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Regional Distribution and Spatial Implications of The Ageing Population: The Case of Baku, Azerbaıjan

Yaşlanan Nüfusun Bölgesel Dağılımı ve Mekansal Etkileri: Azerbaycan'ın Başkenti Bakü Örneği

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ÖZET

21. yüzyılın en belirgin demografik dönüşümlerinden biri olan yaşlanma olgusu, kentsel coğrafya, mekânsal planlama ve sosyo-ekonomik yapılar üzerinde çok boyutlu etkiler yaratmaktadır. Azerbaycan'da, özellikle başkent Bakü'de yaşlı nüfusun mekânsal dağılımı giderek daha belirgin hâle gelmekte; bu durum, erişilebilirlik sorunları, altyapı yetersizlikleri ve kentsel hizmetlerin sunumunda adaletsizlikler gibi yeni mekânsal talepler ortaya çıkarmaktadır. Bu çalışma, Bakü'de yaşlı nüfusun mekânsal dağılımını analiz etmeyi ve demografik yaşlanmanın kent mekânı içindeki dinamiklerini, post-Sovyet dönüşüm süreci, sosyo-mekânsal eşitsizlikler ve yerel yönetişim bağlamında incelemeyi amaçlamaktadır.

Araştırmada, Coğrafi Bilgi Sistemleri (CBS) destekli mekânsal analizlerin istatistiksel veriler ve saha çalışması bulguları ile bütünleştirildiği karma yöntem yaklaşımı benimsenmiştir. Yaşlı nüfusun yoğun olarak bulunduğu alanlar belirlenmiş ve bu alanlardaki sağlık, ulaşım ve sosyal hizmet altyapılarının yeterliliği değerlendirilmiştir. Kuramsal çerçevede, mekânsal erişilebilirlik kuramı ve toplumsal tabakalaşma yaklaşımları kullanılarak yaşlı bireylerin kent içindeki mekânsal konumlanışlarının ardındaki yapısal dinamikler yorumlanmıştır. Bulgular, yaşlı nüfusun özellikle tarihi dokunun korunduğu ancak altyapının yetersiz kaldığı alanlarda yoğunlaştığını; buna karşın modern yerleşim bölgelerinin sosyo-ekonomik ve fiziksel engeller nedeniyle büyük ölçüde erişilemez durumda olduğunu göstermektedir.

Anahtar Kelimeler: Yaşlanan nüfus, demografik dönüşüm, mekânsal planlama, Bakü.

ABSTRACT

The phenomenon of aging, as one of the most prominent demographic transformations of the 21st century, generates multidimensional impacts on urban geography, spatial planning, and socio-economic structures. In Azerbaijan, particularly in the capital city of Baku, the spatial pattern of the aging population is becoming increasingly pronounced; this situation introduces new spatial demands such as accessibility issues, infrastructure deficiencies, and inequities in the provision of urban services. This study aims to analyze the spatial distribution of the elderly population in Baku and to examine the dynamics emerging from demographic aging within the urban space, in the context of the post-Soviet transformation process, socio-spatial inequalities, and local governance.

The research adopts a mixed-methods approach that integrates Geographic Information Systems (GIS)-supported spatial analyses with statistical data and fieldwork findings. Areas with high concentrations of elderly residents were identified, and the adequacy of health, transportation, and social service infrastructures in these areas was evaluated. Within the theoretical framework, spatial accessibility theory and social stratification approaches were employed to interpret the structural dynamics underlying the spatial positioning of elderly individuals within the city. The findings indicate that the elderly population is particularly concentrated in areas where the historical fabric is preserved but infrastructure is inadequate; whereas modern residential zones remain largely inaccessible due to socio-economic and physical barriers.

Keywords: Aging population, demographic transformation, spatial planning, Baku.

Introduction

Contemporary global demographic shifts are leading to profound transformations in the social, economic, and spatial structures of societies. Among these changes, one of the most striking is the process of population aging. Since the mid-20th century, factors such as rapid medical advancements, improved living standards, and declining fertility rates have contributed to an increase in the proportion of elderly individuals worldwide (Harper, 2014; Bloom et al., 2015). According to data from the United Nations (UN) and the World Health Organization (WHO), a significant portion of the global population is aging, and this trend is producing distinct spatial outcomes, particularly in developing countries (United Nations, 2022; WHO, 2021). In the specific context of Azerbaijan, the capital city Baku emerges as one of the urban centers where the impacts of demographic aging are most acutely felt (State Statistical Committee of the Republic of Azerbaijan, 2023).

The process of demographic aging is driving a multidimensional transformation in the socio-spatial fabric of cities (Buffel et al., 2012). Its impacts extend far beyond demographic ratios, influencing areas such as urban infrastructure systems, economic sustainability policies, housing supply, and the distribution of social services (Phillipson, 2011). The spatial distribution of the elderly population within cities is directly linked to factors such as ease of access, housing security, access to healthcare services, and levels of social integration (UN-Habitat, 2020). In rapidly growing and constantly evolving metropolitan areas like Baku, the spatial settlement patterns of the aging population and the resulting spatial needs represent critical issues (State Statistical Committee of Azerbaijan, 2023). As Baku's urbanization process accelerates under the influence of modernization and industrialization, the position of the elderly in urban life and their spatial accessibility have not been adequately considered in planning processes. The spatial distribution of the elderly within the city has moved beyond being a matter of individual choice, becoming a phenomenon shaped by economic, political, and social dynamics (Lui et al., 2008). The housing needs of elderly individuals, their urban mobility, and access to social support mechanisms are among the most essential elements to be addressed in spatial planning for aging populations. In Baku, the areas where the elderly population is concentrated and the infrastructural deficiencies in these areas are among the primary factors limiting the active participation of older individuals in urban life. Inadequacies in transportation systems, the physical environment not being adapted to meet the needs of elderly individuals, and trends of spatial isolation within the city significantly complicate the daily experiences of the elderly (Plouffe & Kalache, 2010). The failure to adopt planning approaches that prioritize the needs of the elderly not only leads to individual-level challenges but also generates long-term social and economic problems. Therefore, the distribution and spatial settlement patterns of the aging population should be addressed within a framework of sustainable and inclusive urban planning (WHO, 2007; UNDESA, 2019).

Following the dissolution of the Soviet Union, Azerbaijan underwent significant transformations in its social, economic, and political structures, resulting in distinct spatial outcomes across both urban and rural areas (Ismailzade, 2005; Suleymanov, 2012). Since gaining independence in the 1990s, the country has embarked on a rapid process of modernization and urbanization (UNDP, 2020). This transformation has reshaped population growth patterns, migration dynamics, and spatial planning policies, particularly in major cities such as Baku. As the largest and most significant economic, cultural, and political center of the country, Baku has experienced substantial demographic shifts driven by intense migration from rural areas during the post-Soviet period (State Statistical Committee of Azerbaijan, 2023). These demographic changes have not been limited to an increase in the young population but have also had considerable implications for the spatial positioning, access to urban services, and social integration of the aging population (UNFPA, 2022).

Urbanization processes are closely linked to the spatial distribution of socio-economic groups, making it essential to examine where elderly populations are concentrated within the city, the adequacy of services targeting this group, and the levels of intra-urban accessibility—all of which are critical elements in spatial planning (Buffel et al., 2012). In Baku, the spatial distribution of the elderly population has historically been shaped by proximity to industrial zones, urban service areas, and regions with developed social infrastructure. However, the acceleration of urban transformation projects in the 2000s, including the construction of high-rise residential buildings and the transformation of traditional neighborhood structures, has hindered the spatial adaptation of elderly individuals and contributed to their isolation from urban life (Plouffe & Kalache, 2010). Understanding the spatial distribution of the elderly within the urban environment and identifying the areas in which they age in place is a critical requirement for the development of sustainable urban policies. The spatial positioning of the aging population in Baku is becoming an increasingly important issue for local governments and planning authorities (WHO, 2007).

