



LONGEVITY IN THE CAUCASIAN POPULATION

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Abstract: The Caucasian population, which lives in the mountainous regions of the Caucasus, is known for its exceptional longevity, which is attributed to a combination of genetic, environmental and lifestyle factors. This article will examine and analyze longevity and the factors affecting it, the statistical analysis of the lifespan of people in the Caucasian peoples, as well as the regions and countries of the region of the Caucasus. The issue of the concept of longevity is now becoming more and more important due to the influence of other factors. Thus, despite the fact that people's lifespans have increased with the development of modern technologies, the widespread use of these technologies in the food industry has caused certain problems by affecting genetics and shortening people's lives.

Keywords: Caucasian peoples, genetic features, longevity, Caucasus region

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Received: 6 May 2025;

Accepted: 4 June 2025;

Published: 30 June 2025

DOI: 10.54414/NECL5001

Introduction:

When discussing longevity in the population of the Caucasus, it is necessary to first provide information about the location and characteristics of the Caucasus on the map. The Caucasus is a geographical region located in both Asia and Europe. The eastern border of the Caucasus is the Caspian Sea, while its western border is the Black Sea. The northern physical-geographical boundary of the Caucasus is the Kuma-Manych Depression (which includes the northern borders of the Krasnodar and Stavropol regions and Dagestan) and, sometimes, Kalmykia is conditionally considered part of the Caucasus. Considering that a large part of the North Caucasus is historically and ethnographically closer to the Russian steppes and the Lower Volga region, the northern border of the Caucasus can be traced along the Kuban River and the ridges of Kuma, Malka, and Terek. Thus, the southern part of Krasnodar region, Adygea, Karachay-Cherkessia, Kabardino-Balkaria, North Ossetia, Ingushetia, Chechnya, and a large part of Dagestan are

included in this area. The southern borders are politically formed by the boundaries with Azerbaijan, Armenia, and Georgia, as well as with Iran and Turkey. Azerbaijan is a Caucasus country (7). The population of the Caucasus is 30.2 million people: 55% of the population lives in the South Caucasus, and 45% in the North Caucasus. The ethnic composition of the Caucasus population is the most complex in the region. Currently, more than 50 different peoples live in the territory of the Caucasus. Relatively, the Lesser Caucasus region includes four states: Azerbaijan, Georgia, Armenia, and the southern part of the Russian Federation. Most of the peoples of the Caucasus belong to four language families: 1) North Caucasian ethnic group; 2) Kartvelian; 3) Indo-European; 4) Altaic (7,8).

According to the Indo-European language family, Slavs and Armenians belong to this group, while Georgians belong to the Kartvelian family. They live south of the Caucasus Mountains. The Turkic language group in the Caucasus includes Azerbaijanis,

Karachays, Balkars, Kumyks, Nogais, and Turkmens. Azerbaijanis mainly live in the Republic of Azerbaijan and make up 90% of the

population. Currently, a large number of Armenians live in Georgia and the North Caucasus (7,8).



Figure 1. Map of the Caucasus. (<https://az.wikipedia.org/wiki/Qafqaz>).

South of the Greater Caucasus, along the coast of the Black Sea, lies the alluvial Kolkheti plain, the site of ancient Colchis. South of the Caspian mountain range, between the Greater and Lesser Caucasus ranges, the Shirak steppe sharply descends into the Kura-Aras plain. In the center of this large depression, the Kura River receives its main right tributary, the Aras River. To the northeast, the Gobustan hills separate the Absheron Peninsula from the Kura-Aras plain. The Lankaran plain stretches to the south between the Caspian Sea and the Talysh Mountains, which reach heights of over 2,400 meters.

The Caucasus is divided into two main regions: The North Caucasus, which covers the southern part of Russia, and the South Caucasus, which includes Georgia, Armenia, and Azerbaijan. The region's rugged mountains and isolated valleys have contributed to its cultural and linguistic diversity. The Caucasus serves as a natural corridor between Europe, Asia, and the Middle East, leading over time to interaction and mixing among various peoples and traditions.

