A Kano Model-Based Needs Analysis and Satisfaction Survey of Contracted Family Doctor Services Among Tianjin Residents: Post-print

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Abstract

Background Family doctor contract services in China have achieved nationwide widespread promotion, yet still face challenges in further improving both the contract signing rate and service quality. Therefore, conducting in-depth investigation and analysis of residents' actual demands for family doctor contract services is of particular importance. Objective To utilize the Kano model to analyze demand differences for family doctor contract services among community residents of different ages and contract statuses in Tianjin, and to evaluate the satisfaction of contracted residents. Methods A multi-stage sampling method was employed to distribute questionnaires to residents of six communities in Tianjin from October 2023 to January 2024. Data collection was conducted through interviewer-assisted administration. Residents' demands for family doctor contract services were analyzed based on the Kano model, while simultaneously investigating their satisfaction with these services. Results A total of 600 valid questionnaires were collected. Kano model analysis of residents' demands for family doctor contract services revealed that community health education, diagnosis and treatment of common diseases, a 5% increase in outpatient reimbursement ratio, and long-prescription drug dispensing aligned with the must-be attribute; home visits, family healthy lifestyle guidance, referral services, and comprehensive health status assessment aligned with the one-dimensional attribute; family medication guidance, personal annual health planning, and family wards aligned with the attractive attribute; cultivating health knowledge and skills, and establishing electronic health records aligned with the indifferent attribute. Demand attribute categories varied among residents of different ages and contract statuses. The top five satisfaction scores among contracted residents were: 5% increase in outpatient reimbursement ratio ($4.1\$\pm1.1$), $long-prescriptiondrugdispensing(4.0\pm1.1)$, $establishingelectronichealthrecords(3.6\pm1.2)$, $diagnosisandtreatment$

$cultivatinghealthknowledgeandskills$(3.1±1.2), $familymedicationguidance$(3.1±1.3), $referralservices$(3.1±1
Conclusion This study demonstrates significant demand variations for family doctor services among residents of different ages and contract statuses in Tianjin, necessitating stratified service strategies to precisely align core medical needs with extended service provision.

Full Text

Demand Analysis and Satisfaction Survey of Family Doctor Contracted Services Among Tianjin Residents Based on the Kano Model

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Abstract

Background Family doctor contracted services have been widely implemented across China. However, challenges remain in further improving the contract rate and service quality. Therefore, conducting in-depth research and analysis on residents'actual needs for these services is critically important. **Objective** To analyze the differences in demand for family doctor contracted services among residents of varying ages and contract statuses in Tianjin communities using the Kano model and evaluate satisfaction levels among contracted residents.

Methods A cluster stratified sampling method was adopted to distribute questionnaires to residents in six Tianjin communities from October 2023 to January 2024. Data were collected through face-to-face interviews. A Kano model-based demand analysis was conducted, and satisfaction levels with contracted services were assessed.

Results A total of 600 questionnaires were collected. Kano model analysis categorized residents' demands as follows: Must-be attributes included community health education, diagnosis and treatment of common diseases, a 5% increase in outpatient reimbursement rates, and extended

prescription services. One-dimensional attributes included home visits, family health lifestyle guidance, referral services, and comprehensive health status evaluations. Attractive attributes included family medication guidance, personalized annual health plans, and home-based medical care. Indifferent attributes included health knowledge/skill development and electronic health record establishment. Demand categories varied significantly by age and contract status. The top five satisfaction items among contracted residents were: increased outpatient reimbursement rates $(4.1\$\pm1.1), extendedprescriptions(4.0\pm1.1), electronichealthrecords(3.6\pm1.2), commondiseasetreatment(3.3$
$healthknowledge/skilldevelopment(3.1\pm1.2), familymedicationguidance(3.1\pm1.3), referralservices(3.1\pm1.0$
$basedmedicalcare(3.0\pm1.3), andhomevisits(2.9\pm\$1.2)$.

Conclusion Significant differences exist in the demands for family doctor services among Tianjin residents of different ages and contract statuses. Stratified service strategies are essential to precisely align core healthcare needs with extended service provision.

