

FACTORS OF CHANGES IN THE DEMOGRAPHIC PROFILE OF THE SOCIETY

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Abstract

This article is focused on the issue of population aging from the point of view of connecting the social (view of overall population aging) and individual (aging of individuals within their life cycle) perspective. The aim of the article is to present the aging process of the Slovak population from above with an emphasis on the factors of research reflecting changes in the population of those aged over 65 years of age on the level of the individual regions of Slovakia. A quantitative strategy was used in the research, based on theoretical-epistemological sources and secondary data was used by applying desk-research. The research was carried out by a combination of desk research and a research strategy focused on the quantification of data collection and analysis. The result of this research is the findings of different dynamics of population growth of those over 65 years of age in individual regions, the findings of different development of the percentage change in the population over 65 years of age in the Bratislava region and identification of factors in a mutual relationship with the development of the population of the over 65 age group in Slovakia and in its individual regions. These findings can serve as a basis for further research in the researched area. The results of the research are partially influenced by the Covid-19 pandemic, which affected the data for the years 2020-2021, but they nevertheless indicate the assumption of further development in the individual regions of Slovakia.

Key words: *Slovakia, Aging Theories, Demographic Aging, Aging Intensity, Demographic Profile, Regional Disparities*

INTRODUCTION

The topic of population aging was presented as part of international discussions at the first World Assembly on Aging in Vienna in 1982. Population aging has since been considered a strong demographic trend with far-reaching consequences for every aspect of an individual's life and society [UN 2023a].

The process of population aging is the result of long-term demographic changes [Ortega 2021; Muszyńska, Rau 2012; Sanderson, Scherbov 2010], which began in Europe several decades ago. This trend is visible in the changes in the age structure of the population and it is manifested in the growing share of an elderly population together with the decreasing share of the working age population in the total population [Eurostat 2022]. It can be stated by the Eurostat, on a European scale, the improvement of a person's life span is the main determinant of the age structure, and improvements in life span are the result of qualitative changes in the case of elderly people (people live healthier; they are more educated, etc.) [Ortega 2021; Muszyńska, Rau 2012; Sanderson, Scherbov 2010].

From the point of view of the last decade, life expectancy at birth increased in the EU, while it has been increasing by an average of more than two years per decade since the 1960s. However, the latest data for the year 2021 in several EU member states point to a halt (in some member countries returning to the level before the Covid-19 pandemic) or even to a decrease in life expectancy. According to preliminary data

from 2021, the mentioned pandemic had a negative impact on the decrease in life expectancy at birth in almost half of the EU member states. Specifically, the largest decreases compared to 2019 were recorded by Bulgaria (-3.7), Slovakia (-3.0) and Romania (-2.7) [Eurostat 2022]. In the long-term horizon, the latest Eurostat forecast EUROPOP 2019 (Eurostat demographic projections with base year 2019) for the period from 2019 to 2070 shows a continued increase in life expectancy at birth and also at 65 years of age for both men and women. Within the EU as a whole, life expectancy at birth should be increased by 7.4 years for men and 6.1 years for women. However, it should be added that since the given forecast was issued in April 2020, it does not yet take into account the impact of the Covid-19 pandemic [European Commission 2021: 19].

The impact of aging is seen as an intergenerational burden [Bohn 2011], which has an increasing trend [Bohn 2011: 164]. As a result of demographic changes, the proportion of the working age population in the EU is decreasing, while the relative number of pensioners is increasing. The share of elderly in proportion to the total population is expected to increase significantly in the next few decades. This can subsequently lead to an increased burden on the working age population, especially from the point of view of covering expenses in the social sphere, which are required by the aging population for a range of related services [Eurostat 2023]. Therefore population aging opens a broad discussion about the impact of this trend - on citizens regardless of their age and on society as a whole. It raises issues that extend across the life cycle, i.e. up to retirement [European Commission 2022: 1]. It is therefore necessary to identify and remove legal, social, financial or other obstacles, which prevent elderly people from seeking and developing opportunities for their participation in personal development and in society [UN 2023b: 4].

The Green Paper on Aging newly published by the Commission from 2021 refers to these demographic changes, to their intensity as well as their impact on society as a whole. It points to the fundamental fact that there are several ways to prevent the negative consequences of the alarming aging of society, or to limit its possible consequences [European Commission 2021: 24; EuroHealthNet 2020]. The key is to anticipate the opportunities it brings and react to them in time. As it further states, the demographic profiles of EU regions differ considerably, especially between urban and rural areas; while some places are aging significantly and in others the number of the working age population is increasing [European Commission 2021: 2].

In this context, it is added, that it is particularly important to recognize regional disparities in aging within a given country and take this key aspect in the adoption of measures and proposals for changes at the regional and national level into account. The purpose of this article is to present a view of the demographic profile of Slovakia in a regional context. A view of the analysis of the development of the population of the age group over 65 years of age at the level of individual regions of Slovakia for the period from 2000 to 2020 is presented. As the absolute numbers depend to

a large extent on the size of the population in a given country, three transformations that express the change in the number of the population over 65 years of age in relative proportions, namely the share of the population over 65 years of age, the percentage change in the number of the population over 65 years of age and the percentage change in the share of the population over 65 years of age are presented. For this purpose, those factors influencing the growth of the population over 65 years of age were identified. The mutual relationship between selected indicators and the share of the population aged 65+ was sought.