The Caucasus is mainly known as a land of longevity. In fact, the phenomenon of longevity has been identified in many of the

peoples living here, and during the Soviet era, most research on the physiology of aging was conducted in this region. Along with longevity, high health indicators have also attracted attention (Karamova N.Y., 2025). Even before modern medical treatments emerged, it was known that a healthy lifestyle improved quality of life and extended life expectancy. Through epidemiological models that assess the impact of different lifestyle factors on quality of life and expected lifespan, the contribution of a healthy lifestyle can soon be quantified, which can enable important steps to strengthen the health of the population. Besides a healthy lifestyle, it is known that a number of other factors influence longevity. The total exposure to various xenobiotics and stress factors accumulated over an individual's lifetime in living and working environments is known as the exposome, which affects both quality of life and longevity. The exposome can currently be linked not only to clinical outcomes but also to biomarkers of exposure that help in the prevention and management of diseases and aid in mechanistically understanding how the human body interacts with environmental factors. Additionally, biomarkers of exposure help quantitatively determine an individual's



susceptibility to damage from environmental stressors. Longevity is the result of a complex interaction between healthy genes and the environment, where the environment modulates gene expression through epigenetic effects. The interplay between the genome and gene expression modulation also plays an important role in longevity. The study of populations spanning many centuries has helped identify genes related to life expectancy, and polymorphisms of such genes can be used to determine susceptibility and resistance to diseases. Polymorphic variations in important genes interacting with the environment can significantly influence the risk of developing a specific disease. High consumption of alcohol, drugs, and tobacco are among lifestyle factors known to have toxic effects on the body and to substantially increase health risks.

Longevity and Factors Affecting It:

Longevity, or the length of an individual's life, is a complex phenomenon influenced by the interaction of genetic, environmental, lifestyle, and social factors. Understanding the determinants of longevity is crucial not only for extending lifespan but also for improving quality of life during aging (Christensen, K., Johnson, T. E., & Vaupel, J. W., 2006).

Genetics plays a key role in determining longevity. Studies conducted on centenarians and long-lived families have revealed that certain genetic variants are associated with enhanced cellular repair, efficient metabolic pathways, and resistance to age-related diseases such as cancer, cardiovascular diseases, and neurodegenerative disorders. For example, genes like SIRT1, FOXO3, and APOE, which are involved in antioxidant activity and regulation of inflammation, have been linked to lifespan extension. These genes slow down the cellular aging process and increase the body's resistance to stress factors. The ability of cells to renew themselves, prevention of DNA damage, and effective metabolism are considered key biological mechanisms related to longevity. Telomeres also play an important role in this process. Telomeres are structures located at the

ends of chromosomes that prevent the loss of genetic information during cell division. The enzyme telomerase maintains telomere length, and longer telomeres allow cells to remain functional for a longer period. Among the peoples of the Caucasus, especially in long-lived individuals, telomere length has been observed to be greater compared to other regions. Similar genetic characteristics have been noted repeatedly among members of long-lived families. This fact indicates that hereditary factors play a significant role in healthy aging. While genetic factors determine the potential for longevity, their interaction with other factors ultimately shapes actual lifespan. In other words, genetic advantages alone are not sufficient for a person to live a long and healthy life. Longevity is closely linked not only to hereditary factors but also to lifestyle. Healthy nutrition, physical activity, effective stress management, and timely medical prevention create conditions for the full realization of genetic potential. Studies conducted in areas inhabited by long-lived people prove that proper nutrition and an active lifestyle are among the main factors that enhance the influence of genetic factors.

The environment significantly affects longevity through factors such as air quality and pollution. Individuals living in certain mountainous regions, where environmental pollution is low, tend to have fewer respiratory and cardiovascular diseases, which contributes to a longer lifespan. Additionally, access to medical care and preventive measures against environmental hazards play an important role in reducing risks related to environmental factors (Chung, W. H., Dao, R. L., et al., 2010).

