

Dynamics of Indicators Characterizing the Health of Kazakhstani Youth

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Abstract Morbidity, prevalence, and mortality are key epidemiological indicators that help to assess the health of young people and draw conclusions about the state of their well-being. The aim of this study is to determine the main trends in morbidity, prevalence, and mortality among youth aged 14 to 28 years for the period from 2018 to 2021. Based on population-based data on cases of diseases and fatalities in the age group 14-28 years in the Republic of Kazakhstan for the period 2018-2021, the dynamics of morbidity (total and primary) and mortality rates were analysed and studied. The period from 2018 to 2021 in the Republic of Kazakhstan is characterized by a decrease in prevalence (from 72,267.9 to 62,112 per 100,000; $b=-3,770.6$; $p=0.05$) and morbidity (from 46,117.4 to 37,648.6 per 100,000; $b=-3,035.4$; $p=0.029$), and an increase in mortality (from 52.7 to 75.8 per 100,000; $b=7.67$; $p=0.153$). The main conclusion that can be drawn is that in the dynamics in the period of 2018-2021 in the youth population of the Republic of Kazakhstan, there is a reliable decrease in the prevalence and morbidity rates and a statistically insignificant increase in the mortality rate. Data on the health status of the young generation can be applied to the development and implementation of preventive programmes and educational activities aimed at minimizing risks and raising awareness of young people about a healthy lifestyle.

Keywords Social Factors, Healthy Lifestyle, Adolescents, Morbidity, Mortality

1. Introduction

Youth health is an integral component of the development of every society. Young people are a dynamic and active population group that makes a significant contribution to the social, economic and cultural development of the country. In the Republic of Kazakhstan, young people play a special role, attracting the attention of researchers, public figures and government bodies. Understanding the dynamics of the health indicators of Kazakhstan's youth is key to developing effective policies and programmes to improve their well-being. According to the latest data provided by the United Nations (UN), young people aged 15 to 24 years account for a significant proportion of the world population and are estimated at approximately 16% [1]. In the context of the Republic of Kazakhstan, the share of young people in the total population structure of the country in 2021 was 19.8%, indicating a good birth rate and further prospects for population growth [2]. These figures highlight the importance of studying the dynamics of indicators characterizing the health of Kazakhstani youth, as according to D. Vandegrift [3], young people in the age group from 15 to 24 years are not only a significant proportion of the population, but also a "strategic reserve" and the basis of human capital. Therefore, at the present

time, it is necessary to develop measures to improve the quality of life of young people by developing a certain algorithm to support this layer of the population.

However, in order to develop effective strategies and programmes to improve the well-being of young people, it is necessary to fully explore the dynamics of health-related indicators. Physical health, nutrition, physical activity levels, and mental wellbeing – all of these aspects have an impact on young people's health and require attention. In light of these changes, it is becoming increasingly important to study the dynamics of health-related indicators among Kazakhstan's youth. In addition, social factors also play an important role in youth health. The social environment, access to education, gender equality, economic stability and employment opportunities can all influence the physical and mental well-being of young people. This article will not only look at the physical and mental health of youth, but will also focus on the social factors that may contribute to or limit their health.

For the purposes of this article, mortality, general morbidity, and the proportion of youth were taken as the indicators that most accurately reflect the physical and mental well-being of youth. The United Nations International Children's Emergency Fund (UNICEF) conducted a comprehensive analysis of morbidity and mortality in the Republic of Kazakhstan in 2009. During this period, the Republic of Kazakhstan had the second-highest mortality rate among adolescents (15-19 years) in the World Health Organization (WHO) European Region, with morbidity rates higher than in other Central Asian countries [4]. The Commonwealth of Independent States (CIS) countries in general have a high risk of mortality among young people from external causes, such as accidents, injuries (including road traffic accidents), poisoning, homicide and suicide, especially among low-income families [5]. Mortality among young men is more than twice as high as among women, and urban youth have higher rates of death [6]. But according to recent data, there is a positive trend. In a study from 2021, A. Orazymbetova and G. Sultanbekova [7] note that over the past 15 years, infant mortality has significantly decreased, and life expectancy has increased by 6.96 years, which indirectly reflects the positive dynamics of health of young Kazakhstanis. Thus, G. Mukhanova et al. [8], in their study from 2022, noted a decrease in general morbidity among young people, although there is still a problem with pulmonary and digestive diseases, which form the main share in this indicator.

