

# Analysis of Health-Related Quality of Life and Influencing Factors among Elderly Residents in Southwest China

Xuang Cao<sup>1\*</sup>, Xueyin Liang<sup>2\*</sup>, Wei Wu<sup>1\*</sup>, Wei Su<sup>3\*</sup>, Donggang Liu<sup>4#</sup>, Yun Zhou<sup>5#</sup>

<sup>1</sup>School of Clinical Medicine, Yunnan Pharmaceutical and Health Career College, Kunming, China

<sup>2</sup>School of Medicine, Xi'an Siyuan College, Xi'an, China

<sup>3</sup>College of Nursing and Rehabilitation, North China University of Science and Technology, Tangshan, China

<sup>4</sup>College of Engineering, Dali University, Dali, China

<sup>5</sup>School of Public Health, Dali University, Dali, China

Email: 810506464@qq.com

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## Abstract

**Objective:** The health-related quality of life (HRQoL) theory was used to assess the health quality of elderly residents in Southwest China. This was done by using the European Five-Dimensional Health Scale in a comprehensive manner and by analysing the factors influencing it. The findings will provide new perspectives and ideas for improving the health-related quality of life of the elderly population and enhancing the precise health management of elderly residents. **Methods:** The response data of 1892 elderly residents in southwestern China were included in the analysis based on the CLHLS data. The factors influencing the occurrence of problems, EQ-VAS scores and health utility values were analysed by logistic regression, multiple linear regression and Tobit regression, respectively. **Results:** The primary health concerns among the elderly population in the Southwest region were limited ability to perform daily activities and pain or discomfort. These individuals exhibited an EQ-VAS self-assessment score of  $66.51 \pm 14.87$  and a health utility value of 0.87 (0.70, 1.00). Gender, age, regular medical check-ups, exercise habits and the prevalence of chronic diseases are the main influencing factors. **Conclusions:** The health quality of elderly people in Southwest China needs to be improved, and a comprehensive management strategy can be adopted in terms of lifestyle management, health needs management and disease management to improve the quality of their healthy lives and promote the development of healthy ageing.

\*Joint first authors.

#Joint senior authors.

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## Keywords

Southwest, Elderly Residents, Health Management, Health-Related Quality of Life, European 5-Dimensional Health Assessment Scale

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## 1. Introduction

As the world's population ages, the health problems of the elderly have gradually come to the forefront of society's attention. According to the statistics of China's seventh national census, the number of people aged sixty and above in China has now exceeded 260 million, an increase of 5.44% over the previous census [1]. Among them, the rate of population aging in southwest China has significantly increased and its severity has intensified, and as one of the regions with a high degree of population ageing in China, the number of elderly people has been increasing [2]-[4], posing unprecedented challenges to the socio-economic and healthcare systems. In recent years, with the continuous development of the medical and public health fields, the definition of health and the indicators for assessing health status have been improved and developed [5]. Quality of life, as an important measure of health assessment, has also developed with the gradual enrichment and transformation of the concept of health. Health-related quality of life is closely related to the physical and mental health of the elderly, and is of great importance for the quality of life and social development of the elderly [6]. The Southwest region of China was chosen for this study due to its rapidly aging population and unique geographical, cultural, and economic factors. These elements, including terrain, climate, and lifestyle habits, significantly influence the health-related quality of life of the elderly. Therefore, investigating this region is essential for identifying specific health needs and improving the well-being of the elderly population.

Therefore, in-depth research on health-related quality of life and management measures for elderly residents in Southwest China is urgently needed. The purpose of this study is to conduct an in-depth investigation of the health status and health-related quality of life characteristics of elderly residents in Southwest China, and through the systematic analysis of various influencing factors, to identify the existing problems and challenges, so as to support the improvement of the health-related quality of life of the elderly population and the formulation of targeted health policies and management measures to achieve the goal of healthy ageing.

## 2. Objects and Methods

### 2.1. Research Subjects and Data Sources

Quantitative analysis based on data from the Chinese Longitudinal Healthy Longevity Survey (CLHLS) [7], elderly residents (60 years and above) in Southwest China were selected as study subjects, and a valid sample of 1892 cases was obtained after screening by region.

## 2.2. Define

Health-related quality of life (HRQOL) is a multifaceted construct that encompasses an individual's physical, psychological, and social functioning as it relates to their health condition. This concept includes various dimensions such as mobility, self-care capacity, the ability to engage in routine activities, experiences of pain or discomfort, and mental health issues such as anxiety or depression. These aspects are typically assessed using standardized instruments, such as the EQ-5D scale utilized in this research. HRQOL offers a holistic evaluation of the impact of health on an individual's overall life quality.

## 2.3. Quality Control

All survey data were rigorously checked to ensure that the data met logical requirements and were not inconsistent or unreasonable. For the missing values present in some data, a scientific approach was taken to deal with them, using the mice function package of the R software, applying the multiple imputation method to predict and impute the missing values by building multiple models to control information bias and ensuring the adequacy of the sample size, so as to ensure the accuracy and reliability of the results of the data analyses.

