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# Evolution of smart elderly care policies: a research review

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**Abstract.** With the trend of global population aging escalating, the problem of population aging in China is becoming increasingly prominent. The traditional home-based elderly care model and institutional elderly care model are being challenged, showing a clear mismatch between elderly care service supply and demand. In light of this context, smart elderly care, has emerged. As an information technology-based model, smart elderly care has become a key focus area for preferential policy support. This study focuses on smart elderly care policies and identifies four directions of current policy research, including technology application and innovation, service system optimization, policy support and establishment of standards, as well as social coordination mechanisms. Specifically, it involves promoting the widespread adoption of technologies such as smart wearable devices, telemedicine, and home monitoring systems to achieve intelligent health monitoring and emergency response; integrating community, institutional, and home-based elderly care resources to build a comprehensive "internet + elderly care" platform that offers personalized services; encouraging active involvement of enterprises through fiscal subsidies, tax benefits, and other incentive measures provided by the government; improving data security and industry standards; promoting multi-stakeholder cooperation, including families, communities, businesses, and non-profit organizations, to establish a sustainable elderly care model. Regarding the core problems of high technology costs, a digital divide among the elderly, and privacy protection, the government should accelerate the implementation of age-friendly design, while leveraging pilot programs to promote mature models, achieving widespread adoption of smart elderly care, and enhancing the effectiveness of policy implementation.

**Keywords:** smart elderly care, elderly care services, the elderly digital divide

## 1. Introduction

Along with the intensifying global trend of population aging, China's aging problem is worsening. Currently, the elderly population in China is growing rapidly. According to the statistics released by the National Bureau of Statistics, the population aged 60 and above in China reached 297 million, accounting for 21.1% of the total population [1]. Among them, those aged 65 and above numbered 217 million, making up 15.4% [1]. Traditional models, including home-based elderly care and institutional elderly care, are faced with enormous pressure, highlighting a prominent supply-demand mismatch of elderly care services. Against this backdrop, the emerging smart elderly care model has become a priority direction for targeted policy assistance.

During the periods of the 13th Five-Year Plan and the 14th Five-Year Plan, China has introduced multiple policies to promote the development of smart elderly care. In 2017, China's Ministry of Industry and Information Technology and Ministry of Civil Affairs jointly released an action plan for the development of the smart health and elderly care industry, noting that technologies such as the Internet of Things (IoT), big data, and Artificial Intelligence (AI) should be leveraged to improve the quality elderly care service [2]. In 2024, the 14th Five-Year Plan clearly stated to incorporate smart elderly care into the national strategy and support the digital transformation of community-based and home-based elderly care [3]. In 2023, a guideline on advancing the development of the basic elderly care service system was released and further emphasized the significance of smart elderly care in optimizing resource allocation and decreasing service costs [4].

In light of this context, this study focuses on smart elderly care policies through a literature review, summarizes the research findings of selected literature regarding relevant policies, and identifies limitations of existing literature.

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## 2. Research method and process

The author adopts the method of literature review. A search was conducted on China National Knowledge Infrastructure (CNKI) using "smart elderly care" as the keyword, and a total of 133 articles were returned in the results, all from Chinese core journal catalogue of Peking University and Chinese Social Sciences Citation Index (CSSCI). The author prioritized newer articles and those with high citation counts, using them as the selection criteria. In addition, articles that focus on specific cases of individual cities or departments were excluded. Instead, preference was given to studies that present generalizable conclusions. Ultimately, 15 articles were selected.

