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Contemporary aspects of the relationship between life expectancy and the standard of living of the population in the Republic of Bulgaria

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Abstract. This article focuses the eternal topic of life expectancy and the everlasting search for prerequisites for its gradual increase. The situation in the province in Bulgaria is presented in terms of gross domestic product (GDP) per capita and life expectancy at birth, as well as overall mortality and mortality by main groups of diseases; moreover, the correlation coefficients were calculated in order to find relationships between the mentioned values. We came to the conclusion that GDP per capita, which is used as a measure of the standard of living, features a moderately positive correlation relationship with foreseeable life expectancy. We also found a moderately negative relationship between standard of living and the overall mortality and in the case of mortality from circulatory diseases. Another finding is the weaker negative relationship between GDP per capita and mortality rate from neoplasms. The weakest appears to be the relationship between the standard of living and the mortality from respiratory diseases. The calculations were made on the basis of official comprehensive field information from the National Statistical Institute for 2023. Conclusions were drawn on the reasons for these results and on the possibilities of increasing life expectancy in line with the increase in population's material well-being.

Keywords: Gross Domestic Product, life expectancy, standard of living
JEL: I31, J1

Introduction

Dynamics in economic development and processes of digitalization of the economy become the cause of new aspects and different power in the manifestation of the relationship between the living standard and life expectancy. On the one hand, the growing standard of living implies better diet, better healthcare, safer cars, greater opportunities to read and travel to get to know the lifestyle of other peoples that have achieved a noticeably longer life span. On the other hand, higher incomes are a prerequisite for the development of some unhealthy habits: abuse of food, alcoholic beverages, drugs, smoking, which start to develop as early as at a young age. While education and building a healthy lifestyle is still difficult to find a place in adolescent curricula, social networks could contribute to the spread of unhealthy habits. At the same time, the traditions in the family remain an essential factor that affects the social positioning of adolescents. Treatment of socially significant diseases continues to be prioritized over sports, prevention and healthy lifestyles. Therefore, it is useful to constantly investigate the relationship between a standard of living and life expectancy. It could be expected that it is not just one-way. Older people, although more vulnerable to diseases and with less stamina, can lead a fulfilling life and create goods rather than just consuming them. However, this may only be feasible if they are physically and emotionally well. Occupational activity after reaching retirement age would not only appear as a way of providing additional resources, just on the contrary: it may also become a prerequisite for preserving the mental and physical abilities of the individual, as well as for a happier life as a result of achieving reasonable goals.

The Human Development Index (HDI) is one of the most prestigious summarizing indicators reflecting the degree of development of a society, however it includes life expectancy, education and the level of well-being, not comparison of them (Anonymous 2023).

"According to the UN report on the happiest country in 2024, Bulgaria ranked 81st, with some Eastern European countries far ahead. Six key indicators were used to obtain the ranking. These are the gross domestic product per capita, social support, life expectancy in good health, freedom, generosity and sensing corruption" (Anonymous 2025).

That was one of the reasons why this study paid particular attention at the gross domestic product (GDP) regarding the latter as a measure for the levels of the standard of living.

The target of research is the material and biological status of Bulgaria's population by provinces.

The subject matter of research are both the direction and the strength of the relationship between the standard of living and the life expectancy at birth.

The objective of this study is to reveal how the standard of living impacts the life expectancy in order to search for some possibilities to utilize the entire potential of this factor.

The tasks whose solution would allow to achieve the goal are: a study of national and international experience and conducting an empirical study in the Republic of Bulgaria based on comprehensive data by provinces.

The main research thesis that will be subject to proof is that life expectancy is favourably affected by the level of life standard, but this is not sufficient, i.e., the relationship is mediated and is of correlation type. This is why it would be worth to be systematically scrutinized to undertake some adequate corrective measures of institutional and personality nature.

The methods used were both logical and statistical (statistical graphic images, Pearson correlation coefficient). The main timeline segment covered the years 2021-2023. Some indices are presented in the dynamics typical of the above period. The data source used was the National Statistical Institute (NSI) website, with those data being exhaustive. A limiting condition to this study was the representation of the standard of living solely by means of the gross domestic product per capita. In a more extensive study, a composite criterion may be used by aggregating several quantitative indicators.

