Analysis of Current Status and Influencing Factors of Health Service Utilization among Rural Residents in Ningxia Hui Autonomous Region from the Perspective of Health Poverty Vulnerability (Postprint)

Authors: Li Chunsheng, Wang Youyun, Song Mingsha, Qiao Hui, Qiao Hui

Date: 2025-03-26T00:00:00+00:00

Abstract

Background In recent years, China' s health policy direction has shifted from health-related poverty alleviation to health-related poverty prevention, with rural residents being a key target population for poverty prevention efforts in the medical and health domain. Objective To understand the current status of healthcare service utilization and its influencing factors among rural residents in Ningxia Hui Autonomous Region under different levels of health poverty vulnerability, and to provide empirical evidence for improving rural residents' healthcare service utilization and promoting poverty prevention governance in the medical and health field. Methods Using a multi-stage stratified cluster random sampling method, a field household survey was conducted in four counties of Ningxia Hui Autonomous Region (Haiyuan, Yanchi, Xiji, and Pengyang) from June to July 2022. The questionnaire collected information on rural residents' general demographic characteristics, health status, healthcare service utilization, and household economic conditions. Three-stage Feasible Generalized Least Squares (FGLS) was employed to quantify residents' health poverty vulnerability, with 0.5 as the cutoff value to divide rural residents into health poverty vulnerable and non-vulnerable groups. Combined with Andersen' s model, multivariate unconditional Logistic regression was used to analyze healthcare service utilization and its influencing factors among rural residents with different health poverty vulnerabilities. Results This study included a total of 17,477 rural residents in Ningxia, including 9,154 males (52.4%) and 8,323 females (47.6%). The measurement and grouping results of rural residents' health poverty vulnerability showed that health poverty vulnerable residents accounted for 29.9% (5,229/17,477), while non-health poverty vulnerable residents accounted for 70.1% (12,248/17,477). The results of rural

residents' healthcare service utilization showed that the outpatient healthcare service utilization rate was 3.5% (185/5,229) among health poverty vulnerable residents and 4.5% (556/12,248) among non-health poverty vulnerable residents. Comparisons of outpatient healthcare service utilization among residents grouped by different health poverty vulnerabilities across characteristic indicators including gender, age, education level, marital status, occupation type, household permanent population size, annual household income, hospitalization due to illness, and self-rated health status showed statistically significant differences (P<0.05). Multivariate unconditional Logistic regression analysis results showed that among health poverty vulnerable residents, occupation classified as "other" (OR=1.571, 95%CI=1.084~2.276, P=0.017), hospitalization due to illness (OR=4.426, 95%CI=3.193~6.136, P<0.001), and self-rated health status classified as "fair" (OR=11.499, 95%CI=1.549~85.390, P=0.017) and "poor" (OR=13.256, 95%CI=1.760~99.823, P=0.012) were promoting factors for rural residents' outpatient healthcare service utilization, while education level of high school and above (OR=0.256, 95%CI=0.073~0.902, P=0.034) and household population size $ $6 persons (OR=0.264, 95%CI=0.074~0.947, P=0.041) were inhibiting factors. Among non-health poverty vulnerable residents, female gender (OR=1.282, 95%CI=1.063~1.547, P=0.009), age groups of 36-55 years (OR=1.689, 95%CI=1.043~2.736, P=0.033) and 56-75 years (OR=1.763, 95%CI=1.063~2.926, P=0.028), marital status of married (OR=2.682, 95%CI=1.464~4.915, P=0.001), marital status of divorced, widowed, or other (OR=2.782, 95%CI=1.412~5.481, P=0.003), hospitalization due to illness (OR=2.458, 95%CI=2.019~2.992, P<0.001), and self-rated health status of "fair" (OR=3.555, 95%CI=2.165~5.836, P<0.001) and "poor" (OR=5.473, 95%CI=3.274~9.151, P<0.001) were promoting factors for rural residents' outpatient healthcare service utilization, while household permanent population sizes of 2-3 persons (OR=0.578, 95%CI=0.373~0.895, P=0.014), 4-5 persons (OR=0.441, 95%CI=0.274~0.710, P=0.001), and $ $6 persons (OR=0.357, 95%CI=0.209~0.609, P<0.001) were inhibiting factors. Among the three dimensions of Andersen' s model, need factors had the most significant impact on rural residents' healthcare service utilization rates, while predisposing characteristics and enabling resources also exerted important influences. Conclusion Rural residents in Ningxia Hui Autonomous Region currently exhibit high health poverty vulnerability and low outpatient healthcare service utilization rates. There is an urgent need for comprehensive policy interventions, proactive measures targeting health poverty vulnerable residents, improvement of the primary-level medical security system, and enhancement of rural residents' outpatient healthcare service utilization levels.

