

CORRECTING THE OFFICIAL LIFE TABLES FOR THE REPUBLIC OF MOLDOVA FOR 1959-2014

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ADNOTARE. Articolul "Corectarea tabelelor oficiale ale mortalității pentru anii 1959-2014" prezintă unele rezultate ale proiectului cu privire la analiza de lungă durată a mortalității pe cauze de deces în Republica Moldova efectuat în colaborare cu cercetătorii francezi de la Institutul Național de Studii Demografice din Franța (Dr. France Meslé și Prof. Jacques Vallin). Lucrarea descrie problemele cu privire la calitatea înregistrării deceselor infantile și a deceselor pentru vârstele avansate, care prezenta anumite deficiențe pentru țara până la mijlocul anilor 70 ai secolului trecut. Datele oficiale cu privire la structura și numărul populației după anii '90 ai secolului trecut nu sunt fiabile din cauza sub-înregistrării considerabile ale fluxurilor migraționale. Ca rezultat, tabelele oficiale ale mortalității pentru Moldova nu sunt credibile atât pentru perioada sovietică, cât și pentru cea după proclamarea independenței. Sunt prezentate estimările alternative ale valorilor speranței de viață la naștere după corectările datelor cu privire la mortalitate și numărul și structura populației.

CUVINTELE CHEIE: *Moldova, calitatea datelor, mortalitate, estimările populației, tabele de mortalitate, speranță de viață la naștere.*

ANNOTATION. The article "Correcting life tables for the Republic of Moldova for 1959-2014" presents some results of the project on assessing long-term cause-specific mortality trends in the Republic of Moldova conducted in collaboration with the French researchers from the National Institute for Demographic Research (Dr. France Meslé and Prof. Jacques Vallin). The paper describes the quality of death registration in infancy and at older ages that is very questionable for the country until the mid-1970s. The official population estimates are also very problematic, especially for the period of independence due to a huge under-registration of migration flows. As a result, the official life tables are not reliable for Moldova for the early soviet period and the period of independence. The new estimates of life expectancy at birth after correcting mortality and population data are presented.

KEY WORDS: *Moldova, data quality, mortality, population estimates, life tables, life expectancy at birth.*

Introduction

Official estimates of life expectancy at birth for the Republic of Moldova show a surprising and inspired growth over the recent years. The Moldovan National Bureau of Statistics estimates life expectancy at birth in 2014 as 67.5 years for males and 75.39 years for females, which is almost four years higher as compared to 2005 for both sexes. How reliable are

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these estimates? To answer to this question it is necessary to examine carefully the quality of population statistics. In the frame of the international Project “Mortality Divergence and Causes of Death” (MODICOD) supervised by the French demographers Dr. France Meslé and Prof. Jacques Vallin (INED, Paris), long-term cause-specific mortality trends were assessed for the Republic of Moldova. The preliminary step of this study was a careful inspection of vital and population statistics. We distinguished the serious problems concerning both official mortality and population estimates. With regard to mortality statistics, we identified death under-registration in infancy and at older ages, especially important until the late 1970s. Official population data are very problematic for the period of independence due to a huge under-registration of migration flows. As a result, a serious systematic numerator-denominator bias exists, which leads to a significant under-estimation of mortality and fertility rates (Penina and Vallin, 2014). Further, we shall briefly examine these data quality problems and show the results of mortality and population corrections proposed in the frame of MODICOD project on life expectancy at birth in Moldova for 1959-2014.

Two types of infant mortality under-registration

Two types of infant mortality under-estimation must be distinguished here. The most important is linked to genuine under-registration of infant deaths in Moldova up to the mid-1970s. The second, less crucial, question concerns the problem of defining live births and hence the very notion of infant mortality.

At the beginning of the 1970s, an unexpected infant mortality increase occurred in all countries of the former USSR. Of all of the European countries of the former USSR, the rise was by far the largest in Moldova, where the infant mortality rate increased by 50% from one year to the next (from 24.5 per 1,000 in 1972 to 36.8 in 1973). Penina, Meslé and Vallin (2010) attribute this increase to improved registration of infant deaths, especially in rural areas. A more moderate rise in the number of infant deaths occurred during subsequent years (up to 1977). This increase very likely reflects not only a continuing improvement of infant death registration, but also a real deterioration of the health status of the population, especially in rural areas.

The infant mortality correction deals solely with the sudden improvement observed in 1973 while ignoring the more moderate death count increase in subsequent years. This correction is based on the assumption that a moderate rise after 1973 reflects not only a continuing improvement of infant death registration, but also a real deterioration of

the health status of the population, especially in rural areas. However, since there are no obvious means to separate the impact of the artificial growth due to improved registration from the real health deterioration, a minimal adjustment option was chosen. Following these assumptions the infant mortality rate should be higher by 27% in 1945, 34% in 1955, 47% in 1965 and 50% in 1972 (Penina et al., 2010).

