



Analysis of Jilin Community Health Service Satisfaction

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Abstract: In order to discuss the satisfaction level of the Jilin community health service, the paper analyzes the aforementioned topic using Factor analysis based on residents and the Analytic Hierarchy Process (AHP) as advised by experts respectively. The study obtained the empirical results by analyzing 1390 survey papers of Jilin residents and 20 expert options. The residents tend to pay more attention to service time and convenience degree and related issues. On the other hand, experts consider the diagnosis value as the most relevant. There are some differences between resident satisfaction and expert options. Through quantifying these differences, we think that the development of Jilin community health service is still on its primary stage. There is a need to strengthen the diagnosis level and health education, in order to effectively meet the residents' requirements for community health service.

Keywords: community health service, satisfaction degree, factor analysis, analytic hierarchy process

1 Introduction

Community Health Service (CHS), as an important part of urban health system, is the precondition of achieving every citizen's right to enjoy primary health care^[1]. Resident satisfaction level of community health service is related to the sustainable development of the medical and health system.

At present, the satisfaction degree has been widely accepted as an important index in evaluating community health service system, which in turn directly reflects the quality of community health service^[2-3]. This paper uses the Factor Analysis method to evaluate Jilin residents' satisfaction levels of community health service, and uses the Analytic Hierarchy Process (AHP) to determine the evaluation results of experts on community health service satisfaction. If contrast results of residents and experts mirror the differences in Jilin CHS, then this study can be recognized as a scientific reference to improve it.

Foreign development in community health service started relatively early, so foreign studies on the evaluation system of community health service appear quite perfect; among these the Australian and the American CHS were in the forefront of the world. In 2003, Jolley GM used a semi-structured interview questions to assess the performance of American community health service^[4]. In 2007, Andrea Radford adopts a system of score cards to measure CHS satisfaction of North Carolina^[5]. On the international level, examples of more mature models of evaluating the quality of the community health service include the Sackett's service object evaluation model and Parker's system evaluation model, which have certain reference valuation for the domestic scholars^[6-7].

Domestic scholars have carried out the preliminary exploration on the evaluation system of community health service. Bao Yong elaborated the contents of CHS evaluation system in 2003^[8]. Liang Wan Nian established the evaluation system of CHS containing 126 indexes using the Delphi method, otherwise, he estimated the satisfaction levels of some cities' community health service by the main factor analysis method^[9]. At the same time, Guo Qing established a complete evaluation system of community health service in 2005^[10].

When it comes to medical and health service quality evaluation, the most commonly used methods are the factor analysis and the analytic hierarchy process (AHP). For example, in 2000, Junya TK, Yuichi IK studied the satisfaction of the patients on medical health and the result illustrated that medical technology is closely related to the degrees of satisfaction^[11]; Zhang Guo Hong, Wu Yang Feng used factor analysis method to investigate and analyze the condition of Beijing community health service, which showed that the service attitude of medical staff needs to improve^[12]; Yang Jing accurately evaluated the utilization of the resources and created the resource evaluation system by analytic hierarchy process^[13]; Sun Yu Ping combined analytic hierarchy process and factor analysis method to research on residents' satisfaction situation in the process of the community health service^[14].

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2 Research methods and data sources

2.1 Methodology

2.1.1 Factor analysis method

Factor analysis refers to a method using a few factors to describe the connection among the many indicators and factors. In other words, it means that the closely related variables are categorized into one kind, and we regard one kind as one factor, then using the less factors reflects the most information of the original data. It is mainly used in the comprehensive index evaluation^[15].

Classic factor analysis model was put forward by Charles Sperman^[16], which is often used to evaluate comprehensive index systems. However, the problems gradually were highlighted with the extension of the application domain. American Professors Richard and Maxwell proposed the question that the classic factor analysis model cannot conclude specific scores of factors, which could weaken the compelling force of empirical analysis^[17]. Therefore, the most widely used model is the factor analysis determine model which can calculate the exact solutions^[18]. The mathematical model of the factor analysis method can be represented as:

$$X = AF + \varepsilon \quad (1)$$

In type (1): $X = (X_1, X_2, \dots, X_p)'$ is the original index matrix; $F = (F_1, F_2, \dots, F_k)'$ means factor loading matrix, $k < p$; $A = (a_{ij})_{p \times k}$ is factor loading matrix; ε as a special factor.

