

Research on the Development Trends and Impacts of Population Aging in China: Current Status and Prospects

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ABSTRACT

To understand the current research status, trends, and frontiers regarding the development and impacts of population aging in China, this study employs CiteSpace to conduct a visual analysis of relevant research literature. 1) The result indicates that the study of the development trends and impacts of population aging in China is currently flourishing, with an overall increasing trend in the annual publication. 2) The current research hotspots focus primarily on three areas: population forecasting, the relationship between population aging and economic development in China, and issues related to elderly care. 3) Relevant research frontiers include the silver economy, the adaptability of the aged to the digital economy era, elderly mental health, elderly labor supply, and the impacts of artificial intelligence on the elderly. The silver economy, elderly care services, the mental state of the elderly, and elderly education are expected to be the key directions for future studies in China.

KEYWORDS

Population aging; Development trend; Visualization analysis; Research frontier

1 Introduction

Population aging refers to the social phenomenon in which the proportion of elderly individuals increases in the total population due to the shrinking size of the younger cohort and the expanding size of the older cohort. At present, population aging is irreversibly reshaping the global development landscape. As of the end of 2023, China's population aged 60 and above reached 296.97 million, accounting for more than one-fifth (21.1%) of the total population, among which the population aged 65 and above reached 216.76 million, accounting for 15.4% (Wang, 2024). These figures indicate that China has officially entered a moderately aging society, highlighting a structural transformation in the age distribution. These also underscore the urgent need for a shift in the country's development model. Consequently, addressing the issue of aging in China requires concerted efforts from multiple parties, and it is crucial to ensure that the elderly enjoy the benefits of progress.

Therefore, we employed CiteSpace visualization software¹ to analyze the annual publication volume, high-frequency keywords, keyword co-occurrence, clustering, burst terms and timeline distribution of literature related to the trends and impacts of population aging in China with core journals indexed in Peking University Chinese Core Journal Catalogue (PKU) and Chinese Social Sciences Citation Index (CSSCI) database² as data sources. The aim is to present the current state of research in this field more objectively and scientifically, analyze current research hotspots and future trends, and provide reasonable suggestions for future academic research and practical exploration related to population aging in China.

2 Data Sources and Research Methods

2.1 Data Sources

CNKI's "Advanced Search" function is used with the topic terms " 'aging AND impact' OR 'aging AND trend' " to retrieve literature published from January 1, 2014 to August 1, 2024 in PKU and CSSCI source journals. After manually screening and excluding irrelevant papers, a total of 2,361 articles are included.

2.2 Data Processing

This section outlines the workflow for analyzing PKU and CSSCI literature using CiteSpace. Literature was exported in Refworks and analyzed using CiteSpace 6.2.R4. The time slice was set to one year, and the node type was set to keywords; thresholds were kept at default values; network pruning adopted the pathfinder, pruning sliced networks and pruning the merged networks. Upon completing parameter settings, the analysis program was executed. When the computational

¹ CiteSpace 6.2.R4 Advanced Edition, download address: <https://sourceforge.net/projects/citespace/>

² Searched from China National Knowledge Infrastructure (CNKI).

process was completed, the system interface automatically launched the visualization module, and the knowledge network could be visually presented by activating the graph generation function³.

3 Annual Publication Volume Analysis

To better understand the development status of research on the trends and impacts of population aging in China, the publication trend chart was plotted according to the chronological order of publication (Figure 1). Overall, the number of publications from 2014 to 2024 shows a general upward trend, indicating that the research interest in the development trends and impacts of population aging in China continues to rise and is of significant research value. The notable increase in the number of related publications from 2020 to 2021 is associated with the guiding role played by the relevant policy documents issued by China. According to linear regression trends, it is inferred that the number of related research publications will continue to increase in future, and the research will be further deepened gradually.

