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Aging of the population and the quality of life

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Abstract

The paper aims at presenting the quality of life in terms of the deepening population aging process conditioned (to a great extent) by the progressive convergence of technologies. The interdisciplinary, theoretical nature of the considerations is a voice in the discussion on the interpretation, place, and role of quality of life, with particular emphasis on the extension of human life as a consequence of medical development.

The authors applied the descriptive analysis method to present the category of quality of life, the phenomenon of population aging, the specificity of technological changes, and selected issues in the field of demographic changes. Polish and foreign literature on the subject was the basis for the considerations. The theoretical aspect of the research is supplemented by the empirical part supported by available secondary data published by Eurostat and Statistics Poland (Główny Urząd Statystyczny).

Poland has been in the top thirty demographically old countries in the world for many years. In 1967, it crossed the threshold of demographic old age, and in 1980 — the threshold of advanced demographic old age. The demographic forecasts of Statistics Poland indicate that the number of people in retirement age will increase, and in 2035, it will reach 26.7% of the population. The ob-

served and forecasted decline in the total population and the growth in the number of people in the senior age lead to an increase in the demographic dependency ratio of the elderly.

The convergence of technologies revealed in medicine creates a new perspective on the population aging process. Extending human life allows one to recognize that the quality of life becomes: 1. the most desirable result of all healthcare policies; 2. dependent on the change of the healthcare model, i.e., the transition from the dominant model of reactive and retrospective care to the desired proactive and prospective model.

Introduction

The aim of the considerations is to present the quality of life in the perspective of the deepening population aging process. The considerations are based on the ongoing technological change. The dynamism and scope of technology convergence has an increasing impact on the lives of human beings. Time as a component of all experience (collective and individual) as well as the measure of quantitative and qualitative change is essential in this aspect. It determines not only the pace of change in life expectancy, but also the reaction (current and future) to the demographic and technological shifts.

The present considerations are based on Polish and foreign literature on the subject. Their theoretical nature is a voice in the discussion regarding the interpretation, place, and role of the quality of life in terms of the population aging process taking place in the conditions of progressing technology convergence and its impact on human existence. The considerations are an attempt to provoke reflection on the challenges resulting from the impact of technology convergence on the population aging process.

Quality of life — the essence and the perspective

Along with the rise and development of civilization, the quality of life has become one of the elements which determine human life. Aristotle already drew attention to the human striving to obtain pleasure, satisfaction from the choices made, and well-being throughout life. Plato defined "quality" as "a certain degree of perfection," and Hippocrates saw it as the goal of medical practices, the main task of which was to provide a person with health, understood as an internal balance between the solid, fluid environment and the psyche. In philosophical concepts, the quality of life was equated with well-being defined as the difference between the sum of all pleasures and all sufferings a person experiences during their life.

There was an increased interest in the subject of the quality of life in the 20th century. Most definitions focused on its relationship to consumerism; it was believed that the higher the degree of satisfaction of needs, the better the quality of

life. The definition of health published in 1947 by the World Health Organization (WHO) (The WHOQOL Group, 1995) had the greatest impact on the extension of the understanding of the "quality of life." Since then, the interest in research on the topic has increased, and the scope of definitions has expanded to include new elements such as life satisfaction, happiness, health, emotions, and education.

Undeniably, the issue of the quality of life has been and will be important for science and public debates. Research on the subject, initiated by numerous complex research tools, based primarily on intuitive beliefs, takes an increasingly specific form, assigned to individual sciences (Zandecki, 1999; Kantowicz, 2001). For instance, sociologists deal with the quality of life in the context of styles and principles of social life, educators — values, goals, and aspirations, whereas psychologists — the sense of satisfaction and well-being (Wnuk et al., 2013, 11).

A review of the literature on the quality of life leads to the conclusion that this category has been treated as a dependent variable, which is conditioned by economic, social, psychological factors, physical state and motor skills, as well as somatic experiences. According to Ebrahim (1995), the quality of life determines the state of health, which is ruled by life expectancy and modified by physical disability, functional limitations, the way they are perceived, and the possibilities of social activity. Therefore, the study on the subject should be identified with specific problems resulting from disease and treatment as well as human activity in terms of physical, mental, social, and subjective well-being of the patient (Schipper, 1990; Guyatt, Feeny and Patrick, 1993).

