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A. Aldangarkyzy[1*], M. Denisenko[2]

[1]Al-Farabi Kazakh National University, Almaty, Kazakhstan
[2]National Research University Higher School of Economics, Saint-Petersburg, Russia
*e-mail: aaldangar@gmail.com

INCOMPLETE EPIDEMIOLOGICAL TRANSITION IN KAZAKHSTAN: CHANGES IN THE STRUCTURE OF LIFE EXPECTANCY AND CAUSES OF DEATH

This article examines Kazakhstan's epidemiological transition, focusing on shifts in mortality patterns and life expectancy within the context of socioeconomic and demographic influences. The study aims to explore the evolution of Kazakhstan's population mortality from 1991 to 2022, encompassing both age-standardized and cause-specific mortality rates, and the corresponding changes in life expectancy. The author set the task of determining which stage of the epidemiological transition Kazakhstan is currently at and identify the key factors influencing the present situation. This topic is important for understanding the dynamics of mortality and health of the population in the context of economic and social changes in the country.

Understanding the complex relationship between death rates, public health, and the changing economic and social fabric of a country is essential to this field of study. This not only helps to systematize the changes in mortality and life expectancy but also provides understanding of the mechanisms these changes, as well as the impact of socio-economic and demographic factors.

The research methodology includes a comparative analysis of official mortality statistics, the use of age and standardized rates, and the calculation of life tables. For a more detailed analysis, the decomposition method was applied, enabling the identification of cause-and-effect relationships in the changes in life expectancy and mortality for the main causes of death.

Analyzing mortality rates using decomposition methods in the period from 2010 to 2022, the main factors influencing fluctuations in life expectancy in Kazakhstan were diseases of the circulatory system, injuries and external causes, as well as cancers and neoplasms.

The main results of the study indicate that mortality in Kazakhstan exhibits stable characteristics of an incomplete epidemiological transition. Diseases of the circulatory system dominate the mortality structure. There is an excessive mortality rate, especially among men.. The high mortality rate of men of working age is explained by mortality from external causes, and in older working age groups-by diseases of the circulatory system, which may mean that the epidemiological shift has not been completed. Developing and putting into action a comprehensive health plan with the dual goals of enhancing the prevention and treatment of circulatory system diseases and lowering mortality from outside sources is required to finish the third stage of the epidemiological transition.

The article's practical significance lies in its utilization of study data to formulate recommendations for enhancing health systems and social policies, decreasing mortality, and raising life expectancy.

Key words: epidemiological transition, causes by death, age-specific and standardized mortality rates, life expectancy at birth.

Ә. Алданғарқызы[1*], М. Денисенко[2]

[1]Әл-Фараби атындағы Қазақ ұлттық университеті, Алматы, Қазақстан
[2]Национальный исследовательский университет «Высшая школа экономики», Санкт-Петербург, Ресей
*e-mail: aaldangar@gmail.com

Қазақстандағы эпидемиологиялық ауысудың аяқталмауы: өмір сүру ұзақтығы және өлім-жітім себептері құрылымындағы өзгерістер

Бұл мақалада Қазақстандағы эпидемиологиялық ауысу кезеңіне талдау жасалып, әлеуметтік-экономикалық және демографиялық факторлар негізінде халықтың өлім-жітім құрылымы мен өмір сүру ұзақтығындағы өзгерістерге зерттеу жүргізілген. Мақаланың мақсаты 1991 жылдан бастап 2022 жылға дейінгі кезеңдегі Қазақстан халқының өлім-жітім динамикасын, негізгі себептер бойынша жас және стандартталған өлім-жітім коэффициенттерін, сондай-ақ өмір сүру ұзақтығындағы өзгерістерді талдау. Автор Қазақстанның эпидемиологиялық өтпелі кезеңінің

қай кезеңінде тұрғанын анықтау және қазіргі жағдайға әсер ететін негізгі факторларды анықтау міндетін қойды. Бұл тақырып елдегі экономикалық және әлеуметтік өзгерістер жағдайында өлім-жітім динамикасын және халық денсаулығын түсіну үшін маңызды.

Зерттеудің ғылыми маңыздылығы статистикалық демографиялық талдау әдістерін пайдалана отырып, Қазақстандағы эпидемиологиялық жағдайды терең талдауда. Бұл өлім-жітім мен өмір сүру ұзақтығының өзгеруін жүйелеуге ғана емес, сонымен бірге осы өзгерістердің тетіктерін, сондай-ақ әлеуметтік-экономикалық және демографиялық факторлардың әсерін тереңірек түсінуге мүмкіндік береді.

Зерттеу әдістемесі өлімнің ресми статистикасының салыстырмалы талдауын, жас ерекшелік және стандартталған коэффициенттерді қолдануды, сондай-ақ өлім-жітім кестелерін есептеуді қамтиды. Неғұрлым егжей-тегжейлі талдау үшін негізгі себептер бойынша өмір сүру ұзақтығы мен өлім-жітімнің өзгеруінің себеп-салдарлық байланыстарын анықтауға мүмкіндік беретін декомпозиция әдісі қолданылды.

2010 жылдан 2022 жылға дейінгі кезеңдегі өлім-жітім көрсеткіштерінің декомпозициясы Қазақстанда өмір сүру ұзақтығының өзгеруіне әсер ететін ең маңызды факторлар қан айналым жүйесі аурулары, сыртқы себептер және қатерлі ісіктен екенін көрсетті.