Key factors such as the spatial mobility of the elderly, their access to healthcare services, use of public spaces, and degree of social integration necessitate the development of age-friendly urban policies (UNDESA, 2019). However, policies targeting older adults in Azerbaijan remain in their early stages, and current urban planning practices do not sufficiently meet the needs of the elderly population (UNFPA, 2022). Rapid urbanization, urban transformation projects, and processes of spatial segregation in Baku have heightened the risk of social exclusion among the elderly, revealing significant gaps in accessibility and age-appropriate housing policies (Phillipson, 2011).

This study analyzes the spatial distribution of the elderly population in the city of Baku and evaluates the key challenges this demographic group faces in urban life. Utilizing Geographic Information Systems (GIS) analyses, the study maps the spatial positioning of the elderly within the urban fabric and supports these findings with fieldwork data. Furthermore, factors such as local governance policies and the infrastructure of health and social services are examined in detail to better understand the spatial mobility of the elderly population and the accessibility of urban spaces.

As the aging population exerts significant pressure on the social and physical structures of cities, the creation of age-friendly urban environments has become a fundamental component of contemporary urban planning. While many developed countries have introduced policies to support the mobility of elderly individuals within cities, such efforts in developing countries remain at an insufficient level. The aim of this study, conducted in the context of Baku, is to contribute to a more inclusive and sustainable urban planning approach by analyzing the spatial distribution and service accessibility of the aging population. The research seeks to answer the following key questions:

1. How is the spatial distribution of the elderly population shaped in the city of Baku?
2. To what extent are the levels of accessibility and transportation opportunities for the elderly population adequate?
3. Which urban areas are characterized by a concentration or lack of services targeting the elderly population?
4. What policies have local governments developed to facilitate the integration of the elderly into urban life?
5. What spatial planning strategies should be adopted to ensure a better quality of life for the aging population in urban areas in the future?

This research aims to make a significant contribution to understanding the settlement dynamics of the aging population within the urban space. Based on the collected data, policy recommendations will be proposed to enable the elderly population in Baku to lead more active and independent lives

within the city. Accordingly, the findings of the study will serve as a valuable reference for urban planners, local administrators, and academics.

Result and Discussion

The data obtained within the scope of this research provide significant findings regarding the spatial distribution of the aging population in Baku and its implications for urbanization processes. The analyses reveal that the elderly population is concentrated in specific areas; however, the urban service infrastructure in these areas does not fully meet the needs of older individuals. Based on Geographic Information Systems (GIS) analyses and field research, the study offers a detailed evaluation of the accessibility, availability of social services, and spatial integration levels of the elderly population. The findings highlight the primary spatial challenges faced by the aging population in Baku and underscore how these issues should be addressed within urban planning processes.

An Overview of the Population of Azerbaijan and Baku

Azerbaijan has undergone various demographic changes throughout its history, particularly facing significant population dynamics following the dissolution of the Soviet Union (Ismailzade, 2005; Cornell, 2011). As the country's capital, Baku serves not only as the economic, social, and cultural hub but also as a major focal point in terms of population growth and migration flows (UN-Habitat, 2020; State Statistical Committee of Azerbaijan, 2023). Therefore, examining the overall demographic structure of Azerbaijan and Baku is essential for understanding urban development processes, demographic trends, and spatial transformations (UNFPA, 2022; Suleymanov, 2012).

Since gaining independence in 1991, Azerbaijan's total population has shown a steady increase. As of 2023, the country's population is approximately 10.5 million. Despite a decline in birth rates, the population has continued to grow due to factors such as migration and increased life expectancy. A significant portion of the population resides in urban areas, with Baku being the most densely populated city. With a population of around 2.4 million, Baku accounts for roughly 23% of the national population. The city attracts both internal and international migration due to its expansive industrial, commercial, and educational opportunities.

Historically, Baku has consistently been a center of migration, becoming a city that accommodates large populations from rural regions. The economic crises that followed the collapse of the Soviet Union and the growth of the oil and gas sectors from the 1990s onward triggered a significant wave of rural-to-urban migration toward Baku. This influx has substantially altered the city's demographic structure and increased urbanization rates. While the majority of Baku's current population consists of young and working-age individuals, the number of elderly residents within the city is also steadily rising.

An analysis of Azerbaijan's overall population structure reveals a decline in fertility rates over time. In the 1990s, the fertility rate was approximately 2.7 children per woman, but it has since decreased to 1.9. This trend is expected to reduce the population growth rate in the long term while increasing the proportion of the elderly population. At the same time, life expectancy has improved. In the 1990s, the average life expectancy in Azerbaijan was around 67 years; today, it has risen to 75 years. This shift has led to a growing share of elderly individuals within the total population, initiating a profound transformation in the country's demographic profile.

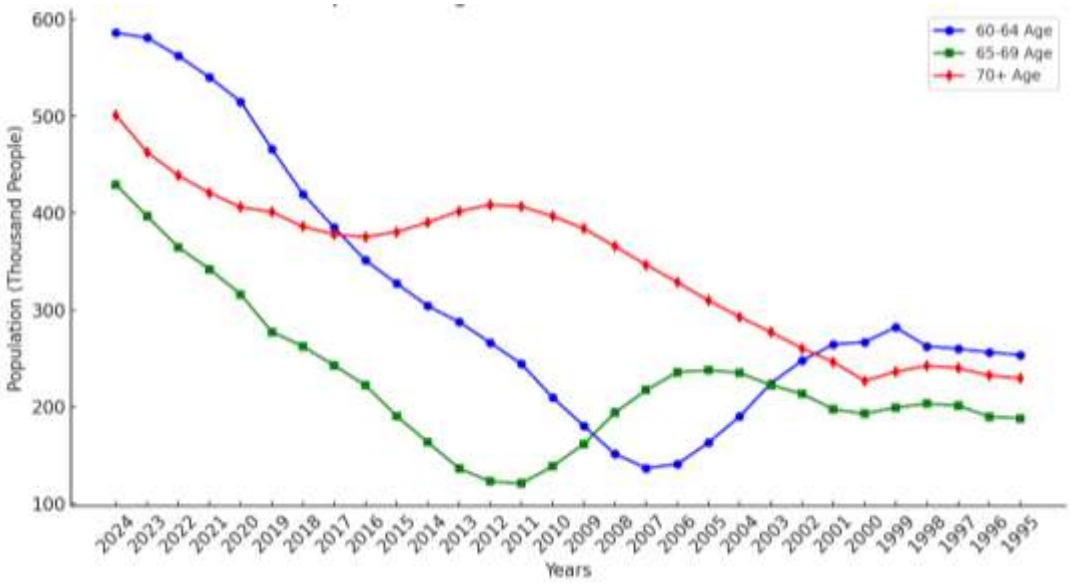

Table 1. Population Trends by Elderly Age Groups in Azerbaijan (1995–2024)

In the case of Baku, the elderly population is concentrated in specific areas of the city. Higher densities of elderly residents are found in the city center and older residential districts. One of the primary reasons for this pattern is that the housing stock in these areas tends to be older and relatively more affordable. In contrast, the city's newly developed districts are predominantly populated by younger individuals, particularly in areas characterized by modern housing developments and new business centers, where young and middle-aged populations are more prevalent.

