ABOUT MORTALITY DATA FOR UKRAINE

by S.Pyrozhkov, N. Foygt, and D.Jdanov

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GENERAL

Since 1997, the State Committee of Statistics of Ukraine has been in charge of the collection and primary processing of population statistics. It was founded on 29 July 1997 by decree №734/97 of the President of Ukraine. The State Committee of Statistics has 25 regional and 495 district subdivisions that collect census and micro-census data at the regional level and they conduct various statistical surveys as well. The information about individual life events (births, marriages, divorces, and deaths) is collected by the bureaux of civil status registration. They do not belong to the structure of the statistical organization and are included in the structure of the Ministry of Justice of Ukraine.

Population statistics in Ukraine have a long history and stable tradition. The first surveys/micro-censuses were conducted in some regions of Ukraine in the mid-19th century. However, they were spontaneous and did not have a strong statistical basis. The first official population census in Ukraine was conducted in 1897 as part of the first general population census of the Russian Empire.

The demographic development of Ukraine in the 20th century and at the beginning of the 21st century was affected by long and short-term influences. Long-term influences included global changes in overall population trends. Shorter-term influences include such crisis events as: World War I and the subsequent civil war and epidemics (1914-1919), famines in 1923 and 1932-1933, mass repressions in the 1930s, World War II (1939-45), population deportation since the 1940s, and famine again in 1947.

Meslé et al. (2003) estimated mortality during 1920-40 in Ukraine using acts of civil status, censuses of 1926,1937, 1939, and 1959, population figures of forcibly displaced persons, and statistics of the GULag[1]. This study demonstrates population losses and shows an increase in mortality during this time.

During 1914-1920, the population losses in Ukraine numbered between 3 and 4 million (in total). For 1929-1939, the loss was 4.6 million. Total population losses in Ukraine in 1929-1959 reached 13.8 million as result of social catastrophes and huge migration during reclamation of new lands in Kazakhstan.

Demographic catastrophes in the first half of the 20th century had a great influence on the population structure and fertility indices as well as on the social and economic development of Ukraine.

[1] Name of the government agency which administered penal labour camps under Soviet rule. GULag is the acronym for Chief Administration of Corrective Labour Camps and Colonies.

The materials from the 1897, 1920 and 1926 censuses can be found in the State archives of Russia. M.V. Ptoukha (1960) and Y.A. Kortchak-Chepurkovskiy (1928) republished some of these data. The results from the "repressed" census of 1937 were only published and made publicly available in 1989 (Thaplin, 1989). Since the 1920s, Ukrainian population statistics can be considered the best in the former USSR. Nevertheless, the quality of data is not reliable before 1959. Moreover, the construction of a continuous series of mortality indicators through World War II is not possible for Ukraine. Data for 1959-1969 are of better quality but should be used with caution (see below under "Data Quality Issues" for details).

The first census after World War II was conducted in Ukraine on 15 January 1959 as part of the USSR population census. Subsequent censuses were conducted every 10 years: 15 January 1970, 17 January 1979, and 12 January 1989. Only the 1959 and 1970 censuses were published and their contents made widely available. The materials from the 1979 and 1989 censuses were published as special statistical collections with the restriction "for service use only." After the collapse of the Soviet Union, the first Ukrainian population census was carried out on 5 December 2001. The results of this census were published in their entirety and are available as a special statistical collection in both electronic and printed forms.

Inter-censal population estimates were first published in 1988 and since 1991 have been published annually as part of the collections of the State Statistics Committee of Ukraine.

Currently, vital statistics are compiled by the State Committee of Statistics based on data from the bureaux of civil status registration. Before 1988, only crude birth and death rates were freely available to the public. Other information was spread across various institutions in the form of special collections for service use only. Since 1993, vital statistics data have been published annually in a publication entitled "Population of Ukraine." Under the same title, the State Statistics Committee of Ukraine - in collaboration with the Institute for Demography and Social Studies – has published the annual analytic reports since 2003.

Source of data

The mortality data that can be included in the Human Mortality Database (HMD) date back as far as 1959. The majority (for the period from 1959 until 1989) is kept by the State archives of Ukraine. Since 1990, data are available in the form of manuscripts from the State statistics committee of Ukraine and in the annual statistical reports "Population of Ukraine." In addition, a detailed mortality database (including causes of death) for Ukraine during 1924-2000 has been compiled by Meslé et al. (2003).