The purpose of this article is to analyse population-based data from 2018 to 2021 concerning disease cases and fatalities among individuals aged 14 to 28 in Kazakhstan. The study seeks to analyse the patterns of morbidity and mortality rates (primary and total) among this demographic during the designated period. By utilising the primary epidemiological indicators, the research hopes to provide valuable insights into the health status and general welfare of young individuals in Kazakhstan.

2. Materials and Methods

In this paper, a retrospective approach was taken and descriptive and analytical statistics were used to analyse the dynamics of indicators in the context of studying the health of young people in the Republic of Kazakhstan. This approach allowed getting a more complete picture of the state of health of young people and to identify trends in changes in indicators over time. The main sources of information were the official reporting data of the Ministry of Health on the number of diseases obtained from the form No. 15 "Report on the number of diseases registered in patients living in the service area of the medical organization and contingents of patients under dispensary observation", as well as register data from the "Register of the attached population" to obtain information on deaths from the "Register of death certificates" [8]. Data for the study were collected for a four-year period from 2018 to 2021 and referred to the age group of 14-28 years in the Republic of Kazakhstan. At the beginning of 2018, the number of youths aged 14 to 29 years was 3,900,834, with males accounting for 50.7% of the total and females accounting for 49.3%, respectively.

To estimate the prevalence, morbidity, and mortality in this age group, a common methodology was used where data were normalized per 100,000 people. For this purpose, demographic data of the Statistics Agency of the Republic of Kazakhstan on the number of the attached population aged 14-28 years were used. To assess the dynamics of health indicators of Kazakhstani youth for the specified period (2018-2021), the researchers determined trends that were classified as ascending or descending. The applied method of single-factor linear regression allowed assessing the statistical significance of the obtained trends. The results of the regression analysis were presented in the form of unstandardized coefficients (b) and levels of statistical significance (p). For a better understanding of the dynamics of indicators, the obtained results were also presented in the form of average annual values obtained by determining the arithmetic mean of the studied indicators [8]. This allows more fully covering and analysing the changes that occurred in the health of Kazakhstani youth in the specified period and identifying statistical trends.

In this study, regression analysis was applied to assess trends in the level of morbidity, prevalence, and mortality among the studied group. To obtain more accurate and valid results, non-standardised regression coefficients (b) for each indicator (morbidity, prevalence, and mortality) were used. Regression coefficients are numerical values that indicate the magnitude and direction of the effect of time on the respective health indicator. If the regression coefficient (b) is positive, it indicates an increase in the indicator over time, and if it is negative, it indicates a decrease. However, evaluation of regression coefficients alone is not sufficient to draw conclusions about the statistical significance of the results obtained. Therefore, a p-value was also applied, which represents the probability

that the observed changes in health indicators were obtained by chance and are not statistically significant. The smaller the p-value is, the more significant the results of the regression analysis are. If the p-value is less than a specified level of statistical significance (e.g., 0.05), it indicates that the changes in health indicators are indeed significant and not random. The use of regression analysis, regression coefficients and p-value made it possible to study the dynamics of morbidity, prevalence, and mortality in the specified age group more fully and objectively, to identify trends and to establish the degree of statistical significance of these changes over the specified period of time. Thus, the described methodology and used materials allowed reliably studying the dynamics of indicators characterizing the health of Kazakhstani youth and conducting statistical analysis of data for the specified period.

3. Results

The dynamics of prevalence, morbidity, and mortality

rates among young people in the Republic of Kazakhstan were thoroughly analysed. Examination of the data presented in Table 1 revealed that for the period from 2018 to 2021. Analysis of the data showed that during this period there was a marked decrease in the prevalence of diseases among young people – from 72,267.9 to 62,112 per 100,000 people. A decrease in the incidence rate was also found, from 46,117.4 to 37,648.6 per 100,000 people. However, during this time, mortality in this age group increased from 52.7 to 75.8 per 100,000 people. Interestingly, trend analyses revealed statistically significant downward trends for both prevalence ($b=-3,770.6$; $p=0.05$) and incidence ($b=-3,035.4$; $p=0.029$). This means that the marked decrease in incidence and prevalence among young people is indeed statistically significant and not a coincidence. However, it is worth noting that the observed upward trend in mortality rate is not statistically significant ($b=7.67$; $p=0.153$). This may indicate that changes in the youth mortality rate over the period are not significant enough to claim statistical significance of such a trend.