A review of relevant literature

The standard of living is typically associated with the material well-being of the population. It differs from the concept of "quality of life", which also takes into consideration an individual's evaluative characteristics regarding their satisfaction with the quantity and quality of goods available to them, their sense of security, justice, corruption levels, welfare, and professional and social fulfilment. In this sense, it might be assumed that the standard of living may have a more objective dimension, by putting together some quantitatively measurable indicators. Vasil Tsanov (Tsanov 2018) takes three groups of indicators in a research work of his:

1. First group: produced gross domestic product per capita in BGN within a compact territory, i.e., in an administrative province, region or throughout the country.
2. Second group: indicators of total income per person from a household in BGN, total expense per person from a household in BGN, average salary.
3. Third group: relative share in % of the population at risk of poverty; a relative share of the population in %, which is at risk of poverty or social exclusion; inequalities in the distribution of income presented via Gini coefficient.

They can either be used separately or after they have been summarized using a suitable algorithm.

Another publication focuses primarily on GDP per capita (nominal and real) as a measure of standard of living, i.e., as a prerequisite for better meeting the material needs of the population. Attention is drawn to the disadvantages of this indicator, for example: the inability to take into account work in the household, home care for the elderly, the uneven distribution of wealth between the different layers of society, etc. Better options that eliminate the disadvantages of GDP per capita are launched by summarizing measures: the Genuine Progress Indicator, the Human Development Index, and the Index of Social Health (Federal Reserve Bank of Boston 2003).

Another focus of interest is the Gross National Happiness Index, whose application was experimentally used by Atanas Luizov and Diana Sabotinova based on data taken from 120 survey forms filled in by inhabitants of the city of Burgas aged over 18 over the period 2018-2019 (Luizov, Sabotinova 2019, 69-83). A foreign methodology has been adapted to summarize self-assessments based on assigned weights and a threshold of sufficiency to make a given individual happy. The authors state that the sample has no claim to representation. In this case, a self-esteem was used for the degree of satisfaction with 9 groups of indicators, including a standard of living, presented by "sufficiency of income" and "income level".

In their publication, Dajana Cvrlje and Tomislav Ćorić define the standard of living as an expression of the level of well-being accessible to the individual, which is measured by the quantity and quality of the goods and services an individual can afford. It is mentioned that the standard of living is most commonly measured by the Gross Domestic Product (GDP) or the Gross National Product (GNP) per capita, or by other indicators such as income inequality or life satisfaction. The distinction between standard of living and quality of life is emphasized, with the quality of life referring to the individual's overall satisfaction with their physical, material, and social well-being. This is usually measured through qualitative characteristics and has an evaluative nature, i.e., the assessment is influenced by the individual's personal value system and perceptions of achieved prosperity. In addition to the dynamics of GDP per capita, the analysis for Croatia also examines the trends in the consumer price index, the index of expenses for the small consumer basket (which includes 60 essential goods), and the overall household consumption expenditures, as well as the at-risk-of-poverty rate, both in its dynamics and by employment status.

The authors draw reader's attention to indicators such as a percentage of the population, which, due to material deprivation, is at risk of not living up to the age of 40, a population percentage using a water source without improving water quality, and a percentage of underweight children, as well as the Gini coefficient for income inequality and the relative share of individuals who, by their own assessment, experience material deprivation. They propose to add some new indicators to the study of the standard of living and the quality of life in the future (Cvrlje, Ćorić 2010). In our opinion, maintaining the set of indicators would be appropriate in order to preserve the possibility of comparisons in dynamics and internationally.

According to the Organisation for Economic Co-operation and Development (OECD), "In 2021, the average life expectancy at birth was 80.3 years in OECD countries. Japan, Switzerland, and Korea lead a large group of 27 OECD member countries where life expectancy at birth exceeds 80 years. The second group, which includes the United States, has a life expectancy between 75 and 80 years. Latvia, Lithuania, Hungary, and Slovakia have the lowest life expectancy among OECD countries, below 75 years" (OECD 2022).