TERRITORIAL COVERAGE

The territory of Ukraine during the last century changed many times. In 1920, the Ukrainian People's Republic gave up their western lands to Poland. In 1939, according to the secret protocol between Germany and the USSR, West Ukraine was incorporated back into the territory of Ukraine. In 1945, Czechoslovakia signed a treaty with the USSR

according to which Transcarpatian Ukraine was included in the Soviet Ukraine. In 1954, Crimea was ceded from the Russian Soviet Federal Republic to the Ukrainian Soviet Republic. All these changes occurred before 1959 and do not affect population estimates in the HMD. After the collapse of the USSR in 1991, Ukraine became independent without any territorial changes.

DEATH COUNT DATA

Coverage and Completeness

By law, a death must be registered no later than three days after its occurrence or after disclosure of a dead body. In cases where it is impossible to obtain the certificate from a medical institution or judicial-medical expert, registration must be completed within five days. Death is confirmed by the medical certificate of death issued by the medical institution, court decision about the fact of death, or announcement of the death.

The individual mortality data recorded in the civil registration offices are centralized and aggregated in the regional statistical subdivisions as a complex set of special tables that reflects in detail the mortality structure by sex, age, type of residence (urban or rural area), and cause of death.

Differences in the definition of a live birth compared with the recommendations of the World Health Organization influence the number of deaths recorded at the youngest ages (see below under "Birth Count Data" for more details).

Specific details

Until 1990, death registration in Ukraine was reliable. However, the mortality data in certain age groups, in particular under one year of age, and those from some causes of death (the 13 most dangerous infections, which included typhoid, plague, cholera, anthrax, and also deaths that occurred at the workplace) were distorted or kept secret. N.M. Levchuk (2002) estimates that, as a result of the restricted definition of a live birth, the proportion of unregistered deaths of newborn babies was 23%. These deaths were recorded as spontaneous abortions.

Since 1990, because of the total liberalization in all spheres of life in Ukraine, the controls on gathering primary death information weakened and the quality of death statistics decreased. The share of deaths with unknown age increased. A serious source of distortion for mortality statistics lies in the difficulties of achieving timely registration of deaths in rural areas. Such unregistered deaths are not included in the official statistics at all.

POPULATION COUNT DATA

Coverage and completeness

Population figures by age and sex are based on the results of the 1959, 1970, 1979, 1989, and 2001 censuses. After summing up of the primary census results, the age- and sex-specific numbers of all population groups without exception (including the population that lives

temporarily in Ukraine) are adjusted to the nearest 1st January using a special estimation procedure. In each post-censal period, population counts are estimated at the end of each calendar year from the age-sex population structure at the beginning of the year and the number of vital events during the year. These post-censal estimates are recalculated once data from the next census become available. These intercensal estimates are produced using special methods. All censuses have covered the *de facto* population.

Population dynamic over inter-censal periods are more or less smoothed, reflecting the high degree of accuracy of population estimates during the Soviet period because of a well-organized registration system of population movement. The period before the first Ukrainian census of 2001 coincided with the socio-economic transformation that radically changed both demographic processes themselves and the means and possibilities of their registration. This resulted in serious discrepancies between the results of the 2001 census and estimated populations.

The discrepancy between the 2001 census counts and the population estimates (with the census population being smaller by 463,200 than the estimates produced prior to the census) resulted from undercounting migrants (mostly emigrants) (for details see Gladun, 2002). The influence of other factors (undercounting of births and deaths) on these discrepancies is unknown. The discrepancy between census counts and the population estimates is estimated at -0,95% of the total population for all types of residence, the result of a 2.25% undercount in urban areas and a 1.8% overcount in rural areas.

The difference between deviations in urban und rural areas can be explained by undercounting of emigrants from urban areas and immigrants to rural areas. The undercounting of the population withdrawal in urban areas resulted from the under-registration of emigration to other countries, especially to the Commonwealth of Independent States. That is, some people moved abroad for economic reasons, but maintained a dwelling and citizenship in Ukraine in the hope of returning home and these people are thus still and erroneously counted as Ukrainian residents.

Specific Details

An additional source of data on the age-specific death counts and population structure up to 2000 is presented in F. Meslé et al. (2003) Nevertheless, considering the significant differences between the estimated population and the results of the 2001 census, the data from Meslé et al. for 1989-2000 need to be corrected.

