources.

the numbers by sex from 1924 to 1927 and from 1933 to 1939. We corrected these series for under-registration, simply by adding to them the estimated non-registered infant deaths. In fact, we have probably slightly underestimated the actual numbers of births in order not to overestimate subsequently the impact of the crisis on mortality. To reconstruct complete series by sex, we applied the mean sex ratios at birth for 1924–27 and 1933–36 to the total for 1928–32.

We then recast the projection using these actual births instead of the expected ones. The new projection gives a total population of 34.5 million for 1939. The difference of 1.0 million from the first projection is an estimate of the net impact of exceptionally low fertility during the crisis. However this estimate is significantly less than the difference actually observed between registered births (after correction) and expected births (1.4 million). This is mainly due to the fact that, even with normal survival rates, a proportion of the births prevented by the crisis would have died before the 1939 Census.

The net effect of crisis conditions on fertility is approximately the same for both sexes, with only a few more males than females (540,000 against 517,000), which correspond exactly to a classical sex ratio at birth of 1.05 (Table 1).

The remaining difference of 3.5 million is the consequence of both exceptional mortality and net out-migrations.

C) Effects of migration and estimation of exceptional mortality

Two types of migrations must be distinguished: forced migrations related to political measures (displacement of families, deportation to gulags, etc.) and voluntary migrations.

Quite plentiful and reliable sources exist that can be used to estimate forced migrations. Victor

Zemskov (1990, 1991a and b) compiled these sources for all-USSR and produced estimates for Ukraine. Using all available data, it is estimated that about 400,000 people were displaced and 530,000 deported to gulags. This total of 930,000 persons was divided into 563,000 males and 367,000 females, according to the sex distributions given by archives for some groups of forced migrants (Table 1).

It is much more difficult to evaluate net voluntary out-migrations precisely. According to a 1937 report by TsUNKhU (Central Direction for National Economy and Accounting), net out-migration would have totalled 1.3 million between 1926 and 1936. However, in the absence of any statistics for the period, it is not possible to have much confidence in the estimate. First, although not expressly stated, the number obviously includes forced migrations. Furthermore, we suspect it was inflated in a bid to hide the excess mortality due to the crisis. In fact actual voluntary migrations were probably quite low, since not only did the soviet system very strictly control any individual move (especially with the introduction of local passports for towns in 1932) but also because better places to live that were in reach were very scarce. We finally concluded that net voluntary migrations would be better considered as around zero during this period (Meslé and Vallin forthcoming).

As a result, 0.9 million must be subtracted from the 3.5 million arrived at above, which means that the mortality effect of the crisis seems to account for 2.6 million of the total losses over the period 1927–38. It is true that, for consistency's sake, the out-migration effect should have been reduced before doing this reduction, since a share of out-migrants died before the 1939 Census. But having assumed zero voluntary migration, the crude estimate of forced migration can be considered as compensating for the latter.

Table 2. *Registered deaths, and expected deaths, from 1927 to 1938, by sex (thousands)*

Year (a)	Forward projection from 1926 (b)	Back projection from 1939 (c)	Adopted estimation (d)	Deaths registered by registrar's office (e)	Non-registered deaths without crisis (f)	Non-registered deaths due to the crisis (g)	Corrected deaths (h)	Difference (d)-(h)
Total								
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	2104	22	457	2583	-2172
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	-1
Total			5743	7405	392	529	8325	-2582
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	288	23		311	-20
1931	282		282	274	21		295	-13
1932	265		265	368	18	16	402	-137
1933	241	179	210	1284	11	171	1467	-1257
1934	225	181	181	242	10	10	262	-81
1935	230	191	191	179	10		189	2
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			2987	4099	207	198	4503	-1516
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	1117	-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
Total			2756	3306	185	331	3822	-1066

Source: Calculations based on Censuses for 1926 and 1939 and registered deaths.

D) Annual life tables for 1926–39

Registered deaths by sex and single year of age are available for each year, from 1933 to 1938. For 1928–32, only the total deaths are available but we also have data for the natural growth by sex.

For the years 1928–32, we first distributed total deaths by applying to births the mean sex ratio at birth observed in 1924–27 and 1933–36 and then subtracting from these births the natural growth by sex to obtain deaths by sex.

