Nicolae Testemitanu **State University of Medicine and Pharmacy of the Republic of Moldova**

Olga Penina

REGIONAL MORTALITY DISPARITIES IN THE REPUBLIC OF MOLDOVA

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Author:

Olga Penina, *Nicolae Testemitanu* State University of Medicine and Pharmacy of the Republic of Moldova

Reviewers:

Mariana Buciuceanu-Vrabie, National Institute for Economic Research, the Republic of Moldova

Inna Danilova, Higher School of Economics National Research University, Russia

Tudor Grejdean, Nicolae Testemițanu State University of Medicine and Pharmacy of the Republic of Moldova

Svitlana Poniakina, The French Institute for Demographic Studies, France

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The study examines and illustrates regional patterns of all-cause and cause-specific mortality in the Republic of Moldova for the five-year period surrounding the population census conducted in May 2014. It is addressed to public health experts, demographers and all those interested in the analysis of mortality in Moldova. A set of annexes is available, including online (https://github.com/PeninaOlga). The publication is prepared within the Project 21.00208.8007.02/PD "Socio-demographic and regional mortality disparities in the Republic of Moldova".

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Introduction

Analysis of long-term mortality trends in Moldova has recently become possible, thanks to previous research on reconstructing the continuity of mortality trends since the mid-1960s, according to the 10th revision of the International Classification of Diseases and Causes of Death (Penina, 2015) based on the original reconstruction method (Vallin and Mesle, 1988). The reconstructed time series have been adjusted to take account of the under-registration of infant deaths and old-age mortality problems which existed in the country up to the late 1970s (Penina, Meslé and Vallin, 2010a). The National Statistical Office has only recently published reliable annual estimates of the post-census population since 2014 (National Bureau of Statistics of Moldova, 2019), although very similar alternative population figures were proposed before the release of the 2014 Census results (Penina, Jdanov and Grigoriev, 2015). The reconstructed death time series for Moldova have been published in the Human Causes-of-Death Database and are updated regularly (www.causesofdeath.org). Analysis of the long-term mortality trends has shown that Moldova, like other countries of the former Soviet Union (FSU), has been confronted with a serious population health crisis since the mid-1960s, which continues to the present day (Penina, Meslé and Vallin, 2010b, 2011; Penina and Raevschi, 2020). Despite the small size of the population (2.9 million, according to the 2014 census), detecting regional differences in mortality by cause of death is an important tool for public health experts in the development of measures to increase life expectancy and bridge the gap with Western countries. The study aims to assess current geographic disparities in overall mortality and mortality by cause of death in Moldova to identify evidence-based ways of reducing them.

The paper is divided into four chapters, conclusions and annexes. The first chapter describes the population health crisis that has affected the FSU countries, including Moldova, since the middle of the 1960s in the light of the health transition theory (Vallin and Meslé, 2004). Particular attention is given to similarities and differences in cause-specific mortality trends between Moldova and the two adjacent countries, Ukraine and Romania, as well as recent studies on regional mortality disparities in the FSU countries. The second chapter gives information about the spatial data and methods used in the study. The third chapter focuses on the regional all-cause and cause-specific mortality patterns. Thematic maps of life expectancy and standardised mortality rates are illustrated. The impact of differences in mortality by age and major causes of death on interregional differentiation of life expectancy is demonstrated. The fourth chapter describes the spatial autocorrelation analysis of all-cause and cause-specific mortality. The conclusions include key findings and some practical evidence-based recommendations for reducing interregional mortality disparities in the country. The publication is intended for public health experts, demographers and all those concerned with the health of the Moldovan population.

Olga Penina

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The monograph is prepared in the framework of Project 21.00208.8007.02/PD “Socio-demographic and regional disparities in mortality in the Republic of Moldova”.

I. BACKGROUND AND RESEARCH QUESTIONS

1. Half-century population health crisis in the FSU countries

A. Long-term divergence in mortality trends between the FSU countries and Western countries

The problem of high mortality in the countries of the former Soviet Union (FSU), particularly in its European part, is extensively discussed in the literature. While the data quality for Moldova is somewhat more questionable compared to Russia or Ukraine (Penina, Meslé and Vallin, 2010a), the overall long-term mortality trends are quite similar in these countries *(Fig. I.1).* In the middle of the 1960s, the difference in life expectancy at birth between the FSU and Western countries was reduced to a minimum. For example, the gap in male life expectancy between Moldova and Japan went down from four years in 1959 to two years in 1965. The same holds true when comparing Moldova to France. At the end of the 1950s, female life expectancy in Moldova was lower than in Ukraine and Russia, but closer to Romania. Between 1959 and 1965, the gap between Moldovan and French women was reduced from 9 to 5 years. This gap with Western countries in the mid-1960s was smaller or even absent when it came to Ukrainian men or Russian and Ukrainian women *(Fig. I.1).* According to Vallin and Meslé (Vallin and Meslé, 2004), the convergence of mortality trends among industrialised countries in the mid-1960s points to the end of the first stage of the health transition, which corresponds to the epidemiologic transition described by A. Omran (Omran, 1971). Both the FSU and Western countries have succeeded in reducing a high level of mortality from infectious diseases through massive, low-cost and effective preventive measures such as antibiotic use and vaccination. The second stage of the health transition, according to the same authors, is associated with a new divergence of mortality since the mid-1960s between the West and the East, between capitalist and communist states. The constant increase in life expectancy in France and Japan since the 1970s contrasts sharply with the dramatic deterioration in the health of the population observed in the FSU countries, as well as in the former socialist countries of Central and Eastern Europe. In the FSU countries, the general downward trend is marked by large fluctuations caused by the 1985-87 anti-alcohol campaign and the serious social and economic crisis that hit the newly independent states after the collapse of the USSR and a sudden transition to a market economy.

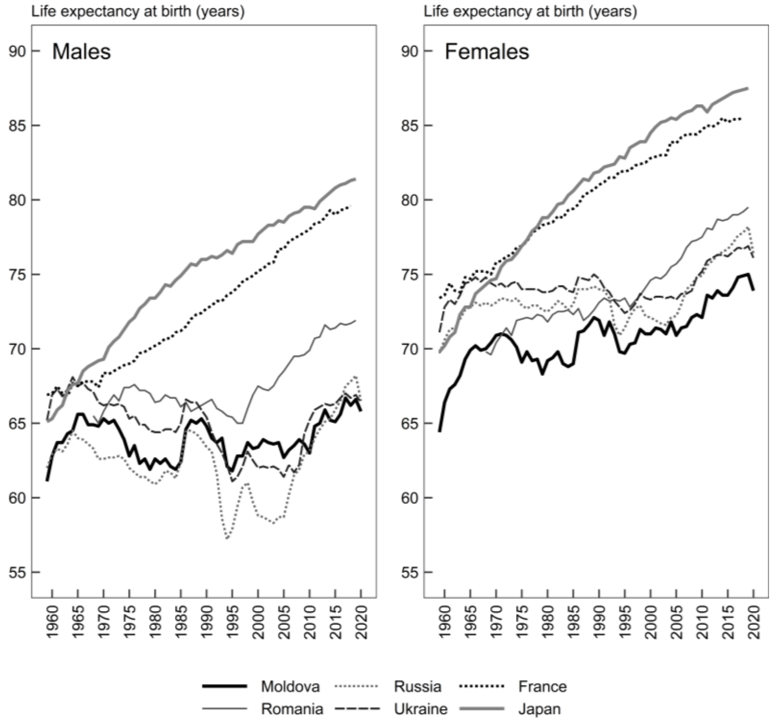

Figure I.1. **Life expectancy at birth since the late 1950s in Moldova, Ukraine, Romania and Russia compared to France and Japan**

Source: Moldova (1959-2020) – calculations based on the NBS unpublished and published data; Romania (1961, 1963, 1965, 1968-2019) – calculations based on the National Institute of Statistics data, https://insse.ro/cms/en; Ukraine and Russia (1959-2006) – (Meslé and Vallin, 2012); Ukraine (2007-2020) –calculations based on the State Statistics Service of Ukraine data, http://database.ukrcensus.gov.ua/Pxweb2007/popul_eng.htm; Russia (2007-2020) – Federal State Statistics Service, https://eng.rosstat.gov.ru/. France and Japan (1959-2018) – the Human Mortality Database, https://www.mortality.org/

Note: For Ukraine in 2014-2020, data exclude the temporarily occupied territory of the Autonomous Republic of Crimea, the regions of Donetsk and Luhansk.

The worst mortality trends were observed among Russian men whose life expectancy in 1994 was 19 years below that of Japanese men (the difference relative to Japanese men was 15 years in Moldova or Ukraine in 1995 and 12 years in Romania in 1996). Moldovan women, whose life expectancy was decreasing very rapidly in the 1970s, were in a far worse position than Romanian, Ukrainian or Russian women, where life expectancy at birth remained virtually unchanged. Despite fluctuations in mortality due to the social and economic circumstances of the 1980s and 1990s, Moldovan female life expectancy has been systematically lower than in other former socialist countries until now.

The considerable progress that Western countries have made in life expectancy over the last 50 years has been made through the development of a new public health strategy to promote healthy lifestyles and prevent the major risk factors associated with chronic non-communicable diseases, first and foremost circulatory diseases. The spectacular decline in cardiovascular mortality observed in Western countries since the 1970s, known as the cardiovascular revolution, in the context of the continued deterioration of population health in the countries of Central and Eastern Europe marked the start of the second stage of the health transition. The bloc of communist countries failed to cope with the new public health challenge. The main groups of causes of death responsible for the long-term health crisis in Russia (Vishnevsky, Andreev and Timonin, 2017) and Ukraine (Meslé and Vallin, 2012) are cardiovascular diseases and external causes of death, a category that includes accidental poisoning, traffic accidents, suicides, homicides and other violent causes. Moreover, in these countries, the resurgence of adverse trends in mortality due to infectious and respiratory diseases typical of the first stage of health transition took place after the collapse of the USSR (Meslé et al., 1996; Meslé and Vallin, 2012). Harmful alcohol consumption in these countries where strong alcoholic drinks are traditionally consumed is considered one of the main determinants of population health deterioration (Nemtsov, Levchuk and Davydov, 2011). Moldova, along with other

FSU countries, has also entered a long period of deterioration in population health since the mid-1960s provoked by a huge increase in adult mortality from non-communicable diseases and external causes of death. Furthermore, in Moldova, which is closer to the Mediterranean type of alcohol drinking pattern with a high share of homemade wine, the burden of cirrhosis of the liver typically associated with the chronic consequences of alcoholism is of particular concern to both men and women. This cause of death affects Moldovan women as much as it affects men. External causes of death closely correlated with acute alcoholism have less effect on changes in male life expectancy in Moldova compared to Russia and Ukraine (Penina, 2017).

Shortly after the collapse of the communist system, negative trends in long-term mortality reversed in most Central European countries. The Czech Republic and Poland were the first countries in the region to record a rapid and sustained rise in life expectancy, with cardiovascular diseases being the main contributors (Fihel and Pechholdová, 2017). In Romania, the positive changes did not occur until 1997. Following several decades of increased mortality and short-term fluctuations, there have been significant recent improvements in life expectancy in Russia since 2005 (Grigoriev et al., 2014) and Ukraine since 2009. In Moldova, these advances are very fragile and have been seen since 2010 among men and 2005 among women. These recent changes can signal the end of East-West divergence in European trends in life expectancy (Meslé and Vallin, 2017).

At present, life expectancy at birth among men is the same in Moldova, Ukraine, and Russia, while among Moldovan women the values are still lower. In Moldova, in the last half-century, life expectancy at birth has risen by only one year for men (65.6 in 1965 vs 66.6 in 2020), while in the case of women, the gain was less than five years (70 in 1965 vs 75 in 2020). The difference with Japan increased to 15 years for males and 13 years for females, and it reached 13 and 11 years, respectively, with France. Figure I.2 shows a "heat" map produced for the ratio of age-specific death rates in Moldova to those in Japan since 1959. Among men, the most problematic age groups range from 30 to 60 years, particularly after independence. For these age groups, the ratio of death rates is five times or higher. For women, the largest health problems are diagnosed at an older age and, as for men, during the period of independence.

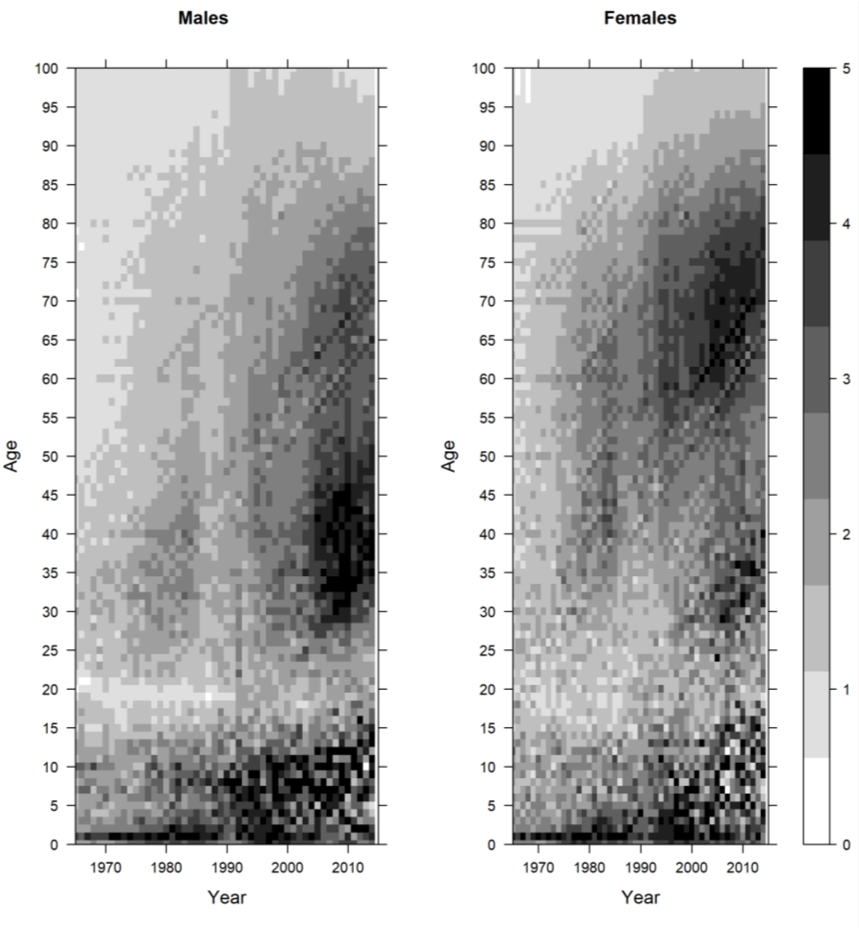

Figure I.2. **Ratio of age-specific death rates (m_x) in Moldova to those in Japan since the late 1950s**

Source: Moldova (1959-2018) – calculations based on the NBS unpublished and published data; Japan (1959-2018) – the Human Mortality Database, https://www.mortality.org/

B. Mortality trends in Moldova as compared to Ukraine and Romania

To understand the current epidemiological situation, it is of great value to compare recent changes in mortality by cause with their long-term trends. However, this is complicated by discontinuities in mortality time series as a result of periodic changes in classification. To overcome this problem, we use the continuous mortality trends reconstructed from 1965 in terms of the 10th revision of the International Classification of Diseases and Causes of Death (ICD-10) (Penina, 2015). A special method of reconstruction was applied (Meslé and Vallin, 1996). The situation in Moldova is compared to that in Ukraine (Meslé and Vallin, 2012; Poniakina and Shevchuk, 2016) and Romania (Ionita and Penina, 2016), for which the reconstructed time series are also available from 1965 and 1980, respectively. The data were retrieved from the Human Cause-of-Death Database (https://www.causesofdeath.org/cgi-bin/main.php). For Moldova and Romania, the data were extended with the reconstructed series for the last years, while for Ukraine with the raw data (2014-2020) after exclusion of the temporarily occupied territory of the Autonomous Republic of Crimea, the regions of Donetsk and Luhansk.

Figures I.3a and *I.3b* show age-standardised death rates for seven main classes of causes of death and overall mortality. In the case of Ukraine, a different type of line is used for the unreconstructed data from 2014 to 2020. *Diseases of the circulatory system* are the primary cause of death for both sexes in the three countries and account for the global trajectory of mortality. The proportion of this cause of death in total mortality is about 60% for men and 70% for women in Moldova and Ukraine for the whole period. In Romania, the same high values can be found in the 1980s and early 1990s, although currently, this share has dropped to 55% for men and 60% for women. In all three countries, the mortality rate was very close until the beginning of the 1990s, especially among men at the height of the anti-alcohol campaign which took place in the FSU in 1985-87. In Romania, after the 1989 revolution, cardiovascular mortality increased among men and remained stagnant among women, followed by a constant decrease since 1997. The response to the social and economic crisis of the 1990s was much stronger in Moldova and Ukraine than in Romania, mainly for the male population. The high mortality from cardiovascular diseases in Moldova and Ukraine, which persists and after the end of the fluctuations of the 1980s and 1990s, contrasts with the regular progress registered in Romania since 1997.

Neoplasms rank second in cause-specific mortality patterns in three countries. Their contribution was roughly the same until the turn of the millennium (approximately 10% for both sexes, higher for men and lower for women). Although the share of neoplasms has increased progressively to reach 20% in Romania, it remains relatively stable in the other two countries. Mortality from neoplasms in men was much higher in Ukraine than in Moldova or Romania until 2000, while women in the three countries showed more similar rates. Without considering the moderate decline in Moldova and Ukraine in the 1990s, which has different explanations (Shkolnikov et al., 1999), the general trend in cancer mortality in Moldova is much closer to that of the Romanian trend.

The proportion of *external causes* of death in total mortality ranges from 5% in Romania to 10% in Ukraine according to the period. Among men, mortality from external causes in Moldova and Ukraine is consistently higher than in Romania during the entire study period, while among women, Moldova had the highest mortality level during the Soviet period. Next, the reaction of the male population to the social and economic upheavals of the 1990s was much stronger in Ukraine than in Moldova. In Romania, immediately following the events of 1989, external mortality continued to stagnate rather than increase. Recent trends in male mortality from external causes of death in all three countries have experienced a more or less steady decline (since 1998 in Romania, 2003 in Ukraine and 2011 in Moldova). The case of Ukraine should be interpreted with caution because of the exclusion of regions affected by the military conflict since 2014. Mortality trends for women in the three countries are more favourable than for men and are expected to reach a similar level in the near future.

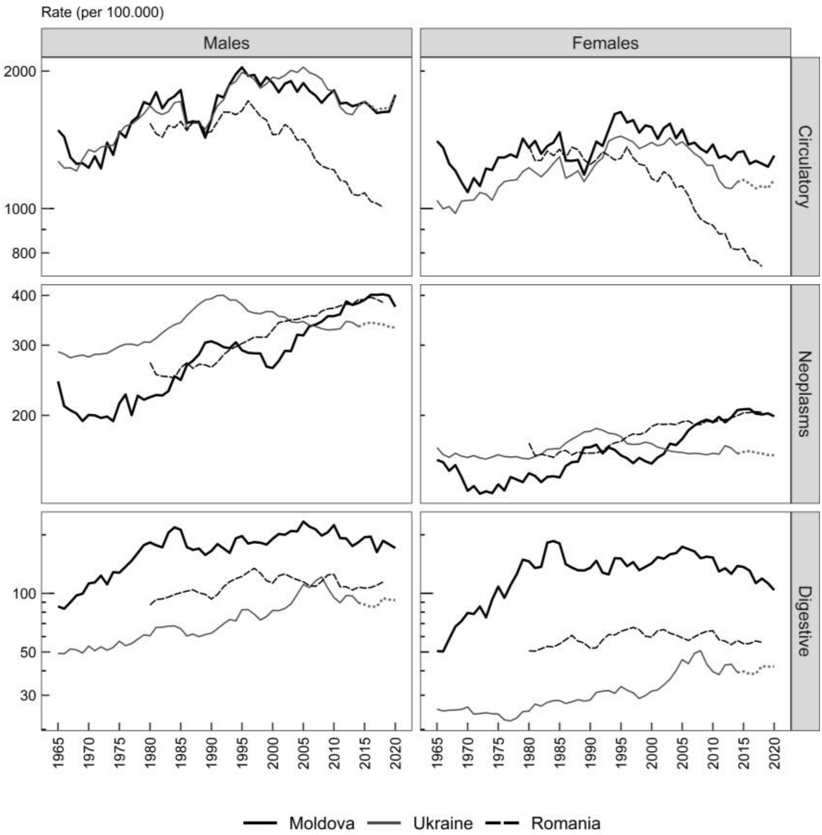

Figure I.3. (a) **Standardised death rates from diseases of the circulatory system, neoplasms and diseases of the digestive system in Moldova (1965-2020) compared to Ukraine (1965-2020) and Romania (1980-2018), by sex, semilogarithmic scale**

Source: Moldova (1965-2014), Ukraine (1965-2013) and Romania (1980-2012) – reconstructed time series from the Human Cause-of-Death Database, https://www.causesofdeath.org/cgi-bin/main.php; Moldova (2015-2020) – reconstructed time series based on the National Agency for Public Health data (Penina, unpublished); Romania (2013-2018) – reconstructed time series based on WHO mortality database, https://www.who.int (Penina, unpublished); Ukraine (2014-2020) – unreconstructed time series based on the State Statistics Service of Ukraine data, http://database.ukrcensus.gov.ua/Pxweb2007/popul_eng.htm

Note: Age-standardised death rates were calculated using the 2013 European standard population, https://www.causesofdeath.org/docs/standard.pdf

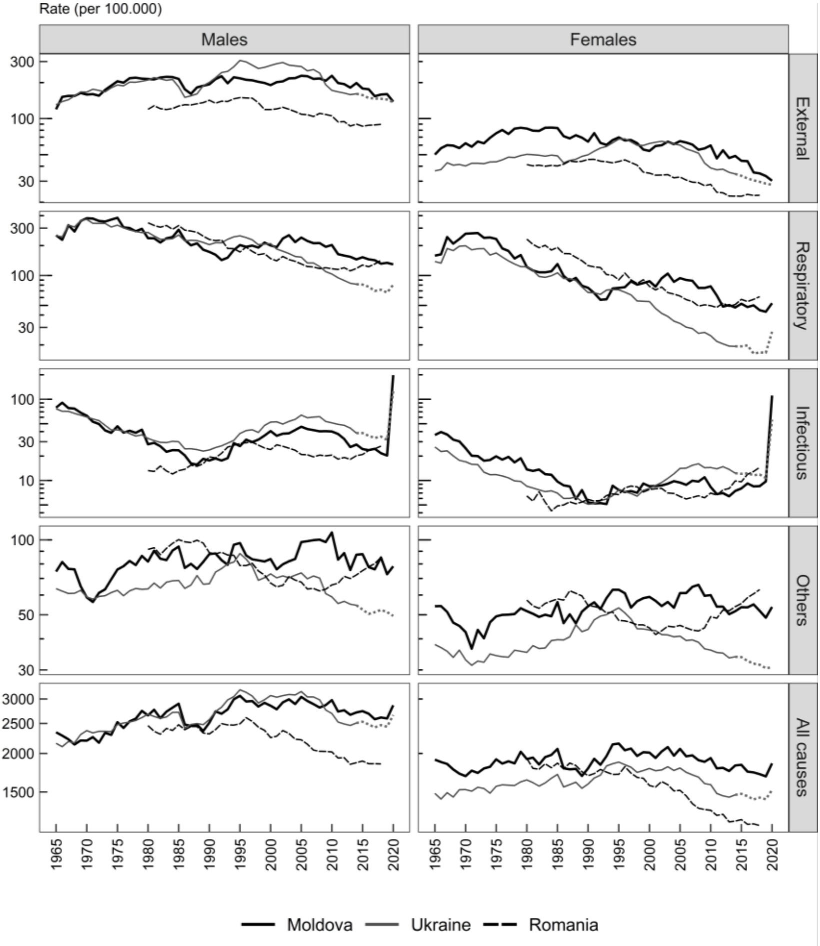

Figure I.3. (b) **Standardised death rates from external causes of death, diseases of the respiratory system, infectious diseases, other diseases and all causes in Moldova (1965-2020) compared to Ukraine (1965-2020) and Romania (1980-2018), by sex, semilogarithmic scale**

Source: see Fig. I.3. (a)
Note: see Fig. I.3. (a)

A distinguishing feature of the mortality pattern in Moldova relative to Ukraine or Romania is an exceptionally high level of mortality from *diseases of the digestive system* mainly represented by liver cirrhosis. In addition, the male-female ratio for this cause of death in the country is consistently lower than in Romania (around 2.0) or Ukraine (around 2.5). This was nearly 1.0 in the early 1980s when the highest mortality values were recorded. The introduction of rigorous anti-alcohol measures in the FSU in 1985 resulted in a rapid and short-term decline in mortality, followed by a resurgence of the negative trend ongoing to date. Recent trends in mortality from diseases of the digestive system show very moderate improvements for females. Unfavourable trends are observed in Ukraine and Romania for both sexes, although the standardised indicators in these countries are still much lower than in Moldova. The situation has worsened in Ukraine, particularly rapidly since 2000, while in Romania mortality has mainly stagnated.

Mortality from *respiratory diseases* was the second leading cause of death in Moldova and Ukraine in the late 1960s (15-17% of total mortality). In Romania, where data are available from 1980 onwards, this effect was equally significant (14% in 1980). In Moldova and Ukraine, mortality due to this cause of death declined considerably up to the 1990s. While in Ukraine, the social and economic crisis of the 1990s temporarily halted this progress for some time, in Moldova, the increase in mortality has resumed since the 1990s and has been interrupted only in recent years. In Romania, mortality from respiratory diseases fell more or less steadily until 2010, followed by stagnation or even growth.

Mortality from *infectious diseases* also improved significantly in Moldova and Ukraine until the end of the 1980s, when it resumed growth until 2005. The decrease that followed is most obvious for Moldovan and Ukrainian men, while women in both countries continued to have health problems associated with this type of mortality and beyond 2005. In Romania, the increase in mortality from infectious diseases, which began in the mid-1980s, did not cease until after 1997, when the general situation improved. However, in recent years, as in the case of respiratory diseases, mortality has started to increase again in Romania. The huge jump in deaths from infectious diseases in Moldova and Ukraine in 2020, the last year of observation for both countries, is entirely related to the COVID-19 infection. This increase was greater in Moldova than in Ukraine, with a ten-fold rise compared to five. Finally, the mortality level of the *"other diseases"* group in Moldova is fairly similar to that of Romania or Ukraine, but the general stagnation in the country contrasts with the continuous decline since the mid-1990s in Ukraine and the recent increase in mortality in Romania.

2. Regional mortality trends and patterns in the FSU countries: literature review

Alongside studies on mortality at the national level, researchers are paying increasing attention to regional trends and patterns in mortality in the FSU countries. Thus, recently, several studies have been carried out in Ukraine, Russia, Belarus and the Baltic States. We will begin with an overview of the studies for Ukraine, Moldova's immediate geographic neighbour, and then look at the situation in other former Soviet countries. We found no similar research in Romania or Moldova published in recent years at the time this monograph was written.

As part of her PhD thesis, Svitlana Poniakina studied the geographic diversity of mortality patterns by cause in *Ukraine* over three different periods: the Soviet period immediately before the USSR collapse (1988-1991), the period of crisis (2001-2003) and the recent period of recovery (2007-2010) (Poniakina, 2014). The first period refers to the years surrounding the last Soviet census conducted in 1989, the second one covers the years around the first post-independence census in 2001 and the third relies on the post-census population estimates. The author divided the regions into three groups according to the differences in mortality patterns by age. The first group comprises the regions with the most favourable age-specific mortality profile, located exclusively in western Ukraine. The second group covers regions in the southeast of the country, where mortality patterns by age are the most unfavourable. Finally, other regions fall into the third group with low infant mortality rates, but an unfavourable situation for the other age groups. The most leading western regions are characterized by much lower mortality among the elderly, indicating a more advanced epidemiological mortality profile. The geographical diversity of mortality in Ukraine between the leading western regions and lagging eastern regions in males or southeastern regions in females is primarily attributable to cardiovascular diseases and external causes of death. The latter explains a strong mortality gradient between the west and the rest of the country. Moran's Index, which is the measure of global spatial autocorrelation and indicates the presence of clusters in the data, is the highest for external causes of death in Ukraine (Moran's I = 0.55). Although cancer is the second leading cause of death in the country, it does not follow a specific mortality pattern. Meanwhile, cancer mortality is the highest among women in the capital Kyiv.

The case of the Odesa region, adjacent to western Moldova, is interesting. Here, the situation is particularly unfavourable for women whose life expectancy is the lowest due to very high mortality associated with cardiovascular diseases and external causes of death. Additionally, female mortality from digestive and infectious diseases is highest in this region. On the other hand, in the Chernivetska region, located in the west of Ukraine and on the border of the northern Moldovan districts (Briceni, Ocnita), life expectancy is highest among men and women.

A group of Franco-Russian researchers studied the geographic diversity of cause-specific mortality trends and patterns in *Russia* over periods surrounding four population censuses in 1970, 1979, 1989, and 1994 (Vallin et al., 2005). A clear division was found between the south-west and north-east both in terms of total mortality and cause-specific mortality patterns. Furthermore, the authors demonstrated that when aggregating data for all four periods, there are two major geographical clusters. The first one includes mainly areas of the western and southern parts of European Russia and is extended by a belt of southwestern Siberia along the border of Kazakhstan. The second one includes the rest of Asian Russia with the north-eastern part of European Russia. Not only all-period mortality is consistently lower in the first cluster than in the second, but these two big clusters also present two different cause-specific mortality profiles.

Inna Danilova carried out the regional analysis of mortality by causes of death in Russia in the framework of her PhD thesis (Danilova, 2018). The author concludes that the recent growth in life expectancy at birth in Russia is not accompanied by a reduction in interregional mortality inequality. On the contrary, the decline in old-age mortality from cardiovascular diseases unfolds differently across regions, which increases the divergence between them. The two major cities, Moscow and Saint Petersburg, as well as the republics of the North Caucasus, contribute the most to this interregional divergence (Danilova, 2018; Timonin et al., 2017). These two big cities and the republics of the North Caucasus form a cluster with a much higher life expectancy and a more advanced epidemiological mortality profile. On the other hand, mortality from external causes of death among youth and middle-aged adults as well as mortality from cardiovascular diseases in middle age reduces interregional inequality in mortality.