BIRTH COUNT DATA

Coverage and completeness

The definition of a live birth in Ukraine (as in many post-Soviet and former communist countries) differs from conventional Western practices and WHO recommendations. According to the Soviet definition (introduced before World War II), a live birth is officially registered by the statistical system if the gestation period is 28 weeks or longer, the body mass at birth is 1000 grams or more, the body length is 35 cm or longer, and the newborn has shown signs of life (breathing). Such a restrictive

rule leads to an underestimation of births and of the population below one year of age as well as to the underestimation of neonatal mortality by about 50% and of infant mortality by about 25% (Anderson and Silver, 1986, Blum and Monnier, 1989, Velkoff and Miller, 1995).

The current birth statistics are compiled by the state statistical agency on the basis of the data produced by the local vital statistics bureaux. By law, births must be registered no later than one month after occurrence. In Soviet times, when there was a system of compulsory registration of pregnancy at a medical institution, the expected birth was recorded long before it actually occurred. Cases of delayed birth registration were very rare; they were usually registered within 1.5 to 2 months after the birth because a woman had to present the birth certificate within two months after giving birth in order to obtain payment for maternity leave and to legalize her leave for taking care of a child. The statistical system accounted for the so-called “thirteenth month” by a delay in compiling the final reports in order to allow for arrival of tardy information about the number of births occurring in a given year.

In the period of socio-economic transformation, the amount of payment for maternity leave became paltry, female unemployment (obvious and latent) increased, and the quality of free medical assistance for pregnant and delivering women declined sharply. Consequently, there was less incentive for pregnancy registration in medical institutions. Reductions in the pre-school education system induced by the fertility decline limited the opportunity to use this service for many families. As a result, many parents, especially in rural areas, do not register a birth until an official certificate of birth is needed. This is often not until the child reaches school age, and sometimes births are not registered at all. As a result, at the beginning of the 1990s the statistical bodies of Ukraine changed to a system of recording births by date of registration rather than by date of occurrence.

DATA QUALITY ISSUES

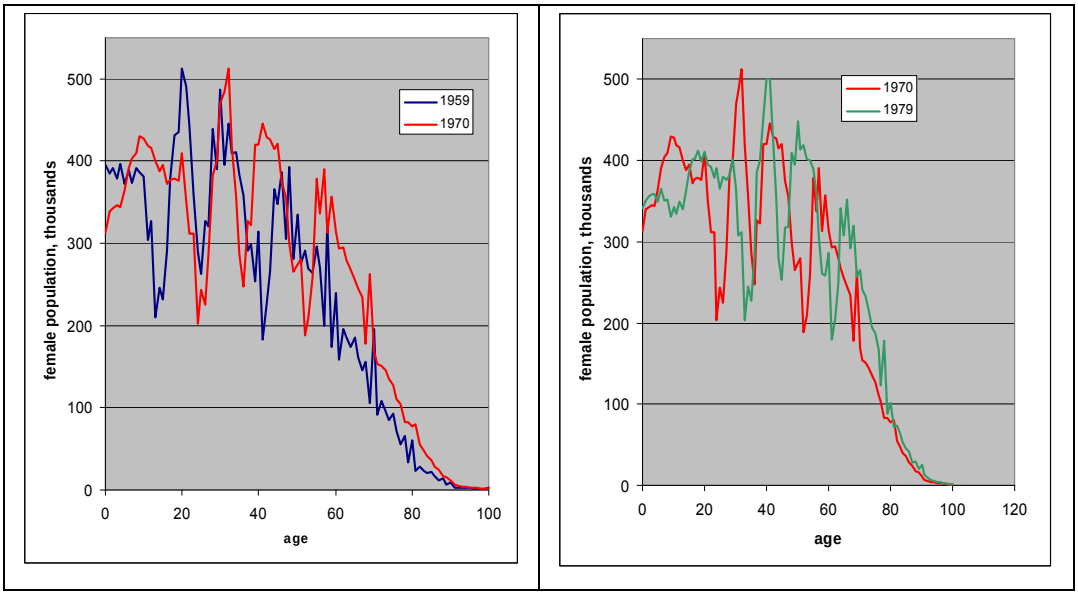
The data pertaining to years prior to 1970 should be used with extra caution due to problems of data quality.