Full Text

Analysis of the Status Quo and Influencing Factors of Health Service Utilization of Rural Residents in Ningxia from the Perspective of Health Poverty Vulnerability

LI Chunsheng[1],[2], WANG Youyun[1],[2], SONG Mingsha[1],[2], QIAO Hui[1],[2]*

[1]School of Public Health, Ningxia Medical University, Yinchuan 750004, China
[2]Ningxia Key Laboratory of Environmental Factors and Chronic Disease Control, Yinchuan 750004, China

Corresponding author: QIAO Hui, Professor/Doctoral supervisor; E-mail: qiaohui71@163.com

Abstract

Background In recent years, China' s health policy direction has shifted from health poverty alleviation to health poverty prevention, with rural residents serving as a key target population for poverty prevention in the medical and health fields. **Objectives** This study aims to understand the current status of health service utilization and its influencing factors among rural residents in Ningxia Hui Autonomous Region under different levels of health poverty vulnerability, thereby providing an empirical basis for improving rural residents' health service utilization and promoting poverty prevention governance in the medical and health sector. **Methods** A multistage stratified cluster random sampling method was employed to conduct a household survey in four counties of Ningxia Hui Autonomous Region (Haiyuan, Yanchi, Xiji, and Pengyang) during June-July 2022. Questionnaires collected information on rural residents' general demographic characteristics, health status, health service utilization, and household economic conditions. A three-stage Feasible Generalized Least Squares (FGLS) method was used to quantify residents' health poverty vulnerability, with a cutoff value of 0.5 to classify rural residents into health poverty vulnerable and non-vulnerable groups. Multifactorial non-conditional Logistic regression analysis based on the Anderson model was applied to examine health service utilization and influencing factors among rural residents with different health poverty vulnerabilities. **Results** A total of 17,477 rural residents in Ningxia were included in this study, comprising 9,154 males (52.4%) and 8,323 females (47.6%). The health poverty vulnerability measurement and grouping results showed that 29.9% (5,229/17,477) were health poverty vulnerable residents, while 70.1% (12,248/17,477) were non-vulnerable. Health service utilization results indicated that the outpatient service utilization rate was 3.5% (185/5,229) among health poverty vulnerable residents and 4.5% (556/12,248) among non-vulnerable residents. Statistically significant differences in outpatient service utilization were observed between the two groups across various characteristic indicators including gender, age, education level,

marital status, occupation type, number of permanent household residents, annual household income, hospitalization due to illness, and self-rated health status (P<0.05). Multifactorial non-conditional Logistic regression analysis revealed that among health poverty vulnerable residents, occupational category of "other" (OR=1.571, 95%CI=1.084-2.276, P=0.017), hospitalization due to illness (OR=4.426, 95%CI=3.193-6.136, P<0.001), and self-rated health status of "fair" (OR=11.499, 95%CI=1.549-85.390, P=0.017) and "poor" (OR=13.256, 95%CI=1.760-99.823, P=0.012) were promoting factors for outpatient health service utilization, while education level of high school and above (OR=0.256, 95%CI=0.073-0.902, P=0.034) and household size $ $6 persons (OR=0.264, 95%CI=0.074-0.947, P=0.041) were inhibiting factors. Among non-vulnerable residents, female gender (OR=1.282, 95%CI=1.063-1.547, P=0.009), age groups of 36-55 years (OR=1.689, 95%CI=1.043-2.736, P=0.033) and 56-75 years (OR=1.763, 95%CI=1.063-2.926, P=0.028), marital status of married (OR=2.682, 95%CI=1.464-4.915, P=0.001) and divorced/widowed/other (OR=2.782, 95%CI=1.412-5.481, P=0.003), hospitalization due to illness (OR=2.458, 95%CI=2.019-2.992, P<0.001), and self-rated health status of "fair" (OR=3.555, 95%CI=2.165-5.836, P<0.001) and "poor" (OR=5.473, 95%CI=3.274-9.151, P<0.001) were promoting factors, while household sizes of 2-3 persons (OR=0.578, 95%CI=0.373-0.895, P=0.014), 4-5 persons (OR=0.441, 95%CI=0.274-0.710, P=0.001), and $ $6 persons (OR=0.357, 95%CI=0.209-0.609, P<0.001) were inhibiting factors. Among the three dimensions of the Anderson model, demand factors had the most significant impact on rural residents' health service utilization, while predisposing characteristics and enabling resources also exerted important influences. **Conclusion** Rural residents in Ningxia Hui Autonomous Region currently exhibit high health poverty vulnerability and low outpatient health service utilization. Comprehensive measures are urgently needed to prospectively intervene in health poverty vulnerable residents, improve the primary healthcare security system, and enhance rural residents' outpatient health service utilization levels.