## 2.4. Statistical Analysis

**Table 1.** Assignment of independent variables.

| Variant                       | Assignment                                                                                                         |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------|
| Sex                           | 1 = male, 2 = women                                                                                                |
| Age                           | 1 = 60~75,<br>2 = 75 - 90 (Older people with high life expectancy),<br>3 = 90 and above (Long-lived older persons) |
| Residence                     | 1 = urban; 2 = rural                                                                                               |
| Educational level             | 1 = Primary and below, 2 = junior high school,<br>3 = High school and above                                        |
| Marital status                | 1 = married, 2 = divorced, 3 = widowed,<br>4 = never married                                                       |
| Health insurance situation    | 0 = No, 1 = Yes                                                                                                    |
| Situation of elderly services | 0 = No, 1 = Yes                                                                                                    |
| Regular check-up              | 0 = No, 1 = Yes                                                                                                    |
| Smoking                       | 0 = No, 1 = Yes                                                                                                    |
| Drinking wine                 | 0 = No, 1 = Yes                                                                                                    |
| Physical exercise             | 0 = No, 1 = Yes                                                                                                    |
| Number of chronic diseases    | 0 = not affected, 1 = 1, 2 = 2 or more<br>(chronic disease co-morbidities)                                         |

Data were analysed and organised using Microsoft Excel, and statistical analyses were performed using SPSS25.0 and R Studio software. For quantitative variables, EQ-VAS self-rated scores were described by  $\bar{x} \pm s$  according to their normality, and differences in self-rated health status between different populations were compared using *t*-tests and F-tests. Describe the health utility case in terms of  $M(Q_1, Q_3)$ . Differences in scores between populations were compared using the Wilcoxon rank-sum test and the Kruskal-Wallis *H* test. For categorical variables, *n* (%) was used and differences between groups were compared using the  $\chi^2$  test. Multifactor logistic regression analysis was used to explore the population characteristics of the occurrence of rating problems on the EQ-5D scale, multiple linear regression to analyse the factors influencing self-rating scores on the EQ-VAS, and Tobit regression to analyse the factors influencing health utility scores. The test level was  $\alpha = 0.05$ . The assignment of the independent variables is shown in **Table 1**.

### 3. Results

#### 3.1. General Information

A total of 1892 elderly residents of the Southwest region were included, with an average age of  $(85.92 \pm 11.68)$  years. Of these, 852 (45.03%) were male and 1040 (54.97%) were female. The majority of the residents had health insurance (94.29%), as well as a high percentage of those with primary education or less (75.48%), urban residents (63.64%) and widows (60.94%); divorced (0.32%) and never married (0.90%) residents accounted for a smaller percentage of the population; and the prevalence rate of chronic diseases reached 75.69%.

#### 3.2. Health-Related Quality of Life of Older People in Southwest China

According to the overall distribution of the levels of the dimensions of the EQ-5D scale among the study participants, the dimensions with a high proportion of problems are mainly daily mobility and pain or discomfort, and the proportion of problems with mobility is relatively low. See **Table 2**.

**Table 2.** Overall distribution of levels of dimensions of the EQ-5D scale among the elderly in the South West Region.

| Dimension                           | No problems |       | Moderate problems |       | Severe problems |       |
|-------------------------------------|-------------|-------|-------------------|-------|-----------------|-------|
|                                     | n           | %     | n                 | %     | n               | %     |
| Mobility                            | 1689        | 89.27 | 131               | 6.92  | 72              | 3.81  |
| Self-care capacity                  | 1419        | 75.00 | 321               | 16.97 | 152             | 8.03  |
| Ability to perform daily activities | 1191        | 62.95 | 429               | 22.67 | 272             | 14.38 |
| Pain or discomfort                  | 1202        | 63.53 | 550               | 29.07 | 140             | 7.40  |
| Anxiety or depression               | 1465        | 77.43 | 306               | 16.17 | 321             | 6.40  |

**Table 3.** Multifactor logistic regression analysis of problems with dimensions of the EQ-5D scale for older residents in the southwest region.

