# About the Republic of Moldova Data on Causes of Death

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## General

In the 19th century, when Moldova (then called Bessarabia) was a province of the Russian Empire, churches registered deaths, births, baptisms, and marriages in parish registers. The earliest known records date back to 1810 (Corlăteanu-Granciuc, 2008). From 1918 to 1940, during its union with Romania, Moldova gradually adopted the Romanian system for recording deaths. In 1940, when the Moldavian Soviet Socialist Republic (MSSR), it switched to the Soviet system. Following independence from the USSR in 1991, Moldova introduced new regulations. In 1990, the eastern region of Transnistria, home to about 14% of Moldova's population, declared independence. Though unrecognized by Moldova or any other country, Moldova offered Transnistria autonomous status. The offer was rejected, leading to armed conflict in 1992.

Moldova has a centralized system for official statistics, managed by the National Bureau of Statistics (NBS), formerly the Central Statistical Administration under Soviet rule. In addition to the NBS, three key ministries handle the collection and processing of vital records:

1. The Ministry of Justice, which oversees the Vital Statistics Office;
2. The Ministry of Information, Technology, and Communications, which supervises the Center for State Information Resources ("Registru"), is responsible for population registries;
3. The National Agency for Public Health, which operates within the Ministry of Health and is responsible for cause-of-death data.

The Center for State Information Resources "Registru" (SE CSIR "Registru") maintains the State Population Register (SPR). Established in the mid-1990s, the SPR includes data on all Moldovan citizens and all foreigners or stateless individuals residing in the country, whether permanently or temporarily. Moldovan citizens remain in the SPR even if they move abroad. Each individual is assigned a personal identification number (IDNP) at birth or upon first registration, which remains unchanged for life. The IDNP is removed from the SPR only upon death or permanent departure (in the case of foreigners).

## Territorial coverage

Since 1997, Moldova's official vital and migration statistics have excluded the Transnistria region. For earlier years, reconstructed cause-of-death data includes this territory; for later years, it does not.

# Part I – Vital statistics and population censuses

## 1. Death count data

## Coverage and completeness

Annual death counts in Moldova, both during the Soviet era and after independence, are based on events that occurred within the country (*de facto* population). However, the registration of infant deaths remained problematic until the mid-1970s.

Throughout the USSR, including Moldova, republican statistical offices conducted annual "control checks" to assess the completeness of birth and death registration. Introduced after 1948 (Kharkova, 2006), these checks involved comparing birth and death records collected from maternity hospitals and medical institutions in urban areas—and from household registers (*pohozeaistvennaia kniga*) in rural areas—with official civil status acts recorded by ZAGS (*Zapis' aktov grazhdanskogo sostoiania*), the registry office responsible for civil status events (Andreev, Scherbov and Willekens, 1995). In Moldova, about 10% of villages were randomly selected each year for control checks, following TCSU (Central Statistical Administration of the USSR) guidelines, which could vary annually. In rural areas, data were reviewed for an entire year, while in urban areas only the last quarter was examined (TCSU of USSR, 1971).

One such control check in 1971 (TCSU of MSSR, 1972) reported that in urban areas, 6% of births, 5.5% of deaths, and 6.8% of infant deaths went unregistered. In rural areas, under-registration appeared lower: 0.2% for births, 0.3% for deaths, and 2.6% for infant deaths. However, these official correction factors are not suitable for adjusting infant mortality rates during this period (see *Specific details: infant mortality*).

Since independence, Moldova's vital statistics have markedly improved. According to a 2007 evaluation by the Health Metrics Network, death registration coverage exceeds 90% (Health Metrics Network, 2007).

Since 1997, official statistics no longer include data from the Transnistria region.

## Specific details: infant mortality

Two major issues have affected the accuracy of infant mortality data in Moldova. The most significant was the widespread under-registration of infant deaths until the mid-1970s. The second issue concerned the definition of a live birth.

In the early 1970s, all former USSR countries saw a sudden rise in reported infant mortality, with Moldova showing the sharpest increase—by 50% in a single year, from 24.5 per 1,000 live births in 1972 to 36.8 in 1973. Penina, Meslé, and Vallin (2010) attribute this spike primarily to improved death registration, particularly in rural areas.

A more gradual increase in recorded infant deaths continued until 1977. This trend likely reflects both ongoing improvements in registration practices and a real decline in population health—again, especially in rural regions.

The corrections applied to Moldova's infant mortality data account only for the abrupt registration improvement seen in 1973, not for the more gradual increases afterwards. Since it is difficult to distinguish between the effects of better reporting and genuine health deterioration, a minimal adjustment approach was adopted. Based on this method, infant mortality rates should be adjusted upward by 27% for 1945, 34% for 1955, 47% for 1965, and 50% for 197 (Penina, Meslé and Vallin, 2010) (*Figure 1*).

Correction coefficients computed separately for neonatal and post-neonatal components were applied to the cause-specific reconstructed death time series (excluding ill-defined items) before 1973.

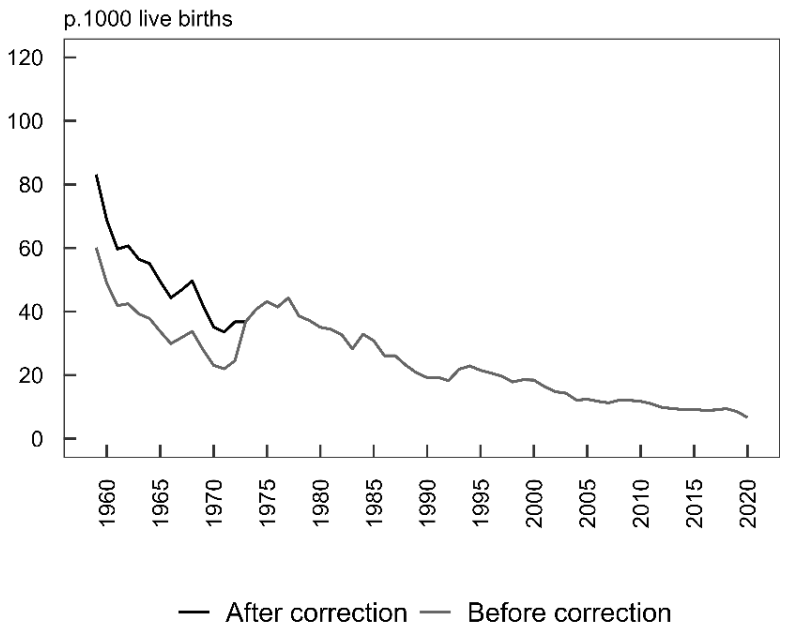



**Figure 1. Infant mortality rate in Moldova before and after correction prior to 1973, both sexes, Moldova, 1959-2020**

Source: (Penina, Meslé and Vallin, 2010), with modification

Another important issue affecting the accuracy of infant mortality data in Moldova concerns the definition of a live birth, which historically did not conform to the international standards recommended by the World Health Organization (WHO). According to Soviet regulations, a birth was registered as live only if it met the following criteria: the gestational age was at least 28 weeks, the body length was 35 cm or more, the birth weight was at least 1,000 grams, and the newborn took at least one spontaneous breath after separation from the mother's body. Births of fetuses delivered before 28 weeks of gestation (or measuring less than 35 cm in length or weighing less than 1,000 grams) were also considered live births if the newborn survived for more than seven days after birth. Studies have shown that these restrictive criteria could lead to significant underestimation of neonatal and infant mortality—by up to 50% and 25%, respectively (Anderson and Silver, 1986; Velkoff and Miller, 1995).

In 1995, the Ministry of Health and the National Bureau of Statistics (NBS) issued a decree titled "*On Shifting to WHO Standards for Live Births and Stillbirths*". The new definition recognized as live any newborn with a birth weight of at least 500 grams who exhibited signs of life. However, while this standard was adopted by medical institutions for internal reporting, civil registration offices continued applying the Soviet-era definition. A more comprehensive reform was implemented in 2008, aligning Moldova's official definition of a live birth more closely with WHO guidelines. Under the updated standard, live births included all infants born after 22 weeks of gestation or weighing at least 500 grams. This change led to a documented 20% rise in early neonatal mortality. Still, experience from the Baltic countries—where a similar definitional shift in the early 1990s resulted in a 50% increase in early neonatal mortality (Estonian Medical Statistics Bureau, Latvian Medical Statistics Bureau, Lithuanian Statistics Bureau, 1993, as cited in Meslé et al., 1996) — suggests that some under-registration may persist in Moldova.

Based on the Baltic precedent, early neonatal mortality rates for Moldova were increased by 50% for all years prior to 2008. No corrections were applied from 2010 onward, while the rates for 2008 and 2009 were interpolated to reflect the gradual adoption of the new definition.

This correction, based on the revised definition of live birth, was applied specifically to deaths caused by selected perinatal conditions and congenital anomalies for the period 1965–2009.

## Specific details: old-age mortality

Two major issues have been identified in relation to the Soviet-era mortality statistics at older ages in the European countries of the former USSR, including Moldova. The first concerns the inaccurate calculation of official population estimates at older ages. Population estimates specifically produced for Moldova according to the Human Mortality Database (HMD) Protocol were used (HMD-like estimates) (see *Population count data*). In line with HMD methodology, the population counts at advanced ages were calculated using the extinct cohort method—applicable from age 70 onwards in the case of Moldova. This method relies exclusively on death statistics for earlier years, thereby avoiding reliance on potentially erroneous population counts at advanced ages.