The other problem is related to the definition of a live birth, which does not conform to the standard definition recommended by the World Health Organization (WHO). According to the Soviet definition, a birth is considered live and registered as such if the period of gestation was 28 weeks or longer, if the birth weight was 1,000 grams or higher, if the body length was 35 centimetres or longer, and if the newborn did not die within the first seven days of life. In 1995, the Ministry of Health and NBS issued a decree titled "On Shifting to WHO Standards for Live Births and Still Births" (Ministry of Health of the Republic of Moldova, 1995). In 2008, a new definition of a live birth, closer to the WHO definition, was introduced in Moldova. According to these new definition, infants born after 22 weeks of gestation or weighing at least 500 grams should be registered as live births. The transition to the new definition resulted in a 20% increase in the early neonatal mortality rate. Given the experience of the Baltic countries, where the transition from the Soviet definition to the WHO definition resulted in a 50% increase in early neonatal mortality in the early 1990s (Estonian Medical Statistics Bureau, Latvian Medical Statistics Bureau, Lithuanian Statistics Bureau, 1993 as cited in (Meslé et al., 1996), a fraction of early neonatal death in Moldova might still be under-registered. Referring to the Baltic precedent, we therefore decided to increase early neonatal mortality by 50% for all years preceding to 2008. Since 2010, we preferred not to correct infant mortality rates; while for 2008 and 2009 the infant mortality rates were interpolated assuming that over these two years the transition to a new live-birth definition was incomplete.

Old-age mortality

Two separate problems can be identified with regard to the soviet mortality statistics at older ages for the European countries of the former USSR, including Moldova. The first one refers to inaccurate calculation of official population estimates at older ages. In this study, we use the population estimates specially produced for Moldova according to Human Mortality Database (HMD) Protocol (J.R. Wilmoth et al., 2007). According to HMD, population counts for advanced ages (in case of Moldova the age threshold was 70 years) are calculated using the extinct cohort method, which for earlier years depends entirely on the death statistics and does not

take into account potentially erroneous population counts at advanced ages. However, even after this population corrections, mortality rates at older ages remain suspiciously low in Moldova at the beginning of the period. Thus, in 1960, life expectancy at age 80 in Moldova compared to a western country with a good death registration system, for example, Sweden, is about two years higher for both males and females. This is the second problem related to the inaccurate registration of death age known as age heaping in deaths. The misreporting of age at death is the main source of mortality underestimation at older ages for the former soviet countries, including in Moldova.

In this study, we corrected underestimated old age mortality rates for Moldova using Coale-Demeny model life tables (Coale, Demeny and Vaughan, 1983). As a key to these models, we used our corrected infant mortality rates. The same approach was taken in the studies for Russia (Meslé et al., 1996) and Ukraine (Meslé and Vallin, 2003, 2012). Based on the average model life expectancy at age 60, new age-specific rates over the age of 60 were computed and life tables were re-estimated for the period 1959-1968 for males and 1959-1970 for females. For females, we prolonged this correction for the very old age groups (80 years and above) until 1977 because of the persisting difference between the model and the observed values. New mortality rates were multiplied by population counts (produced according to HMD Method Protocol) and new death counts were obtained.

Re-estimating population data

The quality of the official population counts for Moldova are very questionable both for the soviet period and after the independence. In our study, we refused of the official population counts for whole period and used the new population estimates specially produced for Moldova according to Human Mortality Database Protocol. Further, we shall focus on the nature of the erroneous official estimates for the period of independence and outline the proposed correction method.

For the period since independence, the Moldovan National Bureau of Statistics (NBS) produces annual population counts by sex, age and region for the *de jure* population and this is what has been used as the denominators for all official demographic indicators. This method creates a systematic bias since deaths and births refer to the *de facto* population (i.e. occurred within the country) while population estimates also include long-term emigrants (Moldavian citizens living abroad), leading to an underestimation of mortality and fertility rates.

Demographic rates are further under-estimated because annual population estimates for the period since independence is that NBS did not replace its post-1989 census population estimates with the new inter-censal estimates after the results of the 2004 census became available. To this day, NBS continues to publish annual estimates of the *de jure* population without taking into account the results of the 2004 census while it appears that such figures over-estimate population counts (leading to the under-estimation of mortality and fertility rates) compared to those from the 2004 census.

In this study, inter-censal annual population estimates for the 1970s were calculated using the standard HMD methodology. Official population estimates are used for the years 1980-1988. For the period after 1989, an adaptation of the HMD Methods Protocol was implemented. Instead of official migration data, we used the administrative data about the state border crossing available from 2009. The result of these calculations shows the difference between the official and alternative population estimates from 1% at the beginning of the 1990s to more than 18% for the end of the period.

