TENDENCIES OF MORTALITY AND LIFE EXPECTANCY IN UKRAINE BEFORE THE RUSSIAN FULL SCALE MILITARY INVASION

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ABSTRACT

The ambivalence of mortality and life expectancy dynamics in Ukraine is a significant and complex demographic problem. Our aim is to examine the last tendencies of mortality and life expectancy, analyse the level and dynamics of mortality by major causes of death before the Russian military invasion of Ukraine. This analysis constitutes a base for the further comparative estimation of demographic losses due to the war. Trends of sex- and age-specific mortality are considered. Specific characteristics of mortality in urban and rural settlements are analysed. We use the following methods: demographic rates, standardized death rates (European standard population), life tables, decomposition method, descriptive statistics, graphic method. Our findings suggest that following a period of growth in life expectancy (2009-2013) a period of fluctuation and stagnation (2014-2019) has started in Ukraine under the influence of political-military and economic factors. Beginning with 2020, life expectancy was additionally influenced by COVID-19. Non-communicable diseases are among significant contributors to premature adult mortality in Ukraine. However, the excessive share of deaths (especially among men) is also related to external causes. The dynamics of mortality from cardiovascular diseases show a general trend of decline over the past fifteen years, however with fluctuations in the latest years. A deterioration has already taken place in 2020. There is a slight decrease in cancer mortality over the past fifteen years. The reduction in death rate from external causes in Ukraine over this period was significant. The standardized death rate from digestive diseases has increased with COVID-19 having played a leading role in the unfavourable changes of life expectancy over the past two years.

Keywords: *life expectancy, premature mortality, standardized death rate, major groups of causes of death, cardiovascular disease, cancer, external causes of death*

Abstract

Ambiguitatea dinamicii mortalității și speranței de viață în Ucraina este una dintre cele mai semnificative și complexe probleme demografice ale țării. Scopul nostru este de a studia cele mai recente tendințe în ceea ce privește mortalitatea și speranța de viață, de a analiza nivelul și dinamica mortalității în contextul principalelor cauze de deces înainte de invazia militară a Rusiei în Ucraina. O astfel de analiză va constitui baza pentru evaluarea comparativă ulterioară a pierderilor demografice ca urmare a războiului. În lucrare au fost analizate tendințele mortalității pe vârste și sexe, caracteristicile mortalității în zonele urbane și rurale. Au fost utilizate următoarele metode și date: indicatori demografici, rate standardizate de mortalitate (conform standardului european), tabele de mortalitate, metoda de decompoziție, statistica descriptivă, metoda grafică. Rezultatele obținute denotă că în Ucraina, după o perioadă de creștere certă a speranței de viață (2009-2013), a început o perioadă de creștere lentă a acesteia, urmată de fluctuații și stagnare (2014-2019) determinată de factori militaro-politici și economici. Începând din 2020, speranța de viață a fost afectată într-o măsură și mai mare de COVID-19. Cea mai semnificativă ”contribuție” la mortalitatea prematură a populației adulte din Ucraina o au bolile cronice netransmisibile. Dar proporția excesivă a deceselor (în special în rândul bărbaților) este asociată și cu cauze externe. Dinamica mortalității din cauza afecțiunilor cardiovasculare arată, în general, o diminuare a acesteia în ultimii cincisprezece ani, dar cu fluctuații în ultimii ani. O agravare evidentă a situației a avut loc în 2020. În ultimii cincisprezece ani se observă, de asemenea, o scădere ușoară a mortalității din cauza cancerului. Scăderea mortalității din cauze externe în Ucraina în această perioadă a fost semnificativă. Rata standardizată a mortalității cauzată de boli ale tractului digestiv a crescut în această perioadă. COVID-19 a jucat un rol esențial în schimbările negative în ce privește speranța de viață în ultimii doi ani.

Cuvinte cheie: *speranța de viață, mortalitate prematură, rata standardizată a mortalității, principalele grupe de cauze de deces, boli cardiovasculare, boli oncologice, cauze externe de deces.*

Неоднозначность динамики смертности и продолжительности жизни– одна из наиболее значимых и сложных демографических проблем Украины. Наша цель - изучить последние тенденции смертности и продолжительности жизни, проанализировать уровень и динамику смертности по основным причинам смерти до военного вторжения России в Украину. Такой анализ станет основой для дальнейшей сравнительной оценки демографических потерь в результате войны. В работе рассмотрены тенденции возрастно-половой смертности. Анализируются особенности смертности в городских и сельских населенных пунктах. Были использованы следующие методы: демографические показатели, стандартизированные коэффициенты смертности (по европейскому стандарту), таблицы смертности, метод декомпозиции, описательная статистика, графический метод. Полученные результаты свидетельствуют о том, что в Украине, после периода безусловного роста продолжительности жизни (2009-2013 гг.), под влиянием военно-политических и экономических факторов, начался период медленного ее увеличения, с последующими колебаниями и стагнацией (2014-2019 гг.). Начиная с 2020 года на продолжительность жизни дополнительное влияние оказал COVID-19. Наиболее «значительный вклад» в преждевременную смертность взрослого населения в Украине вносят хронические неинфекционные заболевания. Однако, чрезмерная доля смертей (особенно среди мужчин) связана и с внешними причинами. Динамика смертности от сердечно-сосудистых заболеваний показывает в целом ее снижение за последние пятнадцать лет, но с колебаниями в последние годы. Явное ухудшение произошло в 2020 году. За последние пятнадцать лет наблюдается также небольшое снижение смертности от рака. Уменьшение смертности по внешним причинам в Украине за этот период было значительным. Стандартизированный коэффициент смертности от болезней органов пищеварения за этот период увеличился. В свою очередь, ведущую роль в неблагоприятных изменениях продолжительности жизни за последние два года сыграл COVID-19.