1. Estimating under-registration of deaths.

Table 2 summarizes our annual estimates of deaths in Ukraine for 1927–38. Column d gives the expected numbers of deaths obtained by applying death rates without crisis to actual population numbers

(which include the effects of the crisis). The latter populations are the previously projected populations for the years 1927–32 while for 1934–38 they have been produced by back projection from the 1939 Census. For 1933 we took the mean of forward and back projections. If we compare the 2.6 million deaths mentioned above with the difference (1.7 million) between the 7.4 million registered deaths (Table 2, column e) and the 5.7 million deaths expected in the absence of crisis (Table 2, column d), the total number of non-registered deaths in the period 1927–38 can be estimated at 0.9 million. A proportion of these 0.9 million unregistered deaths is attributable to the usual under-registration affecting any year even without crisis. To estimate the number of deaths that would have been missed by the registration system without crisis, we have compared the results of previous expected deaths with those of a new computation using interpolated life tables uncorrected for under-registration (Table 2, column f). The total number of these deaths is 390,000, while the rest (530,000) are attributable to under-registration due specifically to the crisis. The latter have therefore been distributed among the three crisis years (1932–34), according to the proportions observed for the registered crisis deaths (Table 2, column e – column d). The results are shown in column g of Table 2. Adding unregistered deaths in both categories (columns f and g) to registered deaths (column e) gives final numbers of deaths for each of the years 1927–38 (column h). The last column of Table 2, obtained by subtracting corrected deaths from expected ones, again shows the total of 2.6 million for the period 1927–38. It also displays slight variances for the normal years (owing to the imprecision of the method) but it is clear that most of the total difference refers to the three crisis years.

Exceptional under-registration of deaths due to the crisis appears much higher for females (331,000) than for males (199,000). Indeed it is possible that under-registration, especially for young children and old people, is higher for females. The only other possible explanation would be that our assumption of zero voluntary migration was invalid and needed to be replaced by a hypothesized in-migration of men or out-migration of females. But such possibilities seem to us rather unrealistic, and would also imply that the excess mortality of males was much higher than it already appears to be in our results.

Finally Table 2 gives the two items of information that will allow us to distribute crisis deaths by age: corrected deaths (column h) and deaths not registered because of the crisis (column g).

2. Redistribution of deaths by age.

For the years 1927–31, we simply applied the age distribution of the expected deaths obtained from the forward projection to the total numbers of corrected deaths.

For 1935–38, registered deaths are available by age. However, the age structure of non-registered deaths is unknown but very unlikely to be similar to that of registered deaths. We therefore chose to repeat the procedure used for the years 1927–31, applying to total deaths the age structure of the deaths obtained from the back projection.

For the crisis period, registered deaths are also available by age for two years (1933 and 1934). For these two years, expected deaths can be subtracted from registered deaths to reveal the age structure of crisis mortality. But as the result would ignore excess infant mortality, it is not realistic. Even if, as can be presumed, breastfed babies were less affected than others by the famine, it is most unlikely that such a crisis had no impact at all on infant mortality. This type of crisis had become so rare in contemporary Europe that comparable cases are hard to find. It is, however, possible to refer to the 1868 Finnish famine, the closest case that is comparable in scale. The comparison led us to conclude that an excess infant mortality of 100 per cent was quite reasonable. In Finland, the rate of infant mortality during the famine was 50 per cent higher than the normal rate (Pitkänen 1993), while the crude death rate was three times higher than the usual one (SGF 1907). Since Ukraine's crude death rate was five times higher in 1933 than in 1931, a 100 per cent excess infant mortality due to the crisis seems an acceptable estimate. We used this special rate to calculate infant deaths, and distributed the rest according to the age distribution of the registered deaths due to crisis mortality at the other ages. We thus obtained, for 1933, the age-specific mortality rates shown in Figure 2, which can be compared with those of 1868 in Finland. It is probably better to adjust the result at ages 1–4 also. In fact we used specific rates of under-registration for ages 1 to 4 in line with that of age 0.

Figure 3 compares the impact of the 1933 Ukrainian famine with that of the 1868 Finnish famine. For Ukraine, the age-specific rates for 1933 are divided by those for 1931, while the Finnish rates for 1868 are divided by those for 1861–65 (Pitkänen 1993). Excess mortality during the crisis appears much higher in Ukraine than in Finland. This is due to the fact that the Finnish famine came at a time when current mortality was still much higher than it was 70 years later in Ukraine. This is
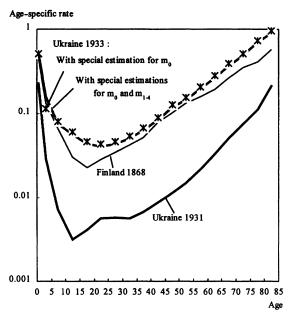
Age-specific rate

Figure 2. Estimated age-specific mortality rates of males in the Ukraine for 1933 compared with those for 1931 and with Finnish rates for 1968.
Source: Finland: Pitkanen 1993. Ukraine: As for Table 2
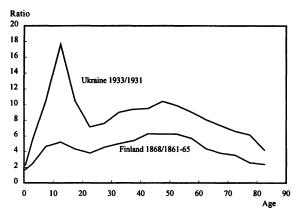
Ratio

Figure 3. Crisis mortality: Excess mortality of males in Ukraine, 1933 compared with that of Finland, 1868.
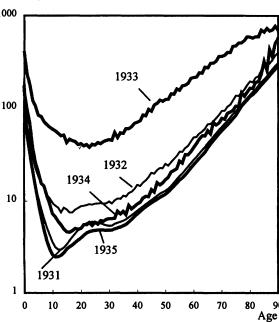*Source*: As for Table 2

Mortality rates (per 1000)

Figure 4. Age-specific mortality rates of males for the crisis years compared to those of 1931 and 1935
Source: As for Table 2

particularly true for adolescents, those in the age group who drew the most benefit from the health transition. Thus, the Ukrainian mortality rate for males around age 14 is 18 times higher in 1933 than it was in 1931.