Keywords Health services; Health poverty vulnerability; Health service utilization; The Anderson model; Influencing factors; Rural residents

1.1 Study Subjects

The data for this study were derived from a field questionnaire survey conducted in June-July 2022 under a National Natural Science Foundation project (72164033). The project surveyed 20,821 rural residents, collecting information on general demographic characteristics, household economic status, health conditions, and health service utilization. All rural residents meeting the inclusion criteria were selected as study subjects, totaling 17,477 cases (83.94%). Inclusion criteria were: (1) age $ $15 years; (2) voluntary participation with signed informed consent; and (3) complete collection of health service utilization and household economic indicators. This study was approved by the Medical Ethics Review Committee of Ningxia Medical University (Approval No.: 2021-G152).

1.2 Survey Methods

1.2.1 Survey Methodology: From June-July 2022, a multistage stratified cluster random sampling method was used to select survey subjects. Based on economic development levels, all administrative villages in townships across four counties in Ningxia Hui Autonomous Region (Yanchi, Haiyuan, Xiji, and Pengyang) were stratified into three levels: good, medium, and poor. Using a random number table method, sample villages were selected at a 40% proportion from each stratum. Systematic sampling was then applied to select 20-33 households per administrative village (40 villages in Yanchi County with 33 households each; 76 villages in Haiyuan County with 33 households each; 58 villages in Xiji County with 20 households each; and 33 villages in Pengyang County with 20 households each). All permanent family members (local residence $ $6 months) from each selected household were included as survey subjects, totaling 20,821 cases. The survey employed a questionnaire method, with investigators conducting face-to-face household interviews. The survey process involved on-site questioning of subjects, recording information, and immediate verification for completeness and retrieval after completion.

1.2.2 Survey Content: The questionnaire was developed by the research team and reviewed by experts before implementation. Main contents included: (1) general demographic characteristics including age, gender, education level, and occupation type; (2) health status including self-rated health, chronic disease prevalence, and mental health status; (3) health service utilization and accessibility including two-week consultation history, annual hospitalization history, and travel time to nearest medical institution; and (4) household and economic conditions including number of permanent residents, household consumption, household income, household borrowing, and housing area.

1.2.3 Quality Control: Detailed training manuals were developed and investigators received centralized training before the survey. During the survey, questionnaire content was verified level-by-level by investigators, team leaders, and quality control personnel to ensure completeness and validity. After the survey, double data entry was used for questionnaire data input.

1.2.4 Study Indicators: The dependent variable was outpatient health service utilization, measured by two-week consultation history. Independent variables were selected based on the Anderson model: predisposing characteristics including gender, age, marital status, education level, and occupation type; enabling resources including number of permanent household residents, annual household income, and type of nearest medical institution; and need factors including self-rated health status and hospitalization due to illness.

1.3 Statistical Analysis

EpiData 3.1 software was used for questionnaire entry, verification, and compilation. SPSS 25.0 was applied for data organization and statistical analysis, while Stata 17.0 was used for health poverty vulnerability calculation and influ-

encing factor analysis. Descriptive statistics were performed for demographic data, with count data expressed as relative frequencies. The ^{2} test was used for inter-group comparisons, and non-conditional Logistic regression analysis was applied for multifactorial analysis with a test level of α=0.05. To explore the influence of the three dimensions (predisposing characteristics, enabling resources, and need factors) on residents' health service utilization, three models were constructed: Model 1 included only predisposing characteristics, Model 2 included predisposing characteristics and enabling resources, and Model 3 included predisposing characteristics, enabling resources, and need factors. In the multifactorial non-conditional Logistic regression analysis, the dependent variable was health service utilization among health poverty vulnerability groups, while independent variables were selected from those showing statistical significance in univariate analysis. Variable assignments in the Logistic regression models are shown in Table 1 .