In this sense, the aim of the article is based on an analysis, to present a view of the process of the aging of the Slovak population from above, with an emphasis on examining the factors of changes in the number of residents over 65 years of age at the level of individual regions of Slovakia. This contribution is structured as follows. The first part of the article outlines the significant opportunities of population aging for sustainable development. Key aspects of aging in an individual's life are characterized in more detail, supplemented by theoretical approaches to aging. The second part describes the methodology used in the empirical analysis. The following section provides an overview of the demographic profile of Slovakia in a regional context. Based on the results of the analysis, the article deals with the evaluation of the researched transformations expressing the change in the number of residents over 65 years of age old at the level of individual regions of Slovakia.

1. THEORETICAL STARTING POINTS OF POPULATION AGING AS A CONTEMPORARY PHENOMENON

Population aging provides significant opportunities for sustainable development. This mentioned fact is related to the assumption of the active participation of the older population in the economy, the labor market and society as such, as the elderly can be a significant contributor in the following interrelated areas [Dugarova 2017: 11-13].

In the area of economic development: the elderly can make a significant contribution to the economy through their work activity, often after reaching retirement age; also through taxes, consumption, transfers of assets and resources to their families. Even if, for example, the breadwinner is absent, their work can be the only source of income to support their families. In the area of unpaid nursing work: the elderly, especially women, play a key role in providing unpaid care to spouses, grandchildren and other relatives. In the area of political participation: the elderly have the potential to become more influential in society as they make up an increasing proportion of the total population. This fact can have a significant impact on social, economic and political outcomes in the country. In the area of strengthening social capital: many elderly tend to be actively involved in community and civic life through volunteering and participation in community institutions, which can contribute to strengthening social capital [Dugarova 2017: 11-13].

Population aging includes a combination of bio-physiological, psychological and social processes that take place over time and lead to death. It therefore concerns all areas of life, i.e. the physical area, psychological area and social area [Filipová in Draganová et al. 2006: 121]. The term “old age” is multidimensional. It includes chronological (referring to the date of birth), biological (related to the capabilities of the human body), psychological (related to psycho-emotional functioning) and social age (related to social roles such as grandparents) [Dugarova 2017: 21]. It is a complex phenomenon that is influenced by biological factors (diseases, heredity), social factors (family, family and economic conditions), ecological factors (environment), health and hygiene factors (nutrition, lifestyle) and living conditions [Filipová in Draganová et al. 2006: 121].

As aging affects the biological, psychological and social areas, it is possible to talk about the following key aspects of aging in an individual’s life:

- biological aging, which is a manifestation of deterioration of adaptation processes, biological changes in the structure, appearance and functioning of the organism [Hangoni et al. 2014: 13];
- mental aging manifested mainly by changes in personality traits, reduction of cognitive abilities, slowing down of psychomotor pace,
- social aging, which is related to the individual’s adaptation to a change in social status, to retirement [Filipová in Draganová et al. 2006: 121-122].

1.1. Theoretical approaches to the aging of the individual

Population aging, which is influenced by biological, psychological and social factors, is considered to be the dominant phenomenon of the present times [Tokovská, Šolcová 2014]. Currently, many experts agree that high levels of physical, cognitive, and social functioning are related to health and successful aging [Franklin, Tate 2008].

The beginnings of the development of theoretical approaches to aging can be observed since the beginning of the 1950s. The oldest theories concerning aging are associated with psychosocial theories (psychological and sociological) that perceive aging in connection with changes in behavior, personality and attitudes. From a narrower point of view, while psychological theories focus on personality development, particularly how an individual’s attitudes, emotions, motivation, and personality influence adaptation to physical and social demands; sociological theories consider how changing status, relationships, roles in society affect an individual’s ability to adapt [Mauk 2006: 58]. In this context, it is possible to mention, for example, the view of sociologists on the research of interdependence between society and persons of 65 years of age and over in the 1970s. One of the results of the research was that individuals of different generations have different experiences that can cause them to age in different ways [Riley, 1994 in Mauk 2006: 62].

Tavel summarised the theory of aging, taking the biological, psychological and social aspects into account. From this point of view, theories are divided into eight basic

groups: aging theories emphasizing the biological aspect (deficit theory, wear and tear theory, free radical theory, telomere theory), qualitative models of aging (E. Erikson's life stage theory, R. J. Havighurst's theory of developmental tasks, Gutmann's theory of increasing gender similarity, gerodynamic theory of old age), growth theories, cognitive theories (cognitive theory of the Bonn School), continuity theory, cultural-anthropological theories, the interaction model of longevity and feeling of satisfaction in old age and theories of successful aging (activity theory, disengagement theory, dynamic theories, SOK-model by P.B. Baltes and M.M. Baltesova. Tavel presents this division despite the statement that the criteria of successful aging are subjective and objective, not clearly defined and generally accepted) [Tavel 2009].