At every age between 5 and 70 years, the 1933 rates are at least 7 times higher than those of 1931. As in Finland, excess mortality of adults in Ukraine peaks around age 50.

For 1934, the number of non-registered deaths is relatively low and the age distribution was similar to that of non-registered deaths for 1933. The year 1932 presents a more problematic case, since no age distribution is available for registered deaths. All we have is the age distribution of expected deaths from the projection. We cannot simply use the 1933 distribution to redistribute by age the 243,000 deaths due to crisis mortality, because the number of births halved from 1932 to 1933. We therefore first estimated the number of infant deaths in 1932 by applying to 1932 the 1933 ratio of excess infant mortality due to the crisis to total crisis mortality. This yields an excess infant mortality due to the crisis of 33 per cent for males and 32 per cent for females. The other deaths due to excess mortality during the crisis were redistributed as for 1933.

3. Constructing tables

To compute mortality rates from these age-specific estimates of deaths, we used the forward projected population by age for 1927–33, the back projected population for 1935–38 and, finally, the mean of forward and back projections for 1934.

Figure 4 shows mortality rates of males for the three crisis years compared with rates for the two normal surrounding years (1931 and 1935). These curves appear quite classical and steady until the older ages, which indicates that our estimates are acceptably reliable. The gap between the 1933 curve (and to a lesser extent the curves for 1932 and 1934) and the 1931 or 1935 curves gives an idea of the scale of the Ukrainian famine of the 1930s.

From 1927 to 1931, although there were slight

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Table 3. *Estimated trends in life expectancy at birth 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	10.8
1934	37.5	42.0
1935	46.4	52.8
1936	47.6	53.0
1937	46.2	51.9
1938	47.9	52.7
1939	47.7	52.5

Source: Calculations based on the results of the study

Life expectancy at birth (years)

Figure 5. Estimated trends in life expectancy at birth from 1927 to 1939
Source: As for Table 2

fluctuations, life expectancy at birth was relatively stable, rising from 43.3 years to 43.5 for males and from 46.8 to 47.9 for females (Table 3 and Figure 5). This period of stability was interrupted by a sharp 9-year drop in 1932, and a further fall of 28 years in 1933. In that year it fell to 10.8 years for females and even to 7.3 years for males!

These may seem grossly overstated figures. We think not. On the one hand, on the basis of rates computed just from registered deaths and our population estimates, life expectancy at birth in 1933 would have already been low at 12.2 for males and 19.5 for females. Distributing non-registered deaths by age, unadjusted for infant deaths, would then have given a life expectancy of 10.3 and 14.0, respectively. We saw earlier how necessary these two corrections are to provide acceptably consistent data. On the other hand, following the estimates made by Andreev et al. (1998) for Russia (15.2 years for males and 19.5 for females) and by the same authors (Andreev et al. 1992) for all-USSR, a level of under 10 for males and around 10 for females was easily foreseeable, since among all the USSR republics, Ukraine paid the highest price for the terrible famine of 1933.

Ukrainian life expectancy was still abnormally low in 1934 but peaked in 1935–36. That is common in a post-crisis period: those remaining after the crisis are even more likely to survive in the conditions that follow it.

II. ESTIMATING ANNUAL MORTALITY BETWEEN 1939 AND 1959

In estimating mortality trends between the 1939 and 1959 Censuses, two different problems must first be addressed (and are addressed in section A) before we undertake for the 1940s (section B) the
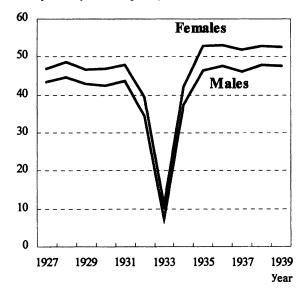
same type of exercise that we have completed for the 1930s.

A) A preliminary step

We cannot proceed directly with the 1940s in the same way as we did for the 1930s. During and after World War II, Ukrainian territory changed dramatically, while the 20-year lapse between the two consecutive censuses is too long to permit the use of the same method we used for the 1930s.

