

Construction And Analysis of Service Satisfaction Survey

Minghui Zhao^a, Tingwei Zhang^b and Peijun Yu^c

School of Dalian Maritime University, Liaoning 116026, China

^azz27327826732022@163.com, ^bztw@dlmu.edu.cn, ^cyupeijun@dlmu.edu.cn

Abstract. According to the Seventh National Population Census Bulletin, China has entered an aging society, "aging" problem is very prominent. In the face of the growing elderly population, society for the "pension" demand is increasing. The survey shows that the proportion of urban residents willing to support the elderly at home has been gradually reduced, and the proportion of community elderly care and elderly care institutions has increased. But the big gap and unbalanced supply of the pension market have become a serious problem, which brings more opportunities and challenges. Now, what we pursue is not only simple "the old has to support, the old has to depend on" more is one kind "the old has to support, raises has the excellence" the retirement pattern. This article is based on the data collected from the "Market Research and Analysis Competition" questionnaire, based on AHP, Maslow's Hierarchy Theory of Demand and Customer Satisfaction Theory combined with SERVQUAL(Service Quality) model, this paper constructs the service evaluation system of elderly care institutions.

Keywords: Aging Population; Elderly Care Institutions; The Analytic Hierarchy Process; SERVQUAL Model.

1. Introduction

According to the newly released data, our country has entered a deep aging society (14% of the population over 65), four years earlier than expected [1]. The current aging problem is mainly reflected in the growing elderly population base and increasing range;the aging process speeds up significantly;there is a great difference in the number of different regions between urban and rural areas;population aging cannot match the development of social and economic level.

Institutional care for the elderly is the focal points of the work. Although the willingness and choice of pension model have changed, there are still big problems in China's pension service market. .It is pointed out in the Statistical Bulletin of National Economic and Social Development of the People's Republic of China in 2020 that by the end of 2020, there are 38,000 pension institutions and 8.238 million pension service beds in China [2].Far less than demand, the problem of resource scarcity is serious. At the same time, there are more problems such as lack of professional talents, low quality of service, unsound pension information and information fragmentation.

Domestic scholars' literature on pension institutions can be roughly divided into three aspects. The first is the investigation and research of pension institutions from the perspective of the government, proposing problems, solving problems and putting forward suggestions.The second is to study the nursing home from a certain angle, such as institutional service level, architectural design, medical services and so on.Third, take a region as an example to conduct a comprehensive study on the service quality of pension institutions and put forward suggestions. Gao Jing et al. (2019) conducted a questionnaire survey on 277 elderly people in 7 pension institutions in Nantong City, tested the reliability and validity of the evaluation form for the quality-of-care services in pension institutions, and formed an evaluation index for the quality-of-care services in pension institutions. The evaluation index of care service quality in endowment institutions includes four dimensions: tangibility, reliability, responsiveness and empathy. Fang Jiji et al. (2020) constructed an evaluation index system of health service quality in nursing homes with a combination of medical and nursing care based on the SERVQUAL model.Centering on the concept, characteristics, connotation, content, etc., of health services in nursing home institutions with combination of medical and nursing care, this paper adopts qualitative and quantitative research methods such as literature research method, semi-structured

interview method, Delphi - AHP method, etc., to build an index system and determine the index weight [3].

This study aims to comprehensively utilize the analytic hierarchy process (AHP) in the evaluation method of system engineering, combine Maslow's analytic hierarchy theory and customer satisfaction theory, build the service quality evaluation system of pension institutions based on SERVQUAL model, and analyze the relevant research data in the "Market survey and analysis Competition" for objective evaluation and management of pension institutions. To provide a theoretical basis for improving the service quality of endowment institutions.

2. Service satisfaction analysis of pension institutions

2.1 Basic concepts of pension institutions

2.1.1 Service quality of social pension institutions

The concept of service quality was first proposed by the Finnish scholar Gruneros, and it is the core content of service marketing. Different from the concept of tangible product quality, the evaluation of service quality can be measured by objective methods, but it is more dependent on the subjective cognition of customers to test, that is, service quality is the sum of the characteristics and characteristics of the service itself. At the same time, its evaluation depends on consumers' perception of the process and results of the service, which is the reaction generated after consumers' perception.

Therefore, Gruneros put forward that service quality is reflected not only in technical quality and functional quality, but also in the gap between customers' expected service quality and perceived service quality. If the perceived level of service quality of customers is higher than the expected service quality, it indicates that the customer satisfaction is higher and the service quality is higher; otherwise, it is considered that the service quality is lower, and the expected service quality is largely affected by customer demand [4].

According to the point of view put forward by Gruneros, as a care service for special groups, the service quality also reflects the service quality of ordinary pension institutions with objective conditions, and the description is mainly based on the elderly's satisfaction with the pension service provided by the pension institutions, which is reflected by the difference between the expected service and the perceived degree of the elderly. Therefore, The two indexes involved in this paper all include the expected value and actual perceived value of the elderly in order to improve the reliability of the final evaluation results.

2.1.2 Maslow's hierarchy of Needs Theory

American psychologist Abraham Maslow proposed the hierarchy of needs theory, also known as the "basic hierarchy of needs theory", from the perspective of human motivation in 1943. He believes that human's basic needs are composed of five levels: physiological needs, safety needs, belonging and love needs, respect needs and self-actualization needs. The five levels are arranged in order from low to high, and human needs have different emphases in different periods. When a person's lower level needs are satisfied, they move on to higher level needs.

