Research Article

Evaluation of Health Information Literacy of Rural Community Residents Based on Intuitionistic Fuzzy Set Multicriteria

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According to the constructed rural community residents' health information literacy evaluation system, this paper proposes a rural community residents' health information literacy evaluation method based on intuitionistic fuzzy sets. Based on the intuitionistic fuzzy set, the multistage interactive group evaluation method whose data form is a point set has been expanded, and the intuitionistic fuzzy set that expresses objective things more delicately and truly is used to reflect the evaluator's preference, which can well simulate the human decision-making psychology and improve the applicability of the interactive group evaluation method. How to accurately measure the value information of relevant intuitionistic fuzzy numbers in uncertain environment has become a difficult problem. Therefore, it is very important to excavate important information in intuitionistic fuzzy numbers, deal with intuitionistic fuzzy numbers, and study the theory and method of multicriteria decision-making under fuzzy information. In this paper, we conducted a research on the health information literacy evaluation model of rural community residents based on intuitionistic fuzzy sets and multicriteria, and found that the formation rate of health behaviors of manual workers is relatively low, and the formation rate of healthy behaviors of female, elderly, and highly educated people is relatively high. A high level of education is conducive to improving the level of residents' health knowledge.

1. Introduction

In this paper, two multiattribute decision-making models based on intuitionistic fuzzy information are proposed. One is to use the scoring function theory to construct a multiattribute decision-making model of intuitionistic fuzzy information. First, the improved scoring function converts the intuitionistic fuzzy information into real numbers. Then, using the prospect theory, a prospect decision matrix is constructed, and a comprehensive consideration of subjective and objective weights is established. The weight of each attribute is obtained by using the constrained optimization model; finally, the principle of maximizing the comprehensive prospect value is used to select the optimal plan; the other is to use the intuitionistic fuzzy information entropy theory to construct a multiattribute decision-making model [1]. First use the appropriate intuitionistic fuzzy information entropy

to determine the weight of each attribute, then use the weighted average operator that comprehensively considers the cross influence of the membership degree and hesitation degree to obtain the comprehensive evaluation value of each scheme, and finally use the improved scoring function to optimize program selection.

With the continuous development of social science and technology, the environment in which things are located is becoming more and more complex, and the speed of change is getting faster and faster, which increases the uncertainty of decision-making, and the decision-making problem becomes quite complex [2]. The intuitionistic fuzzy set theory can well examine people's inertial thinking about the description of objective uncertain things a key research direction. How to accurately measure the value information of related intuitionistic fuzzy numbers in uncertain environment has become a difficult problem. Therefore, it is very important to excavate

important information in intuitionistic fuzzy numbers, deal with intuitionistic fuzzy numbers, and study the theory and method of multicriteria, decision-making under fuzzy information [3]. This paper studies the multicriteria, decision-making problem in which the criterion value appears in the form of an intuitionistic fuzzy set. By analyzing the decision-making information contained in the intuitionistic fuzzy set, the intuitionistic fuzzy number transformation and the combination of the multicriteria method are used to analyze the problem. The intuitionistic fuzzy number is studied based on the multicriteria decision-making method combining integral function and prospect theory, and is applied to the evaluation of health information literacy of rural community residents.

In recent years, with the rapid growth of economic development, the living standards, and quality of life of rural, residents have also been improved accordingly. The medical resources and living environment they have obtained have been greatly improved, and the health level of rural residents has also improved to a certain extent improvement. However, the health problems caused by the lack of health risk behaviors and health knowledge are increasing day by day. The World Health Organization has reported that about 60% of the deaths of rural residents in the world are related to the bad behaviors and lifestyles of rural residents. Behavior-related causes of death accounted for 47.1% of the population's deaths. The prevalence of various health risk behaviors is highest among students over the age of 18 [4, 5]. Among them, the proportion of persons with health risk behaviors seeking counseling from a psychiatrist was significantly higher than that of those without health risk behaviors. Therefore, in the face of this health threat, conducting surveys, analysis, and research on health knowledge and health-related behaviors, and changing the health risk behaviors of urban and rural residents are of great importance in preventing and reducing the occurrence of health risk behaviors, as well as promoting and maintaining people's health significant and far-reaching significance. Although the status quo of rural residents' health knowledge and health-related behaviors has attracted widespread attention at home and abroad, scholars at home and abroad have also conducted a large number of related researches. However, most of the studies are limited to descriptive studies, and the research on the awareness rate of rural residents' health knowledge and the influencing factors of health-related behaviors is not in-depth, and the follow-up studies on behavioral interventions are relatively rare. At present, the basic data on the status quo of health knowledge and health-related behaviors of urban and rural residents in our province is insufficient, and there are few reports on intervention studies. The purpose of this study is to obtain basic data on health knowledge and health-related behaviors of rural residents in an urban community, and on this basis, to further explore the influencing factors of rural residents' health knowledge level and health-related behaviors, so as to provide reference for health authorities to formulate behavioral intervention strategies in accordance with.