1. Territorial changes.

Between the 1939 and 1959 Censuses, the Ukrainian population increased by 11 million people, from 30.9 million (RAN 1992) to 41.9 (TsSU 1962). However, this sizeable increase is only virtual since in the meantime Ukraine had acquired new, much larger, and more populous territories than those it had lost. We therefore had to collect and use all available data for both population and vital events for the country's expanded territory.

Population. Large swathes of Polish territory were annexed to Ukraine in 1939 under the Germano-Soviet pact (the voivodies of Lwow, Stanislawaw, Tarnopol and the Volhynia). Then, in 1940, Ukraine gained Northern Bukovin and Bessarabia from Romania, while in the same year, Moldavia was created by combining Northern Bessarabia with an area of former Ukrainian territory (the Transnistria). Sub-Carpathian Ruthenia was also

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Table 4. *Territories gained or lost by Ukraine, from 1939 to 1954*

Country and *region* involved	Gained by Ukraine		Lost by Ukraine	
	Date	Population in 1939 (thousands)	Date	Population in 1939 (thousands)
Poland				
Lwow (partially)	9–1939	1340		
Stanislawaw	9–1939	1628		
Tarnopol	9–1939	1760		
Wolyn	9–1939	2295		
Total		7022		
Romania				
Bessarabia	6–1940	3173		
Northern Bukovin	1942	574		
Total		3747		
Hungary				
Sub-Carpathian Ruthenia	1945	829		
Moldova				
Romanian part			8–1940	1853
Ukrainian part			8–1940	599
Total				2452
Russia				
Crimea	1954	1124		
Total gains and losses		12 722		2452
Net total (gains – losses)		+ 10 270		

Source: Meslé and Vallin, forthcoming

annexed to Ukraine at the end of the Second World War in 1945. Finally, in 1954, Nikita Kruschev transferred Crimea from Russia to Ukraine.

Population estimates from various sources for these different territories in 1939 (including previous Polish and Romanian Censuses) led us to the conclusion that, with its present territory, Ukraine would have had a population of 41.2 million people – 10.3 million more than on its actual 1939 territory (Table 4, see also Meslé and Vallin forthcoming, chapter 2). Official estimates (TsSU 1962) put it as 40.5 million, but we suspected this was an underestimate for various reasons, not least that the official estimate did not apparently include Sub-Carpathian Ruthenia.

From one unknown source, we acquired a redistribution by sex and age of the officially estimated total population in 1939. This was probably produced by TsSU and is probably fairly reliable. On the assumption that the unknown age structure of the Ruthenian population was not too different from that of the Polish and Romanian territories annexed in 1940, we applied the latter's age distribution to the 0.7 million people missing in the official total population.

Vital events. As is the case for population, statistical information about births and deaths varies with border changes. Official statistics cover the present territory (including Crimea) only since 1953. From 1947 to 1952, Crimea was not included

in the statistics. In 1945–46, Sub-Carpathian Ruthenia was also missing from the statistics. No data at all are available for Ukraine for the period 1941–44 (during the German occupation), while the 1939–40 official statistics refer to the 1939 territory.

For Crimea, substantial data are available from Russian sources, which can be easily adapted and added to the Ukrainian data. The situation is less good for other new territories. For the years 1939–40, we assumed that fertility and mortality in the annexed territories were the same as in the original Ukrainian ones, and made the same assumption for Sub-Carpathian Ruthenia alone in 1945–46.

Ultimately, the big problem to overcome was the total lack of data for 1941–44.

2. Estimation of 1949 population

If we could have followed the same approach that we adopted for the 1930s, we would have projected the 1939 population up to 1959 on the basis of a 'normal' fertility-mortality trend, compared the results with the 1959 Census population to estimate total losses for the whole period 1939–59, and then tried to identify the respective impacts of crisis fertility and mortality, and migrations. However, the 20 years between 1939 and 1959 represent a very long period compared with the years directly affected by the crucial events. In particular, the

protracted lapse between the last traumatic year (1947, the starvation year) and the next census significantly influenced the effect of the normal process of elimination among cohorts enumerated in or born after the 1939 Census.

The first step in circumventing that drawback is to use the detailed data available, which were quite reliable from 1949 onwards, to produce an estimate of the population by sex and age at the beginning of 1949 by back projection from 1959. The previous method can then be applied to the decade 1939–49 alone.

For the back projection from 1959 to 1949, we used registered deaths by sex and age, corrected for under-registration, both for infant and oldest-age mortality, following the procedure described earlier (Meslé and Vallin forthcoming). For migrations, quite reliable statistics were produced during the Soviet era on the basis of the *propiska,* which covers all inter-urban and rural-urban/urban-rural migrations. Only intra-rural migrations are not available. These data also enable trans-Republic migrations to be distinguished from internal ones. Additionally, the TsSU made estimates of annual migration flows to produce estimates of total population at the beginning of each year from 1950. On the basis of all this information we reconstructed a complete set of Ukrainian net external migrations by sex and age for each year from 1949 to 1958.