Grigoriev et al. demonstrated that interregional differences in mortality in *Belarus* are not very pronounced, but they have been increasing in recent years, mainly because of a growing advantage of the capital over the rest of the country (Grigoriev, Doblhammer-Reiter and Shkolnikov, 2013). This inequality is associated with diverging trends from external causes of death between the capital of the country and the Brest oblast, on the one hand, and other regions, on the other hand. Mortality from cardiovascular diseases accounts for a substantial part of the mortality gap between the capital and the rest of the country, but not between oblasts. As in the case of Ukraine, cancer mortality does not follow any particular spatial pattern in Belarus. Another interesting observation is that in Belarus, there is a north-south mortality gradient for diseases of the respiratory system. A similar conclusion was reached with respect to Ukraine (Poniakina, 2014). The authors explain this by differences in climatic conditions, the proximity of heavily polluted industrial centres or by regional differences in the diagnosis of causes of death.

In the study dedicated to regional life expectancy patterns in *Lithuania*, mortality data were analysed for 55 administrative regions in three-year intervals between 1988 and 1996 (Kalediene and Petrauskiene, 2000). The most favourable regions were the major towns and the resort town of Druskininkai. As in Ukraine, Russia and Belarus, mortality from external causes of death among men and cardiovascular mortality contributed the most to regional inequalities in life expectancy. Further, these disparities were correlated with the level of urbanization, education, and marital status. At the same time, no association was found for the distribution of health care resources, unemployment and certain other economic aspects of well-being.

Regional level mortality data are becoming available for a growing number of countries. This allows researchers to move from international comparisons of mortality between countries to large-scale studies on cross-country differences in mortality taking into account the significant disparities within countries. For instance, using spatial autocorrelation technics, it was found that the districts located along with the Belarusian–Lithuanian border, especially those on the Belarusian part, suffer enormously from conditions associated with increased alcohol consumption such as liver cirrhosis and alcohol poisoning (Grigoriev et al., 2016).

3. Geographical location and administrative division of Moldova

The Republic of Moldova or Moldova with a total population of fewer than 3 million people, according to the last population census 2014 lies between Ukraine and Romania. Moldova comprises three geographical regions (north, centre and south), the Transnistrian region and the municipality of Chisinau which includes the capital of the same name *(Fig. I.4)*. Transnistria, located in the eastern part of the country, is home to approximately half a million people in 2004. Transnistria announced its independence in 1990, but Moldova still considers it part of its territory.

The administrative-territorial organization of the Republic of Moldova presented in *Figure I.5* includes two levels. Villages (communes) and cities (municipalities) constitute the first level, while 32 districts, the municipalities Chisinau and Balti, the Autonomous Territorial Unit (ATU) Gagauzia and Transnistria are part of the second level (Parliament of the Republic of Moldova, 2001). Official statistics do not cover the Transnistria region (municipality of Bender, municipality of Tiraspol, Camenca, Grigoriopol, Ribnita, Slobozia and part of Dubasari district) since 1998.

Figure I.4. **Geographical location of the Republic of Moldova**

Source: based on (GADM, 2018)

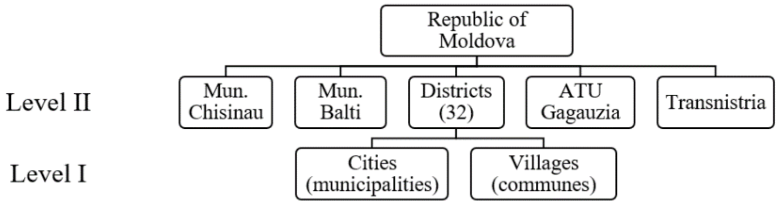

Figure I.5. **Administrative division of the Republic of Moldova**
Source: based on (Parliament of the Republic of Moldova, 2001)

4. Research questions and hypotheses

The study aims to examine the current geographical differentiation of all-cause and cause-specific mortality in Moldova and to identify evidence-based modalities to reduce it.

Our research questions are as follows:

1. What are the regional differences in mortality in Moldova?
2. How do the different components of mortality (age, cause and sex) influence interregional differentiation of mortality?

We hypothesise that the high level of overall mortality in Moldova coexists with statistically significant regional differences in mortality by age, sex and cause of death. It can be assumed that the different geographical entities of the country have progressed differently on the health transition trajectory, resulting in the persistence of interregional disparities in mortality.

Key messages

1. Moldova has been facing a population health crisis since the middle of the 1960s, as have other countries in the former Soviet Union. Diseases of the circulatory system, diseases of the digestive system and external causes of death are the main causes of death that drive long-term decline and short-term fluctuations in life expectancy. Recent improvements are quite modest and can be temporary, especially

among men. In view of the health transition theory, Moldova is in the second stage.

2. Mortality trends by cause in Moldova are quite similar to those in Ukraine. An exceptionally high level of mortality from diseases of the digestive system with no obvious sex gap is a particular characteristic of the Moldovan mortality pattern. The burden of liver cirrhosis in the country is mainly attributed to the existing culture of harmful alcohol consumption represented mainly by homemade wine among men and women.
3. In the countries of the European part of the former USSR, cardiovascular diseases and external causes of death are the main determinants of changes in life expectancy at the national level and interregional differentiation of mortality. Mortality from external causes, which is closely associated with hazardous consumption of spirits in these countries, has a more important impact on geographical disparities in mortality than cardiovascular mortality.
4. The main hypothesis of the study is that the high level of mortality in the country coexists with regional variations in mortality by sex, age and cause of death.
5. The data are analysed at the second level of the administrative division, which comprises 32 districts, ATU Gagauzia and two municipalities (Chisinau and Balti). Transnistria is not included in the study.

II. DATA AND METHODS

1. Population data

Many studies on regional mortality patterns conducted within the FSU are based on the years surrounding the population censuses (Section I.2). In the absence of reliable intercensal or postcensal population estimates, this approach may help to avoid a systematic bias induced by increased migration flows in the FSU since independence. In Moldova, the recent period of migration intensified in comparison with the years immediately after independence was proclaimed and is characterised by the diversification of the countries of emigration and the increase in stocks of Moldovan citizens in the host countries (Tabac and Gagauz, 2020). In addition, the National Bureau of Statistics (NBS) has not estimated postcensal population figures in a regional context at the time of the study. To avoid this type of bias, we rely on the results of the last national census of population and households in May 2014. The NBS provides two types of population counts, according to the 2014 census. The first type refers to the respondent population consisting of the usual resident population and non-residents[1]. The second type is the usually resident population, which was adjusted due to incomplete registration.

The population coverage estimate was determined by the NBS based on the post-censal survey and electricity supplier data (National Bureau of Statistics of Moldova, 2014). *Figures II.1 (a)* and *II.1 (b)* show, respectively, the population pyramids of 34 administrative units and the municipality of Chisinau. Both figures include respondent population numbers (including non-residents) and estimated usual resident population (excluding non-residents). The size of the respondent population for most of the administrative entities presented in Figure II.1 (a) coincides with estimates of the usually resident population, except for a few districts, in particular

[1] Resident is a person who lived in Moldova for at least the last 12 months and who intends to stay in Moldova for the next 12 months, not including temporary absences for holidays or work assignments (Istrati, 2019).

Gagauzia. At the same time, in the municipality of Chisinau, where the population coverage at the moment of the 2014 census was only 59%, the situation is the opposite. In this case, post-census adjustments affected almost all age groups, especially the working-age population between the ages of 20 and 40.

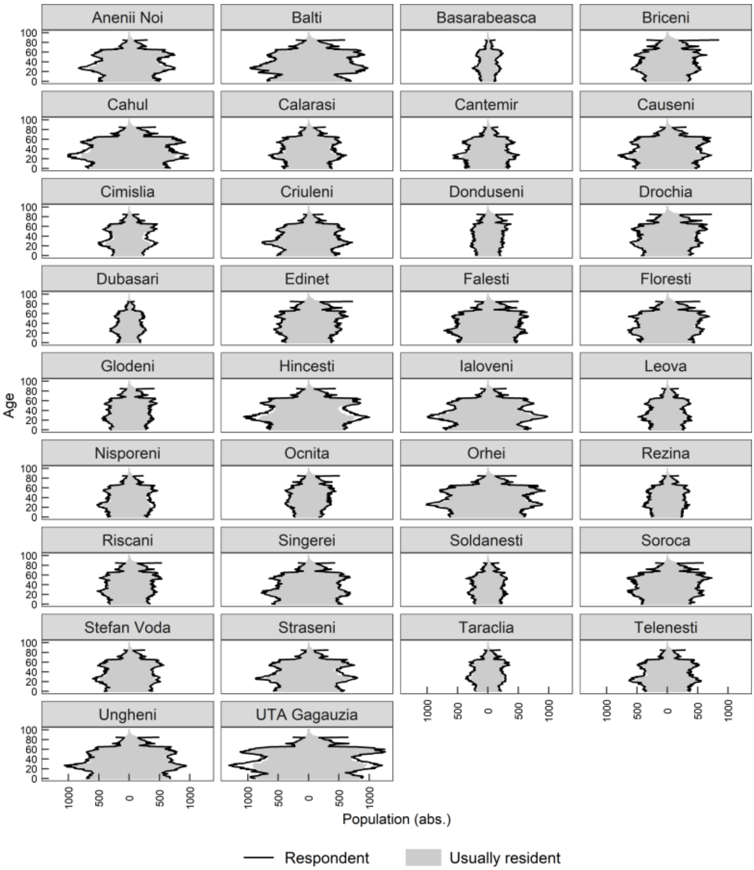

Figure II.1 (a). **Population counts by sex, age and districts (except for the municipality of Chisinau) according to the 2014 census: respondent population (including non-residents) and estimates of the usually resident population (excluding non-residents)**

Source: NBS

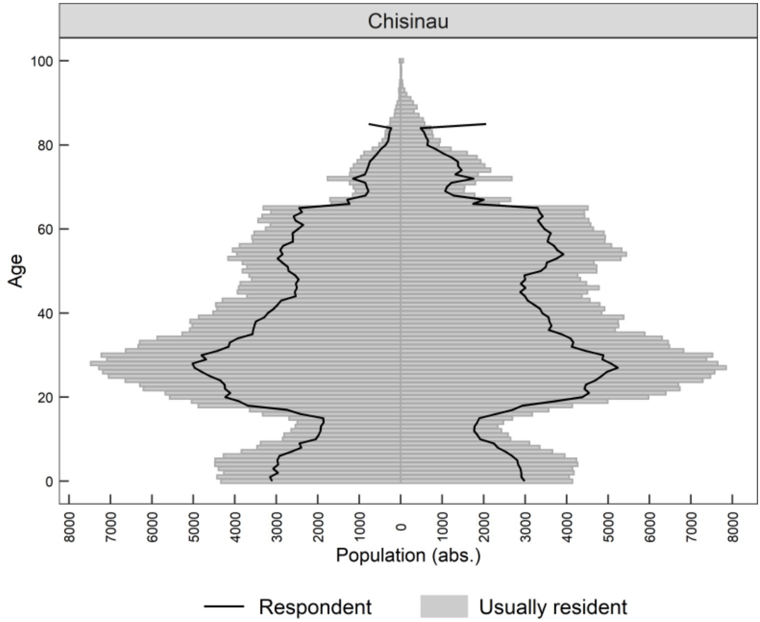

Figure II.1 (b). **Population counts by sex and age for the municipality of Chisinau according to the 2014 census: respondent population (including non-residents) and estimates of the usually resident population (excluding non-residents)**

Source: NBS

Our study is based on officially adjusted estimates of the usually resident population, according to the 2014 census. The average size of the population across the districts is 81 thousand people (with the municipality of Chisinau) and 63 thousand people (without the municipality of Chisinau). The minimum population size is 19 thousand (Basarabeasca) and the maximum size is 676 thousand (Chisinau). In 22 of the 35 administrative units, the population size is 40 to 80 thousand; in 8 districts, it is 80 thousand people and more; in 5 districts, it is less than 40 thousand people. Since 1998, official statistics do not include the Transnistria region.

2. Mortality data

The de-identified database of individual medical death certificates provided by the National Public Health Agency (NAPH) was used. The NAPH has been responsible for the centralised coding of causes of death since 1991 under the 9th revision of the International Classification of Diseases and Causes of Death (ICD) and since 1998 under the 10th revision of ICD. The medical death certificate database contains information on:

1. Year of death registration;
2. The exact date of death (day/month/year);
3. The exact date of birth (day/month/year);
4. Sex;
5. 4-digit code of the underlying causes of death under ICD-10;
6. District code, according to the place of residence of the deceased;
7. Locality code, according to the place of residence of the deceased.

As our analysis is based on the results of the 2014 population census conducted in May, we used the mean of the death counts for the period 2012 to 2016 to ensure better robustness of mortality rates at the district level. Deaths refer to the place of residence of the deceased.

Following the calculation of age at death, the data were aggregated into 35 administrative units (the municipality of Chisinau, the municipality of Balti, 32 districts and ATU Gagauzia). The ill-defined causes of death (R00-R99) that make up less than 1% for the analysis period were distributed proportionately among all causes of death.

The data were aggregated by cause of death under two lists:

1. a short list that includes seven main groups of causes of death;
2. an expanded list that covers 15 causes of death.

Both lists of causes of death are presented in Table III.1 (see Section III.2).

3. Data quality and limitations of the study

Regional data analysis studies can be complicated by variations in regional practices for coding causes of death. This is particularly important in countries where the system of codifying causes of death is decentralised (Danilova, 2018). Given that in Moldova the coding of causes of death is centralised, this problem may be omitted. Next, the statistical continuity of death time series is complicated by periodic revisions of the classification of causes of death and by changes in coding practices between two classifications (Vallin and Mesle, 1988). In our study, we use an average of death rates over the 2012-2016 period. The analysis was carried out for the major groups of causes of death, which is a common measure to avoid discontinuities in the time series. The low proportion of ill-defined causes of death (0.7%) for the study period did not affect the results. Most of the deaths due to ill-defined causes (94%) were recorded among males (74%) in the municipality of Chisinau (37%) and classified under R98-R99 (unattended death and other ill-defined and unspecified causes of mortality).

The principal limitation of the study is the period chosen (2012-2016). To avoid a possible systematic bias that could be induced by intensive internal and international migration flows, we opted for the period surrounding the last census carried out in May 2014. The 2014 census results were adjusted by the National Bureau of Statistics because of the incomplete population coverage in the municipality of Chisinau (Valcov, 2017). Given that mortality trends and patterns in Moldova have not changed much at the national level in recent years, the regional mortality patterns presented in the monograph are consistent with those of recent years. The exception is 2020, a year when mortality trends were heavily influenced by the COVID-19 pandemic.

4. Methods

The results of the study are divided into two parts. The first part presents a description of the overall and cause-specific regional mortality patterns (Chapter III), while the second examines the results of spatial autocorrelation (Chapter IV). Data were analysed in R.

A. Analysis of regional mortality patterns

a) Life tables and confidence intervals

Abridged life tables using 5-year age intervals with a final age group interval of 85+ were computed by sex and district using the methods described by Chiang (Chiang and World Health Organization, 1979). To estimate the 95% confidence intervals for life expectancy, we used the Silcocks et al. method (Silcocks, Jenner and Reza, 2001; Georgina et al., 2020).

b) Decomposition method

The contribution of mortality by age and main groups of causes of death to differences in life expectancy at birth between Moldova and each district was estimated by the method proposed by E. Andreev and M. Shkolnikov (Andreev and Shkolnikov, 2002; Riffe, 2018).

c) Standardised rates and confidence intervals

Mortality rates by sex and cause for each district were standardised by the indirect method. Standardised mortality ratio was multiplied by crude death rate (standardised mortality rate). Age-specific death rates by cause calculated for Moldova, both sexes, were used as a reference rate.

The direct method of standardisation was used to compute death rates by main age groups for each district (age-standardised death rates). The Moldovan population structure according to the 2014 Census was used as a standard population. For mortality rates standardised by indirect or direct methods were computed confidence intervals using Byar's or exact CI methods (Georgina et al., 2020).

d) Thematic maps

To produce mortality maps, we used shape files from the GADM website (GADM, 2018). The "Jenks" optimization method of classification, which maximises the differences between the categories of observations (Muenchow, 2021) was used to produce all the thematic maps. The thematic maps also include the histogram showing the distribution of rates across districts for standardised mortality rates from major groups of causes of death.

B. Analysis of spatial mortality patterns

a) General concepts

Spatial autocorrelation is a fundamental concept in spatial analysis and has a rich history (Getis, 2008). If the traditional correlation finds the relation between two different variables, then the autocorrelation refers to the correlation of the same variable but in different locations. Spatial autocorrelation relates the value of the variable of interest in a given location, with the values of the same variable in surrounding locations (Dani Arribas-Bel, 2017).

Spatial randomness is a key concept of spatial autocorrelation. It can be defined as a lack of any structure or pattern in spatial data. Luc Anselin interprets spatial randomness from two perspectives (Anselin, 2021). From the simultaneous perspective, spatial randomness occurs when the observed spatial pattern of values is as likely as any other spatial pattern. From the conditional perspective, spatial randomness exists when values at one location do not depend on values at other neighbouring locations.

The null hypothesis used in spatial autocorrelation suggests a random distribution of a variable in space or *spatial randomness*. If the null hypothesis is rejected, there is evidence of structure in the data or clustering. In this case, two possible outcomes are possible: positive and negative autocorrelation. For *positive autocorrelation,* similar (low or high) values of a variable of interest in neighbouring locations occur more frequently than for spatial randomness. When the autocorrelation is positive, the variability of the values is less than for spatial randomness. In the case of negative spatial autocorrelation, dissimilar (low vs high) values of a variable occur more frequently than for spatial randomness. This means that the variability of values for negative spatial autocorrelation is higher than for spatial randomness. Positive autocorrelation is closely associated with other two notions: *clustering*, i.e., the presence of structure or pattern in data, and *clusters*, i.e., the indication of a location of clusters with similar values on a map.

Spatial autocorrelation is quantified with indices. Different spatial autocorrelation statistics exist, but they all combine two forms of similarity: attribute similarity, which is a standard correlation coefficient measure, and locational similarity (Anselin, 2021). Attribute similarity measures the degree of similarity or dissimilarity of a variable y (an attribute) between locations i and j. To measure locational similarity, in spatial autocorrelation, the notion of "*neighbour*" is formalised (when locations i and j are considered neighbours), and the matrix of spatial weights w_{ij} is constructed based on the selected notion.

Two main types of spatial autocorrelation statistics are global spatial autocorrelation and local spatial autocorrelation. The former is designed to accept or reject the null hypothesis of spatial randomness in favour of an alternative hypothesis of clustering or negative spatial autocorrelation, but it does not identify clusters. The latter detects the locations of clusters that have similar values on a map. Both types of spatial autocorrelation statistics require an assessment of significance, i.e., the probability of making Type 1 error when rejecting the null hypothesis.

b) Spatial weights

The spatial analysis begins with the identification of neighbours between spatial units (localities) and the construction of a spatial weights matrix. In this study, two main types of spatial weights were tested: contiguity and distance-based weights. In the case of contiguity-based spatial weights, the definition of neighbour is based on a common border. Further, this type of weights matrix can be produced based on the *rook* criterion that eliminates corner neighbours (spatial units that do not have a full boundary in common) and on the *queen's* criterion that includes them *(Fig. II.2)*. There is also the difference between the first-order contiguity that includes only the nearest neighbours and the second-order contiguity (or higher-order contiguity), which also includes the spatial units next to the nearest neighbours (Anselin, 2005). The other neighbourhood definition used in our analysis includes k nearest neighbours, e.g., four nearest neighbours. This method ensures that all spatial units have k neighbours, but it often leads to asymmetric neighbours (Bivand, Pebesma and Gómez-Rubio, 2013).

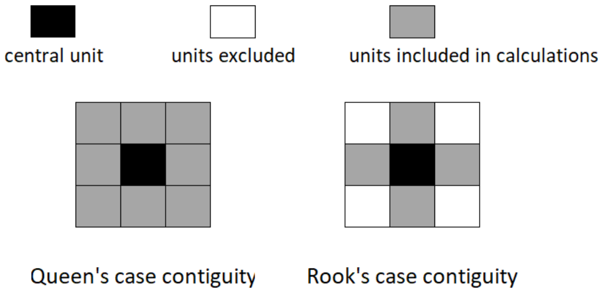

Figure II.2. **Queen's and rook's case contiguity**

Source: (Li, 2019)

The spatial weights define the neighbourhood structure between the spatial units i and j as a $n \times n$ matrix W, where the elements w_{ij} are the spatial weights. The neighbourhood relation is expressed as a binary relation, with weights 1 and 0. The spatial weights w_{ij} are equal to one when i and j are neighbours and to zero otherwise (Anselin, 2020):

$$W = \begin{bmatrix} w_{11} & w_{12} & \cdots & w_{1n} \\ w_{21} & w_{22} & \cdots & w_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ w_{n1} & w_{n2} & \cdots & w_{nn} \end{bmatrix} \tag{1}$$

c) Global spatial autocorrelation

Using global spatial autocorrelation, we can reject the null hypothesis of spatial randomness in favour of an alternative hypothesis that suggests some structure in data, i.e., clustering. Global spatial autocorrelation does not indicate the location of the clusters on a map.

The null (H_0) and alternative (H_1) hypotheses can be formulated as follows:

H_0: All-cause and cause-specific mortality are spatially independent; the observed values are assigned at random across the districts (Moran's *I* is close to zero).

H_1: All-cause and cause-specific mortality are not spatially independent (Moran's *I* is not zero).

The most well-known measure of global spatial autocorrelation is the Moran's Index (Moran's *I*) developed by Patrick Alfred Pierce Moran in 1948. It takes the form described in equation 2 (Dubé and Legros, 2014):

$$I = \frac{N}{\sum_i \sum_j w_{ij}} \frac{\sum_i \sum_j w_{ij}(y_i - \bar{y})(y_i - \bar{y})}{\sum_i (y_i - \bar{y})^2} \tag{2}$$

Where N represents the total number of observations (districts), $\bar{y}$ is the arithmetic average of the variable y (e.g., standardized death rate or life expectancy at birth). The sum of spatial weights, $\sum_i \sum_j w_{ij}$, usually referred to as S_0, is equal to the number of observations when the spatial weights matrix is row-standardized ($S_0 = N$).

It is also possible to write the Moran's Index in a more compact form (Anselin, 1995):

$$I = \frac{N}{S_0} \frac{\sum_i \sum_j w_{ij} z_i z_j}{\sum_i z_i^2} \tag{3}$$

Where: z_i is the deviations from the mean of a variable y.

Since Moran's I is the statistic of spatial autocorrelation, it usually takes the values as the classical correlation coefficient between -1 and +1 and has an identical interpretation. When Moran's I is equal to zero, it means that the distribution of a variable y in space is random. Positive values of Moran's *I* indicate spatial clustering of *similar* values, either high or low. In other words, spatial unit i whose value for a given variable y is under the mean is surrounded by other localities j with values also lower than the mean. And vice versa. Negative values of Moran's I indicate spatial clustering of *dissimilar* values, i.e., a locality with high values is surrounded by localities with low values and vice versa (Anselin, 1995).

To estimate the significance of Moran's I, we used the significance test by permutations based on a Monte Carlo (permutation) approach. Using this approach, we compare an obtained value of Moran's I to a reference distribution obtained from a series (hundreds or thousands) of randomly permuted patterns. The higher the number of permutations, the closer the standard deviation of Moran's I to its theoretical value. It is considered that 1.000 permutations generate reliable results (Dubé and Legros, 2014). If the p-value for the significance test is less than 0.05, we reject the null hypothesis of spatial randomness and accept the alternative hypothesis of clustering.

d) Local spatial autocorrelation

Moran's index gives us an idea only about the presence of spatial autocorrelation for a given variable y in a sample (country) and its intensity. Local spatial autocorrelation statistics allow us to identify the location or clusters with similarly high or low values for a variably y on a map. These local spatial clusters of high or low values, often referred to as "*hot spots*" and "*cold spots*", respectively, can indicate particular behaviours or particularities (Dubé and Legros, 2014).

To measure the local spatial autocorrelation, we used the local indicators of special association (LISA) as proposed by Luc Anselin (Anselin, 1995):

$$I_i = (y_i - \bar{y}) \sum_j w_{ij} (y_i - \bar{y}) \quad (4)$$

If z_i is the deviations from the mean of a variable y, then:

$$I_i = z_i \sum_j w_{ij} z_i \quad (5)$$

The Monte Carlo technique to estimate if "high-high" values and "low-low" values are statistically significant at a confidence level of 0.05

was applied. Localities where spatial autocorrelation is statistically not significant (p-value > 0.05) are labelled as “not significant”.

e) Moran’s scatterplot

The graphical analysis of local indices is based on Moran’s scatterplot constructed between the spatially lagged variable y (weighted average of neighbouring values) on the y-axis and the original variable y on the x-axis (*Fig. II.3*).

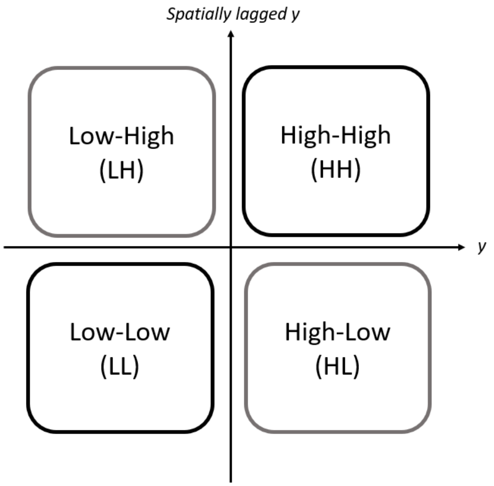

Figure II.3. **Moran’s scatterplot**

Moran scatterplot is split into four quadrants which correspond to the four particular types of local spatial association. The upper right “*high-high*” quadrant corresponds to the locations that have high values of a variable y and are surrounded by other locations that also have high values (higher than the mean) of the variable y. A high-high cluster is often referred to as “*hot spots*”. The lower left “*low-low*” quadrant belongs to the locations with low values of a variable y that are surrounded by the locations with low values (lower than the mean) of the variable y. When the majority of observations are within these two quadrants, it means that there is a positive global spatial autocorrelation. The other two quadrants of spatial autocorrelation represent “high-low” and “low-high” clusters. For the former, high values are surrounded by low values, while for the latter, vice versa, low values are surrounded by high values. When the majority of observations are within the low right and upper left quadrants, it means that there is negative global spatial autocorrelation. Localities detected in “low-high” and “high-low” quadrants are “spatial outliers”. The LISA indices were represented with the help of the so-called LISA cluster maps, which include five categories of local spatial autocorrelation: “high-high”, “low-low”, “high-low”, “low-high” and “not significant”.

Key messages

1. The study is based on adjusted results from the 2014 census of population and individual death records for the five-year period surrounding it. Both population and death counts refer to the usually resident population.
2. Centralised codification of causes of death according to ICD-10 and a low proportion of ill-defined deaths reduce a possible systematic bias related to data quality issues.
3. The analysis of regional mortality patterns is based on abridged life tables, mortality rates standardized by indirect method with 95% confidence intervals, method of decomposition and spatial global and local autocorrelation techniques.

III. REGIONAL MORTALITY PATTERNS

This chapter examines regional mortality patterns for the five-year period surrounding the 2014 population census. First, geographical patterns of all-cause mortality by sex and age are discussed (Section III.1). Then, regional cause-specific mortality patterns are considered (Section III.2).

1. Regional all-cause mortality patterns

In this section, we begin our analysis by looking at the regional differentiation of life expectancy at birth and age 25 and 65 for men and women. Next, the geographical variation in infant mortality and age-standardised death rates by main age group (1-19 years, 20-44 years, 45-64 years and 65 years and over) is discussed. Finally, the contribution of age-specific death rates to differences in life expectancy at birth between Moldova and each of its administrative units is shown.

A. Life expectancy at birth by sex

Life expectancy at birth (e_0) at the national level in 2012-16 is 65.2±0.4 in males and 73.7±0.2 in females. Across districts, it varies between 61.6±2.2 in Soldonesti and 68.6±0.5 in Chisinau among males and between 69.1±2.2 in Cimislia and 76.7±0.5 in Chisinau among females. Depending on population size, confidence intervals for e_0 vary from ±0.5 years in Chisinau to ±3.2 years in Basarabeasca for both sexes. Life expectancy at birth is higher than nationwide only in eight districts of 35 for men and in thirteen districts for women *(Fig. III.1).* With confidence intervals in mind, the situation is more dramatic. For example, the lower limit of male life expectancy at birth is higher than the national level only in the municipality of Chisinau that has been detected as a statistical outlier. At the same time, female life expectancy is constantly above the national average in the municipality of Chisinau as well as in the districts of Briceni, Edinet and Drochia located in the north of the republic. The situation at the opposite end is completely different. In this case, the number of districts with below-national life expectancy is much higher (27 for males and 22 for females). Nevertheless, based on the comparison between the upper confidence limit and e_0 at the national level[2], this number is reduced to eleven for men and twelve for women. *Annexe 2* presents values of life expectancy at birth and confidence intervals by districts.

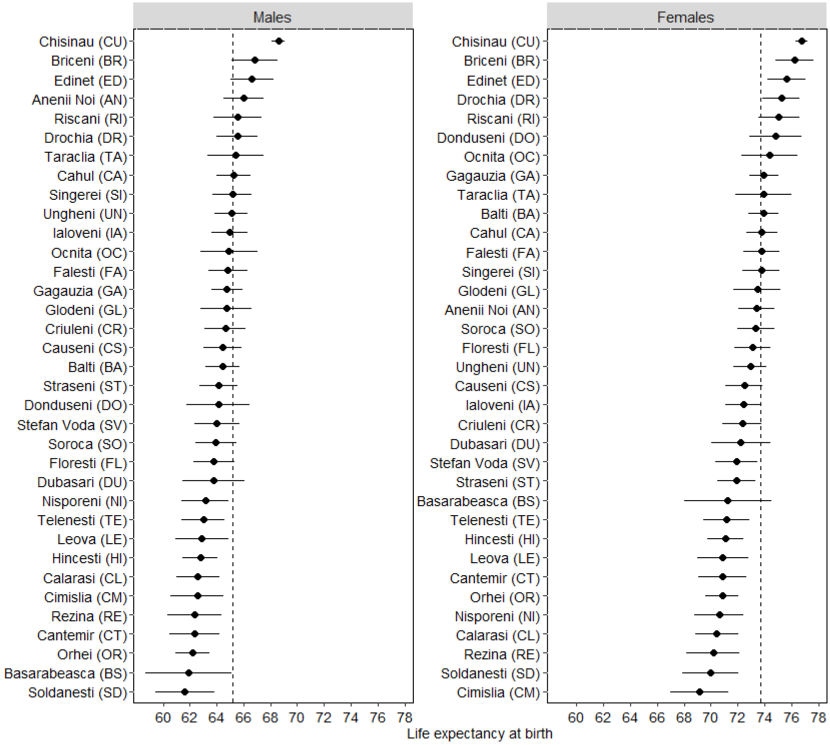

Figure III.1. **Life expectancy at birth and confidence intervals (95%) by districts and sex**

Source: author's calculations based on NAPH and NBS data

Figure III.2 shows life expectancy at birth maps by sex. The classification of life expectancy values is based on the Jenks optimization method

[2] Confidence intervals for life expectancy at birth at national level are rather low (±0.2) and can be ignored.

which identifies categories of similar values and maximises differences between them. In this way, five categories of e_0 can be defined as "very high", "high", "moderate", "low" and "very low".

