CHANGES IN LIFE EXPECTANCY IN MOLDOVA DURING THE COVID-19 PANDEMIC[1]

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During the COVID-19 pandemic, the number of deaths in Moldova has considerably increased in absolute and relative numbers, compared with previous years. Earlier trends in mortality decline worsened for both sexes, while life expectancy decreased by 1.0 years in males and 1.7 years in females, respectively. Comparing the age components in the life expectancy change between pre-pandemic and pandemic periods, we can notice a slight increase in life expectancy in young-population age groups, mainly resulting from external mortality diminution. On the contrary, a sharp decline in life expectancy is observed in both sexes in the ages above 45. Life expectancy diminution was mainly conditioned by increased deaths from coronavirus disease and health system overload, which in many cases led to postponement in planned chronic disease treatment and emergency medical aid. A significant decrease in the number of deaths caused by COVID-19 was highlighted once a considerable proportion of the population was vaccinated against the coronavirus disease. Even though life expectancy is expected to increase in the following years, acquired chronic diseases or their late diagnosis during the COVID-19 pandemic can adversely affect the population's health in the medium and long term. The paper describes the life expectancy change in Moldova during the COVID-19 pandemic, for which the method of decomposition was used.

Keywords: *mortality in Moldova; life expectancy; excess mortality; COVID-19 pandemic; coronavirus disease.*

INTRODUCTION

The Ministry of Health of Moldova reported, as of April 20, 2022, about 11.5 thousand deaths caused by COVID-19, of which 10.3 thousand deaths date to 2020–2021. Compared with the similar two-year period of 2018–2019, in 2020–2021 the number of deaths exceeded by approximately 12.5 thousand, which constitutes a substantial increase in overall mortality. A significant proportion of

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these deaths occurred in a period of high COVID-19 incidence: November – December 2020 and February – April 2021, respectively.

Before the pandemic, life expectancy in Moldova had registered an annual increase of about 0.25 years for both sexes, which resulted from a series of programs on the population's health, and from an increase in the spectrum of the medical services covered by the national health insurance company. This trend was interrupted in 2020, when life expectancy started declining and worsened in 2021, registering values that correspond to the period before 2014 (Gagauz *et al*. 2021; NBS).

The mortality increase during the COVID-19 pandemic resulted from the pace at which coronavirus disease spread among the population, ultimately impacting the medical system overload. This period was challenging for people with chronic and degenerative diseases who postponed their planned treatment. Considering the lockdown period, when certain health services were cut back, some conditions could be diagnosed late, eventually affecting population health, and contributing to mortality increase.

A study on patterns in COVID-19 mortality in Moldova showed visible life expectancy losses due to mortality from infectious diseases, neoplasms and circulatory system diseases (Penina 2021). However, this increase in the leading causes of death may be due to the underestimation of deaths from coronavirus disease in 2020, when the laboratory testing capacity was limited.

The results show that the structural mortality changes in 2020–2021 contributed to a significant decrease in life expectancy from 66.5 years to 65.5 years (-1.0 years) in males and from 75.1 years to 73.4 years (-1.7 years) in females, respectively. By comparing age components' contribution to life expectancy change, we observe a notable increase in mortality in ages above 45 and a slight diminution among the young-age population.

The paper aims to describe the life expectancy change in Moldova during the COVID-19 pandemic. However, given that life expectancy is a synthetic indicator, the results instead picture the situation of mortality during the COVID-19 pandemic, and do not refer to the population's lifespan itself.

LITERATURE OVERVIEW

During the COVID-19 pandemic, the population's health worsened in most high and middle-income countries studied, leading to a decline in life expectancy (Aburto *et al*. 2022; Schöley *et al*. 2022; Islam *et al*. 2021). This decline resulted from the changes in mortality structure, and mainly affected the population above 55 years old with the highest coronavirus disease fatality rate (Levin *et al*. 2020). Among these population age groups was registered a significant proportion of the years of life lost and life expectancy decline (Pifarré i Arolas *et al*. 2021). In Moldova, the number of years of life lost during the COVID-19 pandemic, by

adjusting to the population size, has significantly exceeded, compared to most European countries (William *et al*. 2022). Furthermore, in contrast to these countries, Moldova females emphasised a higher increase in mortality than males during the pandemic period (Geldsetzer *et al*. 2022).