Figure 6 compares the age distribution of the back projected population in 1949 to that of the 1959 Census. These two pyramids bear the clear imprint of the two world wars and the 1933 famine.

B) Estimation of the exceptional losses of 1939–48

Following the same procedure we adopted for the 1930s, we can first estimate total losses due to the 1941–45 war and starvation in 1947, and then attempt to identify the specific impact of each of the three components: fertility collapse, net migration, and excess mortality.

1. Total losses

The mortality in the absence of crisis that was used to project the 1939 population up to 1949 was calculated by an interpolation of age-specific and sex-specific mortality rates between the 1939 and 1949 life tables. These were calculated on the basis of deaths corrected for under-registration. For fertility we used the results of two retrospective surveys conducted in Ukraine in 1960 and 1967. From these surveys, fertility by age of the mother was derived for the 20 previous years. Fertility

without crisis was estimated by interpolation between the 1939 and 1949 rates.

When applying these expected fertility and mortality rates in the absence of crisis from 1939, on the basis of the post-war territory and assuming zero external migration, the population expected for 1949 without crisis is 48.3 million. This may be compared with the figure of 35.7 million obtained by back projection from the 1959 Census. The difference of 12.6 million is an estimate of the total losses due to the crisis. This is very much higher than the 9.7 million previously estimated (Pyrozhkov 1996). This latter figure was, however, based on a global approach for the whole 20-year period (1939–59) and the use of model fertility curves, discounting all of the various intermediate data available. As explained earlier, the first element necessarily tends to underestimate the actual losses, since over time the most severely affected cohorts are increasingly less significant in the total population.

The total losses of 12.6 million comprise 7.9 million men and 4.7 million women. The deficit is very high for both sexes at young ages (around 40 per cent) because of the wartime collapse of fertility and the 1947 famine. It is also very high for working-age men owing to the war losses and deportations.

2. Impact of fall in fertility

To estimate the birth deficit, it is first necessary to evaluate under-registration of births for the years 1939–40 and 1945–48, for which statistics are available, and then to estimate the annual numbers of births for 1941–44.

By comparing registered births with births by cohort resulting from the back projection, it was clear that the registration system was very close to covering all the births around 1956-57 and that the coverage rate was probably in the region of 96 per cent in 1946. For 1945, however, the coverage was much less complete, owing to administrative disruptions caused by the war. We therefore interpolated rates of coverage between 96 per cent and 100 per cent for the years 1946–57, but used the computed rate of 86 per cent for 1945. For 1938–39 we used the same coverage rate as that already used in the previous section. When comparing the corrected births for 1938–39 with the number of births given by the back projection, the difference is mainly attributable to the fact that the back projection takes no account of excess mortality due to the war. Assuming that the effect of war mortality on successive cohorts depends on the number of years of war experienced, we chose to use a decreasing ratio
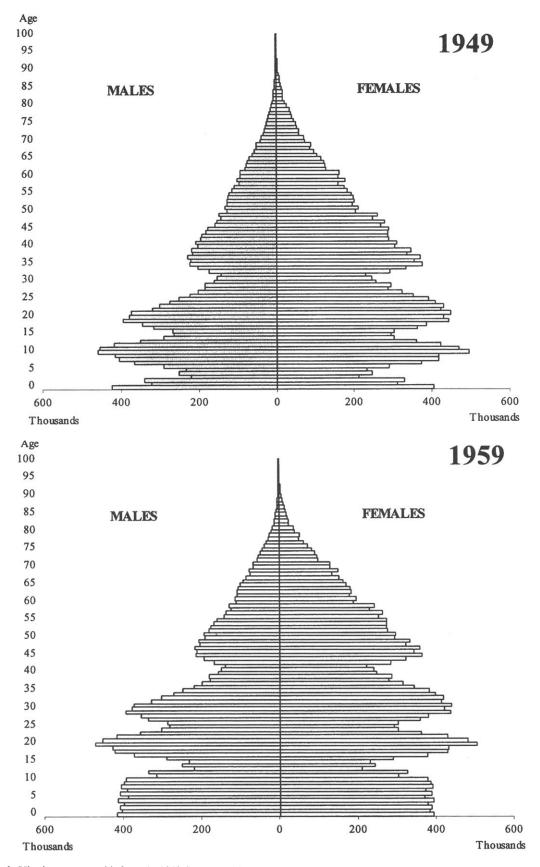
Figure 6. Ukraine age pyramids from the 1959 Census and from the back projected population in 1949
Source: 1959: Census. For 1949: Back projection based on 1959 Census, registered births and deaths, and migration statistics.
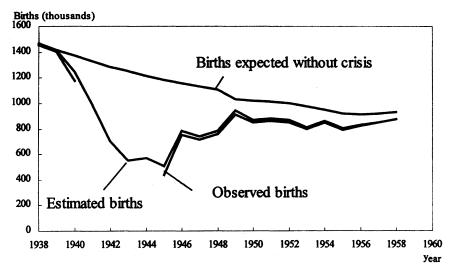
Figure 7. Annual trends in observed and estimated births in Ukraine compared with births expected without crisis
Source: Observed: registered births. Expected: interpolation between 1939 and 1949 estimated age-specific fertility rates. Estimated: calculation based on registered births, under-registration rates, and inter-censal cohort numbers.

