Regional Disparities in Ageing and Longevity in Nepal: A Comprehensive Analysis by Province and Ecological Zone

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Abstract

The current demographic transition in Nepal is characterized by low fertility and increasing life expectancy rates, which result in a very fast aging population. This paper discusses the trend in population aging and disparities involving regional and gender differences in both survival and life expectancy and its implications for social and health policy. The analysis is based on census data of 1952/54, 1991, and 2021 to give estimates of the percentage and growth of older adults (60+ in 1991 and 65+ in 2021), dependency rates, aging indices, survival rates, and remaining life expectancy by ecological zone and province. The descriptive statistical techniques are applied to examine the long-term trends and spatial inequalities. Results show that the percentage of older adults grew from 5.0 percent in 1952/54 to 10.2 percent in 2021, which is higher than the national average. The indicators of ageing differ greatly by the provinces; women always have higher survival and life expectancy than men. This paper presents a geographically disaggregated observation of the aging population in Nepal and

suggests the necessity to implement equity-based and differentiated social and health protection measures.

Keywords: Ageing population, Gender differences, regional disparities, Life expectancy, Policy implications

Introduction

The geographically diverse South Asian nation of Nepal is undergoing a significant demographic shift, as evidenced by an aging population and rising life expectancy. This change reflects a global trend in the developing world, driven by declines in fertility and mortality, as well as innovations in medical care, education, and sanitation (Tausig & Subedi, 2022). According to the 2021 National Population Census, the population aged 60 and older has been rising steadily in Nepal between 2011 and 2021, with the proportion increasing slightly to 10.12 percent in 2021, up from 8.1 percent in 2011, reflecting a higher growth rate of 3.29 percent per annum. Other significant health developments include improvements in life expectancy, which has increased by approximately 27-28 years, from 72 years old in 1952 to 2021 (Mishra et al., 2025).

There are opportunities and challenges of an aging population in Nepal. Older people are an asset to a community when it comes to maintaining cultural heritage and building social cohesion, but can be vulnerable to such factors as social isolation, financial insecurity, and the absence of quality medical care (Chalise & Brightman, 2024; Sharma and Bista, 2025). These problems are aggravated by the major regional differences. An example is Gandaki Province, where the percentage of old people is the highest (11.8%), but the proportion of old people is the least in Karnali Province (5.6%) (National Statistical Office [NSO], 2024).

The seven provinces to which Nepal is divided are Koshi, Madhesh, Bagmati, Gandaki, Lumbini, Karnali, and Sudurpashchim. The three ecological regions of Nepal are the Mountain, Hill, and Terai, which are primarily socioeconomically, culturally, and environmentally different. The state of Bagmati, which covers the capital Kathmandu, is advantaged with developed facilities in the sphere of health, whereas provinces such as Karnali and Sudurpashchim can only complain about poverty and poor access to services (NSO, 2024). Likewise, there is a lack of infrastructure in the Mountain region, and the topography of the same region makes it inaccessible. The Hill region is characterized by high outmigration, whereas the Terai region is more connected and capable of agriculture (Chidi et al.,2024).

Such regional variations have potent impacts on both the quality of life (QoL) and the health status of the older population. Outmigration of the young population has resulted in an increased aged dependency ratio and the problem of left-behind elderly in the rural Mountain and Hill areas, who are forced to do more household and farming labor with a lack of support. Conversely, the cities in such provinces as Bagmati and Madhesh have access to better healthcare and social services, which enhance longevity and health (Subedi, 2022).

Regional differences in aging are an important constituent of the health disparities. The prevalence of non-communicable diseases (NCDs) such as cardiovascular diseases, diabetes, and cancer has caused more than two-thirds of deaths in Nepal. Besides stronger access to healthcare, the Terai region fares better with NCD management than the under-resourced Mountain and Hill regions (Sdhikari et al., Mishra et al., 2025).

There are also social determinants that affect health and even longevity, including gender, caste, ethnicity, and income. Older women, and in particular those living in marginalized communities, have increased vulnerabilities as they experience inequalities concerning their gender and restricted access to resources (Pokharel, 2021). The systemic discrimination and the difficulty to manage economically make Dalits and indigenous people in far provinces such as Karnali especially vulnerable (Nepali, 2018). The migration element adds to the complicated aspects, as feminization of aging (whereby women are left disproportionately behind) contributes to further social and psychological pressure, including disproportionate elderly population living in rural settings, developing depression (Sharma,2024).