Physiological needs are people's most basic needs, such as food, clothing, shelter and medical practice. Physiological needs are the most powerful driving force for human actions. Safety needs are slightly higher than physiological needs, which refers to people's needs for personal safety, health protection and life stability, so as to avoid anxiety and fear. The third level is the need for emotion and belonging, which means that individuals are eager to establish an emotional connection with others, and everyone hopes to be cared for and taken care of, which belongs to the higher level of needs. The fourth level is the need for respect, including self-respect, self-evaluation and respect for others. When the need for respect is basically satisfied, it can generate driving force. The need for self-realization is the highest level of need, which is a kind of creative need. It means that people hope to give full play to their potential and realize their value as human beings [5].

Specifically, the needs of the elderly are also hierarchical. As the most basic needs of the elderly, physiological needs and safety needs are the most concerned problems of all the elderly, which are mainly manifested in diet, travel, medical care and so on. With the continuous improvement of the living standard of the elderly, their level of needs is also rising. On the basis of basic needs, the elderly pays more attention to emotional needs and self-actualization needs, such as whether they can have a normal social life with others in the nursing home, whether they can get care from others, whether they can feel the warmth like a family, and whether their own value can be realized.

2.1.3 Customer satisfaction theory

Customers are the most important resources for enterprises in the market competition. Whether they can win the favor of customers depends on their satisfaction with the products. The research on customer satisfaction arose in the 1970s and can be traced back to the Experimental Study on Customer Input, Expectation and Satisfaction published by Cardozo in 1965. The author believed that improving customer satisfaction would make customers buy the same product again. Early studies are from the perspective of enterprises to explore the gap between the perceived effect of customers and the expected effect of a product. "Focusing on customers" has become a common understanding of enterprises. The higher the satisfaction of customers, the competitiveness of enterprises will be enhanced and the benefits of enterprises will be better. According to the requirements of ISO, enterprises should actively carry out research on customer satisfaction with products, measure and analyze the degree of customer satisfaction, so as to evaluate the performance of the enterprise quality management system as well as the basis for improvement of the quality management system.

Before evaluating customer satisfaction, it is necessary to understand customer demand, including customer demand for product quality, function, price and extension at different levels. However, due to the influence of people's consumption preferences, income levels and other factors, there will be a large degree of difference in the intensity of response to various needs. Therefore, organizations should provide products or services suitable for different consumers according to the different needs and preferences of customers. Generally speaking, customer satisfaction can be divided into five levels: very dissatisfied, dissatisfied, generally satisfied, satisfied and very satisfied [6].

With the introduction of customer satisfaction time increase, the survey method of customer satisfaction has developed from the initial service implementation survey to the later perceived quality survey and satisfaction index model survey, and the object of use has also developed from the simple enterprise to other organizations providing products and services. As organizations providing services for the elderly, the government and pension institutions should also pay attention to the needs of the elderly, as well as the satisfaction degree of the elderly as customers to the products and services, and should take this as an important basis for evaluating and improving their own service quality.

2.2 Elderly care service satisfaction analysis based on SERVQUAL model

2.2.1 SERVQUAL Model Introduction

In the late 1980s, American marketers Parasueraman, Raithammel and Barry proposed a new service quality evaluation system based on the total quality management theory, namely SERVQUAL theory, which was later widely used in the service industry to understand customers' perception and demand, and to provide measurement methods and improvement basis for improving the service quality of enterprises. SERVQUAL is the abbreviation of "ServiceQuality" (service quality). The core content of Servqual is the service quality gap model. For customers who buy goods and services, the quality of service is generated by their own perception, and is also affected by personal needs, economic ability, consumption preference, etc. Each customer's expectation of service quality is different. The service quality gap theory is to calculate the gap between consumers' expectation of service quality before consumption and the actual feeling of service quality, and on this basis to reflect the level of service quality provided by the service industry.

The formula of service quality gap is:

$$SQ = P - E. \quad (1)$$

Where, SQ represents the final result of service quality, P represents the score of service quality actually felt by customers, and E represents the score of customers' expectation of service quality. If SQ is positive, it indicates that the perceived service quality of customers is greater than the expected service quality, and the apparent customer satisfaction is higher. If SQ is 0, it means that the perceived service quality meets the expected service quality and does not exceed the expected service quality. Apparently, customers are satisfied with the service quality. If SQ is negative, it means that the perceived service quality of customers does not meet the expected service quality requirements. Apparently, customers are not satisfied with the service received and the service quality level is relatively low [7].

2.2.2 Applicability analysis of SERVQUAL model

Up to now, many scholars have used the SERVQUAL scale to analyze the evaluation of service quality in different industries, which also indicates that the five dimensions of the model evaluation are highly consistent and can accurately reflect the level of service quality. However, due to the difference of research objects, evaluation content and methods, the evaluation dimension will also change. The pension service provided by pension institutions conforms to the service concept in the general sense. Meanwhile, due to the particularity of pension institutions, the service provided by pension institutions also has its own characteristics. Therefore, this paper reinterprets the five dimensions of SERVQUAL model by combining the service characteristics of pension institutions:

(1) tangibility

This dimension mainly involves the supporting facilities and services provided by the elderly service institutions for the elderly. Before entering a nursing home, the elderly will first consider whether the infrastructure of the institution can meet their needs, such as whether the food provided by the institution is delicious and nutritious, whether the living environment is clean and comfortable, whether it is convenient to travel, whether the medical service is perfect, and whether the service staff's service attitude.

(2) Reliability

Most of the elderly living in ordinary pension institutions have no pension or low pension, so these elderly people pay more attention to the reliability of the institutions. On the one hand, reliability refers to whether an institution can exist stably as a pension service provider; On the other hand, it refers to whether the pension institutions can provide reliable service content and service quality for the elderly, and whether they can abide by the service quality commitment made to the elderly. The reliability of pension institutions has a great influence on the service quality.