Life expectancy at advanced age is a particularly indicative reasoning for welfare. According to NSI data, over the period 2021-2023, "Life expectancy for people aged 65 is 15.2 years, being for men and women 13.0 and 17.1 years, respectively" (NSI 2024).

This life expectancy is expected to increase globally in the coming years.

It is obvious that, against the backdrop of natural cataclysms, the deterioration of natural conditions and water shortages in some parts of the world, the higher standard of living, including better nutrition, better healthcare, less heavy physical labour and risk-associated professions, will lead to rising life expectancy. The need for this longer life to be active and fulfilling becomes feature in the foreground, not excessively burdening the health and social funds and providing individuals with joy and satisfaction. What demographic forecasts cannot predict is the possible outbreaks of regional military conflicts and the strength of the negative effects of income differentiation. The production and trade in arms remain a lucrative business that needs political and military tension. The limited availability of certain natural resources has a similar effect, and their redistribution can also serve as a motive for conflicts and territorial claims. Clean drinking water and fertile land are also among these limited natural resources. To these can be added fossil fuels, raw materials and minerals, the strategic location and the development of information and transport technologies, which are generally factors for growth and prosperity, but require specific raw materials and resources which become a strategic advantage for the countries where they are found and their extraction is economically viable.

In his publication, Raphael Tabani Mpofu points out that according to economists the average real GDP per capita is the generally accepted measure of living standards, but has some shortcomings of its own. For example, the product produced may be concentrated in a small part of the population or in the hands of multinational companies. Moreover, it does not take into account full-time work in the household, the change in the quality of goods and services, the cleanliness of the environment, overcrowding and congestion in large cities, etc. In his study, the author explores the relationship between the quality of life measured by the HDI, where the standard of living is one of the three building blocks, and public spending on education and healthcare as a % of GDP in South Africa during the period 1995-2011. Health is measured by the number of years of life remaining at birth, and education is measured by the number of years of education. In this case, the object of research is not the mere existence of a relationship between the cited variables, but rather how this relationship manifests in South Africa. The conclusion is drawn that public spending on education and healthcare is insufficient and that the effects of such spending are to be expected further in the future (Mpofu 2013).

A review publication entitled "10 Best Places to Retire" (Anonymous 2024) identifies countries with high average life expectancy, high standard of living, well-developed healthcare system, and easy access to it. The top ten of this prestigious ranking lists are: Norway, Switzerland, Iceland, Ireland, Australia, New Zealand, Luxembourg, Netherlands, Denmark, and Czechia. It is impressive that out of all the Eastern European countries, only the Czech Republic classifies among these top ten. Interestingly, the absolute leaders in life expectancy in the European Union (EU) countries for 2023 are Spain (84.0 years), Italy (83.8 years) and Malta (83.6 years) (Trifonova 2024). There are 15 EU Member States where the average life expectancy exceeds 81.5 years, which is average for the Union according to Eurostat data. Against this background, according to NSI, the leaders in the 2022 living standards chart, measured by GDP per capita in Euros, are Luxembourg, Norway, Ireland, Switzerland, Spain, Italy, and Malta. This suggests that, despite the seeming strong influence of the standard of living on life expectancy, it is also influenced by other factors, or perhaps GDP per capita does not fully fulfil its designated role as a measure of material well-being. The most discussed factors affecting life expectancy are diet, physical activity, genetic predisposition, the presence of harmful habits such as alcohol abuse and smoking, the level of development of screening for socially significant diseases, access to modern treatment methods, the presence of excess weight, environmental cleanliness, the age structure of the population, etc. Longevity in good health has always fascinated people, and its study continues to reveal new perspectives and to overcome existing misconceptions about how to achieve it. It is not uncommon to interview a limited number of respondents or even just one person who has lived to be 100 years old, and on the basis of these non-representative interviews to draw conclusions about what is required to achieve longevity. In Bulgaria, it is often found that long living people have spent their lives engaged in physical labour, relying on ascetic nutrition, consisting however of organic home-made foodstuffs, and living in small settlements, far from any medical assistance. There is little chance for this lifestyle to become common or preferred, and therefore people need to learn how to live healthily in an environment characterized by food abundance and a high degree of mechanization and automation of production processes. There are some expugnable hurdles such as: shortage of sports facilities, physical inactivity from a young age, and the loss of a huge resource of time on self-entertainment using electronic devices.