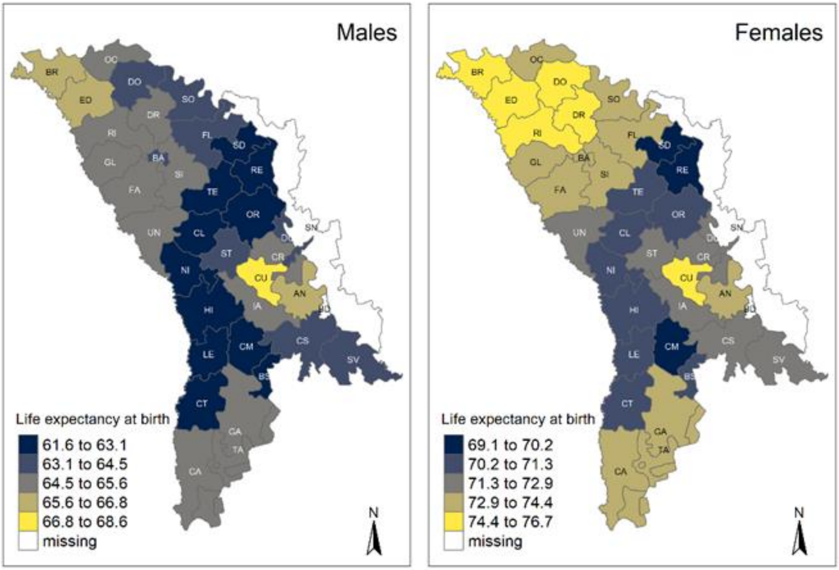

Figure III.2. **Life expectancy at birth by sex**

Source: author's calculations based on NAPH and NBS data
Note: Jenks optimization method of classification was used to produce these and the subsequent maps

For both sexes, the municipality of Chisinau corresponds to the "*very high*" category (66.8 to 68.6 years in males and 74.4 to 76.7 years in females). Among females, the highest values of the indicator are also found in the northern districts. Districts with "*high*" life expectancy (65.6 to 66.8 in males and 72.9 to 74.4 in females) are situated in the northern region for both sexes and in the south for females. In males, only two northern districts (Briceni and Edinet) record "high" life expectancy. In the district of Anenii Noi, adjacent to the municipality of Chisinau, life expectancy at birth is also referred to as "high". The geographical position of districts with "high" and "very high" life expectancy values in the north of the country as a cluster is particularly pronounced for women. Among men, only in two northern districts (Briceni and Edinet) the situation is better than in the other northern districts. Districts having “very high” and “high” life expectancy values can be defined as the *leading*.

The majority of districts with “*very low*” life expectancy (61.6 to 63.1 in males and 69.1 to 70.2 in females) are located in the central region of the country: Soldanesti, Rezina, Telenesti, Orhei, Calarasi, Nisporeni, Hincesti. The first two districts have the lowest life expectancy values for both sexes, while the remainder is for males only. Some southern districts which are directly adjacent to the centre also have a “very low” life expectancy: Cantemir, Leova, Cimislia (both sexes) and Basarabeasca. Interestingly, among females, only three districts were defined as having “very low” values of life expectancy at birth (less than 70.2 years), while among men, this group is much broader (11 districts).

The geographical location of districts with “*low*” life expectancy at birth (63.1 to 64.5 in males and 70.2 to 71.3 in females) also has specific characteristics. First, the location of the districts where female life expectancy is “low” corresponds principally to the location of the districts where male life expectancy is defined as “very low”. Second, if the female population living in the northern region of the country has a “high” or “very high” life expectancy, then the male population in most northern districts, including the municipality of Balti, has “moderate” or even “low” values. Third, some districts that are first-order neighbours of the municipality of Chisinau (Straseni, Dubasari in males) belong to this group too, although others refer to categories having a “moderate” (Ialoveni, Criuleni) or “high” (Anenii Noi) life expectancy. In other words, the immediate geographic proximity of the capital does not guarantee the better health of the population.

Districts with “very low” and “low” life expectancy values are defined in this study as *lagging*. The most lagging districts form *a red belt of high mortality* stretching in men from Soldonesti to Cantemir. While shifting the north or south of the country, the situation is gradually improving. In the southernmost districts (Cahul, Taraclia and Gagauzia), on the one hand, and in the northern districts adjacent to the centre, on the other, male life expectancy has “*moderate*” values (64.5 to 65.6). In females, districts with “moderate” values (71.3 to 72.9) are mainly located in the centre. Finally, in the most remote northern districts, life expectancy increases to reach “very high” values in women and “high” values in men.

B. Life expectancy by age and sex

The clear division of districts into leading (North, capital) and lagging (Centre) areas in terms of life expectancy at birth can be traced back and across age groups though with some peculiarities. *Figure III.3* shows the maps of life expectancy at age 25 (e_{25}). Among men, the number and location of districts with a “very low” life expectancy at the age of 25 are the same as for life expectancy at birth. For women, most districts where life expectancy at birth is “low” have “very low” life expectancy at the age of 25. The red belt of high mortality for life expectancy at age 25 is marked in the same way for both sexes.

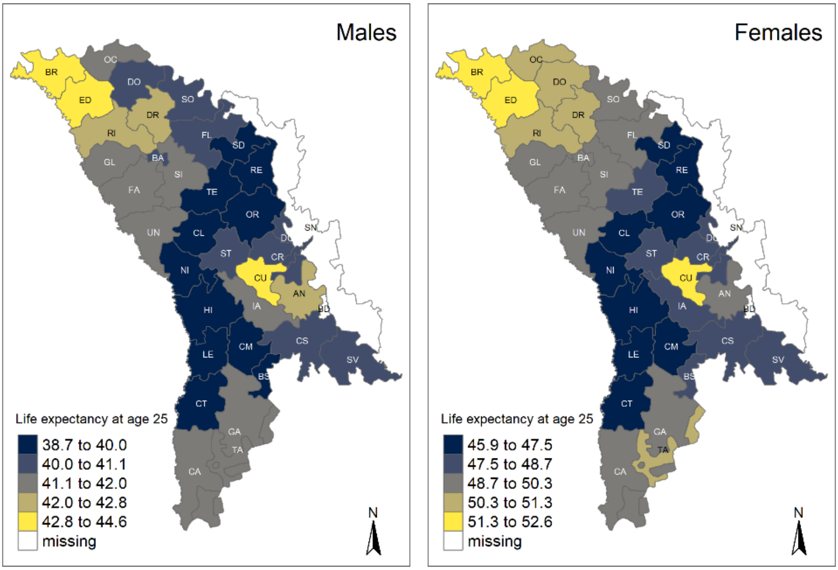

Figure III.3. **Life expectancy at age 25 years, by sex**

Source: author’s calculations based on NAPH and NBS data

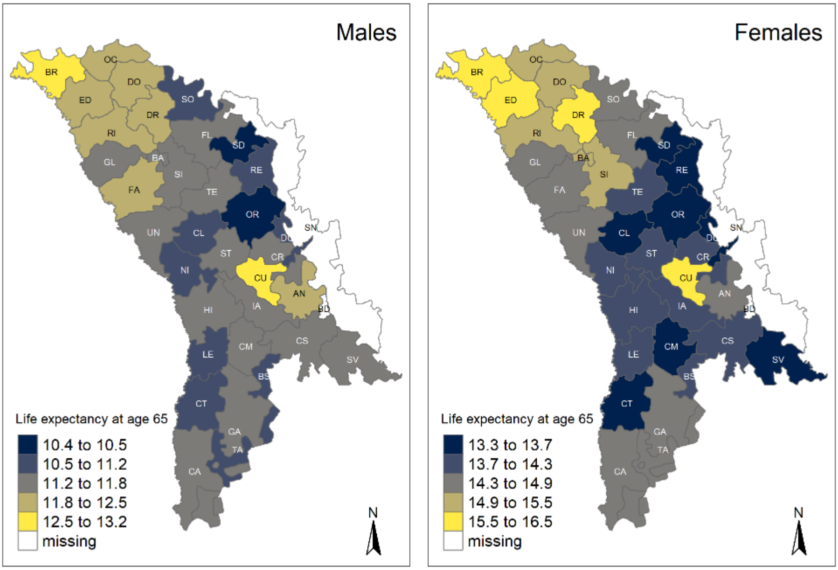

Figure III.4. **Life expectancy at age 65 years, by sex**

Source: author's calculations based on NAPH and NBS data

The geographical position of districts with a "low" life expectancy at the age of 25 is broadly similar for both sexes. The districts directly adjacent to the municipality of Chisinau, with the exception of the district of Anenii Noi in men, have the same adverse mortality pattern as most central districts. Consequently, if not to take account of this exception, the capital of the country is surrounded by districts whose adult population, particularly women, have serious health problems. Our hypothesis put forward earlier that the proximity to the capital is not improving, but instead worsens the health of the population in Moldova is true and in the case of life expectancy at the age of 25. The number of leading northern districts with "very high" and "high" life expectancy values is greatly reduced for e_{25} compared to e_0 among females. Young adults from Briceni or Edinet are at approximately the same risk of death as their counterparts from the capital. The results obtained with regard to life expectancy at age

45 years (not presented here) are very close to those of life expectancy at age 25.

While in young (e_{25}) and mature (e_{45}) adults, the red belt of high mortality is very marked, in older adults (e_{65}), it is less obvious and is represented by a few districts *(Fig. III.4)*. The number of districts with the lowest life expectancy at 65 years is reduced to two for men and eight for women. At the same time, the area covering the leading districts with "high" e_{65} in the north is expanded, especially in males. For the municipality of Balti, which according to e_{25} falls into the "low" or "moderate" categories depending on the sex, life expectancy at age 65 is categorized as "moderate" in older males and "high" in older females.

C. Age-specific death rates by sex

Since sex differences in infant mortality (under one year) and child and adolescent mortality (1-19 years) at the national level are insignificant, geographical mortality patterns for these two age groups are presented for both sexes *(Fig. III.5)*.

Infant mortality in the central region of the country is mostly "low" and "very low" in the capital and its first-order neighbouring districts Criuleni, Anenii Noi and Dubasari. The geographical proximity of the capital explains the more favourable position of the central districts in terms of mortality under one year. At the same time, the situation is worsening in certain districts in the northern or southern part of the country, which is due to the difficulties encountered in providing qualified medical assistance to pregnant women and children. Mortality among children and adolescents (1-19 years) alters its pattern compared to infant mortality. While the municipality of Chisinau continues to hold the leading position, in other districts the situation is more or less homogenous. For the neighbouring districts of the first order, the beneficial geographical proximity of the capital of Chisinau observed in the case of infant mortality is not significant for this age category. At the same time, living in the northern municipality of Balti appears to be as beneficial to the health of children and youth as the capital.

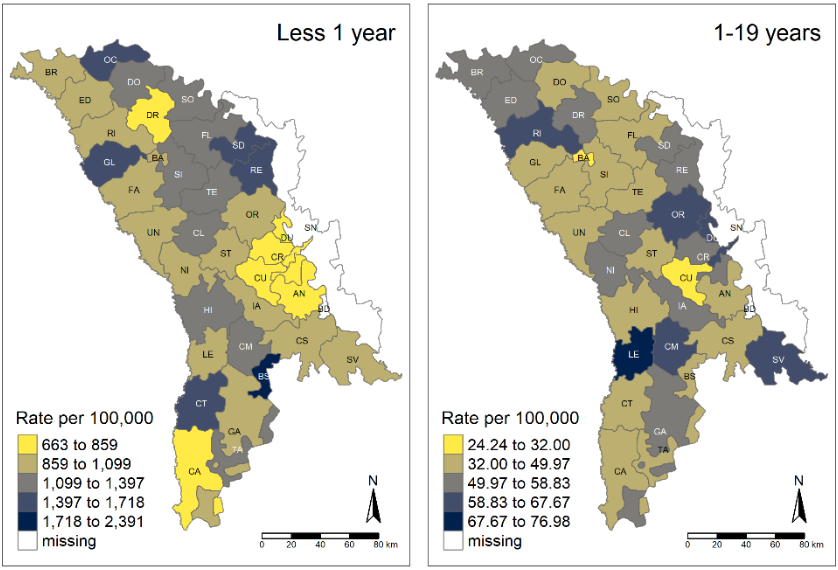

Figure III.5. **Regional pattern of infant mortality rate and standardised death rates at age 1-19 years, all causes, both sexes (per 100,000)**

Source: author's calculations based on NAPH and NBS data

Among young adults aged 20 to 44, regional mortality patterns show significant sex differences in mortality levels (the sex ratio varies between two and five depending on the district), but mortality patterns are quite similar *(Fig. III.6)*. Indeed, death rates among young adults are systematically lower in the north of the country and higher in the centre. This holds particularly true for young women. For them, in the northern districts, mortality is mainly between "very low" and "low", with the exception of the municipality of Balti. At the same time, mortality rates among young males living in the north of the country range from "very low" (Briceni, Edinet) to "very high" (Donduseni). As with young women, young men in the municipality of Balti tend to have more health problems than in nearby districts.

At the same time, for young people living in the central region, death rates vary between "high" and "very high" in males and between "moderate" and "high" in females. The are a few exceptions here. First, the capital of Chisinau continues to have the lowest death rate as the two previous age groups. Second, the health situation of young adults living in districts adjacent to the capital is far better than in other central districts. Finally, the Cimislia district is the only one with the highest death rate among young women (an outlier). In summary, the differentiation of mortality between the more advanced northern districts and the less advanced central districts already observed for life expectancy at the age of 25 is obvious and in the case of young adult mortality.

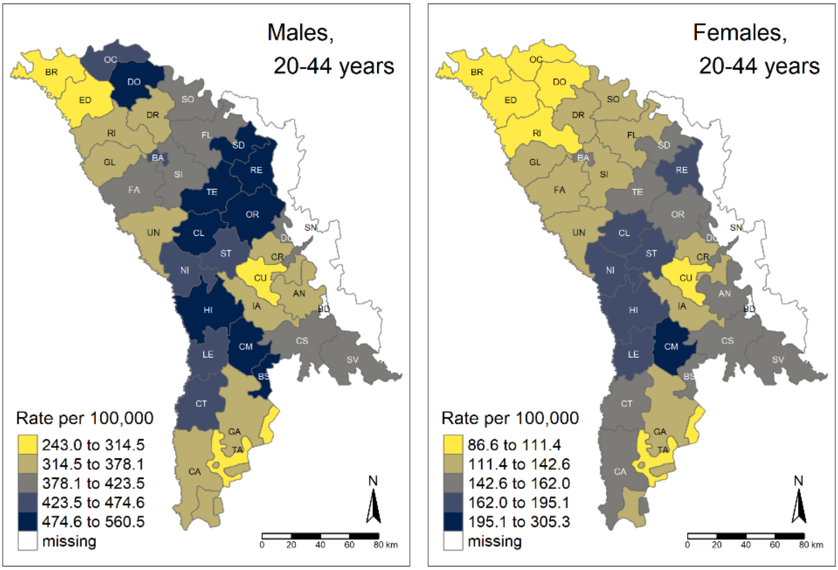

Figure III.6. **Regional pattern of standardised death rates at age 20-44 years, all causes, by sex (per 100,000)**

Source: author's calculations based on NAPH and NBS data

The geographical differentiation of mortality in mature adults aged 45 to 64 follows to a large extent the same geographical pattern already described for the previous age group *(Fig. III.7)*. However, the northern-central mortality gradient is much more evident for this age group than the previous one, particularly for males. Indeed, the geographical location of districts with the lowest and low death rates among mature adult males is much more widespread than among young adult males. Moreover, the location of the leading northern districts is more or less the same for both sexes. In addition, the number of districts with "very high" death rates increases substantially for women and their location becomes more similar to that observed for men. If in the central districts, female mortality for the previous age group fluctuates between "moderate" and "high", then in this age group between "high" and "very high" as for males. In the southern region, the most affected districts are those located directly beside the central region (Cantemir, Leova), while in the more remote southern districts (Cahul, Gagauzia and Taraclia), the health of the population is much better, particularly for Gagauzia females.

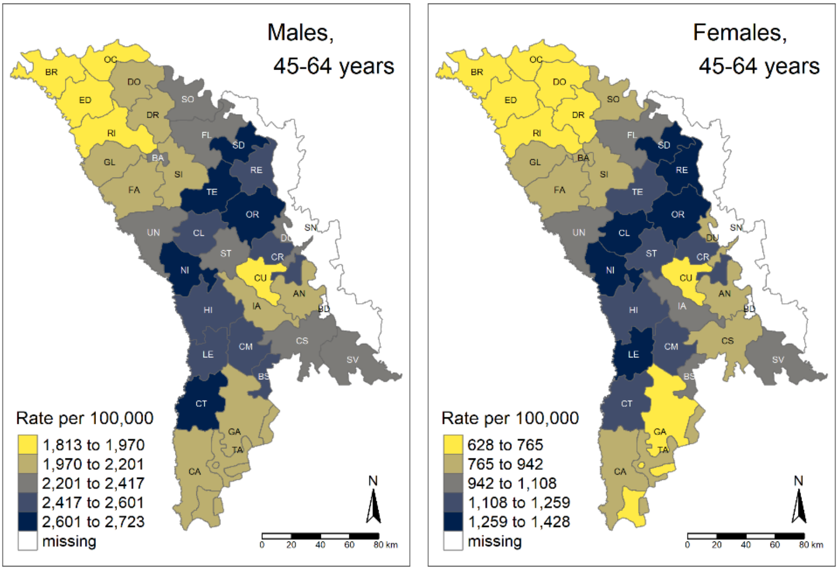

Figure III.7. **Regional pattern of standardised death rates at age 45-64 years, all causes, by sex (per 100,000)**

Source: author's calculations based on NAPH and NBS data

The mortality gradient between the north and the centre remains and for older people, in particular for the female population *(Fig. III.8)*. The health of the population at a later age in districts that form the red belt of a high mortality rate is slightly better than in the previous age group in males, while the situation of older females is the same or even more problematic. Furthermore, the number of the leading districts with "very low" mortality rates is significantly reduced among men and women. Finally, the sex ratio for the elderly varies between 1.2 and 1.5, which is lower than for young (between two and five) or mature (between two and three) adults.

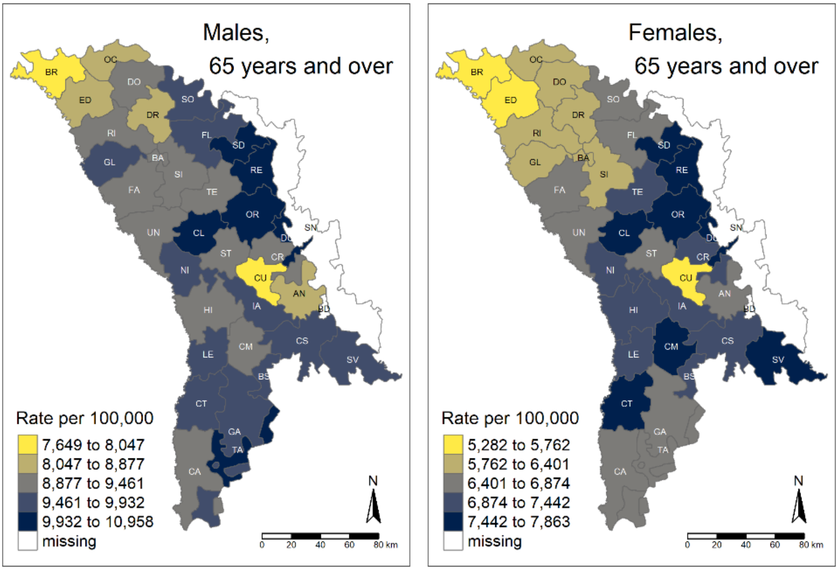

Figure III.8. **Regional pattern of standardised death rates at age 65 years and over, all causes, by sex (per 100,000)**

Source: author's calculations based on NAPH and NBS data

D. Decomposition of interregional differences in life expectancy by age

It is important to understand how the interregional differences in life expectancy at birth presented in the preceding section are influenced by differences in mortality by age. In other words, we want to identify the most vulnerable age groups where high mortality is responsible for low life expectancy in the lagging regions and, on the contrary, those age groups where low mortality explain high life expectancy in the leading districts. To do this, the difference in life expectancy at birth between the Republic of Moldova and each district is decomposed by age *(Fig. III.9)*. The main age groups used in the analysis are as follows: less than one year, 1-19 years, 20-44 years (young adults), 45-64 years (mature adults) and 65 years and over (older adults or the elderly). The corresponding detailed data can be found in *Annexe 3*.

As interregional differences in life expectancy at birth are more pronounced for women than for men, we start with an analysis of the former. The difference in e_0 between the municipality of Chisinau and the Republic of Moldova is 3.1 years among females. Lower mortality among older women in Chisinau than at the national level contributes to this gain of 1.3 years or 44%. Next, the lower mortality rates of the "20-44" and "45-64" age groups add 0.4 and 0.9 years respectively, or 14% and 29%. Finally, the contributions of the "less than one year" and "1-19 years" age groups are very low and together comprise 0.4 years or 12%. Thus, the higher life expectancy of women in Chisinau relative to the national level is largely explained by lower mortality among older and mature adults. Those two groups account for 73% of the overall gap between Chisinau and the Republic of Moldova. Among females, a similar situation can be observed for the other two leading districts Briceni and Edinet. The impact of lower female mortality among mature adults and the elderly account for more than 80% of the difference between female life expectancy at birth in these districts and the national average. However, although life expectancy at birth is defined as "very high" in Briceni and "high" in Edinet, the impact of old-age mortality in these two leading districts is somewhat lower than in the municipality of Chisinau. At the same time, the influence of lower mortality in mature adult females is more important. Among females from other leading northern districts (Riscani, Drochia, Donduseni, Ocnita) the picture looks the same.

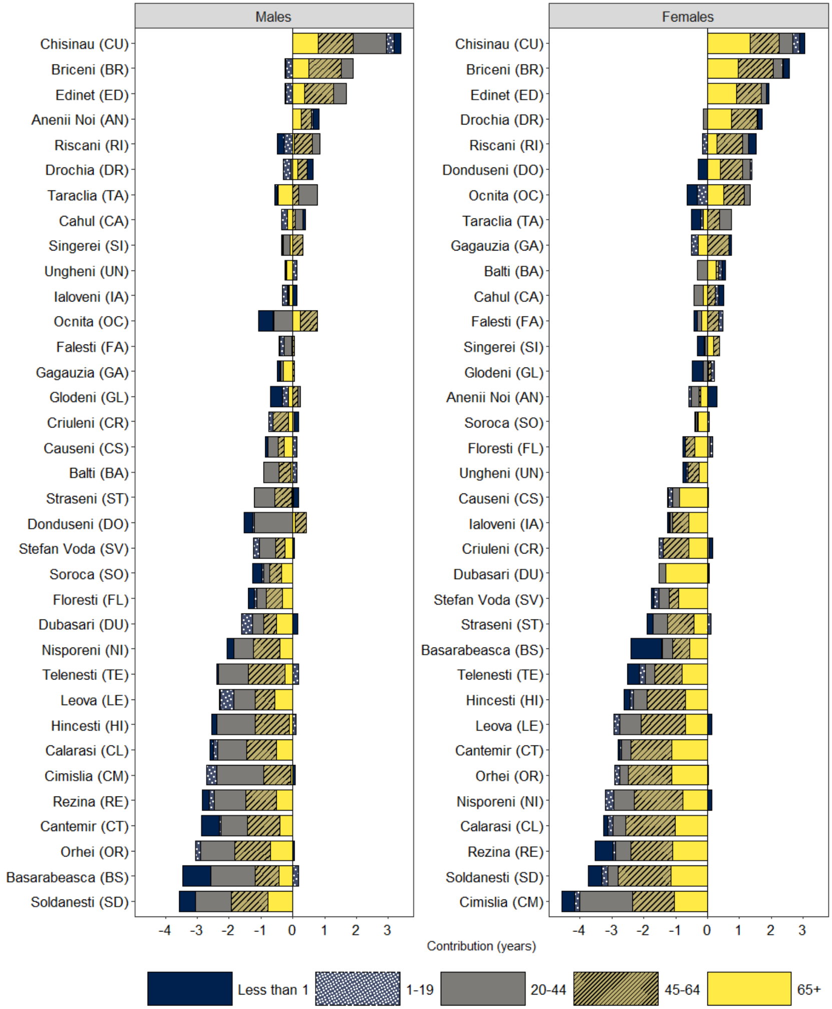

Figure III.9. **Contributions of age-specific mortality to differences in life expectancy at birth between the Republic of Moldova and its 35 administrative units, by sex**

Source: author's calculations based on NAPH and NBS data

The leading districts benefit from higher life expectancy in females than the national average, mainly due to better health among mature and older adult females, even though in younger age groups, the situation is the same as nationally, if not worse. The opposite situation as regards the health of the female population is found in the other pole where the most lagging districts are located. Here, the lion's share of female life expectancy losses is attributed to higher mortality in the adult population aged 45 to 64 and 65 and over. For example, in Soldanesti or Rezina, where female life expectancy is 3.7 and 3.5 years below the corresponding national indicator, respectively, over 70% of these losses are due to higher death rates in these two age groups. Among the districts lagging behind, Cimislia appears as an exception for the female population. In all other lagging districts, the contribution of higher mortality rates among young adult women aged 20-44 years has usually been of minor importance (the mean is -0.3). However, in the case of Cimislia, which has the highest losses of female life expectancy (-4.6 years), the impact of high mortality among young adults (-1.7 years) is even larger than among mature adults (-1.3 years) or the elderly (-1.1 years). Finally, districts with "moderate" female life expectancy at birth (some northern districts adjacent to the centre, the southernmost districts and Anenii Noi), have near-zero gains/losses. Here, mortality contributions in different age groups have different signs (+/-) and are counterbalanced. For example, in Anenii Noi, which is the first-order neighbour of the municipality of Chisinau, the positive contribution is registered only for infant mortality (0.3 years), while other age groups are a negative contributor to the overall difference. (-0.3 years).

In men, the impact of mortality by age on interregional differences has some important features. First, the number of districts with higher life expectancy at birth relative to the national level is much lower among males than among females (8 vs 13). Second, the impact of mortality among older adults on interregional differences is much smaller for men than for women. Third, differences in mortality among young adults have a greater influence on life expectancy gains or losses among men compared to women. Life in the country's capital increases male life expectancy at birth by 3.4 years compared with the country-wide average. These gains are primarily attributed to a lower risk of death among persons aged 45 to 64 years (1.1 years), 20 to 44 years (1.0 years) and 65 years and older (0.8 years). In the other two leading districts Briceni and Edinet, where male life expectancy at birth is categorized as “high”, the contribution of mortality in young adulthood is more modest than in the capital. In the most lagging districts, mortality rates above the national average among young and mature adult men account for the largest proportion of losses. For example, males in the Hincesti district, which is part of the red belt of high mortality, lose 2.2 of 2.4 years due to higher mortality in these two age groups.

2. Regional cause-specific mortality patterns

This section focuses on the analysis of interregional differences in life expectancy by cause of death. It is important to understand which causes of death are responsible for the cross-sectional differentiation of mortality in the country. *Table III.1* lists the causes of death used in our analysis, along with the corresponding ICD-10 codes.

The shortlist includes seven major groups of causes of death, while the extended list also includes more detailed conditions for certain major groups. Ill-defined and unspecified causes of death (R00-R99 under-ICD-10 ICD-10) that account for less than 1% of total mortality for the study period were redistributed proportionally among all other causes of death. First, we analyse the contributions of seven groups of causes of death to the differences in life expectancy at birth between Moldova and each of its administrative units. After that, the interregional differentiation of mortality by age and cause is examined between the municipality of Chisinau and the group of the most backward districts. Finally, we look at the geographical patterns of standardised death rates by cause of death with the help of thematic maps. For the major groups of causes of death, the analysis is made by sex. More detailed ICD-10 items on the extended list are considered for both sexes. The impact of seven groups of causes of death on the differences in life expectancy at birth between the Republic of Moldova and its 35 administrative units is presented in *Annexe 4. Annexe 5* presents the contributions of mortality by age and by cause to the difference in life expectancy at birth between the municipality of Chisinau and the group of districts most lagging behind. Finally, *Annexe 6* contains standardised mortality rates by sex, the main causes of death and administrative units.