Wegner, Naughton, and Furberg (1996) distinguish three aspects of the quality of life: the ability to actively participate in everyday life, the patient's feelings about their health, well-being and satisfaction with life, symptoms and their consequences, which are assessed on detailed quality scales. It is worth adding that Farquhar (1995) considers social contacts to be an equally valued component of a good quality of life, i.e., analogically to health. Walden-Gałuszko and Majkowicz (1994) define it as the assessment of a given period of life between the subject and the environment — a person assesses the quality of life by comparing it with a standard built on the basis of their own experiences or value system, and by further comparing it with the situation of other people.

Bearing in mind the above approaches, the determinants of the quality of life are presumably:

— satisfaction with life (which is subjective and may fluctuate),

— multidimensional factors (from physical health, mental state, level of independence, family, education, wealth, religious beliefs, sense of optimism, local services and transport, employment, housing, and the environment, to social relationships),

— cultural perspectives, values, personal expectations, and goals in life (decisions, dreams, desires to fulfill, which bring people closer to the feeling of happiness in life),

— physical, mental, and social well-being (not the absence of illness).

The quality of life in the face of the dynamic demographic changes observed in the world, especially in Poland, will (and in fact should) arouse more and more interest.

Population aging — the state and the perspective of the process

Population aging is a demographic process that does not take place in subjective and temporal isolation. Its unprecedented scale and intensity cover the societies of Europe and other highly developed countries in the world, and results, i.a., in extending the duration of human life.

It should be emphasized that, in the opinion of researchers, Poland is a country where the population aging will be particularly noticeable in the coming years. As predicted by Eurostat, the demographic forecast until 2100 assumes an increase in fertility for Poland and, in the long term, a positive migration balance, but these changes will not be sufficient to significantly inhibit the unfavorable transformation trends in the country's demographic structure. As a result, the aging of the Polish society is inevitable and irreversible in the next several dozen years (Okólski, 2010). Our country will become one of the oldest, and the share of the Polish population in the total population of European Union countries will be clearly decreasing (Figure 1).

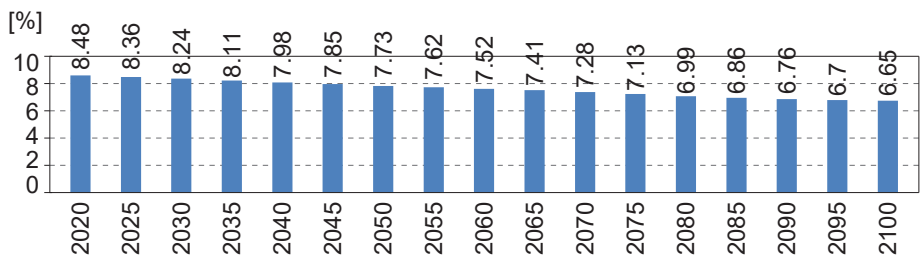

Figure 1. Population of Poland in relation to the population of EU (27 countries) in 2020–2100

Source: own study based on Eurostat data (retrieved May 15, 2022 from https://ec.europa.eu/eurostat/databrowser/view/PROJ_19NP/default/table).

In Poland, at the end of 2019, the number of people aged 60 and more exceeded 9.7 million and increased by 2.1% compared to the previous year. The percentage of elderly people in the Polish population reached 25.3%. According to the forecast of Statistics Poland, the number of people aged 60 and more in Poland in 2030 will increase to the level of 10.8 million, and in 2050 to 13.7 million. These people will constitute about 40% of the total population of Poland (Figure 2; GUS, 2021).

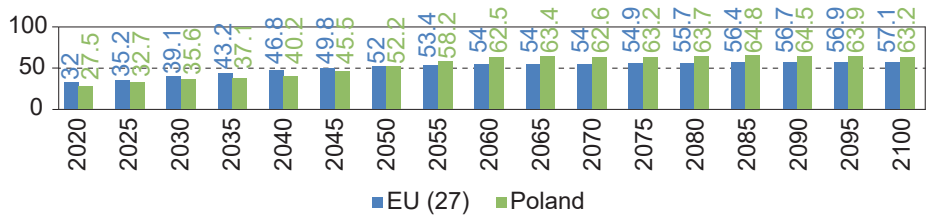

Figure 2. Demographic dependency ratio (population 65 or older to population aged 15–64)

Source: own study based on Eurostat data (retrieved May 15, 2022 from https://ec.europa.eu/eurostat/databrowser/view/PROJ_19NDBI/default/table).