Ключевые слова: *ожидаемая продолжительность жизни, преждевременная смертность, стандартизованный коэффициент смертности, основные группы причин смерти, сердечно-сосудистые заболевания, онкологические заболевания, внешние причины смерти.*

JEL Classification: *J11, I10*
UDC: *314.4*

INTRODUCTION

The medical and demographic processes in Ukraine have been developing in a rather complex and contradictory manner for a long time. The life expectancy in the country has not seen a sufficiently steady positive dynamics for more than half a century.

Beginning in 1970-s, Ukraine began to lose its position among the countries with the highest life expectancy and has later lagged significantly behind. At the mentioned period of time, the task of combating main communicable diseases gave way to the importance of medical-social challenges associated with the spread of chronic non-communicable diseases. At the same time the past two years have seen a renewed importance of infections as a cause of death due to the COVID-19 pandemic.

There were periods of declining mortality between the turn of the twentieth and twenty-first centuries in Ukraine. But the positive dynamics turned out unstable. Therefore, in general the topic of the life expectancy dynamic and mortality by the main causes of death is believed to be one of the most important in demographic context of Ukraine during the last decades.

Among other things it's really important to examine the situation of mortality and life expectancy in Ukraine before Russian military invasion of the country, since it's a base for further assessment of the war's demographic consequences.

The aim of our study is to examine the tendencies of mortality and life expectancy in Ukraine over the last twenty years, analyze the dynamics and structure of mortality by the major causes of death. Life expectancy and mortality by major groups of causes are considered in a comparative context in the paper – in relationship with European Union and the countries of the WHO European Region.

The *research question* of our study is whether the progress in life expectancy observed in Ukraine before the military invasion marked the reversal of adverse long-term mortality trends. We also investigated what sex-age- and cause-specific components of mortality contributed to this improvement.

LITERATURE REVIEW

Ukrainian and foreign scientists have always seen mortality and life expectancy in Ukraine and other countries of Eastern Europe as a relevant and promising research topic. Traditionally the focus has always been on long-time retrospective tendencies in life expectancy, sex-, age- and cause-specific mortality (McKee and Shkolnikov, 2001; Meslé, 2004; Meslé and Vallin, 2012) and their differences between countries (Shkolnikov et al., 2010; Aburto and Raalte, 2018).

Part of the studies available deal with excess mortality, concerned with the periods of social disasters in Ukraine (Vallin et al., 2012), including calculations of demographic losses (Rudnytskyi et al., 2015).

Several studies (for instance Shkolnikov et al., 2001; Levchuk and Luschik, 2019) are devoted to inequalities in mortality and length of life. There has been growing interest in premature and preventable mortality. These have been widely investigated by Ukrainian scientists (E. Libanova et al., 2007; Ryngach, 2016). Some attempts have been made with the purpose to compare the features of mortality and changes in life expectancy in the regions of Ukraine (Ryngach and Luschik, 2018) and in the largest cities of the country (Shevchuk, 2019; Levchuk and Shevchuk, 2021).

Many studies have already appeared on excess mortality due to COVID-19 in the European countries (for instance Penina, 2021; Islam et al., 2021; Konstantinoudis et al., 2022). The methodological approaches to the estimation the direct and indirect effects of the COVID-19 on mortality and some results of excess mortality studies are presented in these papers.

DATA SOURCES AND METHODS USED

The information sources of the analysis are: demographic data of State Statistics Service of Ukraine (by sex, age groups, types of settlement etc.); statistical information from the Eurostat Database; data from European Health for All Database.

Information of the State Statistical Service of Ukraine about the number of deaths for 2014 –2020 have been provided excluding the temporarily occupied territory of the Autonomous Republic of Crimea and the city of Sevastopol and part of the temporarily occupied territories in the Donetsk and Luhansk regions. Due to lack of information about part of the temporarily occupied territories in the Donetsk and Luhansk regions, it is incorrect to make calculations of relative indicators of population reproduction, death rates etc. for the Donetsk and Luhansk regions. The relative indicators of death rates across Ukraine for 2015–2020 have been compiled excluding the relevant data for the Donetsk and Luhansk region (Population of Ukraine, 2021).

