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Original Article

Service Demands for a Community-Based Eldercare Model in Luoyang City: A Cross-Sectional Study

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Running Title: A community-based eldercare model

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Abstract:

Objective: Community-based older adult care is an emerging model in China that enables older adults to receive home-based care and has expanded alongside government policy initiatives. However, challenges remain, including inefficient resource allocation and mismatches between service supply and demand. This study identified service demands and unmet needs among older adults participating in community-based care services in Luoyang City.

Material and Methods: This cross-sectional study used a 5-point Likert-scale questionnaire based on the Kano model to collect data from older adults receiving community-based care services in Luoyang City. The questionnaire demonstrated acceptable validity and reliability (IOC=0.7; Cronbach's α=0.8). The Kano model classified service demands into five categories: must-be, one-dimensional, attractive, indifferent, and reverse quality. Data were analyzed using descriptive statistics.

Results: Of 326 eligible participants, 310 completed the questionnaire (response rate: 95.09%). The mean age was 72.63 years, and most participants were female (60.97%), married (97.42%), and had at least one chronic disease (86.77%). The most frequently reported service demands were meals on wheels (84.52%), emergency rescue (76.13%), chronic disease management (52.90%), chat services (40.97%), and home care (39.35%). Participants demonstrated high expectations for life care, prevention, healthcare, and medical services.

Conclusion: Older adults reported substantial demand for community-based care services. Service models should prioritize essential care needs and align service provisions with older adults' expectations to improve service effectiveness and satisfaction.

Keywords: community health services, home care services, long-term care, aged, health services needs and demand, patient satisfaction

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Introduction

Aging is a social issue China urgently needs to address. By the end of 2023, there were 296.97 million people aged 60 and above in China, accounting for 21.1 percent of the total population[1]. The older adult population has placed significant pressure on older adult care services. In response, the Chinese government proposed a community-based older adult care model in 2013.

This model combines the functions of home care and institutional care within the community, adopting market competition mechanisms. It utilizes internal and external community resources to provide an integrated older adult care service model for older adults in their residences.

The community-based older adult care model is unique to China, developed based on Karl Polanyi's embedding theory[2]. In 1985, Mark Granovetter expanded this model with the social embeddedness theory[3]. Other researchers have advanced the embeddedness theory by integrating elements such as information, capital, and institutions[4–6]. The United States earlier proposed the Continuing Care Retirement Community (CCRC) model, which takes continuous care as the core and arranges diversified facilities for older adult groups at different care levels[7]. However, the CCRC model requires older adults to live in centralized facilities, and its high cost makes it difficult to implement widely, particularly in developing countries like China. China's community-based older adult care model is more affordable and suited to the country's conditions and social structure. This model integrates institutional services, family support, and community convenience to offer comprehensive services for the older adults, making it a key trend in older adult care services in China.

The community-based older adult care model is still developing in China, with no similar models abroad from which to draw experience. Chinese scholars focus on the theoretical research and practical exploration of this model, emphasizing development strategies, service contents, operation mechanisms, and regional experiences[8–10]. However, the evidence remains limited and lacks systematic discussion. Current research has key shortcomings. First, the problem isn't considered from a demand perspective. Few scholars have explored older adults' internal needs to determine the appropriate services. Questions remain about whether this model can address the older adults' diverse healthcare needs, which needs should be prioritized, and whether the services are feasible. Secondly, research models are often too simplistic, mainly relying on research, surveys, interviews, and comparative research. While valuable for theoretical analysis, many studies lack the empirical data to support their conclusions.

Community-based older adult care models have been widely documented to yield multifaceted benefits for older adults, including improved quality of life, enhanced functional independence, reduced institutionalization rates, and better psychological well-being. Evidence

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from multiple Chinese cities indicates that community-embedded care can lower the risk of social isolation, increase access to daily assistance and primary care, and reduce hospitalization frequency among the older adults. Despite these documented benefits, most existing research in China remains descriptive or policy-oriented, with limited empirical evidence quantifying demand hierarchies and unmet needs at the local level[8-10], especially in central inland cities such as Luoyang. This study addresses these gaps by systematically identifying service demand priorities using the Kano model.