Зерттеудің негізгі нәтижелері Қазақстанда өлім-жітім аяқталмаған эпидемиологиялық ауысудың тұрақты сипаттамаларын сақтайтынын көрсетті. Өлім-жітімнің құрылымында қан айналымы жүйесінің аурулары басым. Сондай-ақ ерлер арасында шамадан тыс өлім-жітім деңгейі байқалады. Еңбекке қабілетті жастағы ерлердің өлім-жітім деңгейінің жоғары болуы сыртқы себептерден болатын өлім-жітіммен, ал егде жастағы еңбекке қабілетті жас топтарында – қан айналым жүйесінің ауруларымен түсіндіріледі, бұл эпидемиологиялық ауысымның аяқталмағандығын білдіруі мүмкін. Эпидемиологиялық ауысымның үшінші кезеңін сәтті аяқтау үшін, қан айналым жүйесінің ауруларын алдын алу және емдеуді жақсартуға, сондай-ақ сыртқы себептерден болатын өлім-жітімді азайтуға бағытталған кешенді денсаулық сақтау стратегиясын әзірлеп, енгізу қажет.

Мақаланың практикалық маңыздылығы денсаулық сақтау жүйесін және әлеуметтік саясатты жетілдіруге, өлім-жітімді азайтуға және өмір сүру ұзақтығын арттыруға бағытталған ұсыныстарды әзірлеу мақсатында зерттеу нәтижесінде алынған мәліметтерді пайдалану.

Түйін сөздер: эпидемиологиялық ауысу, себептер бойынша өлім-жітім, өлім-жітімнің жас және стандартталған коэффициенттері, туғандағы күтілетін өмір сүру ұзақтығы.

А. Алдангаркызы[1]*, М. Денисенко[2]

[1]Казахский национальный университет им. аль-Фараби, Алматы, Казахстан
[2]Национальный исследовательский университет «Высшая школа экономики», Санкт-Петербург, Россия
*e-mail: aaldangar@gmail.com

Незавершенный эпидемиологический переход в Казахстане: изменения в ожидаемой продолжительности жизни и структуре причин смерти в Казахстане

В данной статье рассматривается эпидемиологический переход в Казахстане, а также изучаются изменения в структуре смертности и продолжительности жизни населения в контексте социально-экономических и демографических факторов. Цель статьи – проанализировать динамику смертности населения Казахстана в период с 1991 по 2022 годы с учётом возрастных и стандартизованных коэффициентов смертности по основным причинам, а также изменений в продолжительности жизни. Автор ставит задачу определить – на какой стадии эпидемиологического перехода находится Казахстан и выявить ключевые факторы, влияющие на текущую ситуацию. Эта тема важна для понимания динамики смертности и здоровья населения в контексте экономических и социальных изменений в стране.

Научная значимость исследования заключается в глубоком анализе эпидемиологической ситуации в Казахстане с использованием статистических методов демографического анализа. Это позволяет не только систематизировать изменения в уровне смертности и продолжительности жизни, но и более глубоко понять механизмы, стоящие за этими изменениями, а также влияние социально-экономических и демографических факторов.

Методология исследования включает сравнительный анализ официальных статистических данных по смертности, использование возрастных и стандартизованных коэффициентов, а также расчёт таблиц смертности. Для более детального анализа применён метод декомпозиции, который позволяет выявить причинно-следственные связи в изменении продолжительности жизни и смертности по основным причинам.

Декомпозиция показателей смертности на основе данных за период с 2010 по 2022 год показала, что наиболее значимыми факторами, влияющими на изменение продолжительности жизни

в Казахстане, являются смертность от болезней системы кровообращения, внешних причин, а также новообразования.Основные результаты исследования показали, что смертность в Казахстане сохраняет стабильные характеристики незавершённого эпидемиологического перехода. В структуре смертности преобладают болезни системы кровообращения. Также наблюдается избыточная смертность среди мужчин. Сверхсмертность мужчин в трудоспособных возрастах объясняется высокой смертностью от внешних причин, а в старших трудоспособных возрастах – болезнями системы кровообращения, что может свидетельствовать о возможном незавершённом эпидемиологическом переходе. Для успешного завершения третьей фазы эпидемиологического перехода необходимо разработать и внедрить комплексную стратегию здравоохранения, направленную на улучшение профилактики и лечения заболеваний системы кровообращения, а также на сокращение смертности от внешних причин.

Практическая значимость статьи заключается в возможности применения полученных результатов для разработки рекомендаций, направленных на улучшение системы здравоохранения и социальной политики, а также на снижение смертности и повышение продолжительности жизни.

Ключевые слова: эпидемиологический переход, смертность по причинам, возрастные стандартизованные коэффициенты смертности, ожидаемая продолжительность жизни при рождении.

Introduction

Demographers and researchers have long used an empirical approach to study the levels and trends of mortality, birth rate, and population dynamics. In economically developed countries, an increase in the proportion of elderly people can be observed every year. This situation is often associated with a decrease in birth rates, not mortality. In modern demographic studies, researchers emphasize different explanations for the mortality transition. Scientists have made more progress in medical and demographic aspects than in socio-demographic studies and have tried to combine demographic and epidemiological approaches to mortality analysis. On this basis, it was proposed to conditionally divide the mortality transition into different phases:

- the first, a transitional period characterized by high mortality rates;
- the second, an early transitional period characterized by a decrease in mortality from infectious diseases;
- the third, a late transitional period characterized by degenerative diseases.

Some classifications also define a fourth phase, associated with a reduction or delay in deaths from degenerative causes.

Population mortality and life expectancy are not only significant in terms of demographic impacts but also hold social and humanistic importance. Population mortality and life expectancy are key indicators of public health and quality of life, as outlined in the Sustainable Development Goals. It's crucial to analyze how each cause of death impacts life expectancy, a key measure of a country's demographic development. Improvements in the medical field and social conditions of the population have led to a decrease in mortality rates and an increase in life expectancy. The study of the theory of epidemiological transition has allowed us to better understand the evolution of population mortality rates.

A. Omran coined the phrase "epidemiological transition" in science for the first time in 1971. His theory states that there are three stages of epidemiological transition that society goes through:

• The initial stage, when a high rate of death from infectious diseases occurs;

• The second stage, during which life expectancy rises and infectious disease mortality falls;

• The third phase, during which time life expectancy considerably rises and the risk of degenerative diseases rises as a result of the decline in infectious diseases (Omran, 1971).