The aging of the population necessitates the adaptation of social services and urban infrastructure accordingly. In Baku, there are certain challenges regarding elderly individuals' access to social services, utilization of healthcare facilities, and mobility within the city. Factors such as the insufficient accessibility of public transportation systems for the elderly and the lack of age-friendly design in pedestrian walkways and sidewalks restrict the ease with which older individuals can navigate the urban environment.

In Azerbaijan, the processes of population growth and aging have prompted various transformations in the country's economic and social policies. Issues such as access to healthcare for elderly individuals, the sustainability of the pension system, and the adequacy of social welfare policies are gaining increasing importance. For better integration of the elderly population into society in Baku, it is essential that local governments implement age-friendly urban policies. Adapting public spaces, parks, public transport, and buildings for elderly use is one of the most critical steps in this process.

From a migration perspective, Baku displays a dynamic pattern with respect to both internal and international migration. Individuals migrating from rural areas to the city generally do so for reasons such as employment opportunities and better access to education and healthcare services. At the same time, a significant portion of the population emigrating abroad in recent years consists of young and educated individuals. This trend, commonly referred to as brain drain, is also evident in Azerbaijan and poses certain long-term risks for the country's economic development.

Proportion and Distribution of the Elderly Population

The aging trend within Azerbaijan's population has shown a marked increase in recent years. The country's demographic structure has been reshaped by declining birth rates, rising life expectancy, and migration dynamics, all of which have contributed to a growing proportion of elderly individuals. As of 2023, people aged 65 and over constitute approximately 9% of the total population in Azerbaijan.

This figure not only indicates that the country is undergoing demographic aging but also highlights the increasing needs and demands for social services among the elderly population.

In the case of Baku, the distribution of the elderly population exhibits distinct spatial patterns. As the most densely populated city in Azerbaijan, the capital also demonstrates noticeable concentrations of elderly residents in specific areas. Elderly individuals in Baku are particularly concentrated in the historical city center, older residential neighborhoods, and districts near former industrial zones. The primary reasons for this include the presence of long-term residents in these areas, economic constraints preventing relocation to newly developed districts, and a preference to remain within established social networks. Districts such as Icherisheher, Sabail, Nasimi, and Narimanov are among those with relatively higher proportions of elderly residents.

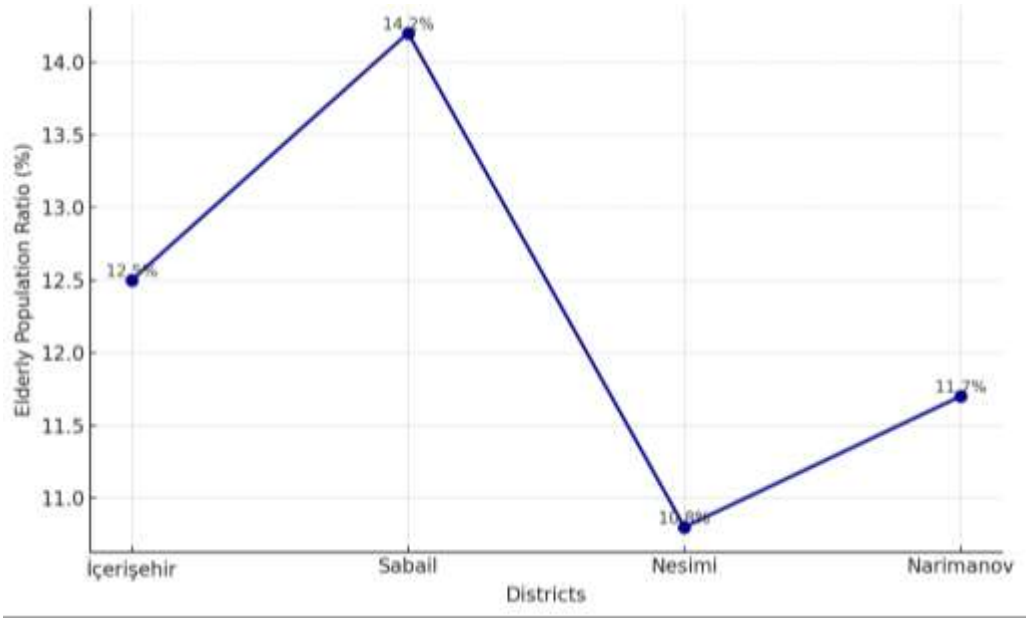

Table 2. Elderly Population Ratio in Baku Districts

One of the key factors influencing the intra-urban distribution of the elderly population is housing prices and economic conditions. In Baku, the high cost of housing in newly developed areas leads many elderly individuals to continue residing in older neighborhoods. In districts where the traditional neighborhood structure is more preserved, the concentration of the elderly population becomes more pronounced. For instance, the Yasamal and Khatai districts are attractive living areas for elderly individuals due to their more accessible social infrastructure and public transportation networks. However, some of the older buildings in these areas lack adequate facilities for modern elderly care, and issues such as the physical environment not being age-friendly persist.

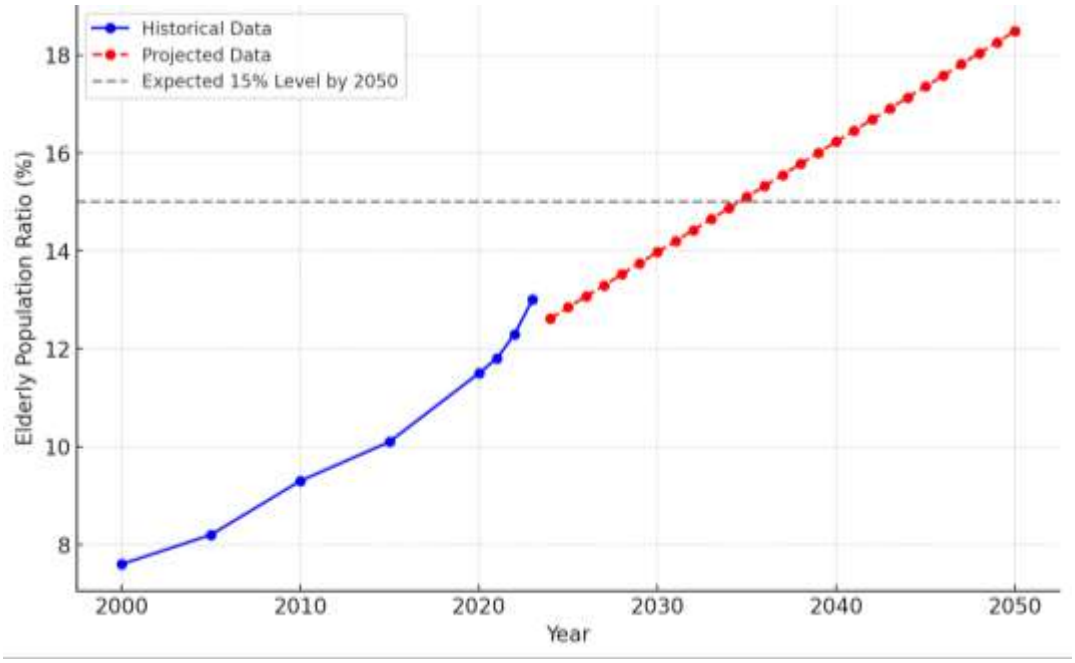

Table 3. Projected Elderly Population Ratio in Baku Until 2050

As in the rest of Azerbaijan, the proportion of the elderly population in Baku is steadily increasing and is expected to reach approximately 15% by 2050. This trend necessitates the development of new policies in various areas, including healthcare services, elderly care centers, social assistance, and urban planning. Currently, a majority of elderly individuals in Baku live with their families, and the proportion of those living independently is significantly lower compared to developed countries. However, changing socio-economic dynamics and transformations in family structures may lead to an increase in independent living among older adults in the future. In this context, the development of specialized housing projects, supportive public transportation services, and robust healthcare infrastructure is of great importance.