2.1.2 Analytic hierarchy process (AHP)

Analytic hierarchy process (AHP) is put forward by American Thomas L. Saaty in the 1970s, which is a systematic and hierarchical decision analysis method of combining the qualitative and quantitative, and it is especially suited for the decision-making procedure on complex target constructions^[19]. The main process of AHP include: determining the hierarchy construction and the standard of pairwise comparison; calculating the weight of each factor by mathematical arithmetic and the consistency test of the pairwise comparison matrices; determining the level of total order using the weights.

(1) Hierarchy structure and scale

In order to form the comparable results, the paper builds the hierarchical structure index (the target layer, standard layer and decision layer) according to the result of factor analysis. Then we get scales by the pairwise comparison using Delphi standard and decision indicators. The 1-9 scaling method designed by Saaty is regarded as the comparison standard when comparing all the experts takes. The specific scales are defined in Tab.1^[20].

(2) Process of determining factors weights and the consistency tests

The weight of pairwise comparison matrices can only indicate the importance of degrees between the two

Tab.1 Scale specific definition

Scale a_{ij}	Define
1	i and j factors are equally important
3	i is more important slightly than j factor
5	i is more important than j factor significantly
7	i factor is more important than j factor strongly
9	i is absolutely important than j
2,4,6,8	Mean the scale values of adjacent status
Bottom	By comparing i and j, the judgment $a_{ji}=1/a_{ij}$

factors, but don't have unity. In order to quantitatively explanation the importance degrees among the factors; it needs specific mathematical operations^[21].

$$X_{n \times n} = \frac{a_{ij}}{\sum_{i=1}^n a_{ij}} \quad (2)$$

$$W_i = \frac{1}{n} \sum_{i=1}^n X_{n \times n} \quad (3)$$

a_{ij} means pairwise comparison matrix elements, $X_{n \times n}$ is unification weighting matrix, W_i represents characteristic vector, a factor score matrix.

The pairwise comparison matrices are subjectivity results of the minds, so it may be perfect unilateralism, and the results of the pairwise comparison matrices may not be consistent matrices. Therefore we need to take the consistency test for the pairwise comparison matrices before the analysis the influence degrees of factors on the overall goal.

$$W_i' = AW_i \quad (4)$$

$$\lambda_{\max} = \frac{1}{n} \times \frac{w_i'}{w_i} \quad (5)$$

$$CI = \frac{\lambda_{\max} - n}{n} \quad (6)$$

$$CR = \frac{CI}{RI} \quad (7)$$

Set in the type (4)-(7), empowerment and vector, λ_{\max} the maximum eigenvector, CR is the consistent rate, general provisions, pairwise comparison matrix consistency is acceptable; CI on behalf of the consistency index; n says the number of indicators in a pairwise comparison matrix; RI is freedom indicators, used for correct consistency for high dimensional pairwise comparison matrix^[22]. According to determine the value, the show has listed below in Tab.2.

Tab.2 The values of CI

n	1	2	3	4	5	6	7	8	9
RI	0	0	0.58	0.96	1.12	1.24	1.32	1.41	1.45

(3) Determination of the combination weights coefficients

Combination weights coefficients refers to calculate and determine the relative importance of all factors of some layer for the top of layers. Determining the combination weights coefficients need to utilize the weights of the upper layer for the top of layers and the layer itself for the upper layer. According to this structure arrangement in the paper, calculation is as follows:

$$V^{L+1} = \sum_{i=1}^n V_i^L \cdot W_i^{L+1} \quad (8)$$

V is combination weight coefficient, W means eigenvector, L is layer number.

2.1.3 Statistical methods

In order to ensure the quality of the questionnaire survey result, we entry and check the data by EpiData 3.1, and do factor analysis by SPSS22.0, and calculate the related hierarchical analysis by Excel.

2.2 Index selection and data sources

2.2.1 Index selection

This article refer to the "medical service quality monitoring questionnaire (QCM design)", Europe satisfaction survey scale (EUROPEP) and Chinese satisfaction evaluation system made domestic scholars from China WANFANGDATA and ChinaInfo to determine 29 representative indexes^[23-26]. The contents of the question paper on community health service are divided into four aspects: the basic situation, the health education issues, project and service functions.

According to the analysis results of the residents' satisfaction on Jilin community health service, we design the expert questionnaire paper on index satisfaction level.

2.2.2 Data source

The data of residents' satisfaction on community health service mainly comes from satisfaction questionnaire of community health service status from community residents about 9 areas (Changchun, Jilin, Meihokou, Tonghua, Liaoyuan, Songyuan, Panshi, Yanji and Antu) in Jilin province during summer holidays on 2014.¹

We recycled 1550 questionnaires while out 1600 questionnaires. Through strict screening, the incomplete and nonconformity questionnaire were deleted, finally retain effective questionnaire 1390, effective questionnaire recovery rate is 86.88%, which provides scientific theoretical basis to set a suitable system for the

region's urban community health service satisfaction evaluation index.