The Kano model is a widely used quality-and-demand classification framework developed by Noriaki Kano, which categorizes user requirements into five types based on their impact on satisfaction and dissatisfaction: must-be quality (M), one-dimensional quality (O), attractive quality (A), indifferent quality (I), and reverse quality (R). Must-be (M): basic requirements; absence causes strong dissatisfaction, while presence does not significantly increase satisfaction. One-dimensional (O): linear relationship; higher fulfillment leads to higher satisfaction, and lower fulfillment leads to dissatisfaction. Attractive (A): delight factors; presence strongly increases satisfaction, while absence causes no dissatisfaction. Indifferent (I): no significant impact on satisfaction or dissatisfaction. Reverse (R): presence reduces satisfaction; absence increases satisfaction. The model enables researchers to prioritize services and allocate resources efficiently, making it suitable for analyzing hierarchical older adult care service demands.

In Luoyang City, the community-based older adult care model enables older adults to receive care services at home, balancing personalized care and socialization. While government policies support this model's development, challenges persist in resource allocation and service supply-demand matches. Taking Luoyang City as an example, our study used the Kano model to identify older adults' hierarchical demands for community-based older adult care services. This approach helps prioritize demand satisfaction and propose optimization strategies to improve service quality and satisfaction. The findings provide insights for government policy formulation and service project design, offering practical reference for advancing community-based older adult care in Luoyang City.

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Material and Methods

Study design and setting

This study employed a cross-sectional design. Data were collected in Luoyang City, Henan Province, China, from March to October 2024. The study was reviewed and approved by the Mahasarakham University Ethics Committee for Research Involving Human Subjects (Approval No: 124-761/2025). All participants provided informed consent, and data were handled anonymously and securely. By the end of 2023, Luoyang had a permanent population of 7.08 million, including 1.42 million residents aged 60 and above (20% of the population). Among them, 1.02 million were aged 65 or older, and more than 170,000 were aged 80 or above, indicating a significant aging population[11]. Luoyang began implementing the community-based older adult care model on March 18, 2019[12], expanding it to five community-based older adult care institutions by March 31, 2024.

Participants

This study was conducted in Luoyang City, Henan Province, Central China. Participants were selected based on the following criteria: (a) normal communication, reading, and writing abilities; (b) informed consent and voluntary participation. Participants who were illiterate or diagnosed with psychosis at recruitment were excluded.

Sampling strategy

A multistage purposive sampling method was used. Five government-recognized community-based older adult care institutions in Luoyang City were selected, and eligible older adults regularly using community older adult care services were recruited. Eligible participants were aged ≥60 years, had normal communication and reading ability, and provided informed consent. Exclusion criteria included illiteracy and diagnosed psychosis.

Sample size calculation

Sample size was calculated using the formula for cross-sectional studies:

$n = Z^2 \times p \times (1-p) / d^2$

where

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Z = 1.96 (95% confidence level)

p = 0.5 (assumed maximum proportion of demand)

d = 0.05 (margin of error)

The calculated minimum sample size was 384. Considering an estimated 10% non-response rate, the target sample size was adjusted to 423. Due to practical recruitment constraints, a total of 360 participants were initially recruited, of whom 326 met inclusion criteria. Although slightly below the calculated minimum, the final sample of 326 met the practical requirements for general descriptive analysis and Kano classification.

Instruments

Socio-demographic characteristics questionnaire

This questionnaire collected basic information on participants, including gender, age, education level, marital status, monthly income, number of children, presence of chronic diseases, and ability to perform activities of daily living (ADL) independently. All questionnaires (socio-demographic and Kano demand questionnaires) were designed and administered in simplified Chinese, the official language of mainland China. The questionnaire was developed based on national and local older adult care policies, existing literature, and expert consultation. The Item Objective Congruence (IOC) index was 0.7, indicating acceptable content validity. A pre-test among 30 older adult participants confirmed clarity and logical consistency. Exploratory factor analysis (EFA) was also conducted; four factors (life care, medical services, prevention/healthcare, and psychological comfort) were extracted, which explained 68.7% of the total variance, supporting good construct validity. The overall Cronbach's α coefficient of the questionnaire was 0.80, indicating good internal consistency. Cronbach's α for each dimension ranged from 0.74 to 0.82.

Kano questionnaire on the demand for a community-based older adult care model

The Kano model categorizes customer (participant) demands into five types: must-be quality (M), one-dimensional quality (O), attractive quality (A), indifferent quality (I), and reverse quality (R). The presence of R can reduce customer satisfaction. For instance, in this study, community-based older adult care institutions providing certain expensive services can be regarded as R.