According to a report by the Healthcare Committee of the American Chamber of Commerce in Bulgaria, "Investments in healthcare are becoming an absolute necessity to guarantee long-term and sustainable economic growth" (Amerikanska targovska kamara v Bulgaria 2021). These investments are expected to lead better health and nutrition of the population, lower mortality at an early age, and a higher life expectancy in good health, which is seen as a resource of labour force, thus improving the ratio between working individuals and those dependent on their income, and ultimately to GDP growth. The report also dedicates some attention to the necessity of reforming and additional funding the healthcare system in Bulgaria so that the average life expectancy in the country reaches at least the EU average value. Data from 2018 is cited, according to which the average life expectancy in Bulgaria lags behind the EU average by 6 years and by 8.5 years compared to the leading country in the Union, Spain.

In our view, today's Bulgarian healthcare system is primarily focused on treatment and recovery rather than on health preservation. A step in the right direction are the free preventive check-ups for the age groups at risk, workplace health screenings, and informational campaigns aimed at encouraging participation in prevention initiatives for the most dangerous and common diseases among men and women. Last but not least come the free vaccinations and efforts to curb the "grey sector" of the economy, which fails to pay health and pension insurance for employees, thus depriving part of the population of regular access to healthcare services and enabling the practice of waiting until respective symptoms are manifested. This would usually entail attempts of self-treatment and resorting to emergency first medical aid when the disease is already at an advanced stage. There is also the pending issue with healthcare services in remote and hard-to-reach settlements, where there are not even pharmacies for the supply of medications and sanitary consumables.

In fact, when it comes to active ageing in Bulgaria, there is no shortage of strategic vision. The National Strategy for Active Life of the Elderly in Bulgaria (2019-2030) outlines that "Measures related to the active life of the elderly should be a priority", including: encouraging active inclusion in the sphere of employment; promoting participation in public life; learning and volunteering;

ensuring independent living through healthcare; access to transport; the provision of goods and services adapted to their needs; strengthening institutions and updating policies related to elder care; ensuring non-discrimination; and encouraging the business to engage in the care of the elderly (Ministerstvo na truda i sotsialnata politika, 21-22). In the report on the implementation of this strategy in the period 2021-2022, the most significant achievements are evident in including older people in lifelong learning and in developing healthcare services to ensure dignified old age in good physical and mental health. The report was drawn up department-by-department within the system of the State Administration. There are also general measures that apply to the entire population, but it is clear that the focus is on achieving activity and a healthy lifestyle for all ages as a prerequisite for a fulfilling old age (Ministerstvo na truda i sotsialnata politika).

Empirical analysis

Ensuring the sustainable development of the regions in Bulgaria requires continuous analysis of socio-economic and demographic processes from a territorial perspective. It turns out that GDP per capita as a measure of the standard of living is highly differentiated, if viewed in a province-by-province aspect, and the average life expectancy shows more moderate territorial differences. In our opinion, this is largely due to the high mobility of the population. For example, many people from the interior of the country work or, by necessity, use highly specialized healthcare services in Sofia, Plovdiv, or Varna, without changing their address registration. These differences are visible from Figs 1, 2, 3 and 4, showing no full correlation between standard of living, as measured by GDP per capita, and life expectancy at birth. For example, the provinces of Kardzhali and Blagoevgrad are not in the forefront of GDP per capita, but they are in the forefront of life expectancy. According to statistical data (NSI 2024), Sofia City Province leads in terms of expected average life expectancy of the population for the period 2021-2023. It is 75.4 years, with the main contributing factors being: access to modern medical services, a higher living standard level, and a well-developed social infrastructure. The Kardzhali Province also ranks high. A specific reason mentioned for the high life expectancy at birth in Kardzhali is the calm lifestyle, attributed to the lack of industry-related stress. The last positions in this ranking are occupied by Vidin Province and Vratsa Province, which suffer a degraded population health status due to the difficulty in gaining access to quality healthcare services and an aging demographic structure. A detailed analysis of the socio-economic status of the individual provinces is presented in the publication "Regional Profiles: Indicators of Development 2024", published annually by a team of researchers of the Institute for Market Economics (Slavova, Nikolov, Nedev 2024).

