*Vienna Yearbook of Population Research 2023 (Vol. 21), pp. 419–443*

# Depopulation in Moldova: The main challenge in the context of extremely high emigration

***Olga Gagauz***[1,*], ***Tatiana Tabac***[1] ***and Irina Pahomii***[1,2]

## Abstract

In Moldova, there has been a long-term decline in the population, mainly due to high levels of emigration. The article presents an analysis of population dynamics in Moldova over the last three decades, and estimates the contributions of fertility, mortality and migration to this process. Using population censuses, data on the population with usual residence, vital statistics and data on Moldovan immigrants from the host countries' statistical institutes, we estimate population changes between 1991–2021, and present demographic projections up to 2040. The results show that migration outflows account for more than 90% of the depopulation trend, with high levels of premature mortality accelerating the natural decline. The fall in births is associated with a decrease in the reproductive-age population. The total fertility rate has been decreasing gradually, while the cohort fertility rates have not fallen below 1.75 live births per woman. Past migration and low fertility are projected to result in long-term population decline. Demographic ageing is expected to increase. While population decline cannot be stopped, its scale can be limited through reductions in emigration and mortality. This study on population decline in Moldova helps to complete the demographic picture of Europe in the 20th century and into the 21st century.

**Keywords:** depopulation; fertility; mortality; migration; demographic projection; Moldova

[1]Center for Demographic Research of the National Institute for Economic Research, Chisinau, Moldova

[2]Department of Demography and Geodemography, Faculty of Science, Charles University, Prague, Czechia

[*]Correspondence to: Olga Gagauz, gagauzo@gmail.com

https://doi.org/10.1553/p-ke2z-76zz

## 1 Introduction

Over the past two decades, Moldova has been experiencing an ongoing decline in population due to massive levels of emigration and natural decrease. This trend has, in turn, led to a number of economic, social and political shifts that have undermined the country's development opportunities and its security (Tabac and Gagauz, 2020). Population decline is occurring in 17 of 48 European countries, most of which are located in Eastern and Southern Europe (Newsham and Rowe, 2022). In Eastern Europe, migration has become the key factor in the overall population dynamics of the region (Sobotka and Fürnkranz-Prskawetz, 2021). Scholars have observed that when population decline is driven by out-migration, natural decrease intensifies due to the deterioration of the age-sex structure, as most international migrants are young (Gagauz et al., 2021; Mihaiu, 2020). At the same time, scientists believe that depopulation is difficult to reverse, especially in the countries experiencing significant international migration and human capital losses (Lutz and Gailey, 2020).

Due to its geographic position bordering Romania to the west and Ukraine to the east, Moldova has been experiencing high levels of outward migration to both the west and the east (Poalelungi et al., 2017). Currently, more than one million Moldovan citizens are living abroad (about 26% of the population). Levels of labour and of youth emigration are particularly high in Moldova (Gagauz et al., 2021).

The demographic trends in Moldova are similar to those in Romania and Bulgaria, which are also facing depopulation over the long run, mainly as a result of high levels of emigration to more developed EU countries (Gheț̆au, 2014; Koyama, 2018; Pop et al., 2021). According to a 2019 Eurostat demographic projection, in the decades to come (up to 2050), Romania and Bulgaria will be the EU countries most affected by depopulation, with a population decrease of at least 20% (Eurostat, 2021). It is, however, worth mentioning that in recent years, the Romanian state has been introducing active policies aimed at encouraging Romanian emigrants to return, and at attracting workers from other countries, including Moldova (Goga, 2020).

This paper provides an overview of Moldova's population dynamics during the last three decades, and analyses the dimensions and the determinants of the country's population decline. The main contribution of this work is that it adds to the existing knowledge about population and demographic processes in Moldova, and thus helps to complete the demographic picture of Europe in the 20th century and into the 21st century, as Moldova has not been included in most comparative analyses related to Eastern Europe.

The paper is organised as follows: First, a brief description of Moldova's socio-economic and cultural context is provided. Second, the quality of the available population data is discussed, and the research methods used in the analysis are described. The main results section contains subsections that outline the population dynamics in Moldova over the last three decades, including the impact of migration, fertility and mortality on depopulation, as well as demographic projections for the 2019–2040 period. The paper ends with a discussion and a presentation of conclusions.

## 2 Moldova's socio-economic and cultural context

Since Moldova proclaimed its independence in 1991, it has undergone a significant political, economic and cultural transformation. It has transitioned from having a highly centralised, planned economy to having an open, market-based economy; and from having an authoritarian government to being an open democracy. This three decade-long transition has been a complicated process involving gradual economic restructuring and slow growth, high levels of indebtedness and widespread losses of savings. Economic and social crises, domestic political instability and the country's territorial disintegration due to the armed conflict in the Transnistrian region in 1992 have negatively impacted the country's socio-economic and demographic development. While the situation improved during certain periods, Moldova has so far failed to make a significant economic breakthrough, and to secure the financial well-being of the country's population. Due to the robbery of three large banks in Moldova in 2014, the country lost $1 billion (Varzari, 2020), which caused enormous damage to its economy. In 2020, Moldova's GDP per capita was just 4551 US dollars, which places it among the poorest countries in Europe. Currently, almost every fourth person living in Moldova has an income below the poverty line, according the poverty headcount ratio based on the national poverty line (World Bank, 2022). Thus, labour migration and remittances have become essential resources for many Moldovan families. Among households in rural areas, remittances represent, on average, one-quarter of total income (Le Heron and Yol, 2019). The long-term effects of these developments are negative, as they are leading to population decline, a decrease in the working-age population, the loss of educated young people and a lack of skilled workers.

Moldova is a multi-ethnic country, with the largest share of the total population identifying as Moldovan/Romanian (80.6%). Slavic ethnic groups (Ukrainians, Russians and Bulgarians) make up 12.4% of the population, while Gagauz people (Turkic people) make up 4.5% of the population, and other ethnic groups account for 2.5% of the population. Over 90% of the country's population identify as Orthodox (National Bureau of Statistics of the Republic of Moldova, 2017). In addition to Romanian, which is the state language, Russian is spoken throughout the country.

In terms of its political alignment, Moldova is balanced between the European Union and Russia. In 2014, the EU–Moldova Association Agreement was signed, granting Moldovan citizens the right to visa-free travel in the Schengen area. At the same time, Russia influences Moldova in the political and economic domains. Moldovan society is separated into those who support European integration and those who favour strengthening relations with Russia.

## 3 Data and methods

Similar to other countries with high levels of outward migration, Moldova has faced difficulties in fully accounting for emigration in its official statistics. Thus, for a long

period of time, Moldova's demographic data did not paint an accurate picture of the country's demographic trends (Penina et al., 2015).

The data from the last Union census in 1989 were used as a benchmark for population calculations in Moldova's first decade of independence. As the territorial mobility of the population has increased considerably since the 1990s, accounting for migration has become problematic. Since 1998, Moldova has not provided the data for Transnistria to the National Bureau of Statistics (NBS) because it lost control over this region. At the same time, the country's lack of control over the borders in Transnistria has made recording migratory flows more difficult.

The data from the population census of 2004 were used only to calculate the total number of residents in the population, while the recalculations by age and sex for the period between the two censuses (1989 and 2004) were not made.

In the calculation of population numbers, a central problem was estimating the net migration level, which was done by using the special form of migrant registration as the data source. Moldovan citizens were included in the statistics as emigrants only if they deregistered from their place of permanent (official) residence, with these individuals being mentioned in the official statistics as cases of "documented" emigration. Citizens who went abroad to work for an extended period of time (12 months or more), but who retained their permanent residency in Moldova, were considered temporary emigrants or labour migrants. Thus, the total population of Moldova covered all citizens, including those who went abroad but were not removed from the register of permanent residents (*de jure population*). As all socio-economic and demographic indicators were calculated for the *de jure population*, these indicators were significantly distorted, with some being underestimated, and others being overestimated.