Scientists J. Olshansky and B. Ault propose to supplement A. Omran's theory with a fourth phase. They call this period the "era of late degenerative diseases" (Olshansky, Ault, 1989). In general, the description of this phase closely matches the third phase in A. Omran's theory. Since late degenerative diseases in the fourth phase are still considered degenerative. Later, A. Omran noted the fourth phase of the epidemiological transition, explaining it as "a decrease in mortality from cardiovascular diseases, an increase in the number of elderly people, and the emergence of new diseases" (Omran, 2019).

The following stages of epidemiological transition in Kazakhstan can be distinguished:

The pre-industrial period, characterized by high mortality rates from infectious diseases such as tuberculosis and smallpox, and poor living conditions;

The second stage is defined by a decline in infectious disease-related mortality, better hygienic conditions, and enhanced social and medical infrastructure.

In accordance with A. Omran's theory, this time frame can be thought of as belonging to the third stage of the epidemiological transition, as Chronic lifestyle-related diseases gain prominence as infectious diseases decline in importance. The COVID-19 pandemic has also brought about additional alterations to the nation's epidemiological landscape.

In industrialized nations, the epidemiological transition started earlier but moved more slowly. Western European nations advanced from the second to the third epidemiological stage. the 19th century's shift. A little over fifty years later, they advanced to the fourth stage. Compared to most European nations, the US and Australia arrived at the second stage later. However, they moved to the third stage almost simultaneously.

Kazakhstan reached the third stage of the epidemiological transition relatively quickly. By the 1960s, decisive preventive measures, the establishment of a healthcare system, and advancements in medical science all contributed to redusing in mortality and rising life expectancy.

Amid World War II, anti-microbials and sulfa drugs were presented into pharmaceutical. This circumstance essentially decreased the mortality rate within the USSR in a brief time. As a result, life anticipation expanded to some degree. By the early 1960s, according to the UN, life expectancy in Kazakhstan was about 60 years.

Central Europe and several republics of the former Soviet Union experienced periods of stagnation from the late 1960s to the early 1980s, which was associated with a marked increase in deaths from cardiovascular diseases and alcohol dependence, as well as lower life expectations after the collapse of the Soviet government. J. Vallin and F. Mesle described the situation in which the "cardiovascular revolution" took place as an extraordinary period of epidemiological development. However, this period did not occur in some Eastern European countries. It turned out that life expectancy has increased, and the number of chronic diseases has decreased. It can be said that the 1985 anti-alcohol campaign describes such positive changes. However, after this short-term improvement, a new period of mortality began in the 1990s after the collapse of the Soviet government (Caselli, 2002).

Literature review

Demographic challenges are one of the most urgent and global problems of our time. In the early years of independence, Kazakhstan experienced several demographic changes. There were difficult demographic situations, such as mass emigration of the population from the country, a decrease in the birth rate, an increase in the mortality rate, and, as a result, a decrease in the population. Such a decay straightforwardly influenced all industry structures within the nation and essentially decreased vital pointers. The demographic situation circumstance of Kazakhstan started to progress from the starting of the 2000s due to the measures of legitimately arranged and actualized state programs. However, in today's rapidly developing world, it is of great importance to constantly study and analyze the trends of the country's demographic situation (Alekseenko, 2011).

Presently, the nation's population expansion primarily stems from natural factors, namely the rise in birth rates and the decline in death rates. The annual natural population growth stands at 1.3%. Nevertheless, global natural disasters and epidemiological circumstances impact population dynamics, including mortality rates. By scrutinizing mortality patterns and life anticipation at birth, it gets to be conceivable to pinpoint stages of statistic and epidemiological move inside the nation. We are going decide in which arrange of epidemiological and statistic move Kazakhstan is by conducting a comprehensive examination of mortality indicators. Mortality information is one of the most pointers of populace wellbeing and statistic patterns (Guillot, 2013). Until the end of the 20th century, mortality statistics were closed and inaccessible, so this topic was not actively studied.

The study of current mortality patterns in Kazakhstan includes many aspects, including age characteristics, ethnic composition, causes of death, and regional comparisons. As society modernizes, mortality and its underlying causes change, shifting from one set of pathologies to another. This situation directly affects the nature of illness and death.

The aim of the consider is to analyze the the causes of passing that influence the mortality rates and changes in life anticipation of the populace of Kazakhstan from 1991 to 2022.

The subject of the ponder is the inadequacy of the epidemiological move in Kazakhstan, changes within the mortality structure of the populace. The

consider analyzes the elements of mortality by diverse age bunches, causes of passing, as well as components influencing life expectancy.

The object of the think about is factual markers of the mortality rate and life expectancy at birth of the populace of Kazakhstan.

Research objectives:

- Analyze the mortality painters of the populace of Kazakhstan for the period from 1991 to 2022;
- Identify components influencing the later in life expectancy at birth of the populace of Kazakhstan;
- Analyze the stages of the epidemiological transition in Kazakhstan and determine the current stage based on the data obtained;
- Apply of the decomposition method to identify cause-and-effect relationships driving changes in life expectancy and mortality rates.

Materials and Methods

The investigation utilized information sourced from Kazakhstan's popu censuses and current official statistical information. The data presented were used to analyze structural changes in morbidity and causes of death. Employing epidemiological methods, such as mean age at death and potential years of life lost, will enhance the understanding of the epidemiological transition in Kazakhstan. The results of the analysis were obtained by demographic analysis (method of decomposition, life table).

The indicators of the life table represent a series of age-specific values that are interrelated and provide a comprehensive description of the process of mortality across different age groups. These values reflect the decline in survival as a result of mortality within a theoretical population of a fixed initial size. Life tables are constructed primarily to estimate the key indicator of «life expectancy».