## 3. Research results

### 3.1. Theoretical perspectives

Sorted by type of theoretical approach, scholars such as Zuo, Yang, and Wang et al. used Maslow's hierarchy of needs theory to analyze the needs of the elderly, divides their needs into five levels, including physiological, safety, social, esteem, and self-actualization, and explores the differences in needs among elderly people living in different residential settings or belonging to different age groups [5-7]. Qi, drawing on lifelong education theory, community education theory, and ecosystem theory, proposed the construction of an ecological system for elderly education—comprising educational resources, learning environments, service models, and technical support—to promote the integration of smart elderly care and elderly education [8]. Wang and Liu, from the perspectives of the theory of the elderly's subjectivity, the social construction of technology theory, and organizational sociology, stressed that smart elderly care technologies should shift their orientation from a technology-driven logic to the subjective needs of elderly individuals, ensuring the right of the elderly to participate in technology design and avoiding silencing the elderly [9]. Yuan and Wang, from the perspectives of risk management theory and multi-stakeholder governance theory, proposed that the development of smart elderly care presents different risks at each stage, which should be mitigated through strategies such as multi-stakeholder governance, baseline regulations, and technological innovation [10]. Zhu, from the theory of digital inclusion and the perspective of elderly rights protection, analyzed that smart elderly care is faced with digital exclusion, resource misallocation, digital addiction, algorithmic opacity, data leakage, and other challenges, which should be addressed through legislation, age-friendly design, two-way inclusiveness, and an inter-departmental coordination mechanism [11]. Zhu and Deng discussed international experience on smart elderly care from a legal and ethical perspective, analyzed ethical dilemmas of privacy protection and emotional dependence, and proposed suggestions for establishing legal and ethical norms [12]. Huang conducted research based on active aging theory and addresses the diverse health needs of the elderly, proposing that smart elderly care should focus on the fulfillment of the social value of the elderly [13]. Based on the age-friendly design theory and user experience theory, Zhu proposed that internet applications need to be adapted for the elderly by improving interface design, simplifying functions, and enhancing privacy protection, thereby bridging the digital divide [14].

Mao et al. assessed the level of urban digitalization from both city and household perspectives, analyzed the accessibility, applicability, and scalability of smart elderly care, and evaluated its effectiveness on improving life satisfaction of the elderly, stressing that the welfare of the elderly can be enhanced through overcoming the digital divide [15].

Gao analyzed the economic and social significance of smart elderly care from the perspective of public policy, proposing suggestions such as technology integration, research and development of inclusive products, and optimization of supply-side policies [16].

Based on policy documents, Shen et al. identified three phases of China's smart elderly care policies, involving industry layout exploration, service upgrades, and system strengthening, and emphasized the interactive relationship between policy and the governance of an aging society [17].

Zuo and Yang analyzed the industrial chain of smart elderly care from the perspective of the silver economy, including the upstream technology sector, the midstream products and services sector, and the downstream application scenarios sector, and highlighted the necessity of reaching unified standards, sharing data, and coordinating key parties [5, 6].

Yang focused on the industrial chain of rural smart elderly care, discussed its applicability and challenges, and emphasized policy support and resource integration [18].

Drawing on the "technology-agency-context" framework, Wen and Liu analyzed the unintended consequences of technology, the lack of digital competence among stakeholders, and the risk of contextual distortion, and proposed concrete strategies such as accurate application of technology and empowerment of stakeholders [19].

## 3.2. Research methods

### 3.2.1. Quantitative research

Wang et al. conducted research using a nationwide questionnaire survey and in-depth interviews and explored six core needs of the elderly living in different residential settings through quantitative analysis [7]. Shen et al., using the Latent Dirichlet Allocation (LDA) topic model, analyzed 2,782 policy documents and selected six major topics to reveal the logic behind policy evolution [17]. Employing chi-square tests combined with logistic regression and using data collected from the China Longitudinal Aging Social Survey (CLASS), Zuo and Yang examined the dynamic needs of elderly people across different age groups [5]. Similarly, Mao et al. used data from the 2020 CLASS survey and a multilevel Logit model to verify the significant impact of smart elderly care at both the city and household levels on life satisfaction [15].

### 3.2.2. Qualitative research

The study by Wang et al. also employed in-depth interviews for qualitative analysis [7]. Zhu and Deng compared legal and ethical regulations of smart elderly care in the European Union (EU), the United States, Japan, and other countries or regions, concluding with implications for China [12]. Yang summarized two typical industrial chain models of rural smart elderly care and proposed suggestions based on policy documents and practical problems [18]. Wang, Liu, Yuan, Wang, and Zhu discussed the challenges, issues of agency, and risks in smart elderly care [9-11]. Gao Chuansheng compared experiences from abroad and China and suggested policy improvements with an emphasis on fiscal support and stimulating demand [16]. Wen and Liu adopted an integrated "technology-agency-context" framework combined with risk sociology theory to explore the manifestations of risks under uncertainty and corresponding responses [19].