Urban Nepal has a higher median age than rural areas and regions with more elders, since urban areas have lost the youth. The rate of elderly dependency is greater in the mountainous regions and other ageing indicators are highest in the hilly regions (Shrestha &Shrestha, 2014). A large portion of the elderly population has chronic diseases, including hypertension and arthritis (Thapa & Rai, 2022), and the healthcare system does not have a qualified geriatric workforce and long-term care services (Dhakal et al., 2024). Policy responses should be area-based, namely chronic disease in Bagmati and basic healthcare in Karnali, but some also claim a national-level approach could be a better way of distributing resources (Cook & Halsall, 2012; Dhakal et al., 2024).

This paper examines regional differences in aging and longevity in Nepal, analyzing elderly population patterns, variations in life expectancy and health, socio-economic influences, and related policy implications for healthy aging. This paper seeks to establish the major factors behind the disparities across regions and their implications on the well-being of the elderly based on an analysis of demographic trends, health outcomes, and social determinants. The value of the work lies in the fact that it can contribute to policymaking that is evidence-based. Here, as an illustration, health policy in urban Bagmati can be centered around geriatric and NCDs, whereas a community health outreach, income support, and inclusive service delivery can be applied in rural Karnali (Gautam & Paudel, 2021).

The research helps Nepal in its overall struggle toward the realization of Sustainable Development Goals (SDGs) in the context of SDG 3 (Good Health and Well-being) and SDG 10 (Reduced Inequalities). It provides meaningful recommendations that policymakers, researchers, and practitioners may follow to create an equitable and sustainable approach to healthy aging and longevity promotion in Nepal by offering a multifaceted insight into both regional and ecological variations in the aging process.

Method and Procedure

Study Design

The research design is a cross-sectional and quantitative study conducted to evaluate regional differences in ageing and longevity in Nepal based on three ecological regions (Hill, Mountain, Terai) and seven provinces (Koshi, Madhesh, Bagmati, Gandaki, Lumbini, Karnali, and Sudurpashchim). The research will give us an idea of the trends of demographic and economic factors of aging and life expectancy because the study will capture the sampled aspect of one moment in time.

Data Source

The study uses the secondary data collected during the 2021 National Population Census (conducted by the Central Bureau of Statistics, CBS, 2023). The census provides detailed and nationally representative data on the demographics of the population, socioeconomic indicators, and household characteristics. It has disaggregated data at the provincial level and the ecological zone, and thus it can be utilized to analyze the differences in ageing and longevity across Nepal in space.

Variables

Two variables, dependent as well as independent, are under examination in the study. The dependent variables are the percentage of the aging population (60 years old and above) and the best guesstimate of life expectancy at birth, depending on age-specific mortality rates by the census. Self-reported health status was also available, where possible. The independent variables include geographic influences (province and ecological zone), socioeconomic factors (education level, household economic status, and occupation type), and demographic properties (gender, caste/ ethnicity, and migration status). With such variables, a multidimensional analysis can be performed on regional disparities.

Data analysis

The proportion of the aged population, life expectancy, and socioeconomic indices associated with the two were analyzed through descriptive statistics and tabulated to reflect the regional trends. The comparison and identification of trends across the provinces and ecological regions, as well as highlighting disparities in demographic and socioeconomic factors, were done by percentages, dependency ratios, and ageing indices. Although this method is suitable for recording the long-term trend and spatial change in census data, the study admits that it lacks inferential statistical analysis. Further studies might enhance analytical rigor by introducing inferential methods, such as regression and decomposition, to formally test the statistical significance of regional variations and more effectively isolate the influence of socioeconomic variables on ageing outcomes.

Data Management

To be precise and homogenous, the census data were cleaned up and required. Issues regarding missing values in key variables were addressed before with multiple imputation, under the assumption that the missing data were at random. CBS provided sampling weights that were used to generate nationally representative estimates.

Limitations

Causal inference is restricted by the cross-sectional nature of the data. Also, the census does not provide health details or information on whether it has changed recently in terms of population mobility or service access. Notwithstanding such beings, the 2021 Census can still be considered a comprehensive source of study on regional ageing and longevity trends in Nepal.