The innovative contribution of the research lies in putting forward an evaluation method of health information literacy of rural community residents based on intuitionistic fuzzy sets. Based on intuitionistic fuzzy sets and multicriteria, this paper studies the evaluation model of health information literacy of rural community residents. It is found that the formation rate of health behavior of manual workers is low, and that of women, the elderly and highly educated people is high. A high level of education is conducive to improving the health knowledge level of residents. Research is of great significance to prevent and reduce the occurrence of health risk behaviors, promote, and maintain people's health. To obtain the basic data of health knowledge and health-related behaviors of rural residents in urban communities, and on this basis, to further explore the influencing factors of health knowledge and health-related behaviors of rural residents, so as to provide reference for health departments to formulate corresponding behavior intervention strategies.

2. Related Work

The theory describes the ambiguity of things from three aspects: membership degree, nonmembership degree, and hesitation degree, and has higher flexibility in terms of ambiguity and uncertainty. There are many forms of intuitionistic fuzzy sets, such as intuitionistic fuzzy numbers, interval intuitionistic fuzzy numbers, intuitionistic triangular fuzzy numbers, and intuitionistic trapezoidal fuzzy numbers. The application of intuitionistic fuzzy sets is very extensive and has a rapid development in many fields such as pattern recognition, decision analysis, data mining, especially in the field of decision-making. With the increasingly fuzzy decision-making information in the actual environment, the multicriteria decision-making method based on intuitionistic fuzzy sets has become a research hotspot in the field of decision-making [6].

Wang analyzed the shortcomings of the previous methods for measuring similarity, and after considering the influence of membership, nonmembership, hesitation, and other factors on the measurement results, a new measurement method was proposed [7]. The definition is analyzed, and a new similarity function is proposed based on this [8]. Wang et al. analyzes the given average similarity operator and weighted geometric similarity operator and based on this, proposes a subjective method of intuitionistic fuzzy information—trust model [9]. On the basis of the above two functions, Calik et al. give a sorting criterion for intuitionistic fuzzy numbers [5], which is favored by many scholars because of its simplicity and comprehension, but in some situations, decision-making still occurs. The results do not match the actual situation [10]. Keshavarz et al. first proposed the intuitionistic fuzzy information entropy theory in dealing with the intuitionistic fuzzy set problem, and its four axiomatic definitions that need to be satisfied. Based on this, a new intuitionistic fuzzy information entropy formula was given [11]. Liang et al. gave the measure formula and properties of the intuitionistic fuzzy information entropy, and on this basis defined a sine and cosine function of the intuitionistic fuzzy information entropy, and applied it to multiattribute decision-making [12]. Alsahafi et al. is designed for the scoring function of intuitionistic fuzzy numbers, but there are some shortcomings [13]. Zhang et al. uses the

intuitionistic fuzzy number to represent the per capita income and makes an evaluation decision for this construction evaluation index [14]. Xu et al. consider the uncertainty that decision-makers may encounter in financial management, and the fuzziness based on the intuitionistic fuzzy number will its application is analyzed in individual investment and financial management [15]. In order to better describe the risk aversion behavior of decision-makers, Zhou et al. combine prospect theory, give prospect value function and probability weight function in the form of intuitionistic fuzzy numbers, construct prospect decision matrix, and use improved TOPSIS method to find attribute weight, and propose a multicriteria decision model. Fuzzy numbers are more complex and relatively more in related applications [16]. Wang et al. consider the uncertainty and fuzziness in the index evaluation of engineering projects, construct the evaluation index of engineering projects, express them with interval intuitionistic fuzzy numbers, and process them to evaluate engineering projects. In terms of the correlation operator of interval intuitionistic fuzzy numbers, a large number of scholars have also made in-depth research on this [9]. Jia et al. extended the ensemble operator of intuitionistic fuzzy numbers and proposed geometric mean operator, weighted mean operator and arithmetic mean operator of interval intuitionistic fuzzy numbers [17]. Wang et al. introduced the basic concepts and operations of interval intuitionistic fuzzy numbers based on this rule, the geometric Bonferroni average operator and the geometric weighted Heronian average operator are, respectively, studied and expanded. In terms of multicriteria decision-making, there are several ways to deal with interval intuitionistic fuzzy numbers: one is to consider the method of combining integration operators and sorting [9]. Wang et al.'s study is based on the membership degree and nonmembership degree of interval intuitionistic fuzzy numbers. The sum and difference of define an interval number scoring function and then compare the size of the scoring function through the possibility [18]. Liang et al. optimally build a model based on comprehensive decision value to obtain the weight and then combine the TOPSIS method to propose a method based on a multicriteria approach to interval intuitionistic fuzzy numbers [19]. Liu et al. build a nonlinear criterion weight model based on the minimum projected total deviation between the alternatives and the ideal solution and give a relative closeness formula based on the projection of the alternatives, so as to make decisions [20].

Based on the reading, sorting, and summarization of a large number of literature, this paper conducts research on the background of multicriteria, decision-making problem with intuitionistic fuzzy sets as the criterion value analyze.

3. Basic Concepts and Algorithms of Intuitive Fuzzy Sets

The intuitionistic fuzzy set adds the concept of hesitation degree to the traditional fuzzy set and describes the uncertainty of things, the complexity of the objective environment, and the decision-maker's attitude toward things from three aspects: membership degree, hesitation degree, and hesitation degree.