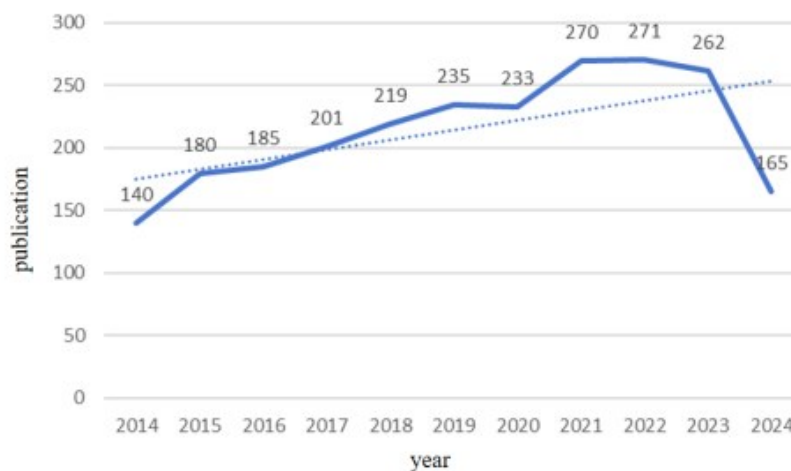


Fig.1 Annual Publication Trend in CNKI

4 Relevant Hotspot Analysis of Research

Based on literature data from the past decade and keyword co-occurrence, centrality, and cluster analysis, supplemented by a manual review of representative literature, research on the trends and impacts of population aging in China can be divided into three main research hotspots: population forecasting, the relationship between population aging and economic development, and elderly care.

4.1 Population Forecasting

Keywords associated with this research hotspot include *population structure*, *urban-rural differences*, *population mobility*, *comprehensive two-child policy*, *three-child policy*, and *marriage law research*. The aging process in China is accelerating, and different regions exhibit diverse population structures, urban-rural disparities, cultural traditions, and levels of economic development. Scientific forecasting of China's aging trend using big data is necessary. The onset and duration of the demographic window of opportunity are expected to differ among provinces and autonomous regions in ethnic minority areas. In the next ten years, regions such as Inner Mongolia, Guangxi, and Guizhou will experience prominent aging rates, and by 2035, the demographic window in Guizhou, Guangxi, Inner Mongolia, and Yunnan may close (Jiang & Wang, 2024). Urban-rural differences in aging will become more pronounced. With the improvement of urban medical conditions and living standards, urban aging is accelerating, but rural aging problems are even more severe. In the future, societies will confront a tripartite demographic challenge characterized by population aging, declining fertility rates, and rising non-marriage trends. Concurrently, delayed age at first marriage and childbirth, coupled with increasing rates of lifelong singlehood, will drive significant transformations in family structures and social dynamics.

³ Due to space limitations, visual maps are not shown in this paper.

4.2 The Relationship between Population Aging and Economic Development

Keywords associated with this research hotspot include *human capital, industrial structure, technological innovation, artificial intelligence, the pension insurance industry, medical insurance, household consumption, and labor supply of the elderly*. Under the dual pressures of declining fertility rates and increasing life expectancy, China is expected to face a growing risk of labor shortages (Yin et al., 2023). In response, enterprises are being compelled to transform and upgrade, accelerating the development of intelligent manufacturing. Through the substitution of labor with machines, production processes are being optimized, thereby reducing reliance on human labor (Fang, 2021).

At the same time, the social security system is under mounting pressure, particularly due to rising pension and healthcare expenditures. This demographic shift is also reshaping the consumption structure, with a noticeable tilt toward healthcare and elderly care services, ultimately altering the broader economic landscape.

Furthermore, improvements in medical standards and living conditions have contributed to increased life expectancy, which in turn presents new opportunities for the growth of intelligent and automated technologies. The development of the elderly care industry is increasingly driven by the integration of technological innovation and service provision, offering critical material and technical support to address the challenges of population aging.