Keywords Family doctor; Family doctor contracted services; Residents' needs; Tianjin; Kano model

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Family doctor services constitute a core component of primary healthcare systems and hold promise for opening new prospects for China' s tiered diagnosis and treatment system. Centered on general practitioners, these services provide continuous, comprehensive medical care and health management through contractual arrangements, aiming to improve health outcomes, optimize resource utilization, and reduce medical expenses. In 2016, with State Council approval, multiple departments jointly issued the "Guiding Opinions on Promoting Family Doctor Contracted Services," launching pilot programs in 200 comprehensive public hospital reform cities. To standardize and promote high-quality development of these services, the Tianjin Municipal People' s Congress formulated the "Regulations on Family Doctor Contracted Services in Tianjin" on December 1, 2022, tailored to local conditions. Tianjin has continuously optimized its "3+1+N" service model, where "3" represents the basic medical-nursing-public health team (family doctors, nurses, public health personnel), "1" denotes the addition of senior hospital specialists to enhance technical support, and "N" refers to integrating diverse professional forces including rehabilitation, healthcare, and psychological counseling to build a multidisciplinary collaborative service system. The city has also improved team specialization, explored innovations in individual doctor contracting and flexible contract periods, and continuously enhanced residents' sense of gain and satisfaction. As of May 2025, Tianjin had established 2,557 family doctor service teams, aiming to reach 5 million contracted residents by 2025. However, expanded contract scale does not directly equate to synchronized service quality improvement, nor does it fully reflect residents' differentiated needs regarding service content, format, and prioritization. To address this gap, this study employs the Kano model to systematically analyze residents' core demand attributes for family doctor contracted services

and inter-group differences, aiming to reveal a synergistic optimization path between "quantity" and "quality" and provide scientific evidence for precise supply-demand matching.

Developed in 1984 by Professor Noriaki Kano of Tokyo Institute of Technology, the Kano model integrates the degree of product quality characteristic implementation with user satisfaction, constructing a two-dimensional cognitive framework of "quality characteristic implementation degree–user perceived satisfaction." Based on the relationship between actual product performance and customers' subjective experience, the model identifies a series of relational attributes within this dual-dimensional framework to classify and prioritize customer needs. It has been widely applied to evaluate patient needs for medical services.

1.1 Study Subjects

This cross-sectional study surveyed Tianjin residents from October 2023 to January 2024. Inclusion criteria were: (1) aged 18–80 years; (2) having resided in Tianjin for at least six months. All participants provided informed consent and voluntarily joined the survey. The study was approved by the Ethics Committee of Tianjin Medical University General Hospital (IRB approval number: IRB-2023-KY-250).

1.2 Sample Size Calculation

Using the sample size formula $n=Z^2\times p\times(1-p)/d^2$, parameters were set to prioritize control of potential bias risk: a 50% response distribution ($p=0.5$) to address the lack of prior data, a 5% acceptable margin of error ($d=0.05$) to balance precision and cost, and a 95% confidence level ($Z=1.96$) to ensure estimation reliability. The calculated minimum total sample size was 384.

1.3 Sampling Method

This study employed multi-stage sampling: (1) **Stratified sampling**: Based on economic vitality index (foreign capital utilization intensity 25%, local and foreign currency deposit balance 20%, private economy proportion 30%, physicians per thousand population 25%, with public health expert scoring determining weights), Tianjin' s 10 districts were divided by index tertiles, with one district randomly selected from high, medium, and low tiers (3 districts total). (2) **Community sampling**: Within selected districts, communities were categorized as old neighborhoods or commercial housing based on construction year, housing price, and property type, with one community randomly selected from each category (6 communities total). Sample size was allocated by household proportion (formula: community sample size = 600 × number of households / total households). (3) **Population sampling**: Over 14 consecutive days across 4 time periods (8:00–10:00, 11:00–13:00, 14:00–16:00, 18:00–20:00), dynamic systematic sampling was implemented at community activity centers (interval =

foot traffic/20, random seed = 202310). Within households, one person was randomly selected using the Kish table, supplemented by 15% mobile households (n=90). The final target was to collect 600 questionnaires.

1.4 Questionnaire Design

1.4.1 Establishment of Thematic Working Group: A thematic working group was formed according to research objectives and subjects, comprising 3 general practitioners from tertiary hospitals (each with over 10 years of grassroots referral coordination experience), 2 specialists from tertiary hospitals (cardiology and endocrinology, covering chronic diseases with high prevalence among contracted residents), and 3 general practitioners from community health service centers (policy implementation effects may vary by community economic level; GPs from high-, medium-, and low-income communities with $ $5 years of experience were selected).

1.4.2 Questionnaire Development: In 2017, Tianjin Municipal Health Commission clearly defined service categories, establishing the "Tianjin Family Doctor Contracted Service Agreement" that divides services into three main components: basic medical services (4 items), basic public health services (6 items), and personalized health management services (2 items), plus other agreed services (1 category), totaling 4 categories with 13 service items (see Table 1). Based on this framework, the thematic working group developed the demand analysis and satisfaction sections of the questionnaire with scientific rigor. Two community health center family doctor team leaders and one statistics expert were invited to discuss questionnaire item completeness, discriminability, and convenience, further refining the instrument.