Cognitive limitations. The reason why mining the information of intuitionistic fuzzy sets can become a key issue of academic research is that it can more delicately describe the fuzzy nature of objective things in terms of evaluation, and it is more expressive when dealing with fuzzy information [21, 22].

When multicriteria decision-making refers to the decision to choose from a finite or infinite set of conflicting and incommensurable alternatives. It mainly aims at the contradiction between various evaluation criteria and the incommensurability between objectives (i.e., the inconsistency of dimensions) and other factors, and designs dimension standardization methods and effective measures to resolve the conflict of criteria. After considering many criteria for each alternative, it is a process of synthesizing and balancing the size of the criteria, sorting and selecting the best of the alternatives [23]. In the multicriteria, decision-making background problem, the research on the multicriteria, decision-making method in which the criterion value appears in the form of an intuitionistic fuzzy set is particularly important. The value function is determined relative to the gain and loss of the reference expected value point selected by the decision-maker, not the final decision value. The expression of the value function is shown in equation (1):

$$A = \{(u, u_A), v_A(u)|u \in U\}. \tag{1}$$

Use an appropriate method to determine the attribute value of each alternative, that is, the attribute weight and set the weight vector of several attributes as shown in equation (2).

$$W = (w_1, w_2, \ldots w_n)^T. \tag{2}$$

Among them, $\sum_{j=1}^{n} w_j = 1.$, finds the standard matrix $X = (x_{ij})_{n \times m}$ and requires that the standardized indicators are all positive indicators. A salient feature of the ordered weighted average operator is that each attribute value is evaluated and re-ordered according to its size, and then each attribute is processed according to this sorting order to obtain the linear weighted average of each alternative, such as (3) is shown.

$$u_i = \sum_{j=1}^{m} w_j x_{ij}, (1, 2, \ldots, n). \tag{3}$$

Let the set X be a nonempty finite set, and for $A = \{ < x, v_A(x), v_A > |x \in X\}$, $B = \{ < x, v_B(x), v_B > |x \in X\}$ be two intuitionistic fuzzy numbers. Then the intuitionistic fuzzy numbers have the following basic operation rules

$$A \cap B = \{ < x, \min\{u_A, u_B(x), \max\{v_A, v_B\} > |x \in X\},$$
$$A \cup B = \{ < x, \max\{u_A, u_B(x), \min\{v_A, v_B\} > |x \in X\},$$
$$A + B = \{ < x, \{u_A + u_B(x), \{v_A, v_B\} > |x \in X\},$$
$$A \cdot B = \{ < x, u_A, (x)u_B(x), \{v_A, (x)v_B\} > |x \in X\}. \tag{4}$$

For the comparison of the size of two intuitionistic fuzzy numbers, the score function is generally converted into a score value for comparison. The degree of identity, degree of

difference, and degree of oppositeness can describe the interrelated information of things from two or three different aspects. Using two elements to describe, the selection of the optimal scheme is shown in formula (5), [24, 25].

$$\begin{cases} a < b \text{ iff } a^U < b^L \\ a \subseteq b \text{ iff } a^L \geq b^L \text{ and } a^U \leq b^L. \end{cases} \tag{5}$$

Set pair analysis divides the deterministic relationship between two different sets into "identity" and "opposition" when dealing with uncertain things. At the same time, the indeterminate connection of the set is divided into the "difference" connection which is different from the "identity" and "opposition" in the deterministic connection. If two sets have the same characteristics, then the two sets are said to have an identity relationship; if they have some opposite properties, then the two sets are said to have an opposite relationship; if the two sets are neither identity-related, nor if the relationship is opposite, the two sets are said to have a differential relationship.

4. Rural Residents' Health Information Literacy Assessment Model

Information literacy refers to the ability of individuals to use information, including cognition, understanding, identification, and application. Individual health information literacy level can directly affect their health status. Health literacy refers to the ability of individuals to obtain, understand, process basic health information, or services, and make rational health decisions. It is an extension of the concept of information literacy in the field of public health. Health information literacy includes both the information skills of information literacy and the health awareness and behavior of health literacy [26]. This paper summarizes its connotations as follows: First, have the awareness of health information literacy and be able to correctly understand the needs of health information; second, use one's own knowledge to understand and obtain health information, and identify possible sources of information; third, identify high-quality health information and judge health information quality and usability; fourth, integrate own knowledge reserves, analyze, and understand information; fifth, use information to make health decisions and solve health problems [27, 28].

On this basis, this paper believes that it can be summarized from six aspects: first, health knowledge information, which is the basis for obtaining health information literacy; second, health information needs, for the daily and special needs of the public; third, health information concepts and concepts, that is, health information needs and awareness; the fourth is health information skills, which is the ability to process and process health information; the fifth is health information utilization ability (health behavior), which refers to the health behavior that achieves self-realization through the application of health information; the sixth is health information background, It is a general term for the environment related to health information. The above two definitions of the connotation of

health information literacy are similar, but the latter emphasizes the ability of the former and points out the importance of paying attention to the background of health information, which is more comprehensive. Based on the definition of the two connotations, health information literacy is the penetration and fusion of the two concepts of information literacy and health literacy, which not only includes the ability to recognize, understand, and apply information in information literacy but also includes the ability to process information and make healthy decisions in health literacy. Decision-making ability and confirm the grade of the evaluated object according to the principle of maximum membership, as shown in Figure 1.