## 3.3. Research contents

### 3.3.1. Technology application and innovation

The research by Wang et al. proposed demand-driven technology design, pointing out that elderly people's core needs or smart elderly care products include health monitoring, privacy protection and age-friendly interaction, emphasizing that technology should cater to individual needs, such as emergency response systems for elderly living alone and family interaction functions for those living with their children [7]. Zuo and Yang suggested that technology should be age-friendly, finding that younger elderly individuals are more receptive to digital services, while older seniors require simplified interaction design [5]. Technology should be dynamically adapted to meet the needs of different age groups [5]. Wang and Liu discussed the evolution of smart technology from platform-based systems to elderly-friendly products, suggesting that technology design should refocus on the needs and agency of the elderly and avoid ethical issues caused by technological determinism [9]. Zhu and Zhao focused on the age-friendly adaptation of the internet and stressed the simplification of operational procedures in technology, which can lower barriers of use for the elderly [14]. Zhu proposed to address the issue of technology rejection through age-friendly design and algorithm transparency [11].

Zhu and Deng discussed the legal and ethical issues of adopting AI technologies in elderly care services, such as privacy leakage and emotional dependence, and proposed to incorporate ethical principles into technology design [12]. Mao et al., Gao Chuansheng, Wen, and Liu suggested technology integration and precise application, indicating that smart elderly care relies on IoT, big data, AI, and other technologies, and it faces problems such as technology fragmentation and barriers to data sharing. A unified digital platform for elderly care services is needed to integrate resources and promote technological coordination [15, 16, 19].

Zuo and Gao suggested enhancing the age-friendliness and inclusiveness of elderly care products, as well as the reliability and operational simplicity with a lower price to reach more elderly people, such as developing one-tap applications and voice-interaction devices [6, 16].

Wen and Liu proposed that the unintended consequences of digital technologies, including privacy leakage and technology dependence, should be avoided by improving regulations and technological iteration [19]. Yuan analyzed different risks that exist in different phases of smart elderly care, such as technology-oriented bias in the planning and design phase, and technology alienation issues during the operation and maintenance phase, advocating for technology innovation to avoid risks [10]. Qi proposed that the establishment of elderly education should be grounded in intelligent technologies, an age-friendly learning environment should be created, and technical safety and efficiency should be valued [8].

3.3.2. Service system optimization

Research by Zuo and Huang et al. both emphasized the importance of age-differentiated service, providing tailored services. For example, younger seniors need social and recreational activities, while older seniors require in-home medical care; middle-aged seniors have a greater need for accessible facilities [6, 13]. According to Huang et al.'s research, current services focus more on basic needs such as health counselling, while higher-level needs such as emotional support and safety monitoring have not been adequately met, which should be precisely delivered via smart platforms [13].

Shen et al. proposed that smart elderly care should be coordinated with local communities and medical institutions, and an integrated "home-community-institution" service chain should be established, thereby avoiding resource underutilization or redundant construction [17]. Mao et al. and Yang suggested that families should coordinate with communities, and a "home + community + informatized platform" model should be established, which combines the emotional advantages of home-based elderly care with the convenience of community services, providing daily living care, health monitoring, and other services [15, 18].

In Zuo's research, it was suggested to design scenario-based services targeting the needs of the elderly, such as smart meal assistance and telemedicine, thereby improving service specificity [6]. Yuan and Wang pointed out that service supply should avoid homogenization and suggested developing a tailored service model and integrating resources through multi-stakeholder governance [10]. Qi stressed that elderly education services should take into account community-based scenarios and provide personalized learning paths [8].