The primary statistical data for constructing a mortality table consists of age-specific mortality rates::

$$ {}_{n}m_{x} = \frac{{}_{n}M_{x}}{{}_{n}P_{x}}, $$

${}_{n}m_{x}$ – mortality rate at age x years;
${}_{n}M_{x}$ – number of deaths at age x years;
${}_{n}P_{x}$ – average population at age x years.

Analysis of epidemiological transitions requires the use of several methods. In particular, demographic and statistical analysis methods (life table, standardization methods). To dispense with the impact of contrasts in age composition over districts, a comparative territorial investigation of mortality was conducted utilizing standardized mortality rates, calculated agreeing to the International Classification of Illnesses, Tenth Amendment (ICD-10). The World Standard Population was used as the reference for standardization (Khar'kova, 2018).

The calculation is carried out by weighting the age-specific mortality rates according to some fixed system of weights:

$$ m_{ст} = \sum_{x-0}^{n} m_{x} V_{x}, $$

$m_{ст}$ – standardized mortality rate;
m_{x} – age-specific mortality rates;
x – age;
V_{x} –shares of the corresponding age groups in the total population taken as the standard.

Research questions and hypothesis

The study of the epidemiological transition raises a number of research questions and hypotheses aimed at explaining the causes and mechanisms behind changes in morbidity and mortality structures. In scientific discourse, these questions and speculations may shift depending on a country's level of socio-economic improvement, socio-cultural variables, and statistic angles. Within the setting of our consider, the investigate questions center on understanding the causal determinants of mortality in Kazakhstan, highlighting steady characteristics of an fragmented epidemiological move and reflecting the complex and ambiguous public wellbeing circumstance within the nation.

An incomplete epidemiological transition in Kazakhstan means that the country has not yet reached the stage where chronic diseases completely overshadow infectious diseases, as seen in more developed countries.

- The incompleteness of the epidemiological transition in Kazakhstan is explained by the increase in the structure of mortality due to diseases of the circulatory system, respiratory organs, and external causes;
- Incorrect diagnosis and coding of the causes of mortality in Kazakhstan contribute to distorting the real picture of mortality and hinder the development of health policy;
- Increasing socio-economic conditions and health of the population of Kazakhstan, as well as increasing well-being, directly contribute to a de-

crease in mortality and an increase in life expectancy.

Results and Discussion

Demographic Trends

Amid the beginning decade of independence, Kazakhstan seen a decrease in its populace measure inferable to increased resettlement, raised mortality rates, and decreased birth rates. In this period, the whole populace diminished by 9.6%, with a net relocation adjust of 2 million individuals. The total death rate per 1000 people increased from 8.4 in 1991 to 10.7 in 1995. Between 1992 and 2001, Kazakhstan experienced a persistent population decline, predominantly attributable to rapid emigration and a reduction in natural population growth (Figure 1). In historical context, the notable surge in mortality rates during the 1990s was ascribed to various factors, including migration patterns, diminished natural population growth, worsening social conditions, declining living standards, and specific policies related to the repatriation of certain ethnic groups to their ancestral territories. The number of Germans decreased by 65.4%, Belarusians – by 45%, Ukrainians – by 44.3%, Russians – by 32.8%, Tatars – by 29.4%, Kazakhs – increased by 17.1%, Uzbeks – by 10.4%. This demographic shift affected life expectancy, especially because most Russian-speaking people who emigrated, especially men, had a higher mortality rate (Bureau of National Statistics).

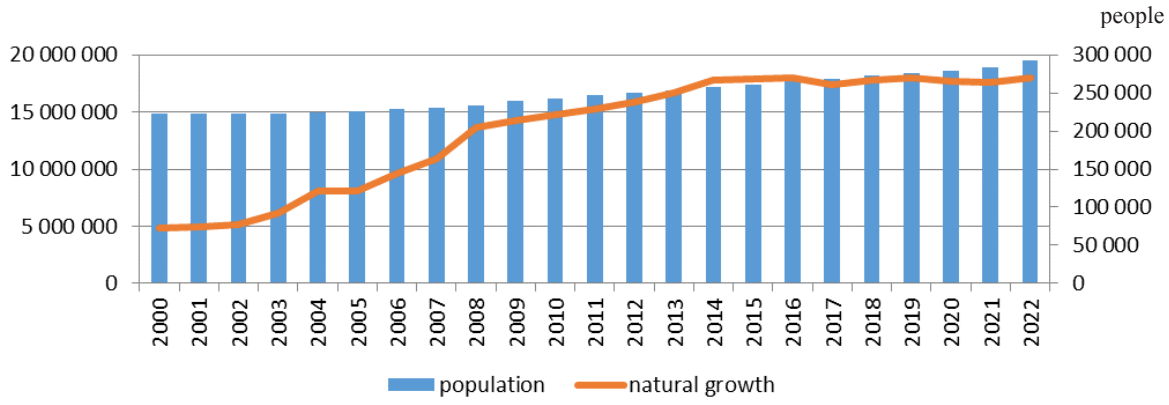

Figure 1 – Population and natural growth of Kazakhstan, 1991-2022
Source: Bureau of National Statistics

Within the early 2000s, with the stabilization of the socio-economic circumstance of the nation and the execution of programs for the return and resettlement of Kazakhs to their local country, significant changes took put within the ethnic composition of the population. (Abisheva, 2011). Within the 2009-2021 census period, the number of Kazakhs increased by 3,401.1thousand people, or 7.3%. Kazakhs make up 70.35% of the overall population.

Demographers, analyzing the mortality design in Central Asian nations, have concluded that Central Asian nations have a one of a kind epidemiological profile (Denisenko, 2011). The unwavering quality of this show in Kazakhstan has not however been clearly built up. Epidemiological transition, which accompanies demographic transition, is characterized by increased life expectancy and changes in the population's mortality structure.

All countries are going through different stages of epidemiological transition. Developed countries have gone through all stages and reached advanced stages of transition. Kazakhstan is still in its early stages. The still high mortality rates of the population, due to both internal and external causes, indicate the incompleteness of the stage of epidemiological transition. This assessment is based on analyzing life expectancy outcomes and mortality causes (Vishnevsky, 2020).