The steps of fuzzy and comprehensive evaluation method include the following: (1) The construction of fuzzy comprehensive evaluation index is the basis of community health information literacy evaluation. The selection of appropriate evaluation indicators will directly affect the accuracy of community health information literacy evaluation. The construction of the evaluation index should widely involve the industry data of the evaluation index system or relevant laws and regulations. (2) The weight vector is constructed by expert experience method or AHP analytic hierarchy process. (3) Construct the evaluation matrix of community health information literacy and establish the appropriate membership function, so as to construct the evaluation matrix. (4) The synthesis of evaluation matrix and weight adopts appropriate synthesis factors to synthesize and interpret the result vector.

Based on the above knowledge, the evaluation steps of community health information literacy based on the interval intuition fuzzy direct determination of the index weight and combined with the fuzzy comprehensive evaluation method are given. The value range of the weight, where j is the kth subcriteria index under the jth criterion layer index. The weight of the sub-criteria layer is obtained by using the interval intuitionistic fuzzy descendant, and the obtained weight is combined with the interval intuition fuzzy weighted average operator to calculate the weighted comprehensive evaluation value under the criterion layer. The integral function value matrix of the weighted comprehensive evaluation value of the criterion layer is calculated by using the scoring function. Substitute the function value matrix into the model to obtain the optimal weight of the criterion layer. The single-factor evaluation matrix is obtained by statistical sorting out the data collected from the elderly questionnaire based on the fuzzy language evaluation method. Finally, the fuzzy comprehensive evaluation method is used to carry out the evaluation work.

5. Experiment Analysis

5.1. Survey Objects and Survey Methods. The object of this survey is rural community residents, and the survey object in this paper is the resident population of the region over the age of 18. The resident population in this paper is defined as the residents who are within the scope and live and live in the jurisdiction for more than half a year at the time of the survey. This survey adopts a multistage cluster sampling
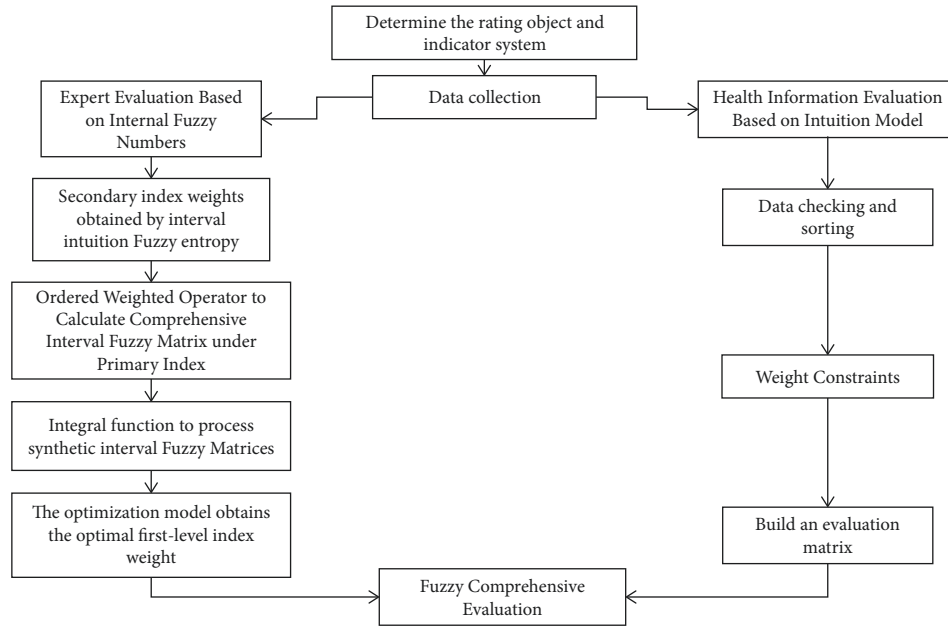
FIGURE 1: Health information literacy evaluation model.

method. In the first stage, according to the number of households and permanent resident population of all neighborhood committees (villages) in the whole building provided by the government, 30 neighborhood committees (villages) were randomly selected by using the capacity proportional probability sampling method (pps sampling method). Simple random sampling method is used to select resident groups, and two resident groups are randomly selected from each sample neighborhood committee, for a total of 60 resident groups (resident groups of greater than or equal to 40 households, for the residents of the group with less than 40 households, according to the principle of living nearby). In the third stage, no less than 30 households are randomly selected from each selected resident group, and all the permanent residents in the households that meet the survey requirements are selected as the survey objects.