Lifestyle is perhaps the most modifiable element of longevity. Key aspects include: diet; water resources; physical activity; sleep; and stress.

Modern science and technology also play a crucial role in increasing longevity. Medical achievements such as vaccinations, early disease detection, and innovative treatment methods have significantly increased life expectancy in the past century. Emerging fields like genomics and biotechnology,

including gene therapy and personalized medicine, hold promise for identifying interventions that promote longevity (Salvioli, S., Olivieri, F., Marchegiani, F., Cardelli, M., et al., 2006).

Longevity Zones of the Caucasus:

The Caucasus region, located between the Black Sea and the Caspian Sea, is famous for its stunning landscapes, cultural diversity, and fascinating history. One of the lesser-known but intriguing aspects of this area is its designation as a center of longevity. The areas known as the “longevity zones” of the Caucasus have attracted attention from both researchers and the public due to the remarkable life expectancy of their inhabitants. Primarily located in the mountainous regions of Georgia, Azerbaijan, and Armenia, these zones provide insights into factors that contribute to extended life expectancy. The mountainous terrain of the Caucasus creates favorable conditions for longevity. Together with clean air and pure water sources, the high altitudes create an environment that supports health. The region’s mineral-rich waters, often praised for their therapeutic properties, contribute to the health of the local population. Additionally, the mild climate and abundance of unpolluted natural surroundings reduce bodily stress and improve overall well-being. At the same time, the social and cultural characteristics of the region play an important role in longevity. Strong social ties based on family values, intergenerational unity, and high respect for the elderly enhance psychological well-being, leading to longer and healthier lives. Traditional lifestyles, consumption of natural and minimally processed foods, and daily activities rich in physical exercise are also key factors contributing to longevity(<https://www.britannica.com/topic/Caucasian-languages>).

Additionally, the optimism and acceptance of life observed in much of the region’s population, along with minimal stress

levels, can slow down the biological aging process of the body. Research investigating the genetic basis of longevity among local residents shows that this trait also stems from hereditary factors. Thus, the longevity zones of the Caucasus represent a rare example of the integration of natural, social, and genetic factors.

Traditional nutrition plays an important role in the longevity of the inhabitants of these areas. The diet, mainly consisting of organic, locally sourced foods, includes whole grains, fresh vegetables, fruits, nuts, and dairy products. Fermented foods rich in probiotics, such as yogurt and kefir, also hold significant importance. The predominance of agriculture in the region greatly contributes to the health and longevity of the people of the Caucasus. Daily activities like farming, animal husbandry, and household chores help individuals remain physically active well into old age. Moderate physical activity combined with this constant engagement supports cardiovascular health, muscle strength, and overall resistance to age-related diseases. Importantly, this lifestyle is not intense but consistent, allowing individuals to maintain energy and vitality over decades. While lifestyle and environment are significant, genetic factors also contribute to the longevity of the peoples of the Caucasus. Studies have shown that some populations in the region possess genetic traits associated with resistance to age-related diseases. Additionally, natural therapies complement modern medical treatments, providing a dual approach through the use of natural health remedies.

The longevity zones of the Caucasus offer valuable insights for modern society, serving as a model for achieving better health and longevity through an active lifestyle and strong social connections. As researchers continue to study these areas, they are uncovering ideas that may help combat the increasing prevalence of chronic diseases and improve quality of life on a global scale.