4.3 Elderly Care

The keywords reflecting this research focus are *social security, pension insurance, medical insurance, elderly care services, social participation, social support, and technological advancement*. Mu Guangzong (2024) noted that currently, the development of China's elderly care industry faces several challenges, including insufficient market segmentation of elderly care needs, a shortage in the supply of care services, and a lack of professional caregivers. Therefore, it is imperative to establish a stratified and categorized elderly care service system by enhancing basic security, expanding inclusive services, and innovating diversified supply models. Such a three-pronged approach will enable a more precise alignment with the country's elderly care demands and promote the coordinated development of the elderly care sector and related industries.

5 Research Frontiers on the Trends and Impacts of Population Aging in China

In order to elucidate the research frontiers in the field of the trends and impacts of population aging in China, the keyword timeline and burst keyword analysis are integrated in this section. The keywords, including *elderly consumption, elderly preferential treatment* and *non-agricultural employment*, appeared together for the first time in 2024, indicating that unlocking the huge potential of the elderly economy will be a top priority in the future. For example, establishing colleges, art centers, and training institutions for the elderly, as well as further upgrading the service system of nursing homes, can meet the material and spiritual needs of the elderly and improve socioeconomic benefits. Non-agricultural employment reflects the increasing attention to the labor supply of the elderly. Peng Xizhe and Song Liangjun (2021) pointed out that guaranteeing the labor participation autonomy of the elderly is the key prerequisite for increasing labor supply. So the traditional mandatory retirement system should be changed to a flexible retirement system, enhancing the participation vitality of the elderly labor market. Therefore, by optimizing the flexible design of retirement policies and the social participation security system, the willingness of the elderly population to participate in the labor force and the efficiency of the reallocation of human resources can be effectively improved.

The keyword *digital economy* ranked second in burst rate at 5.08, just behind the keyword *impact*, indicating that in the digital economy era, with the rapid development of the Internet, the demand for Internet use among the elderly population in China is also increasing. Tang Le, Qiang Wei, and Sun Shiyu (2024) explored the relationship among population aging, Internet usage, and household consumption levels in the digital economy era, providing new insights for high-quality economic development in the context of aging trends. Analysis of recent research trends reveals a surge in studies related to the digital economy, mental health, and consumption upgrade since 2022. Methodologically, the use of moderation analysis is increasingly common, often in conjunction with Population Census data. The importance of labor supply has been consistently highlighted since 2021. Besides, studies exploring mediating effects and artificial intelligence have maintained a strong presence in the literature since 2020. These indicate that the mental health of the elderly urgently needs attention, and the integration of *artificial intelligence* plus *elderly* ××, such as *artificial intelligence* plus *elderly psychological counseling/elderly education*, will become new research hotspots, with research models mostly adopting mediating effect models.

In summary, current research frontiers in the field of trends and impacts of population aging in China primarily focus on the silver economy, adaptability of the elderly to the digital economy, mental health of the elderly, labor supply of the elderly, and the impact of artificial intelligence technology on the elderly, with related research models mostly utilizing mediating effect models.

6 Conclusion

Based on a visualization analysis of existing literature concerning China's aging trends and their effects, the primary directions for future research can be summarized as follows:

6.1 Silver Economy

The first area of focus for future research is the silver economy. Silver economy possesses significant market potential driven by several converging trends in China. First, rising living standards and a growing elderly population with disposable income and leisure time are creating increased demand for recreational activities and self-enrichment, such as fishing and tea ceremonies. This necessitates a transformation within the cultural tourism industry to cater specifically to the needs and preferences of older adults. The market opportunity is vast, encompassing both high-end and mid-to-low-end segments that remain largely untapped.

Besides, the escalating medical needs of an aging population are driving demand for innovative healthcare solutions. This demographic shift is poised to foster the emergence of new business models, including telemedicine and intelligent care systems.