Results and Discussion

Results

Aging trend in Nepal

There is a demographic transition at a high rate in Nepal, where there is a larger elderly population. It can be explained by the decline in fertility rates and an increase in life expectancy, which leads to an increase in the number of citizens aged 60 and older. The ageing trend in Nepal, as illustrated in Table 1, has depicted an incremental and significant change in the proportion and absolute number of the elderly population (60 and above) between the years 1952/54 and 2021. An ageing population is observed to be gradually increasing with an increase in the percentage of the older population, slowly increasing by 5.0 per cent in 1952/54 to 10.2 per cent in 2021.

In particular, the proportion of people aged over 65 growing at a rate steeper than the national rate of population growth has been increasing since 1981, a connotation of a higher rate of ageing. An example could be given by the fact that in 2011, the population growth of the older population was at 3.5 per year, as compared to the growth rate of 1.35 per year in the country. Subsequently, the doubling rate of the older population has experienced a great reduction in recent years, with the frequency reducing to 20-21 years in a period of recent years since it was 41 years in the year 1961, therefore, demonstrating the huge rate of population accumulation. The trends indicate increased longevity and declining fertility and severe implications for social protection, health and policy planning in Nepal by age.

Table 1

Ageing trend and growth rate of older persons in Nepal

Census Year	Total Population	60+ Older Persons	60+ Older Persons (%)	National Population Growth Rate (%)	Older Population Growth Rate (%)	Doubling Time of Older Population (Years)
1952/54	8,256,625	409,761	5.0	-	-	-
1961	9,412,996	489,343	5.2	1.64	1.7	41
1971	11,555,983	621,529	5.4	2.05	2.4	29
1981	15,022,839	857,061	5.7	2.62	3.2	22
1991	18,491,097	1,071,234	5.8	2.08	2.2	32
2001	22,736,934	1,477,379	6.5	2.25	3.4	21
2011	26,494,504	2,154,408	8.1	1.35	3.5	20
2021	29,164,578	2,977,318	10.2	0.92	3.3	21

Source: CBS, Nepal (2003, 2014) and NPHC 2021

Dependency ratio and index of ageing

Table 2 data indicate the difference in the dependency ratio and index of ageing across Nepal and provinces as of 2021. Depending on age 60+, the total dependency ratio nationally is 61.38 (of which children's dependency is 44.91, and old-age dependency is 16.48), which has a greater importance in comparison with the old-age dependency ratio. The ageing index that reveals the relationship between the number of older persons and children is 36.69, which shows that the population is aging as compared to children.

The provinces in Bagmati and Gandaki have moderate to advanced levels of demographic ageing with indices of 48.3 and 55.9, respectively, indicating that most people in these provinces are ageing, whereas Karnali and Madhesh show lower indices (24.06 and 27 57), indicating younger demographics. When the estimate is estimated at the 65+ level, all indicators decrease, but relative trends remain. These differences highlight the importance of implementing regionally targeted policy measures, with more immediate need in those provinces that exhibit the higher rate of ageing and, despite it, are subject to increasing pressures on social support and healthcare systems and their infrastructures.

Table 2

Trend of Dependency Ratio and Index of Ageing – 2021

Area	Based on the Old Age 60+				Based on the Old Age 65+			
	Total Dependency Ratio	Child Dependency Ratio	Old-Age Dependency Ratio	Index of Ageing	Total Dependency Ratio	Child Dependency Ratio	Old-Age Dependency Ratio	Index of Ageing
Nepal	61.38	44.91	16.48	36.69	53.28	42.65	10.63	24.91
Province								
Koshi	59.25	41.38	17.86	43.16	50.38	39.08	11.3	28.92
Madhesh	73.35	57.5	15.85	27.57	65.23	54.81	10.42	19.01
Bagmati	48.85	32.94	15.91	48.3	41.55	31.33	10.22	32.63
Gandaki	59.27	38.02	21.25	55.9	49.41	35.67	13.75	38.54
Lumbini	61.51	46.06	15.44	33.53	53.82	43.87	9.95	22.69
Karnali	69.68	56.17	13.52	24.06	61.88	53.58	8.29	15.48
Sudurpashchim	67.95	52.09	15.86	30.46	60.17	49.67	10.5	

