Study on the Evaluation of Urban Residents' Quality of Life in Gansu Province

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ABSTRACT
With the transformation of social economy and the development of urban construction, the attention of residents' quality of life is gradually improving. Taking the data of 14 cities in Gansu Province as samples, this paper measures the quality of life of urban residents in Gansu Province and evaluates the differences of residents' quality of life through principal component analysis and TOPSIS. The results show that: ① the cities with the highest closeness of residents' quality of life (C_i value > 0.5) are Lanzhou, Tianshui, Dingxi, Pingliang, Longnan, Linxia, Wuwei and Qingyang, and the cities with the lowest closeness (C_i value < 0.4) are Jinchang, Jiayuguan and Gannan; ② At present, the primary factors affecting the quality of life of urban residents are economic factors, followed by educational and cultural factors, life factors, medical and health factors, and finally ecological and environmental factors.

Keyword: *Quality of urban life, Gansu Province, TOPSIS analysis.*

1. INTRODUCTION

The development concept of "people-centered" has prompted people to pay attention to the quality of life[1] . As an academic term, "quality of life" was first put forward by American institutional economist Galbraith in the late 1950s[2]. After half a century of development, the quality of urban life has become a research field widely concerned by western sociology, economics, psychology, medicine, philosophy, geography, planning and other disciplines[3]. At present, the research on the quality of urban life in western academic circles has been very rich [4]: from urban ordinary people to minority social groups; At the same time, the research on the quality of life in the city is also very diverse.

Domestic research on the quality of life rose in the 1980s. Lin Nan took the lead in investigating the quality of life of Shanghai residents[5]. The subsequent research is roughly divided into three directions: quality of life in the sense of social indicators; People's subjective evaluation of life satisfaction; Relationship between subjective and objective indicators of quality of life[6]. In addition, some scholars have studied the spatial characteristics and evaluation methods of urban quality of life[7].At present, the domestic research on the quality of urban life mostly focuses on the economically developed eastern region and provincial capital cities, while there are few evaluation results on the quality of urban life in the western region. The level of urban development in the western region is low, and it is in a critical period of transformation and development. Therefore, taking Gansu Province as the research object, this paper constructs the urban quality of life evaluation system in the western region on the basis of the index system, in order to enrich the urban quality of life evaluation system and provide suggestions for the improvement of urban quality of life in the western region.

2. OVERVIEW AND DATA SOURCES OF THE STUDY AREA

Gansu Province is located in Northwest China, with an area of 425800 square kilometers. As of November 1, 2020, the province's permanent population was 25019831. In 2020, Gansu Province achieved a regional GDP of 901.67 billion yuan. The study area of this paper is 14 cities in Gansu Province, including Lanzhou, Jiayuguan, Jinchang, Baiyin, Tianshui, Wuwei, Zhangye, Pingliang, Jiuquan, Qingyang, Dingxi, Longnan, Linxia and Gannan.

The research data mainly come from the data of the seventh national census of Gansu Province in 2021, China Urban Statistical Yearbook 2020, and Gansu statistical yearbook 2020. Based on the existing research results[8], following the construction principles of scientificity, simplicity and operability, and combined with the actual situation of Gansu Province, 12 indicators

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are selected from the five aspects of economic status, education and culture, living status, medical and health status and ecological environment to construct the evaluation index system of urban residents' quality of life (Table 1). The research methods of this paper mainly use TOPSIS analysis and principal component analysis.