Table 1. Dynamics of prevalence, morbidity, and mortality rates (per 100,000 people) among Kazakhstani youth for the period 2018-2021

	Year				b	p-value
	2018	2019	2020	2021		
Youth regardless of gender						
prevalence	72,267.9	69,820.1	62,581.7	62,112	-3,770.6	0.05
morbidity	46,117.4	43,504.4	38,556.7	37,648.6	-3,035.4	0.029
mortality	52.7	49.8	57.1	75.8	7.67	0.153
Young men						
prevalence	58,310	56,276.7	50,375.3	49,506.3	-3,231.3	0.039
morbidity	38,048.6	35,757	31,501	30,044.3	-2,826.9	0.016
mortality	71.4	67.1	75.7	102	10.04	0.174
Young women						
prevalence	86,398.9	83,610.2	75,069.7	75,092.5	-4,246	0.062
morbidity	54,286.3	51,392.9	45,775.2	45,478.9	-3,204	0.045
mortality	33.7	32.3	38.2	48.8	5.12	0.115

Source: compiled by authors.

Table 2. Yearly average (\bar{X} for 2018-2021) prevalence, morbidity, and mortality rates (per 100,000 people) among Kazakhstani youth (both sexes), by disease class

	Prevalence			Morbidity			Mortality		
	\bar{X}	regression coefficient	p-value	\bar{X}	regression coefficient	p-value	\bar{X}	regression coefficient	p-value
A00-B99	1,679.5	28.5	0.805	1,091.8	-0.46	0.994	1.2	-0.056	0.81
C00-D48	524	-15.8	0.23	242.2	-10.1	0.418	4.9	0.249	0.271
D50-D89	3,247.9	-222.7	0.046	1,433.5	-150.5	0.047	0.3	0.008	0.742
E00-E90	2,213.9	25.6	0.491	735.9	-11.4	0.659	0.8	0.153	0.256
F00-F99	1,259.7	-69.1	0.152	37.1	-18.7	0.033	0.2	0.030	0.372
G00-G99	3,908.3	-159.5	0.046	1,477.9	-88.9	0.066	3.8	0.506	0.106
H00-H59	4,905.3	-253.1	0.192	1915	-130.7	0.155	-	-	-
H60-H95	1,482.3	-98.6	0.121	951.2	-117.9	0.066	0.02	-0.004	0.789
I00-I99	2,127.8	-87.9	0.053	905.9	-41.1	0.02	3.8	0.848	0.031
J00-J99	18,767.3	-1,584.7	0.095	15,687.5	-1,800.2	0.031	2.1	0.171	0.35
K00-K93	5,910.9	-113.4	0.432	3,423.6	-15.5	0.751	1.9	-0.195	0.26
L00-L99	3,407.5	-193.6	0.004	2,643.5	-177.7	0.041	0.1	0.003	0.742
M00-M99	3,343.5	-73.9	0.032	1,619.6	-34.8	0.111	0.5	-0.006	0.922
N00-N99	6,777.4	-762.3	0.018	3,690.2	-412.3	0.014	0.9	0.097	0.312
O00-O99	2,932.3	-370	0.011	2,180.2	-210.3	0.058	0.6	0.124	0.175
Q00-Q99	583.5	-16.6	0.023	140.1	-6.42	0.096	0.6	0.016	0.619
R00-R99	175.3	19.4	0.228	116.9	0.76	0.924	1.1	0.179	0.139
S00-T98	2,767	-157.6	0.001	2,751.3	-144	0.004	27.2	8.867	0.119

Source: compiled by authors.