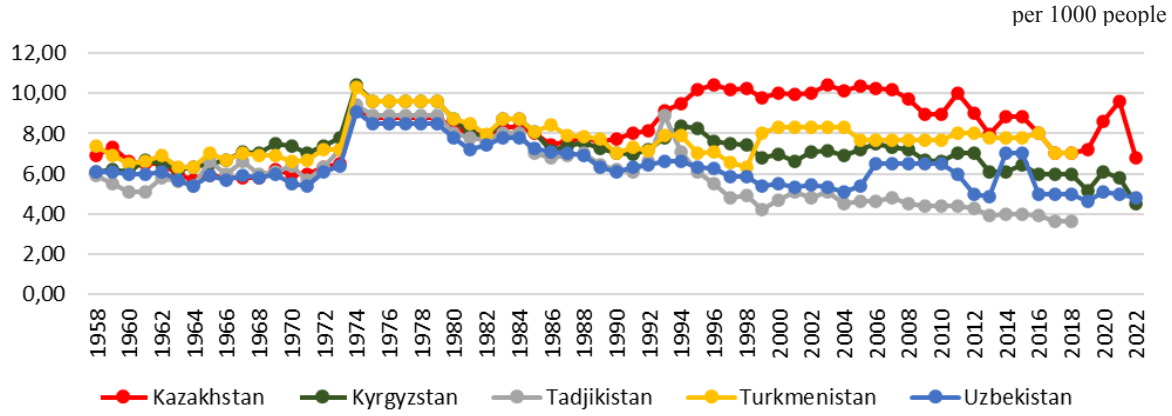

Figure 2 – Total mortality rate in Central Asian countries, 1958-2022
Source: Demoscope Weekly

The mortality rate in Kazakhstan decreased from 1958 to the early 1970s. However, throughout the 1970s and 1980s, this rate escalated, peaking at 8.1 per 1000 people. Since the first half of the 1990s, a notable increase in mortality has been observed, a trend mirrored in most CIS countries (Figure 2) (Guillot, 2013). Despite a decrease in mortality rates in the late 1990s, Kazakhstan continues to exhibit higher mortality rates compared to other Central Asian nations, attributed to the aging population structure. It is worth noting that ethnic groups such as Ukrainians, Belarusians, and Russians, have the most elevated mortality rates (Denisenko, 2011). Concurring to the 1999 populace census, the mortality rate among Russians was 14.0 per 1000 population, Ukrainians – 21.2, Germans – 10.3, and Tatars – 13.6, all surpassing the national average.

From 2009 to 2019, there was a diminish within the mortality rate. The mortality rate come to its least point at 7.1 passings per 1000 population in 2018. In 2018, the mortality rate was 5 deaths per 1000 people lower in the cities of Astana, Shymkent, and the Mangistau region. The highest mortality rates were observed in the Kostanay, East Kazakhstan, and North Kazakhstan regions. In 2020, after years of decline, the death rate rose to 8.6 per 1,000 people due to the coronavirus pandemic. In 2021, the mortality rate reached 9.61 deaths per 1000 people, marking the highest rate since 2009 (Bureau of National Statistics).

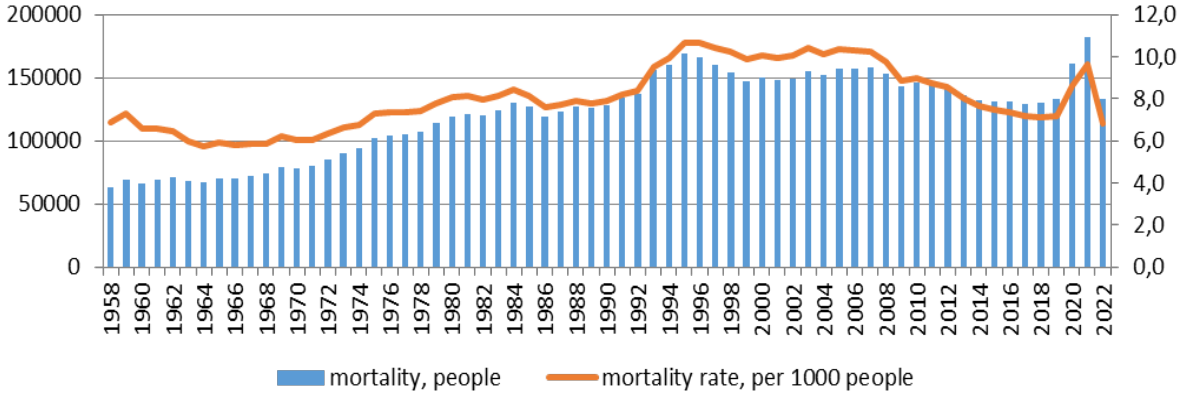

Figure 3 – The mortality rate of the population of Kazakhstan, 1958-2022
Source: Bureau of National Statistics, CSO of the USSR

After the epidemiological circumstance within the nation moved forward, the mortality rate in 2022 diminished by 26.8%,reaching 6.8 passings per 1,000 population. In urban areas display a altogether higher mortality rate compared to rural, with rates of 6.9 and 6.6 deaths per 1000 people, respectively (Figure 4).

The overall mortality rate for the inter-census period showed variations, standing at 9.9‰ per 1000 people in 1999, 8.88‰ in 2009, and 9.61‰ in 2021. Discrepancies in the total mortality rate often stem from differences in the sex-age composition of the population.

Age-specific mortality rates

Age-specific mortality rates are a crucial tool for analyzing demographic trends, evaluating the effectiveness of healthcare systems, and planning socio-economic development. These rates give a nitty gritty picture of mortality designs over diverse age groups, which is fundamental for developing mortality tables and assessing life expectancy.

By studying the causes of death by age group, it is possible to identify the main factors that affect the health of the population at different ages. Such an analysis can help to reveal the characteristics of living conditions specific to different age groups and improve the quality of life.

