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ANALYSIS OF THE IMPACT OF COVID-19 ON THE HEALTHY LIFE EXPECTANCY OF THE POPULATION.

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Abstract
The study analyzes the impact of the COVID-19 pandemic on Healthy Life Expectancy (HALE), a demographic indicator that transcends traditional life expectancy by assessing the qualitative dimension of longevity. HALE quantifies the average number of years a person is expected to live in good health, free from the limitations of disease or disability. Given the global increase in chronic diseases and the unprecedented mortality and morbidity associated with the pandemic, HALE serves as a more comprehensive metric for public health analysis. The methodology uses a two-step approach. Initially, a mortality decrement table is constructed using population and mortality data to calculate age-specific life expectancy. This model is then integrated with health status data obtained from the Minimum European Health Module (MEHM) of the European Statistics on Income and Living Conditions Survey (SILC), which provides self-reported information on three key dimensions of health: self-perceived health status, prevalence of chronic diseases, and limitations in daily activities. The research results indicate a statistically significant decrease in HALE across several age cohorts, with the most pronounced decrease observed among older people. Our findings reveal a dual impact of the pandemic: a reduction in overall life expectancy, coupled with increase in the number of years lived with disability or chronic disease. This suggests that the pandemic has not only accelerated mortality but also exacerbated morbidity. The study highlights the critical importance of HALE as a tool for monitoring the functional well-being of the population and for informing evidence-based public health policies aimed at promoting active ageing and mitigating long-term health consequences.
Keywords: healthy life expectancy, COVID–19, statistics, Republic of Moldova, econometric model.
JEL Classification: *C10, C30, C50, C52*

1 Introduction

The COVID-19 pandemic has profoundly affected mortality, morbidity, and the functioning of health systems worldwide. While conventional measures, such as life expectancy (LE), capture only the dimension of mortality, they do not reflect the qualitative aspects of health. Healthy life expectancy (HALE) is more comprehensive, considering years lived without chronic diseases or disabilities. This paper investigates the impact of the pandemic on HALE, with a focus on the Republic of Moldova, where pre-existing vulnerabilities have amplified the pandemic shock.

The conceptual foundation for measuring Healthy Life Expectancy (HALE) was established by Sullivan (1971), who proposed a single index that integrates mortality and morbidity data to estimate the average number of years a person can expect to live in good health. The Sullivan method, still widely used today, combines life table data with prevalence rates of health conditions (e.g., disability or chronic diseases) to produce a summary measure of population health that reflects both the quantity and quality of life. This approach has been instrumental in shifting policy attention from purely increasing life expectancy to also addressing years lived with disability (YLD), providing a more comprehensive understanding of population health and guiding more effective health system interventions.

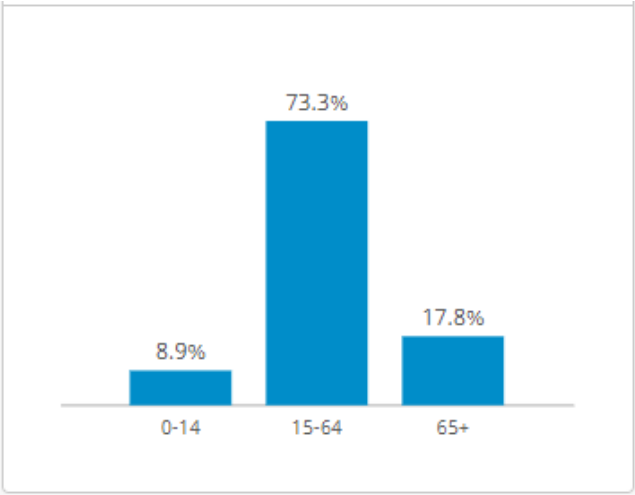


Figure 1. The age distribution of population in Republic of Moldova 2023, %
Source: authors based on National Bureau of Statistics (NBS) data

In 2023, the age structure of the Republic of Moldova (Figure 1) reflects significant demographic changes, with profound implications for public health, labor force dynamics, and social policy. This distribution reveals a **demographically aging population**, with a declining share of children and a growing proportion of older adults. However, to fully understand the implications of this age structure, it is essential to examine it through the lens of **healthy life expectancy** (HALE) – the average number of years a person can expect to live in full health, without significant disease or disability.

This demographic and health profile highlights the urgent need for a **comprehensive approach to health policy** in the Republic of Moldova, across all stages of the life course:

Preventive health programs need to be prioritized, especially for working-age adults, to delay the onset of chronic diseases and extend healthy working lives.