A closer look at the sex-disaggregated data in the youth population of the Republic of Kazakhstan reveals interesting trends. In the male population, there was a significant decrease in the prevalence rate between 2018 and 2021. Specific figures show that this indicator decreased from 58,310 to 49,506.3 per 100,000 people. This decrease is statistically significant ($b=-3,231.3$; $p=0.039$), which emphasizes its reliability and validity. On the other hand, the female population also showed some downward trend in the prevalence rate. Between 2018 and 2021, the rate decreased from 86,398.9 to 75,092.5 per 100,000 people. However, the statistical significance of this decrease was not achieved ($b=-4.246$; $p=0.062$). This means that although there is some decrease in morbidity among female youth, it cannot be considered reliable at the level of significance used in this study. When analysing the dynamics of primary morbidity among young people in the Republic of Kazakhstan for the period 2018-2021, significant changes are found in both sex groups. In the male population, there is a significant decrease in the primary morbidity rate. Specific figures show a decrease from 38,048.6 to 30,044.3 per 100,000 male population. This downward trend is statistically significant ($b=-2,826.9$; $p=0.016$), indicating the reliability of the findings. Similar trends were found in the female youth population. Here too,

there was a significant decrease in the primary morbidity rate from 54,286.3 to 45,478.9 per 100,000 female population. This downward trend also has statistical significance ($b=-3,204$; $p=0.045$), confirming the reliability of the results obtained. Also, the trends of prevalence, morbidity, and mortality rates among Kazakhstani youth were analysed, taking into account the class of diseases (Table 2).

When analysing the mortality rate among young people in the Republic of Kazakhstan for the period under review (from 2018 to 2021), some trends were noticed. In the male population there was an increase in the mortality rate from 71.4 to 102 per 100,000 people, and in the female population – from 33.7 to 48.8 per 100,000 people. However, it is worth noting that the observed upward trends in the mortality rate in the male population ($b=10.04$; $p=0.174$) and in the female population ($b=5.12$; $p=0.115$) are not statistically significant.

As a result of this study, pronounced and statistically significant downward trends in the prevalence rate of various classes of diseases among youth from 2018 to 2021 were identified. These significant results indicate a positive trend in the morbidity of young people during this period and point to possible improvements in the health of the young generation in the Republic of Kazakhstan. Effective

preventive measures implemented within the health care system, along with educating youth about healthy lifestyles and encouraging them to take an active role in preserving their health, are necessary to successfully reduce morbidity. In addition, the study also found less pronounced downward trends in several other diseases. Although these trends did not reach statistical significance at a level comparable to other classes, their detection is still significant because it indicates possible trends of decreasing incidence in these classes.

When analysing trends in primary morbidity among young people in the Republic of Kazakhstan in more detail, statistically significant results were found in various disease classes. When analysing trends in terminal outcomes among young adults, a statistically significant increase in mortality from class I00-I99 disease was found ($b=0.848$; $p=0.031$). The trends in mortality from other classes of diseases were not statistically significant. It is noted that the mortality rate from S00-T98 class of diseases has the highest value on average for the period ($X=27.2$ per 100,000 people), but the observed upward trend of this indicator is not statistically significant ($b=8.867$; $p=0.119$).

According to the study, from 2018 to 2021, the following trends have been observed. Firstly, a significant and statistically significant decrease in the prevalence rates of various diseases was noted. This indicates a positive health trend among young people and indicates a possible improvement in the overall health status of this population group. The decrease in disease prevalence rates may be the result of effective prevention, healthy lifestyle awareness and access to health services. Second, a slight increase in mortality rates in the youth population was found. Although this increase is not statistically significant, its observation warrants attention and further investigation. Possible reasons for this increase may be related to lifestyle changes, increased stress levels, or other factors that may affect the health of youth.

4. Discussion

Kazakhstan's healthcare system has suffered from the coronavirus pandemic. First, demand for COVID-19 testing, treatment, and vaccination has skyrocketed. The increased demand has put a strain on healthcare infrastructure and resources, making it difficult to treat COVID-19 and other patients quickly. The pandemic has also made the healthcare workforce more vulnerable, causing shortages in critical care specialities. Due to heavy workloads, long hours, and virus risk, frontline healthcare workers have experienced burnout and mental health issues.