Wen and Liu suggested that a balance between emotional connection and rights and responsibilities should be maintained to avoid emotional detachment caused by technological replacement. Human interaction should be preserved while clearly defining the boundaries between rights and responsibilities of technological and human services [19]. Wang and Liu critically examined the silencing of the elderly in current services, advocating for an elderly-centric service design to balance technology logic and the need for emotional care [9].

Zhu proposed to establish an "online + offline" closed-loop service, which can avoid waste of resources and focuses on problems of digital addiction and anxiety simultaneously [11].

3.3.3. Policy support and standard development

Shen et al. examined policies released from 2014 to 2023 and identified that China's smart elderly care has evolved from early efforts focused on informatization, such as "internet + elderly care," to a more comprehensive service system. However, issues remain, including regional imbalances—with more policies in the eastern regions and fewer in the west—and a lack of depth and refinement in service content. Their research suggested stimulating company innovation through tax benefits and subsidies, especially to provide support to the smart elderly care industry in less developed regions [17].

Huang et al., Zhu, and Deng's research indicated that there are no unified standards yet for privacy protection and age-friendly product design, and reference should be made to the EU's Ethics Guidelines for Trustworthy AI and Japan's Social Principles of Human-Centric AI to develop regulations tailored to specific sectors to develop regulations for specific subfields [12, 13].

Gao, Zuo and Yang believed that the construction of smart elderly care infrastructure should be coordinated, subsidies and tax incentives should be provided before establishing the long-term care insurance system [5, 16]. Meanwhile, Gao mentioned that experience should be accumulated through pilot projects, such as nursing homes for smart elderly care and age-friendly renovations, gradually expanding coverage step by step [9].

Zuo, Yang and Wen advocated for the development of nationwide unified technical standards and service protocols for smart elderly care, tackling challenges like poor platform interoperability and heterogeneous data [5, 19]. Qi called for establishing a unified platform of education resources, a dynamic updating mechanism, and coordinated inter-departmental implementation [8]. Zhu emphasized that policy should strike a balance between public interests and commercial profits, calling for an inter-departmental collaboration mechanism to enable rational allocation of resources [11].

Yuan and Wang suggested improving the legal framework, enhancing policy implementation effectiveness, and filling institutional gaps [10]. Wang and Liu explored the potential digital bureaucracy problems arising from government-driven technology promotion and suggested that policies should consider both technical standards and ethical constraints [9]. Zhu and Zhao put forward that policies should clearly define standards for age-friendly adaptations, such as accessible design and data security [14].

#### 3.3.4. Social coordination mechanism

Shen et al., Zhu, and Deng referred to the necessity of collaboration among the civil affairs, health, and industrial and information technology departments to share data and address the issue of information silos, such as the lack of integration between medical and elderly care data [12, 17]. Zhu and Deng also called for the enhancement of public ethics education, improvement of digital literacy among the elderly, and promotion of international cooperation to build global governance standards [12].

Mao et al., Wang et al., Yuan, Wang, and Yang suggested that governments, enterprises, communities, and families should coordinate to establish a multi-stakeholder governance model, promote shared responsibility and information exchange among stakeholders: enterprises focus on technology development, communities provide on-the-ground support, and families cooperate in using the services [7, 10, 15, 18]. Qi put forward that resource integration requires collaboration among enterprises, universities, and social organizations with a "family-community-public system" network [8]. Both Mao et al. and Gao suggested that resource allocation be balanced and targeted support should be provided for rural and low-income areas to help narrow the urban-rural gap, such as establishing community internet activity rooms for the elderly [15, 16].

In the research of Zuo, Yang, Zhu, Wen, and Liu, it was suggested to provide digital skills training for the elderly and encourage digital caregiving from children to parents, where children assist their parents in using technology. This can help bridge the digital divide and promote intergenerational inclusion [5, 11, 19]. Wang and Liu pointed out that the integration of technology into families, society, and public systems should respect the agency of the elderly and avoid reversing intergenerational roles [9].

### 3.4. Core conclusions

A common theme in the core conclusions is the emphasis on the importance of differentiated needs and the alignment of policies or technological developments accordingly, with particular attention to the digital divide and the genuine needs of older adults.