Source: NPHC 2021

Lifeexpectancy in Nepal

TaSSble 3 indicates the percentage of people surviving to age 60 according to their ecological zones and provinces. The population survives to age 60, with a significant difference between the genders, where 84.7 percent of women vs. 75.1 percent of men survive to age 60, nationally. In ecological zones, the survival probability is greater in Hill with 81.2 percent, Mountain (80.6), and Tarai (79), indicating longer survival in highlands. Bagmati and Gandaki have the highest survival of females (87), whereas Lumbini has the lowest survival overall (76.8), and also male survival (70.6). Such trends signal the existence of gaps in access to healthcare, nutrition, and conditions of socio-economic status, with women having higher chances of survival in all regions. Data also support the relevance of

geographical and gender-sensitive interventions in health towards equal ageing results in terms of life expectancy disparities.

Table 3

Percentage Surviving to Age 60 by Ecological Zone and Provinces, Nepal

Area	Percentage Surviving to Age 60 (%)		
	Both Sexes	Women	Men
Nepal	80.0	84.7	75.1
Ecological Zone			
Mountain	80.6	84.3	77
Hill	81.2	86.4	75.9
Tarai	79.0	83.5	74.4
Province			
Koshi	78.5	83.2	73.9
Madhesh	81.1	83.9	78.3
Bagmati	82.6	87	78.3
Gandaki	80.5	87	73.4
Lumbini	76.8	82.7	70.6
Karnali	81.7	86	77.2
Sudurpashchim	79.1	85.3	72.4

Source: NPHC 2021

Remaining Life Expectancy at Age 60, by Ecological Zones and Provinces

Remaining life expectancy at age 60 measures the average number of additional years a person who has reached 60 is expected to live. This indicator is analyzed across Nepal's ecological zones mountain, hill, and Terai, as well as its provinces, using data from 2021. In other words, it reflects the expected longevity of elderly individuals in different regions of Nepal after reaching the age of 60.

Table 4 shows how many years at age 60 the ones living till then are likely to live in different ecological zones and in different provinces in Nepal, according to the 2021 Census. At the national level, people who reach the age of 60 can live 19.4 further years, women (20.7) continue to live longer than men (18.2). In ecological regions, the Mountain region has the highest life expectancy at age 60 (20.7 years) compared to the Hill (19.7) and Tarai (19.0), indicating that there may be a factor associated with longevity linked to altitude. At the province level, Karnali and Sudurpashchim provinces have the maximum remaining life expectancy (19.8 years), and Lumbini province has the least (18.8 years).

There is a continued gap between Gender disparities, where women have an extended lifespan of post 60 years, especially in the Mountain and Sudurpashchim provinces.

This is evidence of the regional and gender disparities in mortality, access to care, and socio-economic status that further support the case for specific policies on ageing that focus on space and gender aspects of life expectancy.

Table 4

Remaining Life Expectancy at Age 60, by Ecological Zones and Provinces, Nepal

Area	Life Expectancy at Age 60 (Years)		
	Both Sexes	Women	Men
Nepal	19.4	20.7	18.2
Ecological Zone			
Mountain	20.7	22.3	19.2
Hill	19.7	21.2	18.3
Tarai	19.0	20.0	18.0
Province			
Koshi	19.3	20.5	18.2
Madhesh	19.6	20.3	19.0
Bagmati	19.3	20.7	18.0
Gandaki	20.0	21.4	18.6
Lumbini	18.8	20.0	17.7
Karnali	19.8	21.5	18.3
Sudurpashchim	19.8	21.9	17.8

Source: NPHC, 2021

Discussion

This paper has shown that Nepal is fast becoming an ageing society with the percentage and absolute number of older persons (60 years and above) steadily rising since 1952/54 up to 2021. The proportion of older adults increased to 10.2 percent of the total population, and the population has increased faster than the national average since 1981. The shortening of the doubling time of the aged population, which was 41 years in 1961 to approximately 2021 years in recent decades, is an indication of a rapid demographic transition. Such trends are generally in line with the larger tendencies in low- and middle-income countries (LMICs), as the population structures are being restructured by decreasing fertility and increasing longevity (UN DESA, 2020; Bye et al., 2022).