Knight [Knight 1995] starts from the idea that the biological basis of aging remains unclear and that aging is associated with the random event of "wear and tear" (e.g., stochastic theories). Farková [Farková 2012] uses the WHO periodization, which is expressed by chronological age, to define aging but is also based on other changes that occur during the aging period (e.g. genetic program theory, immunological theory, crossover theory, ecological theories). At the same time, attention is drawn to the fact that both scientists and experts deal with the reasons and causes of aging, as a result of which there are now a number of theories of aging, none of which has yet been generally accepted.

Nevertheless, it is still desirable to study aspects of the aging of individuals, even in the context of population aging. According to Tokovská and Šolcová, the negative effects of aging can be mitigated to a certain extent by the active involvement of seniors in solving the challenges that older age brings, by passing on experience to younger generations and peers and by further education [Tokovská, Šolcová 2014].

1.2. Indicators of changes to the demographic profile of the company

A population is classified as aging when the elderly make up a proportionally larger share of the total population [UNFPA 2012: 12].

The process of population aging reflects changes in the age structure of the population with a shift in favor of older age groups, while changes can occur in three ways, namely through changes in birth rate, death rate and migration. Birth rate is one of the basic demographic processes that, together with mortality, significantly influence population growth [Katuša et al. 2014: 8]. Mortality and mortality ratios, representing the process of the natural movement of the population and reproduction of the population. They are influenced by the level of health care, lifestyle including nutrition and physical movement, the quality of the environment, as well as the intensity of the population's psychological, social and economic burden. Education, marital status, age, gender, genetic disposition, better availability of drugs and medical technology are also important factors [Katuša et al. 2014: 26]. One of the basic demographic processes already mentioned is migration, which affects the distribution and structure of the population in the territory [Hamada, Casa Grande 2014].

It most often involves the working age population, when the decreasing representation of this population group during emigration causes the aging of the population [Káčerová, Nováková 2016; Káčerová, Ondačková, Mládek 2013]. Population aging can thus be the result of both a slower growth in the number of young age groups, which is caused by a lower birth rate, and an accelerated increase in the number of older age groups caused by a rapid decrease in mortality [Tomeš 2005: 5].

The population aging process, due to the decrease in the birth rate can be characterized as aging of the population from below and an aging of the population due to the extension of life, aging of the population from above [Jurčová 2005: 57]. In connection with the rapid increase in the number of people, especially in old age, demographers work with the term “aging at the apex of the age pyramid” [Litomerický 1992; Cséfalvaiová 2012: 3]. The dynamics of aging can also be influenced by changes in the volume of the productive age group of the population aged 15 to 64, which can be characterized as population aging from the center [Mackellar 2003; Káčerová, Ondačková 2015: 45].

Two basic historical milestones can be defined, which are to a certain extent explanatory for the reproductive behavior of populations from the point of view of demography. One of them is the demographic revolution, which can be defined as a process during which quantitative and qualitative transformation of demographic phenomena takes place. It arises at a certain stage of development of the given company and it forms and ends again after a certain period. As mentioned above, reproductive behavior itself is related to various societal factors. At the moment when their fundamental transformation takes place, this fact is also reflected in the reproductive behavior of the population, leading to significant changes and a demographic revolution [Pavlík, Rychtaříková, Šubrtová 1986 in Dimitrová 2007: 25].

The deeper and more radical the transformative changes are manifested, the more radical changes in demographic behavior can be expected in a transforming society, as the demographic behavior of the population reacts to transformation very sensitively [Michalek, Podolák 2017: 2]. The second milestone is the so-called demographic transition. Its essence lies not only in maintaining a low level of mortality and therefore pushing the aging population process, but also in reducing the level of the birth rate [Dimitrová 2007: 25].

In addition to the above, it can be stated that the demographic behavior of the population is to a certain extent determined and will be significantly determined also in connection with modernization, green and digital transformation. A potential question may be what effect the ongoing and further expected structural, cultural and technical changes in society will have on the future level of mortality and the health status of the population. It can be expected that the share of physically demanding work, in which the human body wears out quickly, will continue to decrease. In this direction, further improvement in mortality ratios can be expected. There are also a number of cultural changes taking place in society and they bring, among other

things, higher education. It is known and proven that more educated people can take better care of their health and live longer. And last but not least, a series of new technical changes that will also affect the field of medicine and health care can be observed in developed countries. All the above mentioned changes result in the improvement of the mortality ratios in the given population and the associated increase in the average life expectancy at birth [Fiala, Langhamrová 2013: 338, 353].

Strategic forecasting can have an important role in the demographic context in the process of identifying and anticipating challenges and for better preparing policies to address them altogether [European Commission 2020: 26, 28].

The rate of population aging is monitored through three indicators, namely the aging index, the average age of the population and the average life expectancy, i.e. the average number of years of life for persons of both sexes [Hasa 2019].

Mortality ratios are best described by the average life expectancy (life expectancy), because it clarifies the effect of the age structure, which the crude death rate indicator does not take into account. Average life expectancy at a certain age provides information about how long, on average, a person of a given age will live, assuming that the mortality rates do not change throughout his life [Katuša et al. 2014: 28].

