

Rural Elderly Care Dilemmas and Solution Pathways in the Context of Smart Elderly Care: A Collaborative Governance Perspective

He Jiaoyao*, Wei Yutong

School of Law and Public Administration, Yibin University, Yibin, Sichuan 644000, China.

Abstract: Against the background of population aging, urban–rural structural transformation, and the continued development of digital villages, the supply of rural elderly care services is under growing pressure from the weakening of family care, inadequate digital foundations, and insufficient service coordination. Smart elderly care, supported by the Internet, the Internet of Things, big data, artificial intelligence, and remote health management, provides new governance tools for improving the precision, accessibility, and continuity of rural elderly care services. However, the key to rural smart elderly care does not lie merely in building platforms or deploying devices, but in whether digital technologies can be translated into real, continuous, and affordable elderly care services. Drawing on collaborative governance and digital governance perspectives, and based on a review of relevant studies, this paper summarizes the practical dilemmas of rural smart elderly care into three dimensions: the weakening of family–based elderly care functions and the growing complexity of care needs, insufficient digital infrastructure and age–friendly conditions, and inadequate linkage between online platforms and offline care services. It further identifies three underlying causes: the mismatch between the logic of technological supply and the everyday life logic of older adults, the weak foundation of rural public service resources, and insufficient mechanisms for collaborative governance and sustainable operation. On this basis, the paper proposes three optimization pathways: county–level coordination, demand–oriented and age–friendly transformation, and multi–actor collaboration supported by institutional safeguards. The study argues that smart elderly care can become an important force for improving the quality of rural elderly care and advancing the modernization of grassroots governance only when it is embedded in the grassroots public service system and the everyday social life of rural communities.

Keywords: smart elderly care; rural elderly care; collaborative governance; digital governance; elderly care services; grassroots governance

1. Problem Statement

Population aging is a structural issue that China must confront over the long term in the process of modernization. Compared with urban areas, rural areas are characterized by a more pronounced outflow of young and middle–aged labor, larger public service radii, more dispersed elderly care resources, and the gradual weakening of support that was once provided by traditional family care, land–based security, and neighborhood mutual assistance. Existing research indicates that the rural elderly care service system in the new era faces multiple tensions between growing demand and insufficient service supply, as well as between limited protection levels and the need to improve service quality. Comprehensive adjustments are therefore urgently needed in institutional arrangements and service supply methods ^[1].

Smart elderly care is regarded as an important approach to alleviating the imbalance between elderly care supply and demand. In this paper, smart elderly care refers to the use of the Internet, the Internet of Things, cloud computing, big data, artificial intelligence, smart terminals, and telemedicine to connect, identify, match, and respond to older adults' health status, daily needs, and service resources, thereby improving the efficiency and quality of elderly care services. Research based on rural smart elderly care practice has found that smart elderly care can help

improve the quality of life of rural older adults; however, its implementation in rural areas still faces difficulties such as older adults' unfamiliarity with smart facilities, a shortage of professional personnel, and inadequate service quality^[2].

From the perspective of public management, the essence of rural smart elderly care is the embedding of digital governance tools into the grassroots public service system. Technology itself does not automatically solve elderly care problems. Governance effectiveness can be generated only when technology is combined with organizations, institutions, personnel, and service processes. Existing research on smart elderly care also reminds us that smart elderly care should not be understood merely as an informatization project, but should instead be analyzed within the broader contexts of elderly care service provision, grassroots governance, and social support networks^[3]. Accordingly, this paper follows the logic of "practical dilemmas—underlying causes—solution pathways" to explore directions for optimizing rural elderly care services in the context of smart elderly care.

2. Literature Review and Research Commentary

Research on rural elderly care service systems has mainly focused on demographic structural change, the weakening of family-based elderly care, insufficient public service provision, and the improvement of elderly care security systems. Existing studies generally hold that the basic contradiction in rural elderly care lies in the tension between rapidly growing care needs and insufficient service supply capacity. Lu and Sha (2019) argued, from the perspective of the rural elderly care service system, that elderly care services in the new era should be systematically improved in terms of top-level planning, resource allocation, service networks, and institutional coordination^[1].