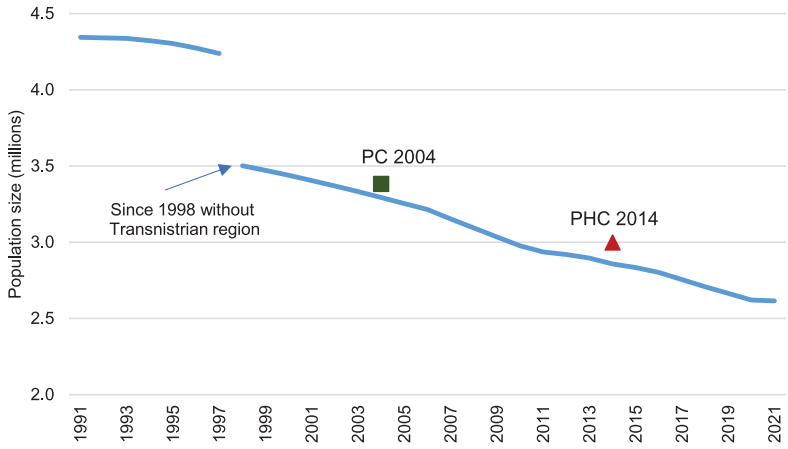
In 2015, Penina et al. (2015) recalculated the Moldovan population with *usual residence* for the years 1980–2015 by excluding Moldovan citizens who were long-term migrants (living abroad for 12 months or more). While the difference between the two data series (NBS and recalculated alternative data) was about 1% in the early 1990s, it had reached 18% by 1 January 2015. These data appear to be quite reliable, and the authors' comparison of their data with the data of two population censuses (2004 and 2014) shows that their data series were close to those of the population census (PC) of 2004 and the population and housing census of 2014 (PHC) (Figure 1). The NBS has been counting the population with usual residence since 2014 based on the population and housing census.

In this study, data on the population with usual residence for 2014–2021 from the NBS and data on the population exposed to risk for the 1991–2013 period (Penina et al., 2015) were used. All demographic indicators on fertility, mortality and migration were calculated for the population with usual residence.

The migration data were drawn from several data sources. The data on Moldovan immigrants came from statistical institutes of the host countries and from the NBS, which helped to ensure the accuracy of the findings. International migration was analysed using foreign data sources for the 1989–2013 period, and using data from the NBS for the 2014–2019 period. Long-term migration was analysed based on the

UN definition of residing more than 12 months abroad. For most EU countries, the US and Canada, the data refer to residence statistics.

**Figure 1:**
**The average annual population with usual residence, 1991–2021**




**Source:** for 1991–2013, estimates are based on Penina et al. (2015); for 2014–2021, estimates are based on data on the population with usual residence from the NBS; for PC 2004 and PHC 2014, estimates are based on census data.

The following databases were consulted: the OECD International Migration Database; Eurostat Population Statistics (statistics on migration); the Federal State Statistics Service of Russia; the State Statistics Service of Ukraine; the National Statistical Institutes of Italy, Portugal and Spain; and the National Bureau of Statistics of Moldova. Migration flows to and from Israel were estimated using data from the Israel Central Bureau of Statistics, as published by demographer Tolts (2020). All these data allowed us to determine the dynamics and the size of migration flows over the last 30 years, which, in turn, enabled us to estimate net migration, net migration rates and age-specific net migration rates.

The analysis of fertility covered the 1991–2021 period, and the data on the number of births by the mother's age from the NBS were used. The fertility investigation focused on two forms of demographic analysis: period and cohort fertility quantum trends. These were investigated using the following indicators: total fertility rate (TFR), age-specific fertility rates (ASFR), adjusted TFR, period mean age of women at first birth (MAFB), period and cohort median age, complete cohort fertility rates and age-specific cohort fertility rates.

The analysis of the impact of mortality on depopulation in Moldova focused on the evolution of age-specific rates, as we considered them effective tools for providing an overview of the mortality level, given that they were less exposed to errors induced by the structure and the number of the population. The data on the numbers of death by sex and age from the NBS were used.

**Table 1:**
**Scenarios of changes in fertility, mortality and migration up to 2040**

| Years | TFR | Life expectancy at birth, female | Life expectancy at birth, male | The net rate of migration, % |
|---|---|---|---|---|
| | | Scenario I – low | | |
| 2018 | 1.82 | 75.0 | 66.3 | −1.30 |
| 2040 | 1.70 | 77.2 | 68.5 | −1.00 |
| | | Scenario II – medium | | |
| 2018 | 1.82 | 75.0 | 66.3 | −1.30 |
| 2040 | 1.90 | 79.4 | 71.8 | −0.50 |
| | | Scenario III – high | | |
| 2018 | 1.82 | 75.0 | 66.3 | −1.30 |
| 2040 | 2.10 | 81.6 | 74.0 | 0.00 |

**Source:** Gagauz et al. (2021).

The paper presents demographic projections for 2019–2040 for Moldova (without Transnistria) based on the data on the population with usual residence in 2018 (Table 1).

## 4 Main results

### 4.1 Population dynamics 1991–2021

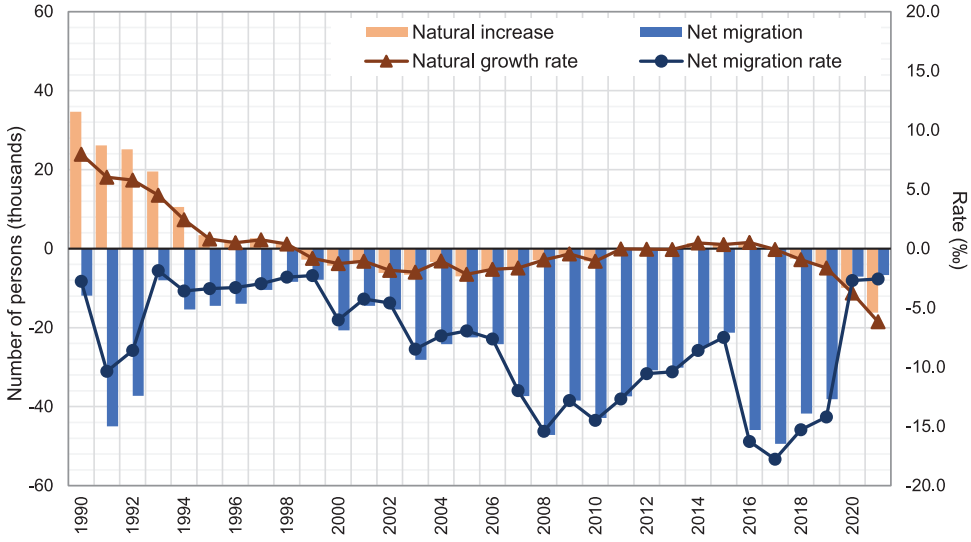
Depopulation has reached high levels in Moldova. In 1991, when Moldova became an independent state, the country's population, including the Transnistrian region, was 4364.1 thousand inhabitants (Table 2). Between 1991 and 1997, the population decreased by 46.6 thousand, mainly due to outward migration (136.2 thousand), which was only partially offset by natural growth (89.6 thousand). Since 1998, the population has been declining faster than in the previous period due to large-scale emigration and natural decline. In 1998, without the Transnistrian population of 665.7 thousand (Chivaciuc, 2014), the population was 3655.6 thousand. In the population census of 2004, the population was 3383.0 thousand, having fallen by 272.6 thousand, with a natural decrease of 25.5 thousand individuals accounting for 9.4% and the emigration of 247.1 thousand individuals accounting for 90.65% of the total decline. By the next census (population and housing, 2014), the decline in the population was significant, falling to 2869.2 thousand. Between 1998 and 2021, the total decrease in the population had reached over one million, with migration accounting for 92.0% of the decline. In 2021, during the COVID-19 pandemic, international migration decreased, and the share of the population decline that was attributable to migration shrank accordingly.

**Table 2:**
**Population changes in Moldova during 1991–2021 and its components**

| Years | Population number (thou.) | Thousand people | | | % | | |
|---|---|---|---|---|---|---|---|
| | | Natural balance | Migration balance | Total balance | Natural balance | Migration balance | Total balance |
| 1991 | 4364.1 | | | – | | | |
| 1997 | 4317.5 | 89.6 | −136.2 | −46.6 | – | – | – |
| 1998 | 3655.6 | – | – | – | – | – | – |
| 2004 | 3383.0 | −25.5 | −247.1 | −272.6 | 9.4 | 90.6 | 100 |
| 2014 | 2869.2 | −26.3 | −487.5 | −513.8 | 5.1 | 94.9 | 100 |
| 2020 | 2643.9 | −15.1 | −210.2 | −225.3 | 6.7 | 93.9 | 100 |
| 2021 | 2615.2 | −16.2 | −6.7 | −22.9 | 70.7 | 29.3 | 100 |
| 1998–2021 | | −83.1 | −951.5 | −1034.6 | 8.0 | 92.0 | 100 |

**Note:** Since 1998 without Transnistria region.
**Source:** Calculated for 1991–1997 based on NBS data; for 1998 based on data from Penina et al. (2015); for 2004 based on data from the population census; for 2014–2021 based on NBS data on the population with usual residence.