2.1 Health Poverty Vulnerability Grouping and Composition

Based on the three-stage FGLS calculation results, the health poverty vulnerability threshold was set at 0.5 [14]. Rural residents with health poverty vulnerability <0.5 were defined as the non-vulnerable group, while those with $ $0.5 were defined as the vulnerable group. The grouping results showed 5,229 cases (29.9%) in the health poverty vulnerable group and 12,248 cases (70.1%) in the non-vulnerable group.

2.2 Comparison of General Characteristics Between Health Poverty Vulnerability Groups

Statistically significant differences were observed between the non-vulnerable and vulnerable groups in gender, age, education level, marital status, occupation type, number of permanent household residents, type of nearest medical institution, annual household income, hospitalization due to illness, and self-rated health status (P<0.05). Regarding household size, the non-vulnerable group was concentrated in the 2–3 persons category (41.8%), while the vulnerable group was concentrated in the $ $6 persons category (43.4%). For annual household income, the non-vulnerable group had a higher proportion (41.1%) in the $ $60,000 yuan category, whereas the vulnerable group had a higher proportion (63.0%) in the $ $30,000 yuan category. Detailed results are presented in Table 2 .

2.3 Health Service Utilization Rates

The two-week consultation rate was 3.5% (185/5,229) in the health poverty vulnerable group and 4.5% (556/12,248) in the non-vulnerable group, with a statistically significant difference between the two groups (^{2}=9.054, P=0.003).

2.4 Comparison of Health Service Utilization Among Rural Residents with Different Characteristics by Vulnerability Group

Within the health poverty vulnerable group, statistically significant differences in health service utilization were found across gender, age, education level, marital status, occupation type, number of permanent household residents, self-rated health status, and hospitalization due to illness ($P<0.05$). Within the non-vulnerable group, statistically significant differences were observed across gender, age, education level, marital status, occupation type, number of permanent household residents, annual household income, self-rated health status, and hospitalization due to illness ($P<0.05$). Comparisons of health service utilization between the two vulnerability groups across characteristics including gender, age, education level, marital status, occupation type, number of permanent household residents, annual household income, hospitalization due to illness, and self-rated health status showed statistically significant differences ($P<0.05$), as shown in Table 3 .

2.5 Multifactorial Non-conditional Logistic Regression Analysis of Health Service Utilization by Vulnerability Group

As shown in Table 4 , goodness-of-fit tests for the constructed models indicated that across both vulnerability groups, the three models showed progressively stronger explanatory power for rural residents' health service utilization, with Model 3 demonstrating the strongest explanatory capacity. The Cox & Snell R^2 and Nagelkerke R^2 values increased substantially in both groups after adding need factors to Model 2, with greater increments compared to adding enabling resources to Model 1, indicating that need factors were the most significant influence on health service utilization for both groups, while predisposing characteristics and enabling resources were also important influencing factors.

Using health service utilization among health poverty vulnerability groups as the dependent variable (assignment: no utilization=0; utilization=1) and variables showing statistical significance in univariate analysis as independent variables (assignments shown in Table 1), multifactorial Logistic regression analysis was conducted. Results showed that in the non-vulnerable group, female gender, age 36–75 years, married status, divorced/widowed/other marital status, hospitalization due to illness, and self-rated health status of "fair" and "poor" were promoting factors for health service utilization, while household sizes of 2-3 persons, 4-5 persons, and $ $6 persons were inhibiting factors ($P<0.05$). In the vulnerable group, occupational category of "other," hospitalization due to illness, and self-rated health status of "fair" and "poor" were promoting factors, while education level of high school and above and household size $ $6 persons were inhibiting factors ($P<0.05$), as shown in Table 4.