However, it shall be noted that the process of population aging is not only a demographic issue, but also an economic-political one. [Michalek, Podolák 2017: 11].

From this point of view, it significantly affects the number and structure of the workforce. From an economic point of view, aging is indicated by the economic burden index, which defines three economic generations, and thus represents the number of persons in pre-productive age (0-14 years of age) and in post-productive age (65 years of age and more) per 100 persons in productive age (15-64 years) [Šilhár 2019]. Changes in the demographic profile of society create new limits and conditions for development in various spheres: 1. in the economic sphere (risk of unsustainability of public systems, declines in the population at productive age; changes in the rate of savings), 2. in the social sphere (changes in the formation of family structures, new demands in the area of social protection and long-term care; the issue of active aging), 3. in the political sphere (systemic reforms in the conditions of an aging society emphasizing higher demands on the area of public resources), 4. in the sphere of international relations (e.g. the ability to respond to new development conditions on time) [Hvozdíková et al. 2008: 68].

As the economic and social situation changes, it can be assumed that there will be an increase in the variability of demographic behavior in proportion to social status, economic security, achieved education and the subjective definition of life values [Michalek, Podolák 2017: 13].

2. METHODOLOGICAL APPROACH

This article focuses on the issue of population aging from the point of view [MoLSAF SR 2021: 9] of connecting the societal (view of the overall aging of the population) and individual (aging of individuals within their life cycle) perspective. The article is based on a combination of desk research and quantitative research - a research strategy focused on the quantification of data collection and analysis. The article analyzes the data on the development of the share, percentage change in the number and the percentage change in the share of the population over 65 years of age. The basic source of relevant data for the researched issue was mainly data obtained from PHC 2021 [The 2021 population and housing census], from the National Health Information Center, from the Health Yearbook of the Slovak Republic 2021 and from the document of the Statistical Office of the Slovak Republic We in numbers: Population change in 2021 compiled from statistical data on the results of demographic processes. The basic dataset was created from the data of the above-mentioned sources, while other indicators (e.g. the ratio of expenses and income) were created from them. The amount of the population over 65 years of age was expressed in proportion to the total number of the population in a given region in order to remove the influence of the difference in the total number of population in different regions. It pointed out the differences in the development trend of the population of the age category of people over 65 years of age in the regions of Slovakia based on the data analysis, it also deals with the evaluation of the investigated transformations expressing the change in the number of the population over 65 years of age at the level of individual regions of Slovakia. Based on the results of the data analysis, a correlation analysis was carried out, as a result of which several statistically relevant factors were identified in the context of population aging in Slovakia.

3. THE VIEW AT POPULATION AGING IN THE DEMOGRAPHIC PROFILE OF SLOVAKIA

The need to create conditions for sustainable development is increasingly reinforced by the consequences of population aging. In the context of current forecasts in the area of the impact of demographic development on the sustainability of social conditions of prosperity, Slovakia adopted for the next period the National Program for Active Aging for the years 2021-2030, which immediately follows on from the first strategic document prepared for the years 2014-2020 [MoLSAF SR 2021: 3].

There are several ways in which the negative consequences of aging on society can be prevented or reduced, as stated in the 2021 Green Paper on Aging. These include supporting healthy and active aging, increasing the resilience of health and care systems, improving the performance of the labor market and modernizing social protection [European Commission 2021: 24]. Healthy and active aging and lifelong learning are two political concepts that make a prosperous aging society possible [European Commission 2021: 4]. The already mentioned Green Paper on Aging also points to

the fact that the demographic profiles of EU regions differ considerably, especially between urban and rural areas, while some places are aging significantly and in others, the number of the working-age population is increasing [European Commission 2021: 2].

In this context, it is added that it is also particularly important to recognize regional disparities in aging within a given country and to take this key aspect into account when adopting measures and proposals for changes at the regional and national level. In 2021 the population and housing census (PHC)¹² was carried out. The research was based on data for 2020, since the data from the mentioned PHC were published gradually during the research. For completeness in this section, (table no. 1 and table no. 2) shows the status and growth of the population of the Slovak Republic and the regions of the Slovak Republic for the year 2021, whereas in previous years, after taking natural increase, natural decrease and increase/decrease due to migration into account, the total number of the population of the Slovak Republic grew, in the 2020s the total increase slowed down and in 2021 there was an even more significant decrease in the population. The stated fact is primarily a consequence of the Covid-19 pandemic or the impaired availability of health care for non-covid patients. The Slovak Health Yearbook for 2021 states that the second most common cause of death in 2021 was confirmed as the Covid-19 infection [NHIC 2022: 16]. According to the National Health Information Center (NHIC), deaths in 2021 were most often caused by one of three causes of death in the following order: circulatory system diseases (38.6%), confirmed Covid-19 infection (20.3%) and tumors (17.7%) [NHIC 2022]. Unfortunately, the mentioned statistics did not apply only to the older generation. According to data from the publication Health Yearbook of the Slovak Republic 2021, 11% more people died in the Slovak Republic in 2020 than in 2019 [NHIC 2022] and in 2021, the so-called second year of the Covid-19 pandemic, 24.3% more people died in Slovakia in comparison to the previous year [NHIC 2022].