Despite an observed decline in deaths caused by external factors during the lockdown period (Calderon-Anyosaand Kaufman 2021), there was an increase in unhealthy diet and reduced physical activity (Calderon-Anyosaand Kaufman 2021), which might affect long-term population health. On the contrary, in Moldova, as in other Eastern and Western European countries, alcohol and tobacco consumption declined during the COVID-19 pandemic (Kilian *et al*. 2022; Kilian *et al*. 2021). However, the consumption of tobacco and especially alcohol in Moldova has been exceedingly high in recent decades, so the observed decrease in their consumption during the pandemic is likely to have an insignificant impact on the reduction in overall mortality in the following years.

With the increase in COVID-19 cases, pressure on the healthcare system has risen, while some planned medical treatments and routine checks have been postponed (Englum *et al*. 2022; Kim *et al*. 2020). During these periods, the quality of medical services has reasonably deteriorated, whilst the patients with diagnosed coronavirus disease might endure long-term health consequences that will affect the length and quality of their life (del Rio, Collins and Malani 2020). Besides the evident impact of the COVID-19 pandemic on physical health, several studies show some deterioration in mental health among specific population groups (Talevi *et al*. 2020; Pfefferbaum and North 2020). Also, given the population's individual economic, social and health needs depending on age, sex and other socioeconomic factors, the COVID-19 pandemic could have a long-term impact on health inequality (Su *et al*. 2021; Ahmed *et al*. 2020).

Vaccination campaigns significantly reduced the number of hospitalisations and adverse outcomes, especially in the elderly population, contributing to the coronavirus disease mortality decline (Moghadas *et al*. 2021). Therefore, in 2022 most countries are no longer in a state of epidemiological alert, given the apparent decrease in diagnosed cases and deaths from COVID-19.

DATA AND METHODS USED

The research estimates the contribution of the age components to the life expectancy change between the pre-pandemic and pandemic periods, for which the algorithm of stepwise replacement for the life expectancy decomposition is used (Andreev, Shkolnikov and Begun 2002). This method of decomposition was selected due to its universality and relevant accuracy. The life tables were calculated based on 5-year age groups, with the last open-ended interval of 85+. For the age components comparison, the life expectancy was calculated for two-year periods 2018–2019 and 2020–2021, which was made in an attempt to exclude

possible annual mortality fluctuations and delays in death registration during the pandemic. Data on population exposure, age- and sex distribution of deaths, and other demographic coefficients were retrieved from the National Bureau of Statistics (NBS) Database. The last open-ended interval of 85+ for the performed calculations was selected due to the methodological aspects of the National Bureau of Statistics, which aggregates the population over 85 years in a single age group.

In the presented research, we assume that registered deaths occurred uniformly within the calendar year, where each person who died contributed 0.5 person-years to the population exposure. However, considering that a more significant part of COVID-19 deaths occurred during specific periods with high coronavirus disease incidence and health system overload, the results must be interpreted accordingly.

Due to differences in vital statistics registration and limited data availability, this research does not cover the population on the left bank of the Nistru River. The *de facto* population of this region is about 10–15% of the population of Moldova, which, during a certain period of the pandemic, had movement restrictions and, therefore, limited access to the Moldovan healthcare system. However, the population on the left side of the Nistru River had access to the vaccination campaign against COVID-19, and was provided with vital equipment for treating the coronavirus disease. Considering that the research is not covering a relatively small population on the left bank of the Nistru River, the presented results must not be significantly influenced by the possible regional disparities in overall mortality. Therefore, a separate article will describe the life expectancy change in the Transnistrian region during the COVID-19 pandemic.