Overall, with strategic policy support, the silver economy can serve as a catalyst for both individual entrepreneurship and the large-scale expansion of the elderly services market. This expansion, in turn, can stimulate synergistic growth across related sectors, such as smart healthcare industries, the supply of age-appropriate cultural products, and wellness tourism. Future research should prioritize the development of a comprehensive, all-age-friendly industrial ecosystem to inject new structural growth momentum into high-quality socioeconomic development.

6.2 Elderly Care Services

The second future research trend is elderly care services. China's elderly population is huge, and the pace of aging is accelerating. The structure of elderly needs is shifting from basic survival security to diversified development. However, there is a severe shortage of professional elderly care service personnel and care teams in China, and the effective supply capacity of home-based and community-based elderly care services cannot meet the growing multi-level needs of the elderly, with the construction of elderly care service systems in rural areas particularly lagging behind. This supply-demand mismatch not only hampers the overall improvement of elderly care service quality but is also a key bottleneck restricting the sustainable development of the elderly care sector in China.

Therefore, building a modern elderly care service system that meets the needs of an aging society is urgent. China needs to establish systematic talent training mechanisms to strengthen the professional quality of practitioners, improve service efficiency through standardized service processes, and use new-generation information technologies such as the Internet of Things and big data to empower and promote the innovative development of smart elderly care models. It is worth noting that while the domestic academic community has explored optimization paths for elderly care services from multiple dimensions and proposed several enlightening suggestions, existing research still lacks theoretical depth and practical guidance. There is an urgent need to integrate interdisciplinary research methods to construct more systematic, forward-looking, and operable intelligent elderly care solutions.

6.3 Psychological State of the Elderly

Mental state of the elderly is the third research trend. With the intensification of social aging, the mental health of the elderly is becoming increasingly prominent. Ignoring their psychological state not only reduces their quality of life but may also lead to a series of mental illnesses and even affect physical health. The factors causing the psychological problems of the elderly include social stereotypes, prejudice, age discrimination, and loneliness. The research shows that the nighttime sleep of middle-aged and elderly people is related to depression and is affected by demographic, socio-economic factors, health behavior factors with higher risks among middle-aged and elderly women than men, and among the oldest-old compared to the younger elderly (Wang et al., 2024). Therefore, society should pay great attention to the sleep and mental health of middle-aged and elderly people to improve their quality of life. To solve this problem, new media exposure is an effective way. (Jiang et al., 2024). In the future, improving the media literacy of the elderly and strengthening the aging-friendly construction of media will jointly promote healthy aging from both internal capabilities and external environmental support.

6.4 Elderly Education

Elderly education is expected to become the fourth research trend in the field of the development trends and impacts of population aging in China. The expansion of the scope of digital transformation and artificial intelligence applications

in different types of products and services has made it urgent to study the possible impact of technology on the elderly population.

Future research should concentrate on the AI-driven structural transformation of education for older adults. This includes investigating the mechanisms by which AI optimizes curriculum relevance and learning engagement, exploring how intelligent technologies can better tailor educational content to the needs and interests of older learners and enhance their active participation in the learning process. Furthermore, it involves systematically evaluating the innovative potential of algorithmically recommended learning pathways, comprehensively assessing how AI-powered personalized learning can cater to the diverse learning styles, paces, and goals of individual older adults, fostering their personal growth. Finally, research should analyze the role of emotional compensation in human-computer interaction within learning environments, including a deep dive into how AI can provide emotional support and companionship to older learners, mitigating potential feelings of isolation, and employing multimodal data analysis to understand the evolving patterns of AI-enabled education for older adults and its overall impact on the learning experience.

In conclusion, current research on the trends and impacts of population aging in China is in full swing, with the annual publication volume showing an overall upward trend. Research hotspots are mainly concentrated on population forecasting, the relationship between population aging and economic development in China, and elderly care issues. In the future, research can further focus on the silver economy, elderly care services, the psychological state of the elderly, and elderly education to improve research quality, provide quantifiable reference indicators for policy-making, and facilitate the rapid development of China's elderly undertakings.

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