Table 1. The state and the change of the population in 2017-2021

Year	Natural population increase/ decrease	Population increase/ decrease by migration	Total population increase/ decrease	State of the population as of 31.12. of the given year
2021	- 16 896	2 338	- 14 558	5 434 712
2020	- 2 439	4 347	1 908	5 459 781
2019	3 820	3 632	7 452	5 457 873
2018	3 346	3 955	7 301	5 450 421
2017	4 055	3 722	7 777	5 443 120

Source: Own processing according to the National Health Information Center (2022, p. 19) based on data from the Statistical Office of the Slovak Republic

¹² Compared to the previous PHC carried out in 2011, there were methodological changes, for example, from 2012, children born abroad to mothers with permanent residence in the Slovak Republic are not included in the number of live births. Such children are included in the number of inhabitants of the Slovak Republic only after their first application for permanent residence in the Slovak Republic, i.e. in the number of immigrants.

Table 2. The state and the movement of the population in 2021 in the regions of Slovakia

Region	Natural population increase/decrease	Population increase/decrease by migration	Total population increase/decrease	State of the population as of 31.12. 2021
Bratislava (BA)	83	4 094	4 177	723 714
Trnava (TT)	- 2 332	1 620	- 712	565 296
Trenčín (TN)	- 3 155	- 610	- 3 765	573 699
Nitra (NT)	- 4 514	161	- 4 353	673 547
Žilina (ZA)	- 1 689	- 399	- 2 088	689 525
Banská Bystrica (BB)	- 3 595	- 1 020	- 4 615	620 986
Prešov (PO)	53	- 1 327	- 1 274	807 657
Košice (KE)	- 1 747	- 181	- 1 928	780 288

Source: Own processing according to the National Health Information Center (2022) based on data from the Statistical Office of the Slovak Republic

Table 3. shows how the average age of the population in the Slovak Republic and other age indicators changes between 2012 and 2021. Age indicators in 2020 compared to Slovakia and the EU-27 are shown in Table 4. Due to the fact that the article deals with aging “from above”, the focus was more on indicators including residents in the 65+ age group.

Table 3. Age indicators of the Slovak population in 2012 – 2021 (male and female total)

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2012
Average age	39,32	39,60	39,87	40,13	40,37	40,59	40,82	41,06	41,26	41,39	39,32
Median age	38,20	38,60	39,00	39,40	39,80	40,20	40,60	41,00	41,40	41,80	38,20
Aging Index (%)	85,51	88,34	91,17	94,22	96,96	99,43	101,9	104,8	107,34	108,27	85,51
Index of economic burden (%)	39,81	40,57	41,39	42,41	43,77	45,21	46,59	47,95	49,20	50,26	39,81

Source: Own processing according to data from Podmanická, Z. et al. (2022)

Table 4. Age indicators of Slovakia 2020 compared to the EU-27

	Slovakia	EU – 27
Population aged 65+ (%)	17,1	20,8
Median age	41,4	44,1
Index of economic burden (%)	49,2	56,0
Aging index - total men and women (%)	107,3	138,4

Index of economic dependence of the elderly (%)	25,5	32,5
Average life expectancy	76,9	81,3

Source: Own processing according to data from Podmanická, Z. et al. (2022)

The aging index is gradually increasing in Slovakia. It is shown from the data in Table 3 that in 2012 there were approximately 86 inhabitants aged 65+ for every 100 children aged 0-14 in Slovakia, in 2020 there were already more than 107 and in 2021 more than 108 inhabitants over 65 years of age. For comparison, in the EU - 27 (as a whole), there are more than 138 persons aged 65+ per 100 children (table no. 4). Italy has the highest aging index across the EU-27 countries at 182.6 and Ireland the lowest at 73.9. Europe is aging, Slovakia is slightly better off than most of the EU-27 countries (only the already mentioned Ireland, Luxembourg 91.5 and Cyprus 102.5 had a lower aging index for 2020) [Podmanická et al. 2022]. The data on the share of the population of Slovakia in the post-productive age in the total population are shown in Table 5. From 2012 to 2021, an increase (despite the Covid-19 pandemic, which mainly threatened seniors) of 4.26 percentage points is recorded.

