

Research on the Measurement of Multidimensional Relative Poverty in Inner Mongolia's Pastoral Areas

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Abstract: China has achieved a comprehensive victory in the battle against poverty, marking a shift in poverty issues from absolute poverty to relative poverty. Addressing relative poverty has become a key element of the rural revitalization strategy and achieving the goal of common prosperity in the new era. This study focuses on the pastoral areas of Inner Mongolia and constructs a multidimensional relative poverty indicator system with characteristics of the region. The A-F method is employed to measure multidimensional relative poverty in these areas. The study finds: (a) Among the main factors leading to poverty in the pastoral areas, per capita household income, access to information, and educational attainment have higher contribution rates, with economic factors still playing a significant role in poverty; (b) Families identified as multidimensionally poor tend to face severe challenges of deep poverty and exhibit high heterogeneity; (c) The degree of relative poverty is positively correlated with policy dependence. This study aims to provide scientific evidence for the governance of multidimensional relative poverty in Inner Mongolia's pastoral areas.

Keywords: Inner Mongolia pastoral areas; A-F method; multidimensional relative poverty

Introduction

China is committed to building a socialist modern country. Important meetings have emphasized the need to comprehensively promote rural revitalization and common prosperity, with the core focus being on improving people's livelihoods. These initiatives also stress the importance of ensuring social equity and justice, as well as adhering to a people-centered development approach. Through reform, modernization will be advanced, with a strong emphasis on safeguarding people's wellbeing.

1. Construction of the Multidimensional Relative Poverty Indicator System

Multidimensional relative poverty analysis highlights the breadth and depth of poverty and the lack of individual capabilities. In this study, the "A-F" method is used to conduct a multidimensional assessment of relative poverty in the pastoral areas of Inner Mongolia. This method identifies both one-dimensional and multidimensional poverty, providing a comprehensive and scientific presentation of poverty levels. The construction of a multidimensional relative poverty indicator system for Inner Mongolia's pastoral areas is critical for identifying poor populations and calculating poverty indices. This system combines the global MPI, the UN Sustainable Development Goals, China's poverty alleviation policies, and the specific circumstances of pastoral areas. It includes five dimensions—income, development opportunities, health, quality of life, and social support—comprising twelve indicators. Equal weights are applied to the indicators, as detailed in Table 1.

Table 1 The index system, critical values and their weights of relative poverty measurement

Dimension	Indicator	Critical Value	Weight
Income	Per-capita net household income	If the household income is below 40% of the sample median (6667 yuan), assign a value of 1; otherwise, assign 0.	1/5
Development opportunities	Fluency in the common language	If fluency in the common language affects communication, assign a value of 1; otherwise, assign 0.	1/15

	Educational attainment	If the household head's education level is below junior high school, assign a value of 1; otherwise, assign 0.	1/15
	Information acquisition ability	If the household occasionally watches the national news broadcast or uses the internet, assign a value of 1; otherwise, assign 0.	1/15
Health	Self-rated health status	If any family member self-reports their health as "not very good," assign a value of 1; otherwise, assign 0.	1/15
	Annual out-of-pocket medical expenses of the family	If any family member's annual out-of-pocket medical expenses exceed 5000 yuan, assign a value of 1; otherwise, assign 0.	1/15
	Medical insurance	If any family member does not participate in social activities, assign a value of 1; otherwise, assign 0.	1/15
Quality of life	Housing safety	If there are safety issues with the housing, assign a value of 1; otherwise, assign 0.	1/15
	Drinking water safety	If there are safety issues with the drinking water, assign a value of 1; otherwise, assign 0.	1/15
	Medical treatment conditions	If the one-way travel time to the nearest medical facility exceeds 1 hour, assign a value of 1; otherwise, assign 0.	1/15
Social support	Social trust	If the person tends to be suspicious in social interactions, assign a value of 1; otherwise, assign 0.	1/10
	Social relations	If the household has limited interaction with relatives, friends, or neighbors, assign a value of 1; otherwise, assign 0.	1/10