Problems regarding the population census of 1959 and official population estimates for the 1960s, 1970s and 1980s

Ukrainian data prior to 1990 suffer from the same problems as data for other former Soviet republics (see also Background and Documentation files for Russia, Lithuania, and Latvia). Our first concern is with the population census data for 1959. Figure 1 shows that substantial and inconsistent fluctuations in population numbers by age are much less pronounced in the 1970 than in the 1959 census (this is also true for the subsequent censuses of 1979, 1989 and 2001). In particular, substantial peaks in the number of females (for example, at ages 60 and 70) identified in the 1959 census data are missing at the corresponding ages (71 and 81) in the subsequent census of 1970. In contrast, all peaks in the 1970 census counts are also present (for the corresponding cohort) in 1979.

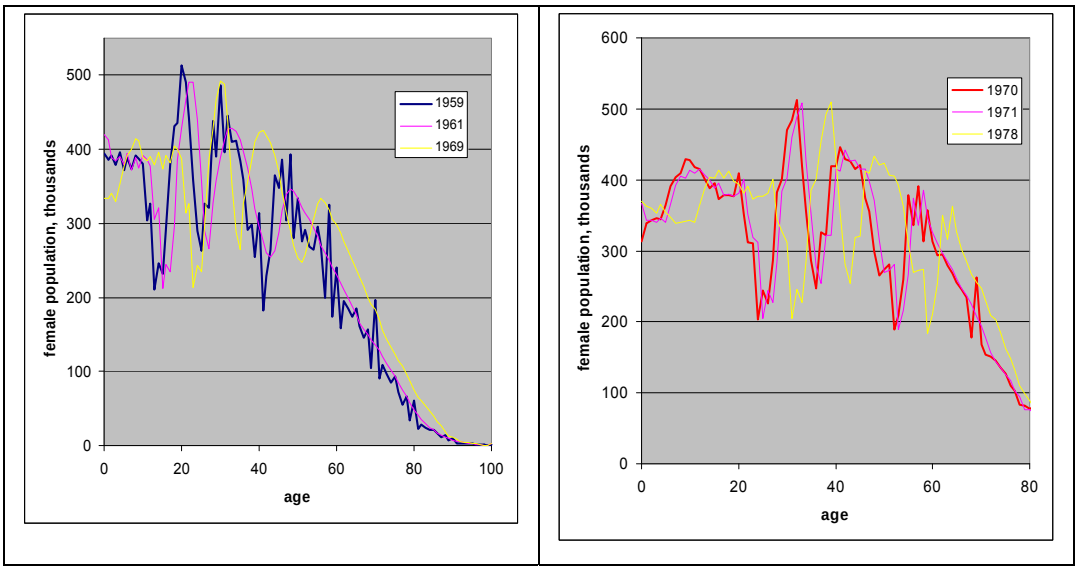
This pattern points to age reporting problems in the 1959 census which have disappeared in later censuses.

Figure 1. Fluctuations in the Ukrainian female population counts by age: differences between the censuses of 1959, 1970, and 1979.



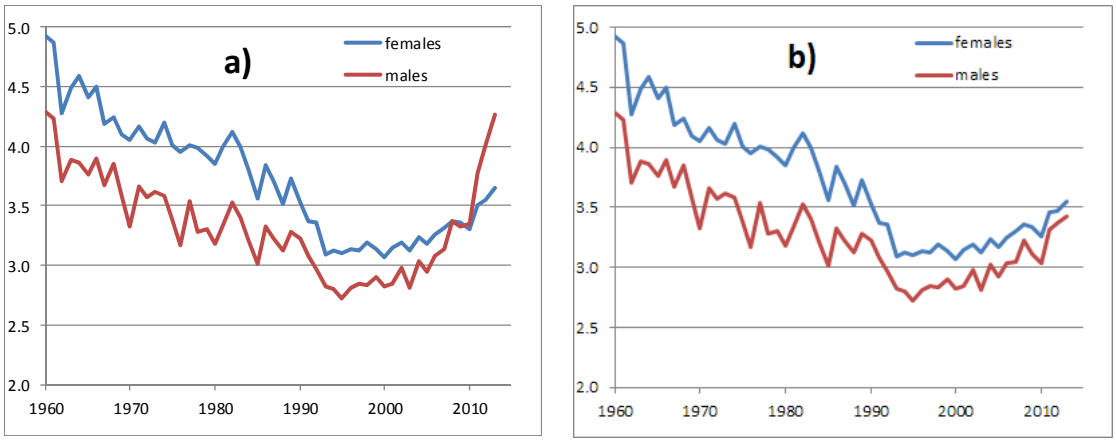
Significant inconsistency has also been revealed between the census data (1959 and 1970) and the official population estimates for the 1960s. The official inter-censal population estimates for the period 1960-1969 appear to have been smoothed above age 30 as significant fluctuations in the number of females in the corresponding age interval are present in the censuses of 1959 and 1970 but not in the population estimates for 1961 and 1969 (see Figure 2, left). In the 1970s, the inter-censal estimates agree with census data with one exception: age heaping for the cohort born in 1900 has been smoothed (Figure 2, right). Therefore, we calculated new inter-censal population estimates for the period 1960-1969 using HMD methods (see Methods Protocol for details). However, even these new population estimates for the 1960s should be treated with caution due to possible data quality problems with the 1959 census.