Table III.1. **List of main groups of causes of death, including detailed causes, and their corresponding codes under the 10th revision of the International Classification of Diseases and Causes of Death**

Causes of death	**ICD-10**
1. Infectious diseases	A00-B99
2. Neoplasms, *including:*	C00-D48
Cancer of digestive organs	*C00-C26*
Cancer of respiratory organs	*C30-C39*
Breast cancer	*C50*
Cancer of the genitourinary organs	*C51-C68*
Other neoplasms	*C40-C49, C69-D48*
3. Diseases of the circulatory system, *including:*	I00-I99, G45
Heart diseases	*I00-I52*
Cerebrovascular and other circulatory diseases	*I60-I99*
4. Diseases of the respiratory system	J00-J98, U04
5. Diseases of the digestive system, *including:*	K00-K93
Liver diseases	*K70-K77*
Other digestive diseases	*K00-K69, K78-K93*
6. External causes, *including:*	V01-Y98
Transport accidents	*V01-V99*
Suicide, homicide, and injury undetermined whether accidentally or purposely inflicted	*X60-Y34*
Other external causes	*W00-X59, Y35-Y98*
7. Other diseases and causes of death	D50-G44, G47-H95, L00-Q99
All causes	*A00-Y98*

Source: (WHO, 2021)

A. Decomposition of interregional differences in life expectancy by causes of death

Figure III.10 shows the effect of mortality by the seven major groups of causes of death on the differences in life expectancy at birth between the Republic of Moldova and its 35 administrative units. As in the previous section, the analysis of interregional differentiation of mortality by cause of death will be given firstly for women and then for men. Moldovan women from the municipality of Chisinau live 3.1 years longer than the national average, largely due to the lower risk of dying from diseases of the circulatory system with a 55% contribution. The situation similar to the capital is and for the district of Briceni where female life expectancy is also defined as "very high". In this district, the positive impact of cardiovascular diseases is 50% (1.3 years of 2.6 years). In other leading northern districts, cardiovascular mortality among women is significantly lower than national values only in Edinet, Drochia and the municipality of Balti. In addition, in the municipality of Chisinau and the leading northern districts, low mortality from diseases of the digestive system is another important cause of the higher life expectancy in women. The positive impact of this disease varies from 0.4 years in Drochia to 0.8 years in Donduseni from total gains of 1.6 and 1.1 years, respectively.

The health of the female population in the most backward districts, most of which form a red belt of high mortality, is significantly impacted by two major causes of death: diseases of the circulatory system and diseases of the digestive system. For example, in Calarasi or Orhei women, high death rates from diseases of the circulatory system (-1.3 years) and diseases of the digestive system (-1.2 years) account for 80% of losses compared with the national average.

Male life expectancy differentiation in the Republic of Moldova is largely due to differences in mortality from three main causes of death: diseases of the circulatory system, external causes of death, and diseases of the digestive system. In contrast to women, in men, the positive/negative impact of diseases of the circulatory system is less obvious across the leading/lagging districts. On the contrary, the influence of external causes of death comes to the forefront in certain districts. Thus, about 60% of the gains in male life expectancy in the municipality of Chisinau compared to the national level are due to external causes of death and diseases of the circulatory system: respectively, 1.1 years and 0.8 years of 3.4 years. In the two northern districts, Briceni and Edinet, males live longer than the national average, largely as a result of improved cardiovascular mortality control. It is worth noting that the positive contribution of external causes of death is only recorded in the country's capital, while in other districts, even with a “high” life expectancy at birth, it is near zero or negative. The most significant negative contributions due to external causes considered to be directly related to the acute effects of alcoholism among men are recorded in Cantemir, Leova and Cimislia, the most lagging districts from the southern region, as well as in the Stefan Voda district. The negative influence of diseases of the digestive system that are mainly presented by liver cirrhosis and more associated with the chronic consequences of alcoholism is more evident in the central lagging districts such as Hincesti, Calarasi and Orhei. These two groups of causes of death related to acute or chronic excessive alcohol consumption may account for the lion’s share of male life expectancy losses in some lagging districts. For example, in Hincesti, the combined effect of diseases of the digestive system and external causes reduces male life expectancy by 1.7 years or 68%.

The impact of other major groups of causes of death, including neoplasms, which occupy the second place in the mortality structure by cause of death nationally, is of minor importance. The municipality of Balti appears to be the only exception with regard to neoplasms, the unusually large negative contribution of which needs to be examined further.

In this way, when it comes to the main causes of death, the geographical diversity of mortality patterns is driven by three main causes of death: diseases of the circulatory system, diseases of the digestive system and external causes of death in males. In women, the impact of cardiovascular mortality is greater than in men, while differentiation in men’s life expectancy is more sensitive to external causes of death. The influence of diseases of the digestive system, mainly represented by cirrhosis of the liver and associated with the chronic consequences of alcoholism, is of particular importance for both men and women.

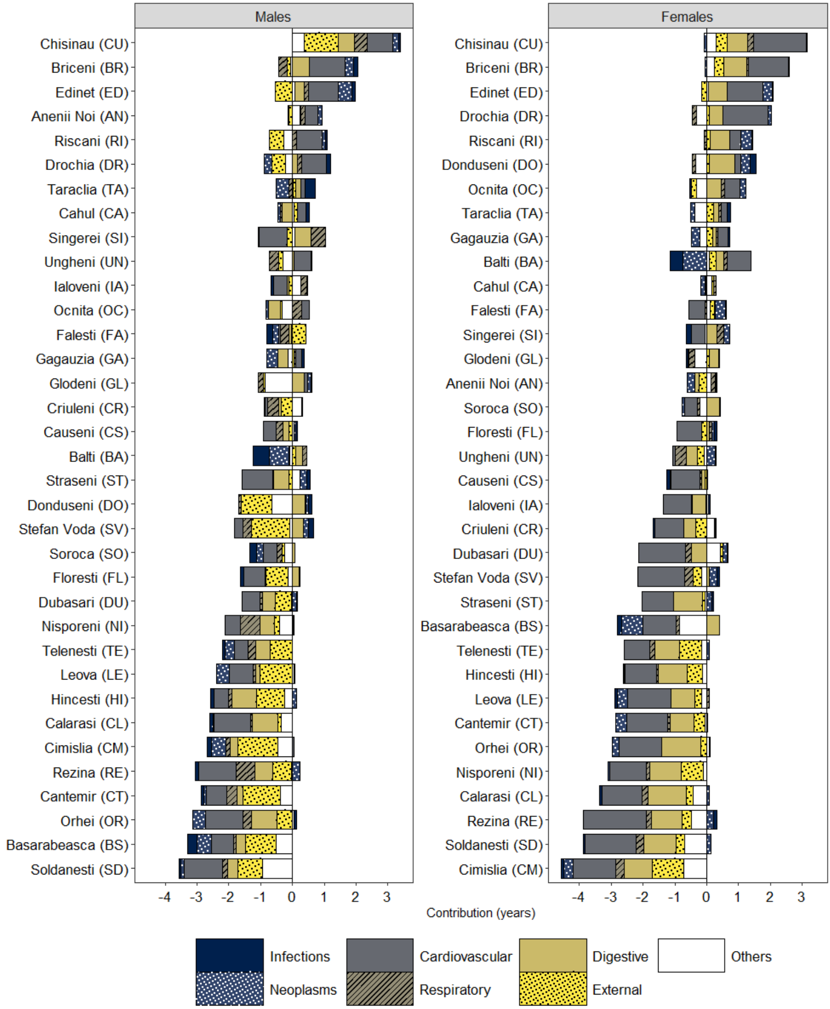

Figure III.10. **Contributions of cause-specific mortality to differences in life expectancy at birth between the Republic of Moldova and its 35 administrative units, by sex**

Source: author's calculations based on NAPH and NBS data

B. Decomposition of differences in life expectancy between the most lagging and leading districts

To examine the combined effect of mortality by age and cause on differentiation of life expectancy, we will decompose the difference in life expectancy at birth between two population subgroups presented by the most leading districts on the one hand and the most lagging districts on the other. The municipality of Chisinau was selected as the most leading district where 24% of females and 23% of males live (e_0 is 68.6 years in males and 76.7 years in females). As the belt of high mortality is more extensive for life expectancy at age 25 or 45 than at birth (Section II.1B), the selection of the worst-lagging districts is based on e_{25}. In the eleven selected districts with the lowest male life expectancy at the age of 25 (less than 40.0 years), 21% of the male population lives. 16% of the female population lives in nine districts with the lowest life expectancy at the age of 25 (less than 47.5 years). Life expectancy at birth recorded in the selected lagging districts is 62.5 years for men and 70.4 years for women. *Table III.2* and *Figure III.11* show the contribution by age groups and seven main causes of death to the difference in life expectancy at birth between the most lagging districts and the municipality of Chisinau. In *Table III.2,* to simplify, the data are grouped into four major age groups: children and adolescents (0-19 years), young adults (20-44 years), mature adults (45-64 years) and older adults (65 years).

The total difference in life expectancy at birth between two extreme sub-groups of the population amounts to -6.1 years for men and -6.3 years for women. The largest losses occur among mature adults (both sexes) and older adult females. High mortality due to diseases of the circulatory system in the most backward districts reduces life expectancy at birth by 1.6 years among men and 3.0 years among women. Among men, external causes of death (-1.7 years) and digestive system diseases (-1.1 years) are the other two main causes of death that affect the health of the population. Among women, diseases of the digestive system are the second largest group of causes of death that substantially increase the gap between the lagging districts and Chisinau. Interestingly, this category of causes of death in women has the same negative impact as external causes of death in men (-1.7 years).

Table III.2. **Contributions of mortality by main age groups and causes of death to the difference in life expectancy at birth between the most lagging districts and the municipality of Chisinau, by sex**

Age	Infec-tions	Neo-plasms	Circu-latory system	Respira-tory system	Digestive system	External causes	Other	All causes
MALES								
0-19	-0.03	-0.02	0.00	-0.10	-0.02	-0.25	-0.25	-0.68
20-44	-0.09	-0.18	-0.21	-0.13	-0.30	-0.97	-0.19	-2.07
45-64	-0.02	-0.19	-0.38	-0.30	-0.58	-0.46	-0.19	-2.11
65+	0.01	0.08	-0.98	-0.10	-0.15	-0.05	0.00	-1.20
Total	*-0.13*	*-0.31*	*-1.57*	*-0.63*	*-1.06*	*-1.73*	*-0.63*	*-6.07*
FEMALES								
0-19	-0.01	-0.01	0.01	-0.09	-0.02	-0.21	-0.29	-0.64
20-44	-0.01	-0.08	-0.16	-0.02	-0.32	-0.26	-0.11	-0.97
45-64	-0.02	-0.15	-0.78	-0.08	-1.01	-0.19	-0.10	-2.33
65+	0.01	0.21	-2.08	-0.08	-0.32	-0.04	-0.02	-2.33
Total	*-0.03*	*-0.04*	*-3.01*	*-0.28*	*-1.67*	*-0.71*	*-0.52*	*-6.26*

Source: author's calculations based on NAPH and NBS data

Note 1: the sum by columns and by rows may differ due to rounding

Note 2: the most lagging districts have life expectancy at the age of 25 under 40.0 years in males (11 districts) and 47.5 years in females (9 districts)

The contribution of mortality among children and adolescents (0-19 years) is close to -0.6 years with the highest impact of external causes among boys and “other causes of death” for both sexes mostly represented by perinatal causes of death. Young men (20-44 years) in the most lagging districts lose 2.1 years (34%) of life expectancy at birth compared to their Chisinau counterparts. These losses result largely from external causes of death (-0.97 years). For young women, the losses are much less pronounced (-0.97 years or 15%), but unlike men, they are mainly due to digestive diseases and external causes of death. Among men, another most affected age group is mature adults (40 to 64 years). The higher level of mortality relative to the capital in these age groups reduces the life expectancy of men in the lagging districts by 2.1 years or 34%.

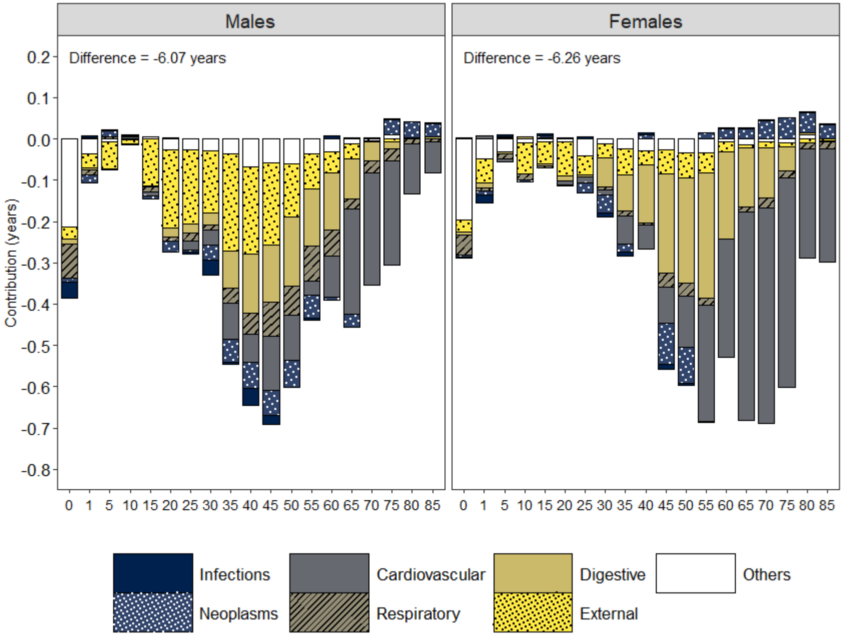

Figure III.11. **Contributions of mortality by age and cause of death to differences in life expectancy at birth between the most lagging districts and the municipality of Chisinau, by sex**

Source: author's calculations based on NAPH and NBS data
Note: see Note 2 for Table III.2

Although negative contributions are reported for all causes of death in mature adult men, external causes of death and diseases of the digestive system account for over half of all losses. Moldovan women aged 45 to 64 from the most lagging districts lose, on average, 2.3 years of life expectancy compared to women from Chisinau. The negative effect of diseases of the digestive system in mature adult females (-1.0 years or 43%) is even greater than that of diseases of the circulatory system (-0.78 years or 33%). At an older age, diseases of the circulatory system play a leading role for both sexes. For females, the contribution of this age group and cause is -2.1 years, which represents 90% of total losses at an older age (-2.1 years) and 34% of total losses across all ages (-6.3 years).

Thus, with regard to the major groups of causes of death, the differentiation of life expectancy at birth in the Republic of Moldova is widely explained by diseases of the circulatory system among the elderly, diseases of the digestive system among mature adults and external causes of death among young and mature adult males. Mortality from diseases of the digestive system has a greater influence on life expectancy in women compared to men. Other causes of death have a much smaller effect on regional mortality disparities.

C. Standardised mortality rates by causes of death

Mapping of standardised mortality rates by cause of death provides a better insight into regional differentiation in mortality. Firstly, we will analyse thematic maps of standardised mortality rates for circulatory diseases, digestive diseases and external causes of death which, as shown above, have the greatest impact on interregional mortality differentiation. Secondly, attention will be given to causes that contribute to a lesser degree such as neoplasms, infectious diseases, respiratory diseases and other causes. Finally, an additional set of maps will be presented for some detailed causes of death for both sexes, as outlined in Table III.1. Taking into account a relatively low number of deaths, death rates have been standardised using an indirect method. To produce the thematic maps, we used the Jenks' optimisation method or the method of natural breaks, previously used for life expectancy (Sections III.1A and III.1B) and age-specific death rate maps (Section III.1C). This method identifies five categories of mortality rates, which vary between "very low" and "very high". For each cause of death, we examined the shape of the distribution of mortality rates, including the coefficient of skewness and presented the most interesting results. Thematic maps for the seven main causes of death include the frequency distribution of death rates.

a) *Diseases of the circulatory system*

Diseases of the circulatory system dominate the overall mortality pattern at the national level, for both men (54%) and women (64%). *Figure III.12* shows the standardised mortality rate maps for diseases of the circulatory system. The shape of the distribution of this category of diseases in males tends to be skewed to the left (skewness= -0.4; mean=1050; median=1070), which means that the number of districts with a higher-than-average mortality rate prevails (20 of 35 administrative units). In men, the lowest mortality rate from diseases of the circulatory system is recorded in the northern district of Briceni (790 per 100,000), while the highest is in the central district of Orhei (1,259 per 100,000). In females, the municipality of Chisinau (519 per 100,000) and the central district of Rezina (913 per 100,000) are positioned in the extreme poles.

The districts with the highest rates of cardiovascular mortality in the centre are Soldanesti, Rezina, Orhei, Dubasari (both sexes) and Calarasi (women). The remaining central districts have high to moderate cardiovascular mortality. The exceptions are the municipality of Chisinau where “very low” mortality is registered and the districts of Anenii Noi and Ungheni (among men) where mortality is “low”. In the more southern districts (Cahul, Taraclia and Gagauzia), the situation is better than in the centre. The exceptions in the south are Cantemir, Leova, Cimislia and Stefan Voda, whose female citizens have a “very high” cardiovascular mortality rate. Finally, in the north of the country, the situation in terms of cardiovascular mortality is far more favourable than in other geographical regions. In addition, the northern districts of Briceni, Drochia (both sexes), Edinet (males) and the municipality of Balti (females) have “very low” mortality rates from circulatory diseases. In other northern districts, cardiovascular mortality varies between “low” and “high”; however, there are no districts with “very high” mortality rates.

Figure III.13 illustrates the two main components of diseases of the circulatory system: heart diseases and cerebrovascular diseases. Given that the “other circulatory diseases” group has a very minor impact on overall cardiovascular mortality at the national level (its proportion hardly exceeds 5%), this category was combined with the “cerebrovascular diseases” group. A relatively small proportion of this residual group is also characteristic of the cardiovascular mortality structure in other ex-Soviet republics such as Ukraine or Russia and is generally explained by poor differential diagnostics of cardiovascular diseases (Meslé and Vallin, 2012).

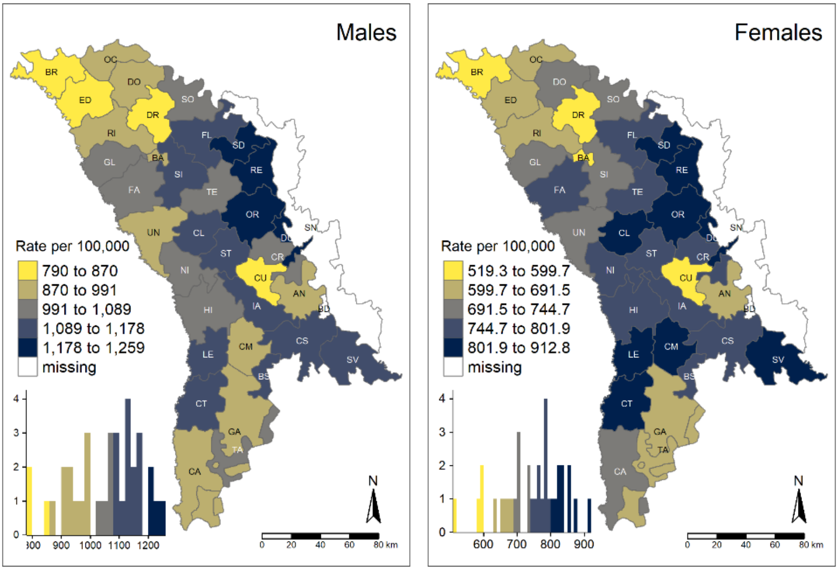

Figure III.12. **Regional patterns of standardised mortality rates from diseases of the circulatory system, by sex**

Source: author’s calculations based on NAPH and NBS data
Note: Jenks’ optimization method of classification was used to produce these and the subsequent maps of this section

The situation regarding *heart* and *cerebrovascular diseases* appears to be particularly interesting for the central and southern districts. Thus, the most backward districts in the centre have “very high” death rates from diseases of the circulatory system mainly due to heart diseases, but not to cerebrovascular diseases. For example, in the districts of Rezina and Orhei, mortality rates from “heart diseases” are “very high” (770.8 to 893.6), while these are “very low” (122.4 to 165.6) from “cerebro-vascular diseases”. At the same time, in certain southern districts (Cantemir, Cahul, Gagauzia, Taraclia), there is a low risk of death from heart diseases and, on the contrary, a high risk of death from cerebrovascular diseases. The traditional mortality gradient between the advanced north and the backward centre appears to be valid only for heart disease. Concerning cerebrovascular diseases, we can speak of the differentiation between the centre (low mortality) and the south (high mortality).

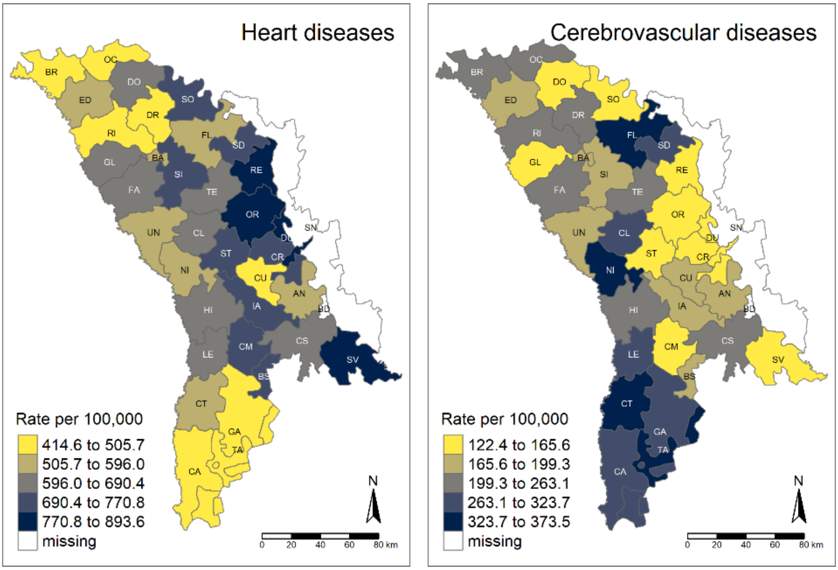

Figure III.13. **Regional patterns of standardised mortality rates from heart diseases and cerebrovascular diseases, both sexes**

Source: author’s calculations based on NAPH and NBS data

b) *Diseases of the digestive system*

Even though digestive system diseases account for about 10% of all deaths nationally for both sexes, these diseases, as well as diseases of the circulatory system and external causes of death in males, have a very important impact on the differentiation of all-cause mortality in the country, especially among females (Section III.2A). *Figure III.14* shows the regional mortality pattern for this group of causes of death. For both sexes, the highest mortality values are recorded in the central district of Orhei for both men (249.6 per 100,000) and women (206.6 per 100,000). The lowest mortality rate is recorded for both sexes in the northern district of Donduseni. Here, it is lower than that in Orhei 2.5 times in men and more than four times in women.

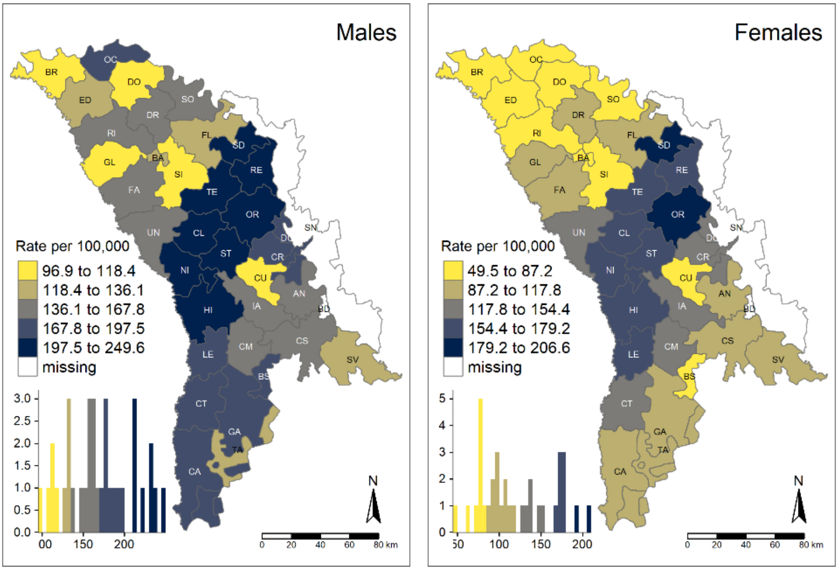

Figure III.14 **Regional patterns of standardised mortality rates from diseases of the digestive system, by sex**

Source: author's calculations based on NAPH and NBS data

The division between north and centre is particularly impressive for women whose mortality rates for digestive diseases in the northern region are presented solely by "very low" or "low" values. It is easy to observe that the districts with "very high" and "high" mortality rates from digestive diseases fall within the red belt of high mortality described earlier for life expectancy map. The municipality of Chisinau is the only administrative unit of the centre unaffected by the burden of digestive illnesses. Since liver cirrhosis accounts for almost 90% of deaths caused by digestive tract diseases, the thematic map of this specific cause of death corresponds entirely to the whole group and is not presented.

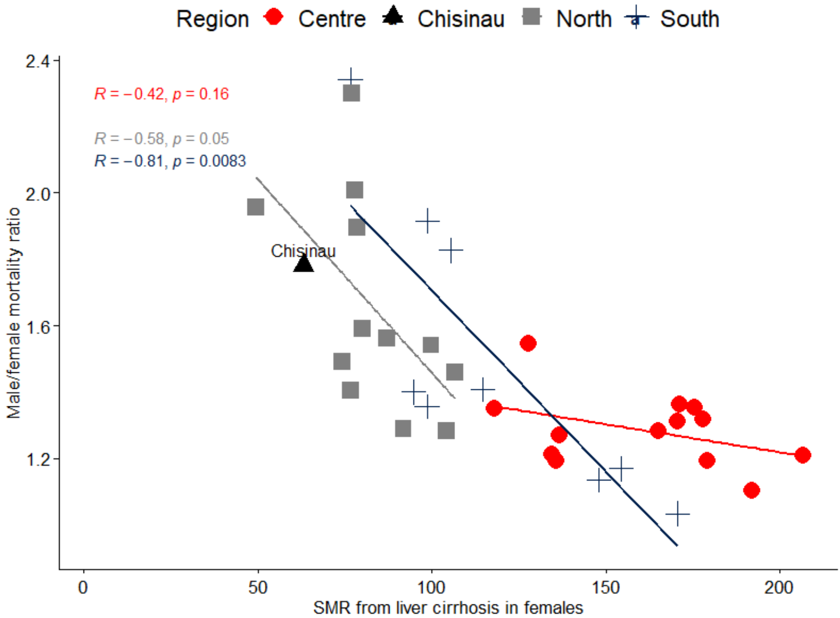

Figure III.15. **Correlation between male/female mortality ratio and standardised mortality rate (SMR) in females for liver cirrhosis by three geographical regions**

Source: author's calculations based on NAPH and NBS data

The sex ratio for liver cirrhosis (ratio of standardised death rate in males to standardised death rate in females) varies by geographic region of the country. Thus, in the more favourable regions of the north and south, this indicator is 1.6 and 1.5 respectively, whereas in the municipality of Chisinau, it is 1.7. At the same time, the sex ratio is closer to one (1.3) in the worst affected central districts. In addition, the correlation between the standardised death rate in women and the sex ratio for liver cirrhosis differs across three geographic regions. For example, in the north and south, where liver cirrhosis mortality rates are relatively low, this correlation is negative and statistically significant. For the northern region, the correlation coefficient is -0.58 ($p<0.05$), and for the southern region, it is -0.81 ($p<0.01$) *(Fig. III.15)*. In other words, in the more favourable districts, the sex ratio decreases in parallel with the increase in female mortality due to liver cirrhosis. This is quite natural and for most other causes of death due to the higher risk of dying in males than in females. The absence of this correlation in central districts suggests that liver cirrhosis mortality is more homogeneous in the population without significant sex differences.

The lack of sex differentiation for liver cirrhosis in central districts, mainly in those falling into the red belt of high mortality, allows us to conclude that here men and women are similarly susceptible to the influence of risk factors causing liver cirrhosis, first and foremost to excessive alcohol consumption. The National Health Survey recently conducted in Moldova highlights the predominance of unregistered alcohol consumption mainly presented by homemade wine without any significant gender differentiation (WHO, 2014). The findings concerning liver cirrhosis at the regional level confirm our hypothesis forwarded earlier at the national level that the hazardous Mediterranean culture of wine drinking in the Republic of Moldova has the same negative impact on the health of men and women (Penina, 2017). Based on the regional mortality analysis, we can further refine this hypothesis and suggest that dangerous wine consumption patterns are more popular in the central districts of the country than in the northern or southern districts.

c) External causes of death

On a national level, external causes of death that include suicide, homicide, transport accidents and other violent causes account for 10% of deaths in males and 4% in females. In men, external causes, as well as diseases of the circulatory system and diseases of the digestive system play a key role in the interregional differentiation of mortality. In females, however, this group of causes of death, as shown above, is less important than in males. The geographical pattern of mortality from external causes of death differs from that of diseases of the circulatory system or diseases of the digestive system *(Fig. III.16)*. First of all, the "very low" death rate among men (113.6 to 134.1) and women (27.6 to 33.7) is recorded only in the municipality of Chisinau, the districts of Falesti (for both sexes), Gagauzia and Taraclia (for females). Second, in the northern districts, which generally have better population health outcomes for diseases of the circulatory system or diseases of the digestive system, the situation for men is similar to that seen in most central districts; although for women the gradient between the north and centre remains. Lastly, the districts with "very high" mortality from external causes of death for men and women refer to the southern region (Cantemir, Cimislia).

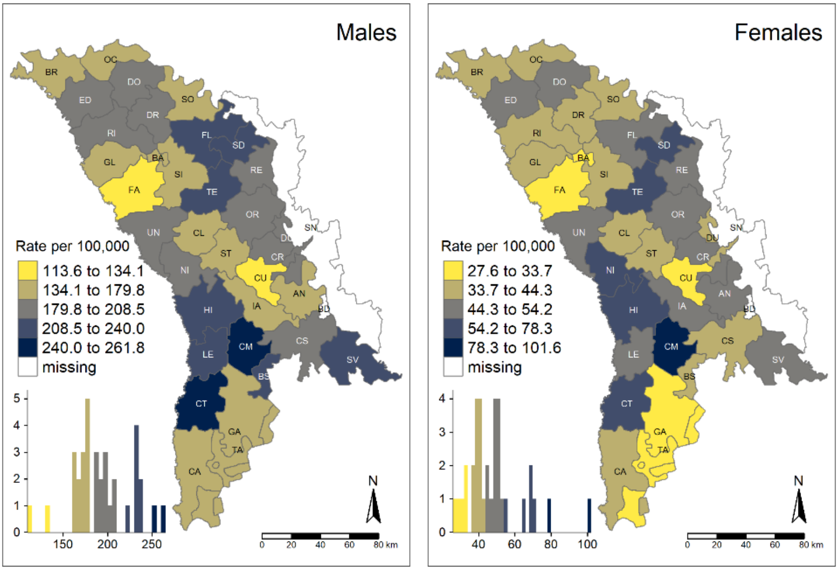

Figure III.16. **Regional patterns of standardised mortality rates from external causes of death, by sex**

Source: author's calculations based on NAPH and NBS data

The sex ratio reported for external causes of death is the highest among all other major groups of causes of death and ranges between 2.6 in the central district of Nisporeni and 6.6 in the southern district of Taraclia.