There is a significant relationship between the areas where the elderly population is concentrated in Baku and the distribution of urban service infrastructure. In terms of access to healthcare services, the availability of hospitals, family health centers, and pharmacies in areas with higher concentrations of elderly residents is a critical issue. Field research indicates that there are considerable shortcomings in healthcare accessibility in some of these areas. Elderly individuals living in peripheral districts of Baku often face difficulties in reaching central hospitals. The limited accessibility of public transportation for the elderly exacerbates this problem.

In terms of social space usage, elderly individuals in Baku have relatively low rates of public space utilization. The main reasons for this include a lack of parks, gardens, and social facilities, the physical environment not being age-friendly, and the design of public spaces being oriented more toward the younger population. While age-friendly city policies are commonly implemented in Western European countries, such approaches are not yet widely adopted in Azerbaijan. The absence of features such as suitable pedestrian paths, benches, ramps, and safe crossing points for the elderly and disabled limits their use of public spaces.

Social isolation among the elderly population in Baku emerges as a significant concern. Changing family roles, coupled with younger individuals migrating abroad or to other cities for work and education, have contributed to the increasing loneliness of older adults. Although elderly individuals traditionally held an important position within Azerbaijani families, shifts brought on by modern lifestyles have weakened their social ties. In particular, elderly individuals with limited access to care services face challenges such as loneliness, depression, and chronic health conditions.

An examination of the health status of the elderly population reveals a rise in chronic illnesses. Cardiovascular diseases, diabetes, hypertension, and musculoskeletal disorders are among the most common conditions affecting older adults. Within Azerbaijan's healthcare system, there are deficiencies in providing regular health check-ups for the elderly, especially for those with lower incomes. Expanding access to free healthcare services is essential for this demographic. Home healthcare services and mobile medical teams, which are widely available in European countries, have not yet become widespread in Azerbaijan. Expanding such services could facilitate elderly individuals' access to healthcare and reduce hospital overcrowding.

Transportation and accessibility also pose major challenges for the elderly in Baku. Public transport systems are not adequately age-friendly; difficulties in accessing bus stops, the lack of elevators in buildings, and high curbs are among the main obstacles that hinder the mobility of older adults in the city. For instance, the limited availability of elevators and escalators in the metro system makes it difficult for elderly individuals to use public transit. Additionally, the insufficient number of designated seating areas for elderly passengers on buses presents another significant issue. These infrastructural shortcomings contribute to the further isolation of elderly individuals and restrict their freedom of movement within the city.

Spatial Distribution of the Elderly Population and Access to Urban Services

When the spatial distribution of the elderly population and their access to urban services in Baku is assessed within the context of urban geography, it becomes evident that demographic changes are closely linked to spatial reflections, infrastructural planning processes, and socio-economic dynamics (UN-Habitat, 2020; Plouffe & Kalache, 2010). As the urbanization process accelerates, the aging population demonstrates distinct spatial patterns shaped by social structures, economic conditions, and urban transformation policies (Buffel et al., 2012; UNDESA, 2019). In the post-Soviet period, Baku has experienced significant population mobility; migration dynamics have altered the city’s population composition, directly influencing the spatial positioning of the elderly (Suleymanov, 2012; State Statistical Committee of Azerbaijan, 2023). Areas with historic city centers and traditional housing stock have emerged as zones with higher concentrations of elderly residents, whereas newly developed districts with high-density residential projects tend to have lower elderly population ratios (Lui et al., 2008). This spatial differentiation is closely related to socio-economic status, housing affordability, transportation accessibility, and the spatial distribution of urban services (Phillipson, 2011; WHO, 2007).

In Baku, the areas with higher concentrations of elderly residents historically overlap with zones of industrial activity, commercial hubs, and public services. Central districts such as Icherisheher, Sabail, Nasimi, and Narimanov exhibit relatively higher proportions of elderly residents, with many individuals having resided in the same neighborhoods for decades. In contrast, Baku’s northern and eastern areas, which have undergone extensive urban transformation and feature modern high-rise developments, are characterized by a demographic structure dominated by younger populations. This pattern indicates that spatial differentiation in the city is influenced not only by economic or cultural dynamics but also by age-based demographic variations.

The spatial distribution of the aging population is a critical determinant of accessibility to urban services. In particular, access to healthcare services is directly linked to the mobility of the elderly within the city. Elderly individuals residing in areas close to the city center have easier access to hospitals, clinics, and family health centers, whereas those living in peripheral districts face more difficulties in reaching these services. This issue is further compounded by the inadequacy of public transportation systems in meeting the needs of the elderly population. For individuals with limited physical mobility, the insufficient urban infrastructure poses a significant barrier to accessibility. The

lack of elevators and escalators in the metro system, the poor accessibility of bus stops, and the absence of designated seating arrangements for elderly passengers on public transport are among the primary factors limiting the mobility of older adults in Baku.

In terms of access to urban services, there are also various challenges related to the use of social spaces and the integration of elderly individuals into urban life. Compared to cities in Western Europe, the rate at which elderly residents use public spaces in Baku is considerably lower. This is mainly due to the lack of age-friendly design in public areas, insufficient benches and resting spots, and the overall focus of urban design on the needs of the younger population. To ensure the active participation of elderly individuals in urban life, spatial planning must prioritize accessibility, the quality of public spaces, and the expansion of social services. In particular, the adaptation of open and green spaces to meet the needs of the elderly would be a crucial step toward preventing social isolation in the urban environment.

Urban transformation processes are among the key factors reshaping the spatial distribution of the elderly population. In Baku, recent urban redevelopment projects have accelerated, replacing low-density traditional residential areas with high-rise modern buildings. This transformation has created spatial adaptation challenges for elderly individuals. While the preservation of traditional neighborhood structures is crucial for maintaining social ties, redevelopment in these areas often forces elderly residents to relocate, distancing them from familiar environments. For those moved to areas farther from the city center, access to transportation and social services becomes more problematic, thereby increasing the risk of social exclusion among the elderly. In this context, urban planning processes must incorporate policies that consider the spatial distribution of the elderly and develop solutions tailored to their needs.

The spatial distribution of the aging population in Baku is emerging as a critical factor that will directly influence long-term urbanization processes and the spatial organization of urban services. Demographic projections indicate that the proportion of elderly individuals in Azerbaijan will reach approximately 15% by 2050, necessitating a reorganization of urban spaces based on age-friendly principles. Expanding healthcare services, making public transportation systems more accessible for the elderly, and implementing spatial arrangements that support social integration are fundamental strategies to prevent the detachment of the aging population from urban life. In spatial planning, enhancing housing security, access to social services, and the usability of public spaces for elderly individuals are essential components that directly affect their quality of life in the city. These dynamics must be considered to achieve a sustainable and inclusive urban development model.