| Variant                       | Reference group   | Comparison group      | Mobility            |           | Self-care capacity   |           | Ability to perform daily activities |           | Pain or discomfort |           | Anxiety or depression |         |
|-------------------------------|-------------------|-----------------------|---------------------|-----------|----------------------|-----------|-------------------------------------|-----------|--------------------|-----------|-----------------------|---------|
|                               |                   |                       | OR (95%CI)          | P         | OR (95%CI)           | P         | OR (95%CI)                          | P         | OR (95%CI)         | P         | OR (95%CI)            | P       |
| Sex                           | male              | women                 | 1.73 (1.01 - 2.96)  | 0.044*    | 1.00 (0.71 - 1.41)   | 0.999     | 0.98 (0.74 - 1.30)                  | 0.890     | 1.25 (0.94 - 1.66) | 0.119     | 1.10 (0.78 - 1.54)    | 0.597   |
| Age                           | 60 - 75           | 75 - 90               | 1.46 (0.38 - 5.64)  | 0.584     | 2.95 (1.21 - 7.23)   | 0.018*    | 1.29 (0.84 - 1.98)                  | 0.246     | 1.10 (0.79 - 1.53) | 0.587     | 0.90 (0.59 - 1.37)    | 0.624   |
|                               |                   | 90~                   | 8.31 (2.33 - 29.60) | 0.001**   | 11.23 (4.63 - 27.23) | <0.001*** | 2.18 (1.38 - 3.42)                  | <0.001*** | 0.98 (0.66 - 1.45) | 0.914     | 0.87 (0.54 - 1.40)    | 0.565   |
| Residence                     | urban             | rural                 | 0.79 (0.49 - 1.25)  | 0.314     | 0.67 (0.48 - 0.93)   | 0.015*    | 1.12 (0.87 - 1.45)                  | 0.367     | 1.00 (0.78 - 1.29) | 0.972     | 0.95 (0.70 - 1.29)    | 0.755   |
| Educational level             | primary and below | junior high school    | 1.05 (0.47 - 2.37)  | 0.900     | 1.22 (0.76 - 1.98)   | 0.412     | 0.95 (0.64 - 1.39)                  | 0.778     | 1.10 (0.79 - 1.52) | 0.572     | 0.77 (0.50 - 1.20)    | 0.246   |
|                               |                   | high school and above | 0.96 (0.27 - 3.41)  | 0.956     | 0.70 (0.32 - 1.55)   | 0.379     | 0.94 (0.53 - 1.66)                  | 0.832     | 0.92 (0.56 - 1.50) | 0.735     | 0.77 (0.39 - 1.50)    | 0.444   |
| Marital status                | married           | divorced              | 0.00 (0.00 - Inf)   | 0.993     | 0.00 (0.00 - Inf)    | 0.989     | 0.00 (0.00 - Inf)                   | 0.971     | 1.62 (0.29 - 9.10) | 0.583     | 1.70 (0.19 - 15.47)   | 0.637   |
|                               |                   | widowed               | 0.79 (0.40 - 1.55)  | 0.489     | 1.27 (0.81 - 1.99)   | 0.289     | 1.15 (0.83 - 1.61)                  | 0.398     | 0.70 (0.52 - 0.95) | 0.021*    | 1.16 (0.80 - 1.68)    | 0.444   |
|                               |                   | never married         | 0.00 (0.00 - Inf)   | 0.986     | 0.00 (0.00 - Inf)    | 0.980     | 0.38 (0.05 - 3.01)                  | 0.357     | 1.44 (0.49 - 4.21) | 0.509     | 1.89 (0.52 - 6.94)    | 0.335   |
| Health insurance situation    | no                | yes                   | 1.09 (0.44 - 2.68)  | 0.857     | 1.85 (0.89 - 3.84)   | 0.098     | 1.35 (0.77 - 2.35)                  | 0.293     | 0.96 (0.57 - 1.61) | 0.866     | 1.16 (0.59 - 2.29)    | 0.663   |
| Situation of elderly services | no                | yes                   | 1.18 (0.72 - 1.91)  | 0.514     | 0.93 (0.67 - 1.28)   | 0.662     | 1.05 (0.80 - 1.38)                  | 0.707     | 1.12 (0.85 - 1.46) | 0.418     | 1.16 (0.84 - 1.62)    | 0.366   |
| Regular check-up              | no                | yes                   | 0.52 (0.33 - 0.83)  | 0.006**   | 0.57 (0.42 - 0.78)   | <0.001*** | 0.77 (0.59 - 1.01)                  | 0.056     | 0.87 (0.66 - 1.14) | 0.319     | 1.41 (1.01 - 1.98)    | 0.048*  |
| Smoking                       | no                | yes                   | 0.25 (0.09 - 0.73)  | 0.011*    | 1.04 (0.67 - 1.62)   | 0.860     | 0.83 (0.57 - 1.21)                  | 0.331     | 1.06 (0.76 - 1.49) | 0.737     | 0.94 (0.61 - 1.45)    | 0.788   |
| Drinking wine                 | no                | yes                   | 1.08 (0.52 - 2.25)  | 0.840     | 0.70 (0.43 - 1.14)   | 0.151     | 0.59 (0.39 - 0.89)                  | 0.013*    | 1.12 (0.79 - 1.59) | 0.509     | 0.67 (0.41 - 1.09)    | 0.108   |
| Physical exercise             | no                | yes                   | 0.07 (0.02 - 0.23)  | <0.001*** | 0.37 (0.25 - 0.55)   | <0.001*** | 0.39 (0.29 - 0.52)                  | <0.001*** | 1.11 (0.86 - 1.43) | 0.420     | 0.68 (0.49 - 0.93)    | 0.016*  |
| Number of chronic diseases    | not affected      | 1                     | 1.51 (0.84 - 2.74)  | 0.171     | 1.06 (0.71 - 1.59)   | 0.764     | 1.10 (0.78 - 1.57)                  | 0.582     | 1.26 (0.87 - 1.81) | 0.215     | 1.27 (0.82 - 1.96)    | 0.277   |
|                               |                   | 2 or more             | 1.56 (0.89 - 2.76)  | 0.121     | 1.30 (0.89 - 1.89)   | 0.173     | 1.80 (1.31 - 2.48)                  | <0.001*** | 2.21 (1.59 - 3.06) | <0.001*** | 1.78 (1.20 - 2.65)    | 0.004** |

Note: “\*\*\*” represents  $P < 0.001$ , “\*\*” represents  $P < 0.01$ , and “\*” represents  $P < 0.05$ .