**Figure 2:**
**Natural increase, net migration and their rates in 1991–2021**




**Note:** Migration growth and the migration growth rate were estimated based on sources from the migrants' destination countries (1990–2013) and NBS data on international migration (2014–2019).
**Source:** Calculated based on host country data, NBS data and data from Penina et al. (2015).

The data on natural and migratory growth (Figure 2) show the oscillations of these indicators over the 1991–2021 period. In the first decade after independence, the prevalence of births over deaths was determined by the population structure, with young people accounting for a large share of the population, and older people making up a small share of the population. A negative natural increase was recorded for the first time in 1999. The natural decline of Moldova's population over the 1999–2010 period ranged from −0.8‰ to −2.2‰. Between 2011–2016, there was a positive natural increase, with insignificant values up to 0.5‰, thanks to the growth in the reproductive-age population, i.e., the generations born in the mid-1980s, and the number of births. Natural decrease began to rise in 2017, and increased sharply during the COVID-19 pandemic, to −3.8‰ in 2020 and to −6.3‰ in 2021.

Negative net migration can be observed over all three decades (Figure 2). The particularly high levels of net migration in 1991–1992 reflect the large flows of emigrants to Israel. For the period between 1993 and 2000, the indicator is low due to high levels of illegal migration (Mosneaga, 2013). Migration has been increasing since 2000–2003 due to the amnesties implemented in Southern Europe, and since 2007 as a result of family reunifications that followed these amnesties. Since 2014, a new wave of emigrants to Western European countries has been emerging. The net number of outward migrants was slightly more than 200 thousand in 2007–2011, and

was 220 thousand in 2014–2019. The net migration rates for the two periods were between 12–15‰ and 9–18‰, respectively. In 2020 and 2021, during the COVID-19 pandemic, the net migration rate declined to 3–2.5‰.

## 4.2 Out-migration is the main cause of depopulation

The first migratory flows from Moldova began in the late 1980s, and consisted mainly of ethnic minorities, including Jews, Germans, Russians and Ukrainians, who were often encouraged to emigrate through the repatriation programs of the origin countries. Between 1989 and 1995, the number of ethnic migrants reached 176.4 thousand. The main destination countries were Israel, Russia, Ukraine, Germany and the USA.

While ethnic migration had largely ended by the mid-1990s, Moldovan citizens were starting to migrate in search of work and to earn money abroad. Due to restrictive migration policies in most EU countries, the largest flow of Moldovan workers during this period was to the Russian Federation and the Commonwealth of Independent States (CIS). Labor migration to the EU was significantly lower, and was mainly clandestine. Most illegal migrants from Moldova were in Southern European countries (Mosneaga, 2013).

Since 2000, migratory flows have changed their trajectories and characteristics. Labor migration to Europe has been increasing substantially, and the length of time Moldovans are staying in the host countries has been rising as well. At the same time, the first stocks of migrants have been emerging. The levels of migration to the EU have been increasing due to the amnesties offered to Moldovan citizens who were living illegally in countries like Italy, Spain and Portugal, and to the family reunifications that followed (Tabac and Gagauz, 2020). The number of emigrants in the 2000–2010 period exceeded 400 thousand, about 60% of whom emigrated to Italy or to Russia.

Our estimations based on data from the OECD international migration database, the Russian Federal State Statistics Service, the State Statistical Service of Ukraine and Israel Central Bureau of Statistics (Tolts, 2020) show that in Moldova over the study period, migration flows were segmented in two directions: towards the Russian Federation and towards Italy (Table 3).

These two countries hosted up to two-thirds of annual migration flows from Moldova in some years. Currently, these two countries host the most extensive stocks of Moldovan emigrants. Russia has become the main emigration destination for male workers, while women often migrate to Italy. During different periods, women who went to work in Italy accounted for 70–80% of the total number of Moldovan emigrants, while men who went to work in Russia accounted for about 70% of the total.

Although migration for temporary work was the most common form of migration in the first two decades of the study period, in the last decade, migration for settlement was increasing as well.

**Table 3:**
**Long-term migration from Moldova and the main destinations of emigrants, in thousands**

| Country/Year | 1989–1995 | 1996–2000 | 2001–2006 | 2007–2010 | 2011–2019 |
|---|---|---|---|---|---|
| Russia | 121,3 | 63 | 41,6 | 57,9 | 259,3 |
| Israel | 39,6 | 7,7 | 2,8 | 0,8 | 1,4 |
| Italy | 0,5 | 1,9 | 49,1 | 78,4 | 47,4 |
| Ukraine | – | 4,4 | 23,3 | 17,1 | 19,7 |
| USA | 8,5 | 5,8 | 13,4 | 7,3 | 21,1 |
| Canada | 0,6 | 1,2 | 3,8 | 5,7 | 8,3 |
| Spain | – | 0,8 | 10,9 | 7,9 | 7,9 |
| Germany | 5,8 | 9,8 | 7,1 | 2,9 | 34,5 |
| Czech Republic | – | 0,2 | 7,3 | 8,4 | 3,7 |
| Portugal | – | – | 10,9 | 7,1 | 3,7 |
| Other countries | – | 1,3 | 7,8 | 7,3 | 10,5 |
| Total | 176,4 | 96,1 | 178,0 | 201,0 | 417,4 |

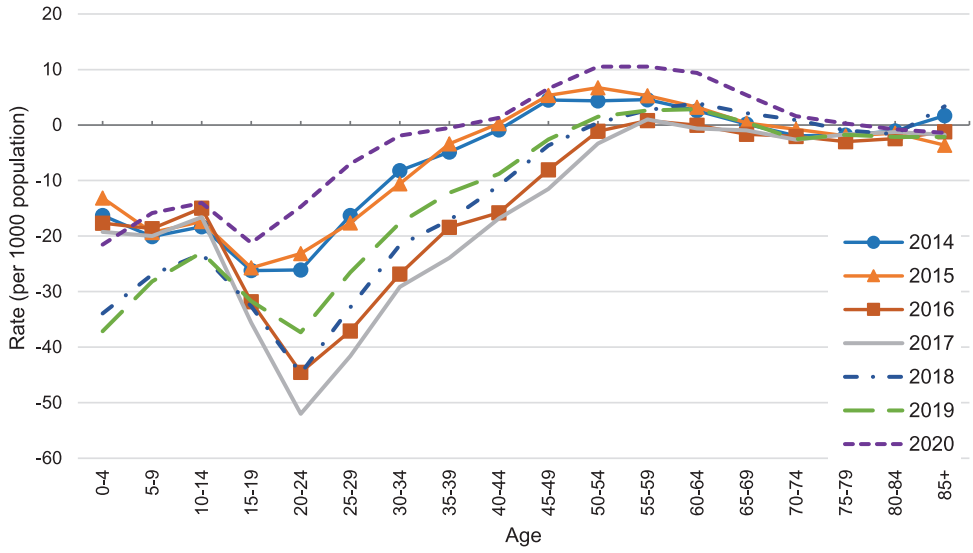
**Source:** Calculated based on data from the OECD international migration database, the Russian Federal State Statistics Service, the State Statistical Service of Ukraine and the Israel Central Bureau of Statistics (Tolts, 2020).

Recent trends in migration flows (over the last 10 years) point to a decrease in migration to Russia and Southern European countries, and an increase in migration to Western Europe, especially to countries such as Germany, France and the United Kingdom (Gagauz et al., 2021). Over the past decade, the ability of Moldovan citizens to acquire Romanian citizenship has played an essential role in the intensification of migration to other European countries (dual citizenship). Under art. 11 of the Romanian Citizenship Law no. 21 of 1 March 1991, all persons who had lived on Romanian territory since 1940 and their descendants up to the third generation have the right to acquire Romanian citizenship. Having access to Romanian citizenship has dramatically increased Moldovan citizens' opportunities to emigrate to other European countries, as it has facilitated legal migration for purposes of employment to all EU countries, and has granted them social protections and employment rights equal to those of European citizens. In particular, having access to Romanian citizenship has increased family migration to Germany, France and the United Kingdom.

High levels of long-term or permanent mass migration combined with low rates of return migration is a pattern specific to Moldova. The Moldovan migrant stocks calculated by the World Bank in *Bilateral Estimates of Migrant Stocks* in 2010, 2013 and 2017 show an upward trend. Globally, Moldovan migrant stocks were estimated at over 770 thousand in 2010; at about 860 thousand in 2013; and at 1025 thousand in 2017 (World Bank, 2017).