Active aging strategies and age-friendly health infrastructure are essential to support the growing elderly population, many of whom live with multimorbidity and limited economic resources.

Investments in child and adolescent health are necessary not only to improve outcomes in childhood, but also to ensure a healthier adult population.

Strengthening the health system, with a focus on primary health care, community services, and health education, is essential to address the current gap between life expectancy and healthy life expectancy.

2 Literature review

Studies by Eurostat, WHO and OECD confirm that HALE declined more steeply than LE in 2020-2021. Research such as Caușan et al. (2025) highlights the socio-economic determinants of HALE, while the IISVSCM framework integrates HALE with labor market participation to assess active human capital. OECD analyses also indicate that health system financing models mediate resilience to health shocks.

In Central and Eastern Europe, including countries such as Ukraine and Moldova, the implementation and development of primary health care – especially family medicine – has been a key factor in shaping long-term health outcomes. Sobol et al. (2020) highlight that while the transition to family medicine in the region has shown promising results in improving access and continuity of care, structural and financial challenges remain significant barriers to realizing its full potential. These limitations directly impact both life expectancy (LE) and healthy life expectancy (HALE), especially during times of systemic pressure, such as the COVID-19 pandemic. In the context of Moldova, where the health system has faced additional pressure due to the emigration of health personnel and chronic underfunding, the pandemic has further highlighted the need for resilient, community-based primary health care models. Strengthening family medicine can not only improve health service delivery but also reduce the growing gap between years lived and years lived in good health.

Zarbailov et al. (2018) note that Moldova has adopted the family medicine model to expand access to primary health care, especially in rural and underserved areas. This reform aimed to shift from hospital-based to community-based care, positioning family physicians as key coordinators. Although progress has been made in terms of training and coverage, persistent problems – such as underfunding, outdated infrastructure and limited autonomy – continue to hinder performance. These challenges impact both life expectancy (LE) and healthy life expectancy (HALE), contributing to delayed diagnoses, suboptimal management of chronic diseases and widening health disparities.

This issue highlights the fact that the deterioration of the population's health has a direct impact on economic performance. Increased levels of morbidity lead to reduced labor force participation, decreased productivity and increased pressure on health and social protection systems. At the same time, reduced economic activity can affect the population's ability to access adequate medical services, significantly amplifying health risks.

3 Methodology and Data

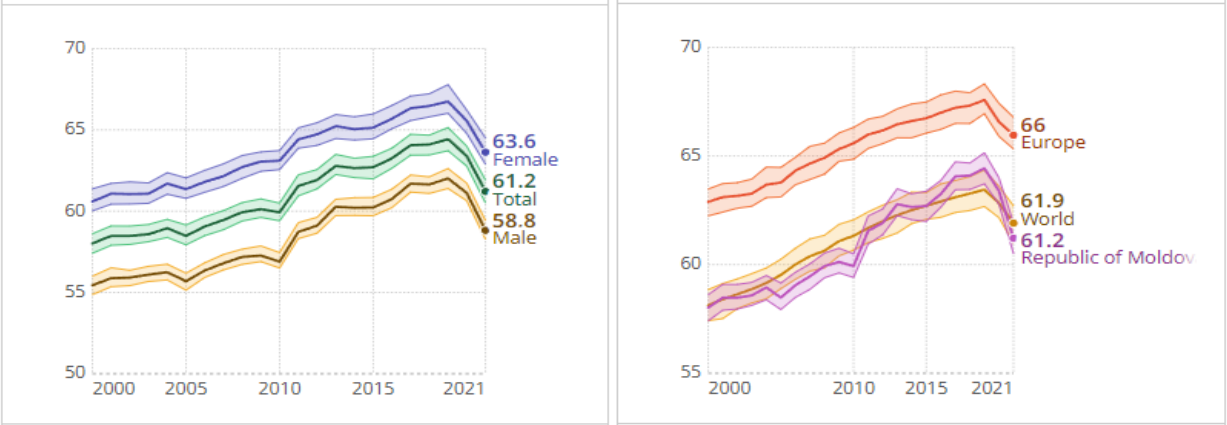
The study uses a two-stage methodology. First, mortality tables are used to calculate age-specific life expectancy. Second, the Sullivan method integrates mortality data with self-reported health prevalence (from MEHM-SILC). For the econometric analysis, an autoregressive econometric model was developed using annual frequency data for HALE (2000–2024, with data for 2022–2024* extrapolated based on NBS information), and the annual data for Gross Domestic Product (GDP).