of actual births to back projected ones, from the level observed for 1938–40 (1.080) to its 1945 level (1.009), to estimate the numbers of births in the years 1940 to 1944 (Figure 7).

A new population projection from 1939 to 1949, using actual estimated births rather than the births expected without crisis, gives a total population of 44.7 million instead of the 48.3 previously expected. The difference of 3.6 million is the net impact of the fertility fall.

3. Impact of migrations

Migration flows in the period 1939–48 were much larger and more complex than those of the previous decade. Fortunately, we were able to collect more and more varied data that we could use to distinguish between different types of forced and voluntary migrations, including data on the following:

- exodus, evacuation, and voluntary migrations,
- exchanges of populations on the basis of the Germano-Soviet pact (Polish populations and German 'Volksdeutsch'),
- migration of forced and voluntary workers to Germany,
- forced migration of Ukrainians to other Soviet Republics,
- deportation to camps, 'colonies', and prisons (gulags),
- repatriations to Ukraine,
- normal migrations in the post-war years.

The use of all available sources (Polian 1996; Zemskov 1990, 1991a, 1991b; RAN 1992; Schechtman 1946; see also Meslé and Vallin forth-

coming) produced a quite complete estimate of exceptional migration flows into and out of Ukraine in the period 1939–47 (Table 5).

In total, 9.4 million people left Ukraine from 1939 to 1947 while 6.5 million entered or returned, i.e. a total net out-migration of 2.9 million.

4. Losses due to crisis mortality

Using various sources, we also estimated both the sex distributions and age distributions of migration flows, both exceptional and normal, for the most recent years. A new projection of the 1939 population to 1949, factoring in both estimated actual births and migrations, produced a new expected total population of 42.8 million for 1949. The difference between this and the previous projection gives the estimated net impact of migration: 2.0 million. The difference with the back projected population in 1949 gives the net impact of exceptional mortality due to war and the 1947 famine: 7.1 million.

Table 6 summarises the components of the exceptional losses of the decade.

There is a difference of 376,000 between deaths expected without crisis and actual deaths estimated after correction for under-registration for the immediately pre-war (1939–40) and post-war (1946–48) years. This difference mainly reflects the impact of the 1947 famine (296,000 deaths) but also partly results from fluctuations in actual mortality. The remaining 6.7 million deaths, which represent the excess mortality due to the war, were redistributed in each cohort by calendar year according to the registered military losses for men and with approx-

Table 5. *Estimation of exceptional migration flows into and out of Ukraine, 1939–47 (thousands)*

Year	Exodus and evacuations	Poles	Germans	Forced or voluntary workers to Germany	Deportations	Gulags	Repatriations	Total
Out-migrations								
1939	25		40		25	44		134
1940			215		103	132		450
1941	3500			48	278	75		3901
1942				1128	7			1135
1943	267		95	518				880
1944	178	117	230	333	259			1117
1945		525			155	218		898
1946	33	294			65	169		561
1947					59	219		278
Total	4003	937	580	2027	951	857		9354
In-migrations								
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	1435	319	47		54	191	997	3043
1946	1095	165	3		35	126	72	1496
1947					22	89	11	122
Total	3247	800	75	436	149	570	1258	6536

Source: Meslé and Vallin forthcoming

Table 6. *Components of Ukraine's apparent losses during the 40s, by sex: reduced fertility, excess mortality, and migrations*

Population and losses	Numbers (thousands)		
	Males	Females	Total
Population			
back projection to 1949 (1)	15 365	20 310	35 675
expected without crisis (2)	23 224	25 041	48 265
expected with mortality without crisis and estimated actual births (3)	21 471	23 277	44 748
expected with mortality without crisis, estimated actual births and migrations (4)	20 632	22 123	42 755
Losses			
total (2) – (1)	7859	4731	12 590
due to birth deficit (2)-(3)	1753	1764	3517
due to emigration (3) – (4)	839	1154	1993
due to excess mortality (4)-(1)	5267	1813	7080
Of which, for mortality :			
a) during the war (1941–45)	5040	1663	6704
b) pre- and post-war (1939–40 and 1946–48)	226	150	376

Source: Calculations based on registered births and deaths and migration data from various sources

imate weightings for the intensity of political and wartime problems experienced by civil populations.