2. Measurement and Indicator Decomposition of Multidimensional Relative Poverty in Inner Mongolia's Pastoral Areas

2.1 Data Sources

This study is based on questionnaire survey data collected from June to October 2023, which is used to construct the multidimensional relative poverty indicator system. The questionnaire includes 37 questions covering family member information, income and expenditure, quality of life, social security, social participation, and information access. The survey covered multiple regions, with 304 questionnaires collected and 286 valid responses.[1]

2.2 Measurement Results of Multidimensional Relative Poverty in Inner Mongolia's Pastoral Area Households

The poverty incidence in Inner Mongolia's pastoral households varies significantly across different dimensions. Among these, the poverty incidence related to information access is the highest at 56.79%, while the poverty incidence related to language fluency is the lowest at 5.92%. The poverty incidence for education level is 48.79%, and for per capita household income, it is 17.83%. In terms of health, most household heads self-reported good health, though some families face high medical expenses or lack medical insurance. Regarding quality of life, some families face housing and drinking water safety issues and difficulty accessing healthcare. In terms of social support, most respondents expressed trust in others or organizations and reported good relationships with people.

Table 2 Unidimensional poverty of herding households in Inner Mongolia pastoral areas in 2023

Indicator	Dimension: Poverty Incidence (%)
Per-capita net household income	17.83
Fluency in the common language	5.92
Educational attainment	48.79
Information acquisition ability	56.79
Self-rated health status	22.3
Annual out-of-pocket medical expenses of the family	32.4

Medical insurance	26.44
Housing safety	12.54
Drinking water safety	14.98
Medical - treatment conditions	21.96
Social trust	8.71
Social relations	8.37

The single poverty incidence indicator cannot fully reflect the poverty situation of households in pastoral areas. Therefore, it is necessary to analyze the multidimensional poverty conditions of 286 pastoral households under different threshold values, including multidimensional poverty incidence (H), average deprivation share (A), and multidimensional poverty index (MRPI). As shown in Figure 1, as the overall deprivation threshold value (k) increases, the multidimensional poverty incidence decreases. When the k-value reaches 0.7, the multidimensional poverty incidence is very low. This is because the widening of the poverty threshold leads to an increase in the poverty thresholds for pastoral households across multiple indicators, and consequently, the number of households identified as multidimensionally poor decreases.^[2-4]

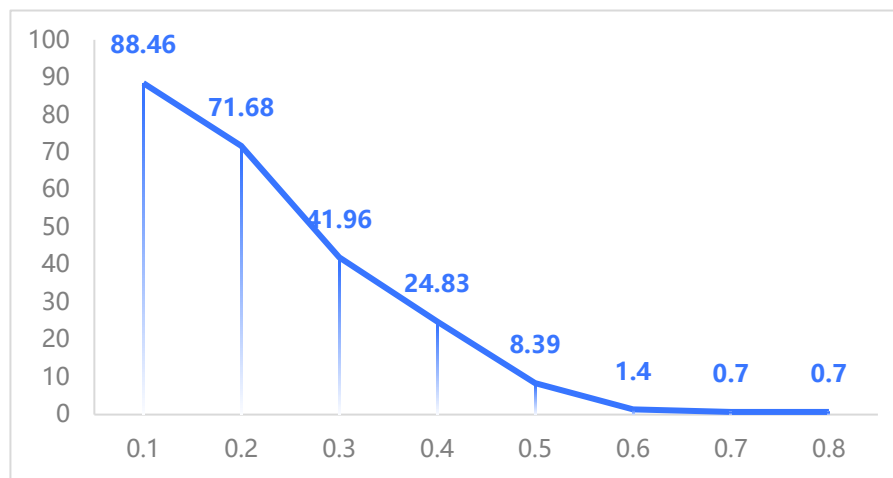


Figure 1 The changing trend of the incidence of multidimensional poverty

As shown in Figure 2, the average deprivation share for the overall sample shows an upward trend. This is because the increase in the k-value significantly reduces the number of multidimensionally poor individuals, indicating that pastoral households are identified as poor on more indicators. When the k-value reaches 0.7 or 0.8, the average deprivation share exceeds 83%, meaning that the average multidimensionally poor pastoral households are deprived on more than 10 indicators, all falling below the threshold. Although the number of multidimensionally poor pastoral households decreases, once identified, they face more severe issues of deep poverty.