Due to the pandemic, telemedicine and digital health solutions for remote consultations, monitoring, and patient care have grown rapidly. These advances have improved healthcare during the pandemic, but they have also revealed technological access and digital literacy gaps, particularly in marginalised communities. One cannot overstate the

pandemic's financial impact on healthcare. Healthcare budgets have been strained by COVID-19 management, infection control, and medical supply and equipment purchases. Revenue losses from cancelled elective procedures and declining patient volumes have deepened healthcare institutions' financial problems. In conclusion, the COVID-19 pandemic has put a strain on Kazakhstan's healthcare system, emphasising the need for pandemic readiness, significant investments in infrastructure and personnel, and universal healthcare access for all demographic groups.

Particular interest is drawn to the dynamics of prevalence and incidence rates in the Republic of Kazakhstan during the periods preceding and including the COVID-19. It is interesting to note that in 2020, the largest decrease in rates was observed compared to the previous year. This decrease is likely due to the limited availability of health care to the population, including young people, due to the quarantine measures and the introduction of the lockdown. The following year, 2021, was also special in light of the pandemic, and the rate of decline in prevalence and incidence during this period was the lowest. This is explained by the pandemic situation at that time, and probably by some adaptations in the health care system to better control the spread of infection and provide health care to the population. In general, for Kazakhstani young people in the period from 2018 to 2021, there is a significant reduction in total and primary morbidity in such areas as diseases of the genitourinary system, diseases related to pregnancy, childbirth and the postnatal period, diseases of the blood, hematopoietic organs and immune disorders, diseases of the skin and subcutaneous tissue, diseases of the nervous system, injuries, poisoning and other consequences of external causes, diseases of the circulatory system, diseases of the musculoskeletal system and connective tissue, as well as diseases of the blood circulation system, diseases of the musculoskeletal system and connective tissue, and infections. These positive changes, according to this study, are associated with the introduction of a set of measures (socio-economic, organizational) carried out within the framework of the state youth policy of the Republic of Kazakhstan under the title "Kazakhstan 2020: the way to the future".

Kazakhstani youth health indicators show complex dynamics during the COVID-19 pandemic. Against the background of decreasing prevalence and morbidity in some classes of diseases, there is an alarming increase in mortality among young people. It is important to note that in 2021, this indicator increased 1.5 times compared to 2019, which represents a serious advance problem for public health and society. The main contribution to the increase in the mortality rate is due to a statistically significant increase in deaths from circulatory diseases. This is concerning as cardiovascular disease can be associated with a variety of risk factors and affect the overall health of young people. This assumption requires further investigation and confirmation. The results of the

study also reveal differences in the dynamics of morbidity rates depending on gender. The prevalence of diseases among female youth in the Republic of Kazakhstan was higher by 31%, and the morbidity rate by 13%, compared to the male youth population. Moreover, mortality rates were 96 per cent higher among men. These gender differences can serve as a basis for the development of specific organizational approaches that take into account gender specificities in optimizing population health. For example, special attention should be paid to the provision of appropriate health services and information, and gender-specific prevention and early detection programmes should be developed.

A careful analysis of the trends in prevalence, morbidity, and mortality rates among young people in the Republic of Kazakhstan for the period from 2018 to 2021 revealed the following trends. The prevalence of diseases among young people decreased from 72,267.9 to 62,112 per 100,000 people. This may indicate the effectiveness of the measures taken to control the spread of diseases and improve public health, and indirectly confirms the effectiveness of treatment and diagnostic protocols during that period. The incidence among the youth also decreased, from 46,117.4 to 37,648.6 per 100,000 people. Research findings in the study population indicate a reduction in risk factors associated with common young-age pathologies alongside improvements in socioeconomic conditions for individuals up to 28 years old. These improvements probably have led to increased access to healthcare, availability of healthy food, and opportunities for adopting nutritional hygiene and an active lifestyle. However, an alarming fact is the increase in mortality in this age group from 52.7 to 75.8 per 100,000 people. This may indicate that there are serious problems or deficiencies in the health system, provision of health care and other aspects affecting the health and safety of young people.