The recent trends show increasing migration among the population of reproductive and working ages. Levels of migration are especially high among young people aged

**Figure 3:**
**Age-specific net migration rates in 2014–2020, per 1000 population**




**Source:** Calculated based on NBS data.

15–34. The negative net migration in this age group has been estimated at 141.4 thousand, which represents just over 60% of the total net migration in the 2014–2020 period.

In 2014–2015, the group with the highest net outward migration rate was young people aged 15–24 years; with 25 out of 1000 people aged 15–24. In 2016–2017, the net outward migration rate of the 20–29 age group increased, to 37 and 52 out of 1000 people aged 20–24 and 25–29, respectively. In 2018–2019, the net outward migration rate was increasing not just among youth aged 20–29, but also among children aged less than 14. The net outward migration rate was highest in the 0–4 age group, with 34–37 per 1000 children aged 0–4. The restrictions related to the COVID-19 pandemic reduced the extremely high levels of migration: in 2020, a decrease in emigration at ages 15–34 and a positive increase in net migration at ages 40–70 was observed (Figure 3).

It may be assumed that a large share of the population of Moldova who are currently living abroad will not return to the country. It is difficult to estimate their number, but many emigrants of Moldovan origin and citizenship have lived in their destination country for 10, 20, and even 30 years. Many have retained their Moldovan citizenship even though they have also acquired the citizenship of their country of residence. More than one million Moldovan citizens have another citizenship as well (Tabac, 2019).

The number of people immigrating to Moldova is tiny. Thus, immigrants to Moldova neither offset the impact of the outflow of workers nor affect population growth in the country.

## 4.3 Impact of fertility on depopulation

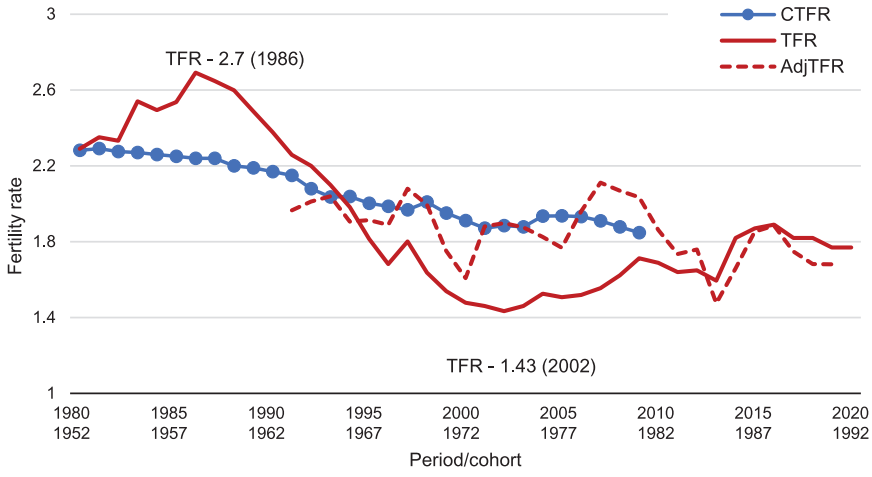
In 1991, Moldova had a relatively high total fertility rate compared to other countries, which ensured the replacement of generations (2.26 births per woman). However, in 1994, the TFR in Moldova dropped to less than two children per woman. In the following years, the TFR declined steadily, reaching a record low level of 1.43 live births per woman in 2002. Thereafter, however, fertility stabilised, and increased slowly as births that were postponed in the previous period were recuperated. In recent years, the TFR has, with some fluctuations, remained at a level of around 1.7 to 1.8 live births per woman. This level places Moldova among the countries with moderately low fertility, based on the benchmark proposed by Sobotka et al. (2019). Moreover, compared to other Eastern European countries, the TFR seems to be more favourable in Moldova, as it is significantly higher than the TFR in Belarus (1.45 in 2018) (National Statistical Committee of the Republic of Belarus, 2019) or in Russia (1.5 in 2019–2021) (Rosstat, 2022), even though these countries have had policies aimed at increasing fertility through financial incentives for more than a decade. At the same time, the TFR in Moldova is close to that of the neighbouring country of Romania, which has a TFR of 1.77 (Eurostat, 2019).

Period TFR in Moldova decreased continuously after 1991, which can be attributed in part to a compensatory decline after a period of significant fertility growth that was fostered by the pronatalist policies implemented in the Soviet Union in 1981, and in part to the impact of the worsening socio-economic situation in the country during the period following independence (Gagauz, 2018). The fertility postponement observed in Moldova starting in 1995 resulted in an increase in the mean age at first birth, which, in turn, led to a reduction in the TFR to 1.43 in 2002. However, the tempo- and parity-adjusted total fertility rate (adjTFRp) was higher in the 1995–2013 period (Figure 4). Despite these fluctuations, cohort fertility rates (CTFR) were decreasing gradually, but did not fall below 1.75 live births per woman, which is considered the threshold for "very low" fertility (Myrskylä et al., 2013; Zeman et al., 2018). The completed cohort fertility rate is 2.2 for women born in 1960, 1.94 for women born in 1970 and 1.88 for women born in 1980 (40 years old in 2020).

In Moldova, the early fertility model has persisted. While the mean age at first birth increased slightly from 21.9 in 1995 to 24.5 in 2020, it has remained significantly lower than in other Eastern European countries.

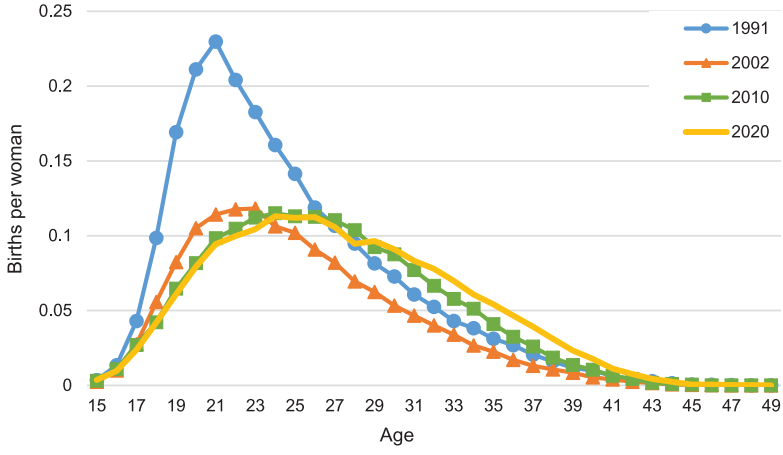
Over the past three decades, fertility rates have been rising faster among women between ages 25 and 40, whereas they have been decreasing among women in their early twenties. Thus, the mean age at childbirth has continued to rise. Delayed motherhood is a long-lasting trend that has changed the profile of the period age-specific fertility curve (Figure 5). The curve's shape lost its sharp top and shifted

**Figure 4:**
**Total fertility rate (TFR) and tempo- and parity-adjusted total fertility rate (adjTFRp) during the 1980–2020 period, and completed cohort fertility rate (CTFR) of women born in 1952–1980**



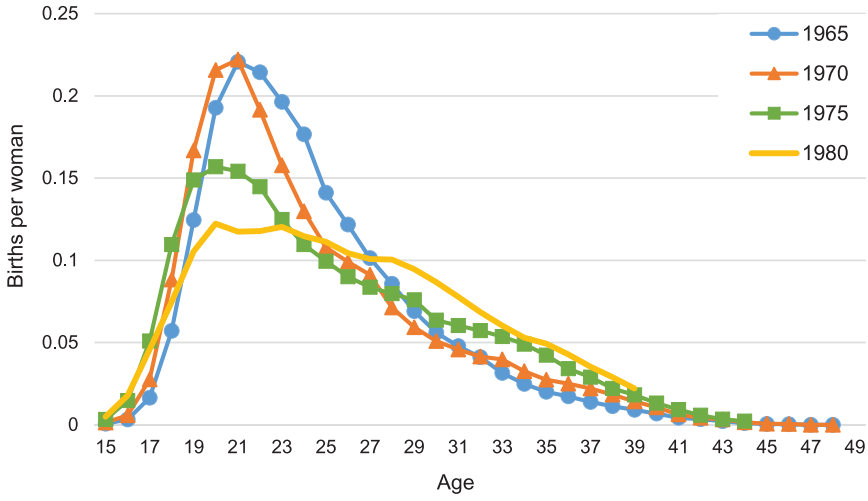

**Note:** Cohort fertility data displayed in the figure are shifted by 28 years, reflecting the mean age at childbearing in the 1960s–1980s. Since 1998 without Transnistria.
**Source:** Calculated based on NBS data.