3.1 Severe Health Poverty Vulnerability Situation in Rural Ningxia with High Proportion of Vulnerable Residents

This study found that health poverty vulnerability among rural residents in Ningxia Hui Autonomous Region reached 29.9%. According to World Health Organization analysis of China' s fourth national health survey data, approximately 173 million people in China fell into poverty due to illness, representing a poverty incidence of 7.5% [15]. This indicates that Ningxia' s risk of falling into poverty due to illness is significantly higher than the national average, presenting a challenging situation for poverty prevention in the health sector. The reasons may include: first, the southern mountainous areas of Ningxia have weak economic development foundations, relatively low rural incomes, and simultaneously suffer from scarce health resources and inadequate health infrastructure [16], resulting in weak capacity among rural residents to cope with health shocks; second, factors such as the COVID-19 pandemic have reduced rural residents' per capita disposable income [17], and COVID-19 patients may have increased catastrophic health expenditures [18], leading to temporary health poverty vulnerability for some rural residents and households.

3.2 Low Health Service Utilization in Rural Ningxia with Differences Between Vulnerability Groups

The study results show that health service utilization was 4.5% among non-vulnerable rural residents, while it was even lower at 3.5% among health poverty vulnerable residents. Compared with the national survey data showing a 12.8% two-week consultation rate in rural areas [19], this study' s results are significantly lower than the national average. The low level of health service utilization among Ningxia' s rural residents may be attributed to: (1) weak health awareness among some rural residents, lacking scientific and systematic health concepts, leading them to choose self-treatment or no treatment when ill [20]; and (2) the need to improve the primary healthcare system and institutions, as service capacity and quality constraints limit the development of primary health service utilization.

The lower health service utilization among health poverty vulnerable residents compared to non-vulnerable residents may have multiple causes. On one hand, income levels may affect healthcare expenditure capacity. The study results show significant income gaps between the two groups, which may lead to differences in health service utilization levels. On the other hand, health poverty vulnerable residents may have poorer initiative in health service utilization and more passive attitudes toward health risks, resulting in higher health poverty vulnerability and lower health service utilization. Additionally, differences between the two groups in awareness and capacity to prevent and respond to health shocks such as diseases may further affect their health service levels [21].

3.3 Need Factors as Primary Determinants of Health Service Utilization with Important Roles for Predisposing Characteristics and Enabling Resources

The study results indicate that for both health poverty vulnerable and non-vulnerable residents, need factors had the most significant impact on outpatient health service utilization, while predisposing characteristics and enabling resources also exerted important influences.

Regarding need factors, hospitalization due to illness and self-rated health status significantly affected health service utilization for both groups. Residents' health status has an important impact on health service utilization; those hospitalized due to illness often have poorer health status and greater medical needs, resulting in higher health service demand [22]. Self-rated health status is an important reference indicator for assessing residents' health status and health service needs [23]. In this study, lower self-rated health scores were associated with higher health service utilization rates, and this phenomenon was more pronounced among health poverty vulnerable residents, possibly because groups with poorer self-rated health often have higher disease prevalence and stronger desires for treatment and rehabilitation [24], thereby increasing health service utilization.

Regarding predisposing characteristics, gender, age, and marital status significantly affected health service utilization among non-vulnerable residents, while education level and occupation type significantly affected utilization among vulnerable residents. Women often require more medical resources due to physiological needs and have higher health risks and weaker disease resistance [25], leading to higher health service utilization. However, women in health poverty vulnerable situations may "suffer from uneven resource allocation" [26], preventing their needs from being reflected in utilization rates. Among non-vulnerable residents, those aged 36–75 years engage in more heavy physical labor such as farming or migrant work, which increases health risks and leads to higher health service utilization [27]. Family social support helps improve rural residents' self-health management efficacy; married residents may benefit from partners' social support and enhanced health management awareness [28], resulting in higher utilization rates. Among health poverty vulnerable residents, higher education levels correlate with stronger abilities to actively obtain health knowledge and self-health management awareness, but also higher expectations for medical services and dissatisfaction with local services, reducing their willingness to accept medical services [29]. Farming and migrant workers, constrained by their health literacy, may lack awareness to independently seek and utilize health services [30]. Additionally, health poverty vulnerable residents, lacking understanding of health policies and influenced by traditional concepts of "difficult and expensive access to healthcare," may avoid treatment to prevent expenditures when ill [31].

Regarding enabling resources, household size significantly affected both groups.

Among health poverty vulnerable residents, those with household sizes $ $6 persons had lower utilization rates, possibly because large households create enormous economic burdens, leading some residents to choose conservative treatment or no treatment when ill. Among non-vulnerable residents, those with household sizes >1 person had lower utilization rates, which may benefit from the positive impact of social support on health status [32].