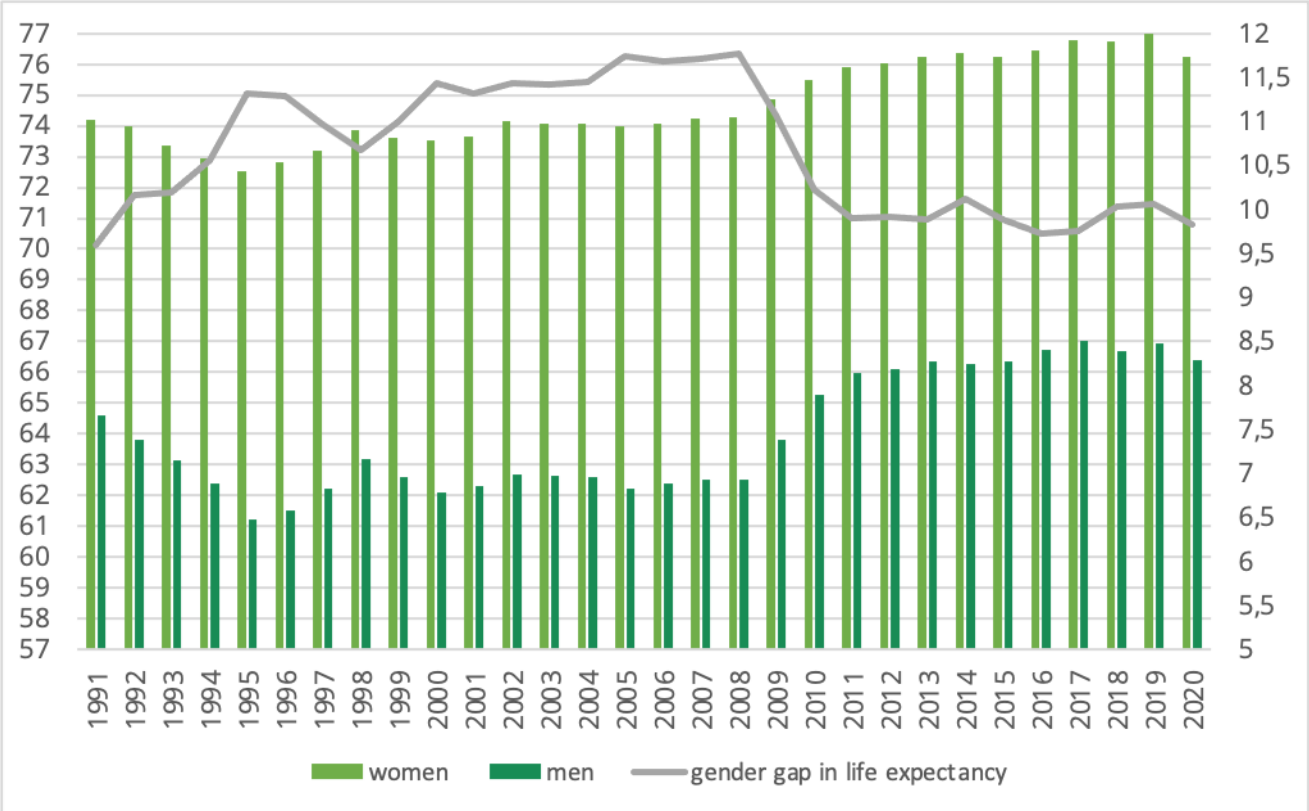
In this paper mortality and life expectancy in Ukraine are examined through the following demographic and statistical measures and methods: calculation and analysis of demographic rates, standardized death rates (European standard population), life tables, the decomposition method (Andreev and Shkolnikov, 2012), descriptive statistics, the graphic method.

THE RESULTS OF RESEARCH AND DISCUSSIONS

During the first decade of Ukraine's independence, unfavourable mortality trends led to an especially sharp drop in life expectancy (Figure 1). A further exit from this unfavorable trend was long and not consistent enough.

Figure 1.

Life expectancy at birth in 1991-2020, Ukraine, by sex (years)



Source: *calculations based on data of State Statistics Service of Ukraine. http://www.ukrstat.gov.ua/*

Periods of declining mortality between the turn of the twentieth and twenty-first centuries in Ukraine were short. Stagnant tendencies prevailed in the dynamics of life expectancy.

Only at the end of the first decade of the XXI century the increase in life expectancy acquired a stable and dynamic character, however, it was not continuous. The beginning of the military conflict with Russia in eastern Ukraine (in 2014) and the associated loss of civilians and military, forced displacement of the population from the relevant territories, and general political and socio-economic instability hindered further favorable changes in life expectancy. In 2020, the COVID-19 pandemic also influenced life expectancy. The period from 2014 to early 2020 can be described as a period of instability and fluctuations with the predominant influence of political and economic factors. Starting