New estimates of life expectancy at birth

Finally, **Table 1** shows the effect of population and mortality (infant and old age) corrections on life expectancy at birth values for 1959-2012 years.

The new population estimates calculated for the period of independence reduce dramatically life expectancy at birth from 0.1 year for males and 0.3 years for females in 1990 till 2.7 years for males and 1.8 years for females in 2012. The effect of the first correction of infant mortality rate (before 1973) diminishes progressively from 1.7 years for males and 1.9 years for females in 1959 to 0.9 years in 1972 for both sexes. The second correction of infant mortality rate linked to a live-birth definition and applied for the period 1959-2009 has an insignificant effect on life expectancy values and varies around 0.2-0.3 year. The correction of life expectancy at age 60 is of much more importance among females than males, especially, in the late 1950s and early 1960s. Thus, in 1960, this type of adjustment accounts to about 65% of the total life expectancy reduction (2.7 years for males and 3.8 years for females). If for males the impact of the old age mortality correction declines gradually by the late 1960 (0.3 year in 1968), for females this is prolonged until the mid-1970s due to life expectancy adjustments for the age groups 80 years and over (0.5 year in 1975). The maximal overall effect of mortality corrections in infancy and at older ages is 4.5 years for males and 5.7 years for females in 1960.

Conclusions. We discussed about the overall mortality by sex and age in Moldova after the Second World War. The data quality for this country with regard to vital statistics is somewhat problematic for the early soviet period. We made an attempt to correct infant and old-age mortality rates which are heavily under-estimated for this country before the mid-1970s. The mortality data for the late soviet period and after the independence seem to be quite reliable with the only minor exception regarding the live-birth definition. This is a common problem for all the former soviet countries, which we also tried to correct. Further, the official data on annual population counts for the period of independence are very inaccurate and distort considerably the recent mortality trends for Moldova. This puzzle was also solved within the study. Disregarding all these data problems, the corrected trends in life expectancy at birth for Moldova are very comparable with those observed in other former soviet republics, like Ukraine or Russia, and they clearly depict a very serious health or so called epidemiological crisis affected the former USSR countries from the mid-60s of the last century. For better understanding the poor Moldovan population health we address to mortality analysis by causes of death in our publications (Penina, 2014 ; Penina, Meslé and Vallin, 2014).

Table 1. Life expectancy at birth (in years) before and after two corrections of infant mortality rate (m_0), life expectancy at older age and population corrections

Year	Cru de data	After population corrections	After the 1st correction of m_0	After the 2nd correction of m_0	After two m_0 and old age mortality corr.	Effect of population corr.	Effect of the 1st m_0 correction	Effect of the 2nd correction of m_0	Effect of old age population correction	Total effect
MALES										
1959	65.3		63.5	63.3	61.1		-1.7	-0.2	-2.2	-4.2
1963	67.2		65.9	65.7	64.3		-1.3	-0.2	-1.4	-2.9
1967	66.7		65.6	65.4	64.9		-1.1	-0.2	-0.5	-1.8
1971	66.0		65.2	65.0			-0.8	-0.2		-1.0
1975	63.0			62.8				-0.2		-0.2
1980	62.8			62.5				-0.3		-0.3
1985	62.6			62.2				-0.3		-0.3
1990	65.0	64.8		64.6		-0.1		-0.3		-0.4
2000	64.0	63.7		63.3		-0.3		-0.3		-0.6
2010	64.8	62.4				-2.5				-2.5
2014	67.5	64.9				-2.6				-2.6
FEMALES										
1959	69.6		67.7	67.6	64.4		-1.9	-0.2	-3.2	-5.2
1963	72.0		70.6	70.4	68.2		-1.4	-0.1	-2.2	-3.7
1967	72.5		71.3	71.2	69.8		-1.2	-0.1	-1.3	-2.7

Year	Cru de data	After population corrections	After the 1st correction of m_0	After the 2nd correction of m_0	After two m_0 and old age mortality corr.	Effect of population corr.	Effect of the 1st m_0 correction	Effect of the 2nd correction of m_0	Effect of old age population correction	Total effect
1971	72.1		71.3	71.2	71.0		-0.8	-0.1	-0.2	-1.2
1975	69.5			69.3	69.0			-0.2	-0.2	-0.4
1980	69.3			69.1				-0.2		-0.2
1985	69.0			68.8				-0.2		-0.2
1990	71.9	71.6		71.4		-0.3		-0.2		-0.5
2000	71.3	71.0		70.8		-0.3		-0.2		-0.5
2010	73.4	71.8				-1.6				-1.6
2014	75.4	73.7				-1.7				-1.7

Source: Penina, Meslé ; Vallin ; 2010, 2014

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