Table 5. Share of the population of Slovakia aged 65+ (%) in the years 2012 - 2021

Year	Percentage of the population aged 65+ (%)
2012	13,13
2013	13,54
2014	13,96
2015	14,45
2016	14,99
2017	15,52
2018	16,04
2019	16,58
2020	17,07
2021	17,39

Source: Own processing based on data from the Statistical Office of the Slovak Republic (2022)

It can be concluded that the population aging of the Slovak Republic in the development of the age structure is mainly influenced by changes in the intensity of fertility and mortality, less by the influence of foreign migration. The growth in the number and share of seniors is accelerating (Šprocha et al., 2022, pp. 90 - 95). An increase in life expectancy can also be observed for people 65 years of age (for example, between 2000 and 2018, the average life expectancy increased from less than 13 years to more than 15 years for men and from less than 16.4 years to 18.8 years for women) (MoLSAF SR 2021, p. 11). In addition, the increase of population aging is reinforced by a significant increase in the number of so-called young-old persons aged 65-74 (compared to 2000 by 63%); in the so-called old-old persons aged 75 and over (by

37%) and even in the oldest residents aged 85+, the so-called oldest old persons (the highest increase in the number of up to 85.7% compared to the year 2000) [von Humboldt, Leal 2015; Šprocha et al. 2022: 90-95]. However, according to the latest available data, the unfavorable epidemiological situation had a negative impact on both the number of deaths and the intensity of mortality [Šprocha et al. 2022: 51]. The Covid-19 pandemic accounted for approximately 80% of the total reasons for the shortening of life for both sexes (-3.15 years for men; -2.71 for women). This meant a decrease in the average life expectancy at birth for men by almost -2.6 years and for women by almost -2.2 years [Šprocha, B. 2022: 104-105] in absolute terms.

The next part of this article focuses on an analysis of the development of the age category of the population over 65 years of age with the aim of identifying the factors of changes in the population over 65 years of age. The first step was to research the frequency of the age category over 65 years of age in Slovakia for the period from 2000 to 2020.

Figure 1. The number and change in the number (in %) of the population over 65 years of age between years 2000 and 2020



Source: own compilation based on data from the Statistical Office of Slovak Republic

The number of the population in the age category 65+ is continuously growing during the monitored period, when researching the percentage change in the number, certain differentiations in the development trend are obvious. Three transformations that express the change in the number of the population over 65 years of age in relative proportions were observed, as the absolute numbers largely depend on the

number of the population in a given country. The next part of this research focused on the following three factors:

- the share of the population over 65 years of age,
- the percentage change of the population over 65 years of age
- the percentage change in the share of the population over 65 years of age.

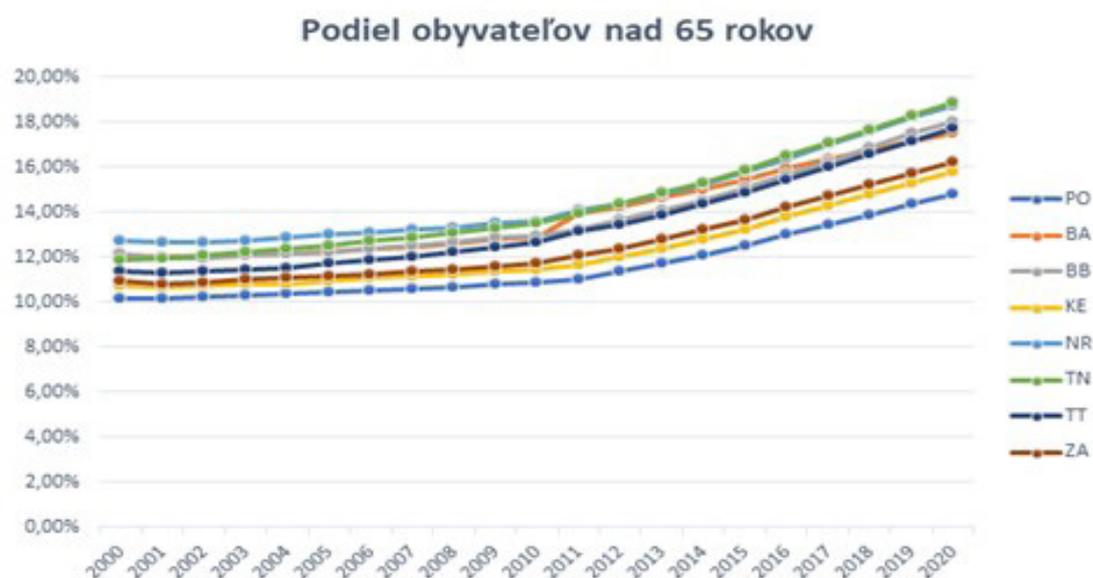
Table 6. Examined factors expressing changes of the population over 65 years of age

Factor	Calculation
I. Share of the population over 65 years of age	$\frac{\text{Number of population over 65 years of age in the region}}{\text{The total number of population in the region}}$
II. Percentage change in the number of the population over 65 years of age	$\frac{\text{Number of population over 65 years of age } t+1 - \text{Number of population over 65 years of age } t}{\text{Number of population over 65 years of age } t+1}$
III. Percentage change in the share of the population over 65 years of age	$\frac{\text{Number of population over 65 years of age } t+1 - \text{Number of population over 65 years of age } t}{\text{Number of population over 65 years of age } t+1}$

Source: own processing

In the first step, it was decided to research the age category over 65 years of age in proportion to the total population in the regions of Slovakia. It is stated that an increasing trend can be observed in all regions of Slovakia, the difference is observed in the intensity of the increase of this indicator.

When expressing the percentage growth of the share of the population over 65 years of age, certain differences can be observed in the regions of Slovakia in the period 2000-2020. The most intensively aging region is the Trenčín region (7.0%), and the lowest growth is reported for the Prešov region (4.6%). Based on the data presented in Table no. 7, it was concluded that although the share of the population is growing in each region, 3 groups can be formed from them.