When analysing the data obtained, it was also found that there was a significant decrease in the prevalence of genitourinary tract diseases in the study population ($b=-762.3$; $p=0.018$), in the time period from 2018 to 2021, in addition to this the primary morbidity decreased ($b=-412.3$; $p=0.014$). In recent years, there has been an increase in the incidence of genitourinary tract diseases in European countries in those under 28 years of age, which is associated with an increase in risk factors in young people, such as obesity and poor hygiene. The number of cases is increasing annually in European countries and according to recent data presented by M. Renko et al. [9] in 2022, among adolescents under 16 years of age, 10% have had at least 1 episode of genitourinary infection. Also in Europe, the number of sexually transmitted infections is increasing, where a meta-analysis by S.M. Redmond et al. [10] in 2015 showed an increase in the detection of chlamydia in people under 20 years of age from 0.4% in 2001 to 6.5% in 2012, which may be related to the increase in unprotected sex and the increasing popularity of sex work in general over the last 15 years. When analysing the incidence of infectious

diseases including human immunodeficiency virus (HIV), hepatitis B and C, a slight increase in prevalence was found among young people between 14 and 28 years of age ($b=28.5$, $p=0.805$). According to K. Mussina et al. [11] in 2023, the number of HIV-infected young people in the Republic of Kazakhstan is increasing annually, and mortality from the effects of acquired immunodeficiency syndrome increased almost twice between 2014 and 2019. In South Korea, there is a negative trend, according to M. Yoo et al. [12] in 2020, the number of new HIV infections increased 6.5 times between 2014 and 2015. In summary, the data of the study conducted by the authors confirm the global trend of increasing incidence of sexually transmitted infections (STIs), but statistics on pathologies of the genitourinary system say that the situation in the Republic of Kazakhstan is better than in European countries, where the risk is more associated with the increasing incidence of obesity and poor hygiene among adolescents.

Data were obtained that the group of diseases related to pregnancy and childbirth also showed a negative trend in prevalence ($b=-370$; $p=0.011$), which may be associated with increased accessibility of medical care and improved health of the reproductive system in young girls. In European countries, there is also a decrease in the reported cases of this group of nosologies. According to R. Linnakaari et al. [13] in 2019 in Finland, the number of miscarriages decreased from 6.5 per 1,000 people in 1998 to 5 per 1,000 people in 2019, which is in line with the global trend. But even with this trend, more than 25% of women from highly developed countries such as Germany, Singapore, and the UK have had at least 1 episode of miscarriage during their lifetime [14]. In addition, it is worth mentioning the other most important pathology among pregnant women – ectopic pregnancy. Until now, this disease has been the main cause of mortality among women in the first trimester of foetus carrying and according to H.J. Hao et al. [15]. From 2023, the incidence of this disease is increasing annually and at the moment it is up to 2% of all pregnancies. Although the above diseases were not analysed in this paper, the total incidence of pregnancy associated diseases has decreased, which may also mean that the incidence of ectopic pregnancies and miscarriages has decreased during this period of time among pregnant women in the Republic of Kazakhstan, which is better than the results obtained in other countries. This may be explained by the low incidence of inflammatory pathologies of the reproductive system and the unpopularity of intrauterine contraception.

A negative trend was found in the group of skin and subcutaneous fatty fibre diseases ($b=-193.6$; $p=0.004$), primary morbidity decreased ($b=-177.7$; $p=0.041$). These results are not in line with the global trend and are associated with an increase in the proportion of urban population, increased accessibility of medical care and increased awareness of the population about necessary hygiene procedures. Recently, there has been an increase in the number of infectious lesions of the skin and

subcutaneous fat, which is most often associated with an increase in the number of antibiotic-resistant strains of *Staphylococcus aureus* and *Escherichia coli*. According to H.S. Lin et al. [16] in 2021 the number of cases of infectious skin lesions in the UK increased from 123 cases per 100 thousand people in 1998-1999 to 236 cases per 100,000 people in 2010-2011. In the Republic of Kazakhstan, the opposite situation is observed, and this decrease is explained by an increase in the proportion of the urban population, which is at low risk of infectious skin lesions.