Differences in sex ratios between the three geographic regions are less evident for external causes of death compared to diseases of the digestive system. The sex ratio for external mortality is 4.1 in the municipality of Chisinau, 4.7 in the north and south and 3.8 in the centre. For all three geographical regions, the correlation between the male-female ratio and standardised female mortality rate for external causes is negative and statistically significant. This fact indirectly proves once again that the external causes of death associated to a greater extent with the acute consequences of excessive alcohol consumption are much more typical of men's health problems. The case of the Cimislia district, the only administrative unit with the highest female mortality from external causes of death (78.3to 101.6), deserves a little more attention. As discussed above (Sections III.1D and III.2A), this southern district bordering the central region has the lowest life expectancy at birth for women, largely due to higher mortality rates among youth and mature adults. Mature adult females in the Cimislia district have more health problems associated with circulatory diseases and cirrhosis of the liver, while younger females experience higher mortality from external causes of death.

Some specific external causes of death also differ geographically *(Fig. III.17). Transport accidents* which at the national level represent 12% of deaths from external causes have the lowest mortality values (8.5 per 100,000) in the capital of the country. Although transport traffic is very heavy in the municipality of Chisinau, mortality from transport accidents there is twice as low as in other parts of the country.

Another important group of external causes includes *suicides, homicides and injury undetermined whether accidentally or purposely inflicted*, which account for over one-third of deaths due to injury and poisoning nationally. Data for this category of external causes of death are moderately skewed to the right (skewness = 0.7), and 22 of the 35 units have a below-average death rate. Most of these favourable districts are placed in the northern region where the mortality rate (31 per 100,000) is lower than in the centre (39.7 per 100,000) or in the south (43.4 per 100,000) but higher than in the capital (25 per 100,000).

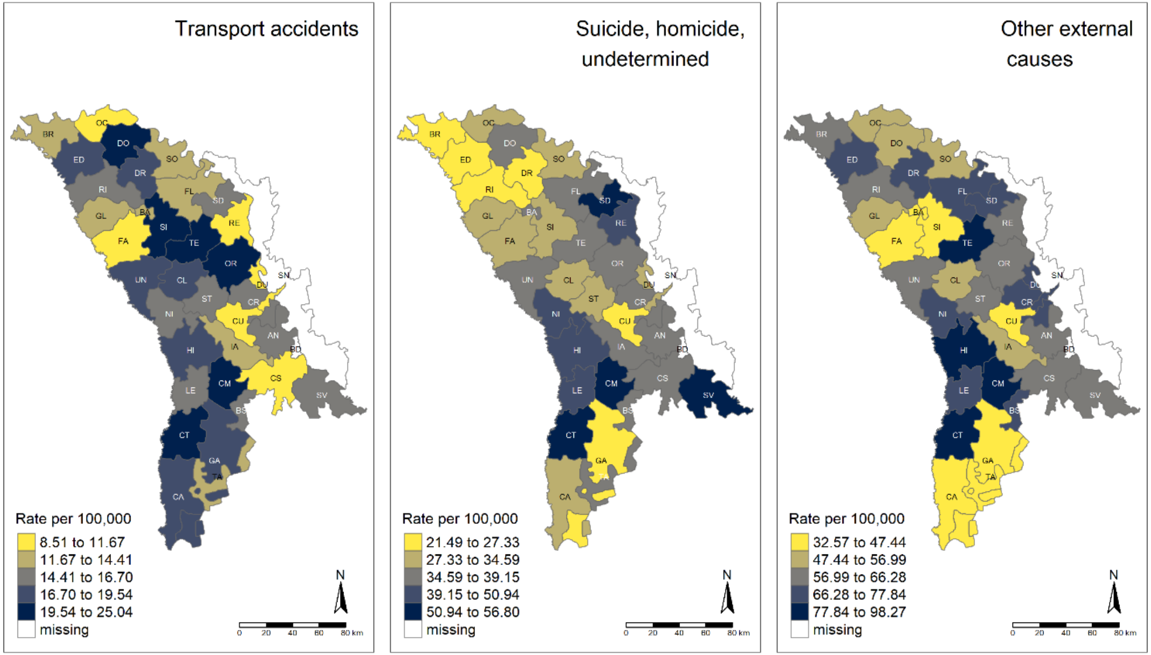

Figure III.17. **Regional patterns of standardised mortality rates from transport accidents, suicide, homicide, injury undetermined whether accidentally or purposely inflicted and other external causes of death, both *sexes***

Source: author's calculations based on NAPH and NBS data

The most problematic districts concerning the “suicide, homicide and undetermined injury” group are Cantemir, Cimislia, Stefan Voda (south) and Soldanesti (centre), i.e., those districts where standardised mortality rates for the entire group of external causes of death are high or the highest.

The *“other external causes”* group covers the remainder of violent deaths and accounts for about half of deaths from injuries and poisonings at the national level. The situation appears particularly alarming for districts located at the border between the central and southern regions (Hincesti, Leova, Cimislia, Cantemir). In the municipality of Chisinau, mortality from this residual group of external causes of death, as for both previous groups, is much lower (32.6 per 100,000) than in the north (57.4 per 100,000) or the centre and south (67 per 100,000).

d) Neoplasms

Although neoplasm mortality ranks second in the overall mortality pattern of both men (15%) and women (13%), its impact on interregional disparities is far less significant than the three groups of causes of death analysed earlier. For neoplasms, the shape of the distribution is moderately skewed to the right in males (median=292; mean=298; skewness=0.8) and highly skewed to the right in females (median=141; mean=149; skewness=1.5). This skewness is mostly explained by the existence of outliers: the municipality of Balti for both sexes and the Basarabeasca district for females *(Fig. III.18)*. In males, the standardised mortality rate from neoplasms in the municipality of Balti (398.9 per 100,000) is 1.6 times higher than that in the district of Edinet (247.4 per 100,000), also located in the north of the country. In females, this relative difference between the maximum value (Balti) and the minimum value (Stefan Voda) is even 1.9 times. Both among men and women, most districts (22 in men and 20 in women) have lower-than-average values.

Among women, the southern districts and adjacent central districts, including the municipality of Chisinau, tend to be more affected by neoplasms than the northern districts and upper centre districts. For men, the cancer mortality picture in the south also appears to be more problematic than in the rest of the country. However, in contrast to women, in males, most central districts, including the capital, have "low" cancer mortality values. It is interesting to note that the most lagging districts in terms of life expectancy have "low" or even "very low" mortality due to neoplasms, the exception being the district of Orhei.

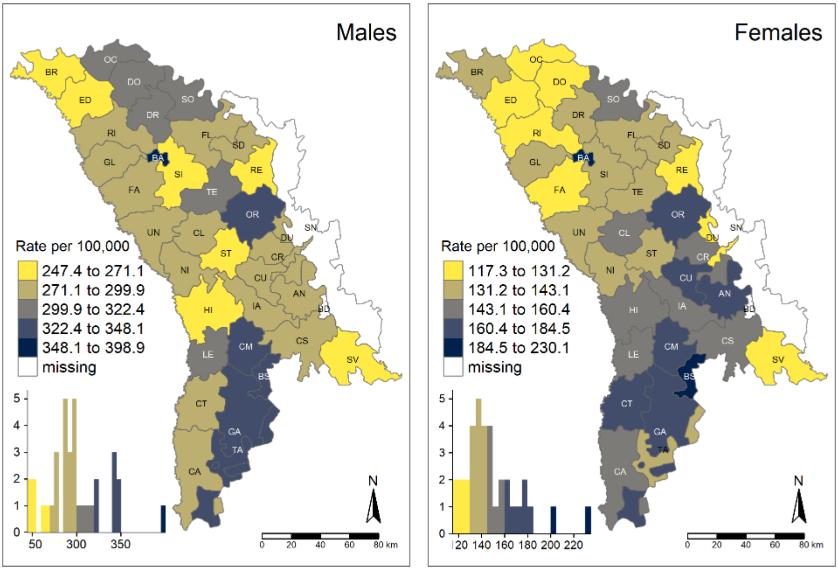

Figure III.18. **Regional patterns of standardised mortality rates from neoplasms, by sex**

Source: author's calculations based on NAPH and NBS data

At the same time, women from the municipality of Chisinau with the highest life expectancy at birth have high neoplasm mortality. The same holds true for the nearby Anenii Noi district. In general, males in the south tend to have a higher risk of dying from neoplasms than males in other geographic regions. Females from the municipality of Chisinau (174 per 100,000) and the southern region (162 per 100,000) are more susceptible to neoplasms than females living in the northern (141 per 100,000) or central (146 per 100,000) regions.

Neoplasms of different locations have specific geographic mortality patterns which should be discussed. Cancer of the digestive system accounts for about 40% of all neoplasms deaths nationally, followed by cancer of the respiratory system (20%) *(Fig. III.19).* For the former, the situation is better in the north and worse in the centre and particularly in the south. For the latter, certain central districts, including the capital, have fewer problems than the north or south. Thus, the standardised mortality rate from *cancer of the digestive system* is higher in the southern region (100.6 per 100,000) compared to the northern region (83 per 100,000), while the central region (89.8 per 100,000) and the municipality of Chisinau (93.5 per 100,000) occupy a middle position among them. At the same time, mortality rates from *cancer of the respiratory system* have very similar values in three geographical regions (from 40 to 43 per 100,000), and they are all above those of the municipality of Chisinau. The exception is the municipality of Balti and the Telenesti district, which are the only two administrative units with "very high" mortality from respiratory cancer.

The low geographic diversity of respiratory cancer may be explained by the absence of regional differences in smoking, which is the major risk factor for lung cancer. At the same time, existing regional differences concerning digestive neoplasms can be attributed to regional differences in food preparation and eating habits. Thus, lower levels in mortality from stomach cancer are positively correlated with the increased food variety in a diet, while higher mortality from intestine cancer is associated with the increased consumption of food and animal fat (Meslé, 1983). The interplay of these factors may explain the regional disparities for cancer of the digestive system. The Municipality of Balti, as in the case of respiratory cancer, is experiencing severe mortality problems from digestive cancer.

Breast cancer and *cancer of the genitourinary system* represent respectively 8% and 15% of all neoplasms deaths. The differentiation of mortality between the north and the south, described earlier for the whole class of neoplasms, is noticeable and for these two pathologies

(Fig.III.20). The municipality of Balti again records "very high" mortality rates for both breast cancer (21.6 to 28.7) and cancer of the genitourinary system (38.9 to 46.2). Finally, the residual group of *"other neoplasms"* that make up 14% of the overall neoplasm mortality in the republic have characteristics similar to the two previous cases. As shown in Section III.2A, in the municipality of Balti, neoplasms have a particularly strong negative impact on the difference in life expectancy at birth between the average national level and the municipal level for both sexes. Mortality from malignant neoplasms of various locations, including the digestive and respiratory system and breast cancer is recorded as "very high" in this northern municipality, which requires appropriate public health interventions.

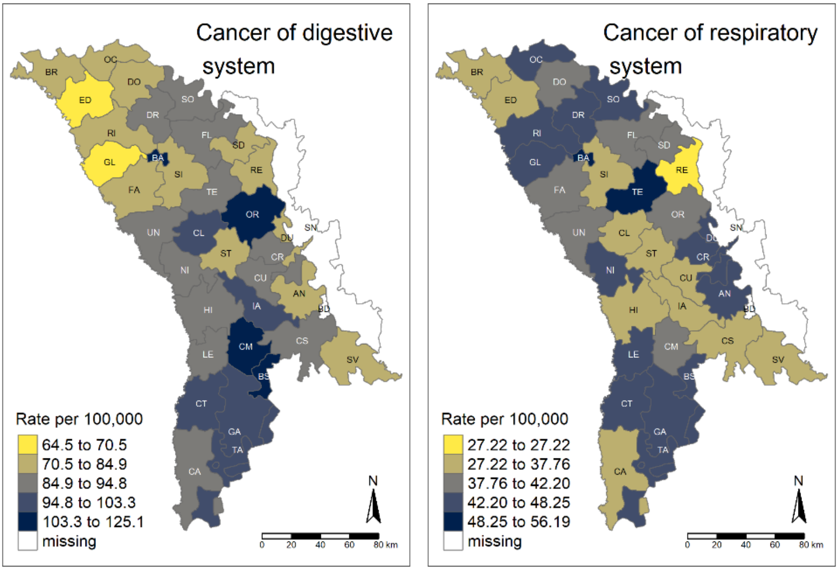

Figure III.19. **Regional patterns of standardised mortality rates from cancer of the digestive system and cancer of the respiratory system, both sexes**

Source: author's calculations based on NAPH and NBS data

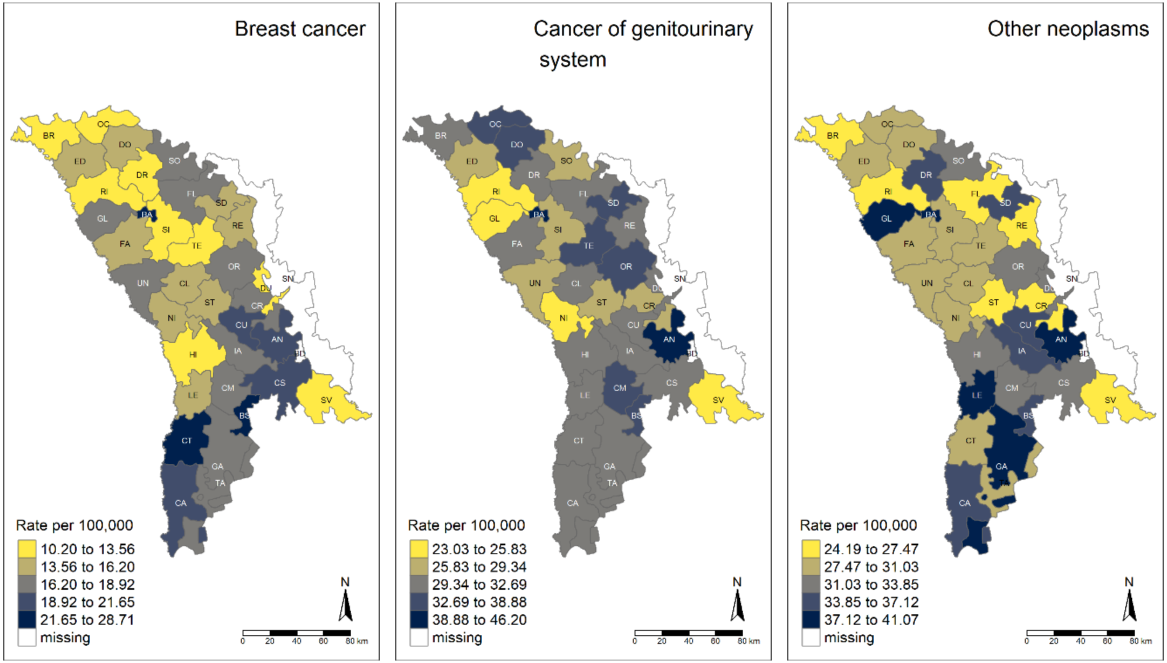

Figure III.20. **Regional patterns of standardised mortality rates from breast cancer, cancer of the genitourinary system and other neoplasms, both sexes**

Source: author's calculations based on NAPH and NBS data

e) Diseases of the respiratory system

Mortality from respiratory diseases is higher in the north and lower in the centre and south, and this is especially evident among females *(Fig. III.21)*. This gradient is most probably due to different climatic conditions.

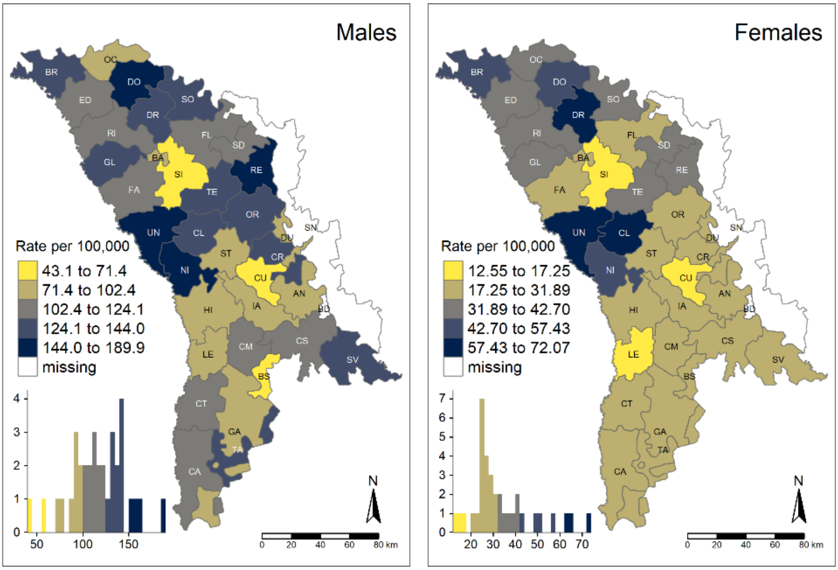

Figure III.21. **Regional patterns of standardised mortality rates from diseases of the respiratory system, by sex**

Source: author's calculations based on NAPH and NBS data

f) Infectious diseases

Infectious diseases that account for less than 2% of total mortality in men and less than 1% in women during the study period have a different regional pattern by sex. Among males, most central districts have "moderate" (23-28.7 per 100,000) or "high" standardised mortality rates (28.7-39.5 per 100,000), except for a few districts. Next, the northern districts closer to the centre, particularly the municipality of Balti, experience more severe infectious disease problems, which are mainly represented by tuberculosis and AIDS at the national level. At the same time, in the more remote districts of the north and south, the situation is more favourable. In females, the distribution of standardised mortality rates from infectious diseases is highly skewed to the right (skewness=2.5) due to the presence of an outlier, the municipality of Balti, which is the only unit with "very high" mortality rates.

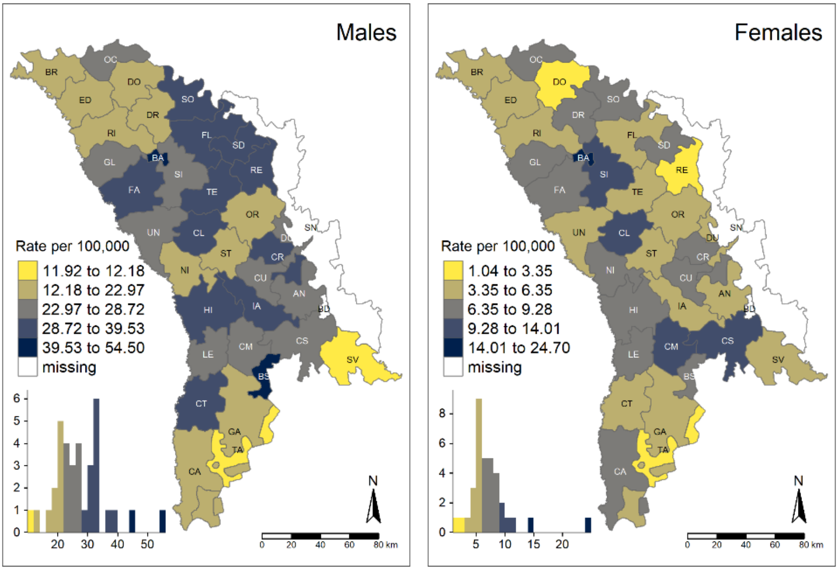

Figure III.22. **Regional patterns of standardised mortality rates from infectious diseases, by sex**

Source: author's calculations based on NAPH and NBS data

g) Other diseases

The residual group of causes of death referred to as "other diseases" represents around 4% of total mortality. This type of mortality has "very low" values among men and women in the country's capital and neighbouring districts. Then, among females, mortality is also systematically lower in the north than in the south, while among males, the more remote northern (Briceni, Ocnita, Edinet) or southern (Cahul, Gagauzia) districts are in a more advantageous position.

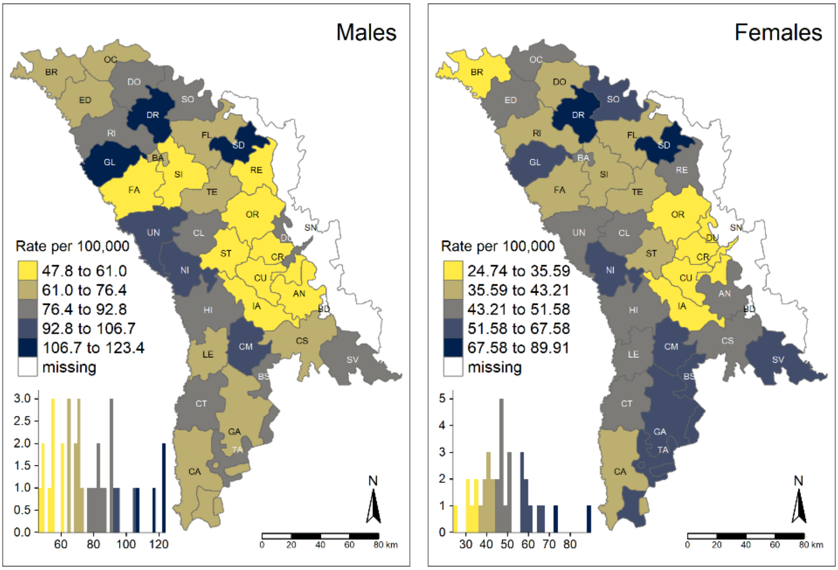

Figure III.23. **Regional patterns of standardised mortality rates from other causes of death, by sex**

Source: author's calculations based on NAPH and NBS data

Key messages

1. There are interregional differences in overall mortality between the municipality of Chisinau and the northern districts, where life expectancy at birth is high, and the central districts with low values.
2. In the most backward districts of the centre, loss of life expectancy is mainly recorded for older women, young men and mature adults aged 45 to 64 (both sexes).
3. The mortality gradient between the capital and the north, on the one hand, and the centre, on the other hand, is best visualized for heart disease and liver cirrhosis. Districts in the south have more problems with cerebrovascular diseases and malignant neoplasms.
4. The municipality of Balti is an outlier with the highest mortality rates for infectious diseases and malignant neoplasms of different locations.

IV. SPATIAL MORTALITY PATTERNS

This chapter examines the spatial autocorrelation of mortality. The global and local spatial autocorrelation analysis is given. First, the analysis focuses on mortality from all causes, then on the major groups of causes of death.

1. Global spatial autocorrelation

A. Neighbourhood structure and spatial weights

Figure IV.1 presents two types of maps showing the relations between 35 administrative units of the Republic of Moldova based on two different definitions of the neighbourhood: first-order queen's contiguity and four nearest neighbours (Section II.4B).

Figure IV.1. **Neighbourhood relation between the districts based on first order queen's contiguity method and four nearest neighbours' method, the Republic of Moldova**

Source: author's calculations based on NBS data

Since the data for Transnistria are not available, this region was excluded from the analysis. The average number of links in the case of the queen's contiguity method is 4.4. The district of Stefan Voda situated in the southeast has only one connection. The Ialoveni, Singerei and Telenesti districts are the most connected and have seven links with the first-order neighbours. Nine districts have three and nine others have five links. Then, seven districts have four connections, five districts have six and a district has two connections. Data distribution according to the number of connections per district is normal (skewness=0.0).

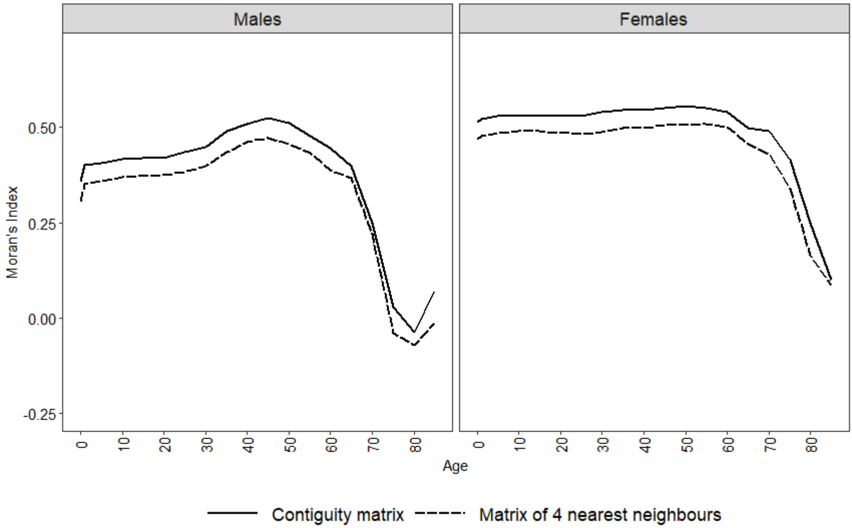

Figure IV.2. **Global Moran's Index for life expectancy by age depending on the type of spatial weights matrix, by sex**

Source: author's calculations based on NAPH and NBS data

To determine the type of spatial weights matrix to be used in the analysis (queen's contiguity matrix or four nearest neighbours' matrix), Moran's index was computed for life expectancy by age *(Fig. IV.2*). Moran's index, whatever the type of weights matrix applied, is systematically higher in females than in males. Furthermore, in older age groups, the global spatial autocorrelation index is closer to zero and even negative in the oldest ages for the two types of matrices.

Moran's index is consistently higher for the contiguity matrix than for the four nearest neighbours' matrix, except for the oldest age groups where the values are nearly identical. For the contiguity matrix, Moran's index is positive and statistically significant (p-value < 0.05) for all age groups up to 75 years among men and 85 years among women. For the second matrix, Moran's index is positive and significant (p-value < 0.05) across all age groups up to 70 years among men and 80 years among women. Considering these differences, we will rely on the first-order queen's contiguity matrix for further analysis.

B. Global Moran's Index

Moran's index of global spatial autocorrelation, which shows only the presence of clusters in the data, was computed for age-standardised death rates by main age groups and sex *(Tab. IV.1)* and for standardised mortality rates by main groups of causes of death and sex *(Tab. IV.2)*. The same age groups and groups of causes of death were used to analyse regional mortality patterns using thematic maps (Sections III.1C and III.2C, respectively).

Table IV.1. **Moran's Index and *p*-value for age-standardised death rates by main age groups and sex**

Age group	Males	Females
1. Less than 1 year	0.071 (p-value > 0.05)	0.087 (p-value > 0.05)
2. 1-19 years	-0.088 (p-value > 0.05)	0.077 (p-value > 0.05)
3. 20-44 years	0.241 (p-value < 0.01)	0.236 (p-value < 0.01)
4. 45-64 years	0.512 (p-value < 0.001)	0.537 (p-value < 0.001)
5. 65 years and over	0.248 (p-value < 0.01)	0.491 (p-value < 0.001)
*All ages**	*0.426 (p<0.001)*	*0.540 (p<0.001)*

Source: author's calculations based on NAPH and NBS data

Note: Moran's *I* computed for age-standardised death rates (all ages) differs slightly from Moran's *I* computed for standardised mortality rates (all causes) presented in Table IV.2.

For overall mortality, Moran's index is positive and statistically significant for men (0.426, $p<0.001$) and women (0.540, $p<0.001$). Thus, we can reject the null hypothesis on the random distribution of mortality in space and accept an alternative hypothesis on the presence of clusters in the all-cause mortality data. This means that we can prove the presence of mortality clusters of "high-high", "low-low" or both types.

Table IV.2. **Moran's Index and *p*-value for standardised mortality rates by main groups of causes of death and sex**

Cause of death	ICD-10	Males	Females
1. Infectious diseases	A00-B99	0.056 (*p*-value > 0.05)	0.048 (*p*-value > 0.05)
2. Neoplasms	C00-D48	0.005 (*p*-value > 0.05)	0.093 (*p*-value > 0.05)
3. Diseases of the circulatory system	I00-I99, G45	0.319 (*p*-value < 0.01)	0.300 (*p*-value < 0.01)
4. Diseases of the respiratory system	J00-J98, U04	0.041 (*p*-value > 0.05)	0.235 (*p*-value > 0.05)
5. Diseases of the digestive system	K00-K93	0.422 (*p*-value < 0.001)	0.597 (*p*-value < 0.001)
6. External causes of death	V01-Y98,	0.162 (*p*-value < 0.05)	0.116 (*p*-value > 0.05)
7. Other diseases and causes of death	D50-G44, G47-H95, L00-Q99	0.036 (*p*-value > 0.05)	0.054 (*p*-value > 0.05)
*All causes**	*A00-Y98*	*0.474 (p<0.001)*	*0.441 (p<0.001)*

Source: author's calculations based on NAPH and NBS data
Note: see Note in Table IV.1

Moran's index and significance test differ across age groups and sex. First, it is positive and significant for all-cause mortality among men and women in the 20-44, 45-64 and 65 and older age groups. For these age groups, as for the overall mortality, it is possible to reject the null hypothesis on spatial randomness and draw a conclusion on the presence of clusters of similar values. The global spatial autocorrelation is especially strong in mature adults aged 45 to 64 years, more so in females (0.537, p<0.001) than in males (0.512, p<0.001). Second, the clustering in all-cause mortality data among the elderly is much stronger in females (0.491, p<0.001) than in males (0.248, p<0.05). At the same time, among young adults aged 20 to 44 years, Moran's index is somewhat higher in males (0.241, p<0.01) than in females (0.236, p<0.01). Finally, for infant mortality and mortality among children and adolescents, there is insufficient evidence to reject the spatial randomness of all-cause mortality (p>0.05).

In terms of causes of death, global spatial autocorrelation showed statistically significant results for only three broad groups of causes of death: diseases of the circulatory system, diseases of the digestive system (both sexes) and external causes of death in males. For both sexes, diseases of the digestive system have the highest intensity of global spatial autocorrelation, more in females (0.597, p<0.001) than in males (0.422, p<0.001). The second group is diseases of the circulatory system that have almost the same impact on the spatial differentiation of mortality for both sexes (0.319 in men and 0.300 in women, p<0.01). Finally, Moran's index computed for the group of external causes of death gives statistically significant results only for males (0.162, p<0.05).

It is important to highlight that mortality from the three main groups of causes of death where the results of global spatial autocorrelation are statistically significant (cardiovascular diseases, digestive diseases, and external causes of death in males) contribute the most to the difference in life expectancy at birth between the national level and 35 administrative units (Section III.2A) or between the most leading districts and the most lagging districts (Section III.2B).

2. Local spatial autocorrelation

The location of clusters of similar values on a map was determined using the Local Indicators of Spatial Association (LISA) calculated separately for all-cause mortality and cause-specific mortality.