Ageing in Nepal is more or less encouraged by high fertility reduction and enhanced survival. The overall fertility rate dropped to 4.6 in 1996 to the replacement level (2.1) in 2020, whereas the life expectancy has risen to 71.7 years in 2021, compared to 58 years in 1990 (NDHS, 2022; WHO, 2023). Also, like other researchers show (Bhandari & Adhikari, 2022), low fertility in cities and more developed socio-economic locations and low mortality

have also played a big role in population ageing. The ongoing trend is projected by UN DESA (2020) in this way, showing that older individuals will make a significant portion of the Nepal population by 2050, and therefore, long-term demographic planning is an urgent issue that should be considered accordingly.

Population ageing presents complicated issues of development to Nepal, which is an LMIC with poor fiscal and institutional resources. Unlike in high-income nations where the ageing process has been met by elaborate social security schemes, Nepal has experienced a two-fold burden of a high child dependency ratio (44.91) and an increasing old-age dependency ratio (16.48). The co-existence is indicative of a transitional demographic phase and increases the risk of the so-called demographic dividend trap, where economic benefits of a large working-age population can be destroyed in case ageing increases more rapidly than investments in health, employment, and social protection (Goodhart & Pradhan, 2017; Lloyd-Sherlock et al., 2022).

The paper also depicts high regional differences in ageing. Other provinces (e.g., Bagmati and Gandaki) are characterized by high ageing, that is, high ageing indices (48.3 and 55.9, respectively), probably because of lower fertility, improved access to healthcare, and increased socio-economic development. However, in comparison, Madhesh and Karnali show younger population constructions, which can be explained by the larger fertility and reduced life expectancy. These geographical trends are consistent with new findings that demonstrate that urbanization, education, and health infrastructure influence the demographic outcomes in the region in Nepal (Subedi et al., 2023). Nevertheless, reduced ageing in the less-developed provinces does not mean that they are less vulnerable, but this fact might mask future risks of poverty, lack of access to health services, and insufficient preparedness for population ageing.

The ageing of Nepal is further complicated by gender and ecological disparities in survival and longevity. The global biological and behavioral trends show that women have more time to live to 60 and better remaining life expectancy than men (Austad & Fischer, 2021). Although female longevity is a demographic benefit, it also leaves older women vulnerable to increased risks of disability and financial vulnerability as they do not have lifetime access to paid work and social security (Sharma, 2024). The ecological difference has a relatively high survival and life expectancy at birth in the Hill and Mountain areas than in the Tarai, potentially due to lifestyle, environmental conditions, and social bond, yet the healthcare access is poor in such provinces as Lumbini, which limits longevity (WHO, 2023; Sapkota et al., 2024).

These results indicate that there should be a multidimensional and regionally differentiated policy response. The advanced ageing population in provinces needs to be provided with enhanced social protection, increased pension, and geriatric health care services, whilst younger provinces must have foresight investments that would help them face the ageing population in the future as they grow old. It is also essential to include ageing issues in national and provincial health policy development, especially by ensuring that the primary healthcare system is empowered to manage non-communicable diseases, as they are the main cause of death among older adults in Nepal (WHO, 2023). Interventions that are

gender sensitive are also crucial to support the unique health and economic vulnerabilities of older women and decrease the premature deaths of men in disadvantaged areas.

The census data used in the study restricts the research to the lived experience and socio-cultural aspects of ageing. Qualitative and longitudinal methods would be useful in future studies to get a better understanding of health trajectories, care arrangements, and policy effectiveness. The recent literature has also highlighted the need to adopt an interdisciplinary approach that synthesizes the demographic, health, and socio-economic approaches to consider the issue of population ageing in LMICs holistically (Belachew et al., 2021).

Conclusion

The fast rate of demographic ageing in Nepal, where the old age population is increasing, there exist regional inequities and also gender disparities in lifespan, need to be both challenges and opportunity areas. The results are consistent with the recent theory that social, economic, and health impacts of ageing are best handled with proactive, context-informed policies. With improved social protection, improved access to health services, and reduced regional and gender inequalities, Nepal can achieve its demographic transition and high levels of equitable and sustainable ageing. The proposed study needs to follow a qualitative and longitudinal study as future research. This is because the studies will help to further understand the dynamics of ageing and the ability to shape evidence-based policy responses to it.

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