Figure 2. Inconsistencies between the data from population censuses and official population estimates in 1959-1969



There are also serious inaccuracies in the official estimation of the population of elderly men and women reported by the State Statistics Committee during recent years. The sex ratio at ages 90+ suggests data quality problems with the population estimates. For example, life expectancy (calculated with the HMD methodology using official population data) at age 90 in 2013 for males is higher than that for females (4.27 vs. 3.65 years, respectively), which seems implausible (see Figure 3a). For most population estimates at ages 80+, the HMD methodology uses the extinct cohort method, which may provide more accurate estimates than the official population estimates. Nevertheless, for more recent years when older cohorts are not yet 'extinct', the authors' methods for estimating population rely on the official estimates. Thus, data quality problems with these estimates influence the quality of HMD estimates for the previous 10-15 years (see the Methods Protocol for more details). This problem is the same as for Russia (see Background and Documentation for Russia). Thus, the same solution was used for both countries. An open age interval 80+ was created, aggregating official population estimates and the resulting figure was redistributed using the survival ratio method for ages 80+ instead of 90+ (see the Methods Protocol for details). Correspondingly, the extinct/almost extinct cohort methods were applied for all ages above 80. Using an open age interval 80+ produces plausible results.

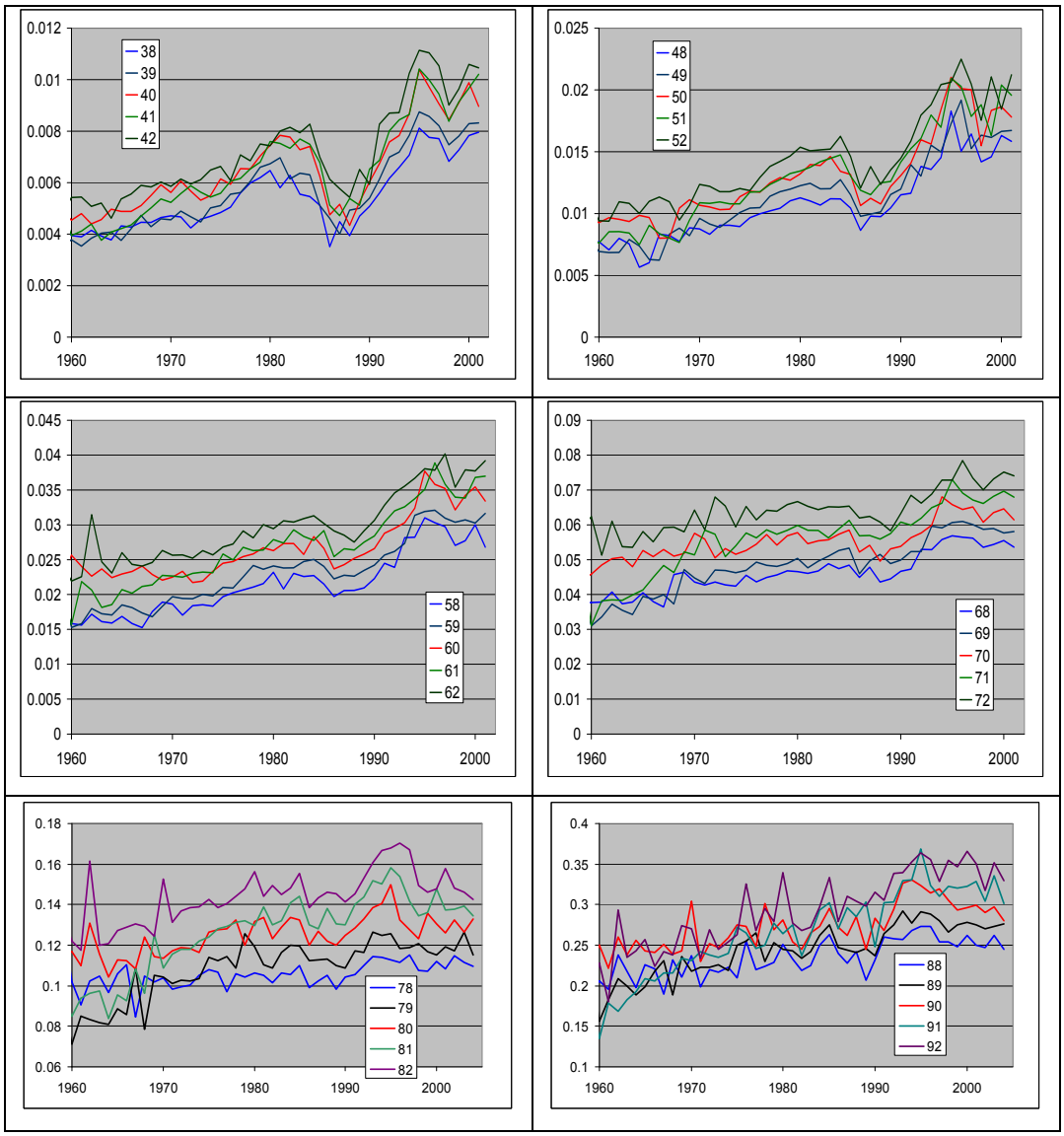
Figure 3. Life expectancy at age 90 before (a) and after (b) correction of the age distribution at ages 80+