A. Spatial variation in all-cause mortality

Moran's scatterplot explores the relationship between the standardised values of standardised all-cause mortality rates and their spatially lagged values *(Fig. II.3)*. Most districts are located in "low-low" and "high-high" quadrants, which means that there is a positive global spatial autocorrelation. The municipality of Chisinau is located for both sexes in the "low-high" quadrant and represents a spatial outlier, i.e., a locality with low standardised mortality rates that is surrounded by localities with high mortality rates.

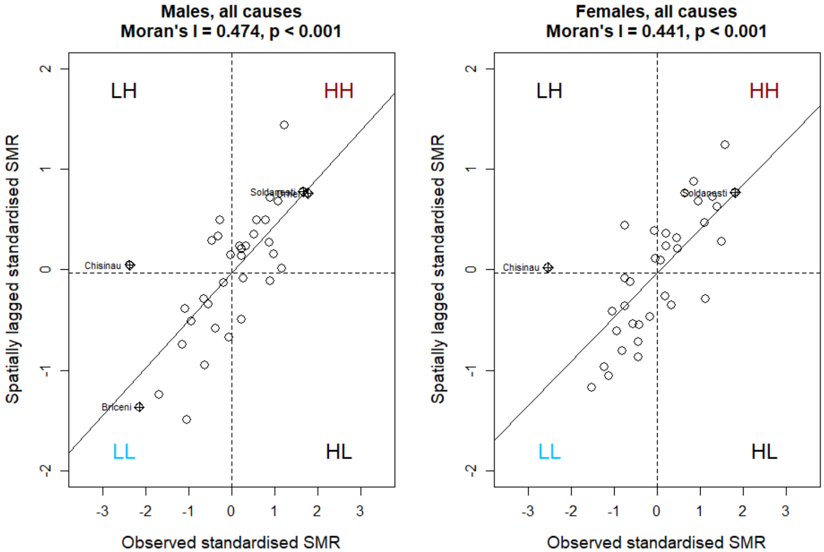

Figure IV.3. **Moran's scatterplot for standardised mortality rates, all causes, by sex**

Source: author's calculations based on NAPH and NBS data

The LISA map produced for the standardised mortality rate for all causes identifies the location of the hot and cold clusters on the map *(Fig. IV.4)*. The division between the leading northern districts and the lagging central districts is very clear. The "hot" cluster of districts with high values of all-cause mortality rates includes the central districts of Soldanesti, Rezina, Telenesti (in males), Orhei, Calarasi and Hincesti (females). The “cold” cluster of districts with low mortality values include the districts of Briceni, Ocnita, Edinet and Riscani.

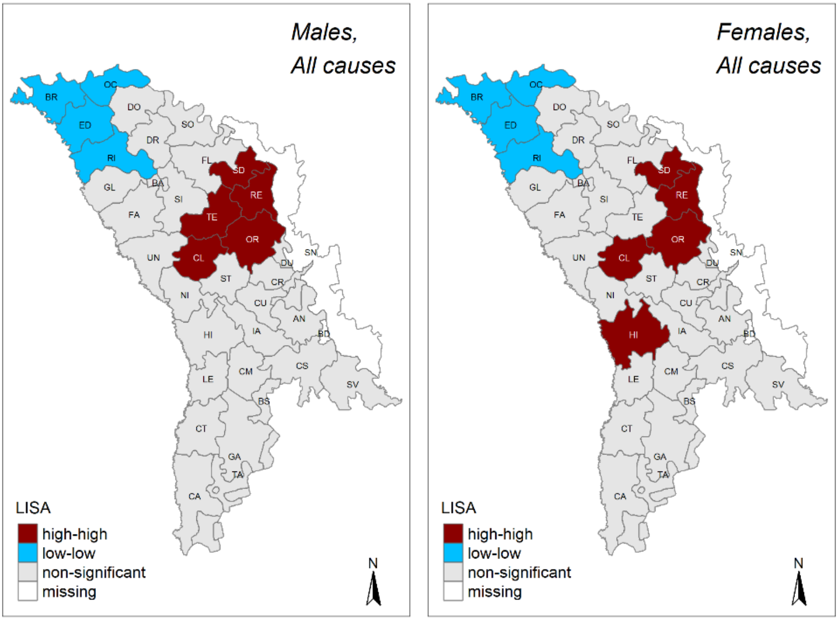

Figure IV.4. **LISA map for standardised mortality rates, all causes, by sex**

Source: author’s calculations based on NAPH and NBS data

Note: p-value <0.001 (number of permutations = 9.999)

B. Spatial variation in cause-specific mortality

The north-centre mortality gradient detected for overall mortality is particularly impressive for diseases of the digestive system, especially in females *(Fig. IV.5)*.

The number of districts forming “hot” and “cold” clusters for *diseases of the digestive system* is higher in females than in males. This group of causes of death has a high-mortality red belt covering the following districts: Soldanesti, Rezina, Telenesti, Orhei, Calarasi, Straseni, Nisporeni and Hincesti. These central districts experience serious health problems related to excessive alcohol consumption. Previous studies have shown that the chronic effects of alcohol consumption, such as liver cirrhosis, have an enormous impact on the health of the Moldovan population, especially women (Penina, 2017). In Moldova, unregistered alcohol consumption dominated by homemade wine plays an important role and accounts for about 30% of the total alcohol consumed, with no significant gender differences. Furthermore, homemade wine is particularly popular among Moldovan women aged 45 to 69, for whom it accounts for around 45% of the total alcohol consumed compared to 35% for men in the corresponding age group (WHO, 2014).

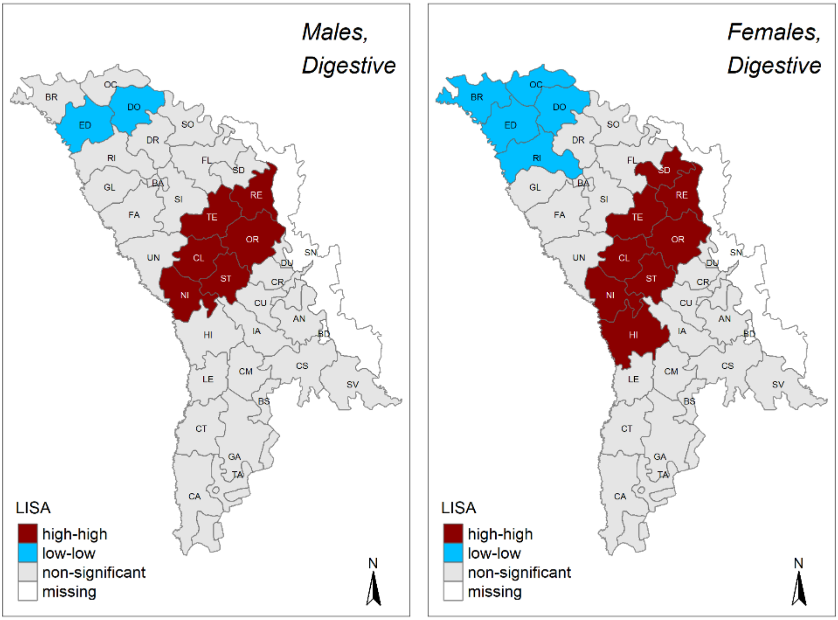

Figure IV.5. **LISA map for standardised mortality rates from diseases of the digestive system, by sex**

Source: author's calculations based on NAPH and NBS data

Note: p-value <0.001 (number of permutations = 9.999)

For *diseases of the circulatory system*, clusters of "low-low" mortality are represented in the north of the country (Briceni, Ocnita, Edinet, Donduseni and Riscani), while "high-high" clusters are found in some central districts (Soldanesti, Rezina, Orhei). The number of "hot" clusters in the case of cardiovascular mortality is much lower compared to diseases of the digestive system *(Fig. IV.6).*

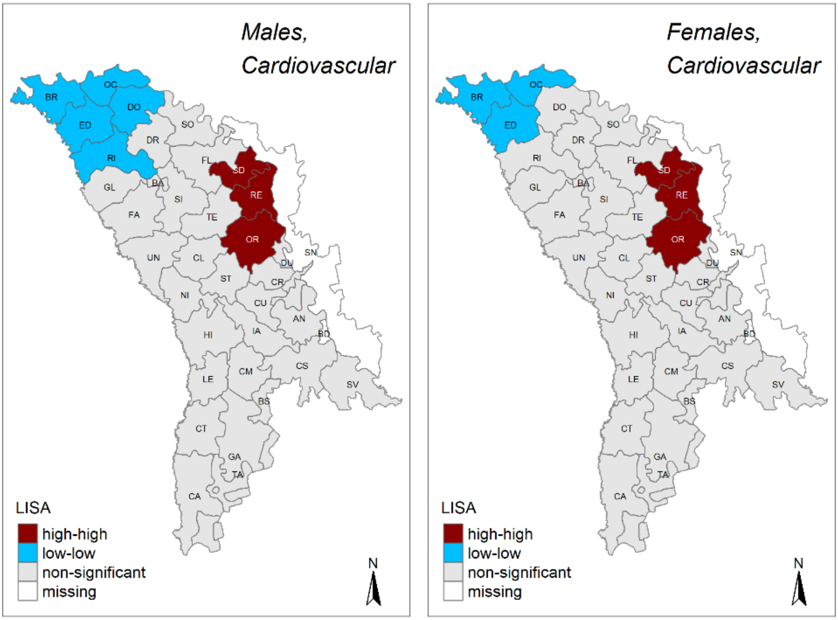

Figure IV.6. **LISA map for standardised mortality rates from diseases of the circulatory system, by sex**

Source: author's calculations based on NAPH and NBS data
Note: p-value <0.01 (number of permutations = 9.999)

Unlike the two previous groups of causes of death, which have a distinct division between the north and the centre, only the municipality of Chisinau and the northern district of Falesti have been identified as "cold" spots for *external causes of death*. The cluster of districts Leova, Cimislia, Hincesti and Soldanesti from the southern and central regions form "hot" spots for this cause of death *(Fig. IV.7).*

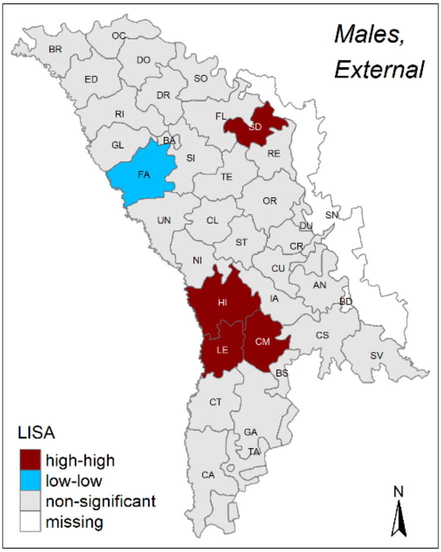

Figure IV.7. **LISA map for standardised mortality rates from external causes of death, males**

Source: author's calculations based on NAPH and NBS data
Note: p-value <0.05 (number of permutations = 9.999)

Figure IV.8 presents the LISA maps for some of the detailed causes in the extended list for where local autocorrelation is statistically significant. Liver cirrhosis is a cause of death with the highest impact on the north-centre mortality partition. Two main types of cardiovascular mortality represented by heart diseases and cerebrovascular diseases have different spatial patterns. If for heart diseases, "high-high" mortality cluster is detected in the centre (Rezina and Orhei), then for cerebrovascular diseases, it is found in the south (Leova, Cantemir, Gagauzia, Cahul and Taraclia). Although the global Moran's index is not statistically significant for the entire neoplasm category, the spatial autocorrelation analysis at the level of more detailed causes detected "hot" clusters in the south of the country (Basarabeasca, Gagauzia, Cimislia) for malignant neoplasms of the digestive system. Then, high mortality from external causes of death in the lagging central districts is mainly attributable to deaths provoked by suicide, homicide and injury undetermined whether accidentally or purposely inflicted.

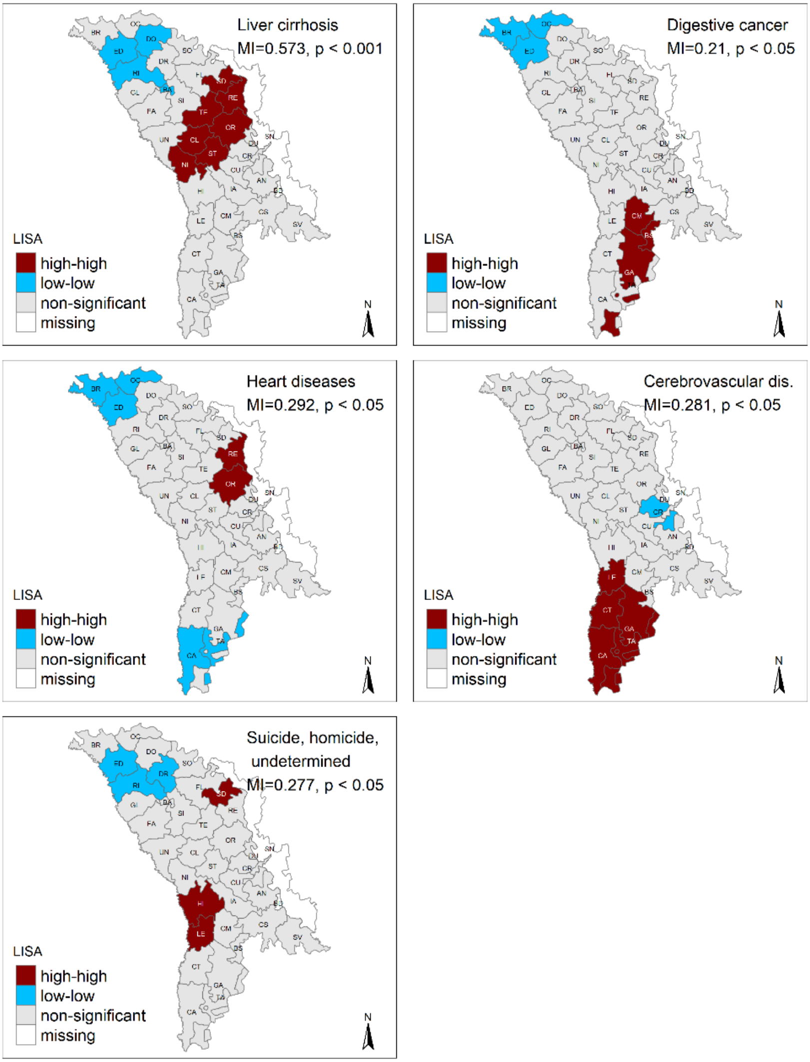

Figure IV.8. **LISA map for standardised mortality rates from some detailed causes of death, both sexes**

Source: author's calculations based on NAPH and NBS data
Note: number of permutations = 9.999

Key messages:

1. The mortality gradient between the leading north and the lagging centre is statistically significant.
2. The spatial variation of all-cause mortality is highest among mature adults aged 45 to 64 years, especially females.
3. Diseases of the digestive system, diseases of the circulatory system and external causes of death (males only) are the three largest groups of causes of death that have a statistically significant impact on interregional mortality differentiation.
4. With respect to detailed causes of death, the north-centre mortality gradient is primarily attributed to liver cirrhosis, heart diseases and deaths from suicide, homicide and injury undetermined whether accidentally or purposely inflicted. Mortality from liver cirrhosis plays the most important role.
5. In the south, there are clusters of "high-high" mortality from cerebrovascular diseases and malignant neoplasms of the digestive system.
6. The main findings point to differences in the drinking habits of the Moldovan population between northern and central regions. Certain districts of the centre have a dangerous culture of wine consumption, which affects both men and women.

CONCLUSIONS

Over the last 55 years, Moldova has not succeeded in raising life expectancy at birth. The cardiovascular revolution, which gave a new impetus to the growth of life expectancy in Western countries in the 1970s, has not yet reached the country. High mortality among the adult population from non-communicable diseases and man-made diseases (cardiovascular diseases, neoplasms, external causes of death) indicates that the second stage of the health transition in Moldova is incomplete. The situation is compounded by the heavy burden of mortality from liver cirrhosis and the persistence of adverse trends in infectious and respiratory diseases. Mortality trends and patterns by cause in Moldova are very close to Ukraine because of the similar system of codifying causes of death and the same economic and social conditions that the two countries went through during the Soviet period and after the collapse of the USSR. Recent improvements in the context of the overall negative long-term trend are very modest and can be temporary, particularly for men, given the fluctuations in mortality in the 1980s and 1990s. This is particularly true today, in an era of emerging public health challenges such as the COVID-19 pandemic and the inevitable increased burden on the health system.

The findings of recent studies on regional differentiation of mortality and causes of death in the Soviet Union countries demonstrate that at both the national and sub-national levels, the same causes of death are respectively responsible for the temporal changes in life expectancy at birth and its interregional differentiation. For Ukraine, Russia, Belarus or the Baltic countries, these groups of causes are diseases of the circulatory system and external causes of death. Mortality from the latter, which is closely associated with harmful alcohol consumption in these traditionally spirits drinking countries, plays a greater role in the variation of geographical mortality than cardiovascular mortality.

This study is based on adjusted 2014 census results and individual death records for the five-year period surrounding the census year. Population and death counts refer to the usually resident population. Centralised codification of causes of death, in accordance with ICD-10, and a small proportion of ill-defined causes of death reduce a bias related to data quality issues.

Current regional patterns of all-cause and cause-specific mortality in Moldova were explored. Interregional differences exist between the municipality of Chisinau and the districts of the north, where high life expectancy values are recorded, and the districts of the centre, where low values are recorded. The districts with the lowest life expectancy make up *the red belt of high mortality* which stretches from the Soldanesti district in the centre to the Cantemir district in the south. This high mortality belt is reflected in both men and women, particularly in the 45-64 age group. The mortality partition is also evident in young adult men and older women.

Many of the most lagging districts are second-order neighbours of the capital. It was surprising to see that in certain districts, which are even the first-order neighbours of the municipality of Chisinau, the health of the population is much worse compared to the capital. Even for a country as small as Moldova, with a total population of under 3.0 million, the proximity of the capital does not improve the health of the population, but rather aggravates the situation. On the other hand, similar studies carried out in the FSU countries show the importance of the capital or big cities for interregional divergence in mortality.

Regional variations in mortality are also explained by differences in age-specific mortality patterns. The effect of age is gender-dependent. Women in the leading administrative units such as the municipality of Chisinau or the northern district of Briceni enjoy higher life expectancy thanks to better control over old-age mortality. In the lagging central districts, such as Rezina or Orhei, losses of life expectancy are mainly linked to high mortality among older women and women aged 45 to 64 and among men aged 20 to 64.

Regional patterns in mortality also differ by cause of death. The gradient between the leading north and the municipality of Chisinau on the one hand and the lagging centre, on the other hand, can be found for diseases of the circulatory system and diseases of the digestive system. The north-central mortality gradient is most pronounced for digestive system diseases. Furthermore, the sex ratio for liver cirrhosis was close to 1.0 in the affected central districts and considerably higher than 1.0 in the north, south and the municipality of Chisinau. This fact is also indicative of the same impact of dangerous alcohol consumption on men and women in the central region. The north-centre differentiation in cardiovascular mortality is mainly attributable to heart disease. At the same time, the southern districts have a tendency to suffer the most from cerebrovascular diseases.

Neoplasm mortality, in particular among women, tends to be higher in the southern region and the municipality of Chisinau than in other regions. The same differentiation is depicted for neoplasms of different locations (digestive, breast, genitourinary and other locations), except for neoplasms of the respiratory system. The northern municipality of Balti faces far greater cancer problems than any other administrative unit in the country. Proper steps must be taken to improve this situation.

Spatial autocorrelation analysis of all-cause mortality and cause-specific mortality identified statistically significant clusters of both “high-high” and “low-low” mortality. Only three broad groups of causes of death play an important role in interregional differentiation of mortality: diseases of the digestive system, diseases of the circulatory system and external causes of death (in males). The north-central gradient of all-cause mortality is largely explained by diseases of the digestive tract, in particular liver cirrhosis, in both men and women. The districts involved in the “high-high” mortality cluster from liver cirrhosis (Soldanesti, Rezina, Telenesti, Orhei, Calarasi, Straseni, and Nisporeni) experience serious health problems related to excessive alcohol consumption, mostly represented at the national level by homemade wine. Adequate alcohol preventive measures are needed in this cluster.

Diseases of the circulatory system also contribute to the formation of the north-centre gradient in mortality, although to a much lesser extent compared to diseases of the digestive system. This is explained by the fact that clusters of "high-high" mortality from cerebrovascular diseases were detected in the south of the country, while those for heart diseases were found in the centre. Clustering of male mortality from external causes of death is largely attributed to deaths from suicide, homicide, and injuries undetermined whether accidentally or purposely inflicted.

Among the most backward districts, the central districts of Soldanesti, Rezina and Orhei should receive particular attention. In this case, the "high-high" mortality clusters were depicted for the three main groups of causes of death responsible for interregional differentiation of mortality represented at a more detailed level by liver cirrhosis, heart diseases, suicides, homicides and injury undetermined whether accidentally or purposely inflicted.

REFERENCES

1. **ALTMAN** Douglas G., **MACHIN** David, **BRYANT** Trevor N., **GARDNER** M. J. (eds.), 2000, *Statistics with confidence: confidence intervals and statistical guidelines*, 2. ed, London, BMJ, 240 p.
2. **ANDREEV** Evgeny M., **SHKOLNIKOV** Vladimir M., 2002, “An Excel spreadsheet for the decomposition of a difference between two values of an aggregate demographic measure by stepwise replacement running from young to old ages”, p. 6.
3. **ANSELIN** Luc, 1995, “Local Indicators of Spatial Association—LISA”, *Geographical Analysis*, 27(2), pp. 93–115.
4. **ANSELIN** Luc, 2005, *Exploring Spatial Data with GeoDa™: A Workbook.*, Santa Barbara, CA, Center for Spatially Integrated Social Science, 245 p.
5. **ANSELIN** Luc, 2020, “GeoDa documentation”, *GeoDa*.
6. **ANSELIN** Luc, 2021, “Introduction to Spatial Data Science. Recorded lectures by Luc Anselin”, *YouTube. GeoDa Software*.
7. **BIVAND** Roger S., **PEBESMA** Edzer, **GÓMEZ-RUBIO** Virgilio, 2013, *Applied Spatial Data Analysis with R*, 2nd edition, New York, Springer-Verlag, Use R!
8. **CHIANG** Chin Long, **WORLD HEALTH ORGANIZATION**, 1979, “Life Table and Mortality Analysis”, Geneva, World Health Organization.
9. **DANI ARRIBAS-BEL**, 2017, “Geographic Data Science”, *GDS16*.
10. **DANILOVA** Inna, 2018, *Regional’nyj analiz smertnosti po prichinam smerti v Rossii*, Ph.D. thesis, Moscow, HSE University, 200 p.
11. **DUBÉ** Jean, **LEGROS** Diègo, 2014, “Spatial Autocorrelation”, *in* pp. 59–91.
12. **FIHEL** Agnieszka, **PECHHOLDOVÁ** Marketa, 2017, “Between ‘Pioneers’ of the Cardiovascular Revolution and Its ‘Late Followers’: Mortality Changes in the Czech Republic and Poland Since 1968”, *European Journal of Population*, 33(5), pp. 651–678.
13. **GADM**, 2018, “GADM maps and data”, *GADM*.
14. **GEORGINA** Anderson, **SEBASTIAN** Fox, **PAU** Fryers, **EMMA** Clegg, 2020, “Common Public Health Statistics and their Confidence Intervals. Package ‘PHEindicatormethods’”.
15. **GETIS** Arthur, 2008, “A History of the Concept of Spatial Autocorrelation: A Geographer’s Perspective”, *Geographical Analysis*, 40(3), pp. 297–309.
16. **GRIGORIEV** Pavel, **DOBLHAMMER-REITER** Gabriele, **SHKOLNIKOV** Vladimir, 2013, “Trends, patterns, and determinants of regional mortality in Belarus, 1990–2007”, *Population Studies*, 67(1), pp. 61–81.
17. **GRIGORIEV** Pavel, **JASILIONIS** Domantas, **SHKOLNIKOV** Vladimir M., **MESLÉ** France, **VALLIN** Jacques, 2016, “Spatial variation of male alcohol-

related mortality in Belarus and Lithuania", *European Journal of Public Health*, 26(1), pp. 95–101.
18. **GRIGORIEV** Pavel, **MESLÉ** France, **SHKOLNIKOV** Vladimir M., **ANDREEV** Evgeny, **FIHEL** Agnieszka, **PECHHOLDOVA** Marketa, **VALLIN** Jacques, 2014, "The Recent Mortality Decline in Russia: Beginning of the Cardiovascular Revolution?", *Population and Development Review*, 40(1), pp. 107–129.
19. **IONITA** Andoria, **PENINA** Olga, 2016, "About Romania data on causes of death", Report, The Human Cause-of-Death Database, INED, MPIDR.
20. **ISTRATI** Valentina, 2019, "Recalcularea numărului populației utilizând definița internațională privind reședința obișnuită", Chisinau, National Bureau of Statistics of the Republic of Moldova.
21. **KALEDIENE** Ramune, **PETRAUSKIENE** Jadvyga, 2000, "Regional life expectancy patterns in Lithuania", *The European Journal of Public Health*, 10.
22. **LI** Angela, 2019, *R Spatial Workshop Notes*.
23. **MESLE** France, 1983, "Cancer et alimentation : le cas des cancers de l'intestin et du rectum", *Population*, 38(4), pp. 733–762.
24. **MESLE** France, **SHKOLNIKOV** Vladimir M., **HERTRICH** Véronique, **VALLIN** Jacques, 1996, *Tendances récentes de la mortalité par cause en Russie 1965-1994*, Paris, Institut national d'études démographiques (Paris), Centr Demografii i Ekologii CHeloveka Instituta Narodnohozyajstvennogo Prognozirovaniya RAN (Moscow), 140 p.
25. **MESLÉ** France, **VALLIN** Jacques, 1996, "Reconstructing long-term series of causes of death. The case of France", *Historical Methods: A Journal of Quantitative and Interdisciplinary History*, 29(2), pp. 72–87.
26. **MESLÉ** France, **VALLIN** Jacques, 2012, *Mortality and causes of death in 20th-century Ukraine*, Dordrecht, Springer Netherlands, Demographic Research Monograph, 279 p.
27. **MESLÉ** France, **VALLIN** Jacques, 2017, "The End of East–West Divergence in European Life Expectancies? An Introduction to the Special Issue", *European Journal of Population*, 33(5), pp. 615–627.
28. **MUENCHOW** Robin Lovelace Jakub Nowosad, Jannes, 2021, "Geocomputation with R",.
29. **NATIONAL BUREAU OF STATISTICS OF MOLDOVA**, 2014, "Control survey within the 2014 Population and Housing Census [Ancheta de control din cadrul Recensămîntului Populației și al Locuințelor 2014]",.
30. **NATIONAL BUREAU OF STATISTICS OF MOLDOVA**, 2019, "Notă metodologică privind estimarea numărului populației cu reședință obișnuită pentru perioada 2014-2019 [Methodological note about the estimation of the population number with usual residence for the period 2014-2019]",.

31. **NEMTSOV** Alexandr V., **LEVCHUK** Natalia M., **DAVYDOV** K.V., 2011, “Alcohol-related mortality in Ukraine and Russia (1980-2007)”, *ICAP Periodic Review on Drinking and Culture*.
32. **OMRAN** Abdel R, 1971, “The Epidemiologic Transition: A Theory of the Epidemiology of Population Change”, *The Milbank Quarterly,* 49(4), pp. 509–538.
33. **PARLEMENT OF THE REPUBLIC OF MOLDOVA**, 2001, “Law 764 as of 27/12/2001 regarding the administrative-territorial organization of the Republic of Moldova [Lege nr. 764 din 27/12/2001 privind organizarea administrativ-teritorială a Republicii Moldova]”, *764*, 764.
34. **PENINA** Olga, 2015, “Reconstruction of the continuity of cause-specific mortality trends for the Republic of Moldova”, *Economie şi Sociologie,* 2, pp. 70–77.
35. **PENINA** Olga, 2017, “Alcohol-Related Causes of Death and Drinking Patterns in Moldova as Compared to Russia and Ukraine”, *European Journal of Population = Revue Europeenne De Demographie*, 33(5), pp. 679–700.
36. **PENINA** Olga, **JDANOV** Dmitri, **GRIGORIEV** Pavel, 2015, “Producing reliable mortality estimates in the context of distorted population statistics: the case of Moldova”, *MPIDR Working Paper WP-2015-011*, p. 35 p.
37. **PENINA** Olga, **MESLÉ** France, **VALLIN** Jacques, 2010a, “Correcting for Under-Estimation of Infant Mortality in Moldova”, *Population (English Edition)*, 65(3), pp. 499–514.
38. **PENINA** Olga, **MESLÉ** France, **VALLIN** Jacques, 2010b, “Mortality by cause in Moldova since 1965: assessing long-term trends and recent changes”, *Проблемы народонаселения в зеркале истории. Шестые Валентеевские чтения*, pp. 183–193.
39. **PENINA** Olga, **MESLÉ** France, **VALLIN** Jacques, 2011, “Причины смерти и продолжительность жизни в Молдове [Causes of death and life expectancy in Moldova]”, *Демоскоп Weekly*, 455–456.
40. **PENINA** Olga, **RAEVSCHI** Elena, 2020, “Mortalitatea cardiovasculară și speranță de viață în Republica Moldova”, *Buletinul Academiei de Ştiinţe a Moldovei. Ştiinţe Medicale*, 1(65), pp. 171–177.
41. **PONIAKINA** Svitlana, 2014, *Causes and evolution of mortality disparities across regions in Ukraine*, Ph.D. thesis, Paris, Université Panthéon-Sorbonne - Paris I, 389 p.
42. **PONIAKINA** Svitlana, **SHEVCHUK** Pavlo, 2016, “About Ukraine data on causes of death”, *The Human Cause-of-Death Database*.
43. **RIFFE** Tim, 2018, “Package ‘DemoDecomp’. Decompose Demographic Functions”.
44. **SHKOLNIKOV** Vladimir M., **MCKEE** Martin, **VALLIN** Jacques, **AKSEL** Eugenia, **LEON** David, **CHENET** Laurent, **MESLÉ** France, 1999, “Cancer

mortality in Russia and Ukraine: validity, competing risks and cohort effects”, *International Journal of Epidemiology*, 28(1), pp. 19–29.