Nevertheless, even after these population adjustments, old-age mortality rates in Moldova remained implausibly low during the early part of the observation period. For instance, in 1960, life expectancy at age 80 in Moldova appeared to exceed that of Sweden—a country with a well-functioning death registration system—by nearly two years for both sexes. This anomaly reveals the second major issue: the misreporting of age at death, or age heaping, which is a known source of mortality underestimation at older ages across the former Soviet republics, including Moldova.

To correct this underestimation, we applied Coale-Demeny model life tables (Coale, Demeny and Vaughan, 1983), using corrected infant mortality rates as the key input parameter. This methodological choice aligns with similar adjustments made in studies of Russia (Meslé et al., 1996) and Ukraine (Meslé and Vallin, 2003, 2012). Using middle-age mortality as a reference would have been inappropriate, given the characteristically elevated mortality at those ages, especially among men, in these countries.

Based on modelled life expectancy at age 60, revised age-specific mortality rates for individuals aged 60 and above were estimated, and new life tables were constructed for the period 1959–1968 for men and 1959–1970 for women. For women, the correction was extended to the 80+ age group through 1977, due to the continued divergence between observed values and the model. New mortality rates were then multiplied by

the HMD-like population counts, generating new death counts. The difference between observed and estimated deaths—referred to as "missing deaths"—was redistributed proportionally across all reconstructed causes of death.

## 2. Population count data

## Coverage and completeness

### *Census data*

Following the end of the Second World War, four population censuses were conducted in Moldova under the Soviet regime—in 1959, 1970, 1979, and 1989. After gaining independence, three additional censuses were carried out: in 2004, 2014, and most recently in 2024, although only preliminary results of the latter were available at the time of this report's preparation.

The censuses conducted in 1970, 1979, and 1989 provided information on both the de jure (legal) and de facto (present) populations. In contrast, the 1959 census was limited to the de facto population. The 2004 census published only de jure population data, although it included supplemental information on the number of residents temporarily absent from the country, with disaggregation by sex, age, and duration of absence. The 2014 and 2024 censuses were based on the concept of the usually resident population, defined as individuals who had resided in Moldova for at least the past 12 months and who intended to remain for the next 12 months, excluding short-term absences for reasons such as holidays or temporary work assignments (Istrati, 2019). All three post-independence censuses excluded the territory of Transnistria..

During the Soviet era, the gap between *de jure* and *de facto* population counts was minimal, owing to limited international migration flows. However, in the post-independence period, this difference has become significantly larger. At the time of the 2004 census, for example, the number of Moldovan citizens who had been abroad for a year or longer reached 130,306, representing 3.9% of the total *de jure* population.

### *Annual population estimates*

Annual population estimates prior to 1980 have not been published and are unavailable in the Moldovan archives. For the period from 1980 to 1988, the National Bureau of Statistics (NBS) published annual population estimates produced by the Central Statistical Office of the USSR. These were based on interpolations between the 1979 and 1989 census results and referred to the *de jure* population.

In the post-Soviet period, the NBS continued producing annual population estimates by age and sex for the de jure population through 2019. These estimates were based on the 1989 census, vital statistics and migration data. However, the migration data was significantly underestimated, as it referred to the *de jure* population. The use of this type of population led to a substantial overestimation of the resident population, resulting in a marked underestimation of mortality rates(Penina, Jdanov and Grigoriev, 2015).

In 2019, the NBS introduced annual estimates of the usually resident population, using the adjusted 2014 census, vital statistics by date of occurrence, and individual border-crossing data. This approach, which excludes long-term temporary emigrants, is closer to the *de facto* population concept.

We use HMD-like population estimates for 1959-2013 (Penina, Jdanov and Grigoriev, 2015), extended by the official usually resident population figures for 2014-2024 (as of January 1).

## Specific details

### *Calculation of the territorial adjustment factors for 1997*

Starting in 1997, the vital statistics (birth and death counts) published by the NBS did not include data from the Transnistria region. Similarly, population estimates did not include residents of the Transnistria region starting in 1998. To produce HMD-like estimates, territorial adjustment factors were computed for 1997, using demographic statistics available for the Transnistria region during that year.

### *Re-estimation of population data*

Inter-censal annual population estimates for the 1959-1979 period were calculated using the standard HMD methodology. Official intercensal population estimates were used for the years 1980-1988. An adaptation of

the HMD Methods Protocol was applied to estimate annual population counts for the years 1989-2013. First, data from the 2004 census were corrected to exclude Moldovans who had been abroad for more than 12 months. Next, intercensal population estimates were computed for the period 1989-2004. Population estimates for 2009, corrected for out-migration, were then used as a reference year to compute another series of intercensal estimates for the period 2005-2008, accounting for the actual net migration rate for those years. The same method was used to compute post-censal population estimates for the years 2010-2013(Penina, Jdanov and Grigoriev, 2015).

*Figure 2* shows the HMD-like estimates (1959-2013), extended with the post-censal usually resident estimates (2014-2024, as of January 1) and official de jure population data for the period 1980-2019. The difference between the HMD-like and de jure estimates ranges from 1% at the beginning of the 1990s to more than 18% at the end of the period in 2014.

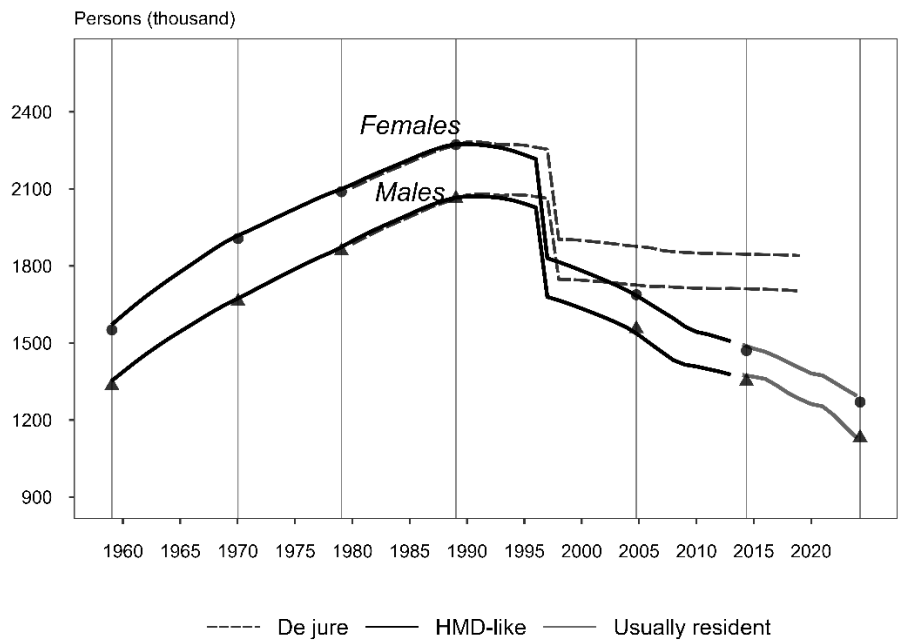



**Figure 2. Population estimates for Moldova: official de jure (1980-2019, as of January 1), HMD-like (1965-2013), and official usually resident (2014-2024, as of January 1), all ages, both sexes**

Note: Official *de jure* population counts do not include the Transnistria region since 1998, HMD-like estimates – since 1997. Vertical lines indicate census dates (year-month-day): 1959-01-15, 1970-01-15, 1979-01-17, 1989-01-12, 2004-10-05, 2014-05-12 and 2024-04-08 (preliminary results).

*Source*: Official *de jure* and usually resident population data: National Bureau of Statistics of Moldova, https://statistica.gov.md/en; HMD-like population estimates (Penina, Jdanov and Grigoriev, 2015).

## 3. Birth count data

### Coverage and completeness

Annual birth counts for both the Soviet period and the post-independence period refer to the *de facto* population (i.e., births occurring within the country).

The medical *birth certificate* is prefilled with the identification number assigned by the Ministry of Information, Technology, and Communications (MITC). The certificate consists of two parts: one is given to the family to be presented at the regional civil registration office within three months, and the other (a notification) is sent to the civil registration office by the medical institution. Birth certificates must be issued by one of 41 accredited medical institutions. Since 2009, births can be registered directly at the medical

institution. If a birth occurs outside of these 41 medical institutions, the birth certificate must be issued within 10 days after a medical examination of the mother and child by a committee of three physicians.

The civil registration office sends the medical birth certificate to the National Bureau of Statistics (NBS). Between 1998 and 2014, an additional form containing thirty socio-demographic variables was also submitted. When the family registers the birth, they present the part of the certificate issued by the medical institution or the committee. This is cross-checked with the notification sent separately by the medical institution. If the information matches, the birth is registered; if not, the case is referred to the police for further investigation. The notification data is also transmitted to the State Registration of Population (SRP) within two days.

### Specific details

Before the mid-1970s, the official number of births was underreported due to the underreporting of infant deaths, as described in the "*Death count data*" section.