4.1 Comprehensive Policy Measures Needed in Ningxia' s Health Sector to Consolidate Poverty Alleviation Achievements

First, given the high proportion of health poverty vulnerable populations in rural Ningxia, efforts should focus on establishing a rural health poverty vulnerability early warning system. Based on this forward-looking system, health poverty prevention policies should be formulated to provide early intervention for health poverty vulnerable residents and prevent illness-induced return to poverty. Second, for health poverty vulnerability caused by factors such as the COVID-19 pandemic that reduced rural residents' income and increased catastrophic health expenditures, these temporarily vulnerable residents should be included as key monitoring targets. Targeted assistance should be provided for their medical treatment and health insurance to help them transition smoothly through this temporary vulnerability.

4.2 Urgent Need for Practical and Effective Strategies to Improve Quality and Efficiency of Rural Health Service Utilization in Ningxia

First, Ningxia should further develop primary healthcare infrastructure based on existing foundations to ensure accessibility of basic public health services for rural residents and meet the growing health service demands resulting from chronic diseases and aging populations. Second, for non-vulnerable rural groups, simple and effective communication methods should be used to expand health promotion and education, focusing on improving rural residents' health awareness and health literacy levels. Third, for health poverty vulnerable residents, in addition to the above strategies, medical assistance measures should be further enriched on the basis of existing medical insurance to reduce household medical burdens, improve willingness to seek medical care, and ensure equitable access to healthcare.

4.3 Focus on Need Factors While Coordinating Predisposing Characteristics and Enabling Resources to Build a New Health Service Model Conducive to Rural Revitalization

First, regarding need factors, efforts should strengthen tiered diagnosis and treatment and the construction of medical communities, improve primary medical institutions' rescue capabilities and service levels to meet rural residents' health service utilization needs. Second, regarding predisposing characteristics and enabling resources, attention should be paid to health service utilization levels of socially vulnerable groups including women, the elderly, divorced/widowed

individuals, and large households. The positive role of medical insurance in bearing and resolving risks should be further leveraged to improve utilization efficiency among health poverty vulnerable residents and ensure that vulnerable groups can access convenient, efficient, and affordable medical services through insurance policies. Third, taking the reduction of rural residents' health poverty vulnerability as a breakthrough point, the long-standing causal link between disease and poverty in rural areas should be broken, and a new primary health service model suitable for consolidating poverty alleviation achievements and transitioning to comprehensive rural revitalization should be explored to further ensure equitable and accessible health services for rural residents.

Currently, health poverty vulnerability among rural residents in Ningxia Hui Autonomous Region remains at a high level, with outpatient health service utilization below the national average. Significant differences exist in outpatient health service utilization levels and influencing factors between different health poverty vulnerability groups. Therefore, there is an urgent need to deepen the reform of rural medical and health service systems and mechanisms, strengthen primary medical and health service system construction, and improve rural residents' health service utilization levels. Simultaneously, based on rural residents' health poverty vulnerability, classified management should be implemented to strengthen monitoring and assistance for health poverty vulnerable residents, provide forward-looking intervention for health risks, continuously improve medical security, and steadily increase health service utilization. For non-vulnerable residents, active health education should be conducted to improve health literacy and change traditional healthcare-seeking concepts. This study has several limitations: first, as the study population is from rural Ningxia, the results and conclusions should be extrapolated cautiously due to regional development constraints; second, the survey was conducted in 2022, and key indicators such as residents' healthcare-seeking behavior and household income may have been indirectly affected by the pandemic; finally, as a cross-sectional study, it cannot establish definitive causal relationships between influencing factors and health service utilization, potentially limiting policy recommendations.

References

[1] LI Jing, WANG Yuejin, YIN Yufei. Analysis of the vulnerability of poverty alleviation achievements in poverty-alleviated areas—Based on health poverty alleviation survey data from four provinces and four counties [J]. Social Science Front, 20, 331(1): 73-81.

[2] XIANG Qin, YAN Chun, MA Yan, et al. Classification and influencing factors of rural elderly' s vulnerability to health-related poverty in central and western regions of China [J]. Global Health Journal, 2021, 5(3): 9.