1.4.3 Questionnaire Content: (1) **Part 1**: Basic demographic information including gender, age, education level, marital status, etc. (2) **Part 2**: Family doctor contracted service needs survey based on the Kano model, with 13 items. Each service item had both positive and negative questions, such as "How would you feel if this service were provided?" and "How would you feel if this service were not provided?" For each question, respondents selected the most appropriate answer from: "dislike," "can tolerate," "indifferent," "should be this way," or "like." (3) **Part 3**: Satisfaction with 13 service items specified in Tianjin' s family doctor contracted service regulations, with response options of "very dissatisfied," "somewhat dissatisfied," "neutral," "somewhat satisfied," and "very satisfied." This section was only for contracted residents.

1.4.4 Pilot Survey: The pilot survey was conducted September 10-15, 2023, in Huayuan Juhuali Community, Nankai District, Tianjin, using convenience sampling. Thirty valid questionnaires were collected (81.1% response rate, 30/37). Reliability analysis showed an overall Cronbach' s α coefficient of 0.847; validity testing yielded a KMO value of 0.828 (Bartlett' s test of sphericity $P<0.001$), indicating good reliability and structural validity.

1.5 Kano Model

The Kano model survey includes both positive and negative questions for each function/need. By combining answers to both directional questions, 25 combination patterns emerge, each corresponding to a Kano model attribute. Based on statistical results, the attribute with the highest proportion serves as the final classification, including indifferent attribute (I), must-be attribute (M), one-dimensional attribute (O), and attractive attribute (A). When implementing quality improvement based on attributes, priority should focus on must-be attributes, followed by one-dimensional attributes, and finally attractive attributes.

1.6 Satisfaction Calculation

Patient satisfaction refers to patients' satisfaction with medical services received, depending on the alignment between actual needs and care experiences. Satisfaction was scored using a 5-point Likert scale, with responses of "very dissatisfied," "somewhat dissatisfied," "neutral," "somewhat satisfied," and "very satisfied" assigned values 1-5. Contracted residents' satisfaction was surveyed. Individual scores $ $4 were defined as satisfied, while <4 were dissatisfied. Service satisfaction score = (5.00 × number of very satisfied + 4.00 × number of somewhat satisfied + 3.00 × number of neutral + 2.00 × number of somewhat dissatisfied + 1.00 × number of very dissatisfied) / number of respondents.

1.7 Survey Method and Quality Control

One community staff member from each community was recruited as an investigator. Twelve investigators received training covering: (1) understanding the survey' s purpose and significance; (2) learning communication techniques. Professional investigators assisted residents one-on-one in completing questionnaires. Before the survey, residents received health education and provided consent. All data were collected through face-to-face interviews. A total of 714 questionnaires were distributed, with 634 collected (88.8% response rate). After collection, all questionnaires underwent dual cross-verification to ensure no duplication or omission, retaining complete cases without logical errors and excluding invalid questionnaires (n=34), yielding 600 valid questionnaires (94.6% valid response rate). Invalid questionnaire criteria were: (1) fewer than 5 items completed; (2) patterned consecutive responses.

1.8 Statistical Methods

Data were double-entered and organized using EPiData 3.1 software, with statistical analysis performed using SPSS 27.0. Count data were expressed as frequency (percentage), and measurement data as ($\bar{x}\pm s$). Descriptive analysis was used for residents' basic characteristics, contract status, reasons for non-contracting, and satisfaction evaluation. The Kano model was applied to classify and prioritize residents' family doctor contracted service needs.

2.1 Residents' Basic Information and Contract Status

Among the 600 surveyed residents, 29.3% were male and 70.7% female. Age distribution showed 39.7% aged 18–39, 39.7% aged 40–60, and 20.7% over 60. Fifty-three percent had underlying health conditions, while 47% did not. Contracted residents accounted for 44.3%, and non-contracted residents 53.7% (see Table 2).

2.2 Kano Model Demand Analysis

Kano model analysis of residents' family doctor contract needs revealed that developing health knowledge and skills, community health education, and establishing electronic health records were indifferent attributes. A 5% increase in outpatient reimbursement rates, diagnosis and treatment of common diseases, and extended prescription services were must-be attributes. Home visits, family health lifestyle guidance, referral services, and comprehensive health assessments were one-dimensional attributes. Personal annual health planning, family medication guidance, and home-based medical care were attractive attributes (see Table 3).