(3) Responsiveness

Specific to the pension institutions, this index mainly involves the service enthusiasm of institutions in the process of providing pension services and the timeliness of responding to the needs of the elderly. Most of the elderly in pension institutions suffer from chronic diseases, and some of them have mobility difficulties. When the elderly needs it, whether the service staff of pension institutions can actively and quickly provide help to these elderly people is the key issue that all the elderly residents pay attention to.

(4) Guarantee

Because of the particularity of the aged group, the service staff of the nursing institution should have the corresponding professional knowledge. The assurance index mainly includes: the professional degree of nursing staff's knowledge and quality; Be able to maintain sufficient enthusiasm and patience in the delivery of services; Whether the service attitude makes people feel warm, comfortable, etc. The professional degree of service personnel is an important factor affecting the service quality of pension institutions.

(5) Empathy

The metric focuses on personalized services. Specifically, due to the differences in the living habits, economic basis, health status, family status and customs of the elderly living in pension institutions,

the order of needs of the elderly is also different. For example, the elderly living in good health may pay more attention to social needs, while the elderly living in poor health need more good medical conditions. How to provide personalized services according to the individual differences of the needs of the elderly is also the key issue that the pension institutions should consider when providing services.

2.3 Construction of service quality evaluation system for elderly care institutions

2.3.1 Selection principles of service quality evaluation indicators

(1) Comprehensiveness

There are many factors affecting the service quality of elderly care institutions, including the government level such as system, policy, management and supervision, as well as the institutional level such as infrastructure construction, investment, management and operation, and service personnel professionalism. It is also very important to the physical and mental health status of the elderly, individual demand differences, economic basis, etc. Although this study focuses on evaluating the service quality of pension institutions according to the elderly's perception of service quality, indicators from other levels will still be used as references in the selection of indicators to ensure the systematic and comprehensive construction of the evaluation system.

(2) Independence

When it comes to the elderly's perception of service quality, some specific indicators of different dimensions have strong intersections, which may affect the consistency of the elderly's judgment on the indicators, increase the difficulty of the analysis process, and reduce the accuracy of the analysis results. Therefore, in the design of indicators, emphasis should be placed on the uniqueness and high differentiation of each indicator, and the repeated crossover of each indicator should be avoided as far as possible to ensure the independence of indicator selection.

(3) Operability

On the one hand, the selection of indicators should be concise, easy to understand and easy for the elderly to understand due to the consideration of factors such as age, educational level and physical health of the elderly. On the other hand, the selected indicators should not only match the actual needs of the elderly, but also be quantified with specific data to ensure their relevance and measurability.

(4) Importance

For the elderly in different pension institutions, the factors affecting the service quality of pension institutions are not the same, and the importance of each factor is also different. According to the general situation of ordinary pension institutions and the urgency of the actual needs of the elderly residents studied in this paper, the importance of indicators is ranked in sequence, and factors with greater influence are selected for analysis to ensure the effectiveness of the analysis results.

2.3.2 Ideas for building index system

After investigation and analysis, Li Juan (2011) established seven specific indicators, including the nature, educational level, gender, marital status, family visits, whether there is pension and medical insurance, and how they get along with friends, from five aspects, including hardware facilities, operation and management, service software, family atmosphere and location environment. Guo Hongyan et al. (2014) established three first-level indicators including management system, facility and equipment quality, basic service quality, and health management quality of the elderly through Delphi method. There were 13 secondary indexes, including management system, satisfaction, complaint, first aid facilities and equipment, meal service, accommodation service, entertainment service, health assessment and care plan, chronic disease management, infection control, psychological support and management, social interaction and adaptation, and health risk prevention. Zhao Na et al. (2018) divided the quality of elderly care service into five dimensions, namely meal assistance, emergency assistance, cleaning, medical care and spiritual comfort, and analyzed the age, gender, education level, marital status, economic source, reason for residence, physical condition and monthly income of the elderly as specific indicators [9].

Under the guidance of relevant documents of service quality of pension institutions issued by the state, this paper reconstructs specific indicators of service quality of ordinary pension institutions by referring to the index principles of various scholars and combining with the research situation.

Table 1 Service quality index of elderly care institutions

Primary indicator	Secondary indicator
A tangibility	A1 Convenient transportation
	A2 Comprehensive infrastructure
	A3 Comprehensive service provision
	A4 Environmental health and safety
	A5 Complete medical equipment
B responsiveness	B1 Meal provision
	B2 Provide emergency measures
	B3 Cleaning service
	B4 Prompt medical care
	B5 Meet demand in time
C reliability	C1 qualified
	C2 Reasonable charging standard
	C3 Comprehensive and reliable medical services
	C4 A healthy and tasty diet
	C5 Satisfy psychological needs
D security	D1 Provide regular medical check-ups
	D2 Ensure personal safety
	D3 The service staff gives respect
	D4 Friendly and warm service attitude
	D5 Service personnel specialty
E empathy	E1 Personalized meal service
	E2 Personalized entertainment items
	E3 Personalized medical service
	E4 Individual psychological needs
	E5 Meet other personalized needs

2.3.3 Weight determination of evaluation index system

(1) Analytic hierarchy Process

The SERVQUAL model determines the influence of different factors on the service quality of ordinary pension institutions by analyzing and calculating the weight of different dimensions and indicators on the service quality, so as to put forward the deficiencies existing in the service quality of ordinary pension institutions and the most urgent areas for improvement. Put forward effective suggestions for the improvement of service quality of pension institutions.

Analytic Hierarchy Process (AHP) is the most common method to determine the weight of the index, and is often used in the index evaluation system with layers and interleaved. Analytic hierarchy process (AHP) generally divides the overall objective into multiple schemes, and then decomposes each scheme into multiple indicators to form a multi-level structural model. The specific steps of AHP generally include the following five steps:

1) Construct the structural hierarchy model

The problems to be solved, factors to be considered in decision-making and decision-making objects are divided into the top, middle and bottom layers to form the final hierarchical model.