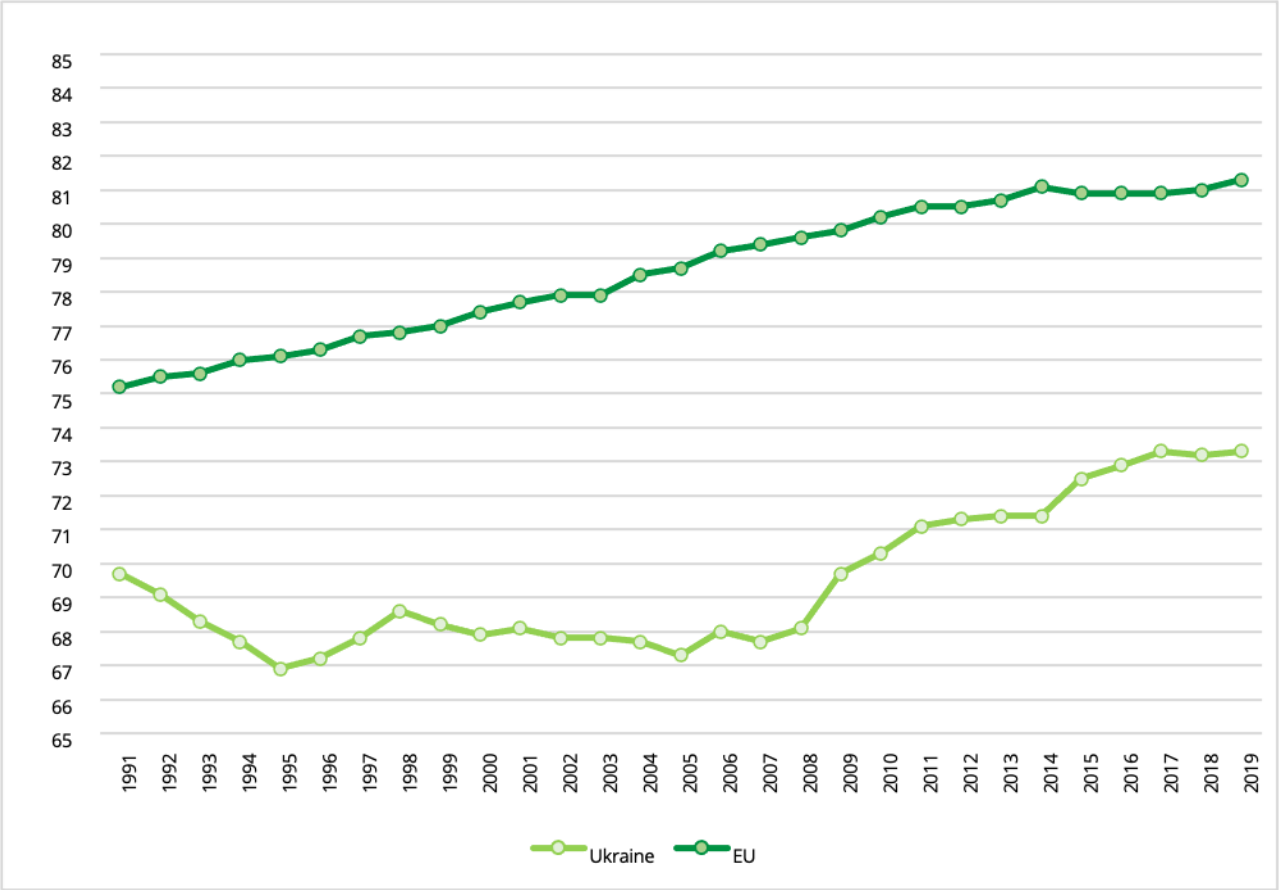
from 2020, life expectancy was additionally influenced by uncertainty in the epidemic situation and the unpreparedness of the healthcare system to respond to COVID-19.

In general, over the last thirty years, the life expectancy of women in Ukraine has increased only by 2.8 years, while in men – by 2.3 years.

The gender gap in life expectancy is still equal to 10 years and is much more significant than the gap in life expectancy between rural and urban areas, which equals 2 years "in favour" of urban residents. Ukraine has lagged far behind the EU countries in terms of life expectancy (Figure 2). Compared to EU citizens, Ukrainian women live an average of 6 years, while men live 11 years less.

Figure 2.

Life expectancy at birth in Ukraine and in the European Union, 1991-2019, both sexes, (years)



Sources: *Eurostat Database https://ec.europa.eu/eurostat/data/database*

The main reason for such differences is the high premature mortality: for instance, in Ukraine the premature mortality rate over three times higher than that of Sweden.

Significant contributions to premature adult mortality are made by major non-communicable diseases (NCDs): cardiovascular disease, cancer, etc. (Table 1). At the same time, in Ukraine the excessive share of deaths (especially among men) is related to external causes (and not only in the young groups of adults). All these causes affect premature mortality in general.

Table 1.

Leading causes of death in women and men aged 15 years and over, Ukraine, 2019.

Rank place	Women			Men		
	15-29 years	30-64 years	65 years and over	15-29 years	30-64 years	65 years and over
I	External causes of death	Cardiovascular diseases		External causes of death	Cardiovascular diseases	
II	Cancers			Cardiovascular diseases	Cancers	
III	Cardio-vascular diseases	Gastro-intestinal diseases	Symptoms, signs, and abnormal clinical and laboratory findings[1]	Gastrointestinal diseases	External causes of death	Symptoms, signs, and abnormal clinical and laboratory findings[2]
IV	Some infectious and parasitic diseases	External causes of death	Gastrointestinal diseases	Cancers	Gastro-intestinal diseases	External causes of death
V	Gastro-intestinal diseases	Some infectious and parasitic diseases	External causes of death	Some infectious and parasitic diseases		Respiratory diseases

Source: *developed based on State Statistics Service data*

Regarding the latest dynamics in life expectancy, both during the period of its unconditional growth (2009-2013) and the last years of slow increase and stagnation (2014-2019), the most important factor of women' life expectancy dynamics was the decrease in mortality from cardiovascular diseases, and for men — the decrease in mortality from external causes.