Logistic regression equations were constructed using the levels of the dimensions of the EQ-5D scale as the dependent variable and the independent variables listed in **Table 1**. It was found that: gender (OR = 1.73, 95% CI: 1.01 - 2.96,  $P = 0.044$ ), age  $\geq 90$  years (OR = 8.31, 95% CI: 2.33 - 29.60,  $P = 0.001$ ), regular medical check-up status (OR = 0.52, 95% CI: 0.33 - 0.83,  $P = 0.006$ ), smoking (OR = 0.25, 95% CI: 0.09 - 0.73,  $P = 0.011$ ) and physical activity (OR = 0.07, 95% CI: 0.02 - 0.23,  $P < 0.001$ ) had a statistically significant effect on action; age 75 - 90 years (OR = 2.95, 95% CI: 1.21 - 7.23,  $P = 0.018$ ), age  $\geq 90$  years (OR = 11.23, 95% CI: 4.63 - 27.23,  $P < 0.001$ ), place of residence (OR = 0.67, 95% CI: 0.48 - 0.93,  $P = 0.015$ ), regular medical check-ups (OR = 0.57, 95% CI: 0.42 - 0.78,  $P < 0.001$ ) and physical activity (OR = 0.37, 95% CI: 0.25 - 0.55,  $P < 0.001$ ) had a statistically significant effect on self-care; age  $\geq 90$  years (OR = 2.18, 95% CI: 1.38 - 3.42,  $P < 0.001$ ), alcohol consumption (OR = 0.59, 95% CI: 0.39 - 0.89,  $P = 0.013$ ) and physical activity (OR = 0.39, 95% CI: 0.29 - 0.52,  $P < 0.001$ ) as well as chronic comorbidity (OR = 1.80, 95% CI: 1.31 - 2.48,  $P < 0.001$ ) had a statistically significant effect on daily activities; widowhood (OR = 0.70, 95% CI: 0.52 - 0.95,  $P = 0.021$ ), chronic disease comorbidity (OR = 2.21, 95% CI: 1.59 - 3.06,  $P < 0.001$ ) had a statistically significant effect on pain or discomfort; regular medical check-ups (OR = 1.41, 95% CI: 1.01 - 1.98,  $P = 0.048$ ), physical activity (OR = 0.68, 95% CI: 0.49 - 0.93,  $P = 0.016$ ) and chronic disease comorbidity (OR = 1.78, 95% CI: 1.20 - 2.65,  $P = 0.004$ ) had a statistically significant effect on anxiety or depression. The results of the analysis are presented in **Table 3**.

### 3.3. EQ-VAS Self-Assessment Score and Health Utility Value and Their Influencing Factors

The EQ-VAS Self-assessment Score of the study population was  $66.51 \pm 14.87$ , and the Health Utility Value was 0.87 (0.70, 1.00). According to the results of the normality test, parametric and non-parametric tests were used to test the difference between the VAS self-assessment scores and health utility scores with different characteristics of elderly residents in the Southwest region. The results showed that gender, age, education level, marital status, regular medical check-up status, smoking, alcohol consumption, physical activity status and prevalence of chronic diseases had an effect on the EQ-VAS self-assessment scores and health utility scores of elderly residents in southwest China, and the differences were statistically significant at the test level of  $\alpha = 0.05$ . The results are presented in **Table 4**.

**Table 4.** EQ-VAS scores and health utility values of elderly residents with different characteristics in the Southwest Region.

| Variant | Clusters | n (%)        | VAS ( $\bar{x} \pm s$ ) | $t/P^b$           | $P$     | health utility value<br>$M(Q_1, Q_3)$ | $Z/H^f$            | $P$     |
|---------|----------|--------------|-------------------------|-------------------|---------|---------------------------------------|--------------------|---------|
| Sex     | male     | 852 (45.03)  | $68.07 \pm 13.63$       | 4.21 <sup>a</sup> | <0.001* | 0.87 (0.75, 1.00)                     | -5.37 <sup>c</sup> | <0.001* |
|         | women    | 1040 (54.97) | $65.23 \pm 15.71$       |                   |         | 0.86 (0.65, 1.00)                     |                    |         |