The observed decrease in the total population, with the simultaneous increase in the number of elderly people, already results in growth in the demographic dependency ratio of the elderly (calculated as the number of people aged 65 and more per 100 people aged 15–64). The dynamic increase in the demographic dependency ratio for the elderly has been noticeable in Poland since 2011 (in the previous years, this indicator remained at a relatively stable level). It is worth mentioning that in 2020, the analyzed indicator at the level of 27.2 was higher by 1.1 than in the previous year (the demographic dependency indicator was 26.1) (GUS, 2021).

The dynamic increase in the number of elderly people is related to the extension of the expected life expectancy. In Poland, the average life expectancy of men by 2100 will be 88.4 years, so over 14 years longer compared to 2020. In the case of women, it will extend by an average of over 10.5 years (Table 1).

Demographic change and its consequences are closely related to time, which is the fundamental dimension and regulator of all human action in quantitative and qualitative terms. The essence of time is the tripartite – that is, the constant movement between the past, present, and past. The ongoing technological change and the convergence of technologies in medicine mean that the aging process of the society puts the considerations on the quality of life in a new light.

Table 1. Life expectancy of men in Poland in 2100 compared to 2020

Men					
2100			2020		
1.	Liechtenstein	89.9	1.	Liechtenstein	82.3
2.	Switzerland	89.8	2.	Switzerland	82.0
3.	Spain	89.7	3.	Italy	81.3
4.	Italy	89.6	4.	Norway	81.3
5.	Malta	89.6	5.	Iceland	81.2
6.	Iceland	89.6	6.	Sweden	81.2
7.	Ireland	89.5	7.	Spain	81.1
8.	France	89.5	8.	Ireland	80.8
9.	Luxembourg	89.5	9.	Cyprus	80.8
10.	Norway	89.5	10.	The Netherlands	80.6
11.	Greece	89.4	11.	Malta	80.5
12.	Sweden	89.4	12.	Luxembourg	80.2
13.	Belgium	89.3	13.	France	80.0
14.	Cyprus	89.3	14.	Austria	79.7
15.	The Netherlands	89.3	15.	Belgium	79.6
16.	Austria	89.3	16.	Denmark	79.4
17.	Finland	89.2	17.	Finland	79.3
18.	Denmark	89.1	18.	Greece	79.1
19.	Germany	89.1	19.	Germany	79.1
20.	Slovenia	89.1	20.	Slovenia	78.6
21.	Portugal	88.9	21.	Portugal	78.6
22.	Czechia	88.5	22.	Czechia	76.5
23.	Estonia	88.4	23.	Croatia	75.3
24.	Poland	88.4	24.	Estonia	74.5
25.	Croatia	88.2	25.	Slovakia	74.3
26.	Slovakia	88.2	26.	Poland	74.2
27.	Romania	88.1	27.	Hungary	73.0
28.	Hungary	88.0	28.	Romania	72.1
29.	Lithuania	87.7	29.	Bulgaria	71.7
30.	Bulgaria	87.6	30.	Lithuania	71.1
31.	Latvia	87.6	31.	Latvia	70.5

Source: own study based on Eurostat data (retrieved May 15, 2022 from https://ec.europa.eu/eurostat/databrowser/view/proj_19nalexp/default/table?lang=en).

Table 2. Life expectancy of women in Poland in 2100 compared to 2020

Women					
2100			2020		
1.	Spain	93.7	1.	Spain	86.6
2.	France	93.7	2.	Liechtenstein	86.4
3.	Liechtenstein	93.5	3.	France	86.2
4.	Luxembourg	93.4	4.	Switzerland	85.8
5.	Italy	93.3	5.	Italy	85.7
6.	Switzerland	93.3	6.	Cyprus	85.0
7.	Malta	93.2	7.	Luxembourg	84.9
8.	Ireland	93.1	8.	Finland	84.8
9.	Slovenia	93.1	9.	Portugal	84.7
10.	Belgium	93.0	10.	Sweden	84.6
11.	Greece	93.0	11.	Norway	84.6
12.	Portugal	93.0	12.	Ireland	84.5
13.	Finland	93.0	13.	Malta	84.5
14.	Iceland	93.0	14.	Slovenia	84.5
15.	Estonia	92.9	15.	Iceland	84.4
16.	Austria	92.9	16.	Belgium	84.3
17.	Sweden	92.9	17.	Greece	84.3
18.	Norway	92.9	18.	Austria	84.3
19.	Cyprus	92.8	19.	Germany	83.7
20.	Germany	92.7	20.	The Netherlands	83.6
21.	The Netherlands	92.7	21.	Denmark	83.3
22.	Poland	92.7	22.	Estonia	83.1
23.	Denmark	92.6	23.	Czechia	82.3
24.	Czechia	92.4	24.	Poland	82.1
25.	Slovakia	92.4	25.	Croatia	81.6
26.	Lithuania	92.2	26.	Slovakia	81.1
27.	Hungary	92.2	27.	Lithuania	80.9
28.	Romania	92.2	28.	Latvia	80.1
29.	Croatia	92.1	29.	Hungary	79.9
30.	Latvia	92.1	30.	Romania	79.5
31.	Bulgaria	91.6	31	Bulgaria	78.9