Over the past period (2014-2019), the overall increase in female life expectancy has appeared to be more than three times lower than in the previous five-year study period. Meanwhile an increase in the contribution of mortality from cardiovascular diseases, as well as from external causes in the dynamics of female life expectancy was observed. The increase in male life expectancy during this period was almost six times less than in the previous five years. There was an increase in the contribution of mortality from external causes, cancers and communicable diseases in the dynamics of male life expectancy. At the same time, changes in cardiovascular mortality have already been unfavourable, therefore they (and, to a lesser extent, the dynamics of respiratory mortality) counteracted an increase in the male life expectancy in recent years.

In 2020, compared to the previous year, life expectancy at birth decreased by 0.5 years for men and 0.8 years for women, mostly through mortality from COVID-19. The component analysis of life expectancy dynamics in 2020, compared to 2019, shows that the contribution of mortality from COVID-19 in reducing life expectancy for both men and women was approximately the same in absolute terms (0.49 years).

The increase in mortality from diseases of the circulatory system also had negative impact on the dynamics of life expectancy, and for men the reduction in life expectancy as a result was even slightly

[1] *This class usually comprises insufficiently defined conditions, symptoms and results of clinical (or other research procedures) that do not comply with the norm, but for which a specific diagnosis has not been established. The significant role (share) of this group death causes (even at an older age) may be an evidence of problems with data quality, especially since in Ukraine the corresponding share of deaths has increased over the last few decades [3, p.51].*

[2] *Men in Ukraine are characterized by a higher proportion of unspecified and unknown causes of death within this class, compared to women (they are dominated by "old age"). This may indirectly indicate lower accuracy in determining the cause of death and lower quality of mortality data namely for men [3, p.54].*

greater than for women. The dynamics of mortality from respiratory diseases and its impact on life expectancy (especially for women) was also unfavorable.

At the same time, mortality from external causes decreased in 2020 (which is due to the impact of quarantine restrictions, in particular, on population mobility, the frequency of informal communication, etc.), and this reduction was more significant in men.

Mortality from diseases of the circulatory system in Ukraine (according to its standardized rate) is on average 1.8 times higher than its level in the European Union and twice higher than this rate for the WHO European Region.

The above ratios reflect both the really high frequency of deaths from diseases of the circulatory system in Ukraine (compared to other classes of non-communicable diseases, as well as against other European countries), and partly the phenomenon of "overdiagnosis" of cardiovascular diseases (CVD), especially in the elderly and the oldest groups of the population. According to recent years, CVD deaths in the country account for more than 80% of all deaths of people aged 70 and older, which may be due in part to the prevalence of routine determination of the cause of death of elderly people ("coronary heart disease; atherosclerotic cardiosclerosis") and a small proportion of cases of post-mortem diagnosis as a result of autopsy (Ryngach, 2013). It should be noted that this causes an underestimation of other age-related pathologies (such as neoplasms, etc.) and somewhat distorts the overall picture of mortality by cause in Ukraine.

As a significant structural factor in the prevalence of cardiovascular disease and mortality is the level of demographic aging, the overall mortality rates of women (who are demographically older) due to diseases of the circulatory system are higher than men, although standardized sex rates show the opposite ratio (table 2).

Table 2.

Mortality from diseases of the circulatory system in Ukraine, 2005-2019, by sex (per 100 thousand people)

Years	Total death rate		Standardized death rate (according to the European standard)	
	women	men	women	men
2005	1070.3	999.6	656.3	1093.8
2006	1065.3	983.6	637.4	1056.9
2007	1063.6	998.1	622.7	1052.6
2008	1071.6	998.6	614.1	1038.2
2009	1052.9	938.6	589.8	970.0
2010	1079.5	937.4	590.7	956.7
2011	1027.1	889.2	549.4	890.0
2012	1017.9	886.7	532.6	873.3
2013	1030.4	895.7	531.0	873.8
2014	1049.9	920.0	534.6	888.6
2015	1068.8	941.2	549.8	930.0
2016	1052.6	927.8	536.6	908.3
2017	1034.1	913.3	521.4	884.1
2018	1048.0	937.6	526.4	899.6
2019	1034.5	937.1	517.6	891.8
2020	1088.1	1010.8	541.0	955.7

Source: *data of the State Statistics Service of Ukraine.*

The total CVD mortality rate in rural Ukraine in recent years is 40% higher than in urban areas. The age-standardized rate is also higher but less than 10%, because the effect of higher aging of the rural population is eliminated.

The dynamics of mortality from cardiovascular diseases shows a general decrease in its level over the past fifteen years. But positive trends were inconsistent, in recent years there have been fluctuations in the dynamics of mortality from diseases of the circulatory system, especially among men. There were clearly unfavourable changes in the mortality rate caused by diseases of the circulatory system for both women and men in Ukraine in 2020, which was already an epidemic year.

In women aged 30 to 70 years, the dynamics of mortality from cardiovascular diseases looks more favourable than in older age: the level of female premature mortality from these diseases decreased in 2019 compared to 2010 – by more than 17%, and in comparison to 2001 – by more than a third, but in recent years this decrease has not been stable. Reduction in male mortality by age from 30 to 70 years from diseases of the circulatory system in 2010 was very "modest" (6% in comparison to 2010) and just as volatile in recent years, the current male premature mortality rate from CVD exceeding not only its level in 2001 but also that of 1991.