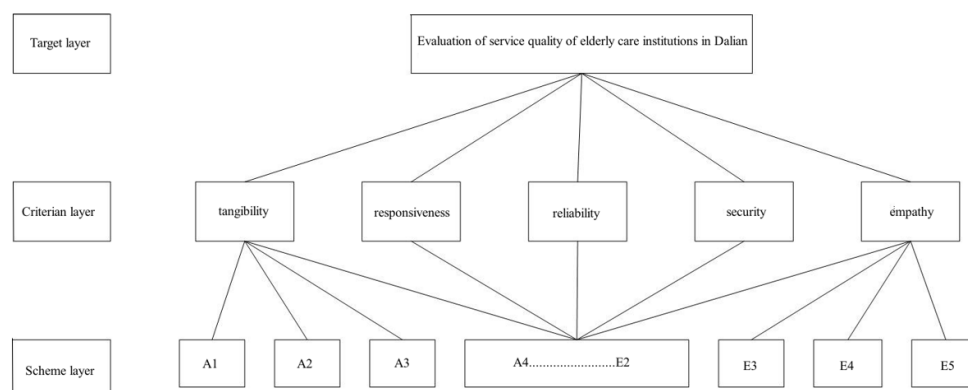


Fig. 1 Structure hierarchy model

2) Construct a judgment matrix

According to the specific perception of the participants, the importance of different indicators in the same dimension was compared in pairs, and the Fig.1 scale method was used to present the importance comparison structure in the form of quantification.

3) Single sort of corresponding hierarchy

Calculate the judgement matrix of the largest eigenvalue λ_{max} and characteristic vector ω , which will be ordered by the level of the importance of each target. In this paper, geometric average method is used for calculation.

4) Consistency test of judgment matrix

By comparing the constructed judgment matrix with the consistency matrix, it is analyzed whether the deviation from the consistency of the judgment matrix is within the acceptable range.

5) Total hierarchical sorting

Calculate the weight value of all factors at a certain level for the overall target.

2.3.4 Construct the hierarchical structure model of service quality of pension institutions

In this paper, the service quality evaluation of pension institutions is set as the ultimate goal, namely the highest level, the five dimensions are set as the intermediate level, namely the criterion level, and the 25 indicators determined according to the five dimensions are set as the lowest level, namely the scheme level, respectively represented by P1-P25. The structural hierarchy model obtained from this is:

The judgment matrix of first order index is constructed and consistency test is carried out

In the construction of the judgment matrix at each level, this paper makes a comprehensive score by consulting the advice of experts and scholars, the proportion of each index in relevant documents and the ranking of each index by the elderly in the institution. After conducting a large number of experiments, Santy obtained the measurement method of the judgment matrix a_{ij} . The corresponding scale value and significance are shown in the following table:

Table 2 Measurement method of matrix a_{ij}

Scale value	meaning
1	Indicates that the indicators are compared in pairs with equal importance
3	Indicates that one indicator is slightly more important than the other indicator
5	Indicates that one indicator is more important than the other
7	Indicates that one indicator is much more important than the other
9	Indicates that one indicator is more important than the other
2. 4. 6. 8	The degree of importance is somewhere in between
reciprocal	The judgment of the comparison between index i and j is a_{ij} , then the judgment of the comparison between index j and i is $a_{ji}=1/a_{ij}$

- (1) Construct a judgment matrix of first-order index

Table 3 first-level index judgment matrix

	tangibility	Reliability	responsiveness	security	empathy
tangibility	1	$\frac{1}{2}$	3	1	3
reliability	2	1	3	$\frac{1}{2}$	2
responsiveness	$\frac{1}{3}$	$\frac{1}{3}$	1	$\frac{1}{2}$	2
security	1	2	2	1	3
empathy	$\frac{1}{3}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{3}$	1

- 1) According to the important measurement values in the above table, the judgment matrix of first-level indicators can be obtained as follows:

$$Q = \begin{pmatrix} 1 & 1/2 & 3 & 1 & 3 \\ 2 & 1 & 3 & 1/2 & 2 \\ 1/3 & 1/3 & 1 & 1/2 & 2 \\ 1 & 2 & 2 & 1 & 3 \\ 1/3 & 1/2 & 1/2 & 1/3 & 1 \end{pmatrix} \quad (2)$$

- 2) The product method is used for normalization to obtain the weight coefficient
3) Find the maximum eigenvalue of the matrix

Table 4 Results of AHP hierarchical analysis

item	Feature vector	Weight value	Maximum characteristic root	CI value
tangibility	1.351	0.243	5.281	0.0703
reliability	1.431	0.2574		
responsiveness	0.6444	0.1159		
security	1.6438	0.2957		
empathy	0.4884	0.0879		

- (2) Consistency test is carried out on the judgment matrix of first-order index
1) Calculate consistency index
2) Compared with the average random consistency index RI, the consistency ratio was calculated

The result shows that it passes the consistency test.

Table 5 Consistency test results

Maximum characteristic root	CI value	RI value	CR value	Consistency test result
5.281	0.0703	1.11	0.0633	pass

- (3) Construct the two-level index judgment matrix for consistency test
1) Tangibility

Table 6 Tangible indicators

index	A1	A2	A3	A4	A5
A1	1	2	4	2	5
A2	$\frac{1}{2}$	1	3	2	4
A3	$\frac{1}{4}$	$\frac{1}{3}$	1	$\frac{1}{3}$	3
A4	$\frac{1}{2}$	$\frac{1}{2}$	3	1	4
A5	$\frac{1}{5}$	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{1}{4}$	1

The weight calculation results of the analytic hierarchy process (root method) show that the weight score of A1 is 0.3853, that of A2 is 0.2637, that of A3 is 0.0976, that of A4 is 0.1998 and that of A5 is 0.0536.