The concentration of population in some provinces is a clear indicator of better living conditions, which reflects the average life expectancy at birth. As shown in Figs 3 and 4, the COVID-19 pandemic has contributed significantly to a decline in life expectancy and its levels are still not recovering to the best values of previous periods.

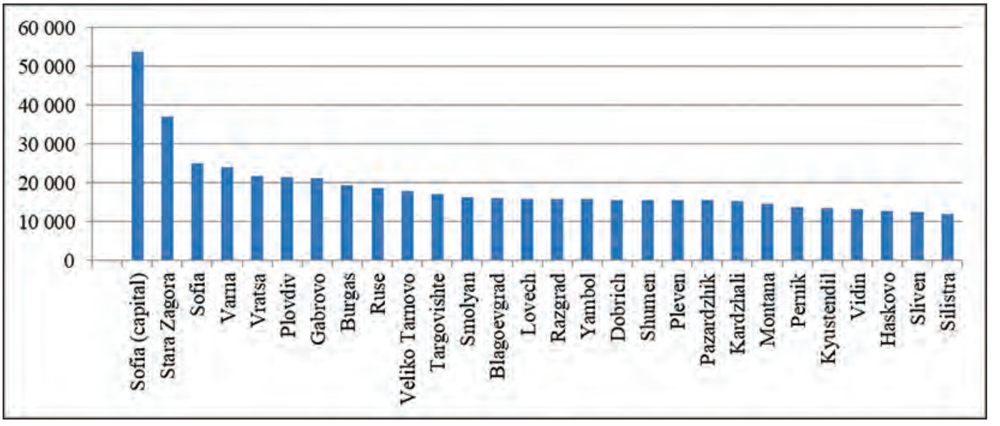

Fig. 1. GDP per capita by provinces in BGN for 2022
Source: NSI (www.nsi.bg).

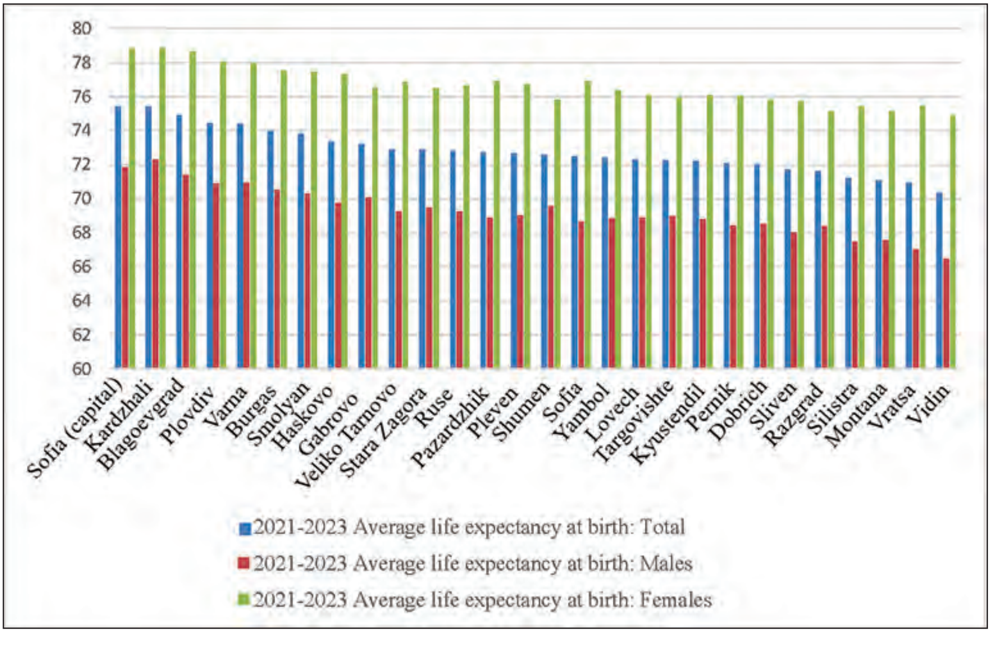

Fig. 2. Average life exectancy at birth in years by provinces and sex in Bulgaria
Source: NSI (www.nsi.bg).