Differentiated needs are demonstrated. Wang et al. identified that the needs of the elderly vary significantly depending on their living arrangements—for example, those living alone tend to prioritize interactive design, while those living with their children place greater emphasis on privacy protection [7]. Zuo and Yang pointed out that younger seniors tend to prefer social and recreational activities, while older seniors rely more on health monitoring and care services [5].

Regarding policy or technology development, Shen et al. proposed that China's smart elderly care policies have shifted from technology-driven to service-centric; however, it faces problems such as imbalanced regional development and overly general policies [17]. Zuo suggested that a smart elderly care platform should provide precise and targeted services based on dynamic demand models and user profiling [6]. Gao proposed to prioritize the establishment of public platforms, research and development of inclusive products, and subsidies for the demand side, with an emphasis on phased technology promotion [16]. Wen and Liu put forward a plan to decrease risks under uncertainty through unified platforms with technology integration, digital literacy training, and emotional support [19].

### 3.5. Implications

Smart elderly care should segment different groups based on age, living arrangements, health status, and other factors, avoiding undifferentiated approaches. Policy coordination between central and local governments, as well as among departments, needs to be strengthened, and regional disparities should be reduced. A comprehensive legal framework should be established alongside efforts to enhance public ethics. While improving efficiency, it is essential to safeguard privacy, emotional dignity, and other ethical boundaries. Governance of smart elderly care should be advanced in stages, with special attention to digitally vulnerable groups. Priority support should be given to platform development, age-friendly technology research and development, and demand-side subsidies. Digital literacy among the elderly should be improved through community training and intergenerational support. Emotional care and clear distinctions between rights and responsibilities must also be emphasized.

## 4. Discussions

Research on smart elderly care exhibits multidimensional and interdisciplinary characteristics, covering areas such as social welfare, industry advancement, policy support, and risk governance. A limitation in existing literature is the frequent mention of the lack of unified standards for technology, data, and services in smart elderly care, while studies on how to establish inter-departmental and cross-regional standardized systems remain scarce. Although the digital divide is often discussed, there is a notable shortage of research on age-friendly technology design that addresses the usage habits and psychological needs of the elderly, and empirical support with participatory design involving the elderly is lacking. Future research should further integrate theory and empirical evidence, strengthen international comparative studies, and explore more inclusive and sustainable models

of smart elderly care. These studies reveal, from different perspectives, the core contradiction in smart elderly care, namely the dual challenge of technology versus human-centeredness. Future research needs to leverage empirical data to explore how to balance technological efficiency with elderly agency and to build a more inclusive and sustainable smart elderly care ecosystem.

## 5. Conclusion

As the global trend of population aging continues to intensify, China's aging population has become an increasingly prominent challenge. Traditional forms of elderly care, including both home-based and institutional, are under immense pressure, and the mismatch between the supply and demand for elderly care services is becoming more pronounced. In this context, smart elderly care, a new model that leverages information technology, has emerged as a key focus of policy support.

Current policy research unfolds in four directions, including technology application and innovation, service system optimization, policy support, and establishment of standards, as well as social coordination mechanisms. It mainly involves promoting the widespread adoption of technologies such as smart wearable devices, telemedicine and home monitoring systems to achieve intelligent health monitoring and emergency response; integrating elderly care resources of communities, institutions and families, establishing a comprehensive "internet + elderly care" platform and providing differentiated services; encouraging enterprises to active engage in elderly care through fiscal subsidies, tax benefits and other incentive measures provided by the government. Meanwhile, it is suggested to improve data security and industry standards, advocate multi-stakeholder collaboration, including families, communities, enterprises, and non-profit organizations, to build a sustainable elderly care model.

The core problems of developing smart elderly care encompass high technical costs, digital divide of the elderly, and privacy protection. To enhance the implementation effectiveness of policies, it is suggested to accelerate age-friendly design implementation and promote mature models through pilot programs, thereby achieving the widespread development of smart elderly care.

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