Figure 2. Share of the population over 65 years old by region and year

Source: own compilation

Table 7. Growth of the share of the population over 65 years of age in the period from 2000 to 2020 (percentage points)

Region	Growth of the share of the population over 65 years of age in the period from 2000 to 2020 (percentage points)
BA	5,4%
BB	5,9%
KE	5,1%
NR	6,0%
PO	4,6%
TN	7,0%
TT	6,4%
ZA	5,3%

Source: own compilation

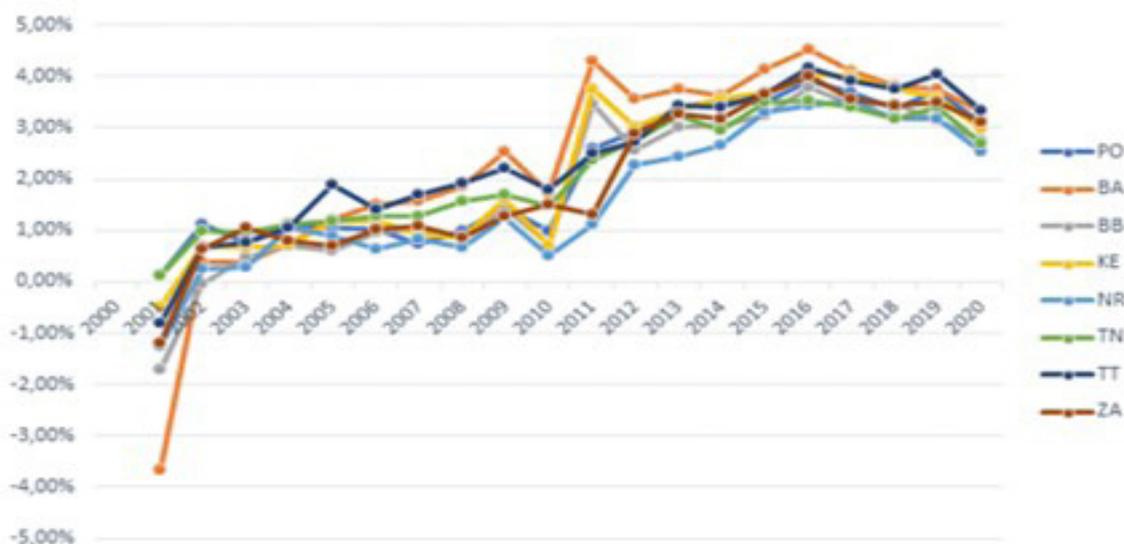
Table 8. Groups of regions according to the development of the share of the population over 65 years of age

Regions	Description
BA	Although it has a high share of the population over 65 years of age, the growth of this share is moderate – 5.4 percentage points.
BB, TN, NR, TT	Already in 2000, it had a high share of the population over 65 years of age, and the growth of this share is still significant – over 6 percentage points (BB 5.9 percentage points). The most significant growth is in the Trenčín Region - up to 7 percentage points.
KE, PO, ZA	In 2000, the share of the population over 65 years of age was around 10%, and by 2020 this value reached 15%. The growth is more moderate, around 5 percentage points.

Source: own compilation

Based on the above facts, it is expected that the growth dynamics of the population over 65 years of age will continue to differ in individual regions. Next, factor II listed in Table no. 6 was researched, i.e. the percentage change in the number of residents over 65 years of age was monitored.

Figure 3. Change in the number of population by regions and years aged 65 plus.



Source: own compilation

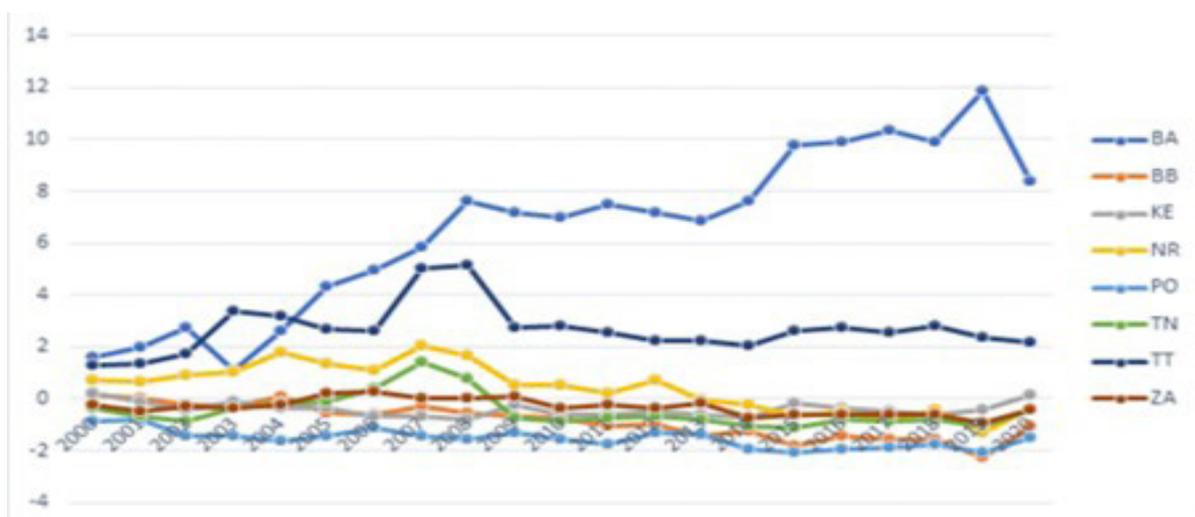
In the years 2005-2019, the largest change in the size of the population over 65 years of age occurred in the Bratislava Region and the smallest in the Nitra Region.