Among the cardiovascular diseases that cause death, including premature death, the leading role is played by coronary heart disease (CHD). It currently accounts for about 7 out of 10 deaths from causes of this class and almost 2/3 of CVD deaths between the ages of 30 and 70. Every fifth case of death (including premature deaths from CVD) in Ukraine is caused by cerebrovascular diseases.

The reduction in premature mortality at the age of 30-69 from cerebrovascular diseases in Ukraine in general from 2010 to 2019 has been much more significant (on average by 19%) than due to coronary heart disease (less than 9%). Of particular concern is the absence of positive changes in the dynamics of coronary heart disease mortality in the age group of young men (15-19 and 20-24 years) in this decade. In general, the mortality rate of women from both cardiovascular diseases during this period decreased more significant than that of men.

In the last few years, there has been no resistant decline in mortality caused by both reasons. The deterioration of the situation has already been in place in 2020. Thus, according to the values of standardized mortality rates due to coronary heart disease, its level over the past year has increased by slightly more than 6% for women and by more than 8% for men; the corresponding growth rates for cerebrovascular diseases in 2020 were 1.3% and 6.7%, respectively.

Diseases of the circulatory system not only predominate in the structure of causes of death of the adult population of Ukraine, but also are among the leading causes of disability, as well as the incidence and prevalence of diseases.

Neoplasms are the second most common class of causes of death. A comparative analysis of standardized rates of premature cancer mortality in Ukraine and the EU, as well as relevant indicators for the population aged 65 and over shows that mortality from cancer in people under 65 in Ukraine is slightly higher than in the EU and much higher than in the WHO European region, however, in relation to older age groups, the ratio is opposite, and not least – because of the underestimation of cancer as a cause of death in old age[3].

The total mortality rates of men from oncological pathology exceed those of women on average one and a half times; more correct standardized rates show twice the frequency of men's deaths. The frequency of deaths of women from neoplasms in urban areas of Ukraine is on average 18-20%

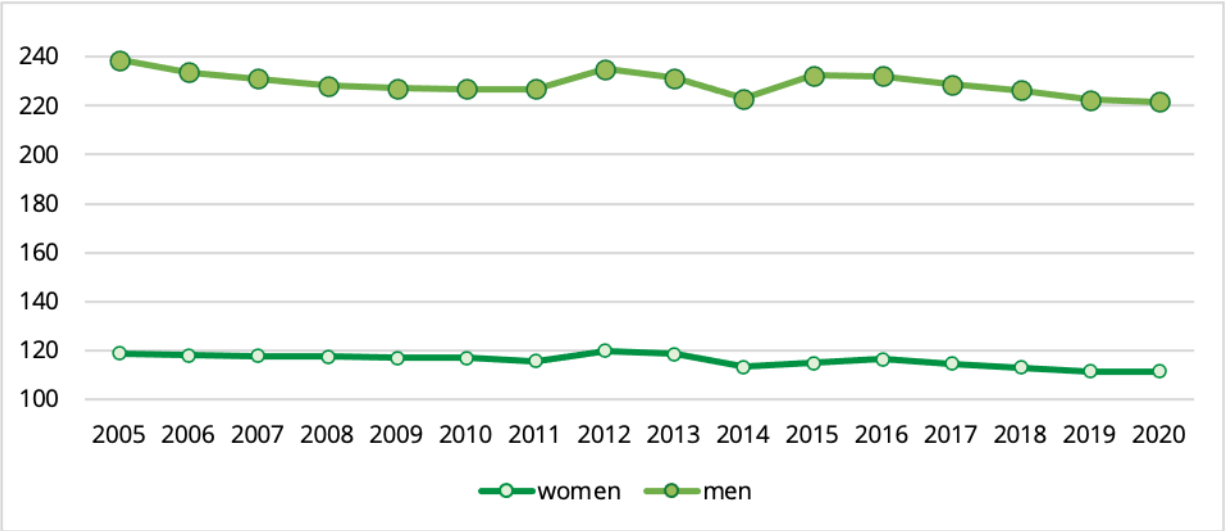
[3] In addition, later detection of cancer, worse survival rates of cancer patients at a relatively young age who thus do not live to old age also plays a role.

higher than in rural areas, while the indicators for men do not have a pronounced inter-settlement differentiation.

The dynamics of standardized cancer death rates show a slight decrease in the mortality rate for this class of diseases in general over the past fifteen years (Figure 3) in the presence of small fluctuations in the studied indicators within this period (especially for men).

Figure 3.

Standardized death rates from neoplasms in Ukraine in 2005-2019, by sex (per 100 thousand people)



Source: *data of the State Statistics Service of Ukraine*

The main cancer type in terms of mortality in women in Ukraine is breast cancer (every fifth case of cancer related female death), while in men these are cancer of the trachea, bronchi and lungs which currently account for 2 out of each 9 deaths caused by neoplasms.

The following places among the localizations of cancer as a cause of death in Ukraine are currently occupied by: malignant neoplasms of the colon; of stomach; of trachea, bronchi and lungs – in women; malignant neoplasms of the prostate; of stomach; of colon – in men.