In this study, the method of household inquiries and surveys were adopted. The investigators went to the sample households to conduct on-site inquiries and surveys on the respondents and filled in the survey forms on the spot. If the respondents cannot understand the meaning of the relevant items in the survey, the investigator can make relevant explanations, but cannot induce the respondents to make a choice. Respondents must voluntarily participate in the survey and answer questions honestly to ensure that the survey results are true and accurate.

5.2. Multivariate Analysis of Influencing Factors of Health Information Literacy. Taking the total score of respondents' health information literacy and the scores of five sub-dimensions as dependent variables, and taking different sociodemographic backgrounds (gender, age, education level, family annual income, religious belief) as independent variables, a multiple linear regression model was established

TABLE 1: Multiple linear regression analysis of influencing factors of health information literacy.

	HIC	HIS	HIE	HIA	HIM	HIL
Gender	−0.18	−0.18	−0.22	−0.21	0.04	−0.18
Age	−0.15	−0.18	−0.16	−0.15	0.14	−0.16
Educational level	0.32	0.21	0.18	0.26	0.04	0.25
Annual household income	0.12	0.19	0.13	0.17	−0.06	0.16
Religious belief	0.26	0.04	−0.05	v0.02	−0.04	0.10

The influencing factors of health information literacy were analyzed, and the results are shown in Table 1.

The results of regression analysis (Figure 2) indicated that the five sociodemographic factors included in this study all had an impact on respondents' health information awareness, and the results were statistically significant. The four factors, gender, age, educational level, and annual family income, all showed influence on the three dimensions of respondents' health information acquisition, health information evaluation, and health information application. Among them, age is also an influencing factor of respondents' health information ethics.

5.3. Multicriteria Evaluation on the Impact of Health Information Literacy of Rural Community Residents. In this paper, the structural element method of intuitionistic fuzzy multiattribute decision-making is applied to the evaluation of College Teachers' teaching quality system. Use qualitative and quantitative methods to comprehensively assess and evaluate all aspects of teachers. Through the qualitative research on the fuzzy thing of teacher evaluation, we can have a more comprehensive and objective understanding of it. Thus, according to the development trend of the external environment and internal conditions, targeted improvement
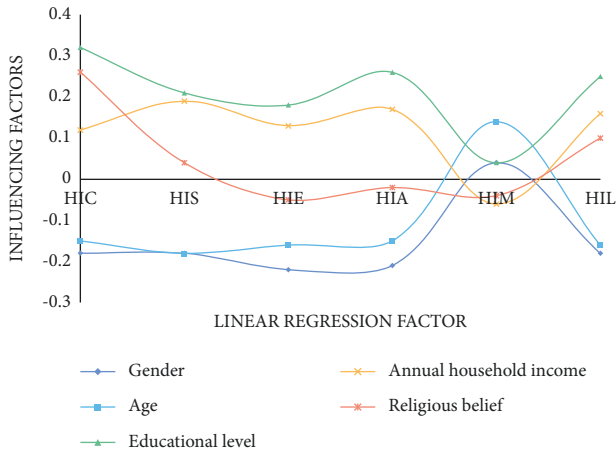
Figure 2: Multiple linear regression analysis of influencing factors of health information literacy.
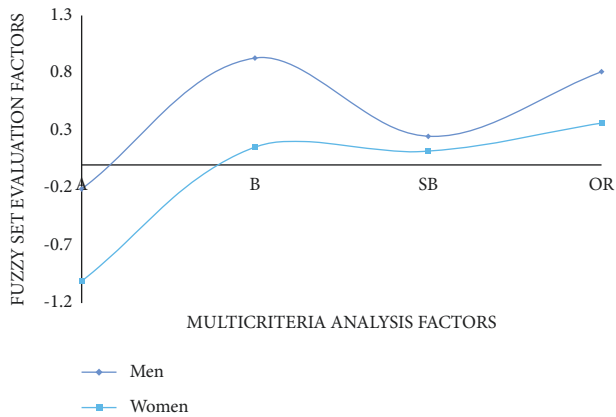

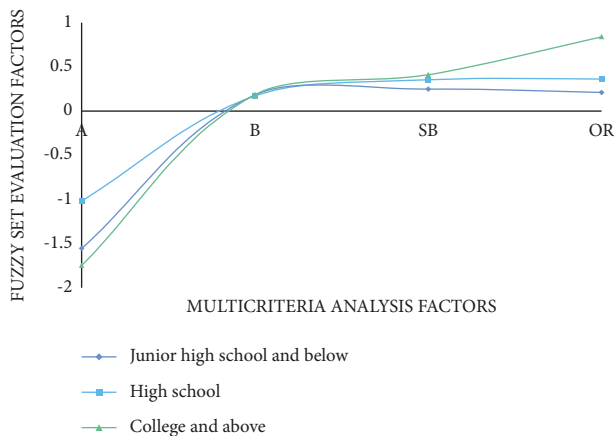Figure 3: Multicriteria evaluation of gender factors.

