

# Population Aging: The Demand caused by the Serious Trend and Its Impact on the Healthcare System

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**Abstract.** Beginning with the problem of lacking of labor forces, the reduction of the production, a problem is shown on the stage of the society, the population ageing. It has been a hot topic and the serious situation discussed in several countries, for instance, China, Japan, Italy, Germany, Finland. This caused problems of lacking of enough resources to provide them with indemnity. The cost of money and labor forces of the aging population solution show a trend of raising. It is generally believed that, during the past years, the birth rate was controlled because of family planning. Meanwhile, in the fast-developing world, the cost of education, medicine and other necessary issues should be considered when raising children. This has brought too much pressure. Consequently, although the elderly are able to live longer with the help of technologies, few people hope to give birth to new kids. That leads to the increasing of the percentage of old people in population. Authors met to discuss, validate and come to a consensus around the main points, bone of contention, and future development trends.

**Keywords:** Population ageing; birth rate, cost.

## 1. Introduction

With the development of the economy and the society of all countries around the world, population aging has become one of the most significant trends of the twenty-first century and an essential issue that can no longer be ignored in many countries. By 2020, the number of elderly people in the world had exceeded one billion [1], and more than one-fourth of the total population of several European countries is aging [2]. This trend raises an inevitable set of problems and causes far-reaching effects on people's daily life and the local healthcare systems of countries. In order to ensure people's health and a certain quality of life in their later years, governments around the entire world have invested a lot of money [3]. Especially, as the population age, the demands for different types of healthcare services are all increasing [4]. This would place enormous invisible pressure on the government, especially the healthcare system, and would challenge their ability of providing high-quality caring services. Taking end-of-life care as an example, a survey of the health registration systems in Belgium, Canada, the United Kingdom, Germany, the Netherlands, Norway [5], and the United States compared these seven countries with very different medical practices, and the data showed that the higher the investment, the better the treatment technology, and the better the results. Two-thirds of America's 5,300 hospices offer home-based care [6]. A large number of economic, and human inputs to create a higher quality of security. And their total health costs account for 18% of GDP in 2021 [7]. For people 65 and older, the average cost is \$11,300 per person per year, nearly three times that of young adults. Such high welfare costs also put a significant strain on national finances, so the elderly often have to undergo rigorous screening before receiving benefits. It also shows that whether the aging situation can be effectively alleviated is closely related to the country's economy, medical system, and other aspects. This review aims to provide a comprehensive overview of the impact of population aging on the healthcare system, exploring demands and the factors driving demand, the challenges faced by the healthcare system, and the possible innovative solutions being developed to address these challenges.

The global population is aging at an unprecedented rate. According to the World Health Organization, by 2050, the total population of people aged 60 years and older around is expected to

be doubled, and the estimated number is around 2.1 billion. Additionally, between 2020 and 2050, there will be an increase of 3 times as many people who are 80 years or older, to 426 million [8], and the healthcare costs of a person would go up as that person ages. In actuality, the average annual cost of healthcare for a 65-year-old is \$11,300. This is over three times what a person in their 20s or 30s pays annually on average [9]. Such high unavoidable expenses would put significant pressure and strain on both personal and national finances; as a result, the true benefit the old people can receive would vary in each country or region over time due to the local situation.

On the other hand, population aging has many complicated reasons. This shift is caused by a number of factors such as decreased birth rates, advancements in healthcare, and increasing life expectancies [10], and most of them are often viewed as indicators of advancement in terms of human development. This indicated that these developments had posed significant challenges for human society. Specifically, the healthcare system faces several difficulties as a result of the aging population issue. The rising need for healthcare services is one of the biggest issues that population aging presents. As a person gets older, it is more likely for him or her to experience chronic health conditions such as diabetes, heart disease, and cancer, and there might be some other age-related health issues, such as dementia and mobility impairments. This indicates that many old people would need special healthcare services since many of these conditions require ongoing and often complex care and would initially lead to increasing demands for more and more high-quality healthcare services. Although, at the same time, there are serious workforce shortages in many healthcare sectors, which would exacerbate these challenges. Equally, the impact of population aging on the healthcare system is complex and multifaceted, and the specific result would definitely vary due to the type and characteristics of the local healthcare system.

## 2. Method

### 2.1. Data source

A thorough search of several internet databases as well as pertinent academic journals produced the data sources for this review study. To ensure the selection of relevant and high-quality research, the search was carried out using particular keywords and inclusion or exclusion criteria.