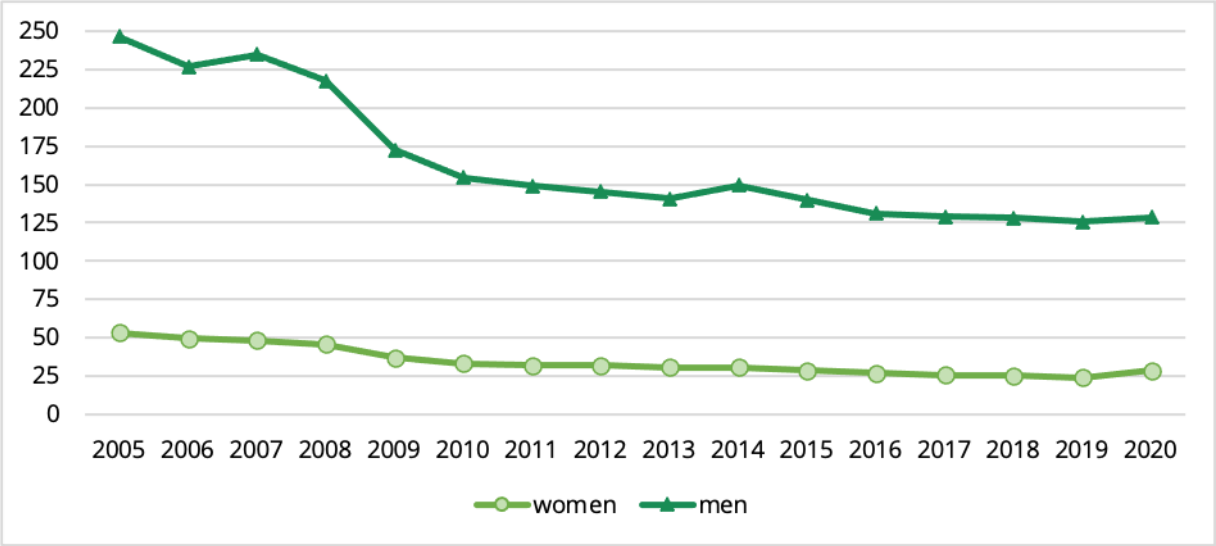
External causes of death. Significant contributions to premature adult mortality in Ukraine are made by external causes. Standardized death rates from external causes are significantly higher than in the EU: almost 2,5 times for men and almost 1.2 times - for women.

Mortality of men from external causes (which is preventable) in Ukraine is far above the level for women (Figure 4). The highest mortality excess of men over women is observed in suicides (5.7 times in 2020) and accidental poisonings (5.6 times).

The reduction in death rate from external causes in Ukraine during 2005-2020 was as significant for men (by more than 1.9 times) as it was for women (by almost 1.9 times).

Figure 4.

Standardized death rates from external causes of death in Ukraine in 2005-2020, by sex (per 100 thousand people)



Source: *data of the State Statistics Service of Ukraine*

Among the external causes of death, the leading roles are played by suicides, homicides (manslaughters and murders), accidental poisonings (for men) and traffic accidents.

The standardized death rate from external causes in rural areas of Ukraine is higher than in urban settlements (in 2020 - 81.8 per 100 thousand people and 60.6 respectively). The biggest differences are in causes such as accidental falling, suicide, accidental drowning.

Chronic diseases of the digestive system are the class of pathologies from which an increasing number of people around the world suffer. Digestive diseases in Ukraine in recent decades have risen up in the hierarchy of causes of death, occupying the fourth place after cardiovascular disease, neoplasms and external causes. In general, the standardized death rate from digestive diseases in the country increased from 32.9 deaths per 100 thousand people in 1991 to 42.9 – in 2001, 48.0 – in 2011, 51.3 – in 2019 and 51.4 – in 2020.

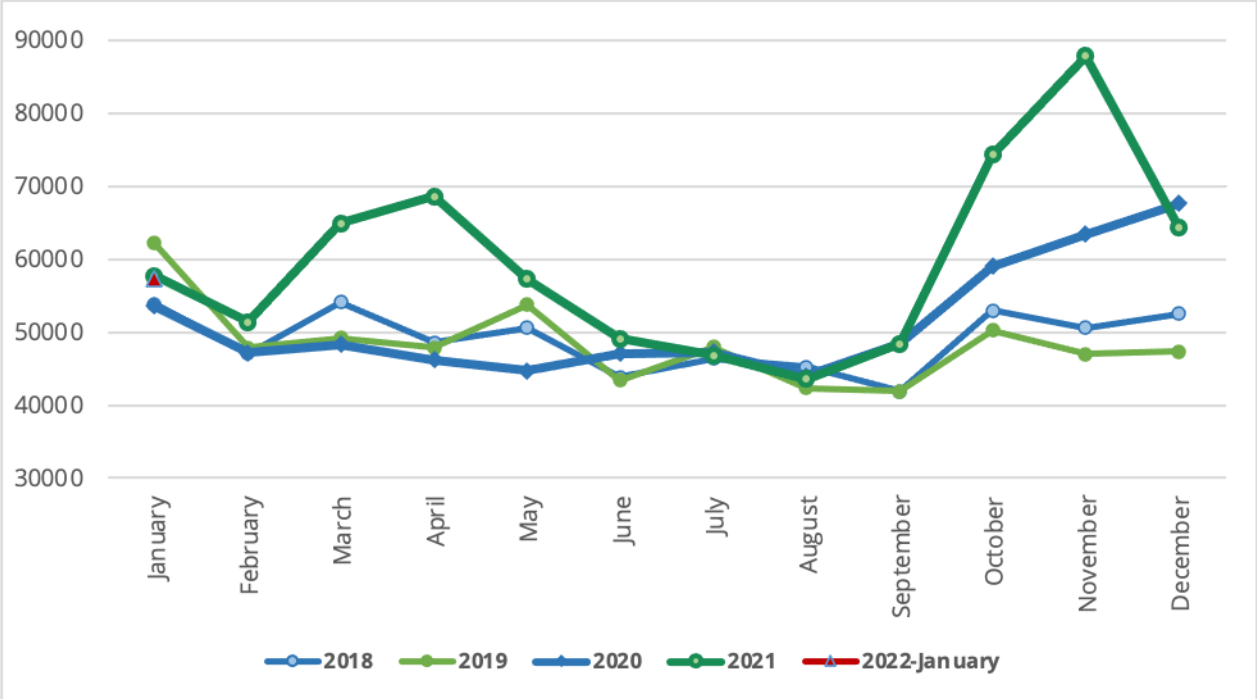
Chronic respiratory diseases represent chronic inflammatory diseases affecting the respiratory tract. Serious respiratory disorders often cause disability and even death, so the contribution of respiratory diseases to the global burden of disease is quite significant. Chronic bronchitis, chronic obstructive pulmonary disease, asthma and other chronic diseases of the lower respiratory tract are perhaps the most dangerous non-communicable respiratory diseases. The total share of deaths caused by these diseases among all deaths from respiratory diseases in Ukraine in last years was 40%.