[3] ZHAI Shaoguo. Collaborative governance of health poverty: Logic, experience, and path [J]. Governance Studies, 2018, 34(5): 53-60. DOI: 10.15944/j.cnki.33-1010/d.2018.05.008.

[4] LIU Yue, LIU Huimin, LI Aichun, et al. Analysis of the connotation of health poverty and health poverty vulnerability [J]. Medicine and Society, 2018, 31(5): 8-10, 16. DOI: 10.13723/j.yxysh.2018.05.00.

[5] HU Zhaoyan, XIAO Wenwen, GAO Baokai, et al. Analysis of relative health poverty vulnerability and its influencing factors among rural women of child-bearing age in Ningxia [J]. Medicine and Society, 20, 36(4): 20-24. DOI: 10.13723/j.yxysh.20.04.004.

[6] DENG Rui, JIAO Feng. Analysis of health vulnerability in deeply impoverished areas from three-dimensional perspectives of time, capital, and environment [J]. Medicine and Society, 2020, 33(11): 9-14. DOI: 10.13723/j.yxysh.2020.11.00.

[7] WANG Sangui, LIU Mingyue. Mechanisms, implementation dilemmas, and policy choices of health poverty alleviation [J]. Journal of Xinjiang Normal University: Philosophy and Social Sciences Edition, 2019, 40(3): 82-91. DOI: 10.14100/j.cnki.65-1039/g4.20181204.001.

[8] CHAUDHURI S, JALAN J, SURYAHADI A. Assessing household vulnerability to poverty: a methodology and estimates for Indonesia [J]. Discussion Papers, 200.

[9] JING Zhengyue. Measurement and dynamic changes of health poverty in rural empty-nest elderly families—A case study of Shandong Province [D]. Jinan: Shandong University, 2021. DOI: 10.27272/d.cnki.gshdu.2021.000065.

[10] LIU Yue. Research on the risk indicator system of health poverty vulnerability among rural elderly [D]. Wuhan: Huazhong University of Science and Technology, 2019. DOI: 10.27157/d.cnki.ghzku.2019.002289.

[11] GUO W Q, DU J C, CHEN K X, et al. The mediation path of physical multimorbidity on the vulnerability to health-related poverty of rural aging families in Ningxia, China: a cross-sectional survey [J]. Front Public Health, 20, 10: 993977. DOI: 10.3389/fpubh.20.993977.

[12] LI Yue'e, LU Shan. Evaluation of the theoretical construction and analytical path evolution of the Anderson model [J]. Chinese Health Service Management, 2017, 34(5): 324-327, 334.

[13] LI Yue' e, LU Shan. Development, application, and implications of the Anderson model in the medical and health field [J]. Chinese Journal of Health Policy, 2017, 10(11): 77-8. DOI: 10.3969/j.issn.1674-298.2017.11.01.

[14] XIANG Qin. Identification and mechanism of multidimensional health risks of poverty vulnerability in rural elderly chronic disease families [D]. Wuhan: Huazhong University of Science and Technology, 2021. DOI: 10.27157/d.cnki.ghzku.2021.004926.

[15] WEN Xingsheng. Discussion on implementation strategies for targeted

medical insurance poverty alleviation [J]. China Health Insurance, 2017(4): 15-18. DOI: 10.19546/j.issn.1674-3830.2017.4.005.

[16] ZHANG Wenli, XIE Fang. Research on equalization of basic public services in northwest ethnic regions—An empirical analysis based on equalization of basic medical and health services in Ningxia [J]. Journal of Northwest Normal University: Social Sciences Edition, 201, 49(3): 121-127. DOI: 10.16783/j.cnki.nwnus.201.0.0.

[17] SHEN J F, SHUM W Y, CHEONG T S, et al. COVID-19 and regional income inequality in China [J]. Front Public Health, 2021, 9: 68715. DOI: 10.3389/fpubh.2021.68715.

[18] LI X Z, JIN F, ZHANG J G, et al. Treatment of coronavirus disease 2019 in Shandong, China: a cost and affordability analysis [J]. Infect Dis Poverty, 2020, 9(1): 78. DOI: 10.1186/s40249-020-00718-3.

[19] XU Ling, MENG Qun. Results of the fifth national health service survey—Part 2: Health service needs, demands, and utilization [J]. Chinese Journal of Health Informatics and Management, 2014, 11(3): 193-194. DOI: 10.3969/j.issn.1672-5166.2014.0.01.