Until 2008, Moldova used the Soviet definition of live birth, contributing to the underestimation of birth numbers. Although a revised, yet still incomplete, definition was adopted in 2008, underreporting may have continued in the following years.

Birth counts for 1965–2009 were adjusted based on two corrections of the infant mortality rate (Penina, Meslé and Vallin, 2010).

# Part II – Information on CoD collection

## 4. Death certificate

### *A) During the Soviet period*

Until 1991, Moldovan population statistics were part of the broader vital registration system of the USSR. After the 1917 Revolution, responsibility for registering vital events—including deaths—was transferred from the Church to newly created district administrative offices (ZAGS). Deaths had to be registered within three days. Relatives or another close person obtained a medical death certificate from a medical institution and presented it to ZAGS. In return, they received a civil death certificate, which served both as a burial permit and a legal document for inheritance. ZAGS then forwarded the medical death certificate to the regional statistical office.

In addition to the civil death certificate, ZAGS issued a statistical record of death known as a civil status act (*akt grazhdanskogo sostoianiia*), produced in duplicate[1]. One copy was kept by ZAGS, while the second was submitted to the statistical office for processing, along with the death certificate.

In Soviet Moldova, processing was centralized at the Central Statistical Administration (TCSU) of the Moldavian SSR (MSSR), which compiled annual statistical forms following guidelines from the USSR's TCSU.

Until the late 1950s, cause-of-death statistics were incomplete, as only doctors could certify causes of death (Meslé et al., 1996). In 1958, a directive allowed *feldshers* (medical assistants) to issue death certificates in the absence of a doctor, except in cases requiring forensic examination (e.g., violent deaths, suspicious deaths, child deaths outside a facility, illegal abortions). Certificates issued by doctors were called medical certificates of death (*vrachebnoe svidetelstvo o smerti*), while those issued by feldshers were feldsher certificates of death (*feldsherskaya spravka o smerti*). In 1959, feldshers issued about 15% of rural death certificates; by the mid-1980s, this share had dropped to 5–6%(Meslé and Vallin, 2012).

[1] The procedure of making two identical copies of a civil status form was adopted by the Soviets in 1926 (Jones and Grupp, 1987).

Formats for death certificates were regulated in 1954 (Ministry of Health of USSR, 1954), 1966 (Ministry of Health of USSR, 1966), and 1984 (TCSU of USSR, 1984). Soviet certificates recorded three types of causes: underlying (primary), immediate, and contributory. Moldovan statistics were based on the underlying cause.

In 1973, the USSR introduced a special perinatal death certificate (*svidetelstvo o perinatalinoi smerti*) for stillbirths (after 28 weeks of gestation) and deaths within 6 days of birth (Ministry of Health of USSR, 1973). Doctors usually certified these deaths, but feldshers or midwives could do so in the absence of a doctor. Forms and instructions were revised in 1984. Stillbirths were registered at ZAGS based on the perinatal certificate; early neonatal deaths were registered using both perinatal and birth certificates.[2] The introduction of the perinatal certificate in 1974 coincided with a rise in infant mortality across the USSR, though in Moldova this increase began slightly earlier, in 1973 (see "*Death Count Data*").

Three certificate types existed for both general and perinatal deaths: *final*, *preliminary*, and *instead of preliminary* (used when the cause of death was unclear and further investigation was needed).

### *B) After independence*

Following independence in 1991, the essential death registration procedures remained largely unchanged. However, the management of vital statistics evolved, notably with the establishment of the State Population Register (SPR) in the mid-1990s. The system of producing two identical copies of the civil status act remains in place but now serves administrative purposes only.

For statistical reporting, the National Bureau of Statistics (NBS) introduced statistical bulletins (Buletin statistic) in 1997, completed based on civil status records (births, deaths, marriages, divorces).[3] The death bulletin included 17 socio-demographic variables, such as the national identification number (IDNP), but excluded the cause of death. In 2015, these forms were discontinued when the NBS gained online access to the SPR (Bargan Natalia, 2016).

The format of the medical death certificate was revised in 1998 (Ministry of Health of Moldova, 1998) and again in 2004 (Ministry of Health of Moldova, Department of Statistics and Sociology, and Department of Information Technology, 2004). From this point on, only medical doctors could issue death certificates. Deaths within 6 days of birth and stillbirths are recorded separately on a perinatal death certificate, completed by a forensic pathologist.

At present, death certificates are issued by certified physicians after examining the body.[4] In cases of hospital deaths, violent deaths, or suspected violence, a forensic autopsy is mandatory. Each medical death certificate, pre-filled with a serial number by the Ministry of Information Technology and Communications (MITC), contains two parts. One is given to the relative (or the person reporting the death) to present at the civil registration office within three days, in exchange for a civil death certificate. The other (the notification) is sent by the physician to the civil registration office by the 10th of each month.

Registration proceeds only if the death certificate and the notification match; otherwise, the civil registrar alerts local authorities. This ensures that all deaths are officially recorded. Each notification is transmitted to the MITC within two days for inclusion in the SPR and forwarded to the NBS.

Since 2014, the NBS has published death counts both by the date of occurrence and by the date of registration. Cause-of-death statistics, produced separately by the National Agency for Public Health (NAPH) and used in this analysis, are based on the date of registration. Differences between the two sources are minimal (around 0.1%).

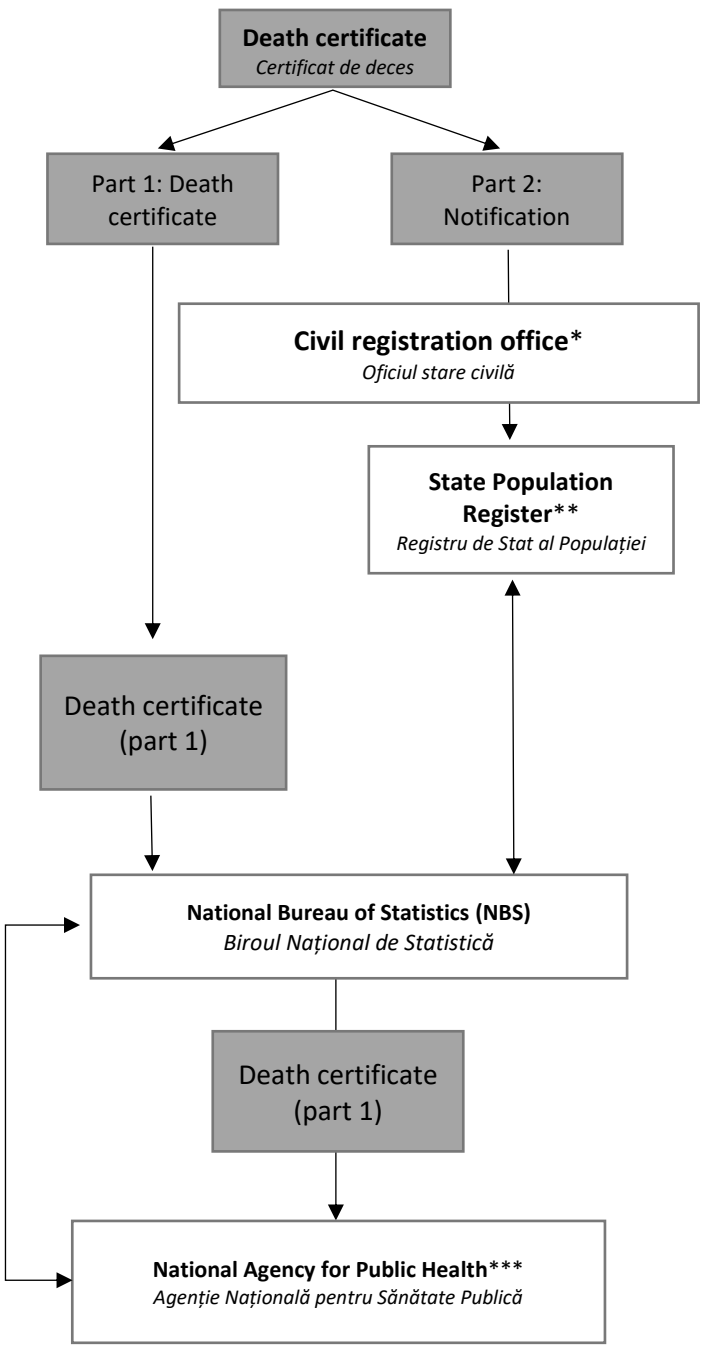
The NBS forwards medical death certificates to the National Agency for Public Health (NAPH), which codes causes of death according to the 10th revision of the International Classification of Diseases (ICD-10), in use

[2] Prior to 1974, stillbirths were documented using a dedicated stillbirth certificate (introduced in 1966), while early neonatal deaths were recorded using either medical or feldsher death certificates.

[3] Four vital registration forms were introduced in Moldova in 1997: one for births (#1), one for deaths (#3), one for marriages (#4), and one for divorces (#5). These forms were reproduced from those used in Romania, except for form #2 (for stillbirths), which is not used in Moldova.