Table 1. Evaluation index system of urban residents' quality of life

Primary index	Secondary index	Mean value	Standard deviation	Coefficient of variation
Economic situation	Per capita GDP / yuan	105.97	1.83	0.02
	Per capita disposable income / yuan	31430.43	6163.71	0.20
	Per capita consumption expenditure/yuan	21666.14	4398.24	0.20
Education and culture	10000 people college degree or above / person	14815.86	6587.83	0.44
	Book collection per 10000 people / volume	87.42	30.05	0.34
Living conditions	Per capita domestic power consumption / L	127.28	43.39	0.34
	Gas penetration rate	90.21	8.58	0.09
	Urban Road area per capita / m^2	17.61	7.94	0.45
Medical and health status	Number of doctors per 10000 people	12776.36	8905.78	0.69
	Number of medical institutions with 10000 people	1906.57	1152.67	0.60
ecological environment	Greening coverage rate of built-up area/%	35.42	3.60	0.10
	Sewage treatment rate /%	96.59	1.75	0.01

3. RESULTS AND ANALYSIS

3.1. TOPSIS evaluation

Calculate the distance between each evaluation object and the best and worst scheme and the closeness C_i value between each evaluation object and the best scheme, and further rank it (Table 2).

Through table 2, it is found that there is a large gap in the quality of life of urban residents in Gansu Province. According to the ranking, Lanzhou, Tianshui, Dingxi, Pingliang, and Longnan have the highest relative closeness ranking, while Jinchang, Jiayuguan, Gannan, Jiuquan, and Zhangye have the lowest relative closeness ranking. Through the coefficient of variation of the indicators, it can also be seen that the gap in the quality of life of urban residents is reflected in the number of doctors per 10000 people, the number of medical institutions per 10000 people, the per capita urban road area, the number of people with a college degree or above, the number of books in public libraries, the per capita living power consumption and other indicators.

According to the research results, the quality of life of urban residents in Gansu Province can be divided into three levels. The first level includes Lanzhou, Tianshui, Dingxi, Pingliang, Longnan, Linxia, Wuwei, and Qingyang, with Ci value of more than 0.5, which shows that these eight regions have strong urban economic strength and the best results in the quality of life of urban residents. The second level is Baiyin, Zhangye, and Jiuquan, with Ci values ranging from 0.4 to 0.5. Most of these cities belong to areas with intermediate health status in the province. To a certain extent, their residents' quality of life is not high. The government should continue to change government functions, improve service levels and effectively improve residents' quality of life to catch up with the first level. The third level includes Jinchang, Jiayuguan, and Gannan, whose Ci value is below 0.4, the closeness is at the lowest level, and the living standard of urban residents is relatively low, but there is little difference from the second level. These areas belong to underdeveloped areas with relatively low health status, and the quality of life largely depends on medical facilities. As long as the government takes measures to eliminate the problem, only by improving the quality of life of residents can we gradually enter the second level team?

Table 2. C_i value and ranking of quality of life of urban residents

City	D+	D-	C_i	Ranking
Lanzhou	0.2820	0.5719	0.6697	1
Tianshui	0.2846	0.4626	0.6191	2
Dingxi	0.2912	0.3961	0.5763	3
Pingliang	0.3085	0.3682	0.5441	4
Longnan	0.3356	0.3858	0.5348	5
Linxia Prefecture	0.3504	0.3749	0.5169	6
Wuwei	0.3288	0.3503	0.5159	7
Qingyang	0.3566	0.3578	0.5009	8
Baiyin	0.3598	0.3368	0.4835	9
Zhangye	0.3668	0.3273	0.4715	10
Jiuquan	0.4331	0.2945	0.4047	11
Gannan	0.4826	0.2938	0.3784	12
Jiayuguan	0.5512	0.3149	0.3636	13
Jinchang	0.5362	0.2832	0.3456	14

3.2. Measurement of urban residents' quality of life

The principal component analysis method is used to measure the comprehensive score of each urban residents' quality of life. Through the Bartlett ball test, the observation variables are suitable for principal component analysis, and three principal components are determined, with a cumulative contribution rate of 78.416%。

By calculating the rotated principal component load matrix, the first common factor F1 has a large load on per capita disposable income, per capita consumption expenditure, per 10000 people with college degree or above, per capita urban road area and sewage treatment rate; The second public factor F2 has a large load on the number of books in public libraries and the number of doctors per 10000 people; The third public factor F3 has a large load on per capita domestic power consumption, gas penetration rate and greening coverage rate of built-up areas. To sum up, the mechanisms affecting the quality of life of urban residents in Gansu Province mainly include economic factors, educational and cultural factors, living factors, medical and health factors and ecological environment factors.