Table 7 Results of tangible AHP hierarchy analysis

item	Feature vector	Weight value	Maximum characteristic root	CI value
A1	2.4022	0.3853	5.1744	0.0436
A2	1.6438	0.2637		
A3	0.6084	0.0976		
A4	1.2457	0.1998		
A5	0.3342	0.0536		

The calculation results of the analytic hierarchy process show that the maximum characteristic root is 5.1744, and the corresponding RI value is 1.11 according to the RI table, so $CR=CI/RI=0.0393<0.1$, passing the one-time test.

Table 8 Results of corporeal consistency test

Maximum characteristic root	CI value	RI value	CR value	Consistency test result
5.1744	0.0436	1.11	0.0393	Pass

2) Responsiveness

Table 9 Responsiveness index

index	B1	B2	B3	B4	B5
B1	1	$\frac{1}{2}$	2	3	3
B2	2	1	3	4	4
B3	$\frac{1}{2}$	$\frac{1}{3}$	1	$\frac{1}{2}$	0.5
B4	$\frac{1}{3}$	$\frac{1}{4}$	2	1	$\frac{1}{3}$
B5	$\frac{1}{3}$	$\frac{1}{4}$	2	3	1

The weight calculation result of AHP (root method) shows that the weight score of B1 is 0.2584, that of B2 is 0.4149, that of B3 is 0.0882, that of B4 is 0.0934 and that of B5 is 0.145.

Table 10 Results of responsive AHP hierarchy analysis

item	Feature vector	Weight value	Maximum characteristic root	CI value
B1	1.5518	0.2584	5.3452	0.0863
B2	2.4915	0.4149		
B3	0.5296	0.0882		
B4	0.561	0.0934		
B5	0.8706	0.145		

The calculation results of the analytic hierarchy process show that the maximum characteristic root is 5.3452, and the corresponding RI value is 1.11 according to the RI table, so $CR=CI/RI=0.0777<0.1$, passing the one-time test.

Table 11 Results of responsiveness consistency test

Maximum characteristic root	CI value	RI value	CR value	Consistency test result
5.3452	0.0863	1.11	0.0777	Pass

3) Reliability

Table 12 Reliability specifications

Index	C1	C2	C3	C4	C5
C1	1	1/5	1/3	1/2	1/2
C2	5	1	3	2	3
C3	3	1/3	1	2	3
C4	2	½	1/2	1	3
C5	2	1/3	1/3	1/3	1

The weight calculation result of analytic hierarchy process (root method) shows that the weight score of C1 is 0.0734, that of C2 is 0.4092, that of C3 is 0.2381, that of C4 is 0.1804, and that of CC5 is 0.0989.

Table 13 Results of reliability AHP hierarchical analysis

item	Feature vector	Weight value	Maximum characteristic root	CI value
C1	0.4409	0.0734	5.2274	0.0569
C2	2.4595	0.4092		
C3	1.431	0.2381		
C4	1.0845	0.1804		
CC5	0.5942	0.0989		

The calculation results of the analytic hierarchy process show that the maximum characteristic root is 5.2274, and the corresponding RI value is 1.11 according to the RI table, so $CR=CI/RI=0.0512<0.1$, passing the one-time test.

Table 14 Reliability consistency test results

Maximum characteristic root	CI value	RI value	CR value	Consistency test result
5.2274	0.0569	1.11	0.0512	pass

4) Security

Table 15 Security indicators

index	D1	D2	D3	D4	D5
D1	1	1/3	1/5	1/3	1/2
D2	3	1	1/4	3	3
D3	5	4	1	3	4
D4	3	1/3	1/3	1	2
D5	2	1/3	1/4	1/2	1

The weight calculation results of the analytic hierarchy process (root method) show that the weight score of D1 is 0.0636, D2 is 0.2291, D3 is 0.468, D4 is 0.1442, and D5 is 0.0951.

Table 16 Results of security AHP hierarchy analysis

item	Feature vector	Weight value	Maximum characteristic root	CI value
D1	0.4066	0.0636	5.2846	0.0712
D2	1.4651	0.2291		
D3	2.9926	0.468		
D4	0.9221	0.1442		
D5	0.6084	0.0951		

The calculation results of the analytic hierarchy process show that the maximum characteristic root is 5.2846, and the corresponding RI value is 1.11 according to the RI table, so $CR=CI/RI=0.0641<0.1$, passing the one-time test.

Table 17 Security consistency test results

Maximum characteristic root	CI value	RI value	CR value	Consistency test result
5.2274	0.0569	1.11	0.0512	Pass

5) Empathy

Table 18 Indicators of empathy

index	E1	E2	E3	E4	E5
E1	1	1/3	3	5	3
E2	3	1	3	7	5
E3	1/3	1/3	1	3	4
E4	1/5	1/7	1/3	1	3
E5	1/3	1/5	1/4	1/3	1

The weight calculation result of analytic hierarchy process (root method) shows that the weight score of E1 is 0.2487, that of E2 is 0.4843, that of E3 is 0.1447, that of E4 is 0.0711, and that of E5 is 0.0512.

Table 19 Results of empathic AHP hierarchy analysis

item	Feature vector	Weight value	Maximum characteristic root	CI value
E1	1.7188	0.2534	5.4369	0.1092
E2	3.1598	0.4659		
E3	1.0592	0.1562		
E4	0.4911	0.0724		
E5	0.354	0.0522		

The calculation result of the analytic hierarchy process shows that the maximum characteristic root is 5.4369, and the corresponding RI value is 1.11 according to the RI table, so $CR=CI/RI=0.0984<0.1$, passing the one-time test.