Research on smart elderly care in China has paid considerable attention to conceptual connotations, development models, policy support, and practical difficulties. Chen and Shao (2021) argued that smart elderly care includes not only intelligent technological applications, but also the integration of service resources and the transformation of governance approaches. In practice, however, problems remain, such as conceptual generalization, technological determinism, fragmented supply actors, and unstable service quality^[3]. Ji (2022) also showed, through an analysis of home-based smart elderly care practice, that smart elderly care services still face problems such as limited service content, insufficient resource integration, and imperfect operational mechanisms^[4].

In the literature on technology-enabled elderly care services, scholarly attention has gradually shifted from "technology application" to an integrated analysis of "technology-organization-institution." Taking Shanghai as an example, Zhou et al. (2023) emphasized that the effective operation of smart elderly care depends on data connection, platform integration, service response, and organizational coordination^[5]. Liang et al. (2022) proposed the idea of "comprehensive elderly care," emphasizing the improvement of smart elderly care service quality through the integration of all elements and whole-process governance^[12]. From the perspective of value co-creation, Gu et al. (2025) further noted that digital technology can empower supply-demand matching and multi-actor collaboration, but insufficient emotional care, inadequate multi-actor participation, and insufficient regulatory standards still affect the realization of value in smart elderly care services^[13].

English-language studies provide important theoretical resources for understanding the acceptance of elderly care technologies and rural digital inequality. Peek et al. (2014), through a systematic review, found that factors influencing older adults' acceptance of aging-in-place technologies include technology cost, privacy concerns, perceived benefits, social influence, and health status^[6]. Saleminck et al. (2017), in a review of rural digital development, pointed out that rural digital inequality is not only a matter of network access, but also involves differences in

adoption capacity, use capacity, and social support^[8]. Majumder et al. (2017) showed that smart monitoring and home-based health management are still constrained by device usability, data processing, and sustained service capacity^[14]. Greenhalgh et al. (2017) proposed the NASSS framework, which also indicates that health and care technologies may face challenges of nonadoption, abandonment, scale-up difficulties, and insufficient sustainability during implementation^[15].

Overall, existing studies provide an important foundation for analyzing rural smart elderly care, but two limitations remain. First, some studies focus more on general models of smart elderly care and pay insufficient attention to how digital technologies can be transformed into offline care services in rural settings. Second, some studies emphasize technological empowerment but pay inadequate attention to grassroots governance, actor coordination, and sustainable operational mechanisms. On this basis, this paper combines collaborative governance and digital governance to analyze the practical dilemmas, formation mechanisms, and optimization pathways of rural smart elderly care service provision.

3. Theoretical Foundations and Analytical Framework

Collaborative governance theory emphasizes that, when facing complex public problems, a single government department or organization can rarely achieve governance goals independently. Instead, governments, markets, social organizations, communities, and the public must form resource complementarity and coordinated action around shared goals. Ansell and Gash (2008) pointed out that collaborative governance usually occurs between public agencies and non-state stakeholders and operates through formal or semi-formal mechanisms for joint decision-making and implementation^[9]. Rural elderly care services are complex. They involve civil affairs, health, medical insurance, disability federations, township governments, and village-level organizations, while also being closely related to family care, social organizations, corporate technology supply, and volunteer services. It is therefore appropriate to analyze them from a collaborative governance perspective.

Digital governance theory emphasizes the use of digital technologies to improve the precision, intelligence, and responsiveness of public management. Dunleavy et al. (2006) argued that digital-era governance requires the public sector to reorganize service processes, integrate information resources, and enhance the responsiveness of public services through digital technologies^[10]. For rural elderly care, digital technology can help grassroots organizations identify older adults' needs and establish health records and service lists. It can also improve service response efficiency through platform-based dispatching, remote consultation, emergency calls, and smart monitoring.

Combining collaborative governance and digital governance forms the analytical framework of this paper. In the needs identification stage, digital platforms, village-level visits, family feedback, and medical data jointly identify older adults' needs for daily care, health management, emotional support, and safety protection. In the resource integration stage, government funding, village-level organizations, rural doctors, caregivers, volunteers, social organizations, and enterprise platforms are connected. In the service response stage, online dispatching and closed-loop offline services are used to improve service efficiency. In the supervision and evaluation stage, data records, satisfaction feedback, and third-party evaluation are used to improve service quality.