Age heaping in deaths

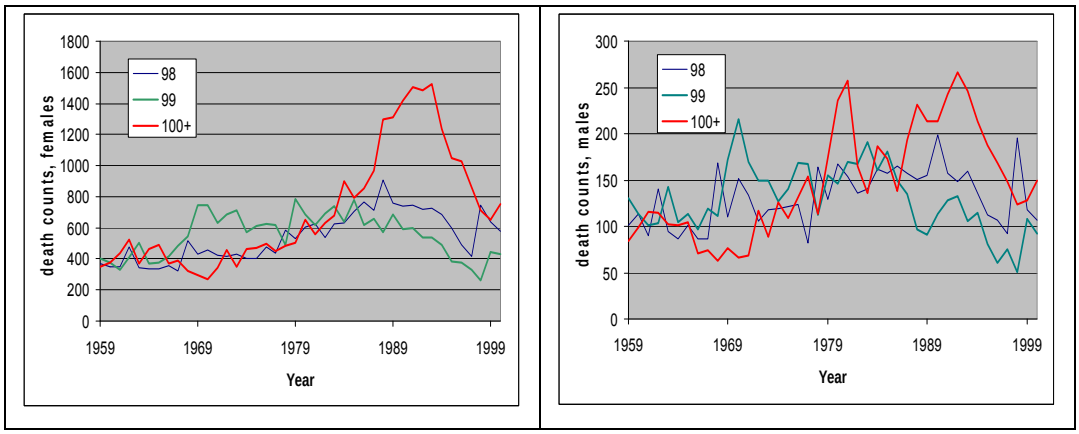
Age heaping at older ages is often considered one of the most serious problems with mortality statistics in the former USSR (Anderson, Silver, 1997). For example, Zakharov has shown that age heaping is very pronounced at ages 70, 80 and 90 in the Russian data for the period before 1970 (see the HMD *Background and Documentation* for Russia). Using the same procedures, we performed a similar analysis for Ukraine. The results suggest that there may be some age heaping prior to the mid-1960s. Figure 4 shows that mortality at ages 40, 50, 60, 70, 80, and 90 seems to be higher than at most ages in between.

Figure 4. Mortality rates for selected ages, Ukraine, males, 1960-2001



As in the case of Russia, a substantial peak was found in the number of deaths at age 99 at the beginning of the 1960s and in the 1970s. At the same time, fewer deaths were registered at age 100+ (Figure 5). In the mid-1990s the situation was exactly the opposite: very few deaths were recorded at age 99, but considerably greater numbers were found for neighboring ages 98 and 100+. It seems that in both cases these inconsistencies could be related to some specifics of the death registration procedures (several hypotheses on the issue are presented in the *Background and Documentation* for Russia). To avoid possible errors, we decided to use 99+ as the open-ended age interval in 1959-1989 for further calculations.