In order to determine the relative weights among each index, this article takes the experts scoring basing the Delphi method, and average the results of arithmetic average, then set it as the basis of hierarchical analysis. According to the research, the numbers of experts is much more suitable from 15 to 50^[27], the paper chooses 20 experts to done the paper.²

2.2.3 Definition of variables

In order to reflect the Jilin community health service more intuitively, we divided satisfaction into five categories: "most satisfaction" equals to 5; "satisfaction" equals to 4; "general" equals to 3; "dissatisfaction" equals to 2; "not satisfied" equals to 1^[28].

3 Results

3.1 Community health satisfaction survey of Jilin residents

3.1.1 Results of basic questionnaires

The results (Tab.3) of Jilin residents' satisfaction degrees survey for the community health service show that the residents with the most satisfaction accounts for 57%, the general satisfaction rate is 25%, while the rate of below satisfaction is 18%.

New rural cooperative medical care system and urban resident insurance appear higher among the medical insurance type, whose rates are 38.85% and 33.09% respectively. The lowest one is the commercial medical insurance, and the rate is 2.88%.

Generally speaking, health insurance is proportional to the family income; residents are more satisfied with the cooperation medical care and urban health care insurance than commercial insurance.

3.1.2 Reliability and validity test

Cronbach's α coefficient used to analyze the inter consistency reliability of indicators. If the coefficient is more than 0.7, we consider that the reliability of the measurement is acceptable^[29-30]. In this paper, the coefficient is 0.998, which means the survey question paper of Jilin residents' satisfaction degrees survey for new rural cooperative medical care system and urban resident insurance appear higher among the medical

¹ We thank the students of Changchun University of Chinese Medicine for distributing and recycling the questionnaire during the summer vacation on 2014.

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Tab.3 Basic questionnaire results

Basic questionnaire results

Explained variables: how much are your satisfaction degrees of community health services:

“most satisfaction”=5; “satisfaction”= 4; “general” =3; “dissatisfaction”=2; “not satisfied”=1

Explaining variables:

Gender: male=1(41%); female=2(59%)

Age: 21-30=1(23.02%); 31-40=2(21.58%); 41-50=3(23.02%); 51-60=4(12.95%); 61-70=5(10.07%); over 71=6(9.35%)

Education: primary school = 1 (10.07%);

Junior high school = 1 (10.07%);

high school or technical secondary school = 3 (21.58%);

college = 4 (14.39%);

bachelor degree and above = 5 (33.81%);

Marital status: unmarried = 2(41.73%); divorce = 3 (20.14%); widowed = 4 (13.67%);

Medical insurance categories: urban worker is basic medical treatment insurance=1 (19.99%);

urban medical insurance = 2 (33.09%);

new type of rural cooperative medical care = 3 (38.85%);

commercial medical insurance = 4 (2.88%);

other payment = 5 (7.19%)

Average monthly income of family: 0-1000 yuan = 1 (11.51%); 1000-2000 yuan=2 (25.90%);

2000-3000 yuan=3(36.70%); 3000-5000 yuan=4(17.27%);

Over 5000=5(8.63%)

Average medical cost: under 1000 yuan = 1 (11.51%); 1000-2000yuan=2(25.90%);

2000-3000 yuan=3(36.70%); 3000-5000 yuan=4(17.27%);

over 5000=5(8.63%)

insurance type, whose rates are 38.85% and 33.09% respectively. The lowest one is the commercial medical insurance, and the rate is 2.88%.

KMO (Kaiser - Meyer - Olkin) test and Bartlett sphere test are mainly used to test structure validity of factor analysis. KMO test and Bartlett sphere test results of this paper are significant (KMO = 0.895, $P = 0.895$, $\chi^2 =$ (degree of freedom is 1550 and $P < 0.001$), which suggests the data suit for factor analysis.

3.1.3 Factor analysis results

We do factor analysis by SPSS22.0 and extract the 5 common factors. According to the size of loading each index in different main factors, this article will name the five main factors respectively as: organization image, service accessibility, service time, medical value and medical personnel service attitude.

3.1.4 Result evaluation of the main factors

According to the factor score matrix and type(1), we concluded the ultimate factor scores and ranking of the main factors and they are shown in tab.4.