## Continued

|                               |                       |              |               |                     |         |                   |                     |         |
|-------------------------------|-----------------------|--------------|---------------|---------------------|---------|-------------------|---------------------|---------|
| Age                           | 60 - 75               | 387 (20.45)  | 72.90 ± 10.37 | 112.22 <sup>b</sup> | <0.001* | 0.87 (0.80, 1.00) | 161.17 <sup>d</sup> | <0.001* |
|                               | 75 - 90               | 694 (36.68)  | 69.23 ± 12.55 |                     |         | 0.88 (0.78, 1.00) |                     |         |
|                               | 90-                   | 811 (42.86)  | 61.13 ± 16.60 |                     |         | 0.78 (0.57, 0.89) |                     |         |
| Residence                     | urban                 | 1204 (63.64) | 66.82 ± 15.21 | 1.19 <sup>a</sup>   | 0.235   | 0.87 (0.70, 1.00) | -0.73 <sup>c</sup>  | 0.465   |
|                               | rural                 | 688 (36.36)  | 65.97 ± 14.25 |                     |         | 0.87 (0.70, 1.00) |                     |         |
| Educational level             | primary and below     | 1428 (75.48) | 64.98 ± 15.25 | 31.83 <sup>b</sup>  | <0.001* | 0.87 (0.66, 1.00) | 26.02 <sup>d</sup>  | <0.001* |
|                               | junior high school    | 335 (17.71)  | 71.44 ± 12.44 |                     |         | 0.87 (0.78, 1.00) |                     |         |
|                               | high school and above | 129 (6.82)   | 70.62 ± 12.91 |                     |         | 0.88 (0.78, 1.00) |                     |         |
| Marital status                | married               | 716 (37.84)  | 70.05 ± 12.22 | 22.58 <sup>b</sup>  | <0.001* | 0.87 (0.78, 1.00) | 49.87 <sup>d</sup>  | <0.001* |
|                               | divorced              | 6 (0.32)     | 66.50 ± 9.97  |                     |         | 0.88 (0.80, 0.97) |                     |         |
|                               | widowed               | 1153 (60.94) | 64.38 ± 15.95 |                     |         | 0.86 (0.64, 1.00) |                     |         |
|                               | never married         | 17 (0.90)    | 62.47 ± 14.87 |                     |         | 0.80 (0.59, 0.88) |                     |         |
| Health insurance situation    | no                    | 108 (5.71)   | 67.21 ± 16.17 | 0.50 <sup>a</sup>   | 0.614   | 0.87 (0.64, 1.00) | -0.06 <sup>c</sup>  | 0.952   |
|                               | yes                   | 1784 (94.29) | 66.47 ± 14.80 |                     |         | 0.87 (0.70, 1.00) |                     |         |
| Situation of elderly services | no                    | 544 (28.75)  | 65.97 ± 15.27 | -1.01 <sup>a</sup>  | 0.315   | 0.87 (0.66, 1.00) | -1.46 <sup>c</sup>  | 0.143   |
|                               | yes                   | 1348 (71.25) | 66.73 ± 14.71 |                     |         | 0.87 (0.70, 1.00) |                     |         |
| Regular check-up              | no                    | 641 (33.88)  | 62.90 ± 16.50 | -7.23 <sup>a</sup>  | <0.001* | 0.80 (0.63, 1.00) | -6.95 <sup>c</sup>  | <0.001* |
|                               | yes                   | 1251 (66.12) | 68.36 ± 13.61 |                     |         | 0.87 (0.73, 1.00) |                     |         |
| Smoking                       | no                    | 1532 (80.97) | 65.93 ± 15.32 | -4.00 <sup>a</sup>  | <0.001* | 0.87 (0.68, 1.00) | -4.17 <sup>c</sup>  | <0.001* |
|                               | yes                   | 360 (19.03)  | 69.00 ± 12.54 |                     |         | 0.87 (0.78, 1.00) |                     |         |
| Drinking wine                 | no                    | 1599 (84.51) | 65.86 ± 15.12 | -5.00 <sup>a</sup>  | <0.001* | 0.87 (0.67, 1.00) | -5.19 <sup>c</sup>  | <0.001* |
|                               | yes                   | 293 (15.49)  | 70.08 ± 12.90 |                     |         | 0.88 (0.78, 1.00) |                     |         |
| Physical exercise             | no                    | 1112 (58.77) | 62.81 ± 15.60 | -14.16 <sup>a</sup> | <0.001* | 0.80 (0.63, 1.00) | -11.38 <sup>c</sup> | <0.001* |
|                               | yes                   | 780 (41.23)  | 71.79 ± 11.93 |                     |         | 0.88 (0.80, 1.00) |                     |         |
| Number of chronic diseases    | not affected          | 460 (24.31)  | 68.81 ± 15.22 | 9.06 <sup>b</sup>   | <0.001* | 0.88 (0.78, 1.00) | 37.11 <sup>d</sup>  | <0.001* |
|                               | 1                     | 581 (30.71)  | 66.66 ± 14.30 |                     |         | 0.87 (0.70, 1.00) |                     |         |
|                               | 2 or more             | 851 (44.98)  | 65.17 ± 14.93 |                     |         | 0.87 (0.64, 1.00) |                     |         |
| Total                         |                       | 1892 (100)   | 66.51 ± 14.87 |                     |         | 0.87 (0.70, 1.00) |                     |         |

Note: “a” represents the *t*-test, “b” represents ANOVA, “c” represents the *Wilcoxon rank sum test*, “d” represents the *Kruskal-Wallis H test*; “\*” represents  $P < 0.001$ .