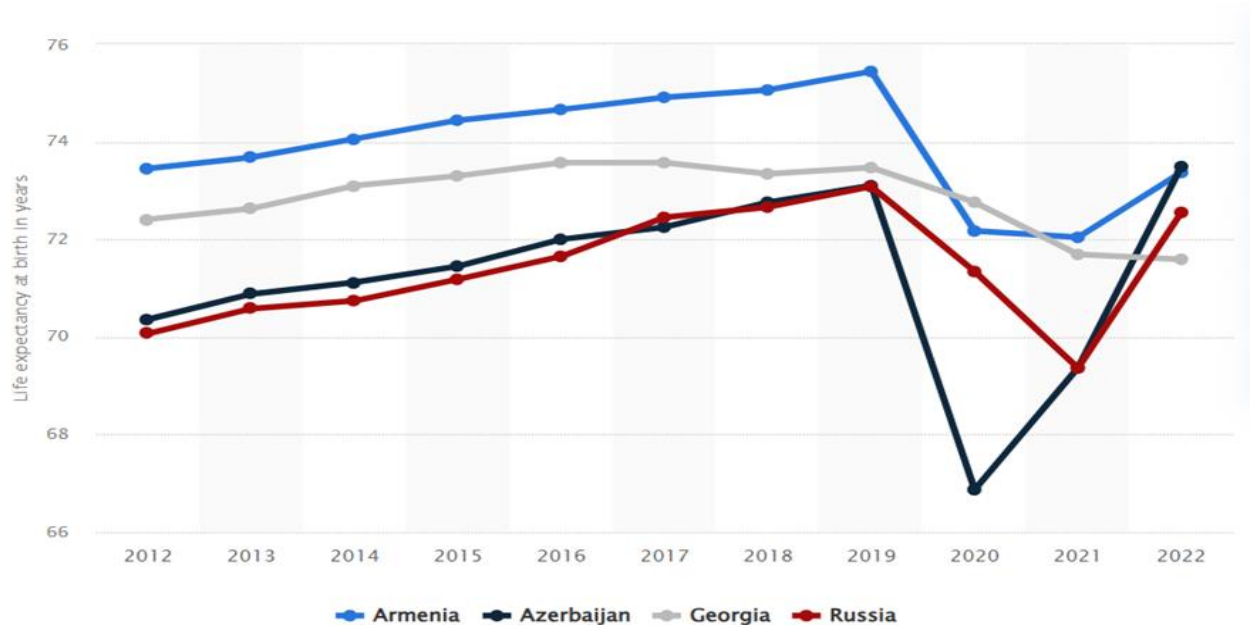


Figure 2. Caucasus countries: Life expectancy at birth from 2012 to 2022 (<https://www.statista.com/statistics/980505/life-expectancy-at-birth-in-the-caucasus-countries>).

Figure 2 shows the life expectancy at birth for individuals born in the Caucasus region of Asia between 2012 and 2022. Observations and statistical analyses conducted during these years indicate that life expectancy in this area has been higher compared to other regions. This fact further confirms that geographical and ecological factors are directly linked to human health and longevity. Various sources note that the majority of long-lived individuals primarily reside in mountainous and foothill zones. The favorable ecological environment in these areas and the close contact of people with nature positively influence their quality of life.

The overall life expectancy index in the Caucasus region is at a high level. For example, in Dagestan, there are more than 70 long-lived individuals per 100,000 people, whereas this figure is only 6 per 100,000 in the United States. Experiments conducted in our country have also shown that long-lived individuals mainly reside in mountainous and foothill areas. These studies revealed that long-lived people living in these regions have a satisfactory health status and physiological functioning. Their physiological functions remain stable and balanced. The aging process in these individuals progresses relatively slowly, and their adaptability is higher (9).

Conclusion:

Longevity is the result of a complex interaction between genetics, environment, lifestyle, and socio-economic factors. While genetic predisposition lays the foundation for lifespan potential, environmental influences—such as air quality and exposure to pollutants—play a significant role in shaping health outcomes. Lifestyle choices, including diet, physical activity, sleep, and stress management, are among the most modifiable factors and offer the greatest opportunities for intervention to improve both lifespan and quality of life. Advances in medical technology, such as genomic research and exposure biomarkers, further enhance our ability to prevent disease and extend healthy life years.

The Caucasus region exemplifies the impact of environmental and lifestyle factors on longevity. The area's clean air and nutrient-rich food sources contribute to longer lifespans. The region's diverse flora, climate, and soil composition, along with its capacity to support various populations, make it a rich resource for studying human health and aging. The Caucasus is truly a land

of longevity, and uncovering the health secrets of its long-lived populations remains a highly relevant scientific endeavor.

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