Table 20 Empathy consistency test

Maximum characteristic root	CI value	RI value	CR value	Consistency test result
5.4369	0.1092	1.11	0.0984	pass

6) Weight comparison and analysis of indicators at all levels

According to the above analysis and calculation, the one-time test results of the judgment matrix of indicators at all levels are within the acceptable range, which proves that the selection of indicators is reasonable. Based on the total ranking formula, the weight value of indicators at all levels and the total ranking of each indicator relative to the quality of service can be obtained through calculation, and the results are as follows:

Table 21 Weight comparison of indicators at all levels

Primary indicator	weight	Secondary indicator	weight	Total sort
A tangibility	0.243	A1 Convenient transportation	0.3853	0.093628
	0.243	A2 Comprehensive infrastructure	0.2637	0.064079
	0.243	A3 Comprehensive service provision	0.0976	0.023717
	0.243	A4 Environmental health and safety	0.1998	0.048551
	0.243	A5 Complete medical equipment	0.0536	0.013025
B responsiveness	0.1159	B1 Meal provision	0.2584	0.029949
	0.1159	B2 Provide emergency measures	0.4149	0.048087
	0.1159	B3 Cleaning service	0.0882	0.010222
	0.1159	B4 Prompt medical care	0.0934	0.010825
	0.1159	B5 Meet demand in time	0.145	0.016806
C reliability	0.2574	C1 qualified	0.0734	0.018893
	0.2574	C2 Reasonable charging standard	0.4092	0.105328
	0.2574	C3 Comprehensive and reliable medical services	0.2381	0.061287
	0.2574	C4 A healthy and tasty diet	0.1804	0.046435
	0.2574	C5 Satisfy psychological needs	0.0989	0.025457
D security	0.2957	D1 Provide regular medical check-ups	0.0636	0.018807
	0.2957	D2 Ensure personal safety	0.2291	0.067745
	0.2957	D3 The service staff gives respect	0.468	0.138388
	0.2957	D4 Friendly and warm service attitude	0.1442	0.04264
	0.2957	D5 Service personnel specialty	0.0951	0.028121
E empathy	0.0879	E1 Personalized meal service	0.2534	0.022274
	0.0879	E2 Personalized entertainment items	0.4659	0.040953
	0.0879	E3 Personalized medical service	0.1562	0.01373
	0.0879	E4 Individual psychological needs	0.0724	0.006364
	0.0879	E5 Meet other personalized needs	0.0522	0.004588

According to the above data, among the tangible indicators, the most important ones for the elderly are infrastructure construction and the convenience of transportation. Among the responsiveness indicators, older people were most concerned about the provision of emergency measures and meal provision; Among the reliability indicators, the elderly care most about comprehensive and reliable medical services and healthy and tasty diet; Among the safety indicators, the elderly care most about the respect and safety of service personnel; Among the indicators of empathy, the elderly care most about personalized entertainment items and personalized meal service.

2.4 Analysis of service quality of pension institutions

2.4.1 Survey of elderly residents' satisfaction and expectation

According to Likert scale, the measurement standards of service quality perception in the questionnaire were divided into five levels: "very satisfied", "relatively satisfied", "satisfied", "relatively dissatisfied" and "very dissatisfied". Similarly, the measurement standards of service quality expectation were divided into "very satisfied", "relatively satisfied", "satisfied" and "relatively dissatisfied". The five grades of "very unsatisfied" correspond to 5 points, 4 points, 3 points, 2 points and 1 point respectively, which is convenient to express the perception of service quality and the degree of expectation in a good form. The actual perception and expectations of the above 25 indicators are scored in the table below

Table 22 Service quality perception expectation degree table

Primary indicator	weight	Secondary indicator	weight
A tangibility	A1 Convenient transportation	3.89	4.18
	A2 Comprehensive infrastructure	3.91	4.12
	A3 Comprehensive service provision	3.88	4.14
	A4 Environmental health and safety	3.92	4.18
	A5 Complete medical equipment	3.81	4.17
B responsiveness	B1 Meal provision	4.03	4.10
	B2 Provide emergency measures	3.87	4.12
	B3 Cleaning service	3.94	4.10
	B4 Prompt medical care	3.82	4.12
	B5 Meet demand in time	3.90	4.02
C reliability	C1 qualified	3.98	4.13
	C2 Reasonable charging standard	3.81	4.00
	C3 Comprehensive and reliable medical services	3.86	4.17
	C4 A healthy and tasty diet	.87	4.12
	C5 Satisfy psychological needs	3.84	4.02
D security	D1 Provide regular medical check-ups	3.88	4.11
	D2 Ensure personal safety	3.87	4.14
	D3 The service staff gives respect	3.93	4.08
	D4 Friendly and warm service attitude	3.86	4.15
	D5 Service personnel specialty	3.86	4.13
E empathy	E1 Personalized meal service	3.81	4.04
	E2 Personalized entertainment items	3.77	4.01
	E3 Personalized medical service	3.81	4.16
	E4 Individual psychological needs	3.80	4.05
	E5 Meet other personalized needs	3.82	4.07

Through the analysis of the mean value of sample data, it can be seen that in the nursing homes surveyed, the average score of the elderly's perception of the service quality actually provided by the institution is about 3.8 points, which is between satisfied and relatively satisfied.

2.4.2 Evaluation results of the quality of elderly care services

According to the weight values of indicators at each level in the above table, the service quality gap SQ value of each indicator in its own dimension can be obtained.

$$SQ_m = \Pi \omega_i W_{ij} (\bar{P}_{ij} - \bar{E}_{ij}) \quad (3)$$

Among them, m refers to the secondary indexes, ω_i represent primary index dimension weight value, W_{ij} refers to secondary index in the primary index weight value dimension.