**Figure 5:**
**Period age-specific fertility rates, 1991, 2002, 2010, 2020**




**Source:** Calculated based on NBS data.

**Figure 6:**
**Cohort age-specific fertility rates of women born in 1965, 1970, 1975 and 1980**




**Source:** Calculated based on NBS data.

to the right at older ages, and the period ASFR significantly increased at ages 25 and older. The median age at childbirth increased from 22.8 in 1991 to 26.3 in 2020. The cohort ASFR (Figure 6) underwent similar changes. Among women in the youngest cohort born in 1980 (40 years old in 2020), who were at their most active reproductive ages in the first decade of the 21st century, the ASFR reached its highest levels when they were between ages 20 and 25. The median age at childbirth was 22.9 for the cohort born in 1965 (CCFR-40), and was 24.9 for the cohort born in 1980 (CCFR-40).

In recent years, the number of births in Moldova has fallen significantly due to the drop in population numbers and the migration of the reproductive-age population. While the number of births in 2014 was 40.9 thousand, by 2020, it had declined to 30.7 thousand. The female population currently of reproductive age includes the relatively small generations born in the late 1990s and the early 2000s. Thus, the number of women of childbearing age (aged 15–49) in Moldova decreased from 714.4 thousand in 2014 to 608.4 thousand in 2020.

The COVID-19 pandemic had an insignificant impact on fertility. In 2021, the TFR (1.73) decreased by just 0.03 births per woman compared to 2020 (1.76). This may be because contraceptive usage fell by around 40% among couples with and without medium-term fertility intentions (Emery and Koops, 2021).

## 4.4 High mortality accelerates the natural decline of the population

Moldova is among the countries with high levels of mortality, in line with the pattern observed across the Eastern European region (Penina, 2021a; Vallin and Meslé, 2004). Male life expectancy in 2019 (66.6 years) was just one year higher than it was in 1965. Over the same period, female life expectancy increased by 5.0 years, reaching 75.0 years in 2019 (Penina et al., 2022). A high level of premature mortality, especially among men, results in a low level of life expectancy at birth (Pahomii, 2018), and a large gender gap (Penina, 2013).

In terms of life expectancy, Moldova lags behind the countries of Western Europe and the other former Soviet republics. A comparison of Moldova with Estonia and Sweden (Figure 7) shows a significant gap that has been increasing over time. In 1991, male life expectancy at birth in Moldova (64.4 years) was only 0.1 years lower than in Estonia (64.5 years), and was approximately 10 years lower than in Sweden (75 years). In 2021, male life expectancy at birth was 7.2 years lower in Moldova (65.2 years) than in Estonia (72.4 years), and was 16.2 years lower than in Sweden (81.4 years).

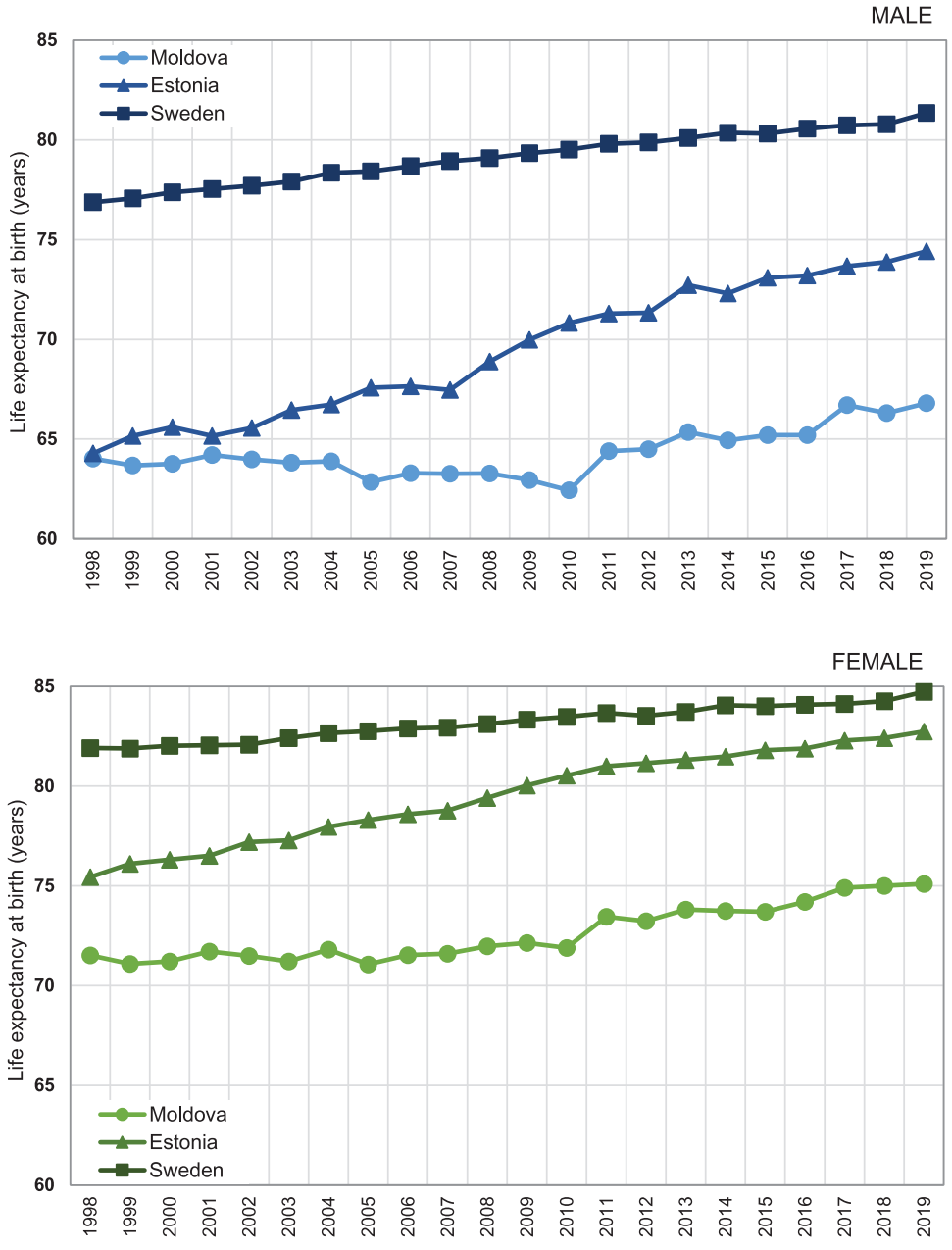
Among women in Moldova, mortality levels have been higher than in other European countries since the early 1990s, with Moldovan women having much lower life expectancy values than women in Estonia and Sweden. In 1991, female life expectancy at birth in Moldova (71.2 years) was 3.8 years lower than in Estonia (75 years) and 8.3 years lower than in Sweden (80.5 years). By 2021, the gap in life expectancy at birth between women in Moldova (73.1 years) and women in Estonia (81.3 years) had doubled to 8.2 years, while the gap between Moldovan women and women in Sweden (85 years) had increased to 11.9 years.

The COVID-19 pandemic led to a significant increase in mortality in both 2020 and 2021. Life expectancy at birth in Moldova dropped by 1.6 years for men and by 2 years for women in 2021 compared to 2019.

An analysis of the age-sex mortality patterns for 1991–2021 shows that the mortality profile did not change significantly over the past three decades (Figure 8). For both sexes, infant and child mortality rates declined the most (from ages one to 14 years among males, and from ages one to nine years among females). The reduction of infant mortality can have a large impact on the depopulation process, given that infant mortality represents the irreparable and immediate loss of population. Thus, reducing this indicator is of central importance (Anderson, 2002).