45. **SILCOCKS** P. B., **JENNER** D. A., **REZA** R., 2001, “Life expectancy as a summary of mortality in a population: statistical considerations and suitability for use by health authorities”, *Journal of Epidemiology and Community Health*, 55(1), pp. 38–43.
46. **TABAC** Tatiana, **GAGAUZ** Olga, 2020, “Migration from Moldova: Trajectories and Implications for the Country of Origin”, *in* pp. 143–168.
47. **TIMONIN** Sergey, **DANILOVA** Inna, **ANDREEV** Evgeny, **SHKOLNIKOV** Vladimir M., 2017, “Recent Mortality Trend Reversal in Russia: Are Regions Following the Same Tempo?”, *European Journal of Population*, 33(5), pp. 733–763.
48. **VALCOV** Vitalie, 2017, “Principalele rezultate ale RPL 2014 [The main results of the 2014 census]”, Chisinau, 31 March 2017.
49. **VALLIN** Jacques, **ANDREEV** Evgeny, **MESLÉ** France, **SHKOLNIKOV** Vladimir, 2005, “Geographical diversity of cause-of-death patterns and trends in Russia”, *Demographic Research*, 12, pp. 323–380.
50. **VALLIN** Jacques, **MESLE** France, 1988, “Les causes de décès en France de 1925 à 1978: une tentative de reclassement dans la huitième révision de la Classification internationale”, *in* **Vallin** Jacques, **D’Souza** Stan, **Palloni** Alberto (eds.), *Mesure et analyse de la mortalité : nouvelles approches*, INED, PUF, Paris, Travaux et Documents, Cahier 119, pp. 317–349.
51. **VALLIN** Jacques, **MESLÉ** France, 2004, “Convergences and divergences in mortality: A new approach of health transition”, *Demographic Research*, S2, pp. 11–44.
52. **VISHNEVSKY** Anatoly, **ANDREEV** Evgeny, **TIMONIN** Sergey, 2017, “Mortality from cardiovascular diseases and life expectancy in Russia”, *Демографическое обозрение*, 4(5), pp. 45–70.
53. **WHO**, 2014, “Prevalence of noncommunicable disease risk factors in the Republic of Moldova, STEPS 2013”, Copenhagen, WHO Regional Office for Europe.
54. **WHO**, 2021, “International Statistical Classification of Diseases and Related Health Problems 10th Revision”, *ICD-10 Version:2019*.

Annexe 1. Administrative-territorial organization of the Republic of Moldova

	Administrative units	**Localities**	**Cities and municipalities**	**Villages (communities)**
1.	Mun. Chisinau	35	7	28
2.	Mun. Balti	3	1	2
3.	Mun. Bender	2	1	1
4.	Anenii Noi	45	1	44
5.	Basarabeasca	10	1	9
6.	Briceni	39	2	37
7.	Cahul	55	1	54
8.	Calarasi	44	1	43
9.	Cantemir	51	1	50
10.	Causeni	48	2	46
11.	Cimislia	39	1	38
12.	Criuleni	43	1	42
13.	Donduseni	30	1	29
14.	Drochia	40	1	39
15.	Dubasari	15	-	15
16.	Edinet	49	2	47
17.	Falesti	76	1	75
18.	Floresti	74	3	71
19.	Glodeni	35	1	34
20.	Hincesti	63	1	62
21.	Ialoveni	34	1	33
22.	Leova	39	2	37
23.	Nisporeni	39	1	38
24.	Ocnita	33	3	30
25.	Orhei	75	1	74
26.	Rezina	41	1	40
27.	Riscani	55	2	53
28.	Singerei	70	2	68
29.	Soldanesti	33	1	32
30.	Soroca	68	1	67
31.	Stefan-Voda	26	1	25
32.	Straseni	39	2	37
33.	Taraclia	26	1	25
34.	Telenesti	54	1	53
35.	Ungheni	74	2	72
36.	ATU Gagauzia	32	3	29
37.	Transnistria	147	10	137
Total		***1681***	***65***	***1616***

Source: (Parliament of the Republic of Moldova, 2001)

Annexe 2. Life expectancy at birth and confidence interval (CI, 95%), 2012-2016, by districts and sex (years)

Administrative units	Life expectancy at birth	Lower limit	Upper limit
	MALES		
Anenii Noi (AN)	66.02	64.54	67.49
Basarabeasca (BS)	61.91	58.72	65.09
Briceni (BR)	66.83	65.12	68.55
Balti (BA)	64.41	63.13	65.69
Calarasi (CL)	62.60	60.99	64.22
Cahul (CA)	65.25	63.97	66.52
Cantemir (CT)	62.34	60.45	64.23
Criuleni (CR)	64.63	63.13	66.13
Cimislia (CM)	62.57	60.59	64.55
Causeni (CS)	64.47	63.04	65.89
Chisinau (CU)	68.59	68.10	69.08
Dubasari (DU)	63.76	61.45	66.07
Donduseni (DO)	64.11	61.77	66.45
Drochia (DR)	65.53	63.97	67.08
Edinet (ED)	66.64	65.03	68.25
Falesti (FA)	64.85	63.36	66.33
Floresti (FL)	63.80	62.29	65.31
Gagauzia (GA)	64.77	63.62	65.93
Glodeni (GL)	64.72	62.80	66.63
Hincesti (HI)	62.76	61.44	64.09
Ialoveni (IA)	64.99	63.65	66.34
Leova (LE)	62.89	60.92	64.85
Nisporeni (NI)	63.13	61.35	64.92
Ocnita (OC)	64.91	62.78	67.04
Orhei (OR)	62.19	60.93	63.44
Riscani (RI)	65.56	63.76	67.36
Rezina (RE)	62.36	60.37	64.35
Soldanesti (SD)	61.63	59.42	63.84
Singerei (SI)	65.17	63.70	66.64
Soroca (SO)	63.94	62.43	65.46
Straseni (ST)	64.14	62.71	65.56
Stefan Voda (SV)	64.02	62.37	65.68
Taraclia (TA)	65.39	63.29	67.49
Telenesti (TE)	62.99	61.36	64.62
Ungheni (UN)	65.08	63.83	66.33
Republic of Moldova	65.20	64.97	65.44

Administrative units	Life expectancy at birth	Lower limit	Upper limit
FEMALES			
Anenii Noi (AN)	73.40	72.03	74.77
Basarabeasca (BS)	71.27	68.05	74.49
Briceni (BR)	76.24	74.82	77.65
Balti (BA)	73.93	72.79	75.08
Calarasi (CL)	70.43	68.82	72.04
Cahul (CA)	73.79	72.62	74.95
Cantemir (CT)	70.88	69.10	72.66
Criuleni (CR)	72.33	70.89	73.77
Cimislia (CM)	69.14	66.99	71.29
Causeni (CS)	72.48	71.12	73.84
Chisinau (CU)	76.75	76.29	77.21
Dubasari (DU)	72.24	70.06	74.43
Donduseni (DO)	74.81	72.86	76.76
Drochia (DR)	75.25	73.86	76.65
Edinet (ED)	75.63	74.23	77.04
Falesti (FA)	73.77	72.41	75.13
Floresti (FL)	73.07	71.74	74.41
Gagauzia (GA)	73.95	72.88	75.01
Glodeni (GL)	73.44	71.68	75.20
Hincesti (HI)	71.09	69.77	72.41
Ialoveni (IA)	72.40	71.10	73.70
Leova (LE)	70.89	68.96	72.82
Nisporeni (NI)	70.61	68.81	72.42
Ocnita (OC)	74.37	72.29	76.46
Orhei (OR)	70.83	69.63	72.04
Riscani (RI)	75.08	73.57	76.59
Rezina (RE)	70.17	68.18	72.16
Soldanesti (SD)	69.97	67.85	72.09
Singerei (SI)	73.75	72.35	75.15
Soroca (SO)	73.35	71.97	74.72
Straseni (ST)	71.89	70.48	73.29
Stefan Voda (SV)	71.92	70.34	73.50
Taraclia (TA)	73.95	71.86	76.03
Telenesti (TE)	71.17	69.47	72.87
Ungheni (UN)	72.93	71.72	74.14
Republic of Moldova	73.69	73.47	73.91

Source: Author’s calculations based on NAPH and NBS data

Annexe 3. Contributions of mortality by main age groups to differences in life expectancy at birth between the Republic of Moldova and its 35 administrative units, 2012-2016, by sex (years)

Administrative units	**Less than 1 year**	**1-19 years**	**20-44 years**	**45-64 years**	**65 years and over**	**Total**
MALES						
Anenii Noi (AN)	0.170	0.050	0.008	0.333	0.249	0.810
Balti (BA)	-0.008	0.137	-0.487	-0.362	-0.062	-0.782
Basarabeasca (BS)	-0.878	0.171	-1.390	-0.749	-0.445	-3.291
Briceni (BR)	-0.034	-0.222	0.376	0.996	0.515	1.631
Cahul (CA)	0.102	-0.205	0.218	0.085	-0.154	0.047
Calarasi (CL)	-0.110	-0.142	-0.907	-0.927	-0.513	-2.600
Cantemir (CT)	-0.550	-0.053	-0.835	-1.014	-0.415	-2.868
Causeni (CS)	-0.074	0.130	-0.344	-0.169	-0.280	-0.737
Chisinau (CU)	0.210	0.256	1.035	1.089	0.807	3.396
Cimislia (CM)	0.074	-0.319	-1.473	-0.855	-0.060	-2.634
Criuleni (CR)	0.113	-0.111	0.055	-0.502	-0.130	-0.574
Donduseni (DO)	-0.261	-0.046	-1.215	0.358	0.072	-1.093
Drochia (DR)	0.165	-0.246	-0.056	0.294	0.165	0.322
Dubasari (DU)	0.158	-0.343	-0.352	-0.398	-0.507	-1.441
Edinet (ED)	-0.050	-0.208	0.405	0.924	0.357	1.428
Falesti (FA)	-0.017	-0.139	-0.240	0.051	-0.021	-0.366
Floresti (FL)	-0.197	-0.085	-0.287	-0.506	-0.327	-1.403
Gagauzia (GA)	-0.075	-0.022	-0.094	0.057	-0.295	-0.430
Glodeni (GL)	-0.392	-0.176	0.067	0.157	-0.146	-0.490
Hincesti (HI)	-0.159	0.107	-1.200	-1.060	-0.124	-2.436
Ialoveni (IA)	0.117	-0.156	-0.026	-0.021	-0.123	-0.208
Leova (LE)	-0.019	-0.430	-0.678	-0.621	-0.557	-2.305
Nisporeni (NI)	-0.218	-0.013	-0.601	-0.838	-0.403	-2.073
Ocnita (OC)	-0.458	-0.022	-0.590	0.553	0.229	-0.288
Orhei (OR)	0.045	-0.172	-1.059	-1.119	-0.713	-3.018
Rezina (RE)	-0.220	-0.164	-0.979	-0.965	-0.514	-2.841
Riscani (RI)	-0.212	-0.278	0.227	0.576	0.035	0.348
Singerei (SI)	-0.037	-0.004	-0.217	0.320	-0.093	-0.031
Soldanesti (SD)	-0.528	-0.005	-1.121	-1.148	-0.772	-3.574
Soroca (SO)	-0.302	-0.055	-0.182	-0.362	-0.359	-1.260
Stefan Voda (SV)	0.046	-0.191	-0.493	-0.295	-0.249	-1.182
Straseni (ST)	0.150	0.020	-0.645	-0.522	-0.043	-1.040
Taraclia (TA)	-0.083	-0.029	0.575	0.188	-0.462	0.190
Telenesti (TE)	-0.047	0.170	-0.929	-1.161	-0.241	-2.207
Ungheni (UN)	0.002	0.134	-0.027	-0.043	-0.185	-0.120

Administrative units	**Less than 1 year**	**1-19 years**	**20-44 years**	**45-64 years**	**65 years and over**	**Total**
FEMALES						
Anenii Noi (AN)	0.306	-0.081	-0.256	-0.049	-0.213	-0.294
Balti (BA)	0.114	0.123	-0.329	0.054	0.281	0.243
Basarabeasca (BS)	-0.976	-0.017	-0.311	-0.548	-0.551	-2.403
Briceni (BR)	0.170	0.050	0.276	1.103	0.962	2.560
Cahul (CA)	0.161	0.108	-0.278	0.253	-0.142	0.102
Calarasi (CL)	-0.135	-0.164	-0.418	-1.529	-1.025	-3.271
Cantemir (CT)	-0.075	-0.043	-0.299	-1.267	-1.132	-2.815
Causeni (CS)	-0.040	-0.117	-0.207	0.038	-0.893	-1.219
Chisinau (CU)	0.172	0.198	0.442	0.901	1.344	3.057
Cimislia (CM)	-0.406	-0.140	-1.676	-1.292	-1.048	-4.562
Criuleni (CR)	0.116	-0.139	0.050	-0.814	-0.579	-1.367
Donduseni (DO)	-0.291	0.043	0.238	0.697	0.402	1.089
Drochia (DR)	0.126	0.012	-0.139	0.809	0.753	1.561
Dubasari (DU)	0.027	0.021	-0.223	0.018	-1.303	-1.460
Edinet (ED)	0.083	-0.011	0.176	0.763	0.914	1.925
Falesti (FA)	-0.093	0.131	-0.149	0.345	-0.173	0.061
Floresti (FL)	-0.079	0.079	0.078	-0.310	-0.393	-0.625
Gagauzia (GA)	0.083	-0.196	0.001	0.660	-0.300	0.248
Glodeni (GL)	-0.328	0.105	-0.146	0.091	0.026	-0.251
Hincesti (HI)	-0.180	-0.091	-0.429	-1.222	-0.685	-2.606
Ialoveni (IA)	-0.070	-0.016	-0.076	-0.502	-0.598	-1.261
Leova (LE)	0.127	-0.185	-0.650	-1.410	-0.686	-2.804
Nisporeni (NI)	0.138	-0.281	-0.642	-1.519	-0.775	-3.079
Ocnita (OC)	-0.313	-0.333	0.186	0.637	0.519	0.696
Orhei (OR)	0.040	-0.153	-0.259	-1.361	-1.128	-2.862
Rezina (RE)	-0.559	-0.091	-0.468	-1.311	-1.103	-3.532
Riscani (RI)	0.262	-0.155	0.188	0.802	0.287	1.383
Singerei (SI)	-0.203	-0.034	-0.074	0.183	0.189	0.060
Soldanesti (SD)	-0.423	-0.192	-0.316	-1.671	-1.136	-3.738
Soroca (SO)	-0.022	0.056	-0.065	-0.021	-0.289	-0.341
Stefan Voda (SV)	-0.081	-0.168	-0.328	-0.280	-0.914	-1.772
Straseni (ST)	-0.207	0.104	-0.439	-0.836	-0.425	-1.802
Taraclia (TA)	-0.287	-0.081	0.389	0.369	-0.137	0.253
Telenesti (TE)	-0.377	-0.181	-0.297	-0.859	-0.794	-2.508
Ungheni (UN)	-0.091	-0.056	0.003	-0.360	-0.262	-0.766

Source: Author's calculations based on NAPH and NBS data

Note: Life expectancy at birth in Moldova in 2014-2016 is 65.2 in males and 73.7 in females

Annexe 4. Contributions of mortality by main groups of causes of death to differences in life expectancy at birth between the Republic of Moldova and its 35 administrative units, 2012-2016, by sex (years)

Administrative units	Infec-tious diseases	Neo-plasms	Circula-tory system	Respira-tory system	Diges-tive system	Exter-nal causes	Other causes	Total
MALES								
Anenii Noi (AN)	-0.020	0.146	0.390	0.153	0.019	-0.108	0.229	0.810
Basarabeasca (BS)	-0.296	-0.440	-0.718	-0.080	-0.293	-0.940	-0.525	-3.291
Briceni (BR)	0.136	0.265	1.122	-0.249	0.537	-0.129	-0.050	1.631
Balti (BA)	-0.504	-0.626	-0.028	0.134	0.208	0.113	-0.079	-0.782
Calarasi (CL)	-0.096	-0.050	-1.129	-0.067	-0.785	-0.119	-0.354	-2.600
Cahul (CA)	0.093	-0.082	0.259	-0.071	-0.315	0.114	0.048	0.047
Cantemir (CT)	-0.089	-0.063	-0.647	-0.319	-0.190	-1.187	-0.374	-2.868
Criuleni (CR)	-0.046	0.039	-0.074	-0.336	-0.087	-0.355	0.284	-0.574
Cimislia (CM)	-0.154	-0.447	0.055	-0.118	-0.242	-1.273	-0.455	-2.634
Causeni (CS)	0.061	0.065	-0.378	-0.234	-0.177	-0.113	0.039	-0.737
Chisinau (CU)	0.058	0.184	0.813	0.402	0.496	1.064	0.379	3.396
Dubasari (DU)	0.006	0.137	-0.575	-0.069	-0.399	-0.522	-0.019	-1.441
Donduseni (DO)	0.086	0.077	0.042	-0.067	0.392	-0.975	-0.648	-1.093
Drochia (DR)	0.152	-0.223	0.752	0.145	0.154	-0.432	-0.226	0.322
Edinet (ED)	0.099	0.434	0.931	0.140	0.309	-0.549	0.064	1.428
Falesti (FA)	-0.174	-0.196	-0.045	-0.277	-0.082	0.435	-0.027	-0.366
Floresti (FL)	-0.091	0.028	-0.678	-0.042	0.202	-0.678	-0.144	-1.403
Gagauzia (GA)	0.102	-0.341	0.177	0.048	-0.325	0.050	-0.140	-0.430
Glodeni (GL)	0.016	0.101	0.112	-0.164	0.368	-0.054	-0.870	-0.490
Hincesti (HI)	-0.113	0.136	-0.455	-0.098	-0.780	-0.885	-0.241	-2.436
Ialoveni (IA)	-0.081	0.023	-0.429	0.178	-0.052	-0.116	0.269	-0.208
Leova (LE)	0.032	-0.392	-0.758	-0.061	-0.133	-1.032	0.040	-2.305
Nisporeni (NI)	0.020	0.015	-0.477	-0.612	-0.441	-0.179	-0.398	-2.073
Ocnita (OC)	0.010	-0.073	0.244	0.281	-0.369	-0.058	-0.321	-0.288
Orhei (OR)	0.070	-0.418	-1.166	-0.271	-0.793	-0.491	0.050	-3.018
Riscani (RI)	0.054	0.108	0.801	0.120	0.000	-0.456	-0.279	0.348
Rezina (RE)	-0.118	0.224	-1.168	-0.589	-0.560	-0.605	-0.026	-2.841
Soldanesti (SD)	-0.075	-0.101	-1.191	-0.166	-0.330	-0.761	-0.950	-3.574
Singerei (SI)	-0.027	0.012	-0.866	0.449	0.505	-0.179	0.075	-0.031
Soroca (SO)	-0.194	-0.235	-0.426	-0.150	0.074	-0.071	-0.258	-1.260
Straseni (ST)	0.093	0.230	-0.964	-0.035	-0.475	-0.118	0.227	-1.040
Stefan Voda (SV)	0.152	0.169	-0.278	-0.275	0.328	-1.180	-0.098	-1.182
Taraclia (TA)	0.313	-0.410	0.142	-0.113	0.148	0.083	0.027	0.190
Telenesti (TE)	-0.093	-0.290	-0.420	-0.237	-0.459	-0.706	-0.002	-2.207
Ungheni (UN)	0.027	0.004	0.549	-0.295	0.034	-0.141	-0.299	-0.120

Administrative units	Infec-tious diseases	Neo-plasms	Circula-tory system	Respira-tory system	Diges-tive system	Exter-nal causes	Other causes	Total
FEMALES								
Anenii Noi (AN)	0.043	-0.241	0.014	0.143	-0.131	-0.251	0.130	-0.294
Basarabeasca (BS)	-0.119	-0.677	-1.034	-0.114	0.389	0.007	-0.856	-2.403
Briceni (BR)	0.045	-0.045	1.252	0.037	0.745	0.286	0.240	2.560
Balti (BA)	-0.402	-0.741	0.732	0.108	0.260	0.200	0.086	0.243
Calarasi (CL)	-0.075	0.090	-1.268	-0.185	-1.204	-0.195	-0.434	-3.271
Cahul (CA)	-0.006	-0.115	-0.050	0.061	-0.015	0.074	0.154	0.102
Cantemir (CT)	0.033	-0.325	-1.307	-0.060	-0.765	-0.334	-0.057	-2.815
Criuleni (CR)	-0.041	0.025	-0.910	0.027	-0.383	-0.336	0.251	-1.367
Cimislia (CM)	-0.061	-0.314	-1.329	-0.272	-0.883	-0.974	-0.728	-4.562
Causeni (CS)	-0.085	-0.031	-0.911	-0.069	-0.103	-0.048	0.027	-1.219
Chisinau (CU)	0.026	-0.088	1.652	0.195	0.640	0.347	0.284	3.057
Dubasari (DU)	0.032	0.145	-1.461	-0.190	-0.483	0.077	0.420	-1.460
Donduseni (DO)	0.172	0.293	0.196	-0.097	0.810	0.073	-0.358	1.089
Drochia (DR)	0.004	0.083	1.431	-0.135	0.434	0.072	-0.329	1.561
Edinet (ED)	0.029	0.280	1.144	-0.002	0.571	-0.158	0.062	1.925
Falesti (FA)	0.037	0.303	-0.490	-0.064	0.027	0.144	0.105	0.061
Floresti (FL)	0.081	0.070	-0.786	0.075	0.094	-0.158	-0.002	-0.625
Gagauzia (GA)	0.053	-0.273	0.336	0.038	0.106	0.198	-0.210	0.248
Glodeni (GL)	-0.058	0.021	-0.036	-0.172	0.292	0.080	-0.379	-0.251
Hincesti (HI)	-0.019	-0.034	-0.988	-0.047	-0.893	-0.498	-0.127	-2.606
Ialoveni (IA)	0.053	-0.012	-0.884	-0.022	-0.430	-0.026	0.061	-1.261
Leova (LE)	-0.071	-0.318	-1.381	0.074	-0.733	-0.215	-0.161	-2.804
Nisporeni (NI)	0.008	-0.041	-1.141	-0.112	-1.002	-0.687	-0.104	-3.079
Ocnita (OC)	-0.031	0.164	0.499	0.091	0.464	-0.185	-0.306	0.696
Orhei (OR)	0.015	-0.219	-1.329	0.018	-1.246	-0.182	0.081	-2.862
Riscani (RI)	0.022	0.371	0.349	-0.070	0.614	0.099	-0.001	1.383
Rezina (RE)	0.119	0.212	-1.971	-0.164	-0.962	-0.287	-0.479	-3.532
Soldanesti (SD)	-0.032	0.127	-1.628	-0.219	-1.016	-0.283	-0.686	-3.738
Singerei (SI)	-0.161	0.168	-0.451	0.230	0.314	0.000	-0.040	0.060
Soroca (SO)	0.013	-0.070	-0.390	-0.091	0.398	0.010	-0.211	-0.341
Straseni (ST)	0.062	0.155	-0.972	-0.007	-0.910	-0.066	-0.064	-1.802
Stefan Voda (SV)	0.069	0.262	-1.492	-0.267	0.070	-0.267	-0.147	-1.772
Taraclia (TA)	0.119	-0.122	0.192	0.066	0.153	0.223	-0.379	0.253
Telenesti (TE)	0.002	0.072	-0.790	-0.165	-0.769	-0.709	-0.148	-2.508
Ungheni (UN)	0.031	0.262	-0.081	-0.342	-0.344	-0.215	-0.078	-0.766

Source: Author's calculations based on NAPH and NBS data

Note: Life expectancy at birth in Moldova in 2014-2016 is 65.2 in males and 73.7 in females

Annexe 5. Contributions of mortality by main age groups and causes of death to the difference in life expectancy at birth between the most lagging districts and the municipality of Chisinau, 2012-2016, by sex

Age	**Infec-tious diseases**	**Neo-plasms**	**Circula-tory system**	**Respira-tory system**	**Diges-tive system**	**Exter-nal causes**	**Other causes**	**Total**
MALES								
0	-0.040	-0.008	0.000	-0.084	-0.012	-0.029	-0.213	-0.386
1-4	0.004	-0.021	0.003	-0.013	-0.004	-0.035	-0.035	-0.100
5-9	0.003	0.015	0.000	0.005	-0.003	-0.065	-0.008	-0.054
10-14	0.004	0.002	0.005	-0.002	0.000	-0.009	-0.003	-0.003
15-19	0.000	-0.008	-0.010	-0.010	-0.003	-0.115	0.005	-0.141
20-24	0.000	-0.027	0.001	-0.010	-0.020	-0.191	-0.026	-0.272
25-29	-0.006	-0.004	-0.022	-0.019	-0.022	-0.180	-0.026	-0.280
30-34	-0.035	-0.037	-0.037	-0.012	-0.029	-0.150	-0.030	-0.330
35-39	-0.006	-0.054	-0.087	-0.038	-0.088	-0.236	-0.036	-0.546
40-44	-0.042	-0.063	-0.068	-0.051	-0.143	-0.211	-0.067	-0.646
45-49	-0.022	-0.061	-0.131	-0.083	-0.136	-0.200	-0.058	-0.690
50-54	-0.001	-0.064	-0.109	-0.071	-0.169	-0.128	-0.061	-0.602
55-59	-0.004	-0.056	-0.035	-0.083	-0.138	-0.086	-0.036	-0.439
60-64	0.006	-0.006	-0.100	-0.062	-0.140	-0.050	-0.032	-0.384
65-69	0.003	-0.031	-0.256	-0.024	-0.097	-0.035	-0.012	-0.453
70-74	0.001	0.000	-0.272	-0.030	-0.045	-0.004	-0.003	-0.353
75-79	0.003	0.037	-0.253	-0.029	-0.018	-0.007	0.009	-0.258
80-84	0.000	0.039	-0.121	-0.011	0.001	-0.001	0.002	-0.090
85 and over	0.001	0.033	-0.075	-0.007	0.004	0.000	0.001	-0.045
Total	*-0.130*	*-0.313*	*-1.570*	*-0.635*	*-1.061*	*-1.732*	*-0.629*	*-6.069*

Age	Infec-tious diseases	Neo-plasms	Circula-tory system	Respira-tory system	Diges-tive system	Exter-nal causes	Other causes	Total
				FEMALES				
0	-0.003	-0.005	0.004	-0.049	-0.008	-0.028	-0.197	-0.286
1-4	-0.017	-0.012	0.007	-0.006	-0.012	-0.059	-0.048	-0.147
5-9	0.004	0.004	-0.005	-0.013	-0.005	0.002	-0.031	-0.046
10-14	0.000	-0.005	0.000	-0.015	0.005	-0.075	-0.010	-0.100
15-19	0.003	0.006	0.002	-0.005	-0.004	-0.053	-0.007	-0.058
20-24	-0.001	0.000	-0.010	0.003	-0.014	-0.082	-0.006	-0.111
25-29	0.004	-0.027	-0.014	-0.001	-0.004	-0.047	-0.040	-0.128
30-34	-0.012	-0.043	-0.012	-0.006	-0.071	-0.035	-0.011	-0.190
35-39	-0.010	-0.019	-0.066	-0.014	-0.086	-0.065	-0.023	-0.283
40-44	0.004	0.010	-0.059	-0.005	-0.142	-0.033	-0.029	-0.253
45-49	-0.012	-0.100	-0.087	-0.034	-0.240	-0.059	-0.026	-0.559
50-54	-0.004	-0.087	-0.124	-0.032	-0.255	-0.059	-0.034	-0.596
55-59	-0.001	0.014	-0.282	-0.018	-0.304	-0.047	-0.034	-0.672
60-64	0.002	0.024	-0.286	0.000	-0.209	-0.026	-0.006	-0.502
65-69	0.004	0.024	-0.505	-0.012	-0.143	-0.006	-0.014	-0.653
70-74	0.002	0.045	-0.522	-0.023	-0.123	-0.014	-0.006	-0.641
75-79	0.000	0.052	-0.509	-0.015	-0.059	-0.009	-0.010	-0.551
80-84	0.003	0.049	-0.266	-0.015	0.006	-0.008	0.009	-0.222
85 and over	0.001	0.035	-0.274	-0.016	-0.003	-0.004	0.000	-0.261
Total	*-0.033*	*-0.036*	*-3.008*	*-0.277*	*-1.671*	*-0.709*	*-0.524*	*-6.259*

Source: Author's calculations based on NAPH and NBS data

Note: the most lagging regions have life expectancy at age 25 less than 40.0 years in males (11 districts) and less than 47.5 years in females (9 districts).