From Tab.4, we can see that the residents' satisfaction degree for the service time is the largest (0.558), and the biggest contribution to the service time is nurses' service attitude. It indicates that Jilin community health service can timely provide residents medical services starting from the vital reality.

Next, the score of institutions image is 0.517. As the systematic construction of the community health, the staffing and basic infrastructure are gradually being improved.

The score of diagnostic and treatment value is 0.398. Diagnostic and treatment value reflects the residents' comprehensive evaluation for medical level, effect and expenses after treatment. Residents' satisfaction degree

for diagnostic and treatment value isn't higher, which shows that the community health service' construction mainly constraposes organization form, rather than connotation construction.

The satisfaction score of the staffing service attitude is 0.386. Staffing attitude mirrors doctors and nurses' quality and technical level for community health service. Residents' evaluation is relatively low level for staffing service attitude, so the team construction for community health service need further strengthen.

The lowest satisfaction score is service availability (0.317). It shows that the space layout of community health institutions is unreasonable. Residents' basic medical and health needs couldn't be met in the space distance.

3.2 AHP results

According to the extracted factors by the factor analysis and the load value, we can establish hierarchy structures: the five main factors are the primary index and the factors are considered as the secondary indexes, so 6 pairwise comparison matrices can be built. The consistent tests of the pairwise comparison matrix indicate that he consistent rate CR of the primary index is 0.094, and the secondary indexes' are 0.070, 0.035, 0.05, 0.089, which means that the consistent rates of the pairwise comparison matrix is under 0.1, so we can consider the experts' judgment is acceptance. After calculation, the combination weights values are shown in Tab.6.the weights of primary indexes of the structure layers respectively are 0.144, 0.148, 0.069, 0.457 and 0.183. In views of the experts, the diagnostic value is the most important factor in terms of influence on the satisfaction of community health service, and the service

Tab.4 Factor loading matrix and common degrees

	Factor M ₁	Factor M ₂	Factor M ₃	Factor M ₄	Factor M ₅	Common
Department settings	0.505	-0.310	0.200	-0.013	0.05	0.647
Equipment integrity	0.780	0.148	0.176	-0.032	0.533	0.685
Personnel allocation	0.655	0.201	0.059	0.218	0.089	0.666
The doctor number	0.740	0.158	0.119	0.226	0.096	0.647
The nurse number	0.780	0.065	0.208	0.142	0.105	0.711
Drug categories	0.506	0.293	0.149	0.338	0.162	0.509
Medicine quality	0.416	0.358	0.028	0.247	0.226	0.533
Internal environment	0.322	0.033	0.243	0.594	-0.040	0.649
Mark guide	0.375	0.210	0.291	0.145	-0.049	0.628
Distance	0.171	0.370	-0.061	0.196	0.140	0.606
Physical Examination Services	0.373	0.212	0.571	0.167	0.088	0.553
Queuing time for consultation	0.079	0.033	0.610	0.408	0.292	0.632
Daily operating time	0.255	0.079	0.256	0.663	0.148	0.600
Telephone counseling	0.294	0.586	0.086	0.141	0.142	0.480
Health education	0.087	0.695	0.251	0.024	0.160	0.607
Referral service	0.069	0.408	0.133	0.603	0.320	0.657
Visit service	0.059	0.442	0.230	0.504	0.190	0.575
Health file	0.134	0.337	0.648	0.276	-0.036	0.638
Doctor's technical level	0.337	0.254	0.478	0.314	0.213	0.556
Nurse's technical level	0.402	0.084	0.475	0.016	0.084	0.475
Secret protection	0.267	0.418	0.140	0.443	0.070	0.571
Ill explain	0.271	0.608	0.152	0.303	0.294	0.645
Personal attention	0.100	0.657	0.269	0.291	0.041	0.625
Drug explain	0.232	0.655	0.378	-0.044	0.191	0.759
Diagnosis costs	0.234	0.313	0.110	0.126	0.678	0.652
Drug price	0.238	0.270	0.268	0.213	0.727	0.776
Diagnosis effect	0.211	0.373	0.314	0.265	0.588	0.698
Doctor's service attitude	0.116	0.288	0.570	0.000	0.385	0.595
Nurse's service attitude	0.088	0.196	0.628	0.214	0.345	0.633

Tab.5 Satisfaction scores of the main factor

Main factors	Score	Ranking
Institution image M ₁	0.517	2
Accessibility M ₂	0.317	5
Service time M ₃	0.558	1
Diagnostic value M ₄	0.398	3
Service attitude M ₅	0.386	4

time is the relatively weakest influence. The combination weights of the rest of the indexes are around 0.15.