Much more optimistic appears to be the picture of the average life expectancy after the age of 65, but from Fig. 5, it can be concluded that a considerable number of the population in the previous age groups fails to live to the age of 65 and therefore Bulgaria loses labour force, thus entailing threats to

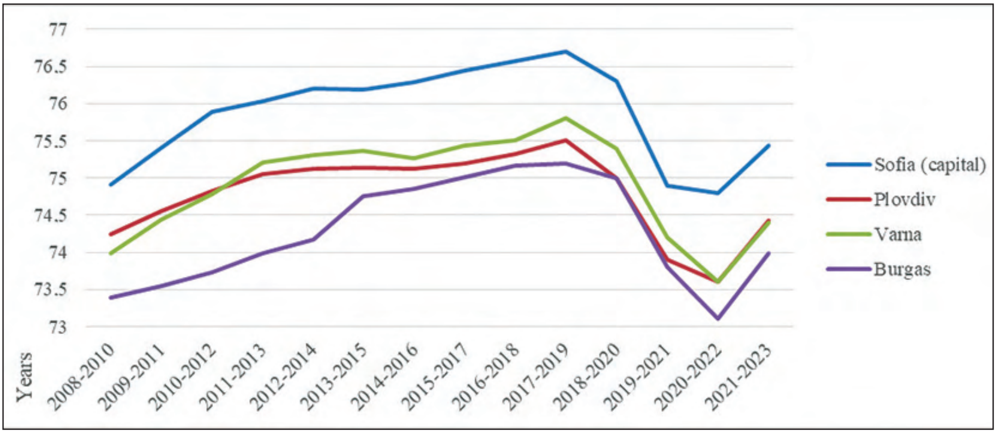

Fig. 3. Dynamics of life expectancy at birth in Bulgaria's four most populous provinces

Source: NSI (www.nsi.bg).

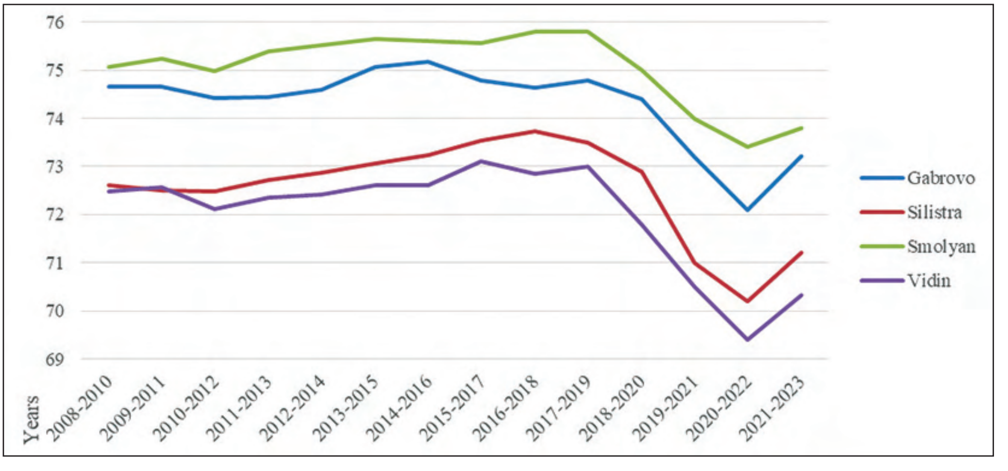

Fig. 4. Dynamics of life expectancy at birth in Bulgaria's four least populous provinces

Source: NSI (www.nsi.bg).

economic growth. The experience of some Western European countries in attempting to attract workforce at a youth age through liberal access for migrants to their labour market has not been entirely positive. The religious, cultural, linguistic, and other differences of incoming migrants require a long integration period, create a housing crisis, and pose a risk of radicalization among certain population groups. These groups often adhere to different life values, prefer to live in compact communities, and are difficult for local authorities to manage.