The authors' study found that the prevalence of diseases of the nervous system and mental illnesses also decreased significantly over the last 4 years ($b=-159.5$; $p=0.046$). This may be due to a decrease in the proportion of infectious lesions of the central nervous system, as the prevalence remains consistently low in other countries. For example, in the UK, the risk of meningitis is 2.73 per 100,000 people, whereas in Ghana the rate is 47.5 per 100,000 people [17]. These results show that this decrease may be due to the improved socioeconomic situation among young people in the Republic of Kazakhstan, whose protection is ensured by developed health care and minimization of contacts with this category of patients. Assessment of mental health, including the presence of stress, anxiety, depression, or other mental disorders, is also an important indicator of youth health. A negative trend in prevalence ($b=-69.1$, $p=0.152$) and a decrease in incidence ($b=-18.7$; $p=0.033$) were also found when reviewing the data presented, but these findings are statistically insignificant. M. Turgumbayev et al. [18] in 2023 reported that in the Republic of Kazakhstan, between 20 and 30 years of age, depression is most common among young women, which is associated with the plight of women in a conservative society. But similar results are seen around the world. About 38% of European adolescents aged 14 years in the general population had at least one episode of anxiety disorder, while 3.1% had a depressive disorder at least once in their lives [19]. Similarly, M.S. Ong et al. [20] in their article from 2021 noted that nowadays suicide due to mental problems has become one of the main causes of death of youth and children, and that half of all living adolescents have psychological trauma. In this case, in the Republic of Kazakhstan there is a stable picture, with no worsening of the situation, which is the main difference from the data for other countries.

A healthy diet is a key factor in maintaining good health. Nutrition-related indicators include the consumption of nutrient-rich foods such as fruits, vegetables, and whole-grain products, and limiting the consumption of unhealthy foods such as sugar and saturated fats. According to V. Ognev et al. [21], from 2023, more than 30% of young Kazakhs do not have a rationed diet, and more than 40 per cent of families consume unhealthy food based solely on taste preferences. Thus, in a study from 2020 A. Baspakova et al. [22] among adolescents from 15 to 18 years old, it was found that 36.8% of them consumed fast food several

times a week, which is a poor indicator compared to other countries. C. Svastisalee et al. [23] in their analysis from 2016 noted that European adolescents that consume fast food once a week are no more than 30% of the total number. When analysing the results of this study, a slight increase in the prevalence of diseases from the group E00-E90, which includes obesity ($b=25.6$, $p=0.491$) was noted, although after careful examination, statistical significance was not achieved. These data indicate a lower susceptibility to obesity among adolescents in the study group than in the European Union and America, where an increase in the number of obesity cases in adolescents under 18 years of age is registered annually.

During this period, the incidence of respiratory diseases decreased sharply, which indirectly indicates an improvement in the situation with smoking among adolescents in the Republic of Kazakhstan ($b=-1,800.2$; $p=0.031$). According to the studies of V.T. Zhanbolatova and L.N. Skuchalina [24], approximately 53% of young people in the Republic of Kazakhstan face smoking-related problems. This is a significant problem for young people, as smoking negatively affects their health and can lead to the development of various diseases. In Europe, smoking rates among adults and adolescents are among the highest among WHO regions, at 28% and 17% respectively [25]. Although statistics show that smoking among adolescents in the Republic of Kazakhstan is 2 times more common than in the European region, the decrease in the incidence of respiratory system pathologies is an indicator of an improvement in the situation regarding smoking among adolescents in the study population. This positive trend indicates possible success in preventive measures and information campaigns aimed at reducing the prevalence of smoking among adolescents in the country, but the situation is still worse than the global average.

In the population studied, the data indicate a decrease in the prevalence of diseases of the hematopoietic system ($b=-222.7$; $p=0.046$), as well as a decrease in morbidity ($b=-150.5$; $p=0.047$). This result is most likely due to a decrease in the proportion of patients with iron deficiency anaemia, which is one of the common diseases in people under 28 years of age. Even in economically rich regions like China, the prevalence of iron deficiency anaemia among adolescents is about 40% [26]. In the Republic of Bangladesh, the prevalence is 46.8% [27]. The decrease in the incidence of this group of pathologies in the Republic of Kazakhstan may indicate that in recent years the availability of food rich in iron has increased, as well as improved preventive measures aimed at reducing the risk of anaemia among the study population. This indicates positive trends in health and nutrition in the country.