Source: own study based on Eurostat data (retrieved May 15, 2022 from https://ec.europa.eu/eurostat/databrowser/view/proj_19nalexp/default/table?lang=en).

Technological dimension of the progressive population aging process as a challenge to the quality of life

The average human life expectancy is systematically increasing with the progress of civilization. Life expectancy has doubled in two centuries. In the 1850s, the average life expectancy was 48 years, and in 2020, it was 72 years (Eurostat, 2022). Undoubtedly, this change is marked by, i.a., the development of treatment methods and strategies, universal access to healthcare and the quality of its services, lifestyle with particular emphasis on diet, addictions and physical activity, and the degree of environmental contamination.

The observed increase in life expectancy is accompanied by change in the social and economic environment. We are currently living in a globalized world where changes are characterized by exponential (not linear) growth. Developing technologies are converging and their combined impact triggers further changes (e.g., increasing access to information, methods, and tools for obtaining financial resources for business activity or meeting consumer needs, as well as saving time and increasing opportunities for professional activity).

Bearing in mind the essence of technological change, the extension of human life should be combined with the ongoing development of genetics. The research on DNA brings scientists closer and closer to the essence of genetic instability responsible for genetic defects and diseases. It is equally important, however, to search for effective treatment methods, new drugs, and to identify the so-called point of therapeutic intervention, i.e., the target site of action of a given medicine (Diamandis and Kotler, 2021, 236).

The aforementioned areas of activity are conditioned by the ongoing technological change and technology convergence. As Diamandis and Kotler (2021, 221) point out:

> every step in medical therapy changes. In the *front end* area, the convergence of sensors, networks and artificial intelligence turns medical diagnostics upside down. In the intermediate tier, robotics and 3D printing are changing the nature of medical procedures. In the back *ended area*, artificial intelligence, genomics and quantum computers are transforming the medicinal products themselves.

Undoubtedly, science is getting closer to extending the life of an individual. In 2018, Ray Kurzweil, technologist, supporter, and promoter of the idea of "escape velocity into longevity" (Gray, 723–726), stated that in 10–12 years, human life expectancy would increase faster in relation to technological changes (extending by over a year each year; Koulopoulos, 2019). Thus, humanity faces the possibility of gaining several dozen more years of life, and therefore influencing the pace of change in the world.

In view of these statements, ensuring the quality of life in an aging population takes on a new dimension. Leading the way is the change in the care model, i.e.,

the shift from a reactive, retrospective system to a proactive and prospective one. The transition from the patient care model to the health care model is due to the dynamically occurring technological change. Even now, human beings are able to monitor their own health at home and react to any deviations from the norm. Products offered in the market equipped with internal and external sensors (e.g., monitoring bands, smartphones, smart watches, toothbrushes) are able to determine the parameters of the body (e.g., sugar level, blood oxygenation, heart rate). Additionally, a follow-up with a complete picture of human health is becoming available, such as full genome sequencing, body magnetic resonance imaging, computed tomography, echocardiogram, and various clinical blood tests. The combination of constant health monitoring at home with a comprehensive checkup makes it possible to quickly diagnose health problems which require medical intervention and to identify a previously undiagnosed disease. Time is crucial in this regard, and the period between the appearance of the disease and being able to detect its first symptoms is shortened.

Conclusions

The progressing population aging, the prolongation of human life due to technological change, and the convergence of technologies make the quality of life possibly the most desirable result of all healthcare policies. Time is crucial here — it is not only a condition for change, a dimension and regulator of all human action, but also, most importantly, it is a component of all experience (collective and individual) as well as a measure of quantitative and qualitative change. Extending human life should be accompanied by healthcare (proactive and prospective model). Only then will a longer healthy life contribute to people's productivity, will to inspire, create innovative solutions and set new expectations. Creating the conditions for a higher quality of life from in terms of physical and mental health is a challenge facing humanity.

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