Standardized death rates (including premature) from bronchitis, asthma and pulmonary emphysema in Ukraine are higher than in the EU, especially for men. Mortality of men from all these diseases in Ukraine is many times higher than that of women (this excess is more significant compared to that in the EU and the countries of the WHO European Region). The death rate from chronic respiratory diseases in rural areas of Ukraine is much higher than in urban settlements. Mortality from these diseases in Ukraine registered a decline in the 2005-2019 period.
In 2020-2021 COVID-19 became one of the significant causes of death. As of 2020, it accounted for almost 3.8% of male deaths and more than 3.1% of all female deaths in Ukraine. COVID-19 has played a leading role in the negative changes in life expectancy over the last two years.

The estimation of excess mortality due to COVID-19 or demographic losses caused by the epidemic falls outside the score of this paper. However, a general idea of the impact of the COVID-19 epidemic waves on the overall mortality of Ukraine in the last two years (before the large-scale Russian invasion) gives a comparison of monthly deaths during the epidemic with at least two previous years (2018-2019) (Figure 5).

Figure 5.

Monthly numbers of deaths in Ukraine, 2018-2021 period



Source: *data of the State Statistics Service of Ukraine. http://www.ukrstat.gov.ua/*

Thus, the maximum monthly deaths in these years - late autumn and early winter 2020, as well as in mid-spring and especially in late autumn 2021 - coincide with the peaks of the corresponding waves of the COVID-19 pandemic in Ukraine.

CONCLUSIONS

This paper examines the last twenty-years' tendencies of mortality and life expectancy in Ukraine and attempts to form a basis for further estimation of excess mortality due to the Russian-Ukrainian war, in particular after the full-scale Russian invasion of Ukraine in 2022.

At the end of the first decade of the XXI century, the increase in life expectancy in Ukraine became stable and dynamic. The period between 2009 and 2013 was characterized by the growth of life expectancy, while the subsequent period of 2014-2019 - by slow increase and stagnation. In both periods the most important factors for the dynamics of women' life expectancy were the decrease in mortality from cardiovascular diseases, and for men — the decrease in mortality from external causes. The dynamics of mortality from a number of causes of death (neoplasms, external causes, diseases of the circulatory system, respiratory diseases) over the period of 2005-2019 was rather favourable in Ukraine. At the same time, for instance, mortality from digestive diseases increased. The gender gap in life expectancy in Ukraine still equals almost 10 years and is much more significant than the gap in the life expectancy of urban and rural residents respectively (2 years).

Ukraine has lagged far behind the European Union countries in life expectancy (women live an average of 6 years and men 11 years less than in the EU). The standardized death rate from diseases of the circulatory system in Ukraine is on average 1.8 times higher than in the EU, corresponding death rate due to external causes – almost 2 times higher, from neoplasms - is slightly higher than in the EU.

In the last couple of years, the stagnation of life expectancy in Ukraine resumed. In 2020, compared to the previous year, life expectancy at birth decreased mostly due to COVID-19, its contribution to reduction of life expectancy for both men and women being the same in absolute terms (almost 0.5 years). The increase in mortality from diseases of the circulatory system also had a negative impact on the dynamics of life expectancy (larger effect – for men). The dynamics of mortality from respiratory diseases and its impact on life expectancy (especially for women) were also adverse in 2020. But dynamics of mortality from external causes of death were rather favourable.

Recent developments, caused by the Russian full-scale invasion, have led to numerous casualties (including civilians) yet. The diverse medical and demographic consequences of ongoing Russian aggression are expected. Not only the direct combat losses and civilian casualties are among them, but also additional deaths due to physical injuries and psychological traumas, lack of medicines for patients with infectious and chronic non-communicable conditions, limited access to urgent emergency medical care and other health services in Ukraine. Unfortunately, their impact on the country's population health and reproduction is likely to be long-term after this war.

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