Annexe 6. Standardised mortality rates (indirect method) from seven main groups of causes of death and confidence intervals (CI, 95%), 2012-2016, by districts and sex (per 100,000)

A) Infectious diseases, neoplasms, diseases of the circulatory system and diseases of the respiratory system

Administrative units	Infectious diseases	Neoplasms	Circulatory system	Respiratory system
MALES				
Anenii Noi (AN)	26.17 (12.04-49.47)	296.2 (237.96-364.37)	930.17 (809.57-1063.66)	90.73 (59.05-133.3)
Balti (BA)	54.5 (35.01-80.91)	398.87 (338.41-467.02)	957.17 (854.28-1069.04)	96.56 (67.68-133.58)
Basarabeasca (BS)	46 (13.74-112.32)	341.2 (233.37-481.64)	1140.7 (915.15-1404.96)	71.38 (26.96-152.74)
Briceni (BR)	18.61 (6.6-41.33)	250.68 (199.02-311.65)	789.59 (700.8-886.52)	143.85 (106.15-190.58)
Cahul (CA)	21.97 (10.52-40.45)	297.71 (246.53-356.39)	983.16 (878.33-1097.07)	114.09 (82.75-153.38)
Calarasi (CL)	32.34 (15-60.83)	286.85 (225.54-359.69)	1178.04 (1041.88-1327.05)	135.35 (93.99-188.69)
Cantemir (CT)	32.97 (13.54-67.02)	292.24 (220.52-379.82)	1160.23 (996.19-1343.56)	109.67 (67.15-169.01)
Causeni (CS)	27.12 (12.63-50.85)	291.49 (235.02-357.44)	1120.08 (993.21-1258.67)	124.08 (87.31-171.09)
Chisinau (CU)	24.32 (19.23-30.35)	287.49 (266.43-309.77)	856.92 (816.33-899)	59.78 (50.33-70.5)
Cimislia (CM)	26.86 (9.47-59.83)	347.86 (272.71-437.32)	990.82 (850.49-1147.7)	116.19 (73.69-174.23)
Criuleni (CR)	33.01 (16.11-59.92)	286.23 (223.93-360.49)	1089.37 (945.16-1249.36)	138.47 (95.54-194.08)
Donduseni (DO)	22.8 (5.94-59.7)	305.63 (231.74-395.58)	964.9 (836.32-1107.65)	153.43 (103.06-219.81)
Drochia (DR)	20.67 (8.09-43.29)	322.38 (265.74-387.53)	798.36 (710.08-894.58)	144.04 (107.28-189.34)
Dubasari (DU)	25.33 (6.01-69.43)	279.74 (190.69-395.96)	1228.91 (1002.6-1491.04)	91.13 (43-169.43)
Edinet (ED)	17.94 (6.38-39.78)	247.42 (197.55-306.06)	869.63 (777-970.27)	112.28 (79.84-153.47)
Falesti (FA)	32.93 (16.65-58.36)	298.08 (242.14-363.06)	1047.7 (938-1166.71)	120.11 (85.67-163.77)
Floresti (FL)	33.5 (16.93-59.39)	288.97 (234.16-352.75)	1124.78 (1010.23-1248.76)	106.18 (73.83-147.87)
Gagauzia (GA)	21.52 (11.17-37.46)	340.72 (292.61-394.47)	986.88 (895.04-1085.58)	100.13 (74.35-131.96)
Glodeni (GL)	25.01 (8.87-55.54)	276.1 (211.66-353.97)	1022.92 (892.58-1166.94)	143.87 (98.39-203.1)

Administrative units	Infectious diseases	Neoplasms	Circulatory system	Respiratory system
Hincesti (HI)	31.8 (17.31-53.5)	271.07 (222.87-326.59)	1070.59 (964.5-1185.16)	99.44 (70.65-136.03)
Ialoveni (IA)	31.26 (16.57-53.6)	299.9 (243.25-365.79)	1114.35 (985.98-1254.78)	78.08 (50.22-115.81)
Leova (LE)	26.49 (8.9-60.64)	319 (240.89-414.35)	1136.81 (971.77-1321.85)	102.36 (60.12-162.84)
Nisporeni (NI)	21.81 (7.15-50.63)	288.64 (221.55-369.65)	1084.13 (939.16-1245.13)	189.92 (135.4-259.05)
Ocnita (OC)	23.96 (7.87-55.55)	303.55 (235.08-385.73)	929.12 (807.02-1064.47)	89.44 (54.23-138.87)
Orhei (OR)	22.97 (11.28-41.55)	342.63 (287.66-405.05)	1259.31 (1139.28-1388.55)	130.96 (97.18-172.68)
Rezina (RE)	32.3 (12.46-68.26)	249.67 (181.05-335.71)	1217.51 (1045.3-1410)	161.1 (106.28-234.16)
Riscani (RI)	18.57 (5.88-43.94)	277.86 (218.96-347.73)	900.36 (794.23-1016.71)	110.49 (74.91-157.09)
Singerei (SI)	28.72 (13.69-53.04)	267.76 (213.37-331.79)	1155.11 (1032.15-1288.69)	43.14 (23.12-73.38)
Soldanesti (SD)	39.53 (15.32-83.27)	291.16 (211.03-391.66)	1218.97 (1036.97-1423.7)	115.11 (66.78-184.78)
Soroca (SO)	36.07 (19.01-62.1)	310.75 (254.59-375.6)	1084.31 (972.36-1205.61)	142.74 (105.09-189.46)
Stefan Voda (SV)	11.92 (2.69-33.43)	260.13 (201.15-330.99)	1135.41 (992.97-1292.54)	131.14 (89.22-185.92)
Straseni (ST)	21.34 (9.02-42.62)	253.16 (200.64-315.22)	1173.85 (1041.76-1318.06)	93.75 (62.17-135.68)
Taraclia (TA)	12.18 (1.5-43.74)	348.09 (261.2-454.61)	1061.44 (890.02-1256.26)	128.54 (77-201.43)
Telenesti (TE)	30.62 (13.32-60.03)	320.27 (252.59-400.5)	1066.59 (930.46-1217.03)	131.79 (89.45-187.21)
Ungheni (UN)	23.99 (11.79-43.35)	295.64 (243.09-356.17)	919.43 (819.01-1028.75)	159.77 (121.87-205.72)
FEMALES				
Anenii Noi (AN)	5.99 (0.84-20.51)	175.64 (136.52-222.48)	669.47 (590.07-756.56)	21.93 (9.71-42.51)
Balti (BA)	24.7 (13.37-41.72)	230.06 (193.38-271.68)	593.61 (535.69-656.08)	26.87 (15.45-43.42)
Basarabeasca (BS)	8.08 (0.1-52.03)	204.47 (132.48-301.49)	790.35 (646.01-957.32)	28.31 (6.77-77.26)
Briceni (BR)	5.31 (0.55-20.3)	134.81 (103.93-171.99)	599.74 (543.02-660.78)	57.43 (38.91-81.69)
Cahul (CA)	6.9 (1.63-18.96)	155.29 (123.86-192.28)	703.72 (635.52-777.24)	29.14 (16.53-47.57)
Calarasi (CL)	9.9 (1.91-29.82)	149.79 (111.11-197.58)	838.16 (745.44-939.21)	64.61 (40.18-98.38)

Administrative units	Infectious diseases	Neoplasms	Circulatory system	Respiratory system
Cantemir (CT)	5.56 (0.24-27.42)	184.49 (133.33-248.79)	818.32 (706.69-942.56)	25.98 (9.55-56.52)
Causeni (CS)	10.13 (2.67-26.39)	154.09 (118.98-196.33)	789.71 (706.86-879.6)	28.46 (14.55-50.03)
Chisinau (CU)	7.15 (4.71-10.42)	173.59 (159.94-188.08)	519.27 (495.47-543.91)	17.25 (13.16-22.21)
Cimislia (CM)	14.01 (2.7-42.22)	175.18 (127.99-234.07)	829.49 (721.23-949.4)	27.58 (10.83-57.66)
Criuleni (CR)	8.57 (1.67-25.71)	149.84 (111.11-197.7)	788.61 (694.24-892.21)	24 (10.27-47.56)
Donduseni (DO)	1.04 (0-21.29)	127.56 (89.81-175.82)	735.39 (653.31-824.93)	51.29 (29.3-83.29)
Drochia (DR)	7.07 (1.25-22.08)	138.3 (108.09-174.33)	581.15 (525.25-641.38)	72.07 (51.44-98.2)
Dubasari (DU)	4.46 (0.02-34.87)	131.18 (78.49-205.75)	855.83 (707.05-1026.65)	27.49 (7.21-71.74)
Edinet (ED)	6.16 (0.88-20.9)	123.69 (94.87-158.52)	636.92 (577.86-700.37)	40.71 (25.51-61.62)
Falesti (FA)	6.78 (1.18-21.27)	119.1 (89.8-154.91)	756.37 (685.43-832.66)	25.32 (13.16-44)
Floresti (FL)	5.82 (0.82-19.91)	143.13 (111.13-181.46)	783.94 (712.58-860.5)	22.49 (11.23-40.19)
Gagauzia (GA)	5.42 (1.27-14.9)	166.37 (137.92-198.94)	671.8 (614.55-732.95)	30.62 (19.2-46.35)
Glodeni (GL)	8.73 (1.22-29.91)	136.79 (99.33-183.72)	709.39 (629.29-796.87)	41.97 (23.07-70.11)
Hincesti (HI)	6.98 (1.44-20.37)	148.14 (116.75-185.37)	801.87 (728.05-881.15)	24.55 (12.84-42.49)
Ialoveni (IA)	5.29 (0.75-18.03)	155.09 (119.04-198.62)	761.51 (676.35-854.44)	25.16 (12.07-46.21)
Leova (LE)	9.28 (0.94-35.61)	160.37 (112.13-222.32)	824.26 (712.17-948.99)	15.55 (3.71-42.48)
Nisporeni (NI)	7.43 (0.64-30.08)	140.05 (98.4-193.35)	786.71 (685.99-898.06)	49.57 (26.3-84.95)
Ocnita (OC)	7.26 (0.74-27.86)	130.81 (94.99-175.69)	652.12 (578.78-732.18)	35.26 (18.54-60.8)
Orhei (OR)	5.82 (1.12-17.53)	164.87 (132.23-203.12)	836.05 (761.39-916.06)	25.71 (13.92-43.42)
Rezina (RE)	2.92 (0.01-23.68)	129.75 (87.05-186.05)	912.77 (795.46-1042.5)	36.56 (16.05-71.25)
Riscani (RI)	5.46 (0.45-22.46)	124.97 (92.65-164.93)	691.47 (621.97-766.6)	42.7 (25.4-67.29)
Singerei (SI)	11.24 (3.19-28.15)	132.4 (100.19-171.68)	736.02 (662.07-815.97)	12.55 (4.41-28.03)
Soldanesti (SD)	8.02 (0.51-35.62)	140.49 (93.79-202.24)	872.9 (756.04-1002.69)	32.94 (13.1-68.33)
Soroca (SO)	7.89 (1.65-22.91)	150 (117.71-188.41)	744.73 (676.94-817.47)	39.79 (24.4-61.27)

Administrative units	Infectious diseases	Neoplasms	Circulatory system	Respiratory system
Stefan Voda (SV)	4.78 (0.3-21.29)	117.3 (83.23-160.63)	857.14 (759.96-963.3)	31.89 (15.43-58.23)
Straseni (ST)	4.37 (0.37-17.75)	138.02 (103.98-179.63)	768.64 (684.6-860.14)	26.61 (12.99-48.3)
Taraclia (TA)	3.35 (0.01-27.09)	141.03 (95.48-200.75)	687.58 (585.77-802)	25.05 (8.59-56.68)
Telenesti (TE)	5.92 (0.49-24.28)	138.65 (99.77-187.64)	777.87 (685.26-879.51)	33.86 (16.5-61.51)
Ungheni (UN)	6.35 (1.32-18.46)	138.63 (107.87-175.43)	705.61 (636.69-779.95)	63.31 (43.45-89.11)

B). Digestive diseases, external causes, other causes and all causes

Administrative units	Digestive system	External causes	Other causes	All causes
MALES				
Anenii Noi (AN)	158.99 (117.96-209.67)	179.46 (137.02-230.88)	60.53 (36.69-94.01)	1769.55 (1612.71-1937.53)
Balti (BA)	136.07 (102.2-177.56)	179.36 (141.47-224.27)	76.38 (52.23-107.83)	1930.21 (1789.04-2079.57)
Basarabeasca (BS)	179.3 (105.09-285.65)	233.39 (147.59-350.8)	92.82 (41-180.2)	2125.26 (1825.78-2459.84)
Briceni (BR)	110.78 (77.3-153.81)	179.41 (135.32-233.28)	64.19 (39.14-99.25)	1544.48 (1416.01-1681.48)
Cahul (CA)	192.5 (152.53-239.74)	164.18 (128.52-206.66)	65.8 (43.65-95.21)	1858.23 (1720.31-2004.27)
Calarasi (CL)	237.18 (182.51-303.09)	173.17 (127.95-229.18)	91.83 (59.52-135.35)	2144.65 (1965.39-2335.86)
Cantemir (CT)	180.56 (126.42-250.02)	261.81 (198.02-339.6)	90.23 (54.18-141.16)	2158.76 (1945.15-2389.41)
Causeni (CS)	161.37 (120.65-211.4)	185.52 (142.58-237.32)	70.3 (44.84-104.95)	1986.14 (1825-2157.7)
Chisinau (CU)	112.58 (99.86-126.47)	113.58 (101.74-126.42)	47.84 (39.95-56.83)	1504.9 (1454.21-1556.91)
Cimislia (CM)	167.84 (117.48-232.46)	252.85 (190-329.83)	106.71 (67.2-160.9)	2037.13 (1840.43-2249.12)
Criuleni (CR)	173.61 (127.2-231.4)	194.39 (147.7-251.14)	55.43 (31.65-90.05)	1991.86 (1810.23-2186.78)
Donduseni (DO)	96.86 (57.19-153.46)	208.19 (145.81-288.21)	87.89 (49.81-143.57)	1825.66 (1642.36-2023.82)
Drochia (DR)	153.85 (115.36-201.06)	195.11 (150.52-248.75)	123.43 (89.08-166.64)	1741.68 (1608.13-1883.37)

Administrative units	Digestive system	External causes	Other causes	All causes
Dubasari (DU)	197.52 (125.56-295.66)	203.1 (133.01-296.95)	79.28 (37.78-146.41)	2110.03 (1832.09-2418.21)
Edinet (ED)	127.21 (92.02-171.4)	195.08 (149.96-249.51)	69.35 (43.89-104.16)	1630.16 (1500.04-1768.54)
Falesti (FA)	155.86 (116.5-204.23)	134.09 (98.2-178.8)	53.3 (31.72-83.92)	1842.2 (1697.51-1995.92)
Floresti (FL)	133.84 (97.68-178.99)	221.09 (173.94-277.07)	72.77 (46.81-107.94)	1983.33 (1832.47-2143.31)
Gagauzia (GA)	189.08 (154.28-229.37)	161.3 (129.78-198.16)	71.89 (51.26-98.05)	1892.61 (1770.75-2020.64)
Glodeni (GL)	118.4 (77.9-172.46)	170.93 (121.52-233.69)	116.09 (75.8-170.13)	1874.94 (1698.41-2064.84)
Hincesti (HI)	233.29 (189.21-284.56)	237.41 (193.76-287.94)	83.65 (58.42-116.07)	2051.36 (1909.04-2201.47)
Ialoveni (IA)	161.7 (121.96-210.24)	170.96 (132.27-217.43)	49.19 (29.24-77.54)	1906.41 (1749.97-2073.08)
Leova (LE)	176.43 (120.76-248.9)	239.99 (175.97-319.69)	68.58 (36.27-117.77)	2087.92 (1871.48-2322.52)
Nisporeni (NI)	213.93 (157.46-284.06)	189.96 (137.94-255.14)	95.78 (59.88-145.27)	2103.4 (1907.15-2314.35)
Ocnita (OC)	177.26 (125.92-242.52)	163.07 (113.33-227.19)	65.79 (35.65-111.02)	1749.68 (1579.46-1933.25)
Orhei (OR)	249.6 (203.95-302.41)	195.81 (156.91-241.42)	55.97 (35.72-83.52)	2269.2 (2116.08-2430.47)
Rezina (RE)	234.09 (169.06-315.85)	208.51 (149.26-283.44)	55.2 (26.46-101.43)	2168.89 (1947.09-2409.03)
Riscani (RI)	156.49 (113.04-211.11)	191.68 (142.63-252.15)	84.1 (53.02-126.71)	1732.24 (1581.88-1893.04)
Singerei (SI)	107.86 (74.89-150.39)	169.78 (128.84-219.61)	61.03 (37.53-93.75)	1824.52 (1673.85-1985.1)
Soldanesti (SD)	211.64 (145.51-297.49)	231.36 (163.42-318.01)	122.93 (73.86-192.2)	2249.28 (2007.86-2511.73)
Soroca (SO)	148.83 (111.14-195.19)	175.17 (134.07-224.91)	82.35 (54.77-118.91)	1984.3 (1834.66-2142.89)
Stefan Voda (SV)	132.76 (92.29-184.92)	233.5 (179.56-298.55)	91.61 (58.91-135.9)	2003.07 (1822.52-2196.67)
Straseni (ST)	211.75 (164.81-267.88)	179.84 (138.13-230.18)	48.85 (28.17-78.76)	1978.13 (1816.22-2150.61)
Taraclia (TA)	133.82 (82.97-204.24)	166.93 (110.04-242.77)	81.06 (42.49-140.05)	1939.78 (1715.36-2185.41)
Telenesti (TE)	223.7 (168.77-290.78)	233.65 (178.98-299.74)	71.92 (42.73-113.41)	2107.52 (1921.57-2306.6)

Administrative units	Digestive system	External causes	Other causes	All causes
FEMALES				
Anenii Noi (AN)	117.84 (86.17-157.34)	52.47 (31.87-81.37)	46.04 (27.1-73.12)	1090.67 (988.7-1200.3)
Balti (BA)	87.17 (65-114.46)	33.73 (20.3-52.67)	46.97 (30.99-68.25)	1044.03 (965.31-1127.45)
Basarabeasca (BS)	76.57 (35.38-144.37)	39.43 (11.38-98.03)	61.27 (24.03-128.18)	1221.41 (1036.11-1430.28)
Briceni (BR)	74.29 (51.17-104.27)	38.27 (21.15-63.69)	31.76 (17.1-53.83)	970.04 (891.83-1053.27)
Cahul (CA)	105.38 (79.65-136.78)	36.6 (21.91-57.37)	40.49 (25.12-61.77)	1082.41 (996.69-1173.53)
Calarasi (CL)	175.38 (132.68-227.44)	44.04 (23.57-74.99)	51.38 (29.55-83.03)	1342.03 (1221.74-1470.96)
Cantemir (CT)	154.41 (107.71-214.46)	68.37 (38.44-112.35)	48.78 (24.69-86.38)	1308.15 (1165.21-1463.78)
Causeni (CS)	114.62 (84.42-152.11)	44.28 (25.95-70.55)	45.46 (27.1-71.5)	1190.06 (1087.5-1299.69)
Chisinau (CU)	63.21 (55.12-72.15)	27.62 (22.48-33.6)	33.07 (27.28-39.72)	838.72 (808.49-869.79)
Cimislia (CM)	147.94 (104.07-204.05)	101.64 (64.08-153.12)	59.66 (32.43-100.46)	1355.7 (1215.16-1508.02)
Criuleni (CR)	136.61 (99.8-182.53)	54.24 (32.17-85.65)	30.37 (14.65-55.57)	1188.7 (1073.08-1313.37)
Donduseni (DO)	49.48 (26.47-84.27)	49.68 (24.58-89.35)	43.21 (21.55-77.32)	1108.43 (999.66-1225.81)
Drochia (DR)	99.83 (73.68-132.24)	41.62 (24.25-66.59)	89.91 (64.54-121.94)	1029.72 (949.96-1114.39)
Dubasari (DU)	127.84 (75.97-201.55)	39.94 (14.07-89.04)	24.74 (5.95-67.37)	1205.28 (1028.99-1403.1)
Edinet (ED)	80.01 (56.52-109.97)	48.58 (29.42-75.52)	46.7 (28.79-71.6)	1007.2 (927.57-1091.84)
Falesti (FA)	106.75 (78.63-141.66)	29.63 (15.3-51.74)	38.96 (22.61-62.52)	1110.81 (1020.92-1206.49)
Floresti (FL)	104.33 (76.76-138.57)	51.27 (31.61-78.59)	36.55 (20.89-59.34)	1174.09 (1082.59-1271.25)
Gagauzia (GA)	98.67 (76.89-124.69)	30.44 (18.59-47)	56.28 (39.97-77)	1066.74 (993.2-1144.28)
Glodeni (GL)	91.87 (61.08-132.71)	37.11 (17.81-68.16)	56.92 (32.94-91.54)	1106.71 (1000.79-1220.79)
Hincesti (HI)	171.12 (136.65-211.64)	69.2 (47.28-97.76)	45.03 (28.16-68.27)	1273 (1177.89-1373.75)
Ialoveni (IA)	135.69 (102.24-176.57)	47.32 (28.78-73.3)	35.59 (19.91-58.69)	1158.87 (1054.75-1270.49)

Administrative units	Digestive system	External causes	Other causes	All causes
Leova (LE)	170.58 (120.1-235.1)	51.49 (25.18-93.36)	47.83 (23.22-87.16)	1286.98 (1143.63-1443.33)
Nisporeni (NI)	179.22 (130.87-239.57)	78.26 (46.62-123.18)	59.01 (32.86-97.64)	1303.4 (1170.19-1447.63)
Ocnita (OC)	77.1 (49.6-114.33)	41.58 (20.89-74.02)	50.21 (27.71-83.63)	1020.24 (922.07-1126.02)
Orhei (OR)	206.62 (169.63-249.29)	48.39 (31.04-71.92)	34.64 (20.41-54.97)	1328.29 (1232.71-1429.31)
Rezina (RE)	177.79 (126.69-242.61)	48.29 (23.26-88.45)	47.29 (22.85-86.44)	1366.51 (1219.84-1525.96)
Riscani (RI)	77.94 (52.24-111.85)	40.17 (21.29-68.9)	41.6 (23.19-68.77)	1059.1 (967.15-1157.44)
Singerei (SI)	76.83 (52.55-108.44)	39.3 (22.18-64.4)	38.47 (22.07-62.29)	1066.77 (974.52-1165.39)
Soldanesti (SD)	192.09 (136-263.55)	64.88 (33.4-113.55)	73.97 (40.68-123.5)	1395.02 (1241.86-1561.86)
Soroca (SO)	78.49 (55.22-108.24)	40.87 (23.76-65.49)	56.17 (36.27-83.05)	1143.11 (1054.75-1236.89)
Stefan Voda (SV)	94.79 (64.28-134.76)	50.08 (28.18-82.25)	64.28 (39.27-99.23)	1224.27 (1106.93-1350.67)
Straseni (ST)	165.17 (127.5-210.48)	42.7 (24.54-69.04)	42.05 (24.38-67.53)	1189.13 (1083.93-1301.78)
Taraclia (TA)	98.63 (60.76-151.3)	32.91 (12.34-70.71)	67.58 (36.36-114.63)	1067.86 (936.7-1212.24)
Telenesti (TE)	170.55 (126.78-224.54)	70.74 (43.24-109.16)	41.41 (21.53-71.95)	1244.92 (1124.59-1374.61)
Ungheni (UN)	134.64 (104.19-171.21)	50.94 (32.86-75.39)	51.58 (33.66-75.64)	1155.63 (1065.32-1251.55)

Source: Author’s calculations based on NAPH and NBS data

Annexe 7. Standardised death rates (direct method) by main age groups, 2012-2016, by districts and sex (per 100,000)

Administrative units	Less than 1 year	1-19 years	20-44 years	45-64 years	65 years and over	All ages (95% CI)
MALES						
Anenii Noi (AN)	834.99	50.33	360.23	2090.51	8633.47	1720.65 (1558.1-1894.7)
Balti (BA)	1109.45	40.66	432.17	2345.43	9154.15	1878.29 (1737.8-2026.9)
Basarabeasca (BS)	2500	43.38	540.81	2576.2	9546.41	2045.22 (1748.2-2377.1)
Briceni (BR)	1148.04	73.62	312.48	1812.62	8047.06	1568.72 (1436.7-1709.5)
Cahul (CA)	938.97	75.28	342.81	2163.85	9297.33	1817.72 (1678.1-1965.5)
Calarasi (CL)	1271.39	71.64	484.63	2574.49	10291.1	2100.25 (1922.3-2290)
Cantemir (CT)	1971.01	60.51	474.64	2637.05	9822.44	2066.57 (1854.3-2295.8)
Causeni (CS)	1212.12	45.51	412.29	2301.1	9932	1950.42 (1785.2-2126.3)
Chisinau (CU)	780.32	30.79	243.02	1844.85	7648.78	1491.9 (1439.7-1545.5)
Cimislia (CM)	979.02	90.72	560.45	2536.13	9033.42	1973.84 (1779.6-2183.2)
Criuleni (CR)	921.31	64.82	360.44	2475.77	9311.91	1909.23 (1723-2109.1)
Donduseni (DO)	1505.38	58.6	515.87	2089.94	9206.82	1853.73 (1665.2-2057.5)
Drochia (DR)	841.12	83.71	367.5	2085.14	8870.05	1756.74 (1621.4-1900.3)
Dubasari (DU)	849.06	93.07	409.99	2363.73	10958	2090.78 (1791-2423.2)
Edinet (ED)	1173.33	77.45	314.5	1886.86	8482.94	1641.12 (1509.4-1781.2)
Falesti (FA)	1122.24	68.07	397.31	2201.48	9218.63	1839.71 (1694.5-1994)
Floresti (FL)	1405.9	64.58	401.89	2416.64	9742.27	1963.63 (1813.3-2123)

Administrative units	**Less than 1 year**	**1-19 years**	**20-44 years**	**45-64 years**	**65 years and over**	**All ages (95% CI)**
Gagauzia (GA)	1212.84	60.43	378.07	2177.06	9496.41	1857.2 (1733.7-1987)
Glodeni (GL)	1708.19	69.73	358.21	2182.9	9596.16	1871.52 (1694.7-2061.7)
Hincesti (HI)	1348.31	48.68	522.77	2601.36	9074.32	1977.79 (1837.8-2125.4)
Ialoveni (IA)	914.63	70.81	369.71	2196.92	9573.59	1867.01 (1703.7-2041)
Leova (LE)	1126.76	105.76	451.76	2505.71	9892.88	2029.61 (1813.8-2263.5)
Nisporeni (NI)	1440.92	52.36	444.63	2617.81	9876.12	2047.72 (1853.1-2257)
Ocnita (OC)	1809.52	57.64	437.39	1970.11	8877.11	1757.86 (1586.3-1942.9)
Orhei (OR)	1025.64	73.27	508.47	2688.81	10705.67	2185.24 (2032.2-2346.4)
Rezina (RE)	1445.78	68.98	495.54	2552.82	10273.52	2097.89 (1878.1-2335.9)
Riscani (RI)	1424.15	86.72	332.35	1938.21	9110.53	1739.14 (1587.6-1901.2)
Singerei (SI)	1154.56	57	389.38	2058.9	9271	1801.36 (1650.8-1961.9)
Soldanesti (SD)	1941.75	57.45	514.11	2691.82	10622.57	2186.78 (1948-2446.3)
Soroca (SO)	1570.44	61.45	386.52	2381.85	9868.49	1964.28 (1814.8-2122.7)
Stefan Voda (SV)	1024.39	74.63	423.45	2358	9712.35	1949.31 (1765.2-2146.7)
Straseni (ST)	863.04	55.4	449.89	2374.7	9280.76	1907.58 (1743.4-2082.4)
Taraclia (TA)	1224.49	56.37	291.91	2196.5	10362.57	1929.57 (1699.4-2181.5)
Telenesti (TE)	1170.21	41.59	491.03	2722.84	9461.39	2040.14 (1856.2-2237.1)
Ungheni (UN)	1093.53	42.84	368.27	2286.62	9385.05	1865.46 (1724.8-2014.4)

Administrative units	Less than 1 year	1-19 years	20-44 years	45-64 years	65 years and over	All ages (95% CI)
FEMALES						
Anenii Noi (AN)	487.8	41.93	154.37	941.77	6636.97	1093.18 (990.8-1203.2)
Balti (BA)	751.88	22.92	161.81	896.39	6166.95	1028.51 (950.6-1111.1)
Basarabeasca (BS)	2272.73	36.36	159.25	1107.93	7092.86	1214.8 (1026.9-1426.7)
Briceni (BR)	679.01	29.77	101.28	628.18	5589.33	866.81 (790.5-948)
Cahul (CA)	686.43	24.06	155.73	852.44	6695.85	1074.23 (989-1164.8)
Calarasi (CL)	1096.61	45.84	172.53	1327.23	7673.58	1333.75 (1213.4-1462.7)
Cantemir (CT)	1011.9	35.72	159.68	1249.54	7641.2	1300.48 (1157.9-1455.8)
Causeni (CS)	962.34	43.3	150.53	927.06	7441.98	1186.46 (1083.9-1296.1)
Chisinau (CU)	676	17.3	86.58	698.78	5282.18	842.76 (812.2-874.2)
Cimislia (CM)	1481.48	43.85	305.28	1259.18	7763.79	1378.39 (1232.8-1536.2)
Criuleni (CR)	747.25	45.41	123.15	1173.15	7029.22	1194.7 (1078.3-1320.2)
Donduseni (DO)	1302.33	27.62	105.17	764.88	6324.97	997.83 (891.8-1112.3)
Drochia (DR)	736.84	30.77	142.6	705.88	5922.38	942.52 (864.9-1024.9)
Dubasari (DU)	869.57	32.15	154.11	921.97	7862.84	1230.85 (1049.2-1434.6)
Edinet (ED)	795.45	33.64	111.37	723.21	5761.8	918.88 (841.4-1001.2)
Falesti (FA)	1033.71	22.96	141.71	831.19	6653.66	1062.63 (974.7-1156.3)
Floresti (FL)	1015.45	26.89	120.49	1008.14	6866.6	1128.75 (1038.6-1224.5)
Gagauzia (GA)	793.27	50.27	127.81	737.55	6810.24	1052.87 (979.9-1129.8)

Administrative units	Less than 1 year	1-19 years	20-44 years	45-64 years	65 years and over	All ages (95% CI)
Glodeni (GL)	1357.14	25.26	142.07	904.09	6400.96	1058.59 (953.4-1171.9)
Hincesti (HI)	1157.32	40.49	173.82	1252.11	7252.53	1264.77 (1169.6-1365.6)
Ialoveni (IA)	1003.13	34.44	135.6	1060.57	7059.08	1172.4 (1066.7-1285.7)
Leova (LE)	729.93	48.31	194.03	1308.95	7206.44	1278.85 (1135.6-1435.1)
Nisporeni (NI)	714.29	56.17	195.13	1312.52	7367.02	1300.26 (1166.3-1445.3)
Ocnita (OC)	1333.33	60.01	109.92	720.71	5987.2	956.52 (858.1-1062.6)
Orhei (OR)	851.79	46.65	154.32	1313.9	7686	1321.86 (1226.5-1422.6)
Rezina (RE)	1693.55	42.14	174.23	1342.03	7791.58	1358.83 (1212.4-1518.1)
Riscani (RI)	552.15	44.4	109.83	719.96	6238.42	971.41 (882.3-1066.7)
Singerei (SI)	1184.92	35.83	134.36	883.56	6275.14	1035.9 (945-1133.1)
Soldanesti (SD)	1502.35	49.71	159.3	1427.95	7854.82	1383.59 (1229.2-1551.8)
Soroca (SO)	937.5	28.07	132.95	936.55	6719.17	1095.93 (1008.6-1188.7)
Stefan Voda (SV)	1019.83	49.32	162	1007.29	7499	1221.45 (1104.1-1347.9)
Straseni (ST)	1193.49	24.44	172.77	1148.28	6874.37	1189.15 (1083.8-1302)
Taraclia (TA)	1300	38.31	88.4	811.63	6593.11	1037.77 (909-1179.5)
Telenesti (TE)	1432.36	46.47	157.36	1178.55	7199.44	1237.3 (1116.8-1367.2)
Ungheni (UN)	1032.45	38.73	127.17	1038.4	6806.03	1135.55 (1046.3-1230.3)

Source: Author's calculations based on NAPH and NBS data

Annexes are also available on https://github.com/PeninaOlga