4. Practical Dilemmas of Rural Elderly Care in the Context of Smart Elderly Care

4.1 Weakening Family-Based Elderly Care Functions and Increasingly Complex Service Needs

The first dilemma in rural elderly care arises from the decline of family care capacity. The out-migration of adult children makes it difficult for older adults to obtain timely assistance with

medical visits, daily care, and emotional companionship. Left-behind, empty-nest, solitary-living, and intergenerational caregiving situations further complicate elderly care needs. Many rural older adults require not only financial support, but also continuous services such as meal assistance, medical assistance, medicine purchasing, cleaning, maintenance, rehabilitation, companionship, and emergency rescue. If smart elderly care focuses only on health monitoring and data recording but cannot respond to these concrete daily needs, it will be difficult to truly improve the quality of rural elderly care. Existing research also shows that the prominent problems of the rural elderly care service system are not limited to insufficient protection in a single dimension, but reflect comprehensive gaps among family support, public services, and social resources^[1].

4.2 Insufficient Digital Infrastructure and Age-Friendly Conditions

Smart elderly care depends on networks, devices, platforms, and data. However, in some rural areas, network signals, smart terminal penetration, equipment maintenance capacity, and digital training support remain relatively insufficient. Even when smart wristbands, call devices, cameras, and health monitoring terminals are installed, they may be difficult to use continuously because of complicated operation, slow fault repair, cost burdens, and a lack of guidance. Liu and Li (2022), in their study of the elderly digital divide, explained that older adults' digital inclusion depends not only on individual learning capacity, but also on social support systems and institutional environments^[11].

4.3 Inadequate Linkage Between Online Platforms and Offline Care Services

When promoting smart elderly care, some localities tend to focus on platform construction, data visualization, and device deployment while neglecting offline service capacity. Platforms can collect older adults' information and display service needs. However, without caregivers, rural doctors, social workers, volunteers, and service organizations to respond, data cannot be transformed into real care. Domestic research indicates that the effective operation of smart elderly care must rely on data connection, resource integration, closed-loop services, and organizational coordination, rather than remaining at the level of devices, platforms, and displays^[5].

5. Causes of Rural Smart Elderly Care Dilemmas

5.1 Mismatch Between the Logic of Technological Supply and the Everyday Life Logic of Older Adults

Many smart elderly care projects are led by technology enterprises or administrative departments. As a result, services are often designed from the perspectives of device functions, platform indicators, and project demonstration, rather than from older adults' everyday lives. The logic of technological supply emphasizes intelligence, visualization, and datafication, whereas rural older adults are more concerned with whether someone will respond, whether the service is convenient, whether it is affordable, and whether it is trustworthy. If platforms are difficult to operate, service access points are fragmented, or use depends heavily on smartphones, older adults may reject or abandon them. Existing smart elderly care research indicates that technological determinism can easily lead to a deviation in service goals and thereby affect the practical effectiveness of smart elderly care services^[3].

5.2 Weak Foundation of Rural Public Service Resources and Professional Teams

Smart elderly care needs to rely on existing elderly care services, medical and health resources, and grassroots governance resources. However, some rural areas already suffer from insufficient service facilities, inadequate service personnel, and limited funding. Digital platforms can accelerate information flows, but they cannot automatically create service resources. Without caregivers, platforms cannot dispatch services; without rural doctors, health monitoring data cannot be interpreted; and without transportation and home-visit services, emergency calls

cannot be translated into timely rescue. If the foundation of rural public services is weak, smart elderly care can easily fall into the structural contradiction of “advanced platforms but insufficient services”^[1].

5.3 Insufficient Collaborative Governance and Sustainable Operation Mechanisms

Rural smart elderly care involves governments, village committees, enterprises, social organizations, medical institutions, families, and older adults themselves. These actors possess different resources and pursue different goals. Governments focus on policy implementation and basic services; enterprises focus on project construction and operational returns; village-level organizations focus on task completion and risk prevention; families focus on cost and convenience; and older adults focus on safety and dignity. If stable consultation, division of responsibilities, feedback, and supervision mechanisms are lacking, smart elderly care may suffer from unclear responsibilities, suspended projects, and weak follow-up operation. Collaborative governance theory emphasizes that multi-actor cooperation requires shared goals, institutionalized participation, and trust relationships^[9].