To estimate the true numbers of deaths due to the war and to famine mortality, these apparent results must be adjusted for the reduction of cohorts over time between the crisis years and 1949. To do that, we weighted the deaths of each cohort by the expected probability of death without crisis between the year concerned and 1949. This procedure produced the final figure: instead of the 6.7 million deaths initially estimated, the full impact

of the war and 1947 famine resulted in 7.4 million unexpected deaths.

In total, the real consequences of the catastrophes of the decade (after doing the same for births and migration) were as follows:

– 4.1 million births missing,
– 2.3 million net out-migrants, and
– 7.4 million unexpected deaths,

In short: a total of 13.8 million losses instead of the 12.6 million globally estimated at the outset.
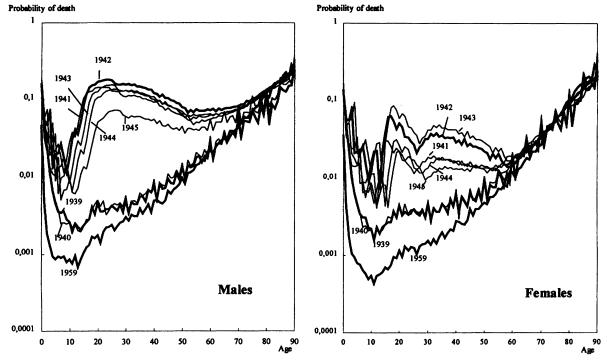
Figure 8. Age-specific and sex-specific probabilities of death estimated for the years 1939 to 1945 and 1959
Source: Calculations based on the results of the study.

C) Annual life tables for the years 1939–59

Finally it was possible to compute life tables for each of the years 1940–48 and to extend the work by also computing life tables for the years 1949–59, from regjstration statistics (corrected for under-registration) and back-projected populations.

Figure 8 compares mortality curves obtained for the war years with those for the beginning and end of the period (1939 and 1959). The adult mortality of males due to the war appears especially high between the ages of 20 and 60. The most destructive year was 1942, but 1941, 1943 and 1944 were little better. In these years, the mortality of young adult males was even higher than infant mortality. Women also appear to have suffered exceptionally at these ages, but in rather different ways both in terms of age and calendar year. However the two observed peaks around the ages of 20 and 35 are questionable. They may owe less to reality than to our assumptions about the age distributions of migrations and crisis deaths, which rely on less detailed information than for males. That aside, and in contrast to the case for males, 1941 and 1944 were significantly less devastating than 1942 and 1943. This difference is more plausible than the age peaks: men were fully involved in military operations, while women suffered more of the civil consequences of occupation and repression.

Table 7 gives annual life expectancy at birth from 1939 to 1959. From a level of close to 50 for men and 55 for women in the immediate pre-war period, life expectancy fell to less than 14 years for men and to less than 20 for women in the darkest years. It rose again in 1945 and for most of 1946 before falling again (to 40 for men and 50 for women) with the 1947 experience of starvation. Eventually an upward trend was established from 1948 to 1959.

CONCLUSION

This reconstruction offers a foundation for a better appreciation and understanding of the severity of the crises that befell Ukraine during the first half of the twentieth century. The 1926 Census enumerated 29 million Ukrainians, yet that of 1939 still reported fewer than 31 million inhabitants, to Stalin's great displeasure. This very low population increase was a consequence of the major crises of the 1930s. Soviet policy in this decade left the Ukrainian population severely damaged. The disasters of the decade culminated in the horrific famine of 1933. These events resulted in a dramatic fall in fertility and a rise in mortality. Our estimates suggest that total losses can be put at 4.6 million, 0.9 million of which was due to forced migration, 1 million to a deficit in births, and 2.6 million to exceptional mortality. Even worse, within its expanded post-war

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Table 7. *Life expectancy at birth estimated for the years 1939 to 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	65.6
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	66.1	72.0
1948	53.8	62.0	1959	65.2	71.1
1949	56.8	64.6			

Source: Calculations based on the results of the study.

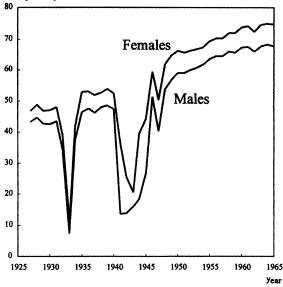
Figure 9. Estimate of annual changes in life expectancy in Ukraine, 1926 to 1965, by sex
Source: Calculations based on the results of the study