A multiple linear regression model was constructed using the EQ-VAS self-rated scores as the dependent variable and the independent variables listed in **Table 1**. According to the results of the statistical analysis, it was found that age ( $B = -4.513$ ,  $t = -9.007$ ,  $P < 0.001$ ), literacy level ( $B = 1.347$ ,  $t = 2.352$ ,  $P = 0.019$ ), regular medical check-ups ( $B = 2.364$ ,  $t = 3.374$ ,  $P < 0.001$ ), alcohol consumption ( $B = 2.375$ ,  $t = 2.583$ ,  $P = 0.01$ ), physical activity ( $B = 6.812$ ,  $t = 10.270$ ,  $P < 0.001$ ) and chronic disease prevalence ( $B = -2.385$ ,  $t = -6.127$ ,  $P < 0.001$ ) had a statistically significant effect on the self-rated scores of the EQ-VAS of the elderly residents in Southwest China, and that the self-rated scores of the EQ-VAS decreased with increasing age and type of chronic disease prevalence. It increased with the increase of literacy level and regular physical examination. The results of the multiple linear regression analysis are presented in **Table 5**.

**Table 5.** Multiple linear regression analysis of factors influencing EQ-VAS scores of elderly residents in the Southwest Region.

| Variant                       | Reference Groups  | <i>B</i> | <i>SE</i> | <i>t</i> | <i>P</i>  |
|-------------------------------|-------------------|----------|-----------|----------|-----------|
| Constant                      |                   | 75.502   | 2.741     | 27.550   | <0.001*** |
| Sex                           | male              | -0.400   | 0.721     | -0.555   | 0.579     |
| Age                           | 60 - 75           | -4.513   | 0.501     | -9.007   | <0.001*** |
| Residence                     | urban             | -0.696   | 0.655     | -1.063   | 0.288     |
| Educational level             | primary and below | 1.347    | 0.573     | 2.352    | 0.019*    |
| Marital status                | married           | 0.054    | 0.389     | 0.139    | 0.889     |
| Health insurance situation    | no                | -1.946   | 1.349     | -1.443   | 0.149     |
| Situation of elderly services | no                | 0.665    | 0.689     | 0.964    | 0.335     |
| Regular check-up              | no                | 2.364    | 0.701     | 3.374    | <0.001*** |
| Smoking                       | no                | 1.186    | 0.887     | 1.338    | 0.181     |
| Drinking wine                 | no                | 2.375    | 0.920     | 2.583    | 0.01**    |
| Physical exercise             | no                | 6.812    | 0.663     | 10.270   | <0.001*** |
| Number of chronic diseases    | not affected      | -2.385   | 0.389     | -6.127   | <0.001*** |

Note: "\*\*\*" represents  $P < 0.001$ , "\*\*" represents  $P < 0.01$ , and "\*" represents  $P < 0.05$ .

A Tobit regression model was constructed using health utility values as the dependent variable and incorporating the independent variables from **Table 1**. The results showed that gender ( $\beta = -0.034$ ,  $t = -2.217$ ,  $P = 0.027$ ), age ( $\beta = -0.073$ ,  $t = -6.827$ ,  $P < 0.001$ ), regular medical checkup status ( $\beta = 0.047$ ,  $t = 3.206$ ,  $P = 0.001$ ), alcohol consumption ( $\beta = 0.059$ ,  $t = 2.999$ ,  $P = 0.003$ ), physical activity ( $\beta = 0.140$ ,  $t = 9.889$ ,  $P < 0.001$ ), and chronic disease prevalence ( $\beta = -0.063$ ,  $t = -7.663$ ,  $P < 0.001$ ) had a statistically significant effect on the health utility value of the elderly residents in Southwest China. The health utility value of females was

slightly lower than that of males; the health utility value of elderly residents in Southwest China decreases with the increase of age and the type of chronic disease prevalence. The results of Tobit regression analysis are shown in **Table 6**.