Figure 4: Multicriteria evaluation of educational level factors.

measures are taken to provide valuable reference for the long-term development of teachers. Multicriteria evaluation and analysis of gender, age, and educational level were carried out using intuitionistic fuzzy sets. As shown in Figures 3, 4, and 5.
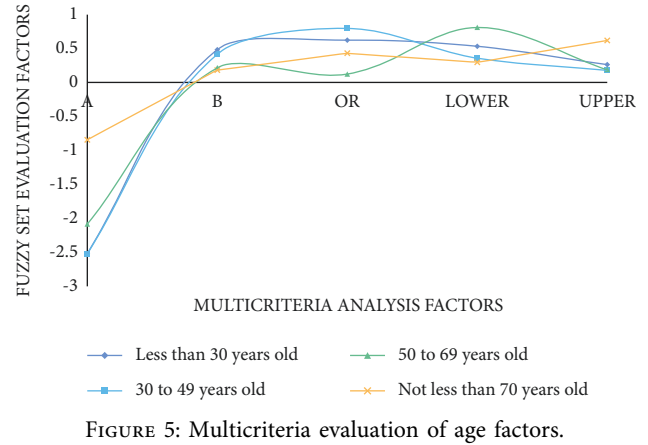

Figure 5: Multicriteria evaluation of age factors.

Gender is a factor strongly associated with health-related behaviors. The results of the univariate analysis of the results of the survey show that: men's health behavior scores and health knowledge scores are lower than women's, but only the health behavior score of the two groups has a statistically significant difference; compared with men, women are more willing to getting health information about health-related behaviors makes it easier to engage in good health-related behaviors. Due to differences in regions, cultural structures, measurement tools, and evaluation indicators, we are not yet sure whether different genders are good or bad in health-related behaviors, but the role of gender on differences in health-related behaviors is certain. This also suggests that gender differences should be prioritized in future health intervention programs for healthy behaviors and targeted interventions and methods should be formulated.

The results of this survey show that age is one of the influencing factors of residents' health-related behaviors. The results of univariate analysis showed that with the increase of age, the health-related behavior scores of residents showed an upward trend, especially the residents over 70 years old scored the highest. Multivariate logistic regression analysis showed that residents under the age of 30 and 30–49 years old had lower health-related behavior scores, and residents over 70 years old had the highest health-related behavior scores.

The results of this study show that educational level is an influencing factor of residents' health-related behavior level. The results of univariate analysis showed that the health-related behavior scores of residents increased with the increase of educational level, and the differences among the groups were statistically significant. Due to the limitations of knowledge, ability to understand health information, and analytical ability, residents with low-education level seldom actively seek good health-related behaviors, and their health awareness is not strong. On the contrary, they are more likely to actively acquire health knowledge and can understand and select correct health behavior information in a short period of time, thereby producing good health behavior habits.

The results showed that after the three independent variables of gender, age group, and educational level were
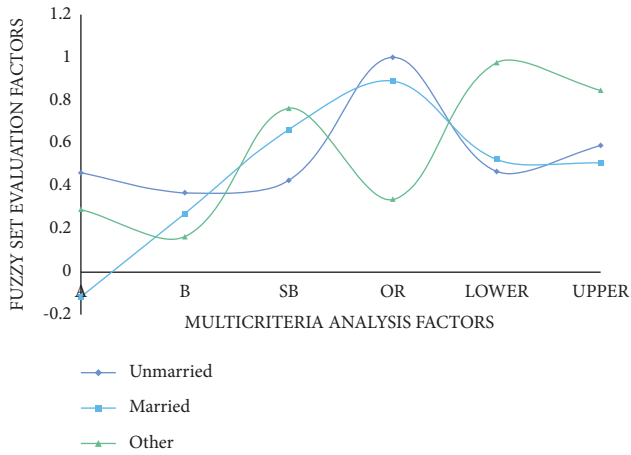
FIGURE 6: Multicriteria evaluation of marital status factors.
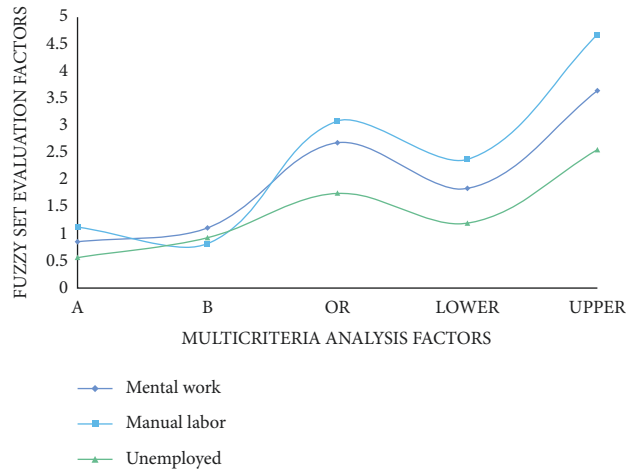

FIGURE 7: Multicriteria evaluation of occupational category factors.

gradually selected, it was concluded that the factors of female, high educational level and medium age were conducive to improving residents' health information literacy.

5.4. Analysis of the Influence of Rural Community Residents' Behavior on Health Information Literacy. This chapter conducts a multicriteria evaluation and analysis based on the marital status and occupational categories of residents in rural communities, as shown in Figures 6 and 7.