National Center for Biotechnology Information (NCBI): NCBI was an official website of the United States government. It is a renowned center that advances science and health by providing access to a wide range of biomedical and genomic information. It serves as a valuable resource for researchers, scientists, healthcare professionals, and the general public interested in exploring and utilizing biological and medical data.

JSTOR: JSTOR is a digital library that provides access to a wide range of academic journals, books, and primary sources. It offers a vast collection of scholarly resources that encompass various disciplines, including humanities, social sciences, natural sciences, and more.

### 2.2. Variable Selection

Variable selection is an essential step in the entire research, since it involves identifying and choosing relevant variables for analysis to address specific research questions or hypotheses effectively. By carefully selecting variables, we can increase the validity, reliability, and interpretability of our findings. In the research, the type of data is mostly quantitative. The independent variables are countries and time, and the dependent variables are the corresponding cost, income, number of population, etc. In addition, since each country would take a different healthcare system and different kinds of healthcare systems would always have their own characteristics and work in different ways, the data of each of them would be analyzed separately. By 2023, the United Nations (UN) recognizes a total of 195 countries around the world. There are 193 official member states and 2 unofficial countries, Vatican City and Palestine, which are not recognized as sovereign states by the UN. However, when the thing comes to the healthcare system, most of these 195

countries basically can be categorized as one of the following four healthcare systems: the Beveridge model, the Bismarck model, the national health insurance model, and the out-of-pocket model.

### 3. Results And discussion

#### 3.1. Comparison of individual income tax payers by sex and age

As the average age and the proportion aging population of a country increase, the average healthcare spending remarkably increases; the aging population also has a relatively higher hospitalization rate, physician visits rate, and prescription drug use rate compared to the younger group. Besides, countries with high aging population trends to have a higher average level of healthcare expenses; however, the relationship and connection between the proportion of the aging population and average healthcare spending vary by country and also by the healthcare system. All in all, population aging can be considered as one of the most essential factors and motivators of increased healthcare costs, but the development of relative technology, the local healthcare system, and other factors also play certain roles.

On the topic of the impact of population aging on healthcare systems, there are several bones of contention. Above all, it's the increase in healthcare costs. As population aging happens, the demand and relative cost of healthcare services would inevitably increase, since aging people are more likely to have chronic diseases, such as disease, cancer, or diabetes. All of these chronic diseases need extra medical care and special treatment, and this would affect the distribution of public resources and the consistency of the healthcare system. In the way, as more and more aging people get chronic diseases, long-term care services would also face considerable pressure and challenge. More healthcare workforce have to be devoted to the service for the aging population, especially in geriatric care and other professional field that provide services to the aging population. However, in modern society, the demand and lack of geriatric care and other relative services are not valued. And the failure of society to value these essential works of caregiving is reflected in the difficult working condition and disrespected treatment of the workers. Besides, the equal distribution of healthcare chances and opportunities would enhance and cause more challenges to the healthcare systems. The uneven distribution of wealth in society is obvious. On such a basis, the discrepancy in healthcare services for the different elderly population would acquire would eventually lead to or enhance the health inequality among these elderly populations, especially for people with lower socioeconomic status. Otherwise, more than just labor force and manpower are required. The invention and development of new medical technologies and therapies are also needed to improve the quality and efficiency of the aging population's healthcare. However, invention and development always take time, and the high cost of these innovations would increase healthcare expenditure for a certain period of time, as Table 1 shows.

**Table 1.** Number of individual Income Tax payers by sex and age.

Year	Age under 65	Age 65 and over	Proportion of age 65 and over
2009 to 2010	26,000	4,530	0.148379
2010 to 2011	26,400	4,910	0.156819
2011 to 2012	25,700	5,090	0.165313
2012 to 2013	25,200	5,380	0.175932
2013 to 2014	24,400	5,970	0.196576
2014 to 2015	24,400	6,330	0.205988
2015 to 2016	24,500	6,490	0.209422
2016 to 2017	24,700	6,490	0.208080
2017 to 2018	24,700	6,460	0.207317
2018 to 2019	25,000	6,580	0.208360
2019 to 2020	25,000	6,500	0.206349
2020 to 2021	24,800	6,810	0.215438
2021 to 2022	26,000	7,310	0.219454

Moreover, since each country would take a different healthcare system and different kinds of healthcare systems would always have their own characteristics and work in different ways, the specific effect the population aging would pose on the system or the nation would be different.