Demand attributes varied by age and contract status. **(1) Age-stratified analysis**: Electronic health record establishment and health knowledge/skill development were indifferent attributes across all age groups. Personal annual health planning was an attractive attribute across all ages. Home visits were a one-dimensional attribute across all ages. Diagnosis and treatment of common diseases, outpatient reimbursement rate increases, and extended prescriptions were must-be attributes among those aged 40–50 and $ $60, but among 18–39-year-olds, they were must-be, must-be, and indifferent attributes respectively. Referral services and family health lifestyle guidance were one-dimensional attributes for ages 40–50 and $ $60, but must-be and indifferent attributes respectively for 18–39-year-olds. Comprehensive health assessment was a one-dimensional attribute for ages 18–39 and 40–59, but a must-be attribute for those $ $60. Family medication guidance was an attractive attribute for ages 18–39 and 40–59, but a one-dimensional attribute for those $ $60. Community health education was indifferent for 18–39, one-dimensional for 40–59, and must-be for $ $60. Home-based medical care was one-dimensional for 18–39, attractive for 40–59, and must-be for $ $60 (see Table 4).

(2) Contract status-stratified analysis: Electronic health record establishment and health knowledge/skill development were indifferent attributes in both contracted and non-contracted groups. Outpatient reimbursement rate increase was a must-be attribute in both groups. Diagnosis and treatment of common diseases, community health education, and extended prescriptions were must-be attributes among contracted residents, but one-dimensional, indifferent, and indifferent attributes respectively among non-contracted residents. Referral services, family medication guidance, and family health lifestyle guidance were one-dimensional attributes among contracted residents, but must-be, attractive, and

attractive attributes respectively among non-contracted residents. Comprehensive health assessment, personal annual health planning, home-based medical care, and home visits were attractive attributes among contracted residents, but one-dimensional attributes among non-contracted residents (see Table 5).

2.3 Satisfaction Among Contracted Residents

The top five satisfaction items among contracted residents were: outpatient reimbursement rate increase (4.09$\pm$1.14), $extended prescription services$(4.03$\pm$1.14), $electronic health record establ$ $health knowledge/skill development$(3.14$\pm$1.24), $family medication guidance$(3.12$\pm$1.26), $referral services$(3.1 $based medical care$(2.97$\pm$1.30), $and home visits$(2.94$\pm$\$1.21) (see Table 6).

Currently, domestic research on supply-demand matching of family doctor contracted services remains limited. This study, focusing on Tianjin community residents, employs the Kano model to deeply analyze core demand differences across populations, providing evidence for optimizing service provision.

3.1 Overall Population Demand Analysis

Results show significant variation in residents' attribute perceptions across services. Basic services such as developing health knowledge and skills, community health education, and establishing electronic health records were classified as indifferent attributes, indicating these necessary services have limited impact on satisfaction improvement, consistent with Zhang et al.' s findings. Medical services including outpatient reimbursement rate increases, diagnosis and treatment of common diseases, and extended prescriptions were must-be attributes, reflecting residents' rigid demand for basic medical security. This aligns with Huang et al.' s research identifying prescription services as a primary need. SHANG et al. found over 80% of residents concerned about medical insurance reimbursement. Advanced services like home visits, family health lifestyle guidance, referral services, and comprehensive health assessments were one-dimensional attributes, suggesting supply levels positively correlate with satisfaction. Zhu et al. found residents prefer home-based services. The State Council' s guidance on promoting tiered diagnosis and treatment clearly emphasizes referral services' importance. Notably, innovative services including personal annual health planning, family medication guidance, and home-based medical care were attractive attributes, indicating substantial potential for satisfaction improvement without causing significant dissatisfaction if absent. Primary care should meet home-based medical needs while ensuring universal basic medical services, enhancing accessibility so residents can solve health problems at their doorstep.

3.2 Age-Stratified Demand Characteristics

3.2.1 Elderly ($ \$60 years): Elderly residents showed strong dependence on must-be services like outpatient reimbursement increases, extended prescriptions, and common disease treatment, reflecting high demand for medical cost

control and medication convenience directly related to this group' s high chronic disease prevalence, similar to Sun et al.' s findings. Improving healthcare accessibility and expanding drug reimbursement lists can significantly enhance elderly satisfaction. Primary institutions should strengthen chronic disease management for elderly patients, optimize outpatient reimbursement policies, and promote extended prescription services. Additionally, this study shows elderly residents have high demand for community health education (must-be attribute). Gu et al. found 74.3% of elderly have health consultation needs, higher among urban elderly possibly due to greater education levels. While existing educational content meets partial needs, optimization remains possible in format and targeting. For example, thematic health lectures addressing elderly health issues or enhanced interactivity through community activities may more effectively improve participation and satisfaction. Home-based medical care was a must-be attribute and home visits a one-dimensional attribute for elderly residents, but coverage remains low, failing to meet actual needs. This relates closely to their declining physical function, high chronic disease prevalence, and need for regular medication and medical support, consistent with Han et al.' s findings. Policy support and technical means (e.g., telemedicine, smart health monitoring devices) should enhance home service accessibility while exploring standardized home-based medical care models.