Marital status is one of the important factors affecting residents' health knowledge score. Univariate analysis showed that residents with different marital status had statistically significant differences in their health knowledge scores. Generally speaking, factors such as economic ability and age of married residents are higher than those of unmarried people, and they are more likely to acquire and accept health knowledge. Widowed persons have relatively negative ways and attitudes toward life and health, so their attention and enthusiasm for their own health are relatively low, so their health knowledge scores are relatively low. Therefore, in the process of formulating corresponding intervention measures, we should carry out different forms

of health education for residents with different marital status.

It can be seen from the comparison results of occupational groups: the scores of health-related behaviors are compared, the scores of mental workers are higher, and the scores of nonemployed workers are lower. Most of the mental workers are residents with a high degree of education. They are more likely to take the initiative to seek health care knowledge and correct health behaviors, and they are more likely to recognize the harm of bad health behaviors for manual workers. In addition, mental workers will have an advantage in their own economic conditions to a certain extent, so they are more able to use various media to obtain health-related information, learn correct health care knowledge, maintain the health of themselves and their families, and improve their quality of life and health level. On the other hand, manual workers, due to heavy work tasks, high economic pressure, and relatively little free time, do not have enough time and energy to focus on good health-related behaviors. In addition, coupled with the limitations of manual workers' educational level, they are not concerned about health information comprehension is also limited. It is recommended to strengthen the health education for manual workers and unemployed people in the work of residents' adverse health-related behavior intervention, and improve their health knowledge level.

6. Conclusions

In order to evaluate the health information literacy of rural community residents more comprehensively and objectively, to overcome the limitations of traditional methods in the selection of indicators, and to solve the problem of ranking the health information literacy of residents in different urban and rural communities in the same region, a multiattribute evaluation method based on intuition fuzzy is proposed, the corresponding index system is constructed, and the relevant weight determination and information integration methods are given. The study found that the level of health knowledge and health-related behaviors in the surveyed areas is not high, and the residents' health knowledge needs to be further improved. The scores of health knowledge and health-related behaviors of residents with different demographic characteristics were statistically different. Among them, the scores of older people, people with primary school education and below, unemployed people, divorced, and other marital status are lower than the scores of other residents in the same group, and the difference is statistically significant. The scores of male residents are slightly lower than that of women, but the difference "no statistical difference" was found; the scores of male, younger, junior high school, unemployed, unmarried, uninsured, and underweight residents were lower than those of other residents in this group, and the difference was statistically significant. The formation rate of healthy behaviors of manual workers is relatively low, and the formation rate of healthy behaviors of females, seniors, and highly educated people is relatively high. Females, married people, and high education levels are conducive to

improving residents' health knowledge. It is suggested that different intervention measures and health education methods should be adopted for people with different demographic characteristics, so as to improve the awareness rate of residents' health knowledge and the formation rate of health promotion behaviors. In addition, the similarity measure of intuitionistic fuzzy sets is not studied in this paper. Similarity measure is a very important quantitative index in data processing and analysis. This paper does not analyze and compare the previous two intuitionistic fuzzy set similarity measures, which have certain limitations.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

References

[1] L. Fan, J. Cao, M. Hu, and C Yin, "Exploring the importance of neighborhood characteristics to and their nonlinear effects on life satisfaction of displaced senior farmers," *Cities*, vol. 124, Article ID 103605, 2022.

[2] H. Linwei, S. Longyu, Y. Fengmei, and G. Xue-qinLijie, "Method for the evaluation of residents' perceptions of their community based on landsenses ecology," *Journal of Cleaner Production*, vol. 281, no. 7, Article ID 124048, 2021.

[3] T. Lee, B. K. Lee, and S. L. Geiller, "The effects of information literacy on trust in government websites: e," *International Journal of Information Management*, vol. 52, Article ID 102098, 2020.

[4] F. Hajizadeh, M. Poshidehro, and E. Yousefi, "Scenario-based capability evaluation of ecotourism development - an integrated approach based on WLC, and FUZZY - OWA methods," *Asia Pacific Journal of Tourism Research*, vol. 25, no. 6, pp. 637–650, 2020.

[5] K. Jackson, R. Roberts, and R. McKay, "Older people's mental health in rural areas: c," *Australian Journal of Rural Health*, vol. 27, no. 4, pp. 358–365, 2019.

[6] J. N. Chu, U. Sarkar, N. A. Rivadeneira, and E. C HiattKhoong, "Impact of language preference and health literacy on health information-seeking experiences among a low-income, multilingual cohort," *Patient Education and Counseling*, vol. 105, no. 5, pp. 1268–1275, 2022.

[7] G. Wang, J. Zhang, and Q. SongLi, "An entropy-based knowledge measure for atanassov's intuitionistic fuzzy sets and its application to multiple attribute decision making," *Entropy*, vol. 20, no. 12, p. 981, 2018.

[8] X. Gou, Z. Xu, and H. Liao, "Hesitant fuzzy linguistic possibility degree-based linear assignment method for multiple criteria decision-making," *International Journal of Information Technology and Decision Making*, vol. 18, no. 01, pp. 35–63, 2019.