### 3.2. Annual disposable income in the United Kingdom

The Beveridge, Bismarck, and national health insurance models are more common and popular in rich, democracies, or developed countries, such as the United Kingdom, Germany, and Semashk. Germany's social insurance system, the National Health Service (NHS) which is a specific example of a Beveridge model healthcare system in the United Kingdom, and private insurance in the United States are all famous examples.

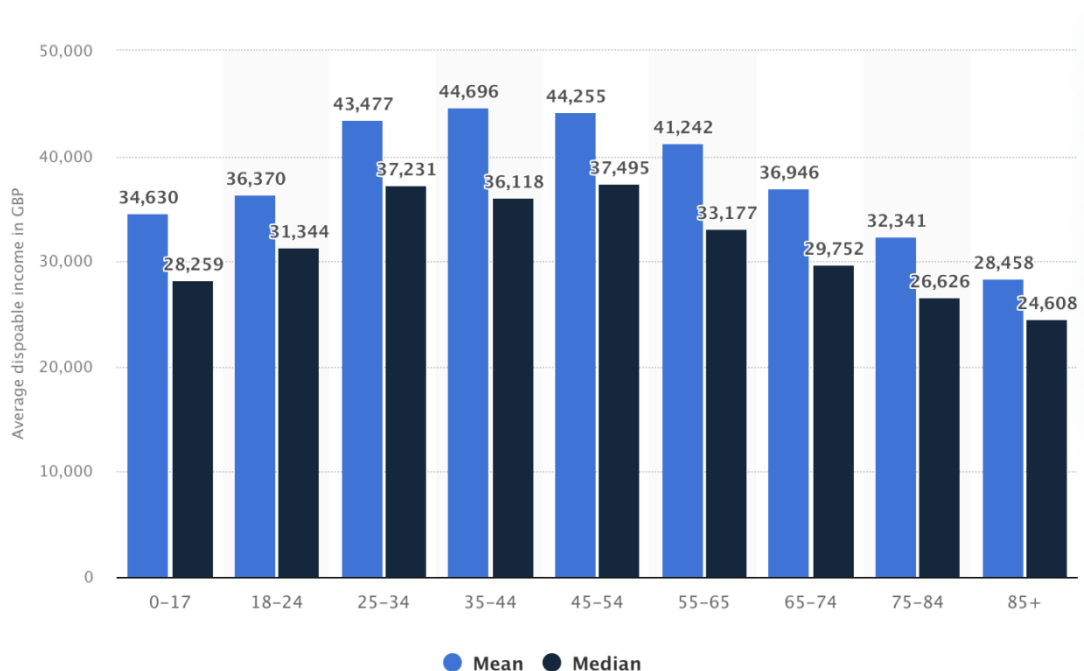
The Beveridge model, which is named after the British economist William Beveridge, is a healthcare system that emphasizes the concept of healthcare as a public service. It is usually used in counties, such as the United Kingdom, where the National Health Service (NHS) would provide free healthcare to all citizens. For the Beveridge Model, the aging population would put great pressure on the financial part of the healthcare system since, in this model, the government responses for providing healthcare to all citizens, finances through taxes and aims to ensure that everyone can have a chance to access healthcare, regardless of their ability to pay. The United Kingdom is a great example of it. Since, in the United Kingdom, healthcare is funded through taxes, this requires all citizens, including the older ones, to pay taxes to fund the healthcare system. In fact, the tax system of the United Kingdom is progressive, which means the more money a person earns the more taxes this person has to pay and individuals with higher incomes usually need to pay more taxes than individuals with lower incomes. This strategy helps to ensure that the entire society would equally bear the financial pressure of healthcare services. However, in the United Kingdom, over 19% of the population was over 65 in 2022, with approximately 11 million of them residing within the country. This is anticipated to rise to about 13 million individuals, or 22% of the population, in ten years. All of these people that retire may no longer earn any income and would pay fewer taxes than people who are still young and working and earning a higher income. Everything should just go with the flow if the ratio of aging individuals does not constant increasing. Although the old ones would need to pay more expenditures on healthcare, when there are not that many old individuals, the taxes paid by young individuals are enough to offset this part of the money shortfall, since the young individuals are usually healthier and would not cause that more expenditures. Unfortunately, the reality is always less than satisfactory. According to Table 1, it is obvious that from 2009 to 2022, the proportion of individual Income taxpayers aged 65 and over keeps increasing. Additionally, according to Table 2 and Figure 1, in 2021/22, people in the United Kingdom aged 25 to 54 trends to have a higher average annual disposable income. By concluding all of the information, it is easy to tell that this balance is about to be broken or has already been broken, as Table 2 shows.