Data on LE and HALE for Moldova cover the period 2000–2024, with a gradual upward trend, disrupted by the pandemic shocks in 2020–2021, followed by a partial recovery. Years lived with disability (YLD) are calculated as the difference between LE and HALE.

Figure 2. Healthy life expectancy (HALE) at birth in Republic of Moldova *(on the left)* and by region / global *(on the right)*

Source: authors based on WHO data

The analysis of data on the healthcare system in the Republic of Moldova for the period



2019–2023 reveals several important trends that reflect both the progress made and the persistent challenges.

First relevant aspect is the constant increase in public spending on healthcare, which increased from 8.5 billion lei in 2019 to approximately 12.2 billion lei in 2023. This increase indicates a greater allocation of financial resources to the sector, reflecting the government's efforts to strengthen healthcare infrastructure and services (Ministry of Finance, NBS, 2024). In addition, the share of public spending in relation to GDP increased from 4.1% in 2019 to approximately 4.7% in 2023, suggesting a relative increase in the priority given to healthcare in the broader economic context. Overall economic activity during 2019-2023 increased by 1.16%. (BNS, 2024; WHO, 2024)

From the perspective of population coverage, the insurance rate within the mandatory health insurance system (AOAM) remained relatively stable, around 87–88%, indicating a consolidation of formal access to medical services (CNAM, 2024). However, a slight reduction in the share of direct out-of-pocket payments in total health spending is observed, from 36% in 2019 to 31% in 2023 - a positive signal for reducing the direct financial burden on patients (CNAM, NBS, 2024).

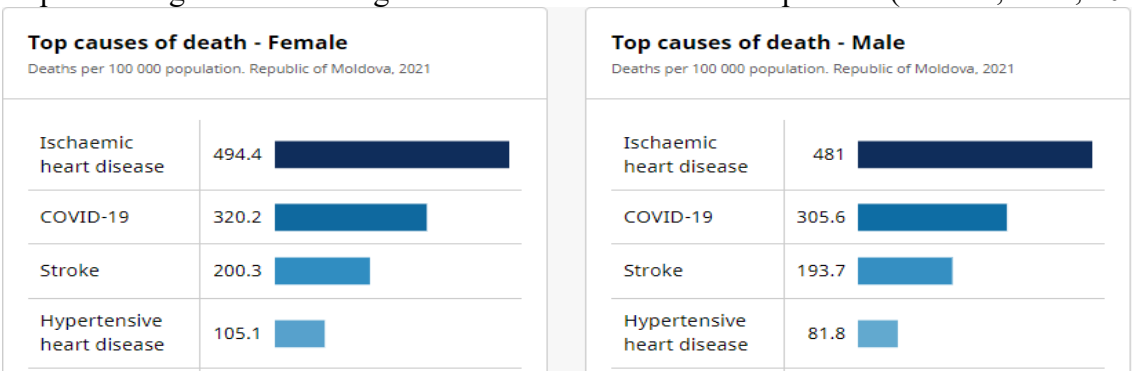


Figure 3. Top causes of death in Republic of Moldova

Source: authors based on WHO data

Another important indicator is the average salary in the health sector, which has gradually increased from 7.8 thousand lei in 2019 to 9.4 thousand lei in 2023. This trend can contribute to retaining and motivating medical staff, which is essential for the quality of services provided (Ministry of Labor, 2024).

In terms of infrastructure, the number of hospital beds per 10,000 inhabitants has steadily decreased, from 45 in 2019 to 38 in 2023. This may reflect both a trend towards optimizing and

streamlining hospital services and the challenges in maintaining adequate care capacity, especially in the context of rising demand for medical services (NBS, WHO, 2024).

4 Results

Figure 2 shows the evolution of Healthy Life Expectancy (HALE) for the Republic of Moldova during the period 2000–2021, differentiated by gender, and compared to the European and global averages. The data highlights the vulnerability of the Republic of Moldova, showing a more pronounced decrease in the HALE indicator during the COVID-19 pandemic, compared to the global trend. Although indicators followed an upward trend until 2019, the onset of the COVID-19 pandemic in 2020 produced a sharp decrease in HALE of approximately 1.1 years in 2020, and a further decrease of 2.2 years in 2021. If we compare the developments with LE, we note that the years 2020 and 2021 are marked by an asymmetry that suggests that the impact of the pandemic was disproportionately reflected in morbidity and disability, not just in mortality.

In this context, the years lived with disability were calculated, and the results show a reduction in the gap from an average of 8.8 years before the pandemic to almost 8.5 years in 2020-2021 (Figure 4). However, this reduction does not necessarily reflect a decrease in the burden of disability and may instead result from the pandemic's impact on mortality and the overall health structure of the population. Although COVID-19 has accentuated functional limitations and long-term chronic conditions, the decrease in YLD may reflect a reduction in life expectancy rather than an improvement in population health.