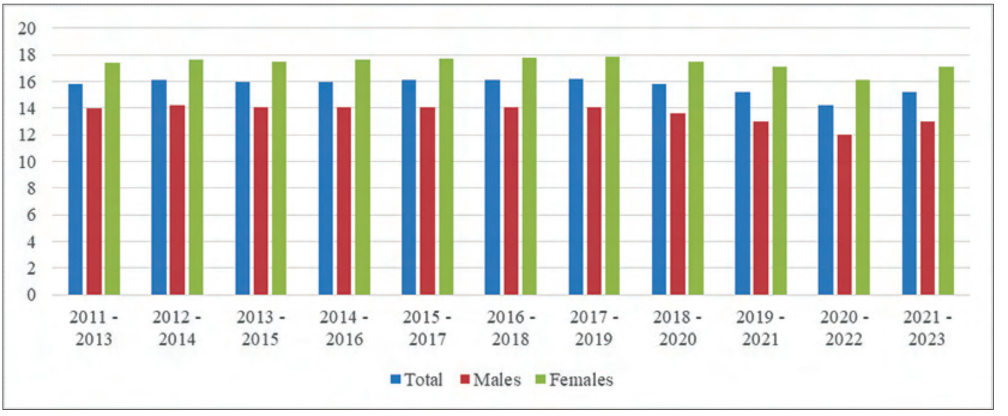

Fig. 5. Average life expectancy among persons aged 65, by sex

Source: NSI (www.nsi.bg).

One of the reasons for the high mortality rate, especially in the high age groups, is the prevalence of diseases that are, in many cases, treatable, but require prevention, early detection and effective healthcare. Mortality by provinces for the three major groups of socially significant diseases in 2023, per 100,000 people of the population is presented in Fig. 6.

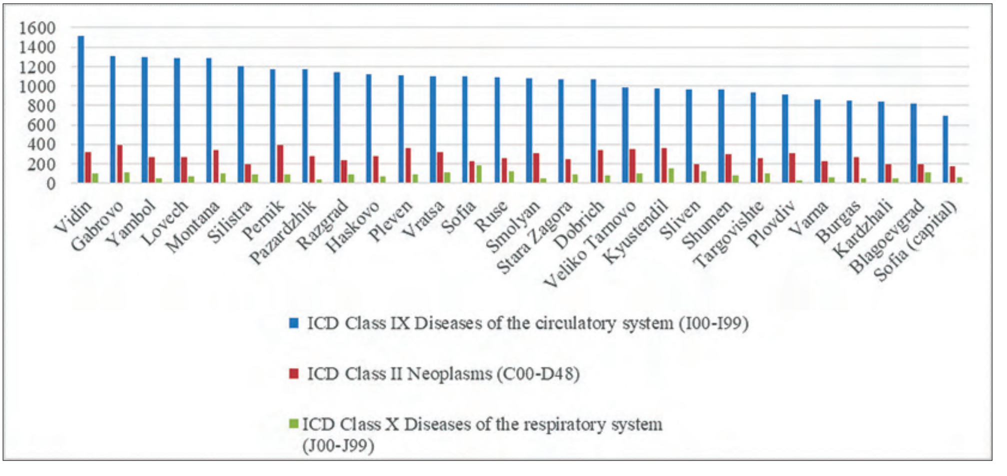

Fig. 6. Mortality by major diseases per 100,000 people of Bulgaria's population by provinces in 2023

Source: NSI (www.nsi.bg).

To reveal the actual direction and strength of the relationship between the standard of living and life expectancy in the Republic of Bulgaria, correlation coefficients were calculated between the studied variables based on regional data. The selection of specific diseases included in the analysis - those leading to

Table 1. Linear correlation coefficients between GDP per capita and life expectancy related indices*

Indepen-dent vari-able - factor	**Dependent variable - outcome**				
	Average life expectancy at birth 2021-2023	Overall mortality for 2023	Mortality by major groups of diseases for 2023 per 100,000 population		
			Diseases of the circulatory system	*Neo-plasms*	*Diseases of the respirato-ry system*
GDP per capita for 2022	0.453	-0.482	-0.432	-0.310	-0.112

* Correlation coefficients were calculated by the authors based on information retrieved from: NSI (www.nsi.bg).

fatal outcomes - was made by prioritizing the most significant ones according to statistical data. The results obtained are presented in Table 1.