The next part of our research was focused on an analysis of the researched phenomenon based on factor III. listed in Table no. 6. The development of the percentage change in the size of the population over 65 years of age shows a similar trend in all regions except the Bratislava Region. The difference in the Bratislava region can also be explained by the above-mentioned facts and the crude rate of net migration- the change in the absolute number of the population over 65 years of age is the highest, but at the same time the number of the population in other age categories is growing faster than in other regions. This is confirmed by the crude rate of net migration balance in Figure 4 below.

In the next part of our research, the identification of indicators that influence the growth of the population over 65 years of age was carried out, the mutual relationship between the selected indicators and the share of the population 65+ was sought. The data available in the databases of the Statistical Office of the Slovak Republic were used. The research focus was on 201 indicators indicating the socio-economic background of the population and which were examined from the point of view of individual regions. Preference was given to those data that were available for the period from 2000 to 2020. For this purpose, a correlation analysis was performed on

all three factors listed in Table no. 6.: Share of the population over 65 years of age (factor I), Percentage change in the population over 65 years of age (factor II), Percentage change in the share of the population over 65 years of age (factor III). The results of the correlation analysis reached the same results from the point of view of all three factors. Mutual dependence with a very high correlation was observed mainly on indicators that are also relevant from the point of view of research on the given issue. It was concluded that the greatest positive dependence at the national level appears to be with indicators that describe economic prosperity (the correlation coefficient for the average monthly nominal wage is 78%, or for the employment rate between the ages of 20 and 64, 77%). On the other hand, there is a negative dependence with indicators that express a less favorable economic background, the correlation coefficient for the percentage of expenditure on food from total income has a value of -73% and the ratio of expenditure and income -63%. The disparity between individual regions was observed in indicators such as the unemployment rate, where this factor has less influence on the growth of the population over 65 years of age in the Bratislava and Trnava regions (the value of the correlation coefficient is -63% and -68%, respectively) than in the Banská Bystrica or Košice regions (-95%, respectively -87%). Similarly, in the case of the indicator of the ratio of expenses and income, the correlation coefficient showed a more significant negative dependence in Bratislava, Nitra and Košice regions (-95%) as in the Trenčín and Trnava regions (-76% and -69%). These findings can serve as a basis for further research, examination and characterization of mutual relationships between the analysed variables.

Figure 4. Crude rate of net migration according to the regions of the Slovak Republic



Source: own compilation

CONCLUSION

Demographic aging is an irreversible process and at the same time a challenge for all member states of the European Union. The European population as well as the population of Slovakia is aging, while the intensity of aging in the Slovak Republic is more prominent. The process of population aging can be studied “from below” (reducing the birth rate) or “from above” (extending the lifespan). It is desirable to introduce public policy measures to increase the birth rate, which will create favorable conditions for young people and systematically improve family support. The article focused on the research of the aging process “from above”. In Slovakia, life expectancy has been continuously increasing since the mid-1960s.

The importance of biological, psychological and social determinants of aging from the perspective of individuals was pointed out. Many experts are supporters of the fact that it is possible to contribute to the solution, or to mitigate the negative impacts of population aging by applying knowledge from research focused on aspects of individual aging in practice. By analysing the aging process in the Slovak Republic, it was discovered that the share of the population over 65 years of age is growing in every region. The growth of this share in the Bratislava region is moderate, in 4 regions of Slovakia it is over 6% and in 3 regions it is around 15%. This development indicates that the growth dynamics of the number of this age category will continue to be different in individual regions. All regions show similar results, except for the Bratislava region, mainly because of the Crude rate of net migration when monitoring the percentage change in the population over 65 years of age. Approaches were triangulated in order to strengthen the results of this analysis, i.e. the correlation was performed on three factors created by us (share of the population over 65 years of age - factor I., percentage change in of the population over 65 years of age - factor II., percentage change in the share of the population over 65 years of age - factor III). As a result of the research, indicators have been identified in a mutual relationship with the development of the population of the over 65 age group in Slovakia and in its individual regions.

ACKNOWLEDGEMENT

This work was supported by the research project of the Scientific Grant Agency of the Ministry of Education, Science, Research and Sports of the Slovak Republic and the Slovak Academy of Sciences (VEGA) No. 1/0851/21 The social economy a modern tool for building an inclusive society in the context of global change and the challenges of the UN 2030 Agenda for Sustainable Development.

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