[4] According to Common Order # 132/47/50 (dated 29/04/2004) of the Ministry of Information Technology and Communications, the National Bureau of Statistics and the Ministry of Health regarding the issuance of death certificates.

since 1996. The NAPH maintains a database of all medical death certificates and is responsible for transmitting aggregated cause-of-death statistics to the NBS for publication and dissemination. *Figure 3* illustrates the circulation of medical death certificates in Moldova.




*Death certificate is prefilled with a serial number from the State Population Register and completed by a doctor. The certificate consists of two parts:*

- *Part 1: Death certificate (given to the deceased's relative)*
- *Part 2: Notification (retained by the medical institution)*

*Transmission to the district civil registration office:*

- *Part 1 is submitted by a relative within 72 hours.*
- *Part 2 is submitted by the medical institution by the 10th day of each month.*

*The civil registration office verifies that the information in both parts matches. If discrepancies are found, the case is referred to the police.*

*The "notification" is transmitted to the State Population Register*

*Since 2015, the National Bureau of Statistics (NBS) has had direct online access to the State Population Register for vital statistics.*

*The death certificate (Part 1) is forwarded from the civil registration office to the NBS.*

*NBS verifies the completeness and correctness of the medical death certificates.*

*NBS then transmits the certificates to the National Agency for Public Health (NAPH).*

*NAPH assigns the cause of death using a four-digit ICD-10 code.*

*NAPH maintains a database of all medical death certificates and sends aggregated cause-of-death statistics to NBS for official publication and dissemination.*

*Ministry of Justice
**Ministry of Information Technology and Communications
***Ministry of Health

**Figure 3. Circulation of medical death certificate in Moldova**

## 5. Cause of Death Coding

The codification of causes of death within the Soviet system, as well as after independence, was centralized at the republic level.

## 6. Classifications in use and collected data

## 6.1 Classification changes

### *A) During the Soviet period*

The former USSR never adopted the International Classification of Diseases and Causes of Death (ICD), instead using its own Soviet classification, which covered 116 items until 1964 and around 200 items from 1965 onward. The first Soviet classification, developed in 1922 and officially adopted in 1924, was fairly close to the 1920 ICD (Meslé et al., 1996). It was revised seven times—twice before and five times after World War II. Since 1965, successive revisions brought the Soviet classification increasingly closer to the ICD. *Table 1* summarizes the revisions to the Soviet classification used since 1955.

The Central Statistical Office of the Moldavian SSR coded causes of death based on the underlying cause and produced annual statistical forms on deaths by sex, age, and cause (known as "Form 5"). Official publication of mortality data, particularly by cause of death, was suspended by Soviet authorities starting in 1974. Moreover, certain causes of death were classified as "secret" and subjected to special statistical treatment. Until 1988, causes such as cholera, plague, suicide, homicide, and occupational accidents were excluded from the main statistical Form 5 and instead reported separately in Form 5b. To maintain consistent totals in Form 5, deaths from these hidden causes were incorporated into Item 159, "ill-defined causes."

In addition to hidden causes, death certificates issued based on testimonial evidence by a doctor or feldsher were also coded under Item 159. Totals of hidden causes (from Form 5b) were subtracted from Item 159 in order to estimate the number of deaths actually classified as ill-defined.

Until the late 1980s, all statistical forms were processed manually. In 1988, electronic data processing was introduced, and form names were updated: Forms 5 and 5b were merged into Form S-51, and Form 4 (deaths by single year of age and sex) became Form S-42. The National Statistical Office of the Moldavian SSR compiled these annual forms both at the national level and separately for urban and rural areas. For rural areas, Forms 5 and 5b were also disaggregated by the type of death certificate—medical, feldsher, or combined.

**Table 1. Classifications of causes of death used in Moldova during the Soviet period**

| Years | Title | Number of items/ ICD level | Age groups |
|---|---|---|---|
| 1955-1964 | 1952 classification (Soviet classification of causes of death, 3rd revision) | 116 | 0, 1, 2, 3-4, 5-6, 7-13, 14-15, 16-17, 18-19, 20-24, 25-29, 30-39, 40-49, 50-59, 60-69, 70 and over |
| 1965-1969 | 1965 classification 1965 (based on ICD7) | 210+13* | 0, 1, 2, 3, 4, 5-9, 10-14, 15-19, 20-24, 25-29, … 80-84, 85 and over |
| 1970-1980 | 1970 classification 1970 (based on ICD8) | 185+10* | 0, 1, 2, 3, 4, 5-9, 10-14, 15-19, 20-24, 25-29, … 80-84, 85 and over |
| 1981-1987 | 1981 classification 1981 (based on ICD9) | 185+10* | 0, 1, 2, 3, 4, 5-9, 10-14, 15-19, 20-24, 25-29, … 80-84, 85 and over |
| 1988-1990 | 1981 classification 1981, adapted for deaths from injury and poisoning (based on ICD9) | 175+10* | 0, 1, 2, 3, 4, 5-9, 10-14, 15-19, 20-24, 25-29, … 80-84, 85 and over |

* An additional number of items from external causes, according to the character of trauma

### *B) After independence*

Between 1991 and 1995, two different institutions independently produced mortality statistics by cause of death in Moldova. The National Bureau of Statistics (NBS) continued coding causes of death using the latest revision of the Soviet classification. Meanwhile, the National Agency for Public Health (NAPH), under the Ministry of Health, coded causes of death according to the 9th revision of the ICD.

Medical death certificates were submitted by the NBS to the NAPH for coding. Since 1996, following the adoption of the 10th revision of the ICD (Ministry of Health of Moldova, 1995), the NAPH has been the sole institution responsible for cause-of-death coding (*Table 2*).

However, the coexistence of two parallel coding systems between 1991 and 1995 should not be confused with genuine double coding, a practice used in some countries for a few years following the adoption of a new classification (see Part III "*Reconstruction Information*").

**Table 2. Classifications of causes of death used in Moldova after independence**

| Years | Title | Number of items/ ICD level | Age groups | Responsible institution |
|---|---|---|---|---|
| 1991-1995 | 1981 classification 1981, adapted for deaths from injury and poisoning (based on ICD9) | 175+10* | 0, 1, 2, 3, 4, 5-9, 10-14, 15-19, 20-24, 25-29, … 80-84, 85 and over | The National Bureau of Statistics of Moldova |
| 1991-1995 | ICD 9 | 4-digital level | Exact age | The National Agency for Public Health |
| Sine 1996 | ICD 10 | 4-digital level | Exact age | |

*An additional number of items from external causes, according to the character of trauma

## 6.2 Collected Data

For the Soviet period (1965–1990), we used the original statistical forms on death counts (Forms 5 and 5b), based on medical or feldsher death certificates compiled by the National Statistical Office of the Moldavian SSR. Mortality data by cause of death for 1959–1990 for Moldova and other former Soviet republics were collected, computerized, and verified at the Institut national d'études démographiques (INED, Paris) using original manuscripts. This major achievement was made possible through collaboration between French and Russian demographers in the early 1990s, when the extensive Soviet archives, previously classified, were opened to researchers.

For the period of independence (1991–2023), we used the electronic database of medical death certificates (Form 106/e) provided by the National Agency for Public Health (NAPH). This database includes the deceased's date of birth (day/month/year), date of death (day/month/year), sex, four-digit ICD code for the underlying cause of death, and place of residence. For 1991–1995, as two different statistical institutions independently produced cause-of-death data using different classifications, we analyzed data from both sources.

## 6.3 Data sources

Mortality data for Moldova for 1965–1990 were provided by INED, with missing data for certain years (Forms 5 and 5b for 1965, Form 5b for 1971, 1977–1979, 1980–1987) retrieved from the Moldovan National Archive and the National Bureau of Statistics (NBS) archive.

For the period of independence (1991–2023), the depersonalized database of medical death certificates was provided by the National Agency for Public Health (NAPH). Cause-specific mortality data coded under the Soviet classification (Form S-51) for 1991-1995 were collected from the NBS archive.

## 6.4 Specific Treatment of the raw data

### *A) Soviet Classification*

For the period before 1988, we corrected the raw data by subtracting the total number of deaths attributed to "hidden causes" (as reported in Form 5b) from Item 159 ("ill-defined causes"). For 1986 and 1987, deaths from hidden causes were subtracted from Item 181 ("Other accidents, excluding occupational") based on the corresponding Form 5b data.

### *B) ICD-10*

Before the full transition from ICD-9 to ICD-10, the following corrections were applied to the raw ICD-10 data for the period 1996–2023:

*1) Correction of asterisk codes*

Asterisk codes, which are not recommended for use as underlying causes of death, were corrected following the methodology described by Barbieri et al. (Barbieri et al., 2021). In total, 15 death records were recodified according to the mapping presented in *Table 3*.

**Table 3. Correction of Asterisk Codes in ICD-10 Used in Moldova (1996–2023) – Total Deaths: 15**

| Nr. | Asterisk code | Title | Target code | Title |
|---|---|---|---|---|
| 1. | G07* | Intracranial and intraspinal abscess and granuloma in diseases classified elsewhere | G062 | Extradural and subdural abscess, unspecified |
| 2. | I39* | Endocarditis and heart valve disorders in diseases classified elsewhere | I38 | Endocarditis, valve unspecified |
| 3. | M03* | Postinfective and reactive arthropathies in diseases classified elsewhere | M029 | Reactive arthropathy, unspecified |

*2) Correction of postprocedural disorders*

Three postprocedural disorders (*Table 4*) were identified in ten death records between 1996 and 2023 and were recoded into Item Y839 ("Abnormal reaction to or late complication of surgical and other medical procedures, unspecified").

**Table 4. Correction of Postprocedural Disorders in ICD-10 Used in Moldova (1996–2023) – Total Deaths: 10**

| Nr. | Postprocedural disorder | Title | Target code | Title |
|---|---|---|---|---|
| 1. | J951 | Postprocedural respiratory disorders, not elsewhere classified | Y839 | Abnormal reaction, surgical procedure, unspecified |
| 2. | K911 | Postprocedural disorders of the digestive system, not elsewhere classified | Y839 | Abnormal reaction, surgical procedure, unspecified |
| 3. | M960 | Postprocedural musculoskeletal disorders, not elsewhere classified | Y839 | Abnormal reaction, surgical procedure, unspecified |

*3) Correction of additional non-recommended codes*

Between 1996 and 2023, an additional 18 codes not recommended for underlying causes of death were used in 5,194 death records (approximately 0.5% of the total number of deaths during this period). These deaths

were recodified as detailed in *Table 5*. Notably, Code I22 ("Subsequent myocardial infarction") and Code I252 ("Old myocardial infarction") accounted for nearly 90% of the cases. The most frequent four-digit code was I229 ("Subsequent myocardial infarction of unspecified site"). Additionally, 180 death records coded as C97 ("Malignant neoplasms of independent (primary) multiple sites") were recoded to C800 ("Malignant neoplasm, primary site unknown").

**Table 5. Correction of Additional Non-UCD Codes in ICD-10 Used in Moldova (1996–2023) – Total Deaths: 5194**

| Nr. | Non-UCD code | Title | Target code | Title | Number of death records |
|---|---|---|---|---|---|
| 1. | C77_ | Secondary and unspecified malignant neoplasm of lymph nodes | C809 | Malignant neoplasm, primary site unspecified | 226 |
| 2. | C78_ | Secondary malignant neoplasm of respiratory and digestive organs | C809 | Malignant neoplasm, primary site unspecified | 22 |
| 3. | C79_ | Secondary malignant neoplasm of other and unspecified sites | C809 | Malignant neoplasm, primary site unspecified | 22 |
| 4. | C97 | Malignant neoplasms of independent (primary) multiple sites | C800 | Malignant neoplasm, primary site unknown, so stated | 180 |
| 5. | F100 | Mental and behavioural disorders due to use of alcohol: acute intoxication | X45 | Accidental poisoning by and exposure to alcohol | 14 |
| 6. | F120 | Mental and behavioural disorders due to use of cannabinoids: acute intoxication | X42 | Accidental poisoning by and exposure to narcotics and psychodysleptics [hallucinogens], not elsewhere classified | 1 |
| 7. | F190 | Mental and behavioural disorders due to multiple drug use and use of other psychoactive substances: acute intoxication | X40 | Accidental poisoning by and exposure to nonopioid analgesics, antipyretics and antirheumatics | 71 |
| 8. | I151 | Hypertension secondary to other renal disorders | N289 | Disorder of kidney and ureter, unspecified | 2 |
| 9. | I158 | Other secondary hypertension | I139 | Hypertensive heart and renal disease, unspecified | 1 |
| 10. | I159 | Secondary hypertension, unspecified | I139 | Hypertensive heart and renal disease, unspecified | 4 |
| 11. | I22_ | Subsequent myocardial infarction | I212 | Acute transmural myocardial infarction of other sites | 3419 |
| 12. | I23_ | Certain current complications following acute myocardial infarction | I212 | Acute transmural myocardial infarction of other sites | 4 |
| 13. | I240 | Coronary thrombosis not resulting in myocardial infarction | I212 | Acute transmural myocardial infarction of other sites | 4 |
| 14. | I252 | Old myocardial infarction | I258 | Other forms of chronic ischaemic heart disease | 1203 |
| 15. | I65_ | Occlusion and stenosis of precerebral arteries, not resulting in cerebral infarction | I639 | Cerebral infarction, unspecified | 16 |
| 16. | I66_ | Occlusion and stenosis of cerebral arteries, not resulting in cerebral infarction | I639 | Cerebral infarction, unspecified | 2 |
| 17. | O82_ | Single delivery by caesarean section | O759 | Complication of labour and delivery, unspecified | 2 |
| 18. | P728 | Other specified transitory neonatal endocrine disorders | P969 | Condition originating in the perinatal period, unspecified | 1 |
| *Total deaths* | | | | | 5194 |

*4) Correction of sex-specific causes*

Data were screened for male-specific causes appearing in females and vice versa. Two cases were identified in males (*Table 6*) and recodified according to recommendations by (Barbieri et al., 2021).

**Table 6. Correction of Female-Specific Causes of Death Registered in Males in Moldova (1996–2023)**

| Nr. | Female-specific code | Title | Target code | Title |
|---|---|---|---|---|
| 1. | D259 | Leiomyoma of uterus, unspecified | D369 | Benign neoplasm of unspecified site |
| 2. | M830 | Puerperal osteomalacia | M839 | Adult osteomalacia, unspecified |

*5) Correction of age-specific causes*

Two death records were identified with age-inappropriate causes (adult-specific causes reported in children under 5 years) and were corrected as shown in *Table 7*.

**Table 7. Correction of Age-Specific Causes of Death Registered in Children Under 5 Years Old in Moldova (1996–2023)**

| Nr. | Age-specific code | Title | Target code | Title |
|---|---|---|---|---|
| 1. | X680 | Intentional self-poisoning by and exposure to pesticides | Y18 | Poisoning by and exposure to pesticides, undetermined intent |
| 2. | X780 | Intentional self-harm by sharp object | Y28 | Contact with sharp object, undetermined intent |

## 7. Specific transition documents

No official documents related to the classification transition were produced by the statistical office. No double coding was conducted during the transition years.

# Part III – Reconstruction information

## 8. Reconstruction of coherent time series

For Moldova, following the reconstruction method outlined by Meslé and Vallin (1996), we performed four transitions between different classifications of causes of death (Penina, Meslé and Vallin, 2022). These transitions are as follows:

1. From the 1965 revision of the Soviet Classification (SC) to the 1970 revision of SC.
2. From the 1970 revision of SC to the 1981 revision, adapted for deaths from injury and poisoning in 1988 (or the 1988 revision of SC).
3. From the 1988 revision of SC to ICD-9 (214 items).
4. From ICD-9 (214 items) to ICD-10 (243 items).

The reconstruction method for each transition from an old classification to a new classification involves three main stages: 1) constructing correspondence tables; 2) defining fundamental associations of items (FAIs) and 3) calculating transition coefficients.

*Tables 8-12* show the distribution of fundamental associations of items (FAIs) by type, along with the corresponding death counts during the transitions to new classifications in 1970, 1981, 1991, and 1996. For the transition from the 1988 revision of the Soviet classification to ICD-9, FAIs were calculated separately for three age groups: less than one-year-old, 1-59 years old, and 60 years and older. Since death distributions for the final revision of SC and ICD-9 are available for the period 1991-1995, FAIs were also constructed for 1991.

### *Transition from the 1965 SC to the 1970 SC*

A total of 141 FAIs were created for the first transition. The majority (70%) of these FAIs are "simple" (type 1:1), covering 26% of the total deaths in 1970. Nine "splitting" (type 1:n) and 14 "merging" (type n:1) associations account for 5% of deaths. Additionally, 19 FAIs are classified as complex, comprising 69% of the total deaths. Based on the established FAIs, transition coefficients were calculated for 210 items of the 1965 SC. For 20 items, transition coefficients had to be age-adjusted.

**Table 8. Distribution of FAIs between the 1965 SC and the 1970 SC by type and death counts**

| | **1970 Classification** | | | |
|---|---|---|---|---|
| | Associations | | Deaths (in 1970) | |
| Association type | Number | Proportion, % | Number | Proportion, % |
| type 1:1 | 99 | 70 | 7014 | 26 |
| type 1:n | 9 | 6 | 1019 | 4 |
| type n:1 | 14 | 10 | 162 | 1 |
| type n:n | 19 | 14 | 18399 | 69 |
| **Total** | **141** | **100** | **26594** | **100** |

### *Transition from the 1970 SC to the 1981 SC*

Similar to the previous transition, the largest proportion of associations is simple (type 1:1), making up 84% of the total, and covering a quarter of all deaths in 1981. However, the share of items involved in complex exchanges (type n:n) is relatively small (13%) but accounts for 69% of the total deaths. New items resulting from the splitting or merging of old items are even less common. For this transition, age adjustment was required for transition coefficients for 19 out of 185 items in the 1981 SC.

**Table 9. Distribution of FAIs between the 1970 SC and the 1981 SC by type and death counts**

| | **1981 Revision** | | | |
|---|---|---|---|---|
| | Associations | | Deaths (1981) | |
| Type of associations | Number | Proportion, % | Number | Proportion, % |
| type 1:1 | 129 | 84 | 10265 | 25 |
| type 1:n | 6 | 4 | 1935 | 5 |
| type n:1 | 6 | 4 | 466 | 1 |
| type n:n | 13 | 8 | 28810 | 69 |
| **Total** | **154** | **100** | **41476** | **100** |

### *Abolishment of the Work Accident Definition in 1988*

In 1988, a significant amendment was introduced regarding accidental causes of death. Under the 1981 classification, accidental deaths were divided into occupational and non-occupational categories, except for a few specific cases. However, in 1988, this distinction was abolished, and all accidental deaths, regardless of their origin, were grouped into a single category. As a result, the classification of deaths from injury and poisoning was adjusted, with items 160-185 in the 1981 SC being merged into items 160-175. This amendment required us to reclassify accidental causes of death by merging the two items into one new item in the 1988 classification.

### *Transition from the 1988 SC to ICD-9*

For the period 1991-1995, we had mortality data coded under two different classifications: the 1988 Soviet Classification (SC) by the National Bureau of Statistics (NBS) and the ICD-9 by the National Agency for Public Health (NAPH).

*Figure 4* illustrates this with two categories of renal diseases: *infectious renal diseases* (item 130 under the 1988 SC and item 590 under ICD-9), and *other nephritis, nephrosis, including nephrotic syndrome* (item 129 under the 1988 SC and items 581-589 under ICD-9). In 1991, the transition year, the total number of deaths

for these causes was identical in both classifications. However, in 1992, there was a sharp increase in deaths from item 129 under the 1988 SC, accompanied by a corresponding drop in deaths from item 130. This shift continued over the following years. Meanwhile, the curves for the corresponding ICD-9 items (depicted as dotted lines in Figure 6) show a smooth continuation of the time series from the Soviet classification. We identified similar patterns for many other causes of death. It appears that in 1992, the NBS introduced new national guidelines for coding causes of death under the Soviet classification, leading to significant disruptions in the mortality data series. Therefore, the parallel cause-of-death coding produced by the two Moldovan statistical institutions during 1991-1995 cannot be considered a true example of "bridge coding," as practised in other countries. Nevertheless, fundamental associations of items (FAIs) and transition coefficients were generated in advance for 1991 (before the NBS's coding changes) and were calculated separately for three age groups: under one year, 1-59 years, and 60 years and older.

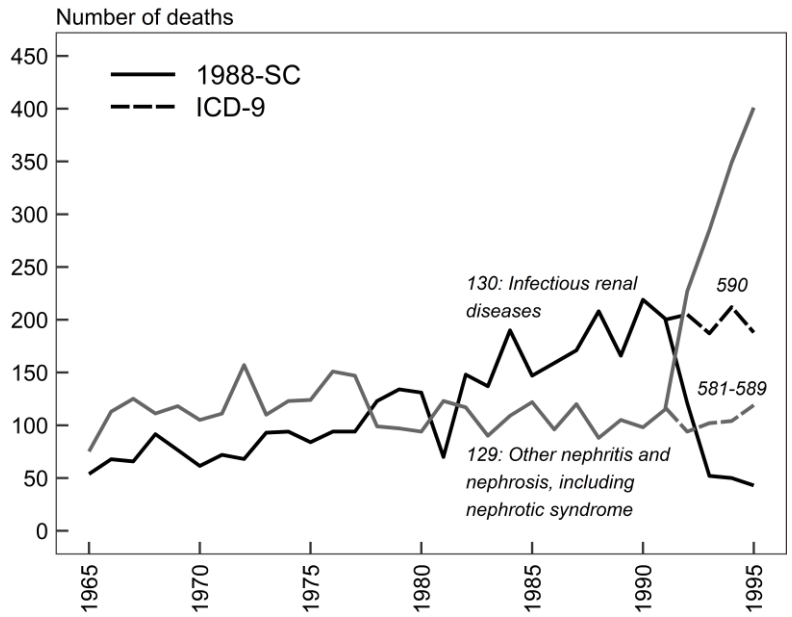



**Figure 4. Trends in annual deaths from "infectious renal diseases" and "other nephritis and nephrosis, including nephrotic syndrome" coded under the 1988 SC and ICD-9**

Source: (Penina, Meslé and Vallin, 2022)

For all three age groups, the majority of deaths were concentrated in the complex associations (type n:n), ranging from 70% for the under-one-year-old group to 86% for the elderly.

**Table 10. Distribution of FAIs between the 1988 SC and ICD-9 by three age groups, type and death counts**

| Type of associations | Under 1 year | | | | 1-59 years | | | | 60 years and over | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Associations | | Deaths (in 1991) | | Association | | Deaths (in 1991) | | Association | | Deaths (in 1991) | |
| | Number | % | Number | % | Number | % | Number | % | Number | % | Number | % |
| type 1:1 | 113 | 80 | 353 | 25 | 87 | 71 | 2320 | 17 | 92 | 74 | 2152 | 7 |
| type 1:n | 16 | 11 | 75 | 5 | 11 | 9 | 478 | 3 | 15 | 12 | 1397 | 5 |
| type n:1 | 3 | 2 | 0 | 0 | 1 | 1 | 347 | 3 | 1 | 1 | 630 | 2 |
| type n:n | 9 | 7 | 1012 | 70 | 24 | 19 | 10459 | 77 | 16 | 13 | 26317 | 86 |
| **Total** | **141** | **100** | **1441** | **100** | **123** | **100** | **13605** | **100** | **124** | **100** | **30497** | **100** |

### *Transition from ICD-9 to ICD-10*

The final transition was from ICD-9 (214 items) to ICD-10. Initially, the mortality data series was reconstructed using the ICD-10 list of 211 items, known as the Baltic list (Penina, Meslé and Vallin, 2022). Subsequently, we performed an additional transition from the Baltic list to the three-digit ICD-10 list (1643

items). Transition coefficients observed in 1996 were applied to the 1965-1995 series reconstructed under the Baltic list. This allowed us to extend the 1965-1995 death series under the three-digit ICD-10 and incorporate crude ICD-10 data for the years 1996-2023, thereby reconstructing the data for the entire 1965-2023 period under the three-digit ICD-10 classification. Subsequently, the time series were aggregated based on the full list, which includes 243 items.

*Tables 11* and *12* show the distribution of FAIs between ICD-9 and ICD-10 (Baltic list) and between ICD-10 (Baltic list) and the three-digit ICD-10, respectively. After analyzing the death series for statistical coherence between ICD-9 and ICD-10 (Baltic list), twenty complex associations were identified, covering 64% of the total deaths. In contrast, simple associations accounted for only 35% of the total deaths. The transition from the Baltic ICD-10 list to the three-digit ICD-10 list involved the creation of 63 splitting FAIs (type 1:n) and 36 simple FAIs (type 1:1), together accounting for 69% of the deaths in 1996. Additionally, one complex association (type n:n), covering 31% of the deaths, was also established.

**Table 11. Distribution of FAIs between ICD-9 and ICD-10 (Baltic list), by type and death counts**

| | **ICD-10** | | | |
|---|---|---|---|---|
| | Associations | | Deaths (in 1996) | |
| Type of associations | Number | Proportion, % | Number | Proportion, % |
| type 1:1 | 142 | 85 | 17560 | 35 |
| type 1:n | 2 | 1 | 424 | 0.5 |
| type n:1 | 4 | 2 | 5 | 0.5 |
| type n:n | 20 | 12 | 32070 | 64 |
| **Total** | **168** | **100** | **50059** | **100** |

**Table 12. Distribution of FAIs between ICD-10 (Baltic list) and three-digit ICD-10, by type and death counts**

| | **ICD-10** | | | |
|---|---|---|---|---|
| | Associations | | Deaths (in 1996) | |
| Type of associations | Number | Proportion, % | Number | Proportion, % |
| type 1:1 | 76 | 36 | 13121 | 26 |
| type 1:n | 132 | 63 | 21443 | 43 |
| type n:1 | 0 | 0 | 0 | 0 |
| type n:n | 1 | 1 | 15495 | 31 |
| **Total** | **168** | **100** | **50059** | **100** |

*Figure 5* provides an example related to obstructive pulmonary diseases. In the transition year, the standardized mortality rate for bronchiectasis and other obstructive pulmonary diseases (items 494-496 in ICD-9 and J44, J47 in ICD-10) saw a sharp increase, while the rate for chronic bronchitis and emphysema (items 490-492 in ICD-9 and J40-J43 in ICD-10) decreased symmetrically. To balance death counts in these time series, we merged them into a single association (Association #109).

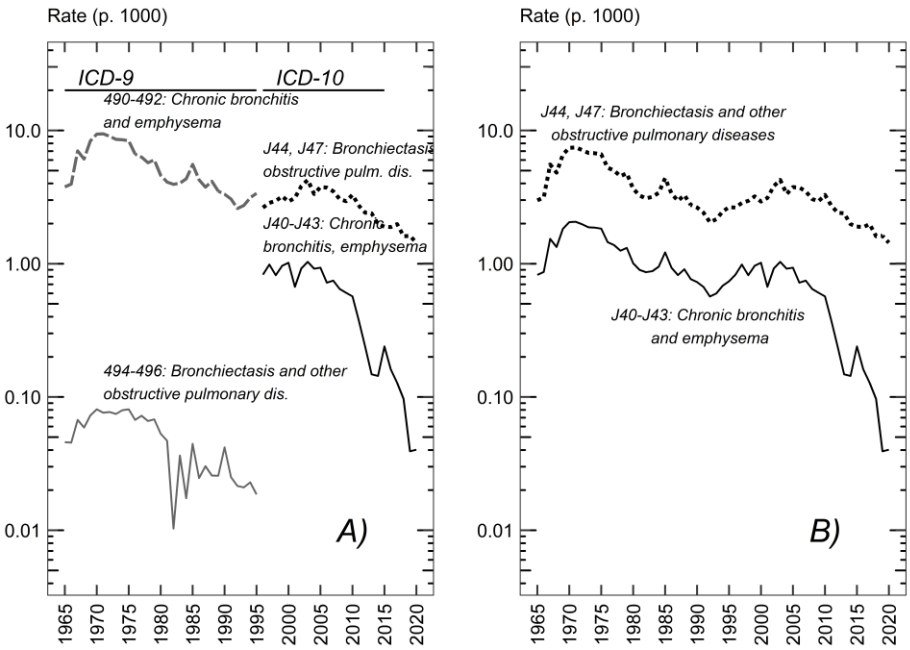



**Figure 5. Annual trends in deaths for some obstructive pulmonary diseases recorded under ICD-9 and ICD-10: before (on the left) and after (on the right) reconstruction**

Source: (Penina, Meslé and Vallin, 2022)

## A posteriori corrections

*A posteriori* corrections were applied after each transition from one classification system to another, implemented in four distinct steps. The first round of corrections was made to the 1965-1980 time series, which were classified under the 1970 Soviet classification. The second round of corrections addressed the 1965-1990 time series classified under the 1988 Soviet classification. Following the third transition from the 1988 Soviet classification to ICD-9, *a posteriori* correction coefficients were applied to the 1965-1995 statistical series. The final round of corrections was conducted after constructing the 1965-2023 time series under the ICD-10 three-digit list. The corresponding *a posteriori* coefficients calculated at each stage are presented in *Tables 13-16*.

*Figure 6* illustrates an example of *a posteriori* correction applied to the 1965-1980 death series reconstructed under the 1970 Soviet classification. Notably, in 1974, the number of deaths classified under item 85, "Chronic rheumatic heart diseases," dropped significantly, while there was a simultaneous, symmetric increase in the number of deaths attributed to item 84, "Active rheumatism." This change is a clear result of a shift in coding practices. In 1973, the TCSU of the USSR issued new instructions for the preparation of the annual cause-of-death statistical forms 5 and 5b (TCSU of USSR, 1973). These guidelines specifically recommended that special attention be paid to the codification of *active rheumatism* (item 84) in age groups over 15 years old and *chronic rheumatic heart diseases* (item 85) in age groups under 15 years old. This revision led to a reallocation of deaths between these two causes in 1974. To correct for this, we applied an a posteriori adjustment: 30% of the deaths initially attributed to item 85 were reassigned to item 84 for the period 1965-1973.

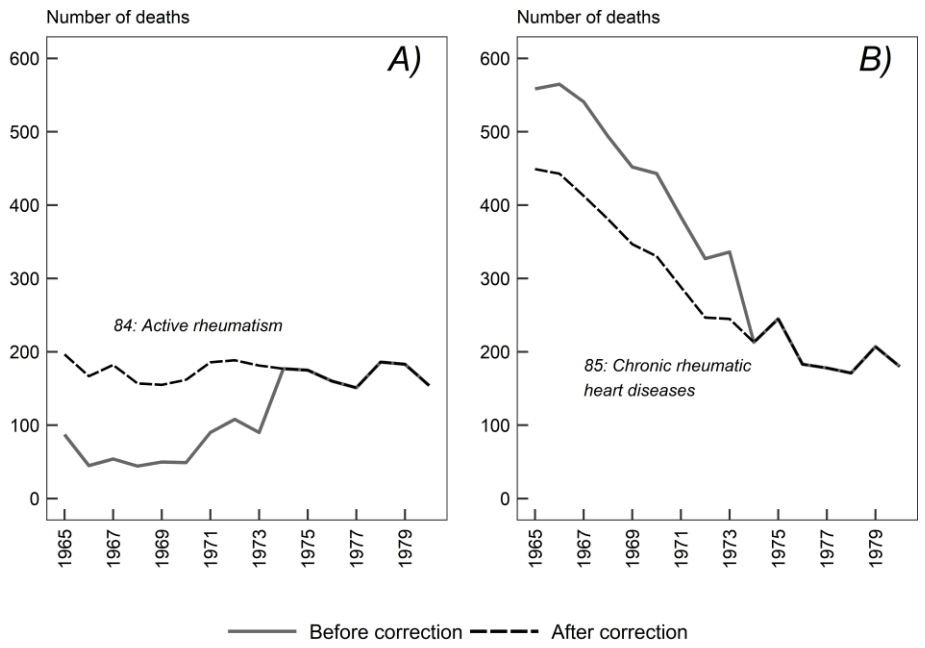



**Figure 6. Annual trends in the number of deaths classified under items 84 and 85 according to the 1970 SC, before and after a posteriori correction, for the age group 1-59 years, both sexes**

**Table 13. Percentage of deaths a posteriori transferred from one item to another in the 1970 SC**

| Item of entrance | Item of exit | Age | Proportion (%) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1965 | 1966 | 1967 | 1968 | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 |
| 49 | 50 | All ages | 45 | 45 | 45 | 45 | 45 | 45 | 45 | | | | | |
| 64 | 55 | All ages | | | | | | | 85 | 85 | 85 | | | |
| 76 | 74 | > 1 year | 40 | | | | | | | | | | | |
| 76 | 75 | > 1 year | 45 | | | | | | | | | | | |
| 77 | 74 | > 1 year | 75 | 75 | 75 | 75 | 75 | 75 | 75 | | | | | |
| 78 | 23 | > 1 year | 80 | | | | | | | | | | | |
| 85 | 84 | 1-59 years | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | | | |
| 88 | 86 | 1-59 years | 35 | 35 | 35 | 35 | 35 | 35 | 35 | | | | | |
| 88 | 93 | 1-59 years | 35 | 35 | 35 | 35 | 35 | 35 | 35 | | | | | |
| 88 | 86 | > 60 years | 45 | 45 | 45 | 45 | 45 | 45 | 45 | | | | | |
| 88 | 93 | > 60 years | 45 | 45 | 45 | 45 | 45 | 45 | 45 | | | | | |
| 89 | 86 | > 60 years | 65 | 45 | | | | | | | | | | |
| 89 | 88 | > 60 years | 25 | 15 | | | | | | | | | | |
| 94 | 96 | 1-59 years | | | | | | | 70 | | | | | |
| 98 | 93 | > 60 years | | | | | | | | 15 | | | | |
| 100 | 92 | 1-59 years | 76 | 56 | | | | | | | | | | |
| 100 | 92 | > 60 years | 56 | 36 | | | | | | | | | | |
| 100 | 91 | > 60 years | | | | | | | | 8 | 18 | | | |
| 100 | 92 | > 60 years | | | | | | | | 8 | 8 | | | |
| 100 | 99 | > 60 years | | | | | | | | 14 | 14 | | | |
| 100 | 93 | > 60 years | | | | | | | | 20 | | | | |
| 101 | 91 | > 60 years | | | | | | | | 10 | 20 | | | |
| 101 | 92 | > 60 years | | | | | | | | 10 | 10 | | | |
| 101 | 99 | > 60 years | | | | | | | | 50 | 40 | | | |
| 106 | 107 | < 1 year | | 85 | | | | | | 95 | 95 | | | |
| 108 | 106 | 1-59 years | 32 | 32 | 32 | 32 | 32 | 32 | 32 | | | | | |
| 108 | 113 | > 60 years | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 20 | 20 | | | |
| 109 | 107 | > 60 years | | | | | | | | | 79 | | | |
| 111 | 107 | < 1 year | | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | | |
| 120 | 121 | < 60 years | 44 | 44 | 44 | 44 | 44 | 44 | 44 | | | | | |
| 122 | 7 | < 1 year | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | | | |
| 123 | 7 | < 1 year | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | | | |
| 127 | 126 | All ages | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | | | |
| 131 | 133 | All ages | | | | | | 82 | | | | | | |
| 150 | 152 | < 1 year | 80 | | | | | | | | | | | |
| 157 | 156 | < 1 year | | | | | | | | | | 70 | 50 | 50 |
| 164 | 163 | All ages | 80 | | | | | | | | | | | |

**Table 14. Percentage of deaths a posteriori transferred from one item to another in the 1988 SC**

| Item of entrance | Item of exit | Age | Proportion (%) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1965 | 1966-1971 | 1972-1973 | 1974 | 1975 | 1976-1978 | 1979-1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986-1987 | 1988 | 1990 |
| 48 | 49 | All ages | | | | | | | | | | | | 54 | | | 54 |
| 49 | 48 | All ages | | | | | | | | | 9 | 9 | | | | | |
| 83 | 80 | < 1 year | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | | | | | |
| 89 | 98 | 1-59 years | 95 | 95 | 95 | 95 | 95 | 95 | 97 | 97 | 97 | 97 | | | | | |
| 93 | 94 | > 60 years | 0.1 | 0.1 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.3 | 0.5 | |
| 93 | 95 | > 60 years | 4 | 4 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 10 | 11 | |
| 93 | 97 | > 60 years | 1 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | | |
| 95 | 93 | 1-59 years | 35 | 35 | | | | | | | | | | | | | |
| 97 | 94 | > 60 years | | | | | | | | | | | | | | 1 | |
| 97 | 95 | > 60 years | | | | | | | | | | | | | | 49 | |
| 99 | 100 | > 60 years | | | | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | | |
| 107 | 103 | < 1 year | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | | | | |
| 107 | 103 | 1-59 years | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | | | |
| 107 | 149 | < 1 year | | | | 2 | 2 | 2 | 2 | 2 | 2 | 2 | | | | | |
| 107 | 150 | < 1 year | | | | 2 | 2 | 2 | 2 | 2 | 2 | | | | | | |
| 107 | 142 | < 1 year | | | | | 2 | | | | | | | | | | |
| 111 | 112 | All ages | | | | | | | | 95 | 95 | 95 | | | | | |
| 128 | 130 | All ages | | | | | | | | 95 | | | | | | | |
| 153 | 152 | < 1 year | | | | | | | | | 25 | 25 | | | | | |

**Table 15. Percentage of deaths a posteriori transferred from one item to another under ICD-9**

| Item of entrance | Item of exit | Age | 1965-88 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|---|
| 61 | 57 | >60 years | 0.2 | 0.2 | 0.2 | 0.2 |
| 122 | 123 | >60 years | 0.4 | 0.2 | 0.4 | 0.4 |
| 145 | 139 | 1-59 years | 0.5 | | | |
| 145 | 139 | >60 years | 0.5 | | | |

**Table 16. Percentage of deaths a posteriori transferred from one item to another under ICD-10**

| Item of entrance | Item of exit | Age | Proportion (%) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 1965-1996 | 1997 | 1998 | 1999-2003 | 2007-2012 | 2013-2016 |
| E14 | E10 | total | 0.2 | | | | | |
| E14 | E11 | total | 0.18 | | | | | |
| E88 | E10 | total | | | | | 0.2 | |
| E88 | E11 | total | | | | | 0.45 | |
| E88 | E14 | total | | | | | 0.2 | |
| I51 | I25 | total | | 0.6 | 0.5 | | | |
| I64 | I63 | total | 0.35 | 0.35 | 0.35 | 0.35 | | |
| I69 | I67 | total | | | | | | 0.45 |

## 9. Redistribution of ill-defined causes

In Moldova, as in many former Soviet republics, very few deaths were classified under "senility" or other ill-defined causes before the end of the 1980s. However, this changed drastically after 1989 when the Soviet Health Ministry, led by Evgeni Chazov, formerly a cardiologist, issued a new directive regarding the diagnosis of deaths from cardiovascular diseases among individuals over the age of 80, as well as the classification of sudden cardiac death at younger ages. According to the new instructions, any death occurring after the age of 80 was to be classified as senility, unless the deceased's medical history or autopsy report allowed for a precise diagnosis of the cause of death, excluding cases due to injury, poisoning, or other external causes (Meslé and Vallin, 2012).

Following the implementation of this directive, there was a dramatic increase in the number of deaths attributed to senility (items 158 under the 1981 Soviet Classification, 797 under ICD-9, and R54 under ICD-10). In 1993, deaths due to senility accounted for 12% of total deaths in males and 21% in females.

Simultaneously, deaths from certain circulatory diseases, particularly atherosclerotic cardiosclerosis, which had previously dominated the mortality pattern in the Soviet era, showed a sharp decline. After 1993, the number of deaths classified under senility decreased significantly, falling to 5% of total deaths by 1997 and to just 3% by the year 2000. In recent years, the number of deaths coded under this item has remained very small, similar to the period before 1989.

The method of senility redistribution adopted for Moldova involves using special coefficients for three different groups of circulatory system diseases: heart diseases, cerebrovascular diseases, and other circulatory diseases (*Figure 7*). The algorithm for calculating these coefficients is detailed in Annex 1.

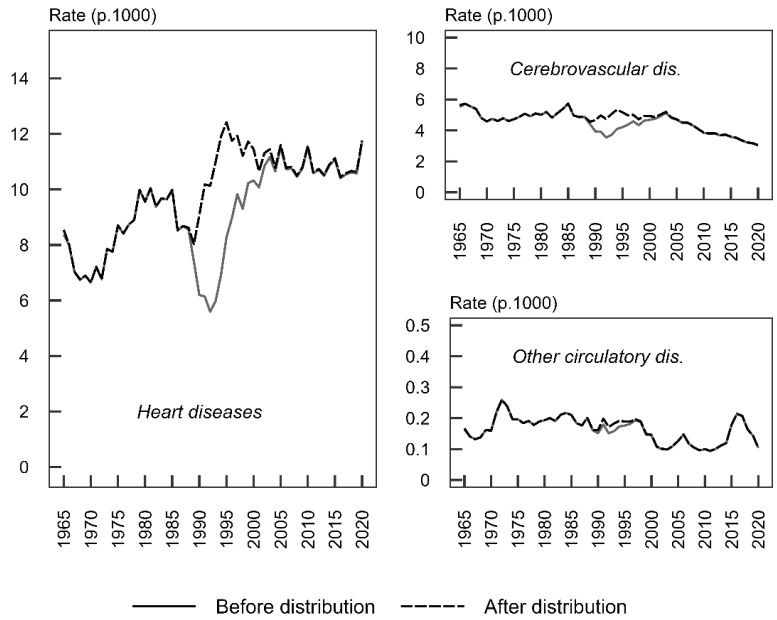



**Figure 7. Annual trends in the standardized mortality rate for three groups of circulatory diseases in Moldova before and after redistribution of senility deaths, all ages, both sexes**

Source: (Penina, Meslé and Vallin, 2022)

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## List of acronyms

BMA - Bureau of Migration and Asylum

FAI - Fundamental Associations of Items

ICD – International Classification of Diseases and Causes of Death

IDNP - personal identification number

MITC - Ministry of Information Technology and Communication

NBS - National Bureau of Statistics

NAPH -National Agency for Public Health

SE CSIR - Centre for State Information Resources

SPR - State Population Register

SC – Soviet Classification

TCSU - Central Statistical Administration

ZAGS - *Zapis' aktov grazhdanskogo sostoiania*, Registry of Acts of Civil Status

## Annex 1. Calculation of Distribution Coefficients for Deaths Registered Under the Item Senility Among Diseases of the Circulatory System

Senility: item R54 under ICD-10

Distribution coefficients are calculated for three groups of diseases of the circulatory system: heart diseases (group 1), cerebrovascular diseases (group 2) and other diseases of the circulatory system (group 3).

Calculations are produced by sex for the age group 80 years and older.

1. Adjustment coefficient $K$ is estimated as the ratio of the total number of deaths in 1991 to the total number of deaths in 1989:

$$K = \frac{D_{tot}^{1991}}{D_{tot}^{1989}} \quad (1)$$

where:
$D_{tot}^{1991}$ : total number of deaths in 1991

$D_{tot}^{1989}$: total number of deaths in 1989

2. The estimated number of deaths in 1991 for the group 2 (cerebrovascular diseases) is calculated according to the equation:

$$D'^{1991}_{gr.2} = D_{gr.2}^{1989} \times K \quad (2)$$

where:
$D_{gr.2}^{1989}$ : registered number of deaths for group 2 in 1989

$K$ : adjustment coefficient

The estimated number of deaths for group 3 is calculated in the same way.

3. To calculate the distribution coefficient for group 2, use the following equation. The difference between the estimated and registered deaths in 1991 for group 2 gives the "missing" deaths. The ratio of "missing" deaths for group 2 in 1991 to the senility deaths in 1991 gives the distribution coefficient for group 2. The distribution coefficients for group 3 are calculated similarly:

$$M_{gr.2} = \frac{D'^{1991}_{gr.2} - D_{gr.2}^{1991}}{D_s^{1991}} = \frac{\Delta D_{gr.2}^{1991}}{D_s^{1991}} \quad (3)$$

where:

$D'^{1991}_{gr.2}$ : estimated number of deaths in 1991 for group 2

$D_{gr.2}^{1991}$ : registered number of deaths in 1991 for group 2

$D_s^{1991}$ : deaths from senility in 1991

4. The distribution coefficient for group 1 is calculated as:

$$M_{gr.1} = 1 - M_{gr.2} - M_{gr.3} \quad (4)$$

where:
$M_{gr.2}$ : distribution coefficient for group 2

$M_{gr.3}$ : distribution coefficient for group 3

Deaths registered under the item *Senility* are redistributed according to the coefficients $M_{gr.1}$ , $M_{gr.2}$ and $M_{gr.3}$ among the corresponding detailed cardiovascular items. The coefficients are applied only to the age group 80 years and older for the period 1989-2023. For the age group 60-79 years old, senility deaths are redistributed proportionally among the detailed items of diseases of the circulatory system.