Regional Distribution Analysis of the Elderly Population

Demographic aging is a multidimensional process that leads to profound changes in the socio-spatial dynamics of cities (Phillipson, 2011; Harper, 2014). The spatial distribution of the elderly population must be evaluated not only in terms of demographic density but also in the context of social inclusion, spatial justice, and intra-urban accessibility (Buffel et al., 2012). Urban demographic transformations are shaped by the interaction of various factors such as socio-economic conditions, housing market dynamics, transportation networks, and the spatial organization of healthcare services (UN-Habitat, 2020; WHO, 2007). From the perspective of spatial accessibility theory, understanding where and how elderly individuals are located within the city plays a crucial role in maintaining their physical and social connections to the urban environment (Geurs & van Wee, 2004).

Social stratification theory explains the spatial segregation of the elderly population by linking it to economic capital, social status, and historical urbanization processes (Harvey, 2009; Smith, 1996). According to this theory, elderly individuals from low-income groups are more likely to cluster in areas close to the city center, whereas those from higher income brackets tend to reside in modern housing

zones on the urban periphery (Scharf et al., 2005). This contributes to deepening spatial inequalities and access disparities in urban development processes (Lui et al., 2008; UNDESA, 2019). In the specific context of Baku, the spatial distribution of the elderly population is closely linked to historical urbanization patterns, socio-economic stratification, and local governance policies. Research findings reveal that elderly individuals from lower income groups are concentrated in central urban areas, while those belonging to higher income groups are more commonly located in modern and newly developed residential zones. This indicates that the spatial distribution of the elderly is part of a broader process of socio-economic

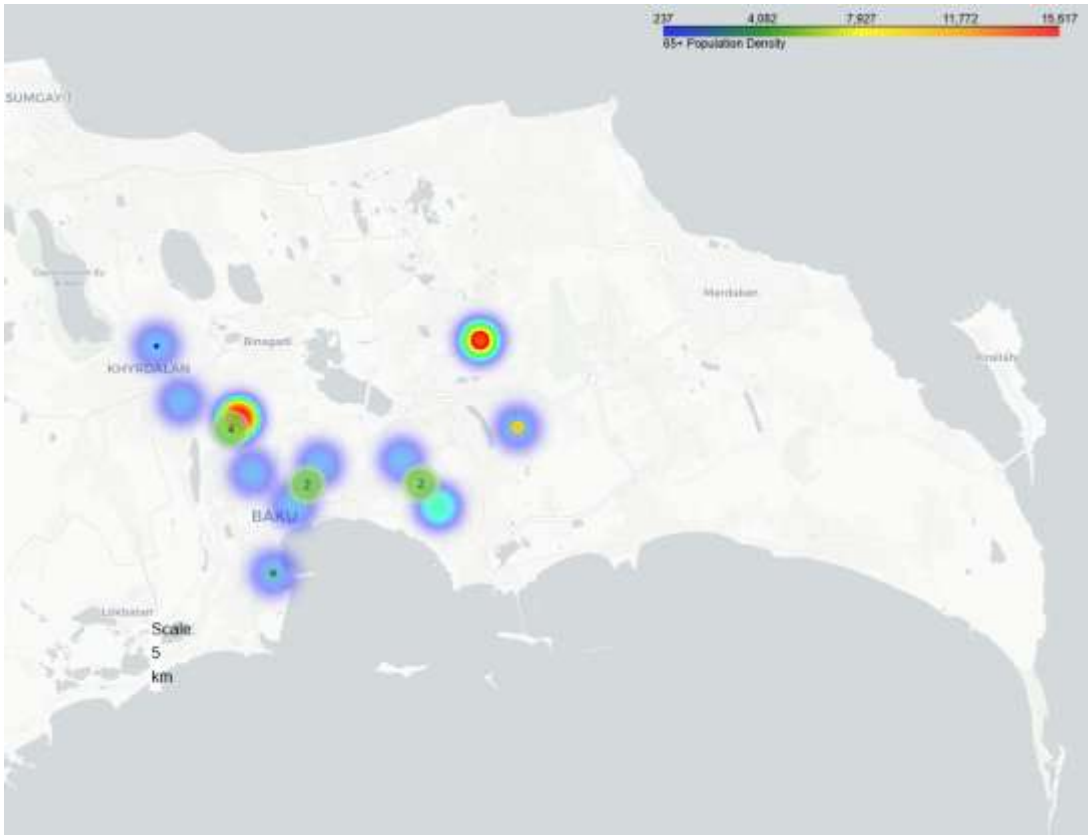

Table 4. Spatial Distribution of 65+ Population Density in Baku

The map reveals that the elderly population forms spatial clusters concentrated in specific areas. The highest-density clusters of elderly residents are found in Baku's central districts, including Icherisheher, Sabail, Nasimi, and Narimanov. The primary factors contributing to the high concentration of elderly individuals in these areas include the preservation of historical urban fabric, long-term homeownership, and relatively easier access to central services. Lower-density clusters are located in the western and southeastern parts of Baku, where the elderly population is more sparsely distributed. This can be attributed to the prevalence of newer and higher-cost residential developments in these areas.

In the northeastern and southwestern districts of Baku, the elderly population is notably sparse. The low concentration of elderly individuals in these areas is largely due to inadequate transportation infrastructure, limited public transit services, and spatial barriers to accessing social services. In regions undergoing rapid urban redevelopment, elderly residents are increasingly being pushed to the urban periphery due to rising housing costs. This trend exacerbates challenges in accessing urban services and deepens the process of spatial exclusion for the elderly population.

The analysis of aging rates is a critical indicator for understanding the pace of demographic change within a society and its spatial implications. Within the framework of demographic transition theory, the aging rate reflects not only structural shifts in the population pyramid but also the complex interaction of multiple variables, including urbanization, health policies, fertility rates, migration dynamics, and economic sustainability. In the case of Azerbaijan, the country has experienced a rapid demographic transformation over the past thirty years, with a noticeable increase in the proportion of elderly individuals. This process is directly linked to declining fertility rates, rising life expectancy, and internal and international migration trends among younger populations.

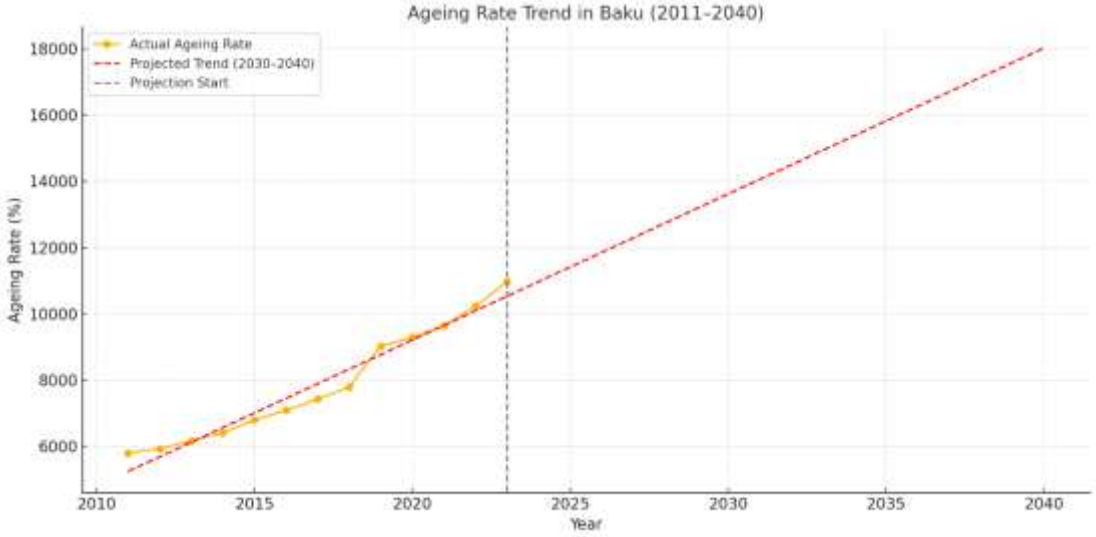

Table 5. Ageing Rate Trend in Baku (2011–2040)