In our country, mortality rates for all age groups have decreased significantly over the past decade. In particular, infant mortality and mortality rates for the working age gather (15 to 40) have diminished. In any case, mortality rates for individuals matured 75 and over stay altogether higher for both sex.

In expansion, in all age bunches (but for 85+ a long time), mortality rates among men, particularly those of working age, are somewhat higher than those among women. This gender disparity in mortality, especially in younger and middle-aged cohorts, highlights ongoing public health challenges that require targeted interventions to address risk factors more prevalent among men (Figure 4).

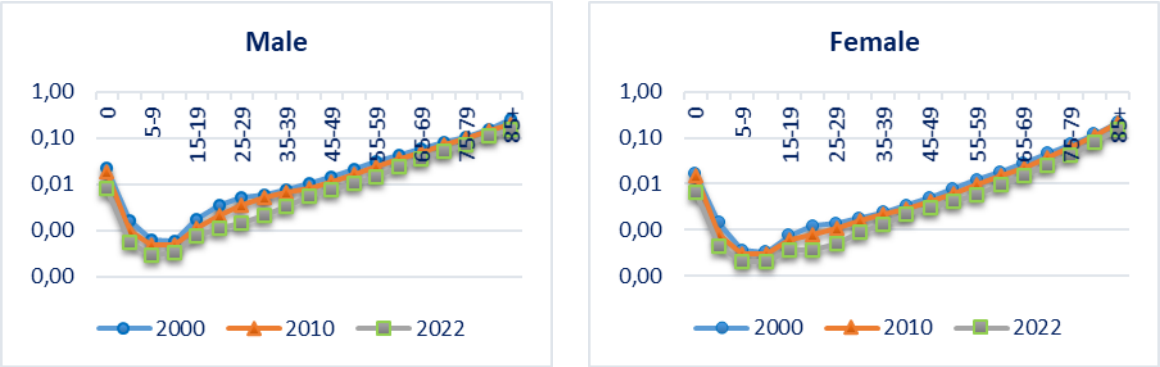

Figure 4 – Age-specific mortality rates of the population of Kazakhstan by sex (logarithmic scale)
Source: Bureau of National Statistics (author's calculations)

Standardized mortality rates by cause of death

The standardized death rate (SDR) is a population mortality rate adjusted for a standard age distribution. It is calculated as the weighted average of age-specific death rates for a given population. Standardized rates are independent of the age structure, allowing for a more accurate reflection of mortality patterns.

From 2000 to 2022, there has been a decrease in the SDR from all causes among both men and women. Among men, mortality decreased from 3,246.69 to 1,990.58 per 100,000 people, while among women, it decreased from 1,884.23 to 1,242.58 per 100,000 people (Table 1).

Particular attention has been given to reducing mortality from circulatory system diseases (CSD). Among men, this indicator decreased by 75.3% (from 1,842.05 to 454.16 per 100,000 people), and among women, it decreased by 81.1% (from 1,269.59 to 239.71 per 100,000 people). However, mortality from CSD in male remains 2.2 times higher than in female. In spite of treatment, circulatory framework infections can still lead to passing.

Table 1 – Standardized mortality rates for the main classes of causes of death in the Republic of Kazakhstan (per 100 000 people)

	2000	2010	2022
	Male		
All causes	3246,69	2792,17	1990,58
Diseases of the circulatory system	1842,05	1399,62	454,16
Neoplasms	397,90	328,56	177,90
External causes of morbidity and mortality	326,34	229,78	123,81
Diseases of the respiratory system	273,63	161,24	248,56
Diseases of the digestive system	96,40	115,95	135,01
Some infectious and parasitic diseases	75,54	29,01	11,73
Diseases of the nervous system	17,36	22,72	413,72
Others	217,47	505,29	425,68
	Female		
All causes	1884,23	1715,86	1242,58
Diseases of the circulatory system	1269,59	931,46	239,71
Neoplasms	206,16	174,29	101,19
External causes of morbidity and mortality	73,76	56,12	28,58
Diseases of the respiratory system	97,26	54,68	106,10
Diseases of the digestive system	54,97	60,85	78,11
Some infectious and parasitic diseases	19,79	9,26	6,52
Diseases of the nervous system	8,61	14,13	331,05
Others	154,09	415,06	351,32

Source: Bureau of National Statistics (author's calculations)

A diminish in mortality from outside causes has too been watched. In men, this marker is four times higher than in ladies (123.81 per 100000 population for male, compared to 28.58 per 100000 population for female). A significant reduction in mortality is also seen from neoplasms and infectious diseases in both sexes.

One alarming factor is the significant increase in mortality from diseases of the nervous system. This rate is 413.72 per 100,000 people among men and 331.05 per 100,000 people among women. For comparison, according to Eurostat, the standardized mortality rate from diseases of the nervous system is 43.33 per 100,000 people in Germany, 49.46 in Spain, 30.72 in Latvia, and only 22.18 in Poland (Eurostat, 2019). There has also been an increase in mortality from diseases of the respiratory and digestive systems in both sexes.

The high mortality rates from these causes, compared to other countries, raise concerns. This may suggest an insufficient level of diagnostics and cause-of-death coding in Kazakhstan, which negatively impacts the accuracy of demographic trend analysis. Despite having a registration system, the quality of mortality data in the country requires significant improvement.

In general, the positive trend in mortality is to a great extent due to a recognizable diminish in rates from illnesses of the circulatory framework, neoplasms, and irresistible infections. In any case, the noteworthy increment in mortality from infections of the anxious framework and other causes remains concerning and warrants further attention and analysis.