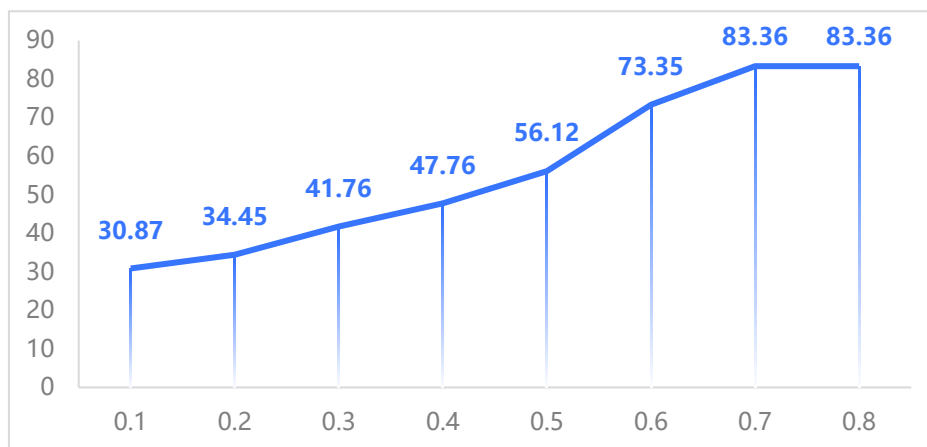


Figure 2 The changing trend of the average deprivation share

As shown in Figure 3, as the parameter k gradually increases, the overall multidimensional poverty index of the sample decreases, indicating that the intensity of multidimensional poverty in the sample

households weakens. The multidimensional poverty index is the product of the multidimensional poverty incidence and the average deprivation share. Although the increase in k raises the average deprivation share, the overall multidimensional poverty index still shows a similar declining trend to the multidimensional poverty incidence. This suggests that the intensity of multidimensional poverty is primarily influenced by its breadth. That is, as poverty tolerance decreases, the number of multidimensionally poor individuals rapidly increases, significantly raising the intensity of multidimensional poverty.^[5-8]

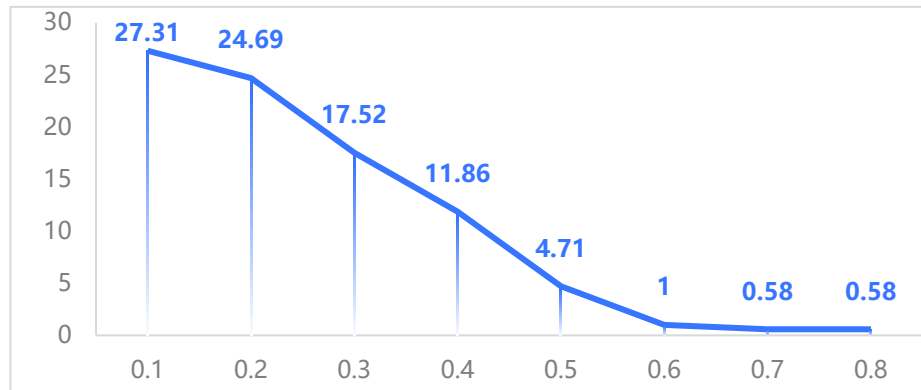


Figure 3 The changing trend of the Multidimensional Poverty Index

2.3 Indicator Decomposition of Multidimensional Relative Poverty Index in Inner Mongolia's Pastoral Households

The decomposition of the relative poverty index reveals the impact of different dimensional indicators on multidimensional poverty. As shown in Table 3, at different threshold values (k), the contribution rates of indicators such as household per capita income, information access, education level, medical expenses, social trust, and relationships vary. For example, at $k=0.3$, the contribution rates of the top three indicators are 33.90%, 11.97%, and 9.58%, respectively. At $k=0.6$, the contribution rates of the top six indicators are 27.9%, 14%, 14%, 9.32%, 6.99%, and 6.99%, with medical insurance and healthcare conditions each contributing 6.99%. At higher threshold values, $k=0.7$ or $k=0.8$, except for household per capita income, social trust, and social relationships, the contribution rate of the six indicators is the same, at 8.034%. Meanwhile, the contribution rates of housing safety and drinking water safety are 0 from $k=0.6$ to $k=0.8$.