Deeply analyzing, among the combination weights of the secondary indexes, the most obviously influence factor on the community health service are the medical costs and the drug price.

The results of primary indexes and the secondary indexes are consistence. The medical costs and the drug price are the vitally important part of diagnostic value, and they are closely related to the residents themselves health; The determine the relatively important degree, while they ignore the effects of the numbers of nurses and the institutions' environment for residents' medical service experience.

3.3 Discussion

From the development of Jilin community health service, the paper focuses on the residents and experts

respectively. The results show that there are gap between residents and experts.

The ranking of the factor analysis scores by residents are as follows: service time > institution image > diagnostic value > service attitude > accessibility. Residents recognize that community health services mainly treat common diseases and they want community health institutions to provide convenient, fast and clean health services. So residents mainly focus on the external image for community health service, though diagnostic and treatment value and staff of health care are weak. As for service accessibility, residents' satisfaction level is the lowest because the institution layout is not reasonable.

While from the perspective of the level points score ranking of experts this result came out: diagnostic value > service attitude > accessibility > institution image > service time, we learn that experts analyze the

Tab.6 The combination weights coefficients

First indexes	Secondary indexes	Combination weights coefficients
Institution image 0.144	Medicine quality	0.026
	Personnel allocation	0.021
	Equipment integrity	0.017
	Internal environment	0.016
	Drug categories	0.015
	Department settings	0.015
	The doctor number	0.015
	The nurse number	0.009
Service accessibility 0.148	Mark guide	0.009
	Health education	0.052
	Ill explain	0.016
	Referral service	0.016
	Drug explain	0.014
	Telephone counseling	0.013
	Secret protection	0.013
	Distance	0.012
Service time 0.069	Personal attention	0.011
	Queuing time for consultation	0.035
Diagnostic value 0.457	Daily operating time	0.035
	Diagnosis costs	0.183
	Drug price	0.183
Service attitude 0.183	Diagnosis effect	0.091
	Doctor's technical level	0.081
	Nurse's technical level	0.029
	Doctor's service attitude	0.024
	Nurse's service attitude	0.022
	Health file	0.016
	Physical Examination Services	0.012

Tab.7 The comparing between residents' factor analysis and experts AHP

Indexes	Residents		Experts	
	Scores	Ranking	Scores	Ranking
Institution image	0.517	2	0.144	4
Service accessibility	0.317	5	0.148	3
Service time	0.558	1	0.069	5
Diagnostic value	0.398	3	0.457	1
Service attitude	0.386	4	0.183	2

question from professional points. They regarded communities as auxiliary and basic unit of the medical resources and can be allocated reasonably. So the experts pay more attention on diagnostic value and assignment more than other items; Medical staff service attitude directly reflect the level of service, it should be attached more attention as the important factor in the process of diagnosis and treatment; With the perspective to service time and availability, the relevant provisions have already been stipulated by state. It includes the service radius of no more than 15 kilometers, arrival time to the nearest community health institution is no more than 15 minutes, and the service time is not less than 20 minutes. Because such situation is not acquired totally by residents, this may form the difference between the residents and experts.

In general, the Jilin community health service is not arranged systematically. There is less publicity about the community health service system; the residents lack the necessary knowledge about community health services. They are not clear about the orientation of community health diagnosis and not show enough trust about community health care levels. This could lead to more evaluation between residents' experience and professional views.

4 Conclusion and suggestion

Through comparing the residents' factor analysis and AHP by experts, we know there are obvious differences between residents own experience and the experts' sense of influence in the various factors of

community health service. As the basis for primary health care service, community health service should pay more attention on service function, information exchange, and resource sharing.

The development of Jilin community health service is on the stage of construction. In order to satisfy the demands of people's health, community institutions should make clear definitions of their community health service system, optimize the distribution of people and equipment, & improve the new urban medical and health services based on CHS.

Community health institutions should complete the health service network focusing on urban community health care; improve the service functions, including disease control and prevention and prevention service, general primary medical service, chronic disease management and rehabilitation service. And they should improve the quality of service, insist actively on door-to-door service, and take on the role as the residents' health "gatekeeper".

From the government side, the layout and structure of community health institutions should be optimized. Community health institutions should give full play to positive efforts in areas such as chronic diseases, geriatrics diagnosis and treatment etc, so they could relieve the diagnosis pressure of city hospitals. On the other hand, community health institutions should establish regular cooperation with city hospitals, train community health staff, and cultivate general practitioners to promote the rational flow of medical resources.

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