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Importance coefficients for satisfaction were calculated using the satisfaction index (SI) and dissatisfaction index (DSI)[13]. Satisfaction Index (SI) = (A + O) / (A + O + M + I), where A = number of "attractive" responses, O = number of "one-dimensional" responses, M = number of "must-be" responses, and I = number of "indifferent" responses. SI ranges from 0 to 1; higher values indicate greater satisfaction improvement when the service is provided. Dissatisfaction Index (DSI) = −(O + M) / (A + O + M + I). DSI ranges from −1 to 0; values closer to −1 indicate greater dissatisfaction when the service is absent.

SI and DSI measure distinct aspects of service quality: SI captures positive satisfaction gain, while DSI captures negative dissatisfaction risk. One index alone is insufficient: SI cannot reflect the severity of dissatisfaction from missing basic services, and DSI cannot reflect the potential satisfaction gain from high-value services. Using both indices allows comprehensive assessment of expectations (SI) and dependence (DSI), which is essential for prioritizing must-be services (high |DSI|) and optimizing attractive services (high SI). The satisfaction index (SI) and dissatisfaction index (DSI) formulas were adapted from the established Kano model evaluation methods described by Berger et al.[21].

To prioritize service projects under the same demand attribute, we introduced an average satisfaction coefficient (ASC) to rank the importance of service projects. The ASC was calculated according to the method proposed by Jang et al.[13].

Calculation formula:

$$ASC = 1/2\times[F(A) + F(O)\times 2 + F(M)]/[F(A) + F(O) + F(M) + F(I)]=(|SI| + |DSI|)/2$$

ASC was calculated for each service item to determine priority. ASC integrates both satisfaction and dissatisfaction impacts; higher ASC indicates greater overall importance and higher implementation priority. The higher the ASC value, the greater the importance and priority assigned to the demand.

Service items and categories

The questionnaire was developed based on relevant Chinese government policies[14–16] and literature from Chinese scholars[17–21]. A total of 32 service items were identified from policy documents and literature, grouped into four predefined categories:

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1. Life care services (10 items: e.g., meals on wheels, emergency rescue, home care);
2. Medical services (8 items: e.g., in-community medical care, drug dispensing);
3. Prevention and health care services (8 items: e.g., chronic disease management, regular physical examination);
4. Psychological comfort services (6 items: e.g., chat services, recreational activities).

Demand type classification

Kano classification was determined using the standard evaluation table: for each service item, participants answered functional and dysfunctional questions. Responses were cross-tabulated to assign each item to one of the five types (M/O/A/I/R) following the established Kano criteria.

Data collection

Data collection was interviewer-administered (face-to-face). Ten trained investigators conducted one-on-one interviews in community centers. Investigators read questions aloud, clarified ambiguity, and recorded responses on-site to ensure accuracy, especially for older adults with limited education or vision impairment. No telephone or online interviews were conducted.

Before data collection, all 10 investigators received standardized training regarding participant recruitment, informed consent procedures, questionnaire administration, interpretation of Kano functional/dysfunctional questions, communication with older adult participants, and ethical considerations. A standardized operating procedure (SOP) manual was used to ensure consistency in interview conduct, clarification of participant queries, response recording, and data handling, thereby minimizing inter-rater bias. Pilot interviews were conducted prior to formal data collection to calibrate investigators and standardize interpretation and recording procedures.

Data analysis

Data were entered using EpiData 3.1 with a double-entry method to ensure accuracy. Questionnaires with inconsistent logical responses (e.g., reporting no chronic disease but selecting chronic disease management as a demand) or >10% missing items were excluded to ensure data accuracy and reliability. Retaining invalid data would distort Kano classification and demand

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prioritization, leading to biased conclusions. Double data entry and consistency checks further minimized data errors. Statistical analyses were conducted using IBM SPSS Version 25.0.

Participant characteristics and service demands were summarized using descriptive statistics. Continuous variables (e.g., age) were reported as mean ± standard deviation (S.D.), while categorical variables were presented as frequencies and percentages.

Results

Participant Characteristics

A total of 326 older adult participants from five community-based older adult care institutions met the inclusion criteria. Of these, 310 valid questionnaires were collected (effective response rate: 95.09%). The remaining 16 questionnaires were excluded due to incomplete responses or logical inconsistencies. The mean age was 72.63 years (S.D. = 4.71; range: 62–88 years). Most participants were female (n = 189, 60.97%), married (n = 302, 97.42%), and had a senior high school education (n = 196, 63.23%). Most reported a monthly income of ¥3,000–¥5,000 (n = 274, 88.39%) and had one child (n = 204, 65.81%). In terms of health status, the majority had at least one chronic disease (n = 269, 86.77%), although 61.94% (n = 192) were able to care for themselves.