**Table 6.** Tobit regression analysis of health utility values of elderly residents in the Southwest Region.

| Variant                                   | Reference Groups  | $\beta$ | <i>SE</i> | <i>t</i> | <i>P</i>  |
|-------------------------------------------|-------------------|---------|-----------|----------|-----------|
| Constant                                  |                   | 1.023   | 0.058     | 17.652   | <0.001*** |
| Sex                                       | male              | −0.034  | 0.015     | −2.217   | 0.027*    |
| Age                                       | 60 - 75           | −0.073  | 0.011     | −6.827   | <0.001*** |
| Residence                                 | urban             | 0.010   | 0.014     | 0.758    | 0.448     |
| Educational level                         | primary and below | 0.008   | 0.012     | 0.676    | 0.499     |
| Marital status                            | married           | −0.002  | 0.008     | −0.215   | 0.829     |
| Health insurance situation                | no                | −0.011  | 0.028     | −0.393   | 0.694     |
| Situation of elderly services             | no                | 0.026   | 0.014     | 1.824    | 0.068     |
| Regular check-up                          | no                | 0.047   | 0.015     | 3.206    | 0.001**   |
| Smoking                                   | no                | 0.031   | 0.019     | 1.634    | 0.102     |
| Drinking wine                             | no                | 0.059   | 0.020     | 2.999    | 0.003**   |
| Physical exercise                         | no                | 0.140   | 0.014     | 9.889    | <0.001*** |
| Number of chronic diseases                | not affected      | −0.063  | 0.008     | −7.663   | <0.001*** |
| The logarithm value of the model variance |                   | −1.318  | 0.021     | −61.504  | <0.001*** |

Note: “\*\*\*” represents  $P < 0.001$ , “\*\*” represents  $P < 0.01$ , and “\*” represents  $P < 0.05$ .

#### 4. Discussion and Recommendations

Following an analysis of the levels of the dimensions of the EQ-5D scale in the study population, it was found that the proportion of problems in the dimensions of ability to perform daily activities and pain or discomfort was high. This result is consistent with the findings of previous studies conducted by domestic scholars [8] [9]. Furthermore, the aforementioned proportion is higher than that observed among residents of the southeastern coastal regions of China, including Shanghai [10] and Hangzhou [11], but lower than that seen among residents of the north-western areas, such as the Xinjiang Production and Construction Corps [12] and Xining [13]. This provides a reference direction for the health management services for the elderly residents of the southwestern region.

Separate analyses of the five dimensions with problems found that women had a higher percentage of difficulties in the mobility dimension than men, which is the same as the findings of Wang [14] *et al.* This may be related to factors such as physiological differences and the division of social roles, coupled with the fact that

women face more health challenges in old age, such as osteoporosis and chronic pain, which lead to mobility limitations. The proportion of difficulties faced by residents in the dimensions of mobility, self-care ability, and ability to perform activities of daily living increases with age, a phenomenon that is consistent with the findings of national and international scholars [15]-[17]. This may be due to the gradual decline of body functions with age, increased wear and tear on the joints of the back and legs, mobility difficulties, and impediments to domestic labor and agricultural work. In contrast to older adults who did not attend regular medical checkups, those who had regular medical checkups experienced fewer difficulties in the mobility and self-care ability dimensions. This may stem from the fact that regular medical checkups help detect and manage physical health problems early, curb potential health risks, and reduce the burden of daily activities and self-care. However, frequent checkups may also exacerbate concerns about health problems, leading to higher rates of anxiety and depressive conditions. The proportion of older adults who exercised had significantly lower rates of problems in the four dimensions other than pain and discomfort compared with those who did not exercise, a finding that is generally consistent with the findings of our scholars [18]. Appropriate physical activity not only slows down the speed and degree of deterioration of body functions, which is conducive to maintaining physical flexibility and enhancing muscle strength, and thus promotes physical and mental health; it also helps to enrich the leisure time of the elderly and improve mental health, thus reducing the negative impact on the quality of life and other aspects. Older adults with chronic disease co-morbidities have a higher incidence of problems in the dimensions of daily mobility, pain and discomfort, and anxiety and depression, a finding that is consistent with the findings of Jing Gao [19] and Changyun Li [20]. Chronic diseases have a long and prolonged course, and are prone to cause other diseases, resulting in a decline in physical fitness, limited mobility, gradual decline in organ function, and a higher probability of pain and discomfort. In addition, the economic pressure during the treatment of chronic diseases is enormous, and the double effect of physical discomfort and economic pressure makes the problem of anxiety/depression more serious. In addition, the dimension of self-care ability of the elderly was influenced by the place of residence, and a higher percentage of elderly residents in urban areas encountered difficulties in self-care compared with those in rural areas, a result that is consistent with the study of Zahidji [21] *et al.* This may be due to the fact that older people are relatively weak in adapting to new things, while urban areas develop faster, thus leading to limitations in self-care abilities.

In addition, the EQ-VAS self-assessment score of elderly residents in Southwest China was  $66.51 \pm 14.87$ , a result that is basically consistent with studies across the west [22]-[24], but significantly lower than that of developed regions in the east [25]. This reflects that the self-assessed health status of elderly residents in the southwest is not very optimistic.