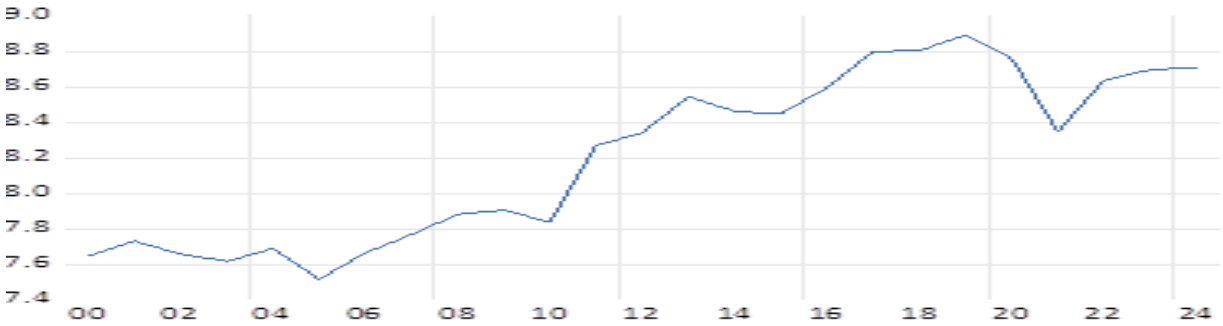


Figure 4. Years Lived with Disability in Republic of Moldova
Source: authors based on WHO data

Table 6. Output of the Regression for YLD.

Dependent Variable: YLD (LE-HALE)				
Method: Least Squares				
Sample (adjusted): 2003 2024				
Included observations: 22 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LE_HALE(-1)	0.888165	0.076947	11.54252	0.0000
d_GDP(-2)	-0.013094	0.006818	-2.320348	0.0070
C	1.021776	0.639864	2.596866	0.0268
Root MSE	0.149952	R-squared		0.887139
Mean dependent var	8.280369	Adjusted R-squared		0.875259
S.D. dependent var	0.456858	S.E. of regression		0.161356
Akaike info criterion	-0.684281	Sum squared resid		0.494681
Schwarz criterion	-0.535503	Log likelihood		10.52709
Hannan-Quinn criter.	-0.649233	F-statistic		74.67463
Durbin-Watson stat	2.010904	Prob(F-statistic)		0.000000

Source: authors based on EViews 11, WHO, NBS data

From an econometric perspective, the estimated model is based on the time series regarding annual YLD and annual growth of GDP, with GDP serving as an indicator of population well-being.

YLD= 1,02+ 0.89*YLD(-1)-0.01*d_GDP(-2) (1)

And results indicate:

The 0,89 coefficient for YLD(-1) is statistically significant, implying persistence in the evolution of YLD. Once shock occur, they continue to influence the trajectory over several periods.

The coefficient -0,01 associated with the variable d_GDP(-2) is also significant, and its value confirms the existence of an inverse relationship between economic growth and years lived with disability, a relationship that manifests with a time lag. This result is consistent with the mechanisms through which economic evolution gradually influences the health status of the population. Economic expansion contributes to increasing living standards, improving working conditions and expanding access to quality medical services, although these effects take time to be reduce chronic morbidity. Also, investments in health infrastructure and prevention programs become more sustainable in the context of a growing GDP, which, in the medium term, reduces the burden of disability. Overall, the result supports the hypothesis that favorable economic dynamics can generate positive effects on the health of the population, by decreasing the number of years lived with disability.

The model obtained is valid and robust, with significance for both the coefficients and the model. Residual diagnostic tests suggest the absence of major signs of autocorrelation.