Aging rate analyses specific to Baku reveal that demographic transformation in the city is occurring more rapidly compared to other regions. In the context of urbanization dynamics, the rapidly changing economic structure following the dissolution of the Soviet Union led to intense migration from rural areas to Baku. However, this migration was predominantly composed of young and middle-aged individuals. While urban demographics were largely youth-dominated in the 1990s, a trend toward aging began in the 2000s, accelerating notably over the past decade. One of the primary drivers of this trend is the decline in fertility rates. While the average fertility rate in Azerbaijan was 2.7 children per woman in the 1990s, it has since dropped to 1.9. Simultaneously, improvements in healthcare and rising living standards have increased life expectancy—from an average of 67 years in the 1990s to 75 years today. This demographic shift has led to a higher proportion of elderly individuals and an accelerated rate of aging.

When the spatial effects of aging are analyzed across Baku's districts, notable regional differences emerge. In areas historically characterized by a higher elderly population, the pace of aging appears relatively slower, while in districts that previously had a predominantly younger demographic, the aging rate has increased more rapidly. For example, in districts such as Yasamal, Nasimi, and Narimanov, although the proportion of elderly residents is already high, the rate of aging is relatively slower. This is primarily due to the earlier onset of demographic aging and the long-term residency of elderly individuals in these areas. In contrast, districts like Binagadi, Sabunchu, and Khatai experienced a youth-dominated phase during the urbanization surge of the 1990s, but in the past decade, the aging rate in these districts has risen noticeably. This is directly linked to the migration of younger and middle-aged populations either to other urban areas or out of the city altogether.

The dynamics of the housing market in Baku also play a critical role in influencing the aging rate. In districts where housing prices are more affordable, elderly settlement tendencies have increased, spatially accelerating the aging process. Compared to global aging trends, Azerbaijan's aging rate remains lower than that of European countries, but it exhibits notable regional disparities.

While aging in Europe typically progresses gradually over several decades, in developing countries like Azerbaijan, the process tends to unfold more rapidly. This can be explained by the acceleration of demographic transition, rural-to-urban youth migration, and faster-than-expected declines in fertility rates.

In large metropolitan areas such as Baku, the spatial distribution of aging shows that elderly populations tend to concentrate closer to the city center, whereas the aging rate is higher in peripheral districts. This trend is directly linked to urban redevelopment projects and housing policies. Due to high real estate prices in central districts, younger populations are pushed toward peripheral areas, while older individuals tend to remain in long-inhabited central neighborhoods—shaping the spatial distribution of the aging process within the city.

Spatial clustering analysis is an advanced method used to identify the distribution patterns of the elderly population within cities and to understand the spatial dynamics underlying this distribution (Anselin, 1995; Dijst et al., 2018). In the context of urbanization processes, the concentration of elderly populations in specific areas is not merely a demographic reality but also a critical phenomenon that must be examined through the lenses of spatial segregation and accessibility (Scharf et al., 2005; Buffel et al., 2012). The spatial positioning of the elderly should be evaluated within a broad framework that includes socio-economic dynamics and urban planning policies, and it should be analyzed scientifically to uncover spatial inequalities (Lui et al., 2008; UN-Habitat, 2020).

Clustering tendencies of the elderly population within urban areas are directly related to socio-economic stratification, housing policies, and urban transformation processes. While urban redevelopment projects tend to spatially marginalize low-income elderly populations, elderly individuals in higher income groups show a tendency to cluster in more accessible and well-planned areas. Spatial analyses conducted in the city of Baku indicate that elderly residents tend to concentrate in neighborhoods where traditional urban fabric is preserved and where homeownership rates are relatively high. This suggests that elderly individuals prefer not to leave their long-term residences; however, due to infrastructural deficiencies and inadequate urban planning, their physical environments are not being sufficiently adapted to the aging process.

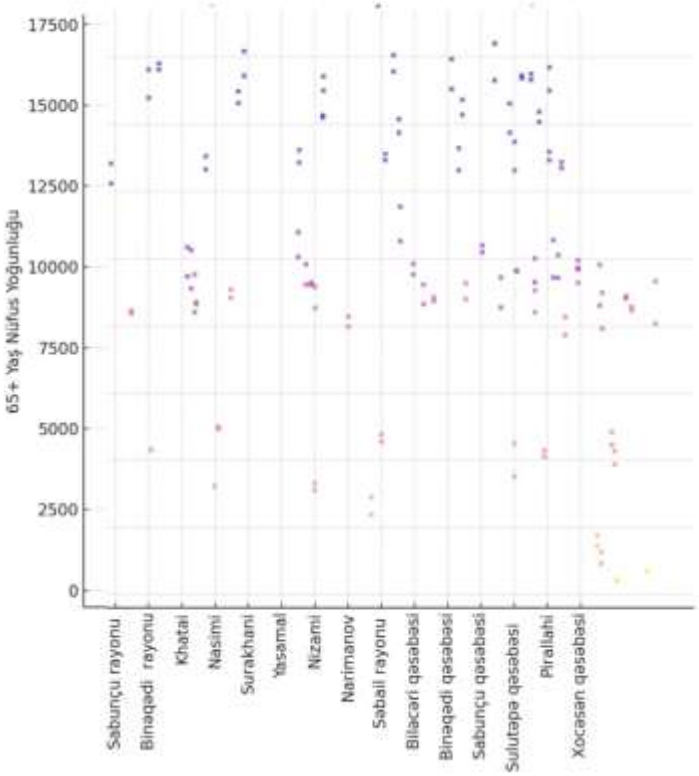

Table 6. Population Density of 65+ Age Group by District and Settlement in Baku

The districts of Sabunchu, Binagadi, Khatai, Nasimi, and Yasamal are among the areas with the highest concentrations of elderly residents. These districts encompass Baku's traditional residential zones, are characterized by high rates of homeownership, and offer relatively easier access to central urban services. In particular, Yasamal and Nasimi are historically among the oldest residential areas in Baku. The main factors contributing to the concentration of elderly populations in these districts include long-term homeownership, the continuity of social networks, and greater accessibility to essential healthcare and care services. In these areas, many elderly individuals prefer to remain in the homes they have lived in for decades. However, it has been observed that ongoing urban transformation projects pose a threat to the elderly population residing in these neighborhoods. The increasing prevalence of high-rise modern housing developments is making it more difficult for elderly individuals with fixed incomes to afford housing costs in these areas, placing them at risk of being displaced toward the urban periphery.

The districts of Khatai and Binagadi exhibit varying spatial patterns of elderly population distribution across both central and peripheral areas. In Khatai, due to its historical integration with industrial zones, elderly residents—many of whom formerly worked and retired in this area—continue to reside in specific neighborhoods, leading to localized population concentrations. However, the proliferation of modern housing developments in parts of the district has prompted displacement of elderly residents and contributed to spatial segregation.