One of the primary objectives confronting the government is tackling the predominant causes death of population, notably diseases of the circulatory system, respiratory ailments, traffic accidents, and neoplasms. It is imperative to devise a national strategy aimed at combatting these diseases, which should encompass the development of preventive, therapeutic, and rehabilitative measures for the

population (UNFPA, 2006). Addressing diseases of the circulatory system poses challenges due to inaccuracies in statistics resulting from misclassification of deaths under other categories. Hence, the Ministry of Health must reassess international disease classifications and ensure stringent monitoring of cause-of-death coding by healthcare professionals. Targeted initiatives are essential to mitigate the most prevalent causes of mortality and enhance life expectancy.

Efforts to reduce mortality demand a multifaceted approach, integrating medical, legislative, educational, and social interventions. The government's responsibility extends to safeguarding citizens' health and furnishing conducive conditions for prolonged and healthy lives. Collaboration with other nations in scientific and medical realms concerning disease prevention, diagnosis, and treatment stands as a crucial stride forward.

When analyzing mortality, it is important to use the life table, or more precisely, life expectancy. The demographic interpretation of life expectancy is the average number of years a person can expect to live at a given age. This indicator is closely related to the mortality rate.

Life expectancy at birth of the population

The trajectory of life expectancy among Kazakhstan's populace has exhibited fluctuations over time. In 1992-1995, as a result of high mortality rates, especially among children and working ages, life expectancy decreased by almost 4 years. However, in subsequent years this trend gradually reversed and life expectancy has steadily increased.

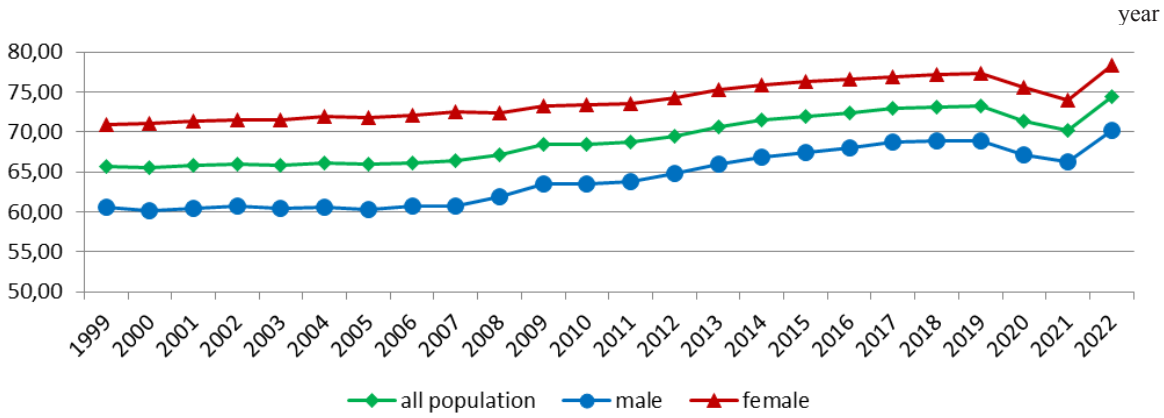

Figure 5 – Life expectancy at birth, 1991-2022
Source: Bureau of National Statistics (author's calculations)

In any case, due to the COVID19, this pointer has strongly diminished in 2020. Compared to 2019 diminished by 2 years, for male – 67.1 years, for female – 75.5 years. And in 2021, diminished by 1.1 years, to 70.23 years, primarily due to the impact of coronavirus infection.

In the context of such an epidemiological crisis, after the Ministry of Health introduced mandatory vaccination protocols for the population, a significant decrease in mortality rates was observed. As a result, in 2022, ex expanded by 4 years, coming to 74.44 years, for male – 70.26 years, for female – 78.41years. In urban areas averages at 74.73 years, whereas in rural regions – 73.94 years (Figure 5). While the urban-rural life expectancy gap in country has diminished, a significant dissimilarity holds on between male and female, wawhich in 2022 amounted to 8.15 years (BNS).

Commitment of person classes of causes of passing to changes in life expectancy of the population

Changes in expectancy hope are closely related to shifts in mortality rates by cause within specific age groups. Using the decomposition method (Andreev, 1982), assessed the contribution of various classes of causes of death to changes in life expectancy. The decomposition of life expectancy by age and cause of death offers a comprehensive view of mortality changes across different age groups and the underlying structure of causes of death.