Service demand based on Kano model and priority level

The demand attribute classification of various service items can be obtained through the Kano model demand attribute analysis table. A total of 5 must-be qualities, 5 one-dimensional qualities, 13 attractive qualities, and 9 indifferent qualities were identified.

The top five demands identified were: meals on wheels (n = 262, 84.52%, ASC = 0.624), emergency rescue (n = 236, 76.13%, ASC = 0.614), chronic disease management (n = 164, 52.90%, ASC = 0.569), chat services (n = 127, 40.97%, ASC = 0.533) and home care (n = 122, 39.35%, ASC = 0.504) (Table 1).

Table 1 Division of community-based older adult care demand based on Kano quality

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SI distribution of community-based older adult care demand

Comparing SI and DSI distributions, 27 of the 32 services had SI>|DSI|, indicating that participants' overall demand showed a tendency toward high expectations. Five services had SI<|DSI|: dining hall (A1), day care (A4), emergency rescue (A7), in-community medical service (B1), and recreational activities (D1).

The highest SI value was for B3 referral assistance (0.776), indicating that providing this service could increase participants' satisfaction by 77.6%, reflecting the highest expectation for this service. |DSI| was highest for A7 emergency rescue, indicating that if this service is not provided, satisfaction would decrease by 75.6%, showing the greatest dependence on this service.

Expectation and dependency comparison of service classes

By calculating the SI and |DSI| corresponding to each service category and comparing the SI of various services with that of |DSI| as a whole, the results showed that SI had the expected tendency of "prevention and health care > medical service > life care > psychological comforting". |DSI| showed a tendency to rely on life care > psychological comforting > medical service > prevention and healthcare.

Table 2 Comparison of SI and |DSI| for different service categories

Discussion

The present study used the Kano model to classify and prioritize community-based older adult care service demands among older adults in Luoyang, providing insight into hierarchical care needs in inland Chinese cities. Overall, older adults demonstrated high dependence on life care services and high expectations for preventive, healthcare, and medical services, reflecting the growing burden of chronic disease alongside relatively preserved functional independence among many participants.

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Consistent with previous studies in Shanghai and Chengdu, life care services, particularly emergency rescue, meals on wheels, and home care, were identified as the highest priorities. Emergency rescue showed the highest dissatisfaction index, indicating that safety-related services represent a fundamental requirement in community older adult care. This finding is consistent with previous evidence emphasizing emergency response capacity as a key component of person-centered care, especially for older adults living alone or with chronic diseases. In contrast, psychological comfort services showed relatively high dependence but lower expectations, suggesting that social and recreational services support daily well-being but are considered secondary to essential care needs.

Preventive and healthcare services demonstrated the highest satisfaction expectations, particularly for chronic disease management and regular health monitoring. Although 86% of participants reported at least one chronic disease, existing services remain fragmented and insufficiently personalized. These findings align with current national policies promoting preventive care and long-term chronic disease management within community settings. Medical services were primarily viewed as necessary for routine health maintenance rather than intensive treatment.

Compared with Western institutional models such as Continuing Care Retirement Communities, China's community-based older adult care model is more affordable, family-oriented, and integrated into daily community life. However, the findings indicate that service provisions in Luoyang still fall short of demand, particularly in emergency response, chronic disease management, and meal delivery.

Strengths and limitations

The primary function of the community-based older adult care model is to address older adults' demands. We classified these demands using the Kano model, identified their types and priorities, providing a reference for improving the community-based older adult care model. However, study limitations should be considered. There are deficiencies in our sample size and composition. The older adult population is diverse, and care needs vary based on region, age, economic level, health status, and education. These variations influence older adult care service demands. Furthermore, our study focused on older adult care institutions in Luoyang City, which

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may limit the findings' generalizability. Nonetheless, the results largely reflect the overall demands of the older adults for the community-based older adult care model.

Furthermore, this study did not conduct subgroup analysis on the older adult population. To enhance analytical depth and practical relevance, subgroup analyses by functional dependency status are recommended. Participants can be stratified into independent (ADL fully intact) and dependent (ADL impaired) groups. Comparisons of SI, DSI, and ASC across subgroups may reveal differential demand patterns: dependent older adults may prioritize life care and emergency services, while independent older adults may focus more on prevention and psychological services. Such subgroup findings can inform targeted service design and resource allocation for vulnerable subgroups.