Finally, the calculation formula of the comprehensive index of resident`s quality of life $S = \sum_{i=1}^{n} W_i F_i$ (I = 1, 2... 12, S is the quality of life index, with the weight of the index, the contribution rate of each principal component, FI is the score of each principal component), the comprehensive index of quality of life of urban residents can be calculated and ranked (Table 3).

Table 3. Comprehensive scores of quality of life of urban residents

City	F1	F2	F3	Comprehensive score	Ranking
Lanzhou	1.88	4.31	0.33	1.78	1
Jiayuguan	4.55	-1.39	-1.52	1.53	2
Jinchang	2.43	-0.97	-0.35	0.83	3
Jiuquan	1.56	0.14	0.11	0.74	4
Baiyin	0.52	0.31	0.96	0.42	5
Zhangye	0.28	-0.22	1.84	0.32	6
Wuwei	0.48	-0.57	1.01	0.22	7

Pingliang	-0.92	0.36	-1.12	-0.48	8
Gannan	-0.51	-1.57	0.59	-0.48	9
Qingyang	-0.81	-0.15	-0.82	-0.5	10
Longnan	-2.24	0.49	0.5	-0.83	11
Linxia	-1.92	-1.41	1.24	-0.98	12
Tianshui	-2.48	0.6	-0.53	-1.05	13
Dingxi	-2.82	0.07	-2.22	-1.53	14

4. CONCLUSION

Based on the construction of the index system of urban residents' quality of life in Gansu Province, this paper uses the TOPSIS method to comprehensively evaluate the quality of life of urban residents and uses the principal component analysis method to measure the quality of life of urban residents. Through the research, the following conclusions are obtained:

(1) There are significant differences in the quality of life of urban residents in Gansu Province. There are 8 cities with the highest closeness of residents' quality of life (C_i value > 0.5), namely Lanzhou , Tianshui， Dingxi, Pingliang, Longnan, Linxia, Wuwei and Qingyang. There are three cities with the lowest closeness C_i (C_i value < 0.4), namely Jinchang, Jiayuguan and Gannan.

(2) At present, the primary factor affecting the quality of life of urban residents in Gansu Province is the economy, followed by education and culture, living conditions, medical and health development level, and finally the ecological environment. The economic aspect mainly includes per capita disposable income and per capita consumption expenditure; In terms of society, it mainly includes per capita domestic power consumption, per capita urban road area, number of college students per 10000 people, number of hospitals per 10000 people, and number of doctors per 10000 people; In terms of ecological environment, there are mainly greening coverage rate of built-up areas and domestic sewage treatment rate.

(3) There are significant differences in the quality of life index of urban residents. Among them, the comprehensive scores of Lanzhou and Jiayuguan are greater than 1, which is much higher than those of other cities, indicating that the residents' quality of life in these two cities is high; The comprehensive scores of Pingliang, Gannan, Qingyang, Longnan, Linxia, Tianshui, and Dingxi are less than 0, indicating that these seven cities are in low-level areas; The comprehensive scores of the other five cities are between 0-1, at the middle level.

Based on the above conclusions, the following suggestions are put forward: first, for high-level cities, their social security factors and economic factors are positive, but there are differences in varying degrees. As the provincial capital, Lanzhou should further attract new investment and development and promote the further development of economy; Jiayuguan should strengthen the implementation of relevant social security policies and the development of relevant supporting services, so as to improve its social security factors and further increase the speed of economic development. Secondly, for intermediate level cities, we should make scientific use of resource advantages and local characteristic culture. Thirdly, for low-level areas, we should combine our own specific conditions and pay attention to the supporting establishment of corresponding social security facilities while promoting economic growth.

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