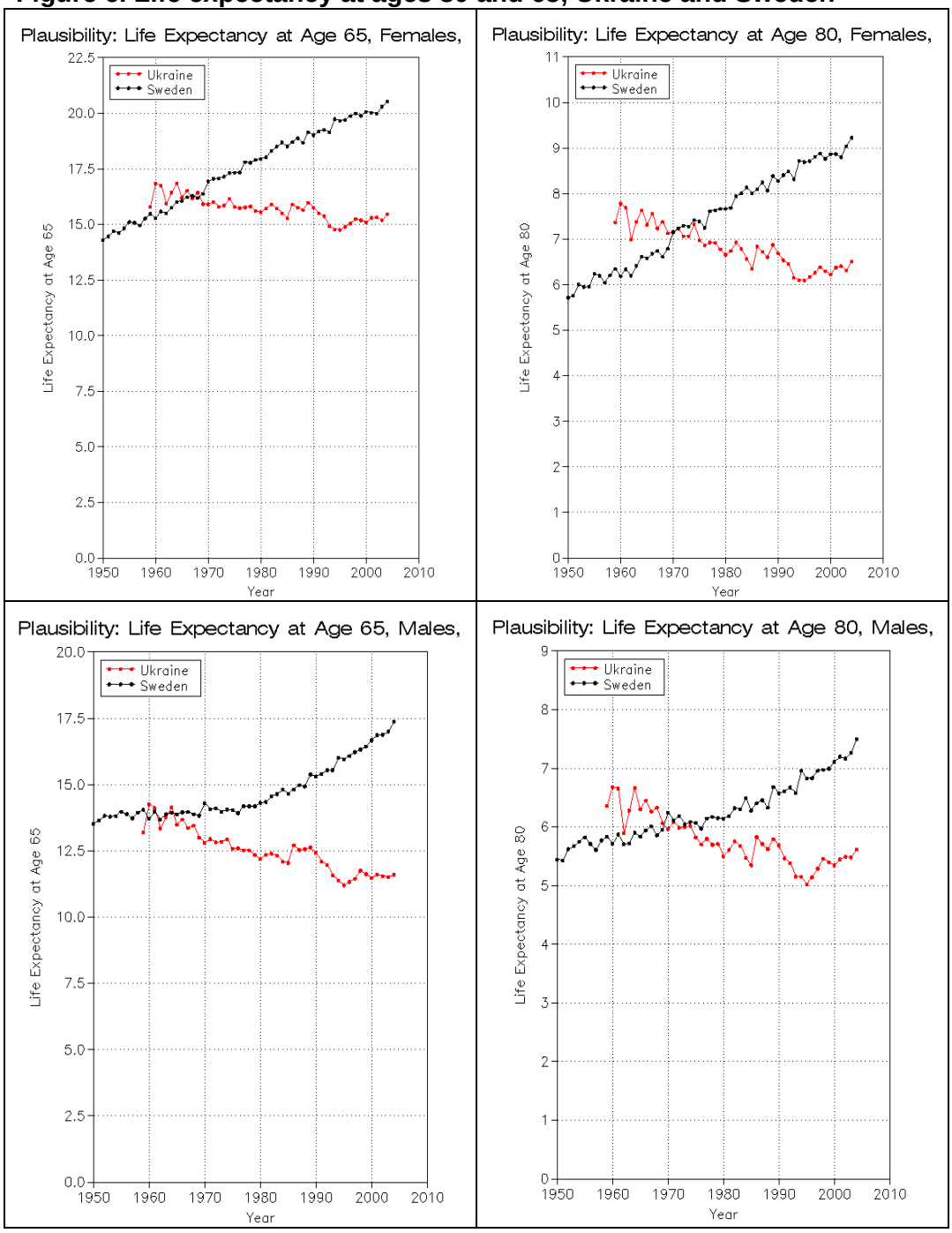
Figure 5. Number of deaths at ages 98, 99 and 100+, Ukraine, 1959-2000