territory, the Ukrainian population fell between 1939 and 1949 from 41.2 million to 35.7 million, and at the Census of 1959 was, at just 41.9 million, barely above its level 20 years earlier. The consequences of multiple traumas, related to the Second World War, German occupation, and Soviet repression, resulted in a total of 13.8 million losses, including a net out-migration of 2.3 million, a deficit in births of 4.1 million, and a loss of 7.4 million due to exceptional mortality. In the main, our results confirm previous estimates, but have made it possible for the first time to distinguish the specific role of mortality from those of fertility and migration. In terms of mortality, no other European country experienced such crises in so short a space of time in the twentieth century. The worst of these was the 1933 famine, which resulted in a life expectancy of less than 11 years for females and barely over 7 years for males. However, overall, the consequences of the Second World War were even worse: life expectancy decreased slightly less (21 years for females and 14 for males at the minimum), but remained at these low levels for four years. Figure 9 shows life expectancy trends from the mid-20s to the mid-60s. The exceptional burden of the two major mid-century crises is clear to see.

NOTES

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REFERENCES

Adamets, Serguei, Alain Blum and Serguei Zakharov. 1994. *Disparités et variabilité des catastrophes démographiques en URSS*. Paris: INED. (Dossiers et Recherches no. 42).

Adamets, Serguei and Vladimir Shkolnikov. 1995. *O довоенных*

таблицах смертности СССР [About pre-war life tables]. Moscow; Institute for economic forecasts, Centre for Population and Human Ecology, (Paper presented at the Conference on Population of the USSR in the 1920s-1930s in light of newly classified documentary evidence, Toronto, January 1995).

Andreev, Evgueny M., Leonid E. Darskij and Tatiana L. Khar'kova. 1992. "L'histoire de la population de l'URSS 1920-1959", *Annales de démographie historique*: 61-150.

Andreev, Evgueny M., Leonid E. Darskij and Tatiana L. Khar'kova. 1998. *Демографическая история России: 1927-1959* [Demographic history of Russia: 1927-1959]. Moscow: Informatika,

Blum, Alain. 1994. *Naître, vivre et mourir en URSS : 1917-1991*. Paris: Plon.

Maksudov, Serguei. 1989. *Потери населения СССР* [Demographic losses of the Soviet Union], Benson (Vermont): Chalidze.

Meslé, France and Jacques Vallin. Forthcoming. *Mortalité et causes de décès en Ukraine au XXe siècle*. Paris: INED (with contributions by Vladimir Shkolnikov, Serguei Adamets and Serhii Pyrozhkov).

Novosselskij, Serguei A. and Vladimir V. Paevskij. 1930. *Смертность и продолжительность жизни населения СССР 1926-1927. Таблицы смертности* [Mortality and Life Expectancy of the Population of the USSR, 1926-1927: Life Tables]. Moscow & Leningrad: Plankhozguiz.

Pyrozhkov, Serhii I., 1996. "Les pertes démographiques en Ukraine dans les années 1930 et 1940", *Population* 51 (4-5): 1032-1040.

Pitkänen, Kari J. 1993. *Deprivation and Disease. Mortality During the Great Finnish Famine of the 1860s*. Helsinki: Hakapaino.

Polian, Pavel. 1996. *Жертвы двух диктатур* [The Victims of the Two Dictatorships]. Moscow: TsIRE.

RAN (Российская Академия Наук). 1992. *Всесоюзная перепись населения 1939 года, основные итоги* [*1939 general population census, basic results*]. Moscow: Naouka.

Schechtman, Joseph B. 1946. *European Population Transfers 1939-1945*. New York, Oxford: University Press.

SGF (Statistique générale de la France). 1907. *Statistique internationale du mouvement de la population d'après les registres*

d'état civil. Résumé rétrospectif depuis l'origine des statistiques de l'état civil jusqu'en 1905. Paris: Imprimerie nationale.

Tsaplin, Victor V. 1989. "Статистика жертв сталинизма в 30-е годы [Statistics of the victims of Stalinism during the 1930s]", *Вопросы истории* (4):175–181.

TsSU, 1962. *Итоги всесоюзной переписи населения 1959 года, СССР. [Results of the 1959 General Population Census, USSR 1973].* Moscow: Tsentralnoye Statisticheskoye Upravleniye.

Zemskov, Victor N. 1990. "Спецпоселенцы (по документации НКВД-МВД СССР) [Deportees, according to documents from NKVD-MVD of the USSR]", *Социлогическе Исследованя [Sociological Studies]* (11):3–17.

Zemskov, Victor N. 1991a. "Гулаг [Gulag]", *Социлогическе Исследованя [Sociological Studies]* (6):10–27.

Zemskov, Victor N. 1991b. "Гулаг [Gulag]", *Социлогическе Исследованя [Sociological Studies]* (7):3–16.

Zhiromskaja, V. B., I. N. Kiselev and Ju. A, Poljakov. 1996. *полвека под грифом «секретно». Всесоюзная перепись 1937 года* [Half a century under the «seal of secrecy». The USSR 1937 Population Census]. Moscow: Nauka.