The study analysis indicated that residents' self-assessed health scores were

negatively correlated with age and the number of chronic diseases, and positively correlated with literacy level. This result aligns with the findings of Li Changle [26] *et al.* Firstly, the negative correlation between age and self-assessed health scores may be attributed to the fact that with age, physical functioning and health conditions gradually diminish, leading to a relatively low evaluation of an individual's own health. Furthermore, as individuals age, they may encounter an increased prevalence of chronic diseases and health complications, which could potentially influence their self-rated health scores. Secondly, the negative correlation between the prevalence of chronic conditions and self-rated health scores may be attributed to the detrimental impact of chronic conditions on an individual's quality of life and overall health status. Those with multiple chronic conditions may experience greater physical discomfort and functional limitations, which may result in lower ratings of their health. Furthermore, older adults with higher levels of literacy tend to have higher self-rated health scores. This may be attributed to their typically higher income levels, access to superior health care resources, heightened concern about health issues, extensive knowledge about health, and possession of more health-related knowledge and behaviours, which collectively result in more positive evaluations of their own health. Furthermore, regular medical check-ups and exercise have a considerable impact on residents' self-assessed health index, which is in line with the findings of the domestic study [27]. Regular medical check-ups facilitate the identification and management of potential health issues, thereby positively influencing individuals' self-assessments of their own health. It is widely acknowledged that regular exercise is an effective means of maintaining physical and mental health. Those who engage in regular physical activity are more likely to demonstrate a greater awareness of their own health and to hold more positive views about it.

In the Southwest region, the utility value of health-related quality of life of elderly residents was 0.87 (0.70, 1.00), a value slightly higher than that of residents of less developed regions [28], which is consistent with the results of studies in other regions of China [29]. It can be seen that the health-related quality of life of elderly residents in the Southwest region is relatively good, but there still exists a certain degree of problems that should not be ignored.

Research analyses have shown that the utility value of health-related quality of life of the population is negatively correlated by age and the number of chronic diseases [30]. This negative correlation may stem from the fact that as individuals age, their physical functioning and health gradually decline, leading to a decline in quality of life and health-related quality of life. In addition, as they age, older adults may experience a greater burden of chronic diseases and health problems, which may also have an impact on their health utility values. Meanwhile, it was found that the health utility value showed a decreasing trend as the number of chronic diseases increased, which is consistent with the findings of many scholars in China [31]-[33]. This may be related to the physical discomfort caused by the disease itself as well as a series of adverse reactions brought about by multiple

medications. Individuals with more chronic diseases may face more physical discomfort and functional limitations, thus affecting their health-related quality of life. In addition, it has also been noted [34] that as the number of chronic diseases rises, the financial burden of the diseases also grows, which further increases the financial pressure on the family and reduces the health-related quality of life of the elderly to a certain extent. Gender, regular medical checkups, and exercise are also factors that affect the health utility value of the population. It was found that the health utility value of females was slightly lower compared to that of males, which is consistent with the results of most studies in China [35]. Women have a heavy burden in the family, in addition to taking care of their families and handling household chores, they also need to undertake a lot of physical labor, which produces a greater load on their bodies. In addition, female patients are relatively sensitive and vulnerable psychologically, which may exacerbate the health risks of chronic diseases. Regular medical check-ups and exercise are considered key measures for maintaining good health and preventing diseases, and those who actively participate in regular medical check-ups and exercise are likely to pay more attention to their own health, thereby enhancing health-related quality of life.

In summary, this study found that the factors affecting the health utility value include age, number of chronic diseases suffered, gender, regular medical check-ups and exercise, etc. These factors are highly consistent with the influencing factors of the self-assessed health scores, which indicates that the elderly residents of Southwest China are able to assess their own health more accurately, and at the same time indirectly verifies the validity of the EQ-5D Scale in reflecting the quality of life of the elderly people of Southwest China. Meanwhile, comparing the results with those of other studies, it was found that there were differences in the health-related quality of life of elderly residents in Southwest China with those in remote areas in the west and developed areas in the east, considering that the reasons for this may be related to factors such as lifestyles, economic development status, and education level, which still need to be further investigated. These findings are crucial to our in-depth understanding of the factors that influence an individual's health-related quality of life, and provide strong support for interventions necessary to promote healthy behaviors and enhance quality of life.

This research primarily utilized self-reported data, which inherently presents some limitations. Self-reported information is susceptible to recall bias, as elderly participants may struggle to accurately recall their health conditions or behaviors over extended periods. Furthermore, there is a potential for social desirability bias, where respondents might be inclined to report more favorable health statuses or behaviors than what is actually the case. To mitigate these biases in future studies, the incorporation of objective measurement techniques is recommended. For instance, physical function assessments, such as the timed up and go test to evaluate mobility and the Barthel index to measure self-care ability, can provide objective insights. Additionally, the collection of medical records can offer a more precise

verification of the presence and severity of chronic conditions. By integrating self-reported data with objective measures, a more comprehensive and accurate assessment of the health-related quality of life among the elderly can be attained.

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### Authors' Contributions

**Xuang Cao:** Writing—review & editing, Writing—original draft, Formal analysis, Data curation. **Xueyin Liang:** Writing—review & editing, Writing—original draft, Formal analysis, Data curation. **Wei Wu:** Writing—review & editing, Writing—original draft, Formal analysis, Data curation. **Wei Su:** Writing—review & editing, Writing—original draft, Formal analysis, Data curation. **Yun Zhou:** Writing—review & editing, Methodology, Funding acquisition, Conceptualization. **Donggng Liu:** Writing—review & editing, Methodology, Conceptualization.

### Conflict of Interest

All authors declare that they have no conflicts of interest.

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