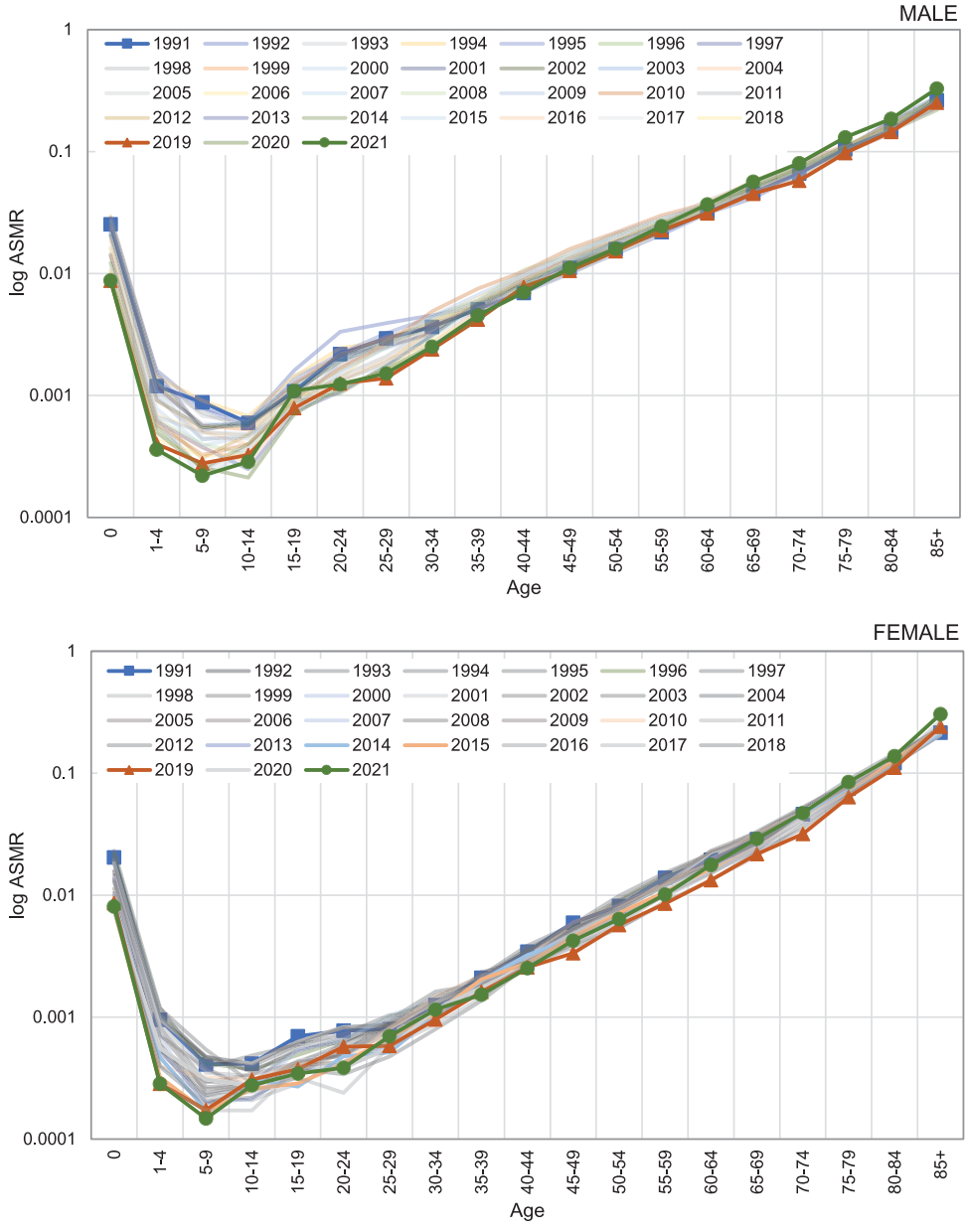
In the adult population, changes in mortality have been very modest, especially for men. A slight decrease in mortality was observed among males in the 15–39 age group, while mortality among men aged 40 and older remained at the same high level. Substantial reductions in mortality were found among women aged 40 and older, with the largest decrease being observed in the 45–64 age group. However, among the elderly population aged 65+, there was no significant decrease in mortality, especially among men. For women, the declining trend in mortality was continuous, and was especially pronounced in the 65–79 age group. A similar pattern, especially

**Figure 7:**
**Life expectancy at birth by sex, Moldova, and some selected countries**




**Source:** Calculated for Moldova based NBS data, and for Estonia and Sweden based on Human Mortality Database (1991–2019) and Eurostat (year 2020) data.

**Figure 8:**
**Dynamics of the age-specific mortality rate (ASMR), by sex, 1991–2021**




**Source:** Calculated based on NBS data.

in the age structure of mortality, has been detected across Eastern European and Balkan countries (Marinković and Radivojević, 2016).

During the COVID-19 pandemic, an increase in mortality was reported among males aged 65+ and among females aged 40+. The increase in mortality found among young males (aged 15–19) seems to be a statistical artefact due to small numbers, and does not represent a real increase in mortality in this age group. A recent study showed that the COVID-19 pandemic amplified premature mortality (Penina, 2021b).

In light of these findings, we can state that high mortality and its age and sex structure continue to be important elements of the process of depopulation. Low life expectancy and premature mortality lead to the loss of human lives, which, in turn, contributes to population decline.

## 4.5 Future trends

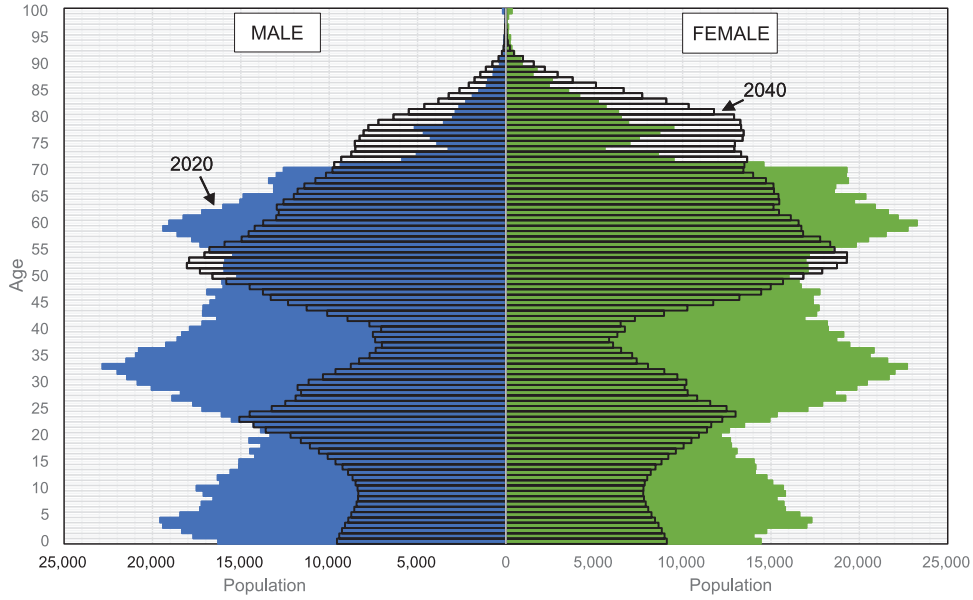
The demographic projections for 2019–2040 show (in an I-low most likely scenario) that in the coming decades, demographic decline will continue at a fast pace in Moldova, increasing annually from 1.6% to 2.3%; and the population will decrease by 34.5%, to 1754.6 thousand (Gagauz et al., 2021). This level of depopulation can be avoided only if fertility increases substantially, but mortality and emigration fall. According to the medium scenario, the population will decrease by 28.2% to 1924.9 thousand; while according to the high scenario, the population will decrease by 21.5% to 2094.5 thousand.

The age-sex pyramid (Figure 9) acquires an "hourglass" shape due to the high levels of migration among young people. The pyramid profile will "weaken" rapidly, gaining a "pinched waist" in the middle and a solid peak reflecting the presence of many old people. A significant shortage of young adults is projected due to the low birth numbers of people born in the late 1990s to early 2000s, many of whom are actively involved in migration. According to the I-low scenario, by 2040, when these cohorts reach ages 30–39, they will be the smallest group in the total population, with their share decreasing from 15.6% to 7.7%.

At the same time, it is projected that people aged 50 and older will make up about half of the total population of Moldova by 2040, while the European Union will not reach the same level of ageing until 2060 (Lutz et al., 2018). It therefore appears that the process of population ageing is occurring two decades earlier in Moldova than in the EU. In Moldova, the median age is expected to increase from 37.3 to 47.3 years between 2019 and 2040. The more significant reductions in mortality projected in the II-medium and III-high scenarios would cause demographic ageing to accelerate, and the median age to increase to 48.5 and 49.7 years, respectively.

Past migration trends and low fertility levels are projected to lead to a decrease in the number of women of reproductive age, and to a long-term decline in the number of births. The magnitude of demographic ageing will be determined by the age-sex structure of the population formed in the previous period, and by recent trends in

**Figure 9:**
**Age-sex pyramid of Moldova in 2020 and 2040 (projection, medium scenario)**




**Source:** Calculated based on NBS data.

the rates of return from abroad of migrants of pre-retirement age. It is projected that the share of young people aged 0–19 in the population will decrease from 23.9% in 2019 to 17.6% in 2040, while the share of older people aged 65+ in the population will increase from 14.2% to 24.4% over the same period.