3.2.2 Middle-aged (40–59 years): This group' s needs reflect dual characteristics of health management upgrading and family responsibility drivers. On one hand, increasing health risks create high demand for comprehensive health assessment (one-dimensional attribute), reflecting vigilance toward personal health risks. Family doctor services should provide comprehensive health assessments and personalized health management plans for middle-aged populations. On the other hand, this group bears dual responsibilities for childcare and eldercare, creating high demand for family-level health management and medical resources, particularly family health lifestyle guidance (one-dimensional attribute), family medication guidance (one-dimensional attribute), and home-based medical care (attractive attribute). Exploring family-unit health management models may better meet middle-aged residents' diversified needs. The "Guiding Opinions on Promoting High-Quality Development of Family Doctor Contracted Services" proposes family-unit contracting, which aligns well with middle-aged needs. Previous research shows interventions targeting patients and family members together are more effective with significant symptom improvement.

3.2.3 Young adults (18–39 years): This group exhibits efficiency-prioritized characteristics. Conflicts between work hours and community service hours create particularly prominent demand for flexible medical services. This study found referral services were a must-be attribute for young adults, but actual utilization and effectiveness remain inadequate. Information technology should optimize referral processes, such as establishing online referral platforms for seamless inter-institutional connection while strengthening primary care institutions' diagnostic and treatment capacities. Although young adults have better

overall health and lighter disease burden, they show high demand for common disease treatment (must-be attribute) and occupational disease prevention. Notably, family medication guidance (attractive attribute) and home-based medical care (one-dimensional attribute) represent underexplored potential needs among young adults. Where resources permit, these services should be gradually promoted and combined with personalized health management plans tailored to young adults' actual needs.

3.3 Demand Differences Between Contracted and Non-contracted Residents

Contracted residents' needs were "core security" -oriented, focusing on must-be services (outpatient reimbursement increases, common disease treatment) but showing insufficient supply of one-dimensional services (referral services, family medication guidance). Attractive attributes like comprehensive health assessment and personal annual health planning could enhance satisfaction but their absence didn' t cause significant dissatisfaction, indicating services remain at the basic security stage. Non-contracted residents showed dual characteristics of institutional security dependence and lagging service value cognition. Outpatient reimbursement increases and referral services were must-be attributes, indicating potential contractors' rigid demand for basic medical security and tiered diagnosis and treatment systems. However, family medication guidance and family health lifestyle guidance were attractive attributes, suggesting non-contracted residents' cognition of family health management value remains inadequately activated. This cognitive lag may stem from information asymmetry, supply-demand disconnect, insufficient service accessibility and flexibility, and doubts about service effectiveness. Previous research shows residents' understanding of family doctor contracted services significantly influences contract rates.

3.4 Limitations

First, dual bias risks exist in sample selection: the study only included daytime community activity center residents, failing to cover long-term homebound, night-shift workers, paralyzed, bedridden, and mobility-impaired populations, limiting representativeness. Additionally, satisfaction survey subjects were limited to contracted residents but included "contracted without contact" individuals who hadn' t actually used services, potentially failing to reflect true beneficiary experiences. Second, the questionnaire was a non-structured instrument designed based on literature, preventing reliability and validity testing. Third, this cross-sectional study' s factor analysis results show only associations without causality. Future research should expand sample size and coverage to further explore influencing factors, providing evidence for policy and service development.

4 Conclusion and Recommendations

This study applied the Kano model to analyze Tianjin community residents' family doctor contracted service needs and satisfaction, revealing significant differences across age groups and contract statuses. These findings suggest service content should be optimized according to different groups' characteristics, with strengthened publicity and supply of family health management services, particularly for non-contracted residents, to enhance contract conversion rates through precise education and service innovation.

Author Contributions: Liu Pei, Liu Ying, and Pan Liping proposed the research topic and designed the study protocol; Wei Tingting, Zhang Zhibo, and Li Ruolan drafted the manuscript; Jia Jie and Zhang Na proofread and revised the initial draft; Bian Bo was responsible for quality control, overall article responsibility, and supervision.

Conflict of Interest: The authors declare no conflicts of interest.

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Note: Figure translations are in progress. See original paper for figures.