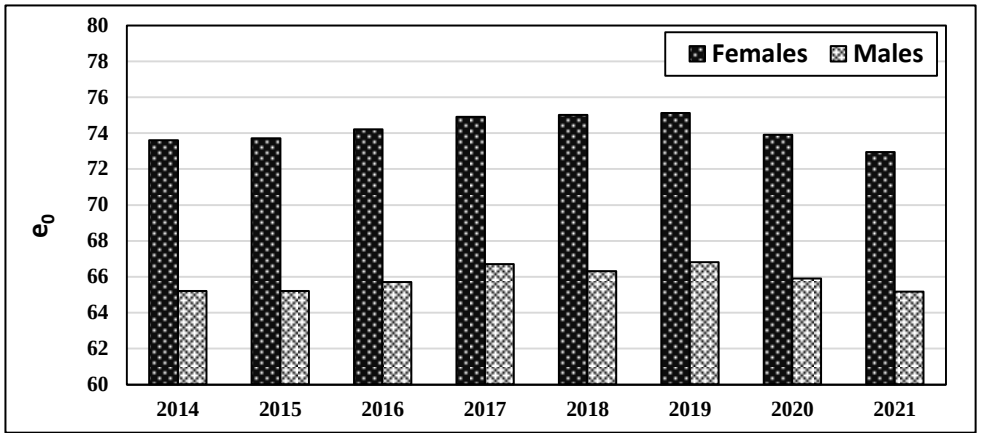
RESULTS AND DISCUSSIONS

In the last years before the COVID-19 pandemic, life expectancy in Moldova registered a stable annual increase of about 0.25 years in both sexes, reaching by 2019 66.8 years in males and 75.1 years in females, respectively (*Figure 1*). This resulted from several programs on the population's health and overall socioeconomic improvement. Therefore, given the ongoing programs on cardiovascular disease prevention and the implemented alcohol and tobacco control policies, this trend in mortality decline was expected to continue in the following years. However, during the COVID-19 pandemic, mortality registered a significant increase, which dropped life expectancy to the level before 2014, registering 65.2 years in males and 72.9 years in females. It is important to note that used 'period life expectancy' is a synthetic indicator of mortality, assuming that death rates remain constant within the hypothetical cohort. Thus, the seasonal increase in mortality temporarily affects the decline in life expectancy, while the implemented public health policies have a long-term effect on the rise in life expectancy.

The life expectancy change in Moldova during the COVID-19 pandemic registered a higher loss in females than in males, compared with previous years. This pattern seems unusual, compared to most countries (Pifarré i Arolas *et al.* 2021), especially when considering higher female responsiveness towards public health programs and immunisation against coronavirus disease (Institute for Public Policy 2021). The observed discrepancy in life expectancy decrease is mainly caused by a higher mortality decline from external causes among young adult males and a more pronounced worsening of mortality in females at the age of 45–64 during the COVID-19 pandemic. However, life expectancy in males and females declined in 2020 and successively in 2021, during which the health system burden considerably increased, lowering its capacity for the medical treatment of specific conditions.

Figure 1

Life expectancy dynamics in Moldova for the years 2014–2021, for males and females



Source: For the years 2014–2020, National Bureau of Statistics database; for 2021, National Bureau of Statistics.

In Moldova, an increase in mortality rates during the COVID-19 pandemic was predominantly caused by the spread of coronavirus disease among the population, which increased fatality rates in older age groups (Penina 2021). The concentration of diagnosed coronavirus disease cases in specific periods contributed to the health system overload and its inability to provide proper medical services for people with chronic diseases and those undergoing planned treatments, compared to the pre-pandemic period. The health system faced severe difficulties, particularly with increased requests for medical emergency aid and intensive care. Considering limited health system resources in terms of medical staff, hospital beds, medical equipment etc., during high coronavirus disease

incidence, the quality of medical services has significantly deteriorated, leading to an increase in the death rate of patients with COVID-19 and other chronic diseases. The period of the COVID-19 pandemic has also been challenging for ongoing routine cancer screening programs and other preventive medicine activities.

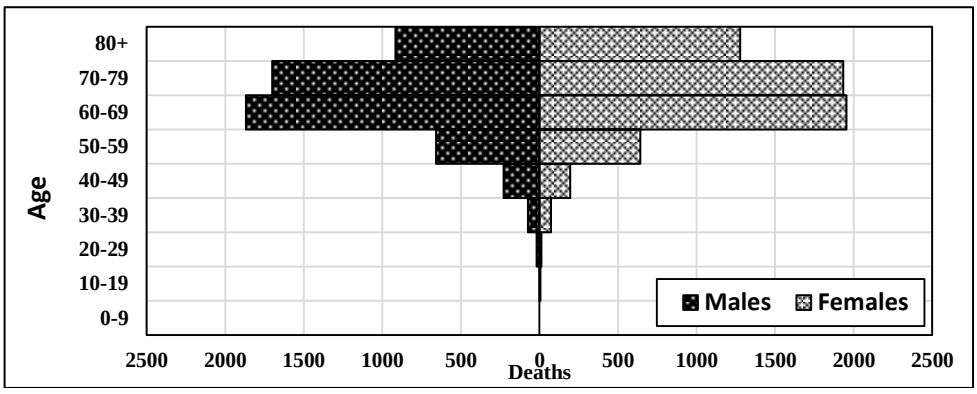
Figure 2 shows the age and sex distribution of deaths caused by COVID-19, where a significant proportion of deaths occurs in the adult population. In the young-age population (0–29), coronavirus disease deaths registered the lowest and nominal values. A slight increase in COVID-19 deaths is observed in ages 30–49, where is almost no differentiation in the sex ratio. The main proportion of COVID-19 deaths during the pandemic occurred in the ages above 50, with significant sex differentiation in the number of deaths registered among the aged population, which is predominantly influenced by population structure.