Old ages

There are serious errors in the official estimation of the population of elderly men and women reported by the GOSKOMSTAT (Central Statistical Office of the USSR), especially for persons over the age of 80. As a result, estimates of changes in the size of the elderly population and, correspondingly, old-age mortality rates, are highly irregular and inaccurate. The official data appear to be increasingly problematic as age increases. These errors could be of methodological nature and, most probably, have to do with the use of the wrong model to approximate migration among very old people. These problems are partly solved by using the extinct (or almost extinct) cohort method to derive HMD population estimates. Nevertheless, our results suggest that during the 1960s life expectancy at age 80 was notably higher in Ukraine than in Sweden, which seems extremely implausible (Figure 6). Thus, it is likely that prior to 1970, the population at older ages is overestimated and thus that death rates are underestimated.

Figure 6. Life expectancy at ages 80 and 65, Ukraine and Sweden



REVISION NOTES

Changes with the December 2017 revision:

Life tables: All life tables have been recalculated using a modified methods protocol. The revised protocol (Version 6) includes two changes: 1) a more precise way to calculate a0, the mean age at death for children dying during the first year of life and 2) the use of birth-by-month data (where and when available) to more accurately estimate population exposures. These changes have been implemented simultaneously for ALL HMD series/countries. For more details about these changes, see the revised Methods Protocol (at http://v6.mortality.org/Public/Docs/MethodsProtocol.pdf), particularly section 7.1 on Period life tables and section 6 and Appendix E, on death rates. The life tables calculated under the prior methods (Version 5) remain available at v5.mortality.org but will not be further updated in the future.

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APPENDIX I:

DESCRIPTION OF DATA USED FOR LEXIS DATBASE

DEATHS

Type of data: Annual officially registered number of deaths by age and sex compiled from the death certificates.

Age grouping: See table below.

Period covered: 1959 – 2013

Period	Type of Data	Age Grouping	Comments	RefCodes
1959-2001	Annual number of deaths by sex and age (1x1 rectangle)	0, 1, …, 99, 100+, unknown age	For the purposes of our calculations deaths were aggregated for ages 99+ for the period 1959-1989 (see "Data Quality Issues")	10,11
2002-2004	Annual number of deaths by sex, age and birth cohort (Lexis triangle)	0, 1, …, 100+		43
2005	Annual number of deaths by sex and age (1x1 rectangle)	0, 1, …, 99, 100+		44
2006-2013	Annual number of deaths by sex, age and birth cohort (Lexis triangle)	0, 1, …, 100+		45, 53, 56, 57, 60

POPULATION

Type of data: *De facto* population at the time of the 1959 census; *De jure* population adjusted to the 1st of January for census years 1970, 1979, 1989 and 2001; estimated *de jure* population on the 1st of January for the inter-censal periods

Age grouping: For the *de facto* population at the time of a census – single age groups (0, 1, …, maximum age attained); for the estimated *de jure* population on the 1st of January – single age groups (0, 1, …, 99, 100+)

Period covered: 1959 – 2014

Period	Type of Data	Age Grouping	Comments	RefCodes
1959	Census counts of population as of 15 January 1959, by sex and single year of age	0, 1, …, maximum age attained		19
1970, 1979, 1989	Census counts of population adjusted to the 1st of January of the corresponding year, by sex and single year of age	0, 1, …, 99, 100+		20
1960-1969,	Annual population estimates as of the 1st of January, by	0, 1, …, 99, 100+		21

Period	Type of Data	Age Grouping	Comments	RefCodes
1971-1978, 1980-1988, 1990-1991	sex and single year of age			
1992-2005	Annual population estimates as of the 1st of January, by sex and single year of age	0, 1, …, 99, 100+		22
2002	Census counts of population adjusted to the 1st of January of the corresponding year, by sex and single year of age	0, 1, …, 99, 100+	As the 2001 census took place on the 5th of December, adjustment has been made to the 1st of January 2002	23
2005	Annual population estimates as of the 1st of January, by sex and single year of age	0, 1, …, 99, 100+		24
2006	Annual population estimates as of the 1st of January, by sex and single year of age	0, 1, …, 99, 100+		25
2007-2014	Annual population estimates as of the 1st of January, by sex and single year of age	0, 1, …, 99, 100+		34, 52,54, 58, 61

BIRTHS

Period	Type of Data	Comments	RefCode
1959-2013	Annual counts of births by sex		30, 31, 51, 55, 59, 62