Table 3 Decomposition of the Multidimensional Poverty Index

k	0.3		0.4		0.5	
	MRPI _j	Contribution rate	MRPI _j	Contribution rate	MRPI	Contribution rate
Per-capita net household income	0.0594	33.90%	0.0343	28.92%	0.0105	22.29%
Fluency in the common language	0.00303	1.73%	0.00256	2.16%	0.001166	2.476%
Educational attainment	0.01678	9.58%	0.01142	9.63%	0.00420	8.917%
Information acquisition ability	0.02098	11.97%	0.01352	11.40%	0.00490	10.40%
Self-rated health status	0.00956	5.46%	0.00769	6.48%	0.00256	5.435%
Annual out-of-pocket medical expenses of the family	0.01492	8.52%	0.01119	9.44%	0.00369	7.834%
Medical insurance	0.01142	6.52%	0.00816	6.88%	0.00326	6.921%
Housing safety	0.00629	3.59%	0.00466	3.93%	0.00186	3.949%
Drinking water safety	0.00699	3.99%	0.00443	3.74%	0.00140	2.972%
Medical - treatment conditions	0.00909	5.19%	0.00746	6.29%	0.00303	6.433%

Social trust	0.00874	4.99%	0.00699	5.89%	0.00699	14.84%
Social relations	0.00466	2.66%	0.00524	4.42%	0.00524	11.13%

(Continued Table 3)

k	0.6		0.7		0.8	
	MRPI _j	Contribution rate	MRPI _j	Contribution rate	MRPI	Contribution rate
Per-capita net household income	0.00279	27.9%	0.00140	24.14%	0.00140	24.14%
Fluency in the common language	0.000466	4.66%	0.000466	8.034%	0.000466	8.034%
Educational attainment	0.000699	6.99%	0.000466	8.034%	0.000466	8.034%
Information acquisition ability	0.000699	6.99%	0.000466	8.034%	0.000466	8.034%
Self-rated health status	0.000466	4.66%	0.000233	4.017%	0.000233	4.017%
Annual out-of-pocket medical expenses of the family	0.000932	9.32%	0.000466	8.034%	0.000466	8.034%
Medical insurance	0.000699	6.99%	0.000466	8.034%	0.000466	8.034%
Housing safety	0	0	0	0	0	0
Drinking water safety	0	0	0	0	0	0
Medical - treatment conditions	0.000699	6.99%	0.000466	8.034%	0.000466	8.034%
Social trust	0.001400	14%	0.000699	12.05%	0.000699	12.05%
Social relations	0.001400	14%	0.000699	12.05%	0.000699	12.05%

After conducting a quantitative analysis of the contribution rates to multidimensional poverty, it is necessary to determine the poverty status of each dimension in pastoral households, i.e., to calculate each dimension's contribution to the multidimensional poverty index. The quantification process includes assessing the contribution rate of each indicator to the overall multidimensional poverty, and then determining the poverty status of each dimension in pastoral households. As shown in Table 4, when k is set to 0.3 and 0.4, the ranking of dimensions remains the same, with poverty severity in the following order: income, development opportunities, health, quality of life, and social support. As the k-value increases, the contribution rate of social support rises, while the contribution rate of quality of life decreases.^[9]

Table 4 Contribution Rates of Each Dimension to the Multidimensional Relative Poverty Index
Unit: %

Dimension	k=0.3	k=0.4	k=0.5	k=0.6	k=0.7或k=0.8
Income	33.90%	28.92%	22.29%	27.9%	24.14%
Development Opportunities	23.28%	23.19%	21.79%	18.64%	24.10%
Health	20.50%	22.80%	20.19%	20.97%	20.08%
Quality of life	12.77%	13.96%	13.35%	6.99%	8.034%
Social Support	7.65%	10.31%	25.97%	28%	24.1%

Data sources: Obtained from the collation of Table 3.