The age and sex distribution of COVID-19 deaths shown in *Figure 2* refer to the entire pandemic period (as of June 29, 2022), a significant proportion of which occurred in November–December 2020 and February–April 2021 (Gagauz *et al*. 2021). However, since COVID-19 death registration is restricted to laboratory-confirmed tests, coronavirus disease deaths might be underestimated, especially in 2020, when laboratories' functionality was limited. Thus, a part of deaths from coronavirus disease was codified as one of the major causes of death.

After the vaccination campaign against COVID-19 was launched in March 2021, the number of coronavirus disease deaths registered a gradual decrease. Besides the effect of vaccination, a mortality decline from COVID-19 might also result from increased collective immunity from coronavirus disease among the population.

Figure 2

Age and sex distribution of deaths from COVID-19 as of June 29, 2022

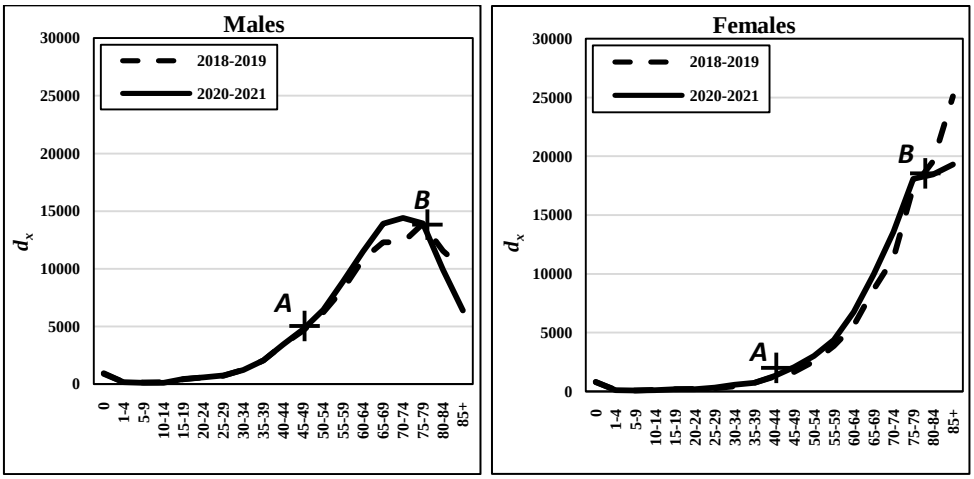


Source: Ministry of Health of the Republic of Moldova.

The increased mortality during the COVID-19 pandemic shifted a significant number of deaths to younger ages, reducing the median length of life from 69.1 to 68.1 in males and from 78.5 to 76.6 in females, respectively. *Figure 3* shows the distribution of life table deaths (d_x) for the 2018–2019 and 2020–2021, where the gap between lines in the ***A***–***B*** segment counts the excess deaths during the COVID-19 pandemic, compared to previous years. In males, pandemic-related excess deaths are concentrated in the age groups 60–79 (+5.5% deaths of the life table cohort), while in females, excess deaths are spread uniformly between the ages 45–79 (+7.0% deaths of the life table cohort). However, deaths caused by coronavirus disease contributed to an increase in mortality among most age groups of the adult population, especially in those above 65.

Figure 3

Age and sex distribution of life table deaths for 2018–2019 and 2020–2021, Moldova



Source: National Bureau of Statistics.

Although age and sex death rates have shown visible changes during the COVID-19 pandemic, recording a significant increase in mortality among the working-age population, overall mortality trends have remained similar as in previous years. Thus, the distribution of the life table deaths in pre-pandemic and pandemic periods registered a continuous increase, starting with the age groups 35–39 in males, and 50–54 in females. Ascending females d_x (2020–2021) curve in the age group 85+ is a consequence of the limitations in extending the last open-ended interval, considering the pronounced increase in the number of deaths in the last aggregated age group, compared to the years before the COVID-19 pandemic.