[20] HE Jiahui, LI Peiwen, MA Ximin, et al. Study on influencing factors of non-consultation behavior among rural residents with two-week illness in western China [J]. Chinese General Practice, 20, 26(16): 1946-195. DOI: 10.12114/j.issn.1007-957.20.0628.

[21] MA Yan, XIANG Qin, YAN Chunyang, et al. Poverty vulnerability and health risk action path of families of rural elderly with chronic diseases: Empirical analysis of 1,852 families in central and western China [J]. Front Public Health, 20, 10: 776901. DOI: 10.3389/fpubh.20.776901.

[22] SHU Shujing, MIAO Chunxia, HUANG Chang, et al. Study on healthcare institution selection and influencing factors among Chinese residents based on Shapley value method [J]. Chinese Health Service Management, 20, 39(7): 509-51, 526.

[23] TAMAYO-FONSECA N, NOLASCO A, QUESADA J A, et al. Self-rated health and hospital services use in the Spanish National Health System: a longitudinal study [J]. BMC Health Serv Res, 2015, 15: 49. DOI: 10.1186/s12913-015-1158-8.

[24] HAO Aihua, CHEN Chutian, LANG Lingling, et al. Relationship between self-rated health and health service utilization among elderly people [J]. Chinese General Practice, 2021, 24(7): 818-8. DOI: 10.12114/j.issn.1007-957.2021.00.0.

[25] XIE Yixian, BAO Xinyu, ZHANG Xiaoxia, et al. Impact of health-related quality of life on health service utilization among community residents [J]. Chinese Health Economics, 2019, 38(4): 60-6. DOI: 10.7664/CHE20190416.

[26] LI Cong, WANG Yue, WANG Lei. Gender differences in rural multidimensional relative poverty—From the perspective of intra-household resource allocation [J]. Journal of Management, 20, 35(4): 65-79. DOI: 10.19808/j.cnki.41-1408/F.20.0039.

[27] CHENG Yu, WANG Ziqi, GUO Meijun, et al. Influencing factors and marginal effects analysis of hospitalization service utilization among rural elderly residents [J]. Medicine and Society, 2021, 34(6): 59-6. DOI: 10.13723/j.yxysh.2021.06.01.

[28] TANG Yanyan, GAO Hongxia, WU Jing, et al. Impact of social support on health management effectiveness among chronic disease patients in Wuhan communities [J]. Medicine and Society, 2017, 30(9): 1-, 11. DOI: 10.13723/j.yxysh.2017.09.001.

[29] JIANG Feng, LIU Jiangfeng, TIAN Kan. Analysis of health service utilization and influencing factors among Jiangsu residents from urban-rural disparity perspective [J]. Health Economics Research, 20, 40(1): 68-7, 77. DOI: 10.20043/j.cnki.MPM.202207299.

[30] ZHANG Ping, HE Lin, ZHANG Renhua, et al. Analysis of health literacy status and influencing factors among Guizhou farmer groups in 2019 [J]. Modern Preventive Medicine, 2021, 48(14):

[31] MA Ximin, LI Peiwen, HE Jiahui, et al. Analysis of hospitalization service utilization and influencing factors among elderly chronic disease patients in central and western rural China—A case study of four counties in Ningxia based on multilevel models [J]. Modern Preventive Medicine, 20, 50(2): 285-291. DOI: 10.20043/j.cnki.MPM.202207299.

[32] LI Dongfang, LIU Erpeng. Impact of social support on health status of rural residents [J]. Journal of Zhongnan University of Economics and Law, 2018(3): 149-156. DOI: 10.19639/j.cnki.issn1003-5230.2018.0045.

Author Contributions: LI Chunsheng was responsible for research conceptualization, design, data analysis, manuscript writing, and overall responsibility for the paper; WANG Youyun and SONG Mingsha were responsible for data organization, cleaning, and manuscript proofreading; QIAO Hui was responsible for theoretical guidance, content review, and quality control.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

ORCID Numbers: LI Chunsheng https://orcid.org/0009-0005-8365-8805; QIAO Hui https://orcid.org/0000-0003-3744-939x

(Received: 2024-04-10; Revised: 2024-12-26) (Edited by: WANG Shiyue)

Note: Figure translations are in progress. See original paper for figures.