Binagadi, one of Baku's largest districts, shows increased elderly population density particularly in neighborhoods with high homeownership rates. The main reasons for this include the legacy of state-supported social housing projects and the preference of residents to remain in these dwellings long-term. In contrast, Pirallahi, Sulutepe, and Khojasan are among the districts with the lowest concentrations of elderly residents. This is largely due to their peripheral locations, dominance of industrial land use, inadequate transportation infrastructure, and limited access to social services. Specifically, Pirallahi's geographic distance from the city center and limited urban services contribute to its low elderly population density. Khojasan and Sulutepe are areas undergoing intense urban transformation and are primarily inhabited by younger, more economically active individuals. As a result, elderly populations tend to cluster in central districts or in areas where traditional housing patterns are still preserved, rather than in these rapidly developing peripheries.

Spatial clustering analysis reveals that the elderly population in Baku does not only concentrate at the district level but also exhibits varying densities at the neighborhood level within districts. In central districts such as Nasimi and Yasamal, elderly residents are more heavily concentrated in neighborhoods where housing prices are relatively more affordable and urban services are more widely available. In contrast, in northern districts like Binagadi and Sabunchu, the distribution of the elderly population is not homogeneous; instead, it tends to cluster in specific sub-neighborhoods. This pattern indicates that spatial factors such as the accessibility of public transportation systems and proximity to healthcare services are key determinants in the spatial positioning of the elderly population.

Conclusion

This comprehensive analysis of the spatial distribution of the aging population in Baku reveals that the city is undergoing a demographic transformation and that elderly individuals are concentrated within specific spatial patterns. The Geographic Information Systems (GIS)-based analyses used in this study demonstrate that the elderly population is not only concentrated in certain areas but also experiences spatial inequalities in terms of access to urban services. It was observed that the areas with higher elderly concentrations are largely located in neighborhoods where the historical and traditional urban fabric is preserved. However, the existing urban infrastructure in these areas does not fully meet the needs of elderly residents.

In districts such as Sabail, Nasimi, Yasamal, and Narimanov—where the elderly population is most concentrated—the physical environment has not been designed to support elderly mobility, and access to transportation, healthcare, and social services remains limited. One of the key findings of this study is that the elderly population in Baku is experiencing spatial segregation within the urban landscape. As urban transformation projects accelerate, elderly residents in central areas are increasingly being displaced to more distant districts due to economic constraints or difficulties in adapting to the new physical environment.

In peripheral areas such as Khojasan, Sulutepe, and Pirallahi, the elderly population is significantly lower, a trend that correlates with inadequate urban services and socio-economic factors. The mobility of elderly individuals in urban areas is not only limited by physical access but is also closely tied to issues of social isolation, financial limitations, and service accessibility. The city's public transport infrastructure is not adequately adapted for elderly use, and pedestrian pathways and public spaces lack age-friendly design, which further complicates elderly integration within the urban fabric.

The study's findings indicate that the spatial distribution of the aging population in Baku exhibits clear patterns that can be directly linked to urban planning policies. GIS-supported spatial analyses show that elderly populations are predominantly concentrated in historic city centers and areas with preserved older housing stock, but are increasingly marginalized due to modern urban transformation projects. In districts where elderly individuals exhibit higher rates of relocation, significant challenges related to service accessibility have been identified. Notably, spatial disparities in access to healthcare and care services result in considerable differences in service quality depending on where elderly individuals reside.

One of the most significant factors influencing the spatial mobility of the elderly population in Baku is socio-economic status differences. Elderly individuals who are economically better off tend to reside in central areas or modern housing developments, whereas those with lower incomes are often pushed to the outer parts of the city due to housing costs. This spatial disparity puts lower-income elderly individuals at a disadvantage in terms of access to urban services. In particular, elderly residents from low-income groups face serious barriers in accessing healthcare services, as they often live in areas with inadequate transportation infrastructure. This spatial division of the urban environment also negatively impacts the social integration of elderly individuals and contradicts the principles of age-friendly urban planning.

In the context of aging rate analysis, it is evident that the elderly population in Baku is on the rise and that this trend will have significant implications for urban planning. The proportion of residents aged 65 and over is expected to reach a considerable level by 2050. Therefore, comprehensive policies must be implemented to support the spatial adaptation of the elderly population within the city during this period. Another key finding of the study is the inadequacy of the spatial adaptation process for Baku's aging population and the lack of urban services specifically tailored to this demographic group. To facilitate the mobility of elderly individuals within the city, transportation, healthcare, social support systems, and housing policies must be addressed through an integrated

approach. Current planning processes do not sufficiently take the needs of the elderly population into account, which contributes to increased social isolation and weakens their connection with the urban environment.

The findings of this study offer significant implications for local governments and policymakers. First and foremost, there is a need to develop policies that facilitate the mobility of the aging population within the city. Strategic priorities should include making public transportation systems age-friendly, improving sidewalks and pedestrian pathways to enhance mobility for elderly individuals, and ensuring spatial equity in access to healthcare services. In areas of Baku where the elderly population is concentrated, expanding social services targeted at older adults, organizing activities to prevent social isolation, and adopting age-friendly spatial planning approaches will help improve the quality of life for elderly residents.

Additionally, preventing the marginalization of the elderly population due to urban transformation projects is essential. Solutions must be developed that allow elderly individuals to continue living within their established social environments without being displaced. Population aging is not merely a demographic issue but a critical concern in terms of urban sustainability and social justice. The study's findings indicate that elderly individuals in Baku are concentrated within specific spatial patterns and that current urban planning practices are insufficient in addressing this demographic shift.

In this context, the development of policies that strengthen the connection between the elderly population and the urban environment is vital for ensuring both social and spatial sustainability. The research contributes significantly to the advancement of age-friendly urban policies and highlights the need to prioritize the needs of the aging population in urban planning. Local governments must revise their urban planning processes to enhance the social and spatial integration of elderly individuals, fostering an environment that supports their active participation in urban life. Improving accessibility for the elderly, adopting age-friendly urban planning approaches, and ensuring a more balanced spatial distribution of social services are fundamental steps that will increase the mobility of the aging population within urban spaces and enhance their overall quality of life.

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Genişletilmiş Özet

Bakü'deki yaşlı nüfusun mekânsal dağılımına ilişkin bu kapsamlı analiz, şehrin demografik bir dönüşüm geçirmekte olduğunu ve yaşlı bireylerin belirli mekânsal örüntüler içerisinde yoğunlaştığını ortaya koymaktadır. Bu çalışmada kullanılan Coğrafi Bilgi Sistemleri (CBS) tabanlı analizler, yaşlı nüfusun yalnızca belli bölgelerde toplandığını değil, aynı zamanda kentsel hizmetlere erişim açısından mekânsal eşitsizlikler yaşadığını da göstermektedir. Yaşlı nüfusun yoğunlaştığı alanların büyük ölçüde tarihi ve geleneksel kentsel dokunun korunduğu mahallelerde yer aldığı gözlemlenmiştir. Ancak bu bölgelerde mevcut kentsel altyapı, yaşlı bireylerin ihtiyaçlarını karşılamada yetersiz kalmaktadır.

Sabail, Nesimi, Yasamal ve Nerimanov gibi yaşlı nüfusun en yoğun olduğu ilçelerde, fiziksel çevre yaşlı bireylerin hareketliliğini destekleyecek şekilde tasarlanmamıştır ve ulaşım, sağlık hizmetleri ve sosyal hizmetlere erişim sınırlı kalmaktadır. Bu çalışmanın temel bulgularından biri, Bakü'deki yaşlı nüfusun kentsel alan içerisinde mekânsal ayrışma yaşadığıdır. Kentsel dönüşüm projelerinin hız kazanmasıyla birlikte, merkezi bölgelerde yaşayan yaşlı bireyler ekonomik nedenlerle veya yeni fiziksel çevreye uyum sağlamakta zorlandıkları için kentin daha dış kısımlarına taşınmak zorunda kalmaktadır.