## 5 Discussion

The results of our study suggest that in Moldova, low levels of fertility combined with high levels of mortality and outward migration are leading to an accelerated long-term demographic decline. The current population structure is developing in a negative direction due to fertility decline and increasing demographic ageing. The process of depopulation is expected to continue in the coming 20 years, with the speed of depopulation reaching unprecedented levels. It is, however, possible to limit the degree of depopulation that occurs. Reductions in population mortality could help to reduce the scale of depopulation. In the years after Moldova achieved its independence, the country failed to achieve a significant breakthrough in its efforts to reduce mortality and increase life expectancy. Thus, the gap in life expectancy between Moldova and other European countries remains large. High mortality, and especially premature mortality, leads to the loss of years of life, and is one of the

factors in Moldova's population decline. Given that people who migrate tend to be young and healthy, while return migrants may be ill or in failing health, it is possible that migration has a negative impact on the dynamics of life expectancy, as it could result in a worsening of health indicators and an increase in mortality due to the relatively high number of elderly and seriously ill people in the population (Ullmann et al., 2011). It is obvious that life expectancy can be increased by significantly improving the population's standard of living and access to high-quality medical services.

Although Moldova's TFR is higher than the rates in other European countries, it is lower than the level needed to replace generations, and it has been decreasing steadily. The birth rate is hard to influence by politics, and the measures aimed at boosting fertility are costly. The emigration of large numbers of young people exhausts the reproductive potential of the country, given that, as was mentioned above, the number of women of reproductive age has been decreasing. Thus, the number of births has been decreasing, which fuels other dimensions of the depopulation process. As recent studies have shown, in countries that are experiencing intensive out-migration, the TFR must be significantly higher than 2.1 children to replace generations (Sobotka and Zeman, 2021).

Reducing the size of emigration flows could help to limit the scale of depopulation. However, there are a few signs that emigration will slow down in the coming years, despite a temporary decrease during the COVID-19 pandemic. As we showed, net migration rates are negative at young adult ages, and are positive at pre-retirement ages, albeit at a low level. These developments contribute to demographic ageing.

The imbalance in the age structure of Moldova, with older people making up a large share of the total population, will accelerate the processes of demographic ageing and depopulation. As other scholars have emphasised, the "depopulation trend contributed to subsequent levels of population ageing, but recent population ageing has also contributed to ongoing depopulation, creating a vicious circle" (Reynaud and Miccoli, 2018).

## 6 Conclusions

In this study, we examined the particularities of population reproduction and the determinants of depopulation in Moldova over the last three decades. All of the demographic indicators were calculated using population data based on usual residence. Our findings are broadly in line with those of previous studies, and our use of reliable statistical data, together with a validated analytical approach, suggests that the results are robust.

Modern approaches to population policies emphasise the need to shift the focus away from population size and towards the quality of human capital; i.e., levels of education and health. Based on forecasts of changes in the education levels of the population, it has been argued that education and labour market participation are the most important issues for countries with shrinking populations (Batog et al., 2019). Many international studies on Eastern European countries have recommended that

the governments of these countries seek to achieve balanced population development in terms of age, gender, education and health, and to promote active longevity. But this advice may be hard to follow in the context of intensive international migration, the flows and directions of which are difficult to predict. Moreover, following these recommendations will require substantial investments. Given that Moldova is close to European economies that facilitate labour migration, and that migration networks are expanding, Moldova will continue to lose human capital. Free mobility of labour, as a part of the globalisation of the world economy, is becoming one of the most important trends in social development, and is fuelling the migration aspirations of the population. The pay gap between Moldova and the EU countries, rural poverty, the chronic lack of well-paid jobs, and increased opportunities to study and work abroad will evolve as push-pull factors of migration (Stratan et al., 2021). While policies aimed at encouraging migrants to return have been tried, they did not have a significant effect.

It has been suggested that the depopulation trend in countries like Moldova is impossible to stop. Some scientists have argued that emigration has far-reaching consequences, and that the countries with high levels of outward migration will, slowly but surely, see their public health and pension systems collapse, especially given that in the post-transitional countries, these systems are mainly based on the solidarity principle. Over the longer run, these countries may be unable to generate sufficient human capital to maintain economic growth, leading to economic collapse (Vuksanović Herceg et al., 2020).

Promoting a regional migration management approach based on European solidarity is crucial in this context. If policies for the recruitment of workers, and particularly well-educated workers from economically vulnerable backgrounds, are implemented, they will fuel high rates of migration, which may lead to imbalances at the regional level (Lutz and Gailey, 2020). Only if responsible actions to manage human capital are taken by the international community, by the governments of donor and recipient countries, and by international organisations concerned with population issues can the demographic development of countries in the European region be balanced.

## Author contributions

The authors jointly contributed to the conception of the work, analysis and interpretation of the data. Specifically, OG contributed to the sections on fertility and future trends, TT contributed to the sections on migration, and IP contributed to the sections on mortality.

## Acknowledgments

The study was carried out in within the state Project 20.80009.0807.21 “Migration, demographic changes and situation stabilization policies”.

## ORCID iDs

*Olga Gagauz* https://orcid.org/0000-0002-1175-1008
*Tatiana Tabac* https://orcid.org/0000-0001-9526-6642
*Irina Pahomii* https://orcid.org/0000-0002-6595-9146

## References

Anderson, B. A. (2002). Russia faces depopulation? Dynamics of population decline. *Population and Environment, 23*, 437–464. https://doi.org/10.1023/A:1015113017848

Batog, C., Crivelli, E., Ilyina, A., Jakab, Z., Lee, J., Musayev, A., Petrova, I., Scott, A., Shabunina, A., Tudyka, A., Xu, X. C., and Zhang, R. (2019). Demographic Headwinds in Central and Eastern Europe (Departmental Paper No. 2019/011). International Monetary Fund. https://doi.org/10.5089/9781498319768.087

Chivaciuc, A. (2014). Демографическая картина Приднестровья [Demographic picture of Transnistria]. Демоскопе *Weekly, 24 March–6 April 2014*. http://www.demoscope.ru/weekly/2014/0591/tema03.php

Emery, T., and Koops, J. C. (2021). *The impact of COVID-19 on fertility behaviour and intentions in the Republic of Moldova*. SocArXiv. https://doi.org/10.31235/osf.io/fcqd9

Eurostat. (2019). *Fertility Database*. Retrieved 30 March 2021, from https://ec.europa.eu/eurostat/data/database

Eurostat. (2021). *Population Projected to Decline in Two-Thirds of EU Regions*, 30 April 2021. https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20210430-2

Gagauz, O. (2018). Рождаемость в республике Молдова: европейские тенденции и национальная специфика [Fertility in the Republic of Moldova: European trends and national particularities]. *Demographi Review, 5*(3), 57–80. https://doi.org/10.17323/demreview.v5i3.8135

Gagauz, O., Buciuceanu-Vrabie, M., Pahomii, I., Ștîrba, V., Tabac, T., and Grigoraș, E. (2021). *Populația Republicii Moldova la 30 de ani de independență: Provocări principale și politici necesare*. INCE, CCD – Chișinău. https://doi.org/10.36004/nier.ccd.2021.978-9975-89-248-3

Gheț̆au, V. (2014). Declinul populației României. Două scenarii pâna la mijlocul secolului [The decline of Romania's population. Two scenarios until the middle of the century]. *Revista de Asistență Socială*, (4), 249–265.

Goga, C. I. (2020). Is Romania in a social and economic crisis caused by emigration? The new policy of the Romanian state on migration. *Sociology and Social Work Review, 4*(1), 31–37.

Koyama, Y. (2018). Migration from new EU member states in Central and Eastern Europe and their depopulation: Case of Bulgaria. *Historical Studies of Socialist System, 2018*(4).

Le Heron, E., and Yol, N. (2019). The macroeconomic effects of migrants' remittances in Moldova: A stock–flow consistent model. *European Journal of Economics and Economic Policies: Intervention, 16*(1), 31–54. https://doi.org/10.4337/ejeep.2018.0039

Lutz, W., Stilianakis, N., Stonawski, M., Goujon, A., and KC, S. (Eds.) (2018). *Demographic and human capital scenarios for the 21st century: 2018 assessment for 201 countries*. European Commission, Joint Research Centre, Publications Office. https://data.europa.eu/doi/10.2760/835878

Lutz, W., and Gailey, N. (2020). *Depopulation as a policy challenge in the context of global demographic trends.* (Human Development Series.) UNFPA Serbia.