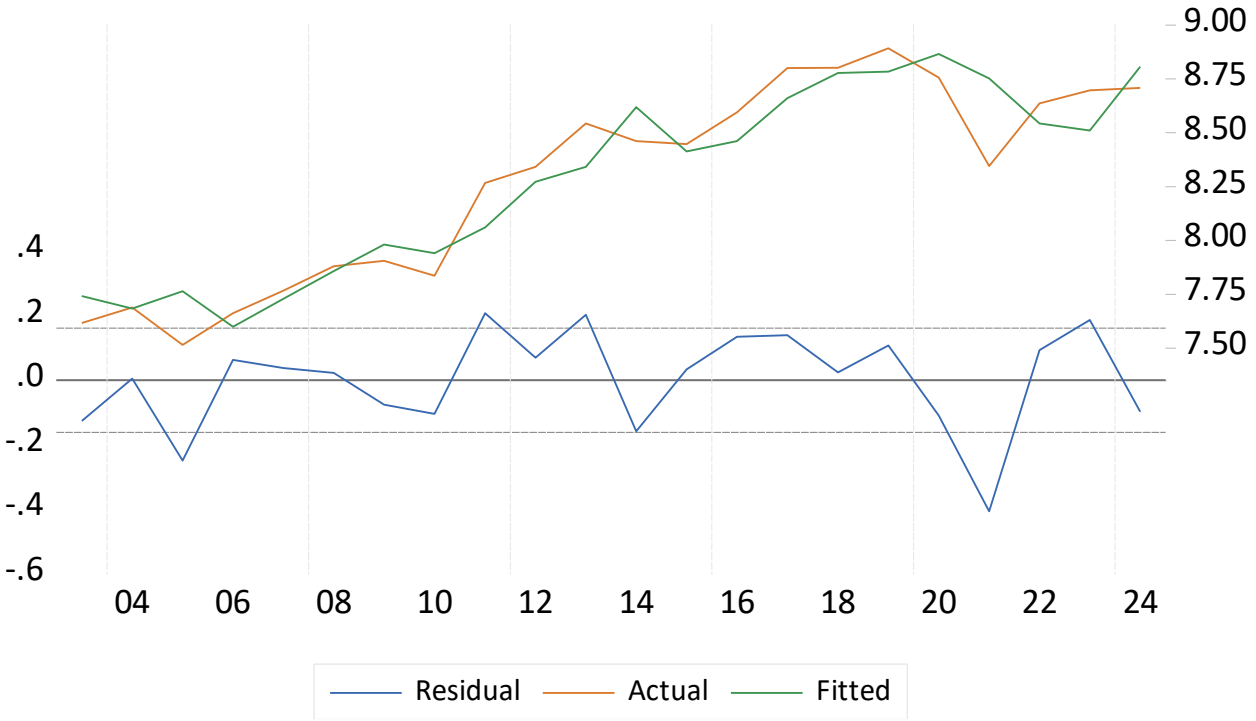


Figure 5. YLD dynamics (actual and fitted)
Source: authors based on EViews 11

These findings indicate that the pandemic shock was not a transient anomaly but was embedded in the medium-term dynamics of the increase in the standard of living in health (HALE). The outlook suggests that a return to the pre-pandemic trajectory would require several years, even under favorable conditions.

5 Discussion

The model highlights two complementary mechanisms through which COVID-19 affected healthy longevity. First, the autoregressive structure shows that health shocks in Moldova tend to

persist, reflecting structural deficiencies in healthcare financing, delayed patient recovery, and the cumulative effects of chronic diseases. Second, the findings indicate that the pandemic shock was not a transient anomaly but was integrated into the medium-term dynamics of HALE. And faster economic growth leads after about two years to a reduction in years lived with disability (YLD).

Together, these results imply that the losses caused by HALE will be slow to recover. Even if mortality decreases in the post-pandemic period, the burden of morbidity - such as cardiovascular complications, respiratory failure and mental health disorders - will continue to affect the healthy life years of the population.

6 Conclusion

In conclusion, the analysis of socio-economic indicators reveals a health system in a continuous process of development, whose dynamics are closely correlated with economic activity. The age structure of the population reflects significant demographic changes, with profound implications for public health and labor force dynamics. This distribution reveals an aging population, with a lower share of children and a growing proportion of elderly people.

The COVID-19 pandemic produced a sharp decrease in HALE of approximately 1.1 years in 2020 and 2.2 years in 2021. When comparing these developments with life expectancy (LE), it can be observed that the years 2020 and 2021 are marked by an asymmetry that suggests that the impact of the pandemic was disproportionately reflected in morbidity and disability, not just in mortality.

The decrease in YLD from an average of 8.8 years before the pandemic to nearly 8.5 years in 2020-2021, reinforces the idea that COVID-19 has exacerbated functional limitations and long-term chronic conditions. However, this reduction in YLD may indicate a decline in life expectancy rather than an improvement in the population's health status. For public health policy, this implies that interventions must extend beyond reducing mortality. Rehabilitation programs, long-term COVID monitoring, and chronic disease management have become essential for mitigating the YLD gap. Furthermore, econometric modeling provides a valuable methodological tool that policymakers can use to simulate the impact of future crises on HALE and to design evidence-based strategies that strengthen health system resilience.

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