6. Solution Pathways for Empowering Rural Elderly Care Services Through Smart Elderly Care

6.1 Building an Online–Offline Service Closed Loop Through County–Level Coordination

Rural elderly care service users are dispersed, and the resources of a single village are limited. Therefore, smart elderly care should not be constructed in isolated village units, but should instead take the county as the basic unit of coordination. County-level governments can integrate resources from civil affairs, health, medical insurance, disability affairs, rural revitalization, and grassroots governance, and establish unified elderly care service information platforms and service dispatch centers. Townships can coordinate service resources, while village-level organizations can be responsible for needs identification, daily contact, and service feedback. Platform construction should revolve around a closed loop of “needs registration—assessment and classification—resource matching—service dispatch—process recording—outcome feedback.” Existing studies show that the key to technology-enabled elderly care lies in connecting data, service response, and organizational coordination^[5].

6.2 Improving Usability Through Real Needs and Age–Friendly Technological Transformation

Rural smart elderly care should start from older adults’ everyday needs rather than from device functions. Platform construction should give priority to connecting high-frequency services such as meal assistance, medical assistance, agency services, accompanied medical visits, maintenance, emergency rescue, chronic disease management, and emotional support. Older adult-facing terminals should promote one-click calling, voice interaction, dialect prompts, large-font display, simplified menus, and offline reminders. Children-facing terminals may provide health alerts, service appointments, fee inquiry, and remote care functions. Grassroots-facing terminals should provide older adults’ information, risk levels, service records, and follow-up reminders. The senior technology acceptance model proposed by Chen and Chan (2014) suggests that age-friendly design should consider physical ability, cognitive ability, perceived benefits, and usage support^[7].

6.3 Promoting Long–Term Operation Through Multi–Actor Collaboration and Institutional Safeguards

To avoid project-based and formalistic implementation, rural smart elderly care must establish mechanisms for multi-actor collaboration and institutional safeguards. Governments should be responsible for basic institutional design, fiscal support, bottom-line protection, and regulatory evaluation. Enterprises should be responsible for technology development, platform operation, and equipment maintenance. Village-level organizations should identify older adults’ needs, link services, and provide daily feedback. Rural doctors, caregivers, social workers, and volunteers

should provide health management, daily care, and emotional support. Family members should participate in remote care and service supervision through children-facing platforms. At the same time, the minimum necessary principle for data collection, access rights, retention periods, and accountability mechanisms should be clarified to prevent information leakage, excessive monitoring, and commercial misuse. Collaborative governance research shows that public service collaboration requires institutionalized participation, clear division of responsibilities, and sustained trust; only in this way can multi-actor resources be transformed into stable governance capacity^[9].

7. Conclusion

Smart elderly care provides an important opportunity for the transformation of rural elderly care services. However, the roots of rural elderly care dilemmas do not lie solely in technological insufficiency, but in the combined effects of weakened family care, inadequate public service resources, the digital divide, and insufficient multi-actor coordination. This paper summarizes the practical dilemmas of rural smart elderly care into three dimensions: the weakening of family-based elderly care functions and the growing complexity of service needs, insufficient digital infrastructure and age-friendly conditions, and inadequate linkage between online platforms and offline care services. It further identifies three causes: the mismatch between the logic of technological supply and the everyday life logic of older adults, the weak foundation of rural public service resources and professional teams, and insufficient collaborative governance and sustainable operation mechanisms. It then proposes three optimization pathways: county-level coordination, demand-oriented and age-friendly technological transformation, and multi-actor collaboration with institutional safeguards.

Future rural smart elderly care construction should realize three shifts: from emphasizing device construction to emphasizing service implementation, from emphasizing platform launch to emphasizing problem solving, and from emphasizing technological display to emphasizing older adults' experiences. Only by organically integrating digital platforms, offline care, medical and health services, social organizations, family support, and grassroots governance systems can smart elderly care truly enter the everyday lives of rural older adults and become an important pathway for improving the quality of rural elderly care services and advancing the modernization of grassroots governance.

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