Table 23 Evaluation results of elderly care service quality

Primary indicator	Secondary indicator	Weight	Satisfaction degree	Degree of expectation	P-E	SQ
A tangibility	A1	0.385 3	3.89	4.18	0.2 9	0.027152
	A2	0.263 7	3.91	4.12	0.2 1	0.013457
	A3	0.097 6	3.88	4.14	0.2 6	0.006166
	A4	0.199 8	3.92	4.18	0.2 6	0.012623
	A5	0.053 6	3.81	4.17	0.3 6	0.004689
B responsiveness	B1	0.258 4	4.03	4.10	0.0 7	0.002096
	B2	0.414 9	3.87	4.12	0.2 5	0.012022
	B3	0.088 2	3.94	4.10	0.1 6	0.001636
	B4	0.093 4	3.82	4.12	0.3	0.003248
	B5	0.145	3.90	4.02	0.1 2	0.002017
C reliability	C1	0.073 4	3.98	4.13	0.1 5	0.002834
	C2	0.409 2	3.81	4.00	0.1 9	0.020012
	C3	0.238 1	3.86	4.17	0.3 1	0.018999
	C4	0.180 4	3.87	4.12	0.2 5	0.011609
	C5	0.098 9	3.84	4.02	0.1 8	0.004582
D security	D1	0.063 6	3.88	4.11	0.2 3	0.004325
	D2	0.229 1	3.87	4.14	0.2 7	0.018291
	D3	0.468	3.93	4.08	0.1 5	0.020758
	D4	0.144 2	3.86	4.15	0.2 9	0.012366
	D5	0.095 1	3.86	4.13	0.2 7	0.007593
E empathy	E1	0.253 4	3.81	4.04	0.2 3	0.005123
	E2	0.465 9	3.77	4.01	0.2 4	0.009829
	E3	0.156 2	3.81	4.16	0.3 5	0.004805 SQ
	E4	0.072 4	3.80	4.05	0.2 5	0.001591
	E5	0.052 2	3.82	4.07	0.2 5	0.001147

2.4.3 SQ indicator analysis in five dimensions and overall

After calculating the service quality gap value of each index, in order to more clearly analyze the overall service quality gap of the nursing home, this paper also calculates the SQ value of the five dimensions of tangibility, reliability, responsiveness, assurance, and empathy of the nursing home, as well as the overall service quality gap value of the nursing home. Specific calculations are as follows:

$$SQ = \sum_{i=1}^5 wQ_i \quad (4)$$

$$SQ_n = \sum_{i=1}^5 wQ_{n_i} \quad (5)$$

$$n = A, B, C, D, E \quad (6)$$

$$i = 1, 2, 3, 4, 5 \quad (7)$$

The perceived quality of service, expected quality of service, gap value of service quality and final SQ value of each dimension can be calculated. The calculation results are as follows

Table 24 SQ values

N	P	E	P-E	Weight	SQ
A	3.88	4.16	-0.28	0.243	-0.07
B	3.91	4.09	-0.18	0.116	-0.02
C	3.87	4.09	-0.22	0.257	-0.06
D	3.88	4.12	-0.24	0.296	-0.07
E	3.80	4.07	-0.26	0.088	-0.02
R	3.87	4.11	-0.24		-0.24

As can be seen from the data in the above table, the service quality gap values of the nursing home in five dimensions are respectively -0.28, -0.18, -0.22, -0.24 and -0.26, which indicates that the service quality provided by the nursing home is somewhat different from the elderly's expectations in five dimensions, and the elderly are not satisfied with the service quality of the nursing home in five dimensions. Among them, responsiveness has the smallest gap, while tangibility has the largest gap. Apparently, the responsive service of pension institutions is strong, but the tangibility service of the elderly is of low quality.

3. Conclusions and suggestions

3.1 Conclusions

The satisfaction of the elderly residents (respondents) to the pension institutions is generally lower than the expected degree.

By reinterpreting the five dimensions of SERVQUAL model and using AHP to determine the weight of indicators, the service quality evaluation system of pension institutions is constructed and the conclusion is drawn:

Among the tangible indicators, the most important for the elderly is the construction of infrastructure and the convenience of transportation; Among the responsiveness indicators, older people were most concerned about the provision of emergency measures and meal provision; Among the reliability indicators, the elderly care most about comprehensive and reliable medical services and healthy and tasty diet; Among the safety indicators, the elderly care most about the respect and safety of service personnel; Among the indicators of empathy, the elderly care most about personalized entertainment items and personalized meal service.

On the basis of the above, according to Likert scale, it is known that in the nursing homes surveyed, the average perceived score of the elderly for the service quality actually provided by the institution is about 3.8 points, which is between satisfied and relatively satisfied for the level. When analyzing each dimension, the conclusion is drawn:

The service quality gap value (SQ value) of the five dimensions is 0.28, -0.18, -0.22, -0.24 and -0.26, respectively, which indicates that the service quality provided by pension institutions is somewhat different from the elderly's expectations in the five dimensions, and the elderly's satisfaction with the service quality of the five dimensions of pension institutions is not high. The smallest gap is responsiveness, and the largest gap is tangibility, which indicates that the responsive services of pension institutions are strong in aspects such as the provision of meals, emergency measures, cleaning services, etc., but in the satisfaction of the tangible services of the elderly, such as the complete degree of medical equipment, environmental health and safety level, and the comprehensiveness of the services provided, the quality is low.

3.2 Suggestions

In the analysis of model construction, it can be concluded that a large part of the elderly residents is not satisfied with the comprehensive service of pension institutions. Therefore, pension institutions need to have a perfect pension service system. In terms of the construction of pension system, based on the service quality index of pension institutions and Maslow's demand chromatography theory, the following suggestions are put forward for pension institutions.