Avoided violent deaths during the COVID-19 pandemic lockdown mainly occurred in the young and working-age population, with a higher mortality decline

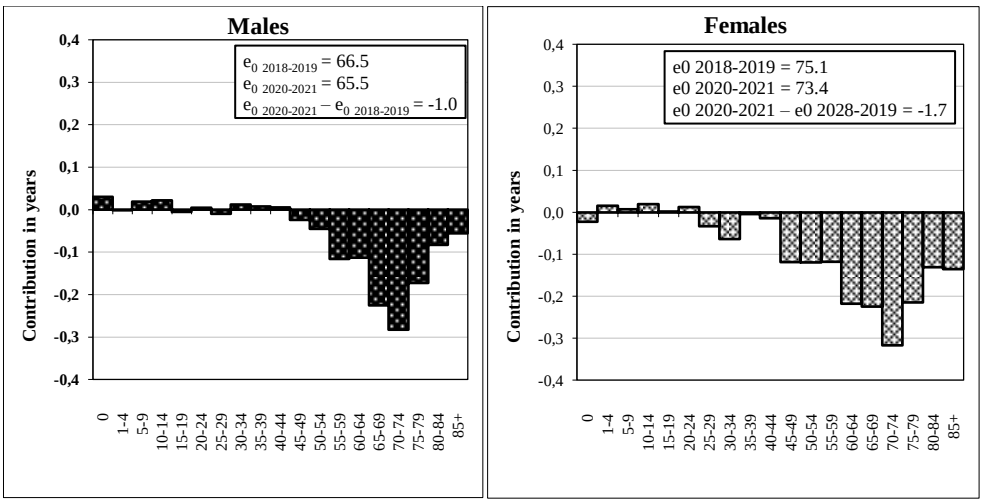
in males, and being one of the few causes of death that registered a pre-pandemic declining trend. Even though the number of avoided violent deaths is significantly lower than those related to coronavirus disease and other chronic diseases, a mortality decline at young ages substantially contributes to reducing potential years of life lost.

The observed mortality shift to younger ages is solely specific to the pandemic period, after which mortality rates most likely will recure to the pre-pandemic level. Also, health system improvements and the population's lifestyle and behavioural adjustments might boost life expectancy more than the pre-pandemic period increase.

The life expectancy decomposition shown in *Figure 4* presents the contribution of the age components to the life expectancy change during the COVID-19 pandemic compared with two previous years, where all causes of death were aggregated. As demonstrated, an overall decrease in life expectancy during the COVID-19 pandemic constituted -1.0 years in males and -1.7 years in females, where the significant losses are attributed to the population above 45 years. Registered life expectancy decline represents the sum of differences in age components that depend merely on mortality changes, by its increase or decrease in particular ages and causes of death.

Figure 4

Age components of the life expectancy changes in Moldova in 2020–2021 compared to 2018–2019, by sex



Source: Author's calculation based on National Bureau of Statistics data.

In 2020–2021, especially during the lockdown and economic recession, mortality from external factors significantly declined, mainly in the young and working-age population. Thus, during the COVID-19 pandemic, males and females registered an overall mortality decline in the age groups 0–44 and 1–24, contributing to a slight increase in life expectancy by 0.08 years and 0.06 years, respectively. Avoided deaths in the young population significantly contribute to increasing the number of person-years to the average age a population is expected to live.

Compared to 2018–2019, in 2020–2021, a slight decline in life expectancy was registered within the ages 49–54 in males (-0.07 years) and 25–44 in females (-0.11 years), and hence, a more pronounced life expectancy decline was highlighted in the adult and aged population. In males, an apparent decline in life expectancy was observed among the age groups 55–59 (-0.12 years), 60–64 (-0.11 years), 65–69 (-0.23 years), 70–74 (-0.28 years), 75–79 (-0.17 years) and 80+ (-0.14 years), while in females its noticeable decrease was registered in the ages 45–49 (-0.12 years), 50–54 (-0.12 years), 55–59 (-0.12 years), 60–64 (-0.22 years), 65–69 (-0.22 years), 70–74 (-0.32 years), 75–79 (-0.21 years) and 80+ (-0.27 years), respectively.

In recent years, a wide range of programs to improve the population's health has been implemented in Moldova. Many of them aim to reduce the incidence and mortality from circulatory system diseases, and to improve the infrastructure of emergency medical aid. Besides, were implemented rigorous alcohol and tobacco control policies. In this regard, life expectancy was expected to increase in 2020–2021 at the pace registered in the previous years.