Khojasan, Sulutepe ve Pirallahi gibi çevre bölgelerde yaşlı nüfusun önemli ölçüde düşük olduğu görülmektedir. Bu durum, bu bölgelerdeki yetersiz kentsel hizmetler ve sosyo-ekonomik faktörlerle ilişkilidir. Kentsel alanlardaki yaşlı bireylerin hareketliliği yalnızca fiziksel erişimle sınırlı kalmamakta, aynı zamanda sosyal izolasyon, maddi yetersizlik ve hizmet erişimi gibi faktörlerle de yakından ilişkilidir. Şehirdeki toplu taşıma altyapısı yaşlı bireylerin kullanımı için yeterince uygun değildir ve yaya yolları ile kamusal alanlar yaş dostu tasarımlardan yoksundur; bu durum yaşlı bireylerin kentsel yaşama entegrasyonunu daha da zorlaştırmaktadır.

Çalışmanın bulguları, Bakü'de yaşlı nüfusun mekânsal dağılımının belirgin örüntüler sergilediğini ve bu örüntülerin doğrudan kentsel planlama politikalarıyla bağlantılı olduğunu göstermektedir. CBS destekli mekânsal analizler, yaşlı nüfusun büyük oranda tarihi kent merkezlerinde ve korunmuş eski konut stoklarının bulunduğu bölgelerde yoğunlaştığını, ancak modern kentsel dönüşüm projeleri sonucunda giderek marjinalleştirildiğini ortaya koymaktadır. Yaşlı bireylerin yer değiştirme oranlarının yüksek olduğu ilçelerde, hizmet erişimi açısından ciddi zorluklar tespit edilmiştir. Özellikle sağlık ve bakım hizmetlerine erişimdeki mekânsal farklılıklar, yaşlı bireylerin yaşadığı yere bağlı olarak hizmet kalitesinde belirgin eşitsizlikler yaratmaktadır.

Bakü'de yaşlı nüfusun mekânsal hareketliliğini etkileyen en önemli faktörlerden biri, sosyo-ekonomik statü farklılıklarıdır. Ekonomik durumu daha iyi olan yaşlı bireyler, kentin merkez bölgelerinde veya modern konut alanlarında yaşamayı tercih ederken, düşük gelirli yaşlılar konut maliyetleri nedeniyle kentin dış çeperlerine itilmektedir. Bu mekânsal eşitsizlik, düşük gelirli yaşlı bireylerin kentsel hizmetlere erişimini dezavantajlı hâle getirmektedir. Özellikle sağlık hizmetlerine erişimde ciddi engellerle karşılaşan bu bireyler, genellikle ulaşım altyapısı yetersiz bölgelerde yaşamaktadır. Kentsel çevrenin bu şekilde bölünmesi, yaşlı bireylerin sosyal bütünleşmesini de olumsuz etkilemekte ve yaş dostu kent planlama ilkeleriyle çelişmektedir.

Yaşlanma oranı analizleri bağlamında, Bakü'deki yaşlı nüfusun artmakta olduğu ve bu eğilimin kentsel planlama açısından önemli sonuçlar doğuracağı açıktır. 2050 yılına kadar 65 yaş ve üzeri bireylerin toplam nüfusa oranının önemli seviyelere ulaşması beklenmektedir. Bu nedenle, yaşlı nüfusun kent içindeki mekâna uyumunu destekleyecek bütüncül politikaların hayata geçirilmesi zorunludur. Çalışmanın bir diğer önemli bulgusu ise, Bakü'de yaşlanan nüfusun mekâna uyumu sürecinin yetersiz kaldığı ve bu demografik gruba özel kentsel hizmetlerin eksikliğidir. Yaşlı bireylerin kent içindeki hareketliliğini kolaylaştırmak için ulaşım, sağlık, sosyal destek sistemleri ve konut politikaları entegre bir yaklaşımla ele alınmalıdır. Mevcut planlama süreçleri yaşlı bireylerin

ihtiyaçlarını yeterince göz önüne almamakta, bu da sosyal izolasyonu artırmakta ve bireylerin kentle olan bağını zayıflatmaktadır.

Bu çalışmanın bulguları, yerel yönetimler ve politika yapıcılar açısından önemli sonuçlar içermektedir. Her şeyden önce, şehirdeki yaşlı nüfusun hareketliliğini kolaylaştıracak politikaların geliştirilmesi gerekmektedir. Öncelikli stratejiler arasında toplu taşıma sistemlerinin yaş dostu hâle getirilmesi, kaldırımların ve yaya yollarının iyileştirilmesi, sağlık hizmetlerine mekânsal eşitlik sağlanması yer almalıdır. Bakü'de yaşlı nüfusun yoğunlaştığı bölgelerde, yaşlılara yönelik sosyal hizmetlerin artırılması, sosyal izolasyonu önlemeye yönelik etkinliklerin düzenlenmesi ve yaş dostu mekânsal planlama yaklaşımlarının benimsenmesi yaşlı bireylerin yaşam kalitesini artıracaktır. Ayrıca, kentsel dönüşüm projeleri nedeniyle yaşlı nüfusun marjinalleşmesinin önlenmesi büyük önem taşımaktadır. Yaşlı bireylerin yerlerinden edilmeden mevcut sosyal çevrelerinde yaşamlarını sürdürebilecekleri çözümler geliştirilmelidir. Nüfusun yaşlanması yalnızca bir demografik mesele değil, aynı zamanda kentsel sürdürülebilirlik ve sosyal adalet açısından da kritik bir konudur. Çalışmanın bulguları, Bakü'de yaşlı bireylerin belirli mekânsal örüntüler içerisinde yoğunlaştığını ve mevcut kentsel planlama uygulamalarının bu demografik değişimi karşılamakta yetersiz kaldığını ortaya koymaktadır. Bu bağlamda, yaşlı nüfus ile kentsel çevre arasındaki bağın güçlendirilmesine yönelik politikaların geliştirilmesi hem sosyal hem de mekânsal sürdürülebilirliğin sağlanması açısından büyük önem taşımaktadır. Araştırma, yaş dostu kentsel politikalara önemli katkılar sunmakta ve kentsel planlamada yaşlı nüfusun ihtiyaçlarının önceliklendirilmesi gereğine dikkat çekmektedir. Yerel yönetimlerin, yaşlı bireylerin sosyal ve mekânsal entegrasyonunu güçlendirecek şekilde kentsel planlama süreçlerini yeniden düzenlemesi gerekmektedir. Yaşlıların kentsel yaşama aktif katılımını destekleyen bir çevre yaratmak; erişilebilirliği artırmak, yaş dostu kentsel planlama yaklaşımlarını benimsemek ve sosyal hizmetlerin mekânsal olarak daha dengeli bir şekilde dağıtımını sağlamak, yaşlı nüfusun kentsel mekânlardaki hareketliliğini artıracak ve genel yaşam kalitelerini yükseltecektir.

Ek bilgiler

Çıkar çatışması bilgisi: Araştırmada herhangi bir çıkar çatışması bulunmamaktadır.
Destek bilgisi: Araştırmada herhangi bir kurum veya kuruluştan destek alınmamıştır.
Etik onay bilgisi: Araştırmada etik kurul gerekli görülmemiştir.
Katkı oranı bilgisi: Yazar katkı oranı tüm yazarlara eşit olarak dağıtılmıştır.