**Table 2.** Average annual disposable income in the United Kingdom in 2021/22.

Age	Mean	Median
0-17	34,630	28,259
18-24	36,370	31,344
25-34	43,477	37,231
35-44	44,696	36,118
45-54	44,255	37,495
55-65	41,242	33,177
65-74	36,946	29,752
75-84	32,341	26,626
85+	28,458	24,608

On the other hand, the Bismarck model which is also known as the social insurance model is constructed based on the idea of social insurance. This model is named after the great German Chancellor Otto von Bismarck, who created the first universal healthcare system in Germany in the

late 19th century. Additionally, this model can be commonly found in countries such as Germany, France, and Japan. It is kind similar to the Beveridge Model and would get pressure from the aging population since its financing is largely based on a system of employer and employee contributions to health insurance funds. As the proportion of old individuals' increases, there would be fewer workers who would fund and support the entire system and more retired individuals that more heavily rely on the system. This would definitely challenge the financial capability of the healthcare system since there would be higher healthcare costs and less income in this system. Some countries with a Bismarck model healthcare system deal with the aging populations by increasing the retirement age or encouraging older workers to remain in the workforce like some Beveridge Model countries would do as well. This strategy might be effective and useful, but most workers would not be happy about it, as Figure 1 shows.



**Figure 1.** Average annual disposable income in the United Kingdom in 2021/22.

Another main healthcare model is the national health insurance model, which can be seen as a hybrid of both the Beveridge model and the Bismarck model and usually happens in countries, such as Canada and South Korea. In this model, healthcare is also provided by private providers, but financing is based on a system of compulsory insurance which is pretty similar to the Bismarck model. Unlike the Bismarck model, the government plays a much more significant role in this system. The government would regulate the healthcare system and somehow provide healthcare to certain disadvantaged groups, such as old people and low-income people. Similarly, the aging population can also put pressure on a National Health Insurance model healthcare system, because older people often need more medical attention and services. However, as this approach is frequently supported by a government-run insurance program, there could be greater room to modify funding levels in order to take shifting demographics into consideration. In addition, several nations that follow the model of the National Health Insurance have put in place measures to promote healthy aging and avoid chronic illnesses, which can aid in lowering healthcare expenses.

Finally, the out-of-pocket model, also known as the direct payment model, is a healthcare system where individuals pay for healthcare services directly out of their pockets. This model can often be found in low-income countries or countries with relatively weak public healthcare systems. In this model, the healthcare a person can get access to be mainly determined by his or her economic capability, and this characteristic would eventually lead to significant disparities in healthcare outcomes. Consequently, the effect of the aging population on an Out-of-Pocket model healthcare system can be the smallest one but might also be the most significant one since, in this kind of system,

people need to pay for healthcare services by themselves. The poor individuals might not have enough money to pay for healthcare, and the old individuals that retired or do not have a job are more likely to have limited financial resources to pay for healthcare services. Eventually, this can lead to untreated medical conditions, decreased quality of life, and higher mortality rates among older individuals.

#### 4. Conclusion

Nowadays, the global aging issue gains more and more attention from people. Healthcare expense is one of the most essential aspects and the future development trend of it is predictable. In the first place, the importance of medical insurance would constantly increase, since, as the proportion of the aging population increase, the corresponding demand would also increase. Both the government and private agencies need to provide added medical insurance to meet the demand of the aging population and the insurance arrangements must be modified to meet the society with a different condition and market. On another side, precautions against prevalent diseases and health promotion become more crucial strategies in order to reduce healthcare costs as much as feasible. Elderly people need better management of health and nutrient intake to reduce the occurrence and development of chronic diseases. On another hand, the effects of an aging population on healthcare systems can vary depending on the specific model in place and the policies implemented to address demographic shifts. However, all healthcare systems are likely to face challenges as populations' age and demand for healthcare services increases.

#### Authors Contribution

All the authors contributed equally and their names were listed in alphabetical order.

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