It turns out that the average life expectancy at birth has a moderately strong positive relationship with the standard of living, represented through GDP per capita. In fact, the presence of material prerequisites for a long, fulfilling and happy life may not always be sufficient for people to live long. It would be more realistic to expect that the life quality could come out as crucial, i.e., achieved goals, security, amount of free time, appropriate use of free time through sports, cultural activities, tourism, opportunities for talent development and more.

The overall mortality has a moderately strong negative correlation with the standard of living. In some regions of the country, the reality is such that even when the population enjoys relatively high income levels, the benefits of this income are difficult to feel if there is a lack of rapid and high-quality medical care. The condition of the tertiary road infrastructure is also poor. An example of this is Vratsa Province (Slavova, Nikolov, Nedev 2024, 123). Even with a relatively high provision of hospital beds, the lack of medical specialists and modern equipment negatively affects life expectancy. Even in some large settlements - excluding university medical training centres - there is a shortage of medical specialists (Kostova 2023). There is a persistent scarcity of vascular surgeons, psychiatrists, anaesthesiologists or paediatricians.

The outdated and poorly maintained communal infrastructure also negatively affects life expectancy. This concerns the deteriorated condition of the water supply network and the imposed water rationing, which does not allow the use of modern household appliances (Manev 2024). In other words, personal well-being largely depends on public services, which are improving too slowly.

The negative correlation coefficients between the standard of living and mortality from major groups of diseases offer hope that the population can successfully cope with some of them. Or at the very least, life-threatening diseases could be converted into chronic illnesses by means of proper medical care that would minimize mortality. Mortality from respiratory diseases shows the weakest dependency on the standard of living. It can be argued that the threat of such diseases has significantly decreased as a result of the country's EU membership and the existence of international commitments to reduce harmful gas emissions into the atmosphere. The same applies to Romania and Greece, which leads to a lower risk of transboundary transfer of harmful emissions from industrial production and the energy sector.

It is worth noting that good material status is sometimes observed precisely in areas where there is intensive activity related to thermal power plants, raw material extraction, or other industries that cause air pollution - challenges that the population and local authorities cannot tackle alone. Therefore, the state is taking measures both to ensure reliable monitoring and to undertake concrete actions. What exactly is being done and what the effect is can be judged by both the real condition of the settlements (Cherneva 2020) and by the adopted strategies, action plans, and implementation reports available on the website of the Ministry of Environment and Water (Strategicheski dokumehti 2025).

Conclusions

1. The standard of living, measured by GDP per capita, and the average life expectancy at birth, according to data for 2022-2023, are in a moderately positive correlation.

2. The overall mortality rate by provinces is in a moderately strong negative correlation with the level of the standard of living. This is determined by the opportunities that a higher standard of living provides to improve the degree of development of healthcare, disease prevention capabilities, the development of sports, nutrition habits, and more.

3. The mortality rate on major groups of diseases is in a moderately strong negative correlation with the standard of living in the case of circulatory system diseases and in a relatively weaker correlation in the case of diseases related to neoplasms and respiratory diseases. This result can be interpreted as an indicator of the progress made in combating these disease groups based on new medicines and technologies, accessible when increasing standard of living. In this case, there are two hypotheses: either the higher standard of living is not being successfully used for the early detection and treatment of some life-threatening diseases, or to some extent, the increase in standard of living is associated with physical inactivity, harmful habits, and stress, all of which are prerequisites for increased morbidity and severe course of diseases with possible complications incompatible with life.

4. Overcoming the substantial differences in the levels of living standards in Bulgaria territorially is key to ensuring a longer and more fulfilling life for all generations. The existence of a National Strategy for Active Life of the Elderly

in Bulgaria can be seen as a step in the right direction, but a sustainable increase in average life expectancy can only be achieved through specific care for all generations. These include: health education, healthy nutrition, the creation of universal conditions for sports, the prevention of socially significant diseases, mandatory comprehensive genetic testing of the foetus during pregnancy, vaccinations, and strict monitoring of the expenditure of social assistance funds to really reach the people in need.

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