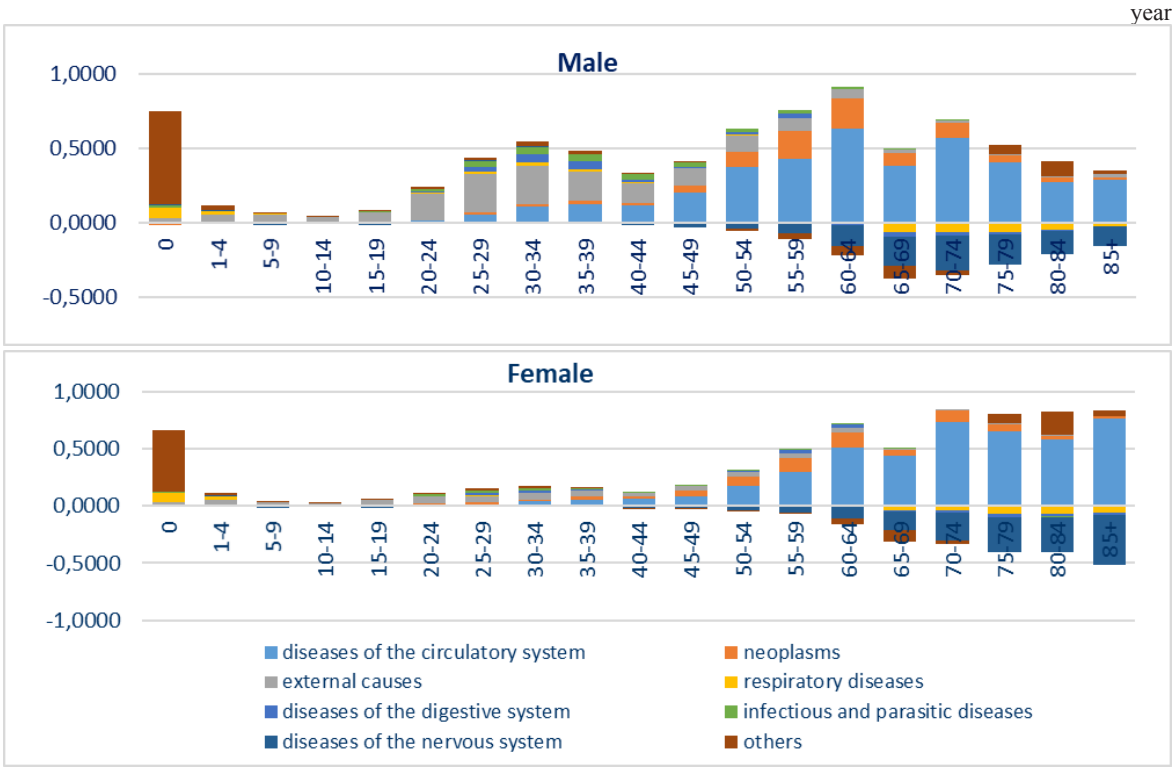

Figure 6 – Commitment of person classes of causes of passing to changes in life expectancy of the population, 2010-2022
Source: Bureau of National Statistics (author's calculations)

Based on accessible information, calculations were made utilizing the decomposition method for the period 2010-2022. As a result, it was determined that the causes of mortality that influence changes within the life expectancy are deaths from the circulatory system, external causes, and neoplasms.

It can also be seen that the large difference in life expectancy between men and women is also due to these reasons. During this period, mortality from external causes decreased significantly among men of working age compared to women. In female over 50 years, a diminish in mortality from the circulatory system is watched. This is often one of the reasons that especially affected the alter in their life expectancy. In expansion, a decrease in mortality from tumors was watched within the age gather from 50 to 80 in both genders. On the opposite, an increment in mortality from infections of the respiratory and nervous systems can be watched over 60 a long time of age (Figure 6).

Analysis of factors affecting population life expectancy using the decomposition method supports the basic principles of the epidemiological transition theory. According to this theory, as societies develop, mortality from infectious diseases declines while chronic diseases become more prominent (Vishnevsky, 2020). The comes about of the decomposition examination uncovered that the causes of passing that play a significant role in changes in life expectancy in Kazakhstan are those caused by the circulatory system, external causes, respiratory diseases, and neoplasms.

Conclusion

Over the past decade, Kazakhstan has made significant strides in healthcare, largely due to the implementation of various state programs. Infant and maternal mortality rates have notably decreased, and life expectancy has steadily increased, except in 2020. The drop in life expectancy that year, as in many countries worldwide, was largely driven by excess mortality related to the COVID-19 pandemic.

However, the main findings of the study indicate that mortality in Kazakhstan reflects characteristics of an incomplete epidemiological transition. While diseases of the circulatory system are declining, they still remain the leading cause of death. This situation highlights the incompleteness of the third

stage and the early elements of the fourth stage of the epidemiological transition. Additionally, there is a notable excess mortality among men due to external causes, suggesting a potential move toward a turn around epidemiological move. According to A. Omran's hypothesis, within the third period, as irresistible infections diminish, the hazard of degenerative infections rises, and life expectancy increments altogether. The fourth period, on the other hand, is characterized by a decrease in cardiovascular mortality, population aging, and the emergence of new diseases.

The rising incidence of diseases of the respiratory and stomach related organs in recent years points to existing gaps in the diagnosis and coding of causes of mortality.

To total the third period of the epidemiological transition, it is fundamental to create and execute comprehensive wellbeing intercessions pointed fundamentally at making strides the avoidance and treatment of cardiovascular mortality, as well as lessening mortality from external causes, particularly among male.

Worldwide involvement appears that considerable decreases in mortality and increments in life expectancy are essentially driven by advancements in healthcare, socio-economic conditions, and by and large population well-being. To take after this way, it is exceptionally vital to prioritize activities pointed at advancing a solid way of life among the population and strengthening healthcare infrastructure in the regions. By implementing such measures can we ensure the long-term sustainability of the nation's health.

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Information about author:

Aldangarkyzy Assem (corresponding author) – 3rd year PhD student, Department of Sociology and Social Work, al-Farabi Kazakh National University, Almaty, Kazakhstan, e-mail: aaldangar@gmail.com;

Denisenko Mikhail Borisovich – Director of the Vishnevsky Institute of Demography at the National Research University Higher School of Economics (HSE), Candidate of Sciences (PhD) in Population Economics and Demography, Associate Professor, Tenured Professor HSE, Saint Petersburg, Russia, e-mail: den-mikhail@yandex.ru

Автор туралы мәлімет:

Алдангарқызы Әсем (автор-корреспондент) – әлеуметтану және әлеуметтік жұмыс кафедрасының 3 курс докторанты, Әл-Фараби атындағы Қазақ ұлттық университеті, Алматы, Қазақстан, e-mail: aaldangar@gmail.com;

Денисенко Михаил Борисович – Экономика жоғары мектебі ұлттық зерттеу университеті А.Г. Вишневский атындағы Демография институтының директоры, э.ғ.к, доцент, ЭЖМ ҰЗУ ординарлы профессоры, Санкт-Петербург, Ресей, e-mail: den-mikhail@yandex.ru

Сведения об авторах:

Алдангаркызы Асем (автор-корреспондент) – докторант 3 курса кафедры социологии и социальной работы КазНУ им. Аль-Фараби, Алматы, Казахстан, e-mail: aaldangar@gmail.com;

Денисенко Михаил Борисович – директор Института демографии имени А.Г. Вишневского, Национальный Исследовательский университет Высшей школы экономики (НИУ ВШЭ), к.э.н., доцент, ординарный профессор НИУ ВШЭ, Санкт-Петербург, Россия, e-mail: den-mikhail@yandex.ru

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