3. Identification of Relative Poverty in Inner Mongolia's Pastoral Areas and Conclusion

3.1 Identification of Relative Poverty

The calculation of the multidimensional poverty index depends on the threshold value k, which determines which groups are considered to be in relative poverty. When using the A-F method to measure multidimensional poverty, selecting an appropriate k-value is crucial ($0 < k < 1$). A household is considered multidimensionally poor if its overall deprivation index exceeds the k-value. Currently,

there is no unified standard for determining the k-value, but in the United Nations Development Programme's MPI index, the recommended k-value is 0.3, and most studies consider this value reasonable. This study also uses 0.3 as the critical threshold for multidimensional poverty. In Inner Mongolia's pastoral areas, if a household's multidimensional poverty composite score exceeds 0.3, it indicates that the household is poor on three or more indicators and is thus identified as multidimensionally poor. As shown in Table 5, the 286 sample households in Inner Mongolia's pastoral areas are divided into six categories using the natural break method based on their MRPI values: Non-poverty (0–0.3), Mild poverty (0.3–0.4), Moderate poverty (0.4–0.5), Severe poverty (0.5–0.7), Extreme poverty (0.7–0.9).

Table 5 The numbers and proportions of poverty identifications in Inner Mongolia pastoral areas

Poverty Intensity	Number	Proportion
Extreme Poverty	2	0.69%
Deep Poverty	26	9.09%
Moderate Poverty	48	16.78%
Mild Poverty	49	17.13%
Non-poverty	165	57.69%

Identifying poverty at the regional level is crucial, but due to the small and uneven distribution of data samples, only an overall analysis can be conducted. Survey data indicates that the characteristics of extremely poor households include old age, living alone, expenditures exceeding income, weak access to information, low education levels, poor health conditions, lack of medical insurance, inadequate healthcare conditions, high medical expenses, and insufficient social support. Deeply poor pastoral households are characterized by low education levels (mostly below junior high school), weak access to information, income and expenditure nearly balanced, lack of medical insurance, high medical expenses, and poor social support. Moderately poor pastoral households exhibit significant heterogeneity, with at least four indicators being deprived, and at least two of the first four indicators being deprived. Mildly poor pastoral households also show heterogeneity, with at least three indicators being deprived, and most households experiencing deprivation in the per capita income indicator.

3.2 Conclusion

Adjusting the threshold value k affects three dimensions of multidimensional poverty: breadth, depth, and intensity. Analysis shows that as the k-value increases, the multidimensional poverty incidence and multidimensional poverty index decrease, while the average deprivation share increases. When the k-value reaches 0.5 or higher, the multidimensional poverty incidence and index significantly decline. This indicates that, although the number of households identified as multidimensionally poor decreases, these households generally face more severe poverty issues and show greater disparities in their poverty characteristics.

When $k = 0.3$, the main indicators affecting the poverty of pastoral households are per capita income, information access, and education level, indicating that economic factors are the key constraints. As the k-value increases, the contribution rate of quality of life decreases, suggesting that significant progress has been made in improving water management, housing, healthcare, and transportation in Inner Mongolia's pastoral areas.

With the change in the k-value, the contribution rates of development opportunities and health to poverty remain consistently above 20%, indicating that these two aspects have a sustained and significant impact on poverty. Therefore, improving the educational level of pastoral populations, enhancing information access, and moderately increasing medical insurance coverage are key paths for poverty governance and achieving common prosperity.

Populations with a higher degree of relative poverty exhibit stronger reliance on policies, especially those in extreme and deep poverty with low education levels, poor access to information, tight family budgets, lack of medical insurance, high medical expenses, and insufficient social support. These groups are more dependent on the improvement of public policies to escape poverty.

From eliminating absolute poverty to addressing relative poverty, and ultimately achieving rural revitalization and common prosperity, these are the key goals in the path of socialist modernization with Chinese characteristics. This is not only an inevitable choice for China's social development but also the foundation for advancing Chinese-style modernization and realizing the great rejuvenation of the Chinese nation. Facing the challenge of governing relative poverty, we must deeply analyze its characteristics, taking into account the regional development disparities and urban-rural integration

trends in China, and establish a multidimensional poverty assessment system with local characteristics, providing both theoretical and practical support for the precise identification and assistance of the poor.

Fund Project

Research on the Measurement of Relative Poverty, Poverty Heterogeneity Identification, and Anti-Poverty Path in Inner Mongolia's Pastoral Areas (NJSY21277), Inner Mongolia Autonomous Region Higher Education Research Project.

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