In 2020–2021, the COVID-19 pandemic abruptly interrupted positive trends in life expectancy registered in the pre-pandemic period. The registered decline does not consider the expected increase in the average years of life under normal circumstances, which underestimates life expectancy losses during the pandemic period. Additionally, a significant number of people diagnosed with COVID-19 may have long-term health consequences, but also acquire some chronic diseases, affecting the duration and quality of their lives.

A registered decline in mortality from external factors in the pandemic cannot be considered a significant achievement, given the registered trends in violent deaths decrease noted in previous years. Nevertheless, a further external mortality decline could be a considerable resource for increasing life expectancy.

Once mortality from coronavirus disease significantly diminished in 2022 (Ministry of Health of the Republic of Moldova), and associated with the COVID-19 pandemic burden on the health system considerably lowered, life expectancy could register close to pre-pandemic period values by the end of the year, and continue to increase in the following years. However, recent investments to improve the health system might contribute to preventing a significant proportion of deaths, particularly those caused by chronic diseases.

CONCLUSIONS

The COVID-19 pandemic interrupted the promising trends of increasing life expectancy until 2019, during which life expectancy declined by 1.0 years in males and 1.7 years in females. The highest contribution to the life expectancy decline was registered in ages above 45, with a peak in the age group 70–74. Nevertheless, the young ages had a small contribution to the life expectancy increase, which is mainly caused by violent mortality diminution during the period of lockdown and recession in economic activities. The significant losses in life expectancy were caused by excess deaths from coronavirus disease and health system overload, during which planned treatments of patients with chronic diseases and non-urgent health care visits were postponed. However, patients diagnosed with coronavirus disease might face disease sequelae that will affect their long-term health and quality of life. Subsequent changes in the population's health will be shaped by the transformations in the health system, programs implemented toward public health, and the population's lifestyle adjustments.

The COVID-19 crisis has been challenging for the Moldovan health system because of its limited resources in a low-middle-income economy. However, increased spending on medical services, international assistance and experience have helped to cope with the pressure on the healthcare system during the COVID-19 pandemic. Besides, the vaccination program against coronavirus disease launched in March 2021 significantly contributed to the decline in deaths from COVID-19.

The reported number of COVID-19 deaths in 2020 was visibly lower than in 2021, partially resulting from the limited laboratory testing capacity at the beginning of the pandemic. As a result, multiple deaths from coronavirus disease were codified as other causes of death.

Further research will focus on socioeconomic and regional inequalities in health resulting from the COVID-19 pandemic.

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Comparativ cu anii precedenți, în perioada pandemiei COVID-19, numărul deceselor în Moldova a crescut considerabil, în cifre absolute și relative. Aceste schimbări în structura mortalității au întrerupt tendințele de creștere a speranței de viață înregistrate în perioada pre-pandemică. Astfel, către sfârșitul anului 2021, speranța de viață a înregistrat un declin de 1,0 ani la bărbați și 1,7 ani la femei. Comparând componentele de vârstă în schimbarea speranței de viață între perioada pre-pandemică și cea pandemică, putem observa o ușoară creștere a speranței de viață în vârstele tinere ale populației, care rezultă în mare parte din diminuarea mortalității prin cauze externe. Dimpotrivă, la vârstele peste 45 de ani se observă o scădere bruscă a speranței de viață la ambele sexe. Declinul în speranța de viață a fost condiționat de creșterea numărului de decese cauzate de boala coronavirus și gradului de supraîncărcare a sistemului de sănătate, care a dus la amânarea unor tratamente planificate a bolilor cronice și a redus capacitatea asistenței medicale de urgență. O scădere semnificativă a numărului de decese cauzate de COVID-19 a fost evidențiată odată ce o proporție considerabilă a populației a fost vaccinată împotriva bolii coronavirus. Bolile cronice dobândite în perioada pandemică, precum și diagnosticarea lor tardivă pot afecta negativ sănătatea populației pe termen mediu și lung. Acest articol descrie schimbările în speranța de viață din Moldova în perioada pandemiei COVID-19, pentru care a fost utilizată metoda decompoziției.

Cuvinte-cheie: *mortalitatea în Moldova; speranța de viață la naștere; excesul de mortalitate; pandemia COVID-19; boala coronavirus.*

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