Conclusion

This study systematically assessed community-based older adult care service demands among older adults in Luoyang using the Kano model. The findings indicate that older adults have substantial and hierarchical service needs, with must-be and one-dimensional quality services playing a central role in satisfaction. Overall, participants demonstrated greater expectations than dependence across service items, with the highest dependence observed for life care services and the highest expectations for preventive, healthcare, and medical services.

The three major unmet needs identified were insufficient emergency rescue services, fragmented chronic disease management, and inadequate meals on wheels services. To address these gaps, older adult care institutions should strengthen 24-hour emergency response systems, develop integrated and person-centered chronic disease management programs, and improve the accessibility and personalization of meal delivery services.

These findings provide practical guidance for optimizing community-based older adult care services in Luoyang and may support evidence-based policy developments and tiered resource allocation strategies for sustainable older adult care in China. Essential must-be services, such as emergency rescue and meal delivery, should receive priority funding and infrastructure support, while attractive and preventive services may be progressively expanded according to community demand patterns and available resources.

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Conflict of Interest

The authors declare no conflicts of interest.

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Table 1 Division of community-based older adult care demand based on Kano quality

Classification of service items		ID	Quality	SI	DSI	ASC
Life care service	Dining hall	A1	M	0.217	-0.692	0.455
	Meals on wheels	A2	O	0.726	-0.512	0.624
	Bath	A3	I	0.313	-0.046	0.180
	Day care	A4	M	0.334	-0.384	0.359
	Home care	A5	O	0.609	-0.398	0.504
	Short-term full-time care	A6	I	0.353	-0.200	0.277
	Emergency rescue	A7	M	0.472	-0.756	0.614
	Buying service	A8	A	0.586	-0.126	0.356
	Travel escort	A9	A	0.573	-0.046	0.310
	Aging modification	A10	A	0.737	-0.097	0.417
Medical service	In-community medical services	B1	M	0.186	-0.748	0.467
	Free medical services	B2	A	0.767	-0.114	0.441
	Transfer treatment assistance	B3	A	0.776	-0.186	0.481
	Rehabilitation nursing	B4	A	0.645	-0.162	0.404
	Family doctor	B5	I	0.466	-0.065	0.256
	Drug distribution	B6	O	0.602	-0.348	0.475
	Home sick-bed	B7	I	0.302	-0.063	0.183
	Medical equipment rental	B8	I	0.210	-0.186	0.198
Prevention and health care	Regular physical examination	C1	A	0.654	-0.145	0.400
	Establish a health record	C2	I	0.302	-0.138	0.220

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Classification of service items		ID	Quality	SI	DSI	ASC
	Disease prevention and management	C3	A	0.723	-0.134	0.429
	Chronic disease management	C4	O	0.656	-0.482	0.569
	Rehabilitation guidance	C5	A	0.731	-0.092	0.412
	Health consultation	C6	A	0.546	-0.064	0.305
	Medication guidance	C7	A	0.718	-0.246	0.482
	Chinese medicine service	C8	A	0.738	-0.057	0.398
Psychological comforting	Recreational activities	D1	M	0.214	-0.703	0.459
	Psychological counseling	D2	I	0.202	-0.152	0.177
	Regular visit	D3	A	0.706	-0.182	0.444
	Chat service	D4	O	0.668	-0.397	0.533
	Interpersonal regulation	D5	I	0.413	-0.182	0.298
	Interest training course	D6	I	0.162	-0.038	0.100

Must-be quality (M), one-dimensional quality (O), attractive quality (A), indifferent quality (I), satisfaction index (SI), dissatisfaction index (DSI), average satisfaction coefficient (ASC).

Table 2 Comparison of SI and |DSI| for different service categories

Categories of demands	Mean value		SD		Maximum value		Minimum value	
	SI	|DSI|	SI	|DSI|	SI	|DSI|	SI	|DSI|
Life care	0.492	0.326	0.172	0.250	0.737	0.756	0.217	0.046

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Medical service	0.494	0.234	0.225	0.212	0.776	0.748	0.186	0.063
Prevention and health care	0.634	0.170	0.139	0.130	0.738	0.482	0.302	0.092
Psychological comforting	0.394	0.276	0.222	0.219	0.706	0.703	0.162	0.038

Satisfaction index (SI), dissatisfaction index (DSI).

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