[9] Z. Wang, F. Xiao, and W. Ding, "Interval-valued Intuitionistic Fuzzy Jenson-shannon Divergence and its Application in Multi-Attribute Decision making," *Applied Intelligence*, vol. 225, pp. 1–17, 2022.

[10] A. Çalık, "A multi-criteria evaluation for sustainable supplier selection based on fuzzy sets," *Business and Economics Research Journal*, vol. 10, no. 1, pp. 95–113, 2020.

[11] M. K. Ghorabaee, M. A. Amiri, and J. Z. T. Antucheviciene, "A dynamic fuzzy approach based on the EDAS method for multi-criteria subcontractor evaluation," *Information*, vol. 9, no. 3, p. 68, 2018.

[12] Y. Liang, H. Huang, Z. Cai, and Z. Hao, "Improving image matting by multiobjective evolutionary optimization based on fuzzy multi-criteria evaluation and decomposition," *IEEE Transactions on Fuzzy Systems*, vol. 99p.12019.

[13] Y. A. Alsahafi, V. Gay, and A. A. Khwaji, "Factors affecting the acceptance of integrated electronic personal health records in Saudi Arabia: the impact of e-health literacy," *Health Information Management Journal*, vol. 51, no. 2, pp. 98–109, 2022.

[14] X. Y. Zhang, Y. Shen, and J. Zhang, "Analysis on user satisfaction of online health information service based on fuzzy comprehensive evaluation model," *Information Science*, vol. 8, no. 44, pp. 63–77, 2018.

[15] L. I. Xu-Fang, Z. Zhang, and W. L. Zhang, "Network Users'e Health Literacy Analysis and Evaluation," *Economic Research Guide*, vol. 2, no. 7, pp. 57–66, 2019.

[16] R. Zhou, W. Yin, W. Li, and X. WangLuLiHu, "Prediction model for infectious disease health literacy based on synthetic minority oversampling technique algorithm," *Computational and Mathematical Methods in Medicine*, vol. 2022, pp. 1–6, 2022.

[17] F. Jia, Y. Liu, and X. Wang, "An extended MABAC method for multi-criteria group decision making based on intuitionistic fuzzy rough numbers," *Expert Systems with Applications*, vol. 127, no. AUG, pp. 241–255, 2019.

[18] X. K. Wang, H. G. Peng, and J. Q. Wang, "Hesitant linguistic intuitionistic fuzzy sets and their application in multicriteria decision-making problems," *International Journal for Uncertainty Quantification*, vol. 8, no. 4, pp. 321–341, 2018.

[19] C. Liang, "Multi-criteria decision making method based on analytic hierarchy process with intuitionistic fuzzy preference information," *International Journal of Reasoning-based Intelligent Systems*, vol. 10, no. 2, p. 109, 2018.

[20] Y. Liu, G. Wei, H. Liu, and L. Xu, "Group decision making for internet public opinion emergency based upon linguistic intuitionistic fuzzy information," *International Journal of Machine Learning and Cybernetics*, vol. 13, no. 3, pp. 579–594, 2022.

[21] I. Kandasamy and F. Smarandache, "Multicriteria decision making using double refined indeterminacy neutrosophic cross entropy and indeterminacy based cross entropy," *Applied Mechanics and Materials*, vol. 859, pp. 129–143, 2016.

[22] A. R. Mishra, R. K. Singh, and D. Motwani, "Multi-criteria assessment of cellular mobile telephone service providers using intuitionistic fuzzy WASPAS method with similarity

measures," *Granular Computing*, vol. 4, no. 3, pp. 511–529, 2018.

[23] W. Huang, F. Zhang, and S. Xu, "A complete ranking method for interval-valued intuitionistic fuzzy numbers and its applications to multicriteria decision making," *Soft Computing*, vol. 25, no. 3, pp. 2513–2520, 2021.

[24] C. Wang, H. Zhou, H. Dincer, and G. S. YukselUbayUluer, "Analysis of electricity pricing in emerging economies with hybrid multi-criteria decision-making technique based on interval-valued intuitionistic hesitant fuzzy sets," *IEEE Access*, vol. 8, pp. 190882–190896, 2020.

[25] R. Kumari and A. R. Mishra, "Multi-criteria COPRAS method based on parametric measures for intuitionistic fuzzy sets: application of green supplier selection," *Iranian Journal of Science and Technology, Transactions of Electrical Engineering*, vol. 44, no. 4, pp. 1645–1662, 2020.

[26] V. Chinnadurai, S. Thayalan, and A. Bobin, "Multi-criteria decision making process using complex cubic interval valued intuitionistic fuzzy set," *Journal of Physics: Conference Series*, vol. 1850, no. 1, Article ID 012094, 2021.

[27] V. Arya and S. Kumar, "Multi-criteria decision making problem for evaluating ERP system using entropy weighting approach and q-rung orthopair fuzzy TODIM," *Granular Computing*, vol. 6, no. 4, pp. 977–989, 2020.

[28] J. Priyadharsini and P. Balasubramaniam, "Multi-criteria decision making method based on interval-valued intuitionistic fuzzy sets," *The Journal of Analysis*, vol. 27, no. 1, pp. 259–276, 2018.