The incidence of cardiovascular pathologies decreased between 2018 and 2021 ($b=-41.1$; $p=0.02$). The most frequent pathology among adolescents is arterial hypertension, often associated with overweight and sedentary lifestyle. According to a meta-analysis from 2019 by P. Song et al. [28], the prevalence of arterial

hypertension among children and adolescents is 4%. According to these data, it is possible to indirectly judge that the number of adolescents with a high body mass index in the Republic of Kazakhstan has decreased. Comparing these data with global trends, the decrease in the incidence of cardiovascular pathologies and arterial hypertension among adolescents in the Republic of Kazakhstan appears to be an important achievement. Globally, cardiovascular diseases and arterial hypertension are among the leading causes of death and morbidity, so reducing their prevalence in the Republic of Kazakhstan may have a positive impact on public health and well-being of the country.

Initially, the findings confirm that there is a significant decrease in the prevalence rates of various diseases among youth between 2018 and 2021. These findings point to successful efforts in disease prevention and healthy lifestyle awareness among the youth population. For example, the declining incidence rates of some classes indicate a positive change in the health status of young people. However, some disease classes show less pronounced downward trends. This may indicate the need for additional and more targeted interventions to prevent and treat these specific diseases. Further study of the factors affecting the rates of these classes of diseases may help to develop more effective health strategies and programmes [29]. A discouraging fact is the difference in the dynamics of the rates according to gender. The observed higher prevalence and incidence rates among female youth may be related to differences in biological, sociocultural and behavioural factors. At the same time, the higher mortality rate in the male youth population highlights the need for specific organizational approaches to optimize the health of these groups. A detailed study of sex-specific characteristics could lead to the development of specialized programmes and interventions aimed at improving the health of young people. This means that changes in the youth mortality rate over the period cannot be unequivocally associated with certain factors or trends. It is necessary to conduct further research and take into account other possible influencing factors to more accurately assess and explain these trends in the youth mortality rate [30].

However, it should be noted that the slight increase in the youth mortality rate requires further study and attention. Possible reasons for this increase may be related to lifestyle changes, including unhealthy diet, lack of physical activity, increased stress and bad habits. Conducting more research and developing interventions to reduce the mortality rate among young people will be important tasks to further improve their overall health. In conclusion, the study conducted on the dynamics of indicators characterizing the health of Kazakhstan's youth provides valuable information on the health status of this population group. The results confirm positive changes in the prevalence of diseases, but attention needs to be paid to problematic classes of diseases and differences between the sexes. This study can serve as a basis for developing more effective

strategies and programmes to improve the health of young people in the Republic of Kazakhstan.

5. Conclusions

These results indicate a positive trend in the morbidity of young people and point to possible improvements in their health. The significant and statistically significant decrease in the prevalence of diseases may be the result of effective prevention and health awareness measures. However, the slight increase in the mortality rate of class IX diseases requires further study and attention. This will help to identify the causes of this increase and develop appropriate interventions to reduce mortality in the youth population. The observed trends in mortality from other classes of diseases have not reached statistical significance, but also require continuous monitoring and analysis to ensure optimal health of the youth population. It is important to continue research and consider the various factors that may influence health in order to develop effective strategies and interventions to reduce mortality rates and improve overall health in this age group.

Overall, the results of the study suggest a positive trend in the health of Kazakhstan's youth. However, further monitoring and interventions are needed to maintain and improve their health. Further research should be conducted to better analyse the reasons for the increase in mortality rates and to develop long-term strategies to improve the overall health of young people. Various other factors, such as physical activity, nutrition, socioeconomic status and education, need to be taken into account to fully understand and assess the health of young people in Kazakhstan. An integrated approach that includes an analysis of all these aspects will allow the development of targeted programmes and measures to maintain and improve the health of young people and ensure their well-being in the long term. This will ensure effective measures to prevent disease and improve the quality of life of the young generation in the Republic of Kazakhstan.

Conflict of Interest

The authors declare that there is no conflict of interest.

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Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author.

Ethics Statement

The study was conducted without human participation. Informed consent is not required.

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