3.2.1 Level of physiological needs

This level is the most basic aspect that pension institutions should have. Based on the model analysis, it is concluded that pension institutions should focus on improving the responsiveness of meal provision and providing emergency services. Institutions should provide elderly people with the basic security of life, such as clothing, food, shelter, proper outside entertainment and so on. And should ensure the above mentioned content clean hygiene and neatness. On this basis, based on the particularity of the elderly, the environment and equipment should be provided to protect the safety and health of the elderly, such as avoiding all sharp objects in the elderly activity places, regularly disinfect and clean the living environment and the objects used by the elderly.

In addition, for the elderly, diet is extremely important for their health. Scientific diet collocation can not only make the elderly people's food and clothing can be solved, but also make their body healthier and obtain enough energy to maintain the operation of the body and life. Many elderly people will become frailer with age, and a better diet is one of the most important ways to keep the elderly healthy in the long run. Pension institutions can choose to hire a special dietitian to match the most suitable meals for the elderly. Of course, in the non-meal time, appropriate milk, eggs and appropriate fruit are essential to make the elderly nutrition more balanced.

3.2.2 Security requirements

Provide comprehensive and reliable medical services and timely psychological counseling to improve the reliability of institutions for the aged. Due to the particularity of the elderly population, old-age care institutions should have their own medical and health security system, such as medical equipment to ensure the basic health of the elderly and nurses and doctors with professional knowledge. In daily life, regular basic examination for the elderly can not only minimize the occurrence of emergencies, but also understand and evaluate the physical condition of each elderly person, and generate the health record of each elderly person through such assessment, which can also provide help for the staff to take better care of each elderly person in the future.

3.2.3 Social needs

Improve the infrastructure and transportation convenience of pension institutions, improve the tangibility of pension institutions, and then meet the social needs of the elderly. After meeting the needs of the old People's Daily life, the old institutions should also put more energy on how to make

the old people's psychology become more abundant. Elderly care institutions can be equipped with some recreational facilities, such as chess board rooms, activity rooms and places to exercise on the basis of ensuring the safety of the elderly. In addition to these daily entertainment for the elderly, some cultural, sports and entertainment activities can also be held regularly to enrich the spiritual life of the elderly, so that they can have their own social circle, instead of feeling the passing of life alone and silent every day. Of course, such activities can make them feel the most cheerful atmosphere at the same time, spiritual life and physical health can be promoted.

3.2.4 Respect the demand side

To effectively train the service of pension institutions, service staff should give enough respect to the elderly, warm and friendly service attitude, improve the safety of pension institutions. Everyone wants to have a stable social status and to have their abilities and achievements recognized by the society. And respect needs to be divided into internal respect and external respect. From the perspective of internal respect, people will gradually feel powerless when they are old, so they may have a feeling that they have been abandoned and left behind by the Times. In order to avoid such psychological feelings, pension institutions can hold some activities regularly, such as finding special people to explain the use of basic electronic equipment for the elderly. This not only gives the elderly something to do and fill their lives, but also feeds their self-respect. External respect, as the name implies, is to be respected by others. Staff respect for the elderly is very important, so when selecting staff, pension institutions should also take personality, patience and other personality factors into consideration in the assessment criteria to some extent. Respect has been satisfied, can make the elderly for life confidence and enthusiasm greatly increased, more can make them experience the value of their lives.

3.2.5 Self-actualization requirements

Focus on increasing personalized entertainment items and meet other personalized needs, improve the empathy of pension institutions, and then meet the needs of self-realization. Self-actualization need is a need to the highest degree, which means that people who can exert their abilities to the maximum extent to achieve self-value and realm accept themselves and others, ask for undisturbed solitude, and get the greatest happiness. For elderly people who cannot afford to live in a single room, pension institutions should seek their advice and arrange elderly people with similar personalities to live together, which can also reduce a lot of unnecessary conflicts and discomfort in life. On the other hand, for some elderly people who have the ability and willingness to take care of themselves and organize their belongings to a certain extent, pension institutions should also give them a certain degree of freedom, rather than staff sweeping the board.

References

- [1] National Bureau of Statistics. Bulletin of the 7th National Population Census (No.5) [EB/OL]. (2021-05-11). http://www.stats.gov.cn/tjsj/tjgb/rkpcgb/qgrkpcgb/2021_06/t20210628_1818824.html. Reference to a book:
- [2] National Bureau of Statistics. Statistical Bulletin of National Economic and Social Development of the People's Republic of China 2020 [EB/OL]. (2021-2-28). http://www.stats.gov.cn/tjsj/zxfb/202102/t20210227_1814154.html.
- [3] Gao Jing, Xiao Yuhua, Geng Guiling, Zhang Qiong, Wang Haitao, Du Xiexue. Construction of evaluation index of nursing service quality in nursing institutions and its reliability and validity test [J]. Chinese Journal of Nursing, 2019, 54(04): 538-542.
- [4] Evaluation and thinking on Service quality of institutional elderly care based on Service quality gap model [J]. Hospital Management Forum, 20(07): 78-80+23.
- [5] Maslow A H. Motivation and Personality [M]. 1. China Renmin University Press, 2007.
- [6] Lu Xiongwen. Dictionary of Management [M]. 1. Shanghai Dictionary Publishing House, 2013.

- [7] Li Yalin, Zhao Yue. Quality assessment of nursing care for disabled elderly based on SERVQUAL model: A case study of an institution in Kunming City [J]. Journal of General Nursing, 201,19(35):4911-4914.
- [8] ZHOU Dequn. Introduction to Systems Engineering [M]. 4. Science Press, 202:185-194.),2018,51(02):64-69.