Marinković, I., and Radivojević, B. (2016). Mortality trends and depopulation in Serbia. *Geographica Pannonica, 20*(4), 220–226. https://doi.org/10.5937/GeoPan1604220M

Mihaiu, S. (2020). România la răscruce: Opțiuni pentru viitor, Editura Pro Universitaria, București, 2015. Cătălin Zamfir și Iulian Stănescu (coordonatori) [Romania at the crossroads: Options for the future, Pro Universitaria Publishing House, Bucharest, 2015. Cătălin Zamfir and Iulian Stănescu (Eds.)]. *Sociologie Românească, 18*(1), 182–186. https://doi.org/10.33788/sr.18.1.12

Mosneaga, V. (2013). *Illegal Moldovan migration to the European union*. (CARIM-East Explanatory Notes 2013/85). Migration Policy Centre, CARIM-East.

Myrskylä, M., Goldstein, J., and Cheng, Y.-H. A. (2013). New cohort fertility forecasts for the developed world: Rises, falls, and reversals. *Population and Development Review, 39*(1), 31–56. https://doi.org/10.1111/j.1728-4457.2013.00572.x

National Statistical Committee of the Republic of Belarus (2019). Демографический ежегодник Республики Беларусь [Demographic Yearbook of the Republic of Belarus]. https://www.belstat.gov.by/upload/iblock/1c0/1c05351f61eba273e04b71df0036594a.pdf

National Bureau of Statistics of the Republic of Moldova (2017). *Key results of the 2014 Population and Housing Census*. https://statistica.gov.md/newsview.php?l=en&id=5583&idc=168

Newsham, N., and Rowe, F. (2022). *Understanding the trajectories of population decline across rural and urban Europe: A sequence analysis.* Paper presented at 30th Annual Geographical Information Science Research UK (GISRUK), Liverpool, United Kingdom, 5th–8th April 2022. https://doi.org/10.5281/zenodo.6410175

Pahomii, I. (2018). Dinamica mortalității premature în ultimele două decenii: Studiu comparativ Republica Moldova-Estonia. In A. In Stratan, O. Gagauz, G. Paladi, T. Bajura, I. Chistruga-Sînchevici, and G. Savelieva (Eds.), *Creşterea economică în condiţiile globalizării [Economic growth in the conditions of globalization]* (Edition XIII , pp. 45–56). Institutul Național de Cercetări Economice.

Penina, O. (2013). Mortality of adult population in the Republic of Moldova. In G. Paladi, O. Gagauz, O. Penina (Eds.), *Creşterea economică în condiţiile globalizării [Economic growth in the conditions of globalization]* (Edition VIII, pp. 72–79). Institutul Național de Cercetări Economice.

Penina, O. (2021a). Spatial disparities in mortality by causes of death in the Republic of Moldova. *Moldovan Medical Journal, 64*(4), 55–61. https://doi.org/10.52418/moldovan-med-j.64-4.21.10

Penina, O. (2021b). Temporal trends and patterns in COVID-19 mortality in the Republic of Moldova. *Economy and Sociology*, (2), 85–93. https://doi.org/10.36004/nier.es.2021.2-07

Penina, O., Jdanov, D., and Grigoriev, P. (2015). *Producing reliable mortality estimates in the context of distorted population statistics: The case of Moldova* (MPIDR Working Paper WP 2015-011). Max Planck Institute for Demographic Research. https://doi.org/10.4054/MPIDR-WP-2015-011

Penina, O., Obreja, G., and Raevschi, E. (2022). Causes of excess mortality in the Republic of Moldova as compared to the European model. *Moldovan Medical Journal, 65*(1), 5–9. https://doi.org/10.52418/moldovan-med-j.65-1.22.01

Poalelungi, O., Mazur, O., Vremis, M., and Craieschi-Toartă, V. (2017). Extended Migration Profile of the Republic of Moldova 2010–2015. Overview of Migration Trends for the Period 2005–2015. International Organization for Migration.

Pop, A., Muntean, A.-D., and Dimitriu, E. (2021). Îmbătrânire și dezvoltare în România [Aging and development in Romania]. In A.-R. Ilovan and A.-D. Muntean (Eds.), *Geografia dezvoltării [Geography of development]* (pp. 47–101). Presa Universitară Clujeană. https://doi.org/10.52257/9786063712050

Reynaud, C., and Miccoli, S. (2018). Depopulation and the aging population: The relationship in Italian municipalities. *Sustainability, 10*(4), Article 1004. https://doi.org/10.3390/su10041004

Rosstat. (2022). *Demography*. Retrieved 30 March 2021, from https://rosstat.gov.ru/folder/12781

Sobotka, T., and Fürnkranz-Prskawetz, A. (2021). Demographic change in Central, Eastern and Southeastern Europe: Trends, determinants and challenges. In R. Holzmann, D. Ritzberger-Grünwald, and H. Schuberth (Eds.), *30 years of transition in Europe. Looking back and looking beyond in CESEE countries* (pp. 196–222). Edward Elgar Publishing. https://doi.org/10.4337/9781839109508.00027

Sobotka, T., and Zeman K. (2021). *Missing generations? A cohort perspective on cumulated outmigration from South-Eastern, Central and Eastern Europe.* Paper presented at the Wittgenstein Centre Conference 2021, Vienna, Austria, 29 November–1 December 2021. https://www.oeaw.ac.at/fileadmin/subsites/Institute/VID/PDF/Conferences/2021/Slides/S01-1_slides_Sobotka-Zeman_Missing_Generations_WIC_conference_29Nov2021_REV.pdf

Sobotka, T., Matysiak, A., and Brzozowska, Z. (2019). *Policy responses to low fertility: How effective are they* (UNFPA Working Paper No. 1). UNFPA.

Stratan, A., Toacă, Z., and Fală, V. (2021). Progresele reformării economiei moldovenești în vederea asigurării tranziției sale la economia de piață. In A. Stratan et al. (Ed.), *Creşterea economică în condiţiile globalizării [Economic growth in the conditions of globalization]* (Edition XV, Vol. 1, pp. 160–174). Institutul Național de Cercetări Economice https://doi.org/10.36004/nier.cecg.I.2021.15

Tabac, T. (2019). Acquisition of foreign citizenship by Moldovan immigrants. *Economy and Sociology, 2019*(2), 104–116. https://doi.org/10.36004/nier.es.2019.2-09

Tabac, T., and Gagauz, O. (2020). Migration from Moldova: Trajectories and implications for the Country of Origin. In M. Denisenko et al. (Eds.), *Migration from the newly independent states: 25 years after the collapse of the USSR* (pp. 143–168). Cham, Springer. https://doi.org/10.1007/978-3-030-36075-7_7

Tolts, M. (2020). A half century of Jewish Emigration from the Former Soviet Union. In: M. Denisenko et al. (Eds.), *Migration from the newly independent states: 25 years after the*

*collapse of the USSR* (pp. 323–344). Cham, Springer. https://doi.org/10.1007/978-3-030-36075-7_15

Ullmann, S. H., Goldman, N., and Massey, D. S. (2011). Healthier before they migrate, less healthy when they return? The health of returned migrants in Mexico. *Social Science & Medicine, 73*(3), 421–428. https://doi.org/10.1016/j.socscimed.2011.05.037

Vallin, J., and Meslé, F. (2004). Convergences and divergences in mortality: A new approach of health transition. *Demographic Research, 10*, 11–44. https://doi.org/10.4054/DemRes.2004.S2.2

Varzari, A. (2020). The Moldovan bank fraud (2012–2015). A process tracing analysis of the Moldovan $1 billion money laundering. *Economy and Sociology, 2020*(2), 96–107. https://doi.org/10.36004/nier.es.2020.2-08

Vuksanović Herceg, I., Herceg, T., and Škuflić, L. (2020). New EU member states' emigration: Projections for future and lessons for the new EU candidates. *Zagreb International Review of Economics & Business, 23*(2), 129–140. https://doi.org/10.2478/zireb-2020-0017

Zeman, K., Beaujouan, E., Brzozowska, Z., and Sobotka, T. (2018). Cohort fertility decline in low fertility countries: Decomposition using parity progression ratios. *Demographic Research, 38*(25), 651–690. https://doi.org/10.4054/DemRes.2018.38.25

World Bank. (2022). *World Bank: Poverty.* Retrieved 15 January 2021, from https://data.worldbank.org/topic/11

World Bank. (2017). *Migration and Remittances Data: Bilateral Estimates of Migrants Stocks.* Retrieved 20 November 2020, from https://www.worldbank.org/en/